

6TH ANNUAL

FALL SYMPOSIUM OF STUDENT SCHOLARS

**NOVEMBER 19 - 21
2025**





PROGRAM

Wednesday, November 19: Poster and Visual Display Presentations

9:00am – 5:00pm: Poster and Visual Display Presentations

Thursday, November 20: Oral Presentations and Performances

9:00am – 9:50am: Southern Polytechnic College of Engineering and Engineering Technology (SPCEET)

10:00am – 10:50am: College of Computing and Software Engineering (CCSE)

11:00am – 11:50am: College of Architecture and Construction Management (CACM)

12:00pm – 12:50pm: College of Science and Mathematics (CSM)

1:00pm – 1:50pm: Radow College of Humanities and Social Sciences (RCHSS)

2:00pm – 2:50pm: Geer College of the Arts (GCA)

3:00pm – 3:50pm: Wellstar College of Health and Human Services (WCHHS)

4:00pm – 4:50pm: Bagwell College of Education (BCOE)

Friday, November 21: Virtual Presentations

12:00pm – 5:00pm: Virtual Presentations

Bagwell College of Education

Elementary & Early Childhood Education

An Analysis of Educators Workplace Conditions Compared to the General Service Workplace Conditions

Poster #21 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Savannah Gill

Research Mentor(s): Kristin Horan

The purpose of this study is to compare and examine workplace conditions of educators with those of workers within the general service industries. This was done in an effort to highlight the disparities in compensation, benefits, and job stability among educators. Using data from the NIOSH Institute for Occupational Safety and Health (NIOSH) Worker Health Charts based on a 2015 National Health Interview Survey, T-test analysis found that conditions such as paid sick leave and employer provided health insurance while negative conditions consisted of lower income, multiple jobs, and hourly pay. These results suggest that while educators experience greater job security and access to stronger benefits their overall earnings do not reflect the heightened demands and responsibilities that come from their respective roles. Addressing these wage disparities is vital in order to improve teacher satisfaction, reducing turnover rates, and improving overall education quality amongst students and learners. Future research should look to further explore how long-term trends and workplace policies can impact and influence teachers' overall wellbeing as well as different ways to improve compensation that could strengthen the education workforce.

Breaking the Pattern: Confronting Math Anxiety in Future Teachers and Exploring Solutions

Poster #23 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Summer Funk

Research Mentor(s): Paula Guerra

Math anxiety is a widespread issue that can most commonly be found in the lives of teachers and, more specifically, pre-service teachers. Previous studies have shown that pre-service teachers who suffer from math anxiety can negatively impact their students' academic performance in math, transmit those feelings to students, foster math-avoidant tendencies, and ultimately feed into a decline of mathematical achievement. However, the programs designed to train future teachers often do not meet the mark when it comes to combating math anxiety or

sufficiently preparing student teachers to teach math effectively. This study investigates how pre-service teachers define math anxiety, what strategies are available to address the issue, and the lasting impact it has on both their development and their future students. It adopts a unique perspective in efforts to fill knowledge gaps surrounding math anxiety in the lives of pre-service teachers, while simultaneously discovering ways to make positive changes that will impact the generations of teachers and learners to come. Pre-service teachers in U.S. teacher preparation programs were surveyed to gain a comprehensive understanding of their math anxiety. This was done using a lens that explores student perspectives from a variety of universities, stages of educational experience, and backgrounds. Survey results found that nearly 93% of pre-service teachers believe that math anxiety is a common issue for their peers that needs to be addressed. Other findings highlight that 80% of pre-service teachers desire more support from their college preparation courses. Specifically, 73% of pre-service teachers expressed a desire for courses that prioritize conceptual understanding, and 80% said they need help developing coping strategies for math anxiety. These results present a need for early intervention in teacher preparation programs in order to help reshape perspectives on mathematics in both future educators and their students.

Children Experiencing Homelessness in Early Childhood Education

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Undergraduate Student(s): DeSai Scott

Research Mentor(s): Jinhee Kim

This study examines how early childhood teacher education addresses issues of homelessness. While existing literature has explored the experiences and challenges of children experiencing homelessness within the school system, there remains limited discussion of homelessness within teacher education. Adopting the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher et al., 2015; Page et al., 2021), we searched for studies related to homelessness in early childhood education using key terms (e.g., “homelessness,” “homeless”) through the EBSCO databases. From an initial pool of approximately 114,000 articles published between 1996 and 2025, we identified 764 studies addressing children experiencing homelessness and focused on studies published in early childhood education journals (Early Education and Development, Early Childhood Education Journal, and the Journal of Early Childhood Teacher Education). From the selection process, 35 empirical studies were selected for analysis. Our findings indicate a paucity of research on how teachers and teacher candidates are prepared to support children experiencing homelessness. Most existing studies emphasize the challenges faced by these children rather than how teachers support them in their classroom. This study offers insights for teacher education programs seeking to better prepare educators and researchers to support marginalized children.

Education Leadership

Empowering Students for Success in the Workplace

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

4:00pm – 4:50pm

Undergraduate Student(s): Amelia Baker

Graduate Student(s): Ahmad Ali

Research Mentor(s): Brian Wooten, Christine Ziegler, Judy Craven, Nicole Philips, Justin Lawhead

Although a bachelor's degree is commonly viewed as a pathway to career success, many students graduate without the practical skills and real-world knowledge needed to thrive in the workplace (Song, 2025). Employers are placing greater importance on critical thinking and soft skills such as communication and collaboration—areas that traditional academic programs may not always prioritize. In spring 2025, a multi-institutional team developed and completed a research study evaluating the curriculum of a course focused on preparing students for the workforce. Individuals in business, government and/or non-profit communities reviewed the current course curriculum and offered insight for emerging trends needed to support the success of the students as they enter the work world. The survey included eight major areas: work essential skills, graduate readiness for workforce entry, understanding personal motivations and values, identifying strengths and growth areas, understanding organizational culture, behaviors that support early career success, the value of mentoring, and navigating workplace culture. Preliminary findings (N = 128) revealed that most respondents had over six years of professional experience and emphasized the growing need for employees who demonstrate adaptability, communication, and leadership skills. Respondents also underscored the importance of understanding workplace culture and aligning personal values with organizational goals. Results from the study will be shared as well as an overview of identified trends for better preparing students for work after degree attainment will be discussed.

Instructional Technology and Innovation

"Chess, Not Checkers": Strategic Navigation of Intersectionality by Black Women in EdTech Leadership

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

4:00pm – 4:50pm

Graduate Student(s): Monika Davis

Research Mentor(s): Laurie Dias

Although diversity in educational and technology leadership is increasingly recognized as a factor that can improve student learning outcomes, Black women are significantly underrepresented in these roles. The purpose of this phenomenographic study was to explore the varied ways Black women in educational technology (EdTech) leadership roles within public school districts experience and perceive their positions. Existing literature on Black women in educational leadership and corporate IT highlights pervasive tokenism, technical credibility challenges, and cultural taxation. However, it critically lacks empirical exploration of these specific intersectional realities within K-12 EdTech leadership. Using in-depth semi-structured interviews with seven Black women district leaders, this research investigated the compounded realities they navigate, including gendered cultures, microaggressions, and systemic barriers. The findings identified eight categories of description organized into a four-layered outcome space that models the strategic transformation of these experiences. This structure reveals the proactive resilience and agency, metaphorically described as "Chess, Not Checkers," by which these leaders fulfill their mission to drive digital equity. The results advance the understanding of their leadership journeys and provide insights to support the advancement of Black women in EdTech.

College of Architecture and Construction Management

Architecture

Adaptive Refuge: Reimagining Biophilic Settlements for Sudanese Refugees in Addis Ababa, Ethiopia

Poster #18 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Neeya Yahaya

Research Mentor(s): Robin Puttock

Every day, thousands of people are forced to flee their homes escaping war, disaster, and instability. What begins as a temporary refuge often becomes a lifetime condition. In Ethiopia, over 4.6 million refugees live within this state of protracted displacement, with more than one-fourth arriving from Sudan after the 2023 conflict. Most remain in remote, rural camps along border regions far from the educational, economic, and social opportunities of the city. These spatial and social divides reinforce dependency, limit access to livelihood, and erode personal dignity. Yet proximity to urban infrastructure could offer a pathway toward belonging, participation, and long-term resilience. This thesis asks: How can refugee settlements be re-envisioned as adaptive, biophilic, and semi-permanent communities that promote healing, education, and livelihood? Centered in Akaki-Kality, a transitional district on the southern edge of Addis Ababa, Ethiopia the project proposes a new model for urban-accessible refugee living. Through biophilic design principles, it reframes the refugee camp as a living system composed of adaptive housing clusters, wellness and learning centers, and shaded courtyards that connect people through ecology and community. Using precedent analysis and qualitative research, the study investigates how architecture can merge environmental systems, material adaptability, and human-centered design to create places of belonging rather than containment. Ultimately, this project envisions displacement not as isolation, but as integration where architecture becomes a catalyst for ecological restoration, social empowerment, and collective healing. It positions design as a bridge between humanitarian relief and long-term urban development, transforming the refugee camp from a symbol of crisis into a framework for regeneration.

Architecture as a Mediator: Where the Living and Water Coexist

Poster #21 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Rodrigo Carbajal

Research Mentor(s): Ehsan Sheikholharam Mashhadi

The Huatanay River once nourished the greatest civilization in South America, the Incan Empire. Now, its waters contain fecal coliform levels more than twenty times the safe limit and its banks lined with debris. A river that once tied the people together has become one that divides them. The Huatanay River, “the one that ties”, once anchored Cusco’s urban, agricultural, and spiritual systems, as noted by scholars such as John Hyslop and Carolyn Dean. Today, studies by the Instituto de Manejo de Agua y Medio Ambiente reveal that over eighty percent of Cusco’s wastewater flows untreated into the river, transforming this sacred artery into a source of contamination and loss. As a Peruvian who has stood beside its polluted banks, this disconnection feels personal. This design research explores how architecture can act as a mediator between people and their environment, drawing from Julia Watson’s Lo-TEK and Andean water traditions to reimagine the Huatanay as a living system capable of restoring reciprocity between culture, ecology, and community. Methodologically, this project employs historical research, cartographic analysis, and site observation to understand the Huatanay’s spatial, cultural, and ecological transformations. Qualitative mapping and visual documentation are paired with precedent and theoretical studies to bridge empirical research with speculative design. The Cheonggyecheon Stream Restoration in Seoul, Madrid Río in Spain, and the Los Angeles River Revitalization Plan serve as guiding precedents, revealing how urban rivers can be reclaimed as ecological and social infrastructure. The paper engages Julia Watson’s Lo-TEK: Design by Radical Indigenism, which values indigenous innovation and symbiosis with nature, alongside Kenneth Frampton’s Critical Regionalism, which situates architecture within cultural and climatic context. Together, these frameworks ground the argument that architecture, when rooted in memory and reciprocity, become the language through which the Huatanay River and its people learn to coexist again.

Architecture in Motion: How Arata Isozaki and Metabolism Ideals Reimagined Post War Cities and Inspired the Worlds of Japanese Animation

Poster #9 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Alyssa J. Nelson

Research Mentor(s): Ehsan Sheikholharam Mashhadi

What if the glowing skylines and collapsing towers of anime aren’t just fiction, but reflections of Japan’s architectural dreams and anxieties? The futuristic and post-apocalyptic worlds of animes such as Akira, Ghost in the Shell, and Neon Genesis Evangelion capture not only technological imagination but also the nation’s struggle to define its identity during this period of rapid modernization. Japan faced widespread destruction in several of its cities after World War II. In the decades following, Japan’s architects and artists were trying to make sense of rapid modernization and the loss of traditional identity. The Japanese Metabolism Movement, led by

figures like Kenzo Tange, Kisho Kurokawa and Kiyonori Kikutake, imagined architecture that could grow, evolve, and adapt like living organisms. Their projects, such as megastructures and modular housing systems, expressed optimism about human progress and collective growth. Pritzker Prize winner, Arata Isozaki, who began his career connected to this movement, later broke away from its utopian ideals. His postmodern work reflected skepticism toward stability and permanence, showing cities as unstable, fragmented, and constantly transforming. This paper explores how the architectural ideas of Arata Isozaki and the Japanese Metabolism movement influenced the way Japanese anime visualizes cities, technology, and the future. Through a comparative analysis of architecture and visual culture, this paper engages specific case studies in anime like Akira, Ghost in the Shell, and Neon Genesis Evangelion, alongside writings and works by Isozaki and key Metabolists. It draws on theories of modernity, postmodernism, and consumer culture to understand how architecture becomes narrative space in animation. Arata Isozaki and the Japanese Metabolism movement both reimagined how cities could grow and adapt to modern life. Their ideas didn't just stay in architecture but they helped shape the way anime visualizes the future. Metabolism's vision of living and flexible megastructures inspired anime's massive evolving cityscapes, while Isozaki's more postmodern and skeptical approach revealed the fragility behind that futuristic optimism. Together, their influence turned anime into a cultural space where architecture, technology, and identity collide, reflecting Japan's struggle to balance modernization, consumerism, and tradition in a fast changing world.

Architecture of Hope: Empowering the Youth Through Safe and Creative Spaces in Mexico

Poster #10 (Event Center)

9:00am – 9:45am

Graduate Student(s): Arturo Resendiz

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Architecture, to me, began as a medium of expressing creativity—an extension of my upbringing and my father's work in construction. Over time, I developed a new understanding of what it means to be an architect. I have come to realize that architecture is nothing more than an empty vessel; dormant until it is experienced. I believe we are here to use it as an instrument of connectivity—one that shapes relationships, strengthens community, and inspires hope. In many parts of the world, youth face environments defined by violence, drug abuse, and limited access to opportunity. The absence of safe and inspiring communities contributes to disconnection and vulnerability. This research responds to those conditions by exploring how architectural qualities can be leveraged to create spaces that protect, inspire, and connect young people. This thesis asks: How can architecture create environments that inspire youth identity, develop creativity, and offer alternatives to violence and drug culture in Mexico? The goal is to

develop design strategies that foster mentorship, discipline, and a sense of belonging through socially engaged architecture. Drawing from Giancarlo Mazzanti's work in Colombia and other Latin American precedents, the study analyses site conditions, community dynamics, and programmatic experimentation. It envisions a hybrid youth center that integrates education, sports, and the arts—transforming unsafe areas into meaningful places of encounter and pride. Architecture, when utilized as an active social tool, can unite and empower young people by creating environments that foster creativity, safety, and a sense of belonging. These spaces become catalysts for confidence and collective growth within vulnerable communities. Ultimately, this thesis positions architecture as a tool to strengthen community and develop our youth within safe environments. By providing spaces for self-expression and cultivating hope, design demonstrates its ability to create meaningful changes by building not only structures but also futures.

Atlanta Third Spaces: How Architecture Can Design Spaces for At Risk Youth

Poster #18 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Shannon Jones

Research Mentor(s): Robin Puttock

Juvenile crimes are rising in many US communities, amplifying stress, anxiety and safety concerns for teens, especially in high-crime neighborhoods where supportive spaces are scarce. This thesis tests whether the environment to design practice in teen focused third spaces, specifically lighting materials and restorative views can measurably reduce stress, anxiety, and violence among youth. Founded in environmental sociology, trauma enforced design and biophilic theory This evaluation centers on creative third space design that locates maker spaces for cooking, coding, woodworking and welding, and ceramics with a calm commons and an outdoor space the design centers on a creative third space prototype that integrates maker spaces such as skill studios, creative labs, and maker spaces, connected to a common space and outdoor learning gardens. Prior school research informs three core factors that guide the design process which are lighting quality, materiality, and views paired with flexible space. Glare controlled daylight supplemented by warm lighting supports calm, attentional focus, and perceived safety. Tactile, durable, youth safe finishes with meaningful acoustic absorption reduce ambient noise, enable de-escalation, and signal care and stewardship. Layered sightlines to nature, opportunities to spill outdoors, and rooms that reconfigure from quiet study to active making cultivate belonging encourage interaction. The intent is to provide a constructive, skill building alternative to destructive options by channeling after school hours into supervised making, learning, and belonging. Context mapping establishes City of Atlanta and Fulton County

boundaries and compiles layers for candidate third spaces, high schools, and residential hubs to visualize teen catchments and access.

Avant-Garde Architectural Influences in Japanese Cinema: The Influences of Kenzo Tange and Archigram

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Undergraduate Student(s): Aissatou Balde

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Kenzo Tange and Metabolists created a blueprint for utopian and organic urban futures in postwar Japan, inspiring the fictional worlds of Japanese cinema and animation, from Akira's cyber-punk cityscapes to Howl's Moving Castle's urban mobility. These futuristic cities have a lot in common with Archigram in their "Walking City" concept. While Metabolists focused on cities that could grow and change like living organisms, Archigram took it further by designing robot-like megastructures that could walk across the planet. Neither group built most of their ideas, but both used imaginative designs to rethink how cities could work in a fast-changing world. These visions made their way into Japanese pop culture. Films like Akira and Howl's Moving Castle show cities that are alive and full of movement, just like the ideas from Metabolism and Archigram. This paper examines how these avant-garde architectural movements helped shape not only how we think about real cities, but also how we imagine the future in films, anime, and pop culture.

Between Life and Death: Ritual of Discovering Water in the Depth of the Desert

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Undergraduate Student(s): Aissatou Balde

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Beneath the arid deserts of Iran, men once descended into darkness wearing kavan, the white burial shroud, to carve channels of water deep into the earth. Their descent was an acceptance of death in order to bring life, an act transforming labor into devotion. What does this reveal about the relationship between their work and belief systems? Going underground was not merely technical labor; it was a sacred act that blurred the line between survival and sacrifice. My research focuses on qanats, an underground water system that made life possible in dry environments. Qanats are an underground system that carries water from the mountains to villages across miles of dry land. What makes them interesting isn't just their engineering but also their "spiritual meaning". In many communities where qanats exist, water is seen as sacred, and the act of accessing it has religious importance. The workers who dig the qanats (muqannīs)

*often wear burial cloths (kafan) symbolically accepting death in order to bring “life” to their villages. This almost “self-sacrificial” act connects to the idea that people sometimes must risk or give up everything for the greater good. My thesis argues that qanats represent a journey between worlds, moving from darkness underground, like in Dante’s Inferno or Islamic beliefs of Barzakh (purgatory), into the light of life above ground. The construction of a qanat isn’t just a practical solution to getting water, but a sacred act of turning a lifeless desert into a place where communities can thrive. This can be seen as a form of religious sacrifice, where the land becomes sacred through the risk (dangers) and work of its people. Qanats have existed for thousands of years, spreading from ancient Iran to the Middle East, North Africa, and even parts of Europe and Asia. Their presence enabled entire civilizations to settle in previously uninhabitable regions and encouraged unique systems of collective labor and management. I will use texts from Mircea Eliade’s *The Sacred and the Profane* and Dante Alighieri’s *Dante’s Inferno* to explore the metaphor presented with qanats representing the border between life and death. My research will draw on spiritual symbolism and experience of qanat builders. This paper aims to show qanats are a technological innovation and an outlook on the sacredness of the land.*

Beyond the Policy: Xinhua’s Supportive Housing for Children

Poster #10 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Katharine Massey

Research Mentor(s): Robin Puttock

To some people children are seen as a blessing, but for China, they were considered detrimental to the economy status of the country. For 35 years China implemented a policy that limited families to one child so they could curb their rapid population growth and keep their image of being an economic leader of the world. This thesis will look at the lasting impact the one-child policy had on the population of China and what results has emerged since the law has ended, along with the 2024 stop on foreign adoption programs and who was most impacted by it. The research focuses on a site in Xinhua County, the fourth-most populous and rural county-level division in Hunan Province of China. The focus of the design will be to create an orphanage that gears to the care of children that were “left behind” due to their uncontrollable birth defects or mental disabilities. Biophilic, trauma-informed, and accessible design principles will be looked at on how they promote healing, safety, and resilience in children. Grounded in using these principles as a way to reimagine the orphanage as a sanctuary of belonging, the project explores how spatial qualities can help restore emotional stability in children recovering from abandonment or disability-related stigma. While limited information is widely available online, this research relies on the personal testimonies from books and the outreach approach to connections with creditable knowledge on this topic. By merging evidence-based design and cultural sensitivity, the project aims to demonstrate how architecture can become a healing space for China’s most vulnerable children.

Beyond the Wall: Reimagining Campus Architecture to Support Sexual Assault Survivors

Poster #10 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Olivia Aratea

Research Mentor(s): Robin Puttock

This thesis explores how trauma-informed design principles can be integrated into Kennesaw State University's Marietta Campus to promote psychological safety, emotional resilience, and reduction of trauma triggers for survivors of sexual assault. While trauma-informed approaches have been implemented in healthcare and counseling, their application within academic architecture remains limited. This gap is important to consider given the rising rates of sexual assault, which have increased 62.5% since 2020. Current data shows that four in five women (81%) and two in five men (43%) experience sexual assault in their lifetime, specifically noting that college-aged women are three times more likely to experience it than the general population. Given the ongoing emotional impacts of trauma among students, this research focuses on addressing that gap, establishing the built environment as an active agent in student healing and resilience. A qualitative research approach will be utilized, combining historical analysis, precedent studies, and site-specific observation. Behavioral and sensory mapping, the implementation of trauma-informed principles, and biophilic design strategies will inform an understanding of how architectural elements such as light, circulation, materiality, and spatial thresholds influence perceptions of safety and wellbeing, along with improvements in student performance despite the presence of anxiety, depression, and PTSD among sexual assault survivors. Through adaptive reuse of existing structures, proposing new "hubs" within the campus framework, and reimagined campus circulation, this thesis proposes a new composition of campus design that not only educates and spreads awareness but also restores trust, dignity, and emotional refuge.

Bridging Intergenerational Gap: A Campus for the Cohabitation of the Elderly and Foster Children

Virtual Presentation (Microsoft Teams)

12:00pm - 1:00pm

Undergraduate Student(s): Rachel Ayers

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Fifteen cigarettes per day: research on addiction underlines the severity of social isolation. Statistics show that addiction is proven to be the only way out of loneliness and isolation. There

are two groups that are at risk of being affected by this phenomenon: the elderly and the foster children. Architecture, as a spatial and social medium, has the capacity to mend these fractures. This design research explores how architecture can cultivate a sense of belonging and work against isolation through cohabitation of these two seemingly apart social groups. Social science research shows that both groups face alarming levels of loneliness, with studies revealing that nearly seventy percent of older adults and sixty percent of foster youth experience isolation. This paper starts with identifying needs for each group under examination to propose a spatial solution that incorporates their unique needs and emotional ideals. To bridge their distinct needs, this paper draws on the notion of “Third Space,” understood as an intermediary zone between separate domains to in the end connect them through architectural spaces. Social connection encompasses the structure, function, and quality of relationships, directly influencing our biological, psychological, and behavioral health. When these bonds weaken, so too does our sense of self and purpose. The overlap presents design opportunities to foster mutual support between two generations; but how can architecture be the solution to this problem? This design proposal envisions an intergenerational environment as a catalyst for human connection where the elderly may not only gather but also live, sharing daily experiences with the youth. Through intentional spatial programming and combining the wisdom of the elderly with the energy of the young, the project redefines architecture not merely as a building for human activity but as a participatory agent in the cultivation of community and the restoration of human connection.

Can Heterogeneity Be a Style? Rejection of Architect's Ego in the Place-based Practices of Tatiana Bilbao

Poster #12 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Madison Wall

Graduate Student(s): Karla Jacobs

Research Mentor(s): Ehsan Sheikholharam Mashhadi

We recognize architects by their signature style- a consistent formal language that has become integrated with their design identity. Their signature style reflects not only their personal vision, but also the dominance of the architect's ego in shaping the built environment. Tatiana Bilbao, however, resists this expectation. Her work, which she once described as “schizophrenic,” refuses to conform to a singular aesthetic style. Instead, Bilbao's projects come from specific cultural, social, and ecological contexts of each site prioritizing place-based solutions over personal authorship. This paper will explore whether such heterogeneity can itself be understood as a style- one that redefines the role of the architect in contemporary practice. Tatiana Bilbao's book, *A House is Not Just a House*, emphasizes her thoughts on architecture being place based and a site-specific expression. Architecture design should respond to specific cultural, social, and ecological contexts and many projects do, but is integrating a stylistic element into it necessary

or ornamental? Through an analysis of Bilbao's writings, interviews, and selected projects, this research will examine how her approach challenges the modernist approach of formal consistency by privileging collective authorship and site-specific expression. The work will show that heterogeneity could be considered a fundamental style characterized by a loyalty to function, by which the forms are solely guided. The traditional definitions of style and ornament will be questioned, providing valuable insights and considerations for architects who must all craft and refine their own style.

Combating Addiction with "Addiction:" Fostering Sobriety Through a Rehabilitation Center in Columbus, GA

Poster #12 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Coraima Perez

Research Mentor(s): Ehsan Sheikholharam Mashhadi

28 million – that is how many Americans ages 12 and older have developed an alcohol use disorder. In Columbus, GA, 19% of adults reported binge drinking at least once a month, the highest percentage in the state (according to the National Institute of Alcohol Abuse and Alcoholism). Research shows that addiction is driven by large surges of dopamine to the brain's reward center, reinforcing behaviors that become habitual and difficult to break. Though addiction is considered a psychological disorder, it is also a spatial one. A bar room, in this case in point, exposes individuals to these specific environments that trigger certain moods and behaviors: dim lighting, compressed circulation, and a visual focus on alcohol. Though rehabilitation centers are intended to support recovery, they are often used as a neutral backdrop instead of an active participant in recovery. But what if architecture can enable a person to resist one addiction by fostering other forms of addictive habits? This design research explores how architecture can create new routines and social habitus to undermine other modalities of addiction. This research draws from Pierre Bourdieu's concept of habitus – the embodiment of certain behaviors, rhythms, and dispositions shaped by spatial and social environments. Habitus is not just cognitive, but also physical: a body can learn patterns until they become instinctive. Architecture can therefore become a stage and a stimulus for alcohol addiction. This is further explored through Annabel Jane Wharton's view on how built spaces can have agency, and what effects buildings have on their users. A case study that focused on different phases of a person's recovery, which probed the research even more, was Clean and Sober Living in Fair Oaks, California. This design research argues, however, that architecture can also cultivate new forms of addiction that redirect compulsion towards well-being.

Convertible Small Spaces: Transforming Activities Using Linear Mechanisms

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

11:00am – 11:50am

Undergraduate Student(s): Jovann Ordonez Orozco, Alexis Brown, Cole Conaway, & Lillie Palmer

Research Mentor(s): M. Saleh Uddin

This project examines how linear mechanical systems can transform compact architectural spaces, support different activities, and create varied atmospheres. Using a 6'x6'x6' pod as a testing prototype, the design studies how rail tracks and X frame structures (linear mechanisms) enable walls and other structure components to slide, fold, or extend, altering the volume and function of the space. The pod transitions between programs such as dining, studying, and relaxing. A vital precedent, The Shed in New York City, demonstrates how movement and scale can reshape perception of openness and light. Its architectural phenomenology inspires this smaller, more intimate application of similar principles. The result is a compact and adaptable environment where mechanical design and sensory awareness work together to create a responsive and human centered architecture.

Crossing Heaven and Earth: Pilgrimage to Mountain Monasteries of Meteora as a Sacred Act

Poster #15 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Rachel Pickert

Research Mentor(s): Ehsan Sheikholharam Mashhadi

In northwestern Greece lies a sandstone formation of pillars climbing 1300 feet above the plain below. These massive stone columns were named Meteora, meaning lofty or elevated, signifying how their sheer cliffsides made access very difficult and dangerous. Despite this topographic challenge, the peaks of these pillars have been home for a community of Eastern Orthodox monasteries since the 9th century. Beginning as a refuge to hermit monks, the political upheavals in the 13th century led them to construct monasteries for shelter from Turkish attacks upon Greece. As a defense strategy, the only access points were removable ladders, hoisting ropes, or nets. These political threats have since disappeared, and yet monks have continued to keep the monasteries practically inaccessible. Why have they chosen such an isolated and perilous location to make their sacred dwelling? This paper explores the relationship between ascetic practices, extreme rituals, and spatial configurations to argue that architecture is not merely a background for religious practices, but what renders certain experiences possible. Monastic architecture does not provide solely a dwelling but can provide an environment for spiritual practices and define sacred space. This research draws on the distinctions between sacred and

profane space as developed by Mircea Eliade and further explored by scholars such as Shelley Ashdown, who states that sacred space is not exclusive but an ephemeral paradox. To illustrate how the sacred is constructed, this research also engages themes of liminality and spirituality through the works of Victor Turner and Thomas Barrie. By examining the monasteries through the lens of these scholarly works, this paper shows how the journey to access the monasteries of the Meteora mountains can blur the boundaries between profane and sacred space and evoke a liminal state.

Environments of Empathy: The Role of Architecture in Neurodiverse Well-Being

Poster #4 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Brooklyn Chance Devereaux Watson

Research Mentor(s): Robin Puttock

Architecture by its very definition is the art or science of building; that is, specifically the art or practice of designing and building structures and especially habitable ones. (Merriam Webster Dictionary) Besides being an art of habitable spaces, architecture influences how people experience belonging, comfort, and autonomy, yet contemporary design often overlooks the needs of all types of people, such as the neurodivergent experience. Despite advances in technology and policy, architectural design continues to lag in addressing the full spectrum of disability needs. The Americans with Disabilities Act requires accessibility in new construction, but is often interpreted through minimal interventions such as ramps, elevators, and accessible restrooms. (ADA National Network, 2024). While these measures are critical, they primarily serve visible and physical disabilities, leaving the sensory and cognitive needs of neurodivergent individuals, such as autistic young adults, largely unconsidered. Research has shown that inclusive design practices remain inconsistently implemented across the building industry, with many professionals still defaulting to compliance rather than innovation. (Zallio & Clarkson, 2021) bntThis research redefines accessibility as empathy, an active design approach grounded in human diversity. Through precedent studies, literature, and site analysis, it identifies inclusive tactics such as predictable circulation, sensory zoning, adaptable lighting, and acoustic control. The site at 77 North Park Square in Marietta provides an urban setting where civic and residential systems intersect, fostering both independence and connection. Synthesizing therapeutic, educational, and architectural insights, the project proposes empathetic housing that nurtures comfort, sensory balance, and belonging. Rather than separating neurodivergent and neurotypical users, the design celebrates difference, using architecture as a medium of care, inclusion, and shared humanity.

Expansion and Contraction through Mechanisms: Exploring through Design Build

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

11:00am – 11:50am

Undergraduate Student(s): Nancy Sanchez, Marfier Garcia, Kendel Constant, & Wendy Montalvan-Ortiz

Research Mentor(s): M. Saleh Uddin

Through the exploration of expansion and contraction, efficient spatial experiences are created through architectural design. For this studio-built project, it will focus on understanding how mechanisms can help with pulling and pushing outwards creating a kind of tension that makes space feel more dynamic and alive. The studio-built design will explore the expansion and contraction using mechanisms. For the design methodology, the process began with researching various types of mechanisms that examine the expansion through strategies of extension, projection, and spatial opening that connect interior to the surrounding context. The concentration is explored through the enclosure and spatial focusing that creates moments of intimacy and concentration. This paper aims to help position the contraction and expansion of the studio-built design to work together to create a space that people can experience. By using spatial sequences that alternate between expansion and contraction, the studio-built design creates open areas and tighter, more focused areas of the space. The expansion and contraction of the design creates a rhythm through the space that gives the illusion that the pod is breathing. The material choices and the lighting strategies are used to emphasize the rhythmic quality. Having textured surfaces such as the wood, will allow for the experience of the building to feel more grounded and contained. Light becomes an important aspect of the space as it floods the space to open and create a focus beam that compresses the feeling of the room. The research of this studio-built design demonstrates that expansion and contraction function to create experiential conditions that shape how the architecture is perceived and inhabited. The duality creates a unified design concept that responds to the programmatic needs of the design.

Form Beyond from Formalism: Geometry and Abstraction in Russian Constructivism and John Hejduk

Poster #19 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Justin Barkie

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Imagine a building where one's senses are gripped, where reflection is bred, and where perception itself is challenged. John Hejduk's expressive projects, often resembling animate forms rather than conventional buildings, reveal an architecture of imagination and personal narrative. Similarly, Russian Constructivists in the early twentieth century conceived monumental, geometric structures that embodied a collective, revolutionary ideal. Though separated by

ideology and time, both used abstraction and geometry to challenge architecture's traditional boundaries. This paper compares the formal and conceptual use of geometry in Constructivist architecture and Hejduk's "Masques," arguing that while Constructivists used form as a vehicle for social transformation, Hejduk internalized abstraction as a personal and poetic language. Drawing on Constructivist writings from Vkhutemas and Hejduk's own reflections and library of personal works, the research will explore how geometry and abstraction in architecture shift from a utopian, collective vision to an existential, individual expression. Through this shift, architecture becomes a language for personal reflection, exploring themes of memory, solitude, and existential meaning. The paper argues that abstraction, in both movements, becomes a mechanism to question architecture's social role moving from the political to the poetic, from the shared to the solitary.

From Efficiency to Ecology: The Changing Definition of "Sustainability" through the Lenses of 20th-century Modernism and 21st-century "Material Ecology"

Poster #23 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Wade Brock

Research Mentor(s): Ehsan Sheikholharam Mashhadi

As the changing climate refocuses the architect's moral obligations, the idea of sustainability has evolved from efficiency and moderation towards stewardship and reciprocity. A comparison of the works of the modernist architect Frei Otto and the "material ecologist" designer Neri Oxman reveals how two, distinct forms of experimentation --- the structural and biological, respectively --- highlight the moral necessity of design through empirical inquiry. Modernist architects of the 20th century, such as Ludwig Mies van der Rohe, advanced "Less is More" as an aesthetic of ethical economy: efficiency equated to virtue, a refutation of past epochs. Rejecting the fascist aesthetics of Germany's Third Reich, Frei pursued a minimization of matter through exhaustive form finding, developing tensile structural systems and lightweight envelopes, with the goal of an egalitarian and democratic built form. Presently, twenty-first-century designer Neri Oxman advances matter to the position of collaborator. Through her theory of "material ecology," Oxman integrates biological and computational methodologies to produce forms and structures that grow, calcify, and decompose, highlighting the environmental and architectural needs of the new millennium. This paper examines this shifting definition of sustainability through a comparative analysis of Otto's and Oxman's respective works. Drawing on their writings and projects, including Otto's Munich Olympic Stadium and Oxman's Aguahoja I & II, an argument is formed that suggests Otto's ethic of efficiency and Oxman's framework of symbiosis exist within two distinct ecological paradigms. Ultimately, Otto's sustainability is quantitative; Oxman's is qualitative. Together, their work traces the disciplinary shift from a modernist

efficiency to a posthuman ecology: from “less is more” to “what if the built environment lived with and beyond us?”

From Formalism of High-tech to Environmentally Conscious Design: A Transition in the Work of Renzo Piano

Poster #14 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): David Castillo

Research Mentor(s): Ehsan Sheikholharam Mashhadi

The architectural landscape is one that has rapidly been evolving, since the early remnants of monolithic building to present times. The creation of architecture was and has been a monumental invention that has reshaped how people experience the world around us. Renzo Piano is a famous and influential architect born in 1937, born to a family of builders. His architectural works were influential so much so that he was awarded the Pritzker Prize in 1998 for his multitude of works that had impact on the architectural landscape. His use of materials, forms, and design aesthetics were contributive in delivering exemplary design work in various buildings, including but not limited to civic, stadiums, offices, museums, educational, and cultural centers. One of his early works was one of his most influential: the Center Pompidou. Sustainable design has been around since ancient times and has evolved to become an integral part of the built environment. The concept of a sustainable building, while relatively new, focuses on minimizing the impact that buildings have on the environment by conserving resources such as energy and materials, integrating nature into architectural design, and creating accessible, healthy environments for all users. This paper examines the relationship between Renzo Piano’s works and sustainably conscious design. Using background information, the Pritzker prize and an understanding of the history of sustainable design definitions, I will be examining how Renzo Piano’s work shifted from utilizing light, expressive, and systematic forms synonymous with high-tech design to integrate more sustainably conscious buildings. These ideas will be examined and explained through his previous works.

From Stigma to Sanctuary: Reimagining Rehabilitation through Architecture in Mexico

Poster #21 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Karen Reyes

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Addiction is not a disease, society is. Rehabilitation is often burdened by cultural stigma, perceived as a sign of weakness, deficiency, or failure rather than an opportunity for growth and renewal. This thesis challenges the negative perception of rehabilitation centers by reimagining

them as architectural environments that affirm dignity and fosters belonging. It proposes an approach that moves beyond purely medical treatment to embrace the social, cultural, and spiritual dimensions of healing. Rather than isolating individuals during their recovery, these spaces are envisioned as sanctuaries that nurture community, dialogue, and reflection, encouraging individuals to see recovery as a shared and hopeful process. The project takes Ecclesiastes principles, which emphasize the seasons of life and the strength found in unity. These principles are deeply intertwined with Mexican culture and its Catholic heritage. In a society where faith and community are central to identity, these ecclesiastical teachings offer a powerful counterpoint to the stigma surrounding rehabilitation. They remind us that there is “a time to break down and a time to build up,” affirming that recovery, like all human experience, belongs to the rhythm of renewal. Within this framework, rehabilitation is understood not as an endpoint of shame but as a natural and transformative passage within the human condition. Architecture, in this vision, becomes both materially functional and symbolically expressive. It bridges the physical needs of recovery with the emotional and spiritual dimensions of human experience. The proposal explores how spatial arrangements such as communal gathering areas, contemplative gardens, and spaces for cultural and spiritual expression can embody a sense of renewal and hope. These design elements invite participation, reflection, and connection, allowing individuals to rediscover purpose and belonging. Through this lens, rehabilitation centers become places of integration rather than isolation, uniting body, mind, and spirit. The project positions architecture as an active participant in the healing process, capable of reshaping social attitudes as much as physical environments. It argues that when architecture acknowledges the dignity of human vulnerability, it has the power to restore meaning to spaces often associated with shame and separation. Ultimately, this thesis aims to redefine the cultural understanding of rehabilitation in Mexico by presenting it as a collective journey toward wholeness. It envisions spaces that restore not only health but also identity and community. By transforming the stigma surrounding rehabilitation into an architecture of hope and renewal, this project aspires to demonstrate that healing is not a condition of deficiency but an essential expression of humanity itself.

Globalized Sin: The Shortcomings of Globalization and the Importance of Regionalism in Architecture

Poster #1 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Adal Kahsai

Research Mentor(s): Ehsan Sheikholharam Mashhadi

At the turn of the twentieth century, architecture stood at a crossroads: should it carry forward the traditions of the past or embrace a new vision for the modern world? The decision to move forward led to the rise of modernism, a movement born from a desire to address the urgent needs of an industrializing, rapidly changing society. Groups such as CIAM (Congrès Internationaux

d'Architecture Moderne) formed to redefine architectural practice in response to new social, technological, and economic realities. However, while modernism aimed to be progressive and people-centered, it ironically became rigid, and its leaders became gatekeepers for what architecture should be on a global scale. Architects such as Le Corbusier and Mies van der Rohe understood that architecture must serve human needs, however, their universalist often abandoned specific cultures and regions. In seeking a one-size-fits-all solution, modernism failed the very people it claimed to serve, committing the greatest sin in architecture. This paper will explore how that contradiction emerged, and how later architects such as Álvaro Siza and Jeanne Gang have reoriented architectural practice towards a more contextualized, regionalist approach, that respond more authentically to the people it is meant to serve. Rather than demonizing globalized architecture, the goal here is to understand its limitations, learn from its missteps, and argue for a more nuanced, inclusive vision of architectural practice—one that places people, culture, and context at the center.

How Can an Educational Facility Help Farmers in Niger Affected by Climate Change?

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Undergraduate Student(s): Mari Sadou

Research Mentor(s): Robin Puttock

Niger is currently facing a severe food crisis worsened by climate extremes, with 80% of its population depending on rain-fed agriculture. The country ranks 19th among those affected by climate change and is the second most vulnerable nation in the world in terms of climate adaptation. It is experiencing rising temperatures and unpredictable rainfall that threaten health and food security, particularly for vulnerable groups such as children and mothers. In 2022 alone, over 4.4 million people required humanitarian assistance due to crop failures caused by drought, with nearly half of the children suffering from stunting. To tackle these challenges, a proposal has been made to establish an educational facility for farmers. This center will provide essential tools and resources to help them adapt to changing conditions. The facility will facilitate knowledge sharing in local languages and will include infrastructure such as a seed bank, research facilities, and community support areas. A strong focus on agricultural adaptation strategies—such as crop diversification and improved irrigation—will help prevent migration, create livelihoods, and enhance food security. The design of the facility will emphasize sustainability, serving as a model for how architecture can respond to climate change while minimizing environmental impact. By analyzing reports, scientific research, and case studies, this initiative aims to provide targeted support to farmers and foster a resilient community in Niger.

Immersion Into the Abyss: The Experience of the Sublime in the Georgia Aquarium

Poster #14 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Elliott Willis

Research Mentor(s): Ehsan Sheikholharam Mashhadi

*What image comes to mind when you think of an aquarium? Is it a place that you went to as a kid, sticky hands and an abject fascination with fish you called “Nemo” indiscriminately, or maybe a place that you got dragged to by your younger siblings when you could care less? But if we ask German theologian Rudolf Otto, he might express his encounter as Holy, as “mysterium tremendum et fascinans”—an experience of divinity that is both terrifying and yet enchanting. The goal of this paper is to expound on an aquarium’s capacity to evoke something sacred or holy. There is a long-standing connection between religion and the ocean. Constantin Jurca and Alina Burzarna-Tihenea in *The Sea, Cradle of Divine Spirituality* go into the many ways the ocean is intertwined with Biblical texts—the way God reveals himself through the sea. An aquarium is a space that facilitates a direct connection to the ocean. It’s also a space that is secular in nature—one that seems unlikely to hold spiritual significance. However, Julian Holloway in *Make-believe: spiritual practice, embodiment, and sacred space* and Mircea Eliade in *The Sacred & The Profane: The Nature of Religion* would argue the contrary. Even seemingly ordinary spaces can be transformed into that of the sacred through those that engage with it, but not everyone will view an aquarium as something inherently religious. Then what can be agreed upon is that an aquarium holds something sublime. Iris Murdoch in *The Sublime and the Good* calls to the idea that the sublime is something vast and formless—the juxtaposition of power and serenity. This paper explores the Georgia Aquarium, specifically, as a case for how it exemplifies this nature of “awe” and the “sublime” and how that relates to both the natural world and religious experience.*

Imposition or Integration: Comparing the Critical Regionalism of Luis Barragan and Phenomenology of Place of Peter Zumthor

Poster #11 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Katherine Valentinova

Research Mentor(s): Ehsan Sheikholharam Mashhadi

*There something remarkable of one walking into a space that evokes a feeling deeper than the surface and visual – in architecture, that term is coined phenomenology. The phenomenological and regional experiences offered by architecture can behold contrasting and yet converging features that evoke a range of human emotions. This phenomenological nature of place comes in a variety of expressions and perceptions. This paper explores these approaches to context by comparing the works of Latin American architect Luis Barragán and Swedish architect Peter Zumthor- specifically in the works of Barragán’s *Torres de Satélite* (1957) and Zumthor’s *Therme Vals* (1996). Besides style, these architects pursue emotionally resonant spaces that*

deeply connect to humanity, offering a similar sense of dwelling even in their diverging methodologies. Looking specifically into the way these sites were approached, the question of integration versus imposition arises. Torres de Satélite, a group of sculptures planted onto a traffic junction in Mexico City, offers an abrupt yet vernacular presence that is experienced as a reminder of the human capability for innovation in the world. Therme Vals, on the other hand, is notably merged into the rolling hills of Vals, Switzerland, appearing to be emerging from the context itself as a seamless presence both in structure and materiality. Comparing the two, they both offer nostalgic reminders for humanity's role in existence- being one of creation and innovation yet originating from the earth around us. As Barragan highlights vivid expressiveness of colors and planes, Zumthor highlights an intentional stillness and honesty of materiality and form in its given context. Despite crafting with a similar purpose in mind of heightening our awareness of belonging, both architects can offer information about the way a multifaceted humanity relates to itself.

Interweaving Cairo's Urban Fabric: The Historical, the Informal, and the Contemporary

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Undergraduate Student(s): Hagar Ahmed

Research Mentor(s): Ameen Farooq

*Architecture is a continuum, an ongoing dialogue between past, present, and future. It is a conscious act of preservation or erasure, remembrance or forgetting. Through design, we embed histories, needs, and identities into the built environment. Cairo, the palimpsest city, now faces an architectural crisis: the contemporary steadily encroaches upon the heart of the historic. The tabula rasa advances indiscriminately, threatening to erase entire neighborhoods, whether historic or informal, with equal indifference. While the value of preserving Cairo's historic fabric is widely accepted, an urgent question arises: should we also preserve the informal? Manshiyat Nasser, often known as Garbage City, stands as one of Cairo's most emblematic informal settlements. Nestled between Islamic Cairo and the modern developments of Mokattam Hill, this neighborhood has, for over five decades, sustained itself through the informal collection and recycling of the city's waste. The Zabbaleen, its inhabitants, have developed a deeply integrated communal system capable of recycling up to 80% of collected waste, surpassing even global leaders such as Germany. Here, recycling is not only labor but culture, a form of living heritage that embodies resourcefulness and community resilience. Yet this invaluable fabric stands on precarious ground. To its west rises a tourist promenade; to its east, sprawling luxury developments. The forces of erasure press in from both sides. Drawing from the ethos of Megawra – The Built Environment Collective and inspired by Hassan Fathy's vision in *Architecture for the Poor* and Alois Riegl's "the modern cult of Monuments," this research*

redefines what is worth preserving. It argues that the everyday, the lived-in, and the adaptive possess intrinsic cultural value. This thesis proposes an architectural framework that interweaves the informal, historic, and contemporary, envisioning Garbage City not as a relic to conserve but as a living organism to empower, sustain, and evolve.

In TSIRA: Trauma-Informed Architecture for Survivors of Violence in Northern Nigeria
Poster #14 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Ololade Akinyemi

Research Mentor(s): Robin Puttock

This thesis asks a focused question about how trauma-informed and sustainable design strategies in wellness centers can foster safety, healing, agency and empowerment for women and children survivors of gender-based violence in Northern Nigeria. Trauma-informed design centers safety and steadiness, using clear layouts, gentle light and sound, and consistent cues to lower triggers, while giving users real control over light, air, and privacy. Sustainability is framed as climate smart practice that adapts to local conditions through deep shade, glare free daylight, cross ventilation, rainwater capture, solar power, and repairable local materials. The proposal is set on a city edge site in Northern Nigeria and draws on compound traditions and daily movement patterns. Nature is used as a design tool through shaded courts, trees, water, and productive gardens that support therapy, routine, and livelihood. The scholarly context shows growing interest in trauma informed and biophilic strategies, yet findings are largely qualitative, Western centered, and hard to replicate in places like Northern Nigeria where survivors may face ostracization, bereavement, interrupted schooling, and complex reintegration with children and extended families across wide catchment areas. Methodology combines literature review, cultural mapping, and site analysis with program testing, adjacency modeling, and section first environmental simulations, and sets measurable outcomes for safety, healing, agency, and empowerment. Expected results include a transferable design framework and a design prototype organized by layered courts that pair care with education and livelihood, for example counseling beside clinic, and skills training beside childcare and a small market edge. The contribution is both design and method, offering spatial rules of thumb, evaluation metrics, and a phased delivery plan with local partners so that architecture can move beyond shelter to support recovery, dignity, and long-term reintegration.

Legacies of Revolution: Persistence of Constructivism in Contemporary Architecture
Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Undergraduate Student(s): Quentin Combs

Research Mentor(s): Ehsan Sheikholharam Mashhadi

How does the philosophy of past revolutionary movements persist into the modern age? Throughout the early 20th Century, liberation and revolution were defining aspects of several artistic movements and philosophies around the world. Questions arose concerning how this novel form of social consciousness could integrate industrial advancement into the fabric of contemporary society, technology, and everyday life. Stylization was struck down to foster a novel philosophy, one that would reflect the contemporary context and embrace the products of industrial society rather than idealizing what came before. Constructivism was that philosophy, taking cues from Futurism and Russian Avant-Garde, defining itself through abstraction and austerity in service of the 'revolution'. The movement itself persisted for decades, shaping how the Soviets presented themselves to the rest of the world, a bastion of advanced technology with a communist social purpose, influencing several art and architectural movements from the 1940s into the modern age. Legacies of Constructivist thought continue to influence architectural philosophies, construction technologies, and the built environment. While not a direct descendant of the framework, Carla Juaçaba; a Brazilian architect known for the spatial clarity, material usage, and community engagement of her distinctive work; may be representative of one of its contemporary reinterpretations. Her architecture synthesizes the industrial and social principles of her community into a contemporary, human-centric context. The comparative framework of this paper will investigate how Juaçaba's work reflects and reinterprets Constructivist ideals alongside architects such as Iakov Chernikov and others. It examines how these ideas persist through purpose-oriented design, austere abstraction, spatial dynamics, and social engagement. The case study of Humanidade2012, a collaborative project between Juacaba and Bia Lessa, shows how contemporary architecture can use historical philosophical thought as a conceptual tool to shape form, structure, and human experience across more formal, ideological, technological, and cultural lines.

Light and Labor: From Monumental Beauty to Communal Craft

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Undergraduate Student(s): Jesus Anaya-Ruiz

Research Mentor(s): Ehsan Sheikholharam Mashhadi & Karla Jacobs

What makes a building meaningful? The beauty of it or the craftsmen that put it together? This paper will dive into Louis Kahn's Kimbell Art Museum (1972) in Forth Worth, Texas, and Zhang Pengju's West Wusutu Village Community Center (2019) in Hohhot, China, projects that have different approaches to how architecture engages people and defines space. Louis Kahn's design is praised for its ability to exhibit art, he uses daylight as his primary material to define space and emotion. Through the use of cycloid vaults and reflected light he enhances the occupants' experience gently, expressing architecture through beauty, proportion and permeance. However, Zhang Pengju redefines the architectural value of his design through local construction practices rather than perfection. By using locally sourced materials like recycled

brick and timber, Zhang collaborated with the community collecting their knowledge and labor tactics to erect the building. The design itself isn't anything crazy and modern but it was built to blend in with the community's daily life - built for them and by them. This paper will examine how both architects translate culture and materials into form, yet they differ from one another. Khan's mastery of light and beauty versus Zhang's ability to conform with society and their environment to create a collaborative design using vernacular methods. Deep research and case studies on phenomenology, critical regionalism and socially inclined architecture will help drive the investigation of this paper. Explaining how architecture can go from serving as an artistic expression to a catalyst for communal empowerment. In conclusion, the investigation will back up how Kahn saw to define beauty through light and how Zhang differentiated in finding beauty in the given context and reality of place. Two equal architectural strategies that are distinguishable but shape the human experience.

Light And Silence

Visual Display #10 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Chandler Marshall

Research Mentor(s): Robin Puttock

This research investigates how sacred architecture can employ light and silence to create restorative spaces that support human well-being. Contemporary sacred environments often prioritize visual form and symbolism while neglecting the sensory and psychological dimensions that foster reflection, calm, and renewal. This study proposes light and silence as active design agents capable of shaping emotional, physiological, and spiritual balance. Using both qualitative and quantitative methods, the research analyzes precedents such as Tadao Ando's Church of Light, Peter Zumthor's Therme Vals, and Louis Kahn's Salk Institute for their orchestration of light, material, and atmosphere. These qualitative insights are evaluated through measurable frameworks including the WELL Building Standard, the 14 Patterns of Biophilic Design, and neuroscience-based research that connects environmental qualities with cognitive and emotional restoration. By integrating sensory experience with empirical data, the study establishes a dual framework that unites phenomenology and neuroscience. The results aim to demonstrate that when light and silence are designed intentionally, they can transform sacred architecture into environments that promote psychological clarity, circadian balance, and spiritual well-being. Ultimately, this thesis reframes sacred architecture as a multisensory and evidence-based practice, revealing that the orchestration of light and silence can serve as a pathway toward healing, contemplation, and restoration.

Modular Transformation of Architectural Assemblies Through Rotational Mechanism Systems

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Undergraduate Student(s): Quincy Smith, Jose Alejandro Carpio, Arturo Resendiz, & Chase Rogers

Research Mentor(s): M. Saleh Uddin

The focus of this research is on the configuration potential of modular transformation in architecture through rotational mechanisms. The value of this research is based on how mechanisms enhance architectural design in construction, transportation, and experience of space with mass-produced devices. This is especially relevant within compact areas or high-density environments, in which expansion or contraction is functionally and aesthetically desirable. Key elements of the flexible and dynamic nature of kinetic forms in this project are an examination of changes to program, circulation, experience, and the overall transportable nature of the entire assembly. Within experience specifically there is a wide range of interactive potential, from visual and physical privacy to varied levels of enclosure and social adjacencies. One of the important constraints for this research was a limited square footage for the design footprint and area of human experience. Another significant constraint for the study was the selection of basic rectilinear modules from the part-to-whole assembly scales. The methodological procedure for the analysis in this study involves precedent analysis, digital and physical model-making of prototypes, and visual matrices for comparison of different configuration options. The collection of rotational mechanism types, optimal application between various modules measured by visual and physical integration, and ideal application based on efficient transfer of weight loads underpin the assessment of mechanical systems. Quantifiable measurements include the ratio of modules to possible configurations, the ratio of possible configurations to experiential quality as measured by standard dimensions for human comfort, and the ratio of configurations to mechanical elements used. Expected production includes both a modeled example founded on insights gathered, and design rules for application in small-scale architectural interventions in which a single mechanical system can create strong variation for an engaging experience of the design.

Museums as a Religious Site: The High Museum of Art as a Numinous Experience

Poster #24 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Coraima Perez

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Fyodor Dostoevsky's face showed agitation and dread; he was enraptured by the distorted, suffering face of Jesus Christ, and could not help but just stand and watch with an unearthly emotion. The Body of the Dead Christ in the Tomb by Hans Holbein is an example of how a person can experience something beyond the canny. Rudolf Otto describes this feeling of the

presence of a divinity as numinous. It is revealing and indicative, coupled with “mysterium tremendum”, he draws attention to a non-rational, “awe-inspiring mystery” religious experience that people can feel. A sacred space can also break the bounds of reality, according to Mircea Eliade, and where hierophanies manifest the sacred. A similar experience can be found in museums, where our current-day example would be the High Museum of Art in Atlanta. Visitors feel as if they are going through a processional experience through the museum’s ramps. The skylights and the four-story atrium fill the museum with atmospheric light, and the design has places of pause and gathering. So, could museums be seen and experienced as religious and sacred spaces? This project investigates how museums, such as The High Museum of Art, can be considered religious and sacred spaces. The research draws on Rudolf Otto’s concept of “numinous,” where this “wholly other” falls outside the realm of the usual. This is further elaborated by Mircea Eliade, who, instead of studying the ideas of God, analyzed how humans experienced these ideas of the sacred. This research argues that there is holiness inside museum walls, where revelation, transcendence, and transformation can be found. This project demonstrates that, through its architectural procession, manipulation of light, and provision of spaces for contemplative pause, the High Museum of Art evokes a numinous experience.

Natural Disasters as Catalysts for Innovation in Architecture: Sustainable Solutions by Shigeru Ban and Nader Khalili

Poster #16 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Emmy Lopez

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Just as innovation is not limited to building types, compassion should not be limited by budget. Natural and manmade disasters displace millions worldwide, creating urgent needs for affordable, safe, and dignified shelter. This paper explores how architects Shigeru Ban and Nader Khalili respond to these challenges by blending cultural context, using sustainable materials, and creative techniques. Khalili’s earthbag structures, made from local earth and stabilized with minimal additives, offer economical, seismically safe homes inspired by traditional methods from Iran. Ban’s use of recyclable materials, such as paper and cardboard tubes, emphasizes emergency architecture in disaster zones like Japan and Korea, emphasizing fast, efficient use and environmental responsibility. Through a comparative analysis of their work, this paper investigates how cultural context and material innovation influence humanitarian architectural design. The paper argues that both, winner Architects from the Pritzker Architecture Prize and Aga Khan Development Network Award, redefine disaster relief as an opportunity for creative, compassionate design that restores dignity and supports people recover. This research demonstrates that effective disaster architecture does not have to rely on today’s high-tech solutions but on culturally informed, resourceful answers that respond directly to human needs.

People as an Architectural Material: Dwelling in the Reconstruction of the Nural Yaqin Mosque and the Memorialization of JFK

Poster #6 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Caleb Tuggle

Research Mentor(s): Ehsan Sheikholharam Mashhadi

*A tsunami, and an assassination. Architecture serves multiple purposes. At times it offers relief or respite to the victims of a tsunami; at others, it creates monuments to the victims of an assassination. But can these two types of functions relate? The JFK Memorial Library was built by I.M. Pei as a national response to the assassination of JFK. Dave Orlando and Fandy Gunawan designed the Nural Yaqin Mosque in response to the 2018 tsunami. Both architects share similar characteristics but in drastically different manners. I.M. Pei, a Pritzker Prize winner, has a vast body of monumental modernism. Orlando and Gunawan, on the other hand, have a single project recognized by the Aga Khan for its service to the community and the region. Both pay homage to past tragedy and lift it to a new plane of existence. But how can tribute be paid without independent agents—without free and active participation? The answer is—it cannot. This paper will shed light on the cross-pollination between these two works: one birthed in modernism, the other in regionalism. Although there are clear differences between the two movements and their ideologies, the intersection that exists in the articulation of their memorial spaces is fascinating. While one is characterized as placeless and the other might be seen as vernacularized, their similarities lie in how humans are given the pedestal to fulfill the space in both instances. As a philosophical anchor, this research draws from Martin Heidegger's seminal essay *Building, Dwelling, Thinking* (1951) to deepen the understanding of these claims. Although not an architect, Heidegger's writings inspired thinkers exploring belonging on a broader scale. These comparisons allow us to see through this lens—what it means for humans to be a material of architecture.*

Perception of Mental Illness: Exploring Spatial Impacts on Well-Being

Poster #8 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Dilan Stafin

Research Mentor(s): Robin Puttock

People with bipolar disorder often switch between depressive and manic states. This illustrates how the built environment can either enhance or undermine emotional experiences. However, the psychological impact of thresholds and transitions on mental health is rarely acknowledged in design. This thesis asks: How can architectural thresholds and spatial sequencing within a

museum in Harris County, TX, bridge the gap between spaces of abuse and spaces of care for individuals with bipolar disorder? The proposal transforms the museum from a neutral display area into a spatial framework for an immersive experience. The study investigates how light, materiality, sound, and spatial rhythm might represent psychological shifts between safety and vulnerability (Herman, 1992), drawing on trauma theory and therapeutic environmental design. To prototype a museum of experience and care, the project employs a qualitative and phenomenological methodology to examine case studies of trauma-informed and therapeutic architecture, spatial mapping of thresholds, and sensory sequencing within the Texas Medical Center sector. The final design uses thresholds as therapeutic mediators to help visitors move from confusion toward peacefulness by translating psychological variability into spatial rhythm. The museum suggests an architecture of care based on empathy and awareness by coordinating changes in light, size, and sound. In the end, this study makes the case that architectural sequencing may serve as a therapeutic language by redefining architecture as an active participant in mental health advocacy and bridging the gap between environments that cause damage and those that promote healing.

Reimagining the Urban Neighborhood Library: A Sanctuary for Restoring Human Connection in the Tenderloin

Poster #1 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Ahmed Shaker

Research Mentor(s): Robin Puttock

Childhood today, particularly ages 3-14, is increasingly defined by digital saturation and social disconnection, as screens and AI tools replace tactile, imaginative, and relational experiences that once nurtured growth and play. In this context, architecture can serve as a restorative force that rebuilds social connection and cognitive balance. This thesis explores how architecture can reimagine a neighborhood library in the Tenderloin as a family-centered civic sanctuary that accommodates children, fosters community interaction, and counteracts digital overstimulation, positioning it as a catalyst for the neighborhood's development. The Tenderloin, San Francisco's most child-dense yet open-space-deficient neighborhood provides an urgent testing ground where overstimulation, insecurity, and limited restorative environments erode daily well-being.

Through a mixed-method research and design process, the study integrates psychology, neuroarchitecture, and biophilic design to identify architectural strategies that strengthen family interaction, encourage human connection, and transform civic space into an active framework for community life. Literature on restorative environments and precedents such as Helsinki's Oodi and Charlotte's ImagineOn inform design strategies of refuge, play, and adaptability. Site analysis of the Tenderloin examines demographic pressures, environmental stressors, and spatial inequities to anchor the project within real urban conditions. The resulting proposal envisions an urban neighborhood library that extends beyond its informational function to become restorative

civic infrastructure: a family-engagement hub that weaves literacy zones, storytelling theaters, wellness rooms, and biophilic courtyards into an interconnected landscape of social and sensory relief. By positioning the library as both sanctuary and catalyst, the project demonstrates how architecture can transform digital overstimulation into an opportunity for urban renewal, family reconnection, and collective well-being.

Reintegrating the River: Sope Creek Mill as the Site for Reviving the Connection to Chattahoochee

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

11:00am - 11:50am

Undergraduate Student(s): Terra Castresana

Research Mentor(s): Ehsan Sheikholharam Mashhadi

What environmental feature does San Antonio, Chicago, and Atlanta have in common? Despite their radically different urban cultures, these cities are all built around rivers! As anthropologists have shown, rivers are foundational to the creation of human settlement, and many cities design their urban fabric to interact with their respective rivers. Despite the scale of the Chattahoochee River, a visitor of Atlanta might not see the river as it is covered with highways and other infrastructures. Since the inception of colonial Atlanta as a railroad town in the nineteenth century, the urban design deviated from having the rivers be central to the city's evolution, as scholarship shows. There was still an existing relationship with its rivers when waterways played essential roles in the economy as power sources for industrial mills. Once the economic use of mills declined, the relationship with rivers also fizzled out. This broken ecological relationship can be seen through the rise and fall of mills as a once-important part of Atlantean landscape. One such mill was Marietta Paper Mill on the Chattahoochee River that was once a booming economic source that lays abandoned today. These ruins symbolize the current relationship that the people of Atlanta have with rivers. This research design project brings into light the fraught relationship between Atlanta and its rivers. How can architectural interventions transform Sope Creek Paper Mill ruins to reconnect the broken ecological relationship between the Chattahoochee River and people into the urban fabric of Atlanta? This design research explores adaptive reuse of the Sope Creek Paper Mill as a technique to revive the connection between people and the Chattahoochee River. By reprogramming the Sope Creek Paper Mill and restoring the space, people who are not just hikers would interact with the space and establish their connection to the Chattahoochee River.

Resisting Globalization: Gando Primary School and Majara Residence Beyond Critical Regionalism

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Undergraduate Student(s): Gerdon Chavez

Research Mentor(s): Ehsan Sheikholharam Mashhadi

What happens to countries that do not have the economic power to initiate or keep up with globalization? In moments of revolution, architecture often plays a pivotal role in shaping and boosting the economy for cities. However, this is more often portrayed or studied in wealthy countries like Germany, Russia, and the United States. Countries that do not have economic power, especially developing nations, begin to mix culture with modern architecture. The Gando Primary School, a project located in Gando, Burkina Faso is a school that was built cooperatively by the village community funded by members who lived away from home. This project consisted of clay walls that support a double structured roof and a tin roof that made the inside of the building up to six degrees cooler than a singular layer tin roof. This project was awarded the Aga Khan Award for Architecture and contributed to Francis Kéré receiving the Pritzker Architecture Prize. Similarly, the Majara Residence was awarded the Aga Khan Award in 2025, which is described as a vibrant archipelago of varying programs that serve to incrementally build an alternative tourism economy. This paper investigates how architects Francis Kéré and ZAV Architects Collective used local materials and community engagement to develop impactful buildings that reflect the local culture. This paper compares these two precedents through the interpretation of Kenneth Frampton's 6 Points of Architecture Resistance, showcasing the resistance to globalization aesthetics through a design strategy that incorporates the unique characteristics of a specific location. This research argues that struggling countries or cities can combat the standards of globalization through designs that involve the community, adapt to local materiality, and embrace culture, establishing cultural agency.

Port of Being

Poster #24 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Ninnti Crooks

Research Mentor(s): Ameen Farooq

In the furthest, West Point of Africa, Dakar Senegal, the current fishing port is dually acting as a driver for survival and a neglected civic threshold. This site is identified by its fast paced utility usage and has quite a bit of infrastructural decay. My architectural thesis is driven by research to reimagine how Dakar's fishing port can turn into an iconic civic space for the community. I believe that built environments show a reflection of the mental state of its people. How can we heal social fragmentation by changing the necessity of this infrastructure into an experience? To have a piece of infrastructure that transcends beyond simple industrial usage. Using ideas from Abraham Maslow's Hierarchy of Needs this project defines designing from a framework that meets survival instincts and discovers self actualization. By creating a space where physiological

safety needs can propel the community to have a sense of belonging through cultural expression and empowering the economy. I plan to use methods of spatial mapping, as well as socioeconomic statistics to understand the relationship that lies between vendors, fisherman, and the transportation of supplies. I propose that this port gets transformed into an area where it contains educational facilities, markets, communal gathering spaces, and food supply storage. By threading in public gathering spaces and proper circulation into this area, it can now be positioned as a space to be the civic common area rather than feeling excluded if you are not utilizing it for labor. Utilizing this as a form of framework really attacks how infrastructural architecture that is typically ruled by logistics and efficiency can transcend into a place with urban resilience. By redesigning this area, it's no longer just a place that people go to fish or transport, but a renewal framework of civic gatherings. This piece inevitably argues that architecture can address a full spectrum of what a person needs, evolving from an instrument of survival into a heart of community nuance.

Sacred Sounds and Profane Places

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Undergraduate Student(s): Denaesia Robinson

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Life is comprised of many moments big and small and each of these moments help to shape people into who they are and who they will become. These moments constitute self or Home for individuals. The idea of homelessness is the plight many humans face during their lifetime. This feeling of being lost leads many on a journey of discovery where people seek themselves or a feeling of belonging (Home). Those who suffer from the metaphysical sense of homelessness go on journeys looking for the sacred and sometimes they find it in the profane. In history we learn about how people form societies and create communities. Community is what gives people that sense of home or sense of self. Can the sacred be found in the secular or profane? Who decides what is sacred and what is not? The idea of the sacred and the profane play's a large part in why, how and where people find home. This Paper explores the relationship of Sacred space and investigates what key elements of architecture aid in achieving the feeling of home. To understand all of the parts that allow a place to embody the sacred which allows said space to become home for many people. In this instance we will compare the Hans Scharoun Concert Hall to a Church to show the architectural differences between a place that is typically looked at as sacred and one that is profane. The comparative analysis of these two buildings will illuminate the physical and metaphysical aspects of architecture that embody the feeling of home thus making a space sacred. This Paper Draws on the writing of "The Sacred & Profane" Mircea Eliade, A Method For Thinking about Power Dynamics In Christian Space" " A home in the World" by Thomas Barrie. All of the aforementioned text have ideas and themes that support and oppose my theory that home or the feeling of home is what creates the sacred both physically and

metaphysically. The significance of these findings will support the theories drawn on why some people find home in places like concert halls and the validity of a space that would typically be categorized as profane being called sacred.

Sculpting the Soundscape: Creating Refuge Spaces for Neurodivergent People

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Undergraduate Student(s): Lillie Palmer

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Loud honking, steady movement, constant chatter, and tumult. Cities are full of sound. For most people, this background noise fades away. Yet, for many neurodiverse individuals, these sounds can become overstimulating, exhausting, if not stifling. Clinical research has shown how a controlled environment can improve the neurodivergent experiences, especially when space filters sound in nuanced ways. However, such controlled spaces are not typically in reach in urban settings. How can we insert spaces for relief in urban life beyond clinical facilities? This design research explores the capacities of architectural interventions to create spaces for neurodivergent refuge. The challenge is that architecture is often approached as something to be seen and occupied. This research explores how we can intentionally sculpt sound to create restorative, yet sensory-inclusive retreats within urban environments. This work begins with the idea that sound can be designed. By using methods such as shaping geometries, surfaces, and natural buffers, architecture can turn noise into calm. This is achieved by diffusing, absorbing, reflecting, and reframing sound into a rhythm. This study focuses on how these spatial and acoustic strategies can help regulate sensory input, giving users a sense of calm, control, and grounding within the intensity of the city. This proposal develops a network of small, neuro-inclusive spaces that sit within the city while providing separation from it. In an effort to shift sound by creating transitions between intensity into quietness, techniques such as gravel paths, wood paths, water, and planted buffers will be used. This paper argues that architecture can act as an instrument for listening while also shaping how sound is perceived and felt. By reframing urban design through sound and sensory inclusion, this research imagines a city that doesn't just make room for quiet but essentially learns how to listen.

Spatializing Hybrid Identities: Designing a Third Space for (East) Asian-Americans

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Undergraduate Student(s): Tina Wong

Research Mentor(s): Ehsan Sheikholharam Mashhadi

In a world shaped by hyper-globalization, identities are no longer bound to a single construct — but forged at the intersection of complex and layered vectors of belonging. It is increasingly more

challenging to define one's identity within clear-cut boundaries especially those with multicultural backgrounds. For many Americans with ethnic backgrounds, a sense of belonging is fragmented, as their identities are stretched across multiple cultural frameworks. How can architecture create a space representative of such hybrid identities? How can design help foster a sense of belonging for hyphenated identities, particularly for East-Asian-Americans? This research paper investigates the role of architecture in providing a place where Asian Americans in urban metropolises such as Atlanta reinvent their hybrid identities. It argues that a place should avoid three traps: essentialism, museumification, and fetishization. These three factors freeze culture in time, strip its agency, and allow outsider control. A place of belonging - by contrast, resists static representation and performs rituals of the living people. A research paper, "Hybridity in and Beyond Architecture: Liminal Conditions," Jevremovic informs that hybridity is a condition - a state of constant transformation rather than fixed composition (Jevremovic, 2017). Investigating hybridity and place, the research paper argues that a place should embody these features: cultural familiarity, the social, perception of nature, and perspective between the two distinct cultures. Thirdly, the research paper argues that placemaking should move away from perspectival and toward non-perspectival. Moving away from historical one perspective narrative, collaging offers a way to represent fragmented yet interconnected identities. In Dada and Cubism, collage was used to systematize contemporary living under globalization, oscillating between resistance and hybridity. Investigating systematized collages creates a dialogue for understanding, recognizing, and clarifying place and identity.

Spectacle Reframed: Transforming the Drive-In Theater into a Social Landscape

Poster #4 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Jacob Gonzalez

Research Mentor(s): Ehsan Sheikholharam Mashhadi

About half of all Americans live in what they would describe as a suburb, and for many of them their car is considered an extension of their home. People laugh, cry, sing, and even have sex — all from the comfort of their cars. This prolific car culture has dominated America since the economic boom of the post war era, and our built environment reflects that part of our identity. An important invention that came from the extensive ownership of cars was the drive-in movie theater. During the mid twentieth century, several typologies centered around the car were developed under the term "roadside architecture" to fit the needs of the early automobile age such as gas stations, drive-thru restaurants, and motels. Other typologies such as campgrounds were also made more popular thanks to the widespread adoption of cars in America. Unfortunately, even though with time cars have only become more popular within the country, the same cannot be said for certain types of roadside architecture. Drive-in theaters specifically have taken a huge decline in popularity amongst Americans. Suburbanites used to find enjoyment in one of the over 4,000 locations across the country during its prime, but now that number has dwindled

down to less than 400. Despite their crippling popularity, the legacy of drive-in theaters can serve to be adapted for the modern era of American entertainment. The conception of a drive-in can inform how a new experience can be designed through the use of a car, beyond just the film. This project examines the question of what the cinematic experience is, and what that looks like while driving through space. This analysis will draw from and build upon architects like Bernard Tschumi and his influence under the avant-garde cinematographer Sergei Eisenstein as well as Guy Debord and his work alongside Constante Nieuwenhuys to design a curated space for the driving experience.

Structure as Civic Space: The Tabiat Pedestrian Bridge in Dialogue with Frei Otto and Shigeru Ban

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Undergraduate Student(s): Allison L. Ware

Research Mentor(s): Ehsan Sheikholharam Mashhadi

What if a bridge could be more than just a means of crossing from one point to another? What if it could become a place of gathering, reflection, and connection between people and their city? The Tabiat Pedestrian Bridge in Tehran, Iran, challenges conventional ideas of infrastructure by transforming a simple crossing into a dynamic public space that celebrates structure, culture, and community. Completed by Leila Araghian and Alireza Behzadi of Diba Tensile Architecture, the Tabiat Pedestrian Bridge received the Aga Khan Award for Architecture in 2016. The bridge represents a shift in how infrastructure can serve urban life, not merely through function but through experience and interaction. As an elevated structure connecting two parks, it invites visitors to pause, engage, and participate in the life of the city. While rooted in local culture and context, the bridge's innovative steel structure places it within a global architectural conversation about the relationship between form, material, and social use. This paper examines the Tabiat Pedestrian Bridge in Tehran, Iran, as an example of how contemporary infrastructure can integrate structural innovation with social and environmental awareness. Rather than serving only as a functional crossing, the bridge acts as a civic landmark that encourages public gathering, rest, and interaction. By comparing the Tabiat Bridge with the works of Frei Otto and Shigeru Ban, this study situates the bridge within a broader conversation about architecture's role in shaping modern society. The Tabiat Bridge combines aspects of both architects' philosophies, merging Otto's structural clarity with Ban's social consciousness in a local Iranian context that emphasizes cultural identity and community use. This paper argues that the Tabiat Pedestrian Bridge combines aspects of both Otto's and Ban's architectural philosophies, merging Otto's structural clarity with Ban's social consciousness within a local Iranian context that emphasizes cultural identity and community engagement. Through this comparison, the paper shows that the bridge reflects a shared vision between the Pritzker Prize and the Aga Khan Award, that architecture can be both technically ambitious and socially meaningful. Ultimately,

the Tabiat Pedestrian Bridge demonstrates how infrastructure can evolve beyond utility to become a transformative public space, connecting people not only across physical divides but also through shared cultural and civic experiences. This paper argues that the Tabiat Pedestrian Bridge combines aspects of both Otto's and Ban's architectural philosophies, merging Otto's structural clarity with Ban's social consciousness within a local Iranian context that emphasizes cultural identity and community engagement. The bridge thus reflects a shared vision between the Pritzker Prize and the Aga Khan Award: that architecture can be both technically ambitious and socially meaningful. Ultimately, it demonstrates how infrastructure can evolve beyond utility to become a transformative public space, connecting people not only across physical divides but also through collective civic experience.

The Echoes of Empires: Hagia Sophia as a Palimpsest of Politics and Cultures

Poster #13 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Olivia Gaskins

Research Mentor(s): Ehsan Sheikholharam Mashhadi

*When entering the Hagia Sophia in Istanbul, Türkiye, one is captivated by the approximately seven meter in diameter calligraphic medallions that suspends between columns within the building. Inscribed on these medallions in gold lettering are eight of the holiest names of Sunni Islam, which include "Allah" and Prophet "Muhammad." However, with further discovery of the mosque, Christian mosaics are found slightly uncovered, sparking a spectacle among many individuals. Considering the aniconism within Islam and the contrast between Christianity and Islam, this epitomizes the entanglement between the sacred and the political. Hagia Sophia's layered history, from Byzantine cathedral to Ottoman Mosque, to secular museum, and back to an active mosque in 2020, reveals how architecture can serve shifting regimes and ideologies across time. In the contemporary context, President Recep Tayyip Erdoğan's decision to reconvert Hagia Sophia from a museum into a functioning mosque reasserts the building's role as a political and cultural symbol. This transformation has reignited debates about secularism, nationalism, and the place of Islam within the modern Turkish Republic. Erdoğan's policies have reframed the meaning of Hagia Sophia, positioning it as both a testament to Islamic identity and a statement of political sovereignty, while simultaneously challenging the legacy of Atatürk's secular reforms. By tracing the transitions of Hagia Sophia, this research explores how sacred architecture mediates between spiritual devotion and state power. It will examine how the building's reinterpretations reflect broader ideological shifts, from Byzantine Christianity's imperial authority to Ottoman Islam's dominance, and finally to modern Türkiye's contested national identity. Drawing on Mircea Eliade's theories of sacred space in *The Sacred and The Profane: The Nature of Religion* and Emilio Gentile's concept of the "sacralization of politics" in *Fascism as Political Religion* and other books, articles, and images, this study positions Hagia Sophia as a case study in how political regimes appropriate religious monuments to reinforce*

legitimacy and cultural continuity. A qualitative historical analysis approach will be used to interpret how Hagia Sophia's evolving role proves the enduring capacity of sacred architecture to negotiate power, faith, and identity, embodying how religion and politics are still inseparably intertwined within both historical and contemporary contexts.

The Right to Belong: Reclaiming Public Space through Community-Based Design

Poster #13 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Daisy Bhambhani

Research Mentor(s): Robin Puttock

India's rapid urbanization has resulted in fragmented urban fabrics, where women and children remain in vulnerable positions. They face systemic barriers in education, safety, and social participation due to under-resourced environments. Despite the nation's commitments to gender equality and the right to education, slum environments continue to lack adequate infrastructure that supports learning and collective well-being. Architecture has the potential to combat these challenges by creating spaces that promote social inclusivity. While architects and planners have recognized the increasing need for inclusive spaces, most projects do not explore how a built form itself can create empowerment within marginalized populations. This thesis investigates how multifunctional community centers can be designed to advance empowerment for women and children in Jaipur's Kacchi Basti slum. Through a qualitative research approach, this study integrates precedent analysis, site investigation, and design exploration to examine how architecture can strengthen social connections and community life. Precedents such as women-led schools and community hubs across India and other similar global contexts provide design strategies rooted in community participation and sensitivity to the local environment. The Kacchi Basti serves as a case study to test how adaptable, programmatically flexible spaces can strengthen community inclusion and opportunity. The expected outcome is a design framework for multifunctional community centers that demonstrates how architecture can support empowerment through accessibility, safety, and shared learning. By linking spatial design to social transformation, this research aims to position community architecture to promote gender equality and advance educational opportunity within India's informal settlements.

Transit Hubs as Mixed-Use Areas: Architectural Solutions for 24/7 Vibrant Streets

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Undergraduate Student(s): Amber Henry

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Monday morning, again. Walking into the cold, isolated transit hub reflects your internal emotion of dragging your feet back to work. All to do it again the next day. The routine of

walking past architectural marvels like Mercedes-Benz Stadium and the Marquis Hotel just to walk into a cold and distant transit hub displays two drastic priorities of the architectural fabric in Atlanta. The largest transit hub for MARTA within Atlanta is Five Points, which contains all four train lines currently in use today. According to Downtown Atlanta's Master Plan published in 2017, "In 2015, close to 1.2 million people used Downtown MARTA rail stations each month, with almost 500,000 using Five Points alone," which is more than the total population of Atlanta at the time of the 2010 census, which was a reported 420,003 people. This signifies the importance of Five Points as a MARTA transit hub within the city of Atlanta. According to a study analyzing the feasibility of commercial to residential within the Five Point station area done in 2024, the building stock by use in 2023 contained 75% office buildings, 18% hotel buildings, and 7% residential buildings. Even though most of the buildings in the area are office buildings, there has been an increase in mixed-use projects being approved, like Centennial Yards, multiple projects near the Beltline, and others. With the research already done and to be done, this design research project will explore successful mixed-use transit hubs in the US, Asia, and Europe to propose a redeveloped Five Points station that elevates the notion of what a transit hub can look like, using examples like Shinjuku Station and Dongdaemun Design Plaza as a baseline. This research argues that transit hubs should serve as mixed-use areas to create 24/7 vibrant streets, with this paper demonstrating the importance of transit hubs to the downtown core of Atlanta.

The Usage of Mechanisms for a Multipurpose Pod Design and Construction

Poster #24 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Tiffany Nguyen, Kimberly Espinoza, & Joshua Landrum

Research Mentor(s): M. Saleh Uddin

Our research consists of applying mechanical systems within a compact space that enhances spatial adaptability and user efficiency. The project focuses on the design of a multipurpose pod that incorporates three primary functions—studying, sleeping, and dining. The concept emphasizes the play between user interaction activity and structure, where each mechanical system helps reshape its form and functionality. With the use of struts and hinges, the pod adapts to the needs of the user. The curvature of the design, while creating an organic shape and implying the softness of the internal ambiance, creates a unique challenge for the construction phase. Our key design feature of the pod is the usage of a strut-supported sleep system and while we considered counterweight and spring, we found struts to be the most efficient in terms of usability. A section of the wall hinges downward with the aid of hinges and struts that transform from a vertical wall to a sleeping platform. This transformable design allows the pod to maximize its usage and multipurpose design. The partition on the frame is split in half so that it creates a semi-private space while the other half of it is on a pivot hinge system that hinges down with the section of the wall to create a more private space. The exterior, sleek with metal cladding,

provides perforations that allow light to transmit through the frame. The interior is decorated with semi-transparent fabric to diffuse the light into the space while the carpet on the floor gives a warm texture for the user to enjoy. To aid in use for studying, a desk hinges across from the sleep system, revealing a break in the fabric facade. The ambiance of soft lighting and textures creates a delicate cocoon to invite the weary student for a warm embrace.

Two Geographies, Similar Concerns About Natural Disasters: The Work of Marina Tabassum in Bangladesh and Carme Pigem in Spain

Poster #6 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Luke M. Portier

Research Mentor(s): Ehsan Sheikholharam Mashhadi & Karla Jacobs

Award winning architects use design to mitigate against natural disasters by taking into account the local environment in their choices of sustainable materials and thoughtful design. Marina Tabassum reimagines a mobile home for families in Bangladesh built with materials that are locally sourced, and Carme Pigem designed an underground winery in Spain incorporating natural light while protecting the building. This paper demonstrates how building sustainable and environmentally conscious structures can be resilient in the face of climate challenges. This paper draws on the work of Duanfang Lu in Third World Modernism and an examination of the works of Pigem and Tabassum to explore the challenges of designing and building in the developing world. Marina Tabassum and Carme Pigem were awarded and recognized for their projects due to how they designed their buildings. These buildings are incorporated into the environment to mitigate climate issues and to make them resilient from natural disasters. Marina Tabassum's mobile housing in Bangladesh is made out of bamboo to incorporate the material of the overall surrounding environment which allows for faster building. Carme Pigem's Bell-Lloc Winery is designed to have natural light and to be embedded underground, and she also uses material from vegetation around the area to blend in with the environment.

Two Modalities of Building for the Poor: Empowering Architecture of Kere and Vernacular Modernity of B. K. Dushi

Poster #8 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Ninnti Crooks

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Sometimes, the most powerful architecture is not built to impress, but to uplift. This research compares two architects Francis Kere of Burkina Faso and Balkrishna Vithaldas Doshi of India, who both address how design can serve the underserved communities through educational

architecture. They come from different backgrounds and countries, however, both demonstrate that architecture can be an instrument of empowerment rather than privilege. This paper engages in Architecture research by understanding how community participation and cultural longevity become a method of social transformation. Using research methods such as comparative material analysis, case studies, and geometric methodology to dissect both architects' material choice and process of design in their perspective ways of shaping a community. Through this analysis, I found that Kéré's Gando Primary School is a demonstration of local participation, redefining power and ownership and environment adaptation. This paper also demonstrates that Doshi's Indian Institute of Management, Ahmedabad, shows us how vernacular methods can be embedded into modern geometry to design a spatial order and balance. These results showcase how both architects created works that resonate with the culture and can be grounded contextually. Collectively, these two architects are demonstrating to us ways to build for the poor. Concluding that building for the poor doesn't work through limitations but through liberation. They defined a community's way to evolve doesn't just depend on wealth, but how design can connect with the environment and culture of its people.

Two Modes of Building National Identity Through Architecture: How Critical Regionalist Correa and Doshi Preserve Indian Culture

Poster #11 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Charly Munoz

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Did the popularity and supposed progressiveness of global modernism triumph the reality that a sacrifice of Indian culture and identity was made? As one of the most influential movements of the 20th century that reconstructed global modernist principles with a strong cognizance of local tradition and environmental conditions, this study analyzes the cultural and spatial reinterpretations of Indian architecture through critical regionalist Charles Correa and Balkrishna Doshi. After gaining independence in 1947, India adopted international style and were influenced by modernist architects such as Le Corbusier and Louis Khan. However, modernism disregarded vernacular traditions, climate, and cultural identity of India, which led to rise of critical regionalism for cultural revival. This paper analyzes architectural works from Correa and Doshi to explore different design techniques that balanced modernity and regionalism by rejecting the placelessness and homogenous landscapes of pure modernism, and in turn create spaces rooted in India's identity. This paper draws on writings of theorist Kenneth Frampton, and influences of modernist architects, Le Corbusier and Louis Khan, to explore the balance of integrating modernity's innovation and preserving cultural values of India. This research argues that critical regionalism constructed true progressive prosperity in India's

architecture by respecting its local traditions, materiality, climate, environment, and vernacular techniques.

Two Visions of an Architectural Revolution: Archigram and Italian Futurism

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Undergraduate Student(s): Christopher Amaya

Research Mentor(s): Ehsan Sheikholharam Mashhadi

The idea of a revolution in architecture is prevalent in both Archigram and Italian Futurism. Although Archigram was a group of architects that formed after World War II and Italian Futurism was a movement that pushed Italy closer to fascism before World War I, both reveal how architecture can promote new ways of living and new ways of seeing the world. The fundamental ideas behind their values differ in how they approach sociopolitical issues that appear eclectic throughout time. On one hand, Italian Futurism pushed a new age of propaganda that celebrated industrial progress which introduced a new architectural language—one that ultimately never took flight. The Futurist movement rejected historical references in favor of a future defined by speed and emerging technologies. On the other hand, Archigram, a collective of six architects, envisioned a revolution in architecture that embraced technological innovation while responding to the cultural conditions of its time and emphasizing community engagement. This paper explores the relationship between Archigram and Italian Futurism through the lenses of phenomenology, sociopolitical context, and formalism still relevant today. It argues that although Archigram and Italian Futurism emerged in different contexts, both generated similar visions for a new architectural vernacular that integrates technology and community.

Village of Hope: Moving Away from The Conception of Temporary to Permanent Shelter in Haiti

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

11:00am – 11:50am

Undergraduate Student(s): Korine Dorval

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Around the world, 1.6 million people lose their homes every week. The Internal Displacement Monitoring Center estimates that 1 million people were internally displaced in Haiti as of the end of 2024. In Haiti, displacement repeats in a cycle driven by gang violence and natural disasters. Today, as the situation grows worse, the solution is still centered on refugee camps. Architecture seems to intervene only in emergency relief without addressing long-term stability. This design research examines how architecture can contribute to reducing gang violence by facilitating the transition from temporary to permanent shelter in Haiti. This paper challenges assumptions about temporary shelters by creating opportunities. Such as integrating systems of

security, agriculture, education, labor, and culture into design it reinforces the belief that people, if given the tools, can shape their own future. This paper draws on the work of Elemental, led by Alejandro Aravena, to design housing units that can withstand natural disasters while meeting the essential needs of residents. Each unit is conceived to expand and evolve as the family grows and gains more financial stability. This research considers displacement not as an end, but as a map for reconstruction. This paper proposes a new type, "Village of Hope," where architecture becomes a tool in reshaping the future of Haiti.

When Modernism Meets Cultural Identity: Luis Barragán's Poetic Modernism and Marina Tabassum's South Asian Vernacular Approach

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Undergraduate Student(s): Esther Shukrani

Research Mentor(s): Ehsan Sheikholharam Mashhadi

Modernism emerged as a universal language of geometry, light, and order. What Le Corbusier described as a "fundamentally new aesthetic" that rejected the architecture of past epochs to express "the spirit of an age." Rooted in abstraction and universality, modernism sought to define a language freed from ornament and guided by progress. Yet when it encounters culture, faith, and climate, modernism transforms. This research asks what happens to modernism when it becomes regional, examining how Luis Barragán and Marina Tabassum reinterpret modernist ideals through light, material, and spirituality. Using a comparative analytical approach, the study looks at Barragán's work through the lens of phenomenology, where silence, color, and light become direct experiences of emotion and reflection and at Tabassum's work through her vernacular modernist approach, where brick, air, and light connect to Bangladeshi culture and collective identity. Through the analysis of key projects such as the Capuchinas Chapel, Casa Gilardi, the Bait Ur Rouf Mosque, and the Khudi Bari, this research explores how geometry, material, and atmosphere move beyond formal expression to embody emotion, culture, and belonging. From this study, we have found that Barragán turns modernism inward, transforming it into an architecture of introspection and stillness, while Tabassum turns it outward, shaping it into an architecture of community and resilience. Both show that modernism does not lose its meaning when it adapts; it becomes more human, more connected, and more alive through the identity of place.

When Two Critiques of Universalism Collide: Seeing Majara Residence through Post Modernism and Critical Regionalism

Poster #2 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Blake Archbold

Research Mentor(s): Ehsan Sheikholharam Mashhadi

*When discussing the most famous and renowned architects, instantly recognizable names such as Le Corbusier or Frank Lloyd Wright are often the first to come to mind. This is because, for most of the 20th century, serious architecture was defined by Modernism. In the late 1960s, however, a new movement arose in reaction to Modernism's strict, minimalist, and sterile style that suppressed ornament, color, and individuality. Robert Venturi, an American architect, is often credited as one of the founders of Postmodern architecture. He pioneered the movement with his pivotal 1966 manifesto *Complexity and Contradiction in Architecture*, in which he criticized Modernism for its flat sameness and proposed an opposing design approach for what serious architecture could be. In the decades since, contemporary architecture has frequently revisited the visual and conceptual tools of postmodernism, often as a means to resist the flattening effects of globalization. Yet, the most compelling contemporary uses of postmodern techniques emerge when these bold formal gestures are grounded in reflecting and serving local context and social purpose. This is an ideal that echoes the voice of early critics of postmodernism, who sought a deeper alternative in critical regionalism. This paper argues that ZAV Architects' Aga Khan award-winning Majara Residence operates at the intersection of these two postmodern reactions: it borrows the expressive, formally experimental visual language of postmodernism while grounding it in the ethical and contextual intentionality of critical regionalism. Themes of postmodernism, critical regionalism, and globalization are explored to frame ZAV Architects' work as both a continuation and a transformation of postmodern design strategies. It draws on the writings of those like Robert Venturi to situate postmodernism's formal playfulness and symbolic language within broader critiques of modernist homogeneity. Simultaneously, Kenneth Frampton's theory of critical regionalism informs this paper's view of ZAV's practice as one rooted in contextual responsiveness and local identity. This paper examines ZAV's Majara Residence in comparison to postmodernist works to analyze its use of color, geometry, and repetition. Additional reference to ZAV's *Habitat for Orphan Girls* supports the argument that the firm extends these ideas into socially embedded, materially grounded design. This research argues that ZAV Architects' Majara Residence demonstrates how postmodern visual expression can coexist with regionalist intentionality to create architecture that is both visually striking and socially rooted. The project echoes the color and vibrance of postmodernist works yet departs from abstraction by intentionally embedding those same postmodern gestures within a real, lived community context. In doing so, ZAV brings substance to the spectacle, turning postmodernism's design language of irony into a built dialogue between form, color, and community.*

College of Computing and Software Engineering

Data Science & Analytics

Are Magic Mushrooms the Magic to Healing?

Poster #19 (Event Center)

11:00am – 11:45am

Graduate Student(s): Gale Wohlfarth

Research Mentor(s): Susan Mathews Hardy & Herman Ray

“Magic mushrooms” produce a naturally occurring psychedelic compound called psilocybin. Public opinion surrounding psilocybin mushrooms generally holds that they are primarily used for recreational purposes, which may have contributed to their widespread prohibition in the United States. However, prior studies have demonstrated the potential efficacy of psilocybin in treating depression, anxiety, PTSD, migraines, and end-of-life psychological distress. Drawing on published research as well as information found in this observational data, the need for further advocacy of “magic mushrooms” as a legitimate medicine is clearly identified. Using a data set from DRYAD, an open-source data repository, psilocybin use among 7,139 U.S. adults in 2021 was analyzed. Logistic regression was used to identify the predictors of psilocybin usage. Multiple ANOVA and two mean t-tests were used to assess the relationships between an individual’s awareness of psilocybin benefits and their psilocybin usage, versus their anxiety, depression, and Veterans RAND Mental Health Composite scores. Differences of proportions were used to assess the relationships between an individual using psilocybin versus having migraines, having health insurance, using urgent care services, and using alternative healthcare providers. Individuals most likely to use psilocybin mushrooms were male, between the ages of 20 to 30 or 40 to 60, experiencing migraines, aware of psilocybin benefits, and had moderate to severe anxiety. Moderate to severe anxiety, depression, and poor overall mental health were associated with both awareness of psilocybin benefits and psilocybin usage. Regarding physical ailments, individuals with migraines were more likely to be aware of psilocybin’s benefits and were more likely to use psilocybin. People who use psilocybin mushrooms were less likely to have health insurance but were more likely to utilize urgent care services and alternative health resources. Through these statistical analyses, a compelling case is presented to support the usage of psilocybin mushrooms as a legitimate medicine.

Baby Size Showdown: Effects of Gestational Age and Maternal Diabetes on Infant Birth Weight in U.S. NICUs

Poster #20 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Minaahil Cheema

Graduate Student(s): Thalia Pacheco

Research Mentor(s): Nicole Ferguson & Kevin Gittner

There has been a higher rate of infants born to diabetic mothers in recent years. “The percentage of mothers giving birth who received a diagnosis of diabetes during pregnancy (gestational diabetes) increased from 6.0% in 2016 to 8.3% in 2021” (QuikStats, 2023). Premature infants born to diabetic mothers are typically heavier weights at birth and often require extended stays in the neonatal intensive care unit (NICU) to stabilize (e.g., regulate glucose levels) (Abramowski et al., 2023). Consequences can lead to lifelong conditions due to size, such as a higher rate of obesity and cardiovascular abnormalities (Abou Shady et al., 2024). The purpose of this study was to describe the relationship between maternal diabetic status and infants’ weight at birth. Birth data from NICU infants across the U.S. born at 23-41 weeks gestational age (GA) from Pediatrix Clinical Data Warehouse were analyzed. Birth weight was classified as small for GA (< 10th percentile; SGA), appropriate for GA (10th- 90th percentile; AGA), and large for GA (> 90th percentile; LGA) using the Olsen growth curves. Infants were then stratified by GA and maternal diabetic status and distribution of birthweight classifications were reported. Results and conclusion will be presented at the Symposium for Student Scholars.

Is Hockey still Canada’s game? How USA teams have won every Stanley Cup since 1994

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

10:00am – 10:50am

Undergraduate Student(s): Aaron Montgomery & Long Doan

Research Mentor(s): Joe DeMaio & Michael Frankel

The last Canadian team to win Lord Stanley’s cup in the National Hockey League was the Montreal Canadiens in 1993. Since then, each championship has been claimed by a team geographically located in the United States. Is this streak unusual? Perhaps it is particularly unusual in light of the fact that Hockey is known as Canada’s game. Is Hockey in its modern incarnation still Canada’s game? Given the long history of the NHL should we expect such a streak to occur at some point in time? Are we too fixated on the geographic location of the teams in question? Perhaps the nationalities of the players on these Championship American teams skew heavily towards Canadian? Or perhaps to other countries? Alternatively, perhaps we are at the start of country spanning sports curse akin to the Red Sox trade of Babe Ruth. Or maybe we should just follow the money. In this paper, we examine the likelihood of such a streak, the changing landscape of nationalities and influence factors on players in the NHL.

Racial Disparities in Infant Mortality: An Analysis of Infants Born to Black Mothers in the United States

Poster #14 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Kendra Falloon & Kismet Hall

Research Mentor(s): Kevin Gittner

The Period Linked Birth-Infant Death data files collected by the National Center for Health Statistics (NCHS) under the Centers for Disease Control and Prevention (CDC), link infant death certificates to their corresponding birth certificates. This link gives a broad resource for examining the infant mortality rates in the United States in relation to maternal and birth characteristics. For this project we decided to analyze the data from the 2017 file that includes about 3.8 million live births and 22,341 infant deaths nationwide. Our research question asked Does the manner and underlying causes of infant death differ for infants born to Black women compared to infants born to women in other racial and ethnic groups? To address this, we chose to focus on two primary variables, (1) Maternal Race/Ethnicity specifically identifying Black/African American mothers and (2) Manner of Infant Death which records the circumstances of the infant's death such as natural, homicide or accident. We also included three secondary variables for additional context which are Gestational Age, Birth Weight and Maternal Age since they have a direct relationship with infant mortality risk. The dataset was provided in .csv format with variables cleaned and recoded to fix any missing data. For example, any missing/unknown values in the race and cause of death fields were coded as blanks or specific numeric values that we defined as missing in SPSS. We hypothesize that infants of Black mothers will experience disproportionately higher deaths classified as natural, especially those related to preterm birth complications and low birth weight compared to infants of other races. By exploring the racial disparities in infant death outcomes this study aims to help contribute to the public health understanding of maternal and infant health inequities as well as highlight areas where interventions could potentially help reduce preventable infant mortality.

Sleep Quality and Perceived Stress in Students

Poster #5 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Genesis Adams

Research Mentor(s): Kevin Gittner

Sleep and stress have a big effect on how healthy young adults are. This small project uses the Student Stress Monitoring dataset (Kaggle: StressLevelDataset.csv) to talk about sleep quality and perceived stress and to make a plan on how to look at their relationship in a group of students. I recorded data import and cleaning choices in SPSS (correct naming, types,

measurement levels, missing values, and value labels), make variables that are easy to analyze, and do univariate exploratory data analysis with frequency tables and checks of the distribution. Stress level and sleep quality are the working variables. The uploaded SPSS run showed that the quality of sleep ranged from 0 to 5 (1=Strongly disagree - 5=Strongly agree) while stress level ranged from 1 to 2 (0=low and 2=high.) Univariate EDA reveals a nearly equal distribution across stress categories and a wide range of quality of sleep scores (0–5), with 3.1% coded as 0. The planned inferential analysis for the complete paper is a chi-square test of correlation between quality of sleep and their level of stress, utilizing stacked bar visualization and effect size measurement (Cramer's V). I conclude with limitations (survey self-report, cross-section, coding constraints) and provide a reference template for the incorporation of peer-reviewed sources in the KSU Library. This paper takes into consideration and expands on the teacher's previous comments about variable choice, recoding logic, labels, and needed descriptives.

Computer Science

A Comparative Study of Multi-Domain Intent Classification Models Using Explainable Artificial Intelligence

Poster #15 (Event Center)

12:00pm – 12:45pm

Graduate Student(s): Jamia Jackson, Josh Zuniga, & Ayooluwa Asonibare

Research Mentor(s): Md Abdullah Al Hafiz Khan

Intent classification is a critical task in enabling the ability of intelligent systems to identify the purpose of text generated by users. While existing research has achieved strong results using transformer-based models such as BERT, most studies only focus on a single domain such as emails, text messages, or social media posts, this limits the generalization and interpretability of intent recognition systems across diverse communication settings. This research presents a comparative analysis of traditional machine learning and transformer-based models for multi domain intent classification, integrating explainable artificial intelligence techniques to enhance model transparency. This study will explore applications such as identifying potentially harmful or criminal intent in online forums, which could prevent future harm and distinguish genuine purchase intent from casual search in e-commerce site visits, which will improve targeted recommendations. By combining a multi-domain evaluation with explainable analysis, this work contributes to a framework that can be used for all domains that develops accurate and interpretable intent.

Actionable Review Intelligence Using Aspect-Based Sentiment Analysis

Poster #5 (Event Center)

11:00am – 11:45am

Graduate Student(s): Deekshitha Kanala & Sukumar Muthusamy

Research Mentor(s): Md Abdullah Al Hafiz Khan

Customer feedback provides valuable insights that extend beyond basic positive or negative sentiment. For example, “the pasta was cold” and “I don’t like Italian food” are both negative statements, but only the first offers an actionable suggestion for improvement. This project develops an advanced natural language processing framework that performs aspect-based sentiment analysis along with a new dimension called actionability classification. The goal is to identify which aspects of a product or service are being discussed, determine the sentiment associated with each aspect, and evaluate whether the feedback contains a constructive and actionable point. The model is designed using a multi-task learning architecture based on BERT and RoBERTa, with three components: a Conditional Random Field layer for aspect extraction, an attention-based classifier for sentiment analysis, and a regression head for predicting actionability scores. These components are trained jointly using a weighted loss function to balance accuracy and interpretability. The model is evaluated on the Amazon Fine Food Reviews dataset, which includes over 500,000 entries, and a manually annotated subset for actionability assessment. Evaluation metrics include F1-score for aspect extraction, macro F1 for sentiment classification, and Pearson correlation and mean absolute error for actionability prediction. The proposed system helps organizations focus on specific and constructive feedback that can lead to practical improvements. This research contributes to the field of sentiment analysis by integrating actionability into the interpretation of customer reviews, creating a more comprehensive and meaningful understanding of user opinions.

An NLP-Driven Hybrid System for Predicting Fruit Freshness Using Text Descriptions and Adaptive Questionnaires

Virtual Presentation (Microsoft Teams)

3:00pm – 4:00pm

Graduate Student(s): Henry L Sanchez II

Research Mentor(s): Md Abdullah Al Hafiz Khan

The core idea of this project is to build a system that predicts fruit freshness from user input. Users will first give a free-text description of the fruit’s appearance, texture, or smell, which will be classified, followed by an adaptive questionnaire that asks targeted follow-up questions based on fruit type and detected cues. The free-text classification and questionnaire responses will then be combined to generate the final freshness prediction. The workflow includes data collection and preprocessing, feature extraction for text and questionnaire responses, training and evaluating the models. Finally, using all data to deliver a clear freshness result to the user.

A Study on the Comparative Effectiveness of News Article Embedding Methods for Extractive Summarization

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Undergraduate Student(s): Caleb Dow

Graduate Student(s): Zhiwen Zheng

Research Mentor(s): Md Abdulla Al Hafiz Khan

Our research project seeks to assess the comparative effectiveness of various methods of article embedding on the performance of a Recurrent Neural Network trained to perform extractive summarization. Typically, extractive summarization is performed via the following general steps: dataset selection and preprocessing, data embedding, model training, and model evaluation. In our research, we aim to primarily focus on assessing the “data embedding” step and determine what kind of embedding performs most optimally for extractive news article summarization. To perform our study, we make use of the CNN/DailyMail dataset, which consists of 311,971 news articles and corresponding summaries. These summaries are abstractive in nature, so to make use of the dataset for extractive purposes, we predict extractive sentence labels by using a greedy ROUGE-based approach, which computes the five article sentences which combined have the closest ROUGE-based similarity to the expert-written summary of the article. These sentences are labeled as being part of the “ideal” extractive sentence summary. Then, the various news articles are transformed into series of sentence vector embeddings via various methods, including: series of TF-IDF sentence vectors computed on a by-article basis, series of sentence vectors based on a Word2Vec approach, where sentence vectors are computed by averaging Word2Vec vectors of the words they contain using both per-article trained and Google News 300 Pre-trained Word2Vec models, and series of sentence vectors based on a SBERT sentence embedding approach. These various series of sentence embeddings are then fed into a Long Short-Term Memory Recurrent Neural Network which is trained to predict the sentences which will belong in the final extractive summary of each article. Finally, we will gather the performance results for the RNN for each method of embedding and compare them to determine which type of article embedding allows for the best performance.

Autumn Lite LLM

Poster #23 (Event Center)

12:00pm – 12:45pm

Graduate Student(s): Michael Kurtis Knighten

Research Mentor(s): Md. Abdullah Al Hafiz Khan

Autumn Lite is an inspectable, small-footprint language modeling pipeline for reproducible experimentation and practical integration into video-game non-player character (NPC) systems. It comprises four components: (1) a regex-aware tokenizer/normalizer for vocabulary

construction and mixed prose–code handling; (2) a classical evaluation track that reports perplexity to quantify predictive quality; (3) a compact neural language model (decoder-only Transformer) targeted at low latency and controllable outputs; and (4) a lightweight sentiment classifier (logistic regression) that assigns positive/neutral/negative tags to steer text-to-speech (TTS) prosody during NPC dialogue. By combining transparent preprocessing with baseline metrics and a small, deployable decoder, Autumn Lite aims to deliver predictable, designer-friendly behavior for NPC speech, enabling subtle, real-time adjustments to rate, pitch, and emphasis instead of monotone delivery. This system operates as a standard small LLM and can be combined with NPC dialogue/TTS; in this presentation I will cover only the LLM portion.

Blood Flow Prediction Using UNET and VNET Architectures

Poster #13 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Pedro Henrique Goncalves Sila Pinto

Research Mentor(s): Chen Zhao

Coronary artery disease (CAD) is one of the leading causes of death worldwide, making the assessment of blood flow and pressure distribution within coronary vessels essential for diagnosis and treatment planning. Fractional Flow Reserve (FFR) is a key measure used to determine the severity of arterial blockages, but traditional methods, such as invasive measurements or computational fluid dynamics (CFD) simulations, are not only time-consuming and costly, but also invasive. This project explores the use of deep learning to predict blood pressure distribution in coronary arteries using a 3D convolutional neural network. The dataset consists of Coronary Computed Tomography Angiography (CCTA) scans paired with blood pressure obtained from CFD simulations. After preprocessing and voxelizing the CCTA scans, the VNet model learns to map the vessel's geometry to its internal pressure distribution. Our model achieved a Pearson correlation of 0.93 and an R^2 score of 0.84 between the predicted and simulated pressures. These results indicate that VNet delivers accurate, spatially consistent pressure predictions that closely match CFD outputs while substantially reducing computation time. This approach underscores the potential of deep learning to accelerate non-invasive FFR estimation and enhance patient-specific cardiovascular analysis.

Defense Approaches against Adversarial Attacks on Remote Sensing Applications

Poster #17 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Sanjaykrishnan Ravikumar

Research Mentor(s): Kazi Aminul Islam

Remote sensing systems rely on deep learning models to interpret satellite imagery for tasks like land classification and surveillance. However, these models are vulnerable to adversarial

attacks—small input perturbations that can cause critical misclassifications. This work explores the impact of Fast Gradient Sign Method (FGSM) attacks on satellite image classification using the UC Merced Land Use Dataset. We evaluate several defense strategies, including PGD adversarial training, gradient masking, detection-based classifiers, and input transformations such as median and Gaussian filtering. Black-box scenarios are also considered to assess robustness under limited attacker access. In addition, we propose two novel defenses. The first combines median and Gaussian filters as a lightweight preprocessing step. The second uses a partial-access ensemble of diverse models, where only one is attacked, allowing clean models to stabilize predictions. Our findings highlight the strengths and trade-offs of each defense, offering practical insights for improving the robustness of remote sensing systems against adversarial threats.

Detecting Relevance and Spam in Product Reviews

Poster #14 (Event Center)

12:00pm – 12:45pm

Graduate Student(s): Jacob Tyler

Research Mentor(s): Md Abdullah Al Hafiz Khan

Online retailers such as Amazon allow customers to make review on purchased products, which can lead to challenges in managing irrelevant and deceptive product reviews. These reviews can be misleading to customers and decrease the level of trust that they have in the marketplace. This project aims to create a framework for detecting review relevance and spam through semantic analysis. Term Frequency-Inverse Document Frequency with logistic regression will be used to establish a baseline, while SBERT embeddings will provide semantic similarity between a review and the product description. To advance this project further, an Aspect-Based Sentiment Analysis with Explicit Sentiment Augmentations (ABSA-ESA) will be used. This is an advanced deep learning approach to transform implicit sentiment into an explicit statement. A transformer model such as RoBERTa will be tuned on both the original and augmented data in order to capture the aspect-sentiment relationships. These aspects can be cross-referenced with known product attributes to assess relevance and inconsistencies between sentiment and ratings along with other irregularities can be used assess spam detection. The framework will be trained and evaluated using the Amazon Fine Food and Commerce Review datasets, the UCI SMS Spam dataset will inform spam detection, and the SemEval laptop and restaurant datasets will be used for ABSA-ESA development. Evaluation metrics will include accuracy, precision, recall, F1-score, and area under the precision-recall curve. This framework is designed to produce a high-precision system capable of distinguishing relevant reviews from spam or irrelevant reviews. The goal is to improve transparency and reliability in online review systems such as the one used on Amazon.

Efficient Summarization with Lightweight LLMs through Sparse Input Activation and Adaptive Prompting

Poster #18 (Event Center)

3:00pm – 3:45pm

Graduate Student(s): Ramya Madhuri Narapureddy, Mohana Priya Palanisamy, & Srinivasan Subramanian

Research Mentor(s): Md Abdullah Al Hafiz Khan

Large Language Models are powerful tools that are designed to read, reason and generate in human language. They help us by making knowledge, problem-solving and communication easier through natural language understanding and generation. However, their performance heavily depends on the effectiveness of the prompt given and the size of the model. Light-weight LLMs(sub-10B parameters) struggle with summarizing complex technical documents like research publications due to technical jargon, lengthy citations, and mathematical notations, often leading to hallucinations that reduce reliability and accuracy. Our project introduces the hybrid framework that combines NLP driven pre-processing techniques, sparse input activation and prompt engineering to enhance the summarization capacity of the small-scale models by minimizing hallucinations and maximizing factual accuracy. The pipeline starts with cleaning and segmenting full articles into sections, removing references, citations, and formulas. On this normalized output, salient sentence extraction and keyphrase extraction is performed as part of the sparse input activation module. The activated input and optimized prompt is fed to LLMs of different scales and the summary is benchmarked with respect to different prompting strategies and scale of the models. This workflow significantly enhances the factual accuracy and reliability of summaries generated by Light-weight LLMs, making them competitive for complex scientific and technical summarization tasks.

Interactive Summarizer: Real-Time Personalized Document Summarization

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Graduate Student(s): Tejasree Penumaka, Monika Juttiga, & Sowmya Rao Muthyala

Research Mentor(s): Md Abdullah Al Hafiz Khan

As today's generation going on wheels, reading through lengthy paragraphs and contents like news articles and passages that required to be read for their work progression is quite not feasible and not time efficient. Whatever the existing text summarization tools available, provides quick overviews, yet they often lack user control and flexibility. This project, Interactive Summarizer: Real-Time Personalized Document Summarization, aims to address these gaps by focusing on a customizable abstractive summarization system. This tool allows users to upload a text file and choose whether to summarize an entire document or a specific part of the document, along with the adjustments in the length of the desired summary. Using the T5 transformer model, the

system is going to generate eloquent, more human-like summaries which extracts the essence of the content rather than simply forming sentences from the original content. This model is cleaning the text using some preprocessing techniques like tokenization and generating real-time summary through an interactive interface. Inspired by recent advances in text summarization research, this project focuses on creating a user-friendly, efficient, and adaptable solution that enhances information accessibility and reading efficiency for text types.

Multi-Hop QA Comparison

Virtual Presentation (Microsoft Teams)

3:00pm – 4:00pm

Graduate Student(s): Tyler Ebersold

Research Mentor(s): Md Abdullah Al Hafiz Khan

The goal of this project is to evaluate and compare transformer-based models (RoBERTa, Longformer, DPR, and T5) on complex questions and answer corpora. Using corpus' such as hotpot_qa, we will ask complex questions that take multiple hops between documents to return correct answers. Work will be done in Python with a few supporting libraries to aid implementation and visualization. Evaluation of these models will be done using formulas such as Euclidean distance to determine how far away our answer was from the expected output. Other comparison metrics will include accuracy, precision, recall, and f1 score. Once a baseline evaluation of these models is complete, fine-tuning will be attempted to further improve the results. Complex question and answering are important when our questions may be incomplete or only give the general gist of what we are truly asking. We aim to put the model's ability to infer up to the test. Comparing these models and completing fine-tuning with respect to the datasets used should provide a meaningful culmination of data-points to display and analyze. Pending analysis, shortcomings in the aforementioned models will be investigated and potential solutions will be explored and potentially implemented.

Open-Domain Question Answering with Wikipedia and SQuAD

Poster #20 (Event Center)

4:00pm – 4:45pm

Graduate Student(s): Siri Yellu, Akshay Krishna Varma Buddharaju, & Pranay Kumar Peddi

Research Mentor(s): Md Abdullah Al Hafiz Khan

Finding precise answers in a sea of online information remains a constant challenge, even with powerful search engines at our fingertips. Our project explores how natural language processing can bridge that gap by building an open-domain question answering system that understands a question and retrieves a clear, evidence-based answer instead of a list of documents. The system combines information retrieval and deep language understanding in a two-step process. First, a

retriever model using Dense Passage Retrieval or MiniLM embeddings with FAISS identifies the most relevant sections from large text collections such as Wikipedia. Then, a fine-tuned BERT or DistilBERT model reads those sections and pinpoints the exact phrase or sentence that answers the question. This structure allows the retriever to quickly narrow the search space while the reader provides precise, context-aware responses. We will train and test the model using benchmark datasets such as SQuAD v1/v2 and the Natural Questions dataset, which contain thousands of annotated question-answer pairs drawn from real text. System performance will be evaluated through Exact Match, F1 Score, and Recall to assess both retrieval accuracy and answer quality. The goal of this project is not only to build a functional QA prototype but also to show how transformer models and dense retrieval can work together to make information access faster, more reliable, and closer to how humans naturally seek answers. In the long run, we hope this approach can help transform traditional search into true question understanding, allowing users to interact with knowledge more directly and meaningfully.

Natural Language Classification of Job Acceptance Emails

Poster #7 (Event Center)

4:00pm – 4:45pm

Graduate Student(s): Jacques Gatipon, Clark Pfohl, & Abrham Dejene

Research Mentor(s): Md Abdullah Al Hafiz Khan

As individuals attempt to enter the job market, the importance of proper electronic mail (e-mail) management rises. The ability to respond to and sort through hundreds or even thousands of messages becomes a necessary task that can take otherwise valuable time. These conditions call for an all encompassing system that can help automate the process of job email acceptance or denial while also handling other use cases for normal email usage. This study compares a developed DeBERTa language model implementation against a developed Support Vector Machine (SVM) implementation using the Naive Bayes algorithm for text classification in terms of efficiency and accuracy on a dataset of various types of emails. The research involves determining accuracy of classification and the time taken to find the proper results of email classifications. Two separate text classification implementations will be directly compared to each other based on accuracy and number of positive classifications of email types. These implementations include the DeBERTa language model and SVM using Naive Bayes method for classifying emails. Emails are separated into specific types including job acceptance, job rejection, interview emails, pending application emails, and normal non-job application emails. The data will be trained using multiple datasets that include job application emails and non-job application emails. The results of this experiment have not been concluded, but we hypothesize that the SVM implementation will outperform the DeBERTa language model implementation. The DeBERTa language model is meant for very large datasets while also needing various adjustments in order to work properly. Further results will be posted by the time of the symposium.

PRISM (Proxy Recognition and Inclusion Scoring Method)

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Graduate Student(s): Destiny Raburnel & Crystal Tubbs

Research Mentor(s): Md Abdullah Al Hafiz Khan

AI-driven automated hiring tools are reshaping how companies find talent, but they often reproduce the hidden biases embedded in their training data. Our project, PRISM (Proxy Recognition and Inclusion Scoring Method), investigates how subtle demographic signals, specifically first names associated with gender and race, influence AI resume screening even when candidates have identical qualifications. We built a controlled dataset of resumes that are identical in every way except for the applicant's first name, with each resume using a racially neutral surname to isolate how first names alone affect scoring. We tested these resumes against job postings in technology, healthcare, and law to capture different professional contexts. Our research compares two AI systems: a Sentence-BERT model that measures how well resumes match job descriptions, and a large language model designed to imitate how a human recruiter would score candidates. We look at how scores, rankings, and pass/fail cutoffs vary across demographic groups, using statistical tests to measure whether the differences are significant and meaningful. Specifically, we examine whether AI systems use names as proxies for identity, potentially leading to scoring gaps between candidates with identical qualifications. These tools are already being used to screen job applicants, making this issue directly relevant to people's career prospects. PRISM goes beyond identifying problems by testing solutions like masking demographic proxies to see what actually reduces bias. We believe responsible AI innovation must prioritize equity and transparency. As AI hiring tools spread rapidly across industries, PRISM serves as an initial investigation into embedded bias. By examining how names influence algorithmic scoring, this research raises vital awareness about whether AI hiring advances fairness or simply automates existing discrimination.

Real Time Fallacy Detection

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Graduate Student(s): Sahil Mangotra, Robel Mamo, & John Yare

Research Mentor(s): Md Abdullah Al Hafiz Khan

In today's fast-moving era, social media often creates echo chambers where users see content that supports their existing beliefs, whether the arguments are sound or not. This combined with shrinking attention spans, makes it difficult for users to critically assess the information they

consume. The objective of this project is to assist with this problem by creating a tool for the automated detection of logical fallacies, providing a much-needed counterbalance against flawed reasoning and helping to enhance digital literacy. Our project's core idea is a three-stage process. First, an audio or video file of spoken arguments is transcribed into text. Second, this text is cleaned and prepared for analysis. Finally, a classifier model performs multi-class classification on the text to identify and label a specific fallacy. To build our classifier, we will implement and compare several supervised learning models, such as Naïve Bayes, Logistic Regression, and Support Vector Machine (SVM). We will use a combination of datasets for training, including the LOGIC dataset for its diverse collection of fallacies and the Propaganda Detection dataset. Combining these sources will help us train a more robust model. We will measure the success of our project using standard metrics like accuracy, weighted precision, recall, and weighted F1-Score to evaluate the model's overall performance.

Smart Sensing and Computing for Dementia Care

Poster #20 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Kaden Rogers

Research Mentor(s): Zhongxing Xie

This project investigates the use of radar sensing and signal processing to monitor gait characteristics in elderly individuals with dementia. The central goal is to develop a contactless, automated system capable of detecting changes in walking patterns that may reflect early signs of cognitive or physical decline. Our work builds on emerging research in radar-based gait monitoring, which offers an alternative to traditional wearable devices that can be inconvenient or impractical for older adults. Using Texas Instruments radar modules, we collect raw radar data from individuals walking in indoor environments. A series of signal processing techniques are then applied to isolate the motion of the subject from background clutter, including range Fast Fourier Transforms, static clutter removal, and advanced beamforming algorithms. Detected points are clustered and tracked over time using density-based algorithms to consistently locate the subject's torso. From this tracked motion, we extract key gait features such as step timing, step length, and torso velocity. To improve clinical relevance, we are currently developing a post-processing stage that will automatically isolate the stable walking phase—excluding periods of acceleration and deceleration that could distort analysis. This is intended to provide a more accurate representation of habitual walking behavior, which is critical in evaluating gait consistency and health changes over time. We are also working toward a fully contactless, low-cost radar system capable of detecting detailed gait parameters in real-world environments without requiring users to wear sensors or follow scripted procedures. Once complete, the system is intended to support long-term, passive monitoring in care facilities or homes and may offer early detection of mobility decline or cognitive issues. This research

contributes to the development of practical, technology-based tools for enhancing dementia care and promoting aging in place.

Sign to Sentence: Translating Sign Languages Gestures into Fluent Natural Language Using NLP Techniques

Poster #16 (Event Center)

3:00pm – 3:45pm

Graduate Student(s): Rakshak Nath Gurung & Nino Tkabladze

Research Mentor(s): Md Abdullah A Hafiz Khan

The communication gap between deaf and hearing individuals remains a major accessibility challenge due to the limited understanding of American Sign Language (ASL) among the general population. While computer vision models have made progress in recognizing ASL gestures, the generated English translations often lack fluency, coherence and grammatical accuracy. These issues stem from the structural differences between ASL and English, as well as limitations in the gloss-based translation approaches. We develop a gloss-free, NLP-driven post-processing module that refines first-pass English sentences generated by ASL recognition systems. The model is fine tuned on the How2Sign dataset to enhance linguistic structure, context, and readability in translated outputs. By focusing on semantic fluency, our model approaches to improve the naturalness of ASL to English translation.

Video Game Recommendation via NLP ML Model

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Graduate Student(s): Clarence Barron III & Juston Bryant

Research Mentor(s): Hafiz Khan

This project explores the use of Natural Language Processing and Machine Learning to recommend video games by analyzing player reviews from the Steam platform. We plan to collect review data coming from the Steam API database, mainly from games released between early 2024 and September 2025. The text from the reviews will be processed in a NLP model, and it will be tested to give games a positive, negative, or possibly even mixed reactions. For the evaluation of our model, we will be using metrics like precision and RMSE to help analyze and combine the data using keywords to mark a review as the appropriate rating for the game. This will give people who use the Steam platform more of an edge to choose what games to buy and what is worth playing in the current landscape. In the end, the goal of the project is to help better the recommendation system on the Steam platform and give people who use it a better way of knowing if something is good or not. Of course, there will be difficulties with applying this with things akin to review bombing or random reviews made by users of the platform. However, with

those in mind, the model will analyze the text in each game and help assist gamers with more of a choice in their games.

Wikipedia Question Answering Using SQuAD1 Dataset

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Graduate Student(s): Code Bijoux, Trenton Miller, & Kishan Mistry

Research Mentor(s): Md Abdulah Al Hafiz Khan

With continuous experimentation and implementation of Machine Learning when it comes to information processing and retrieval, we hope to further this research by delving into creating a program that uses machine learning to analyze Wikipedia-sources and answer questions based on inquiry from the user. The program will use a combination of document retrieval using TF-IDF (Term Frequency-Inverse Document Frequency) and answer extraction using recurrent neural Networks to pull accurate responses to inquiries based on the target information. We will be both training and testing the algorithm using the Stanford Question Answering Dataset. To goal of the algorithm is to be able to tackle more complex questions and explore alternate retrieval methods. We will utilize extrinsic testing to compare practical results of the program with the anticipated correct response. The results are still pending as we are finalizing testing and comparison, but we hope that the result of this research will show a different approach to information retrieval that could be used for AI-powered inquiry responsive algorithms.

Information Technology

AD ADRD Databases: Organizing Key Research Domains to Enhance Diagnostics and Treatment

Virtual Presentation (Microsoft Teams)

3:00pm – 4:00pm

Undergraduate Student(s): Johaan Kathilankal Jis

Research Mentor(s): Choe Yixin Xie

Alzheimer's Disease (AD) is a neurodegenerative disorder that progressively characterized by cognitive decline, memory loss, and behavioral changes. AD belongs Alzheimer's Disease-Related Dementias which is a broader term used to classify neurodegenerative disorders. According to a study by the National Institute of Aging, AD is currently the 7th leading cause of death in the United States. As research for this disease advances, new computational methods have shown promise in improving diagnosis, understanding of disease mechanisms, and identifying potential treatments. However, today researchers are finding it hard to navigate the vast landscape of AD ADRD databases which are dispersed across domains and difficult to

integrate. To help with this, this works conducts a structure review and comparative analysis of databases that are publicly available and evaluate on different criteria such as accessibility, data type, metadata quality, and integration of datasets with external applications. Our results was that we were able to classify 8 databases into 3 primary categories: clinical and population data, genetics and genomics, and drug discovery and therapeutics.

Deep Learning in Orthopedic Imaging: Detectron2 for Knee Osteoarthritis Detection and Grading

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Undergraduate Student(s): Moneesh Rajaram & Joshua Daniel

Research Mentor(s): Sathish Kumar Gurupatham

The application of Detectron2 in the classification of knee osteoarthritis (KOA) is a landmark advancement in the diagnosis of medical imaging. This research solves a critical issue in the management of the elderly wherein conventional classification using the Kellgren-Lawrence system is subject to subjectivity, efficiency limitations, and reliance on expert knowledge.

Detectron2, a state-of-the-art instance segmentation model, is distinct from typical Convolutional Neural Networks (CNNs) in its ability to precisely localize knee anatomy. This allows for more nuanced feature extraction and improved detection of faint radiographic manifestations of osteoarthritis that typical methods may overlook. Such anatomical sensitivity is preferable in clinical orthopedic imaging, where spatial precision is paramount. The work uses the Osteoarthritis Initiative (OAI) dataset with high-quality, clinically validated images.

However, the comparatively small size of the dataset (210 training, 60 validation, and 30 test images) can possibly limit generalizability over wide-ranging patient populations and imaging scenarios. Deep learning networks usually require larger datasets in order to handle robustly and without prejudice. Results on performance are astounding. For binary classification, the model was 98.6% accurate, 97.8% precise, 98.4% sensitive, and had a 98.1% F1-score, with near-perfect discrimination between osteoarthritic and normal knees. Multi-class classification was up to 94.2% accuracy with F1-scores of over 92%, and segmentation had an 89%

Intersection over Union (IoU), i.e., strong anatomical accuracy. These results point towards performance equal to, if not exceeding, that of experienced radiologists. Yet, in this instance, high scores suggest potential for overfitting, and therefore, there is a significant need for external validation in larger, more diverse datasets. As interestingly noted, integration with explainable AI techniques enhances transparency, addressing the "black box" concern and establishing clinician trust. Clinically, this model can potentially demystify diagnosis, reduce observer bias, and improve treatment planning and monitoring. Future prospective studies are needed to confirm its real-world effectiveness and clinical practice radiology integration.

SANDRApp (Supporting Adults Needing Direct Relationships App)

Poster #4 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Dante Galvan & Rami Elmostafa

Research Mentor(s): Maria Valero, Valentina Nino, Paola Spioletini, & Israel Sanchez-Cardona

SANDRApp (Supporting Adults Needing Direct Relationships App) is a socially aware digital platform designed to reduce isolation and enhance safety for older adults aging in place. The project combines user-centered design, ethical AI, and community-based support to empower seniors through meaningful social connections. The platform features four modules: Distant Check, which unobtrusively monitors well-being using sensors; Visiting Social Network, which facilitates companionship through intelligent matchmaking; Volunteer Program, which promotes intergenerational engagement; and Marketplace, which connects users with local services. The machine learning pipeline uses an enriched public social dataset, augmented with synthetic features reflecting mobility, technology affinity, and communication comfort. Each user profile is represented as a structured set of emotional, behavioral, and logistical attributes. A Multilayer Perceptron (MLP) classifier built with scikit-learn generates compatibility scores, which are optimized using the Gale–Shapley Stable Matching Algorithm to form socially meaningful pairs. A React frontend visualizes these matches in real time. SANDRApp bridges social science and AI, offering an ethical and scalable approach to enhancing connectedness, empathy, and safety for older adults.

Software Engineering and Game Development

Analyzing Emotional Responses and Learning Outcomes in Immersive Virtual Classrooms

Poster #4 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Anaiya Tucker

Graduate Student(s): Ploynapas Masi

Research Mentor(s): Sungchul Jung

Emotion is substantially correlated with cognitive control in learning, making the understanding of emotion critical. A popular way to study emotion is virtual reality (VR) due to its immersion qualities. Many emotion datasets have been created from VR experiences because these datasets can be used to train AI to recognize emotions. The problem is that there is a lack of emotion datasets within the educational context creating a research gap that needs to be addressed. This gap limits the development of emotionally aware educational technologies, such

as virtual instructors, or learning platforms. This study aims to address this gap by creating an emotional elicitation dataset in a simulated virtual classroom setting. By capturing brain activity, physiological signal, behavior tracking including eye and head, and self-reported emotional responses, this research will contribute domain specific dataset for understanding emotion in learning and for training affective computing models in educational applications.

Exploring Large Language Models for Curriculum Advising

Poster #17 (Event Center)

1:00pm – 1:45pm

Graduate Student(s): Laetitia Neno Aloyem

Research Mentor(s): Chenyu Wang

Universities face increasing challenges in optimizing academic advising and course enrollment. Many advisors report burnout, over 40% experiencing it at least weekly especially during peak advising periods, while first-year students often feel overwhelmed by complex graduation requirements and lengthy course catalogs. These challenges highlight the need for an intelligent, data-driven approach to support both advisors and students. This research explores the use of Large Language Models (LLMs) for curriculum advising, aiming to develop a personalized recommender system that leverages institutional catalog data and student profiles to generate accurate degree planning recommendations. The study compares three approaches: Retrieval-Augmented Generation (RAG), fine-tuning using Low-Rank Adaptation (LoRA), and a hybrid RAG + LoRA method across different open-source models with different parameter size (e.g., LLaMA 3B, Gemma 7B). PDF catalogs from multiple programs, colleges, and universities are embedded into a vector database to support grounded retrieval. The system is evaluated using metrics of accuracy, grounding (hallucination rate), and speed (latency) using a test set of advising-related questions derived from the university catalog. Preliminary findings suggest that RAG ensures strong factual grounding by retrieving precise information from external sources, while fine-tuning, especially through tools like LoRA, is designed for specific applications where data is used to train the model to understand the industry. The combination of both methods yields the most balanced results, demonstrating improved advising accuracy while keeping the source of each answer easy to verify. Overall, this research contributes to the development of AI-assisted academic advising systems capable of reducing advisor workload, supporting personalized student decision-making, and improving the overall advising experience in higher education.

Imperceptible Attacks in LLM-aided NFT Transactions via Blockchain Semantic Poisoning

Poster #11 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Maan Bhagat

Graduate Student(s): Raghava Sammet
Research Mentor(s): Chenyu Wang

The management of Non-Fungible Tokens (NFTs) depends on public blockchain metadata, event logs, and transaction histories to ensure verifiable ownership and authenticity. While smart contract code typically undergoes extensive auditing, the surrounding on-chain data layer remains an underexplored attack surface. To address this gap, we present an experimental research platform built on a private Ethereum-compatible network. The platform implements a suite of 3D asset management contracts that simulate realistic NFT lifecycles integrated with Generative AI (GAI) models. These artifacts enable systematic investigation of semantic poisoning attack scenarios in which, even without altering contract code, trusted on-chain data can be manipulated to trigger unauthorized transfers, misattribute ownership, or corrupt asset provenance—particularly through the exploitation of Large Language Models (LLMs). We further discuss how LLM-assisted attacks could compromise NFTs encapsulating GAI-generated 3D assets by substituting, corrupting, or misdirecting asset pointers and metadata. By offering a testbed and realistic 3D asset workflows, our platform substantially advances research on semantic poisoning attacks in blockchain ecosystems.

Refining Saggah's Framework to Further Promote Collaboration in Educational Game Design & Development

Virtual Presentation (Microsoft Teams)
1:00pm – 2:00pm
Undergraduate Student(s): Colin Bechtel
Research Mentor(s): Lei Zhang

Digital Game-Based Learning (DGBL) has a fair number of frameworks involving educators in the design processes. However, there are limited frameworks developed with the goal of promoting synergy between educators and game developers during said processes. Saggah's 2020 developed framework focuses on collaboration but has areas in need of refinement, suggesting further research is needed. Such improvements needed are ease of use, greater comprehensiveness, and more overall appeal. The objectives of this research are to 1) Ascertain areas of improvement needed for the original framework and make improvements where needed, 2) Ascertain interest in the future use of the improved framework in both the creation and learning of creation for Digital Game-Based Learning development, and 3) Demonstrate increased collaboration between educators and game developers through mockup development planning. K12 Educators of varying subjects and Game Developers of three distinct backgrounds will take part in a quantitative survey and a qualitative survey, with refinements to the framework based on responses following. Participants are then selected for the following phase based on background, with K12 educators grouped by Gagné category, subject taught, then grade ranges. Selected participants will then take part in focus groups conducting mockup testing, each

consisting of one K12 educator, one student of game design and development, one faculty member of game design and development, and one industry professional of game design and development. Anticipated results for the qualitative and quantitative survey are expected to reveal weaknesses in the central feedback loop between educators and game developers. The updated framework should confirm a more refined and suitable framework based on Saggah's proposal for promoting synergy between educators and game developers for collaboration. Results will be presented at the Fall Symposium of Student Scholars.

Simulating the AP1000: An Educational Game to Promote Understanding of Nuclear Energy Safety and Sustainability

Poster #21 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Mithil Honkanadavar, Evan Weir, Marco Cheng, Va'Queuz Friday, & Caitlin Tigani

Research Mentor(s): Eduardo Farfan & Joy Li

With global concerns surrounding climate change and human-driven pollution, it is understandable that many people express anxiety over the large clouds emitted from cooling towers of nuclear power plants. For individuals unfamiliar with the inner workings of these facilities, misconceptions can easily arise about the nature of the emissions and their potential impact on the environment. While numerous forms of air pollution and environmental harm stem directly from human activity, nuclear power generation remains a comparatively minor contributor, contrary to common misconceptions. Continuous innovations in nuclear technology have enhanced its potential as a clean and renewable energy source. Nevertheless, public education on the safe operation of nuclear facilities presents ongoing challenges, largely due to the perceived complexity of the subject. This project aims to provide an accessible and engaging method for educating the public about the safety and environmental benefits of nuclear energy, as well as the fundamental operations of nuclear power plants. To achieve this, an educational game has been developed that simulates the AP1000, Advanced Passive Pressurized Water Reactor. The AP1000 is distinguished by its simplified design, which relies on fewer active systems than conventional reactors. The game highlights these design features, allowing players to explore reactor operations in an interactive environment. As participants progress, they encounter educational modules that explain how the reactor functions and how it is safely managed. Gamified elements, including mini-games, encourage engagement by tasking players with maintaining stable reactor performance. Certain scenarios employ dramatized storytelling to enhance engagement, with clear disclaimers distinguishing educational simulations from real-world reactor conditions. Playtesting with high school and college students will be conducted to help assess its educational impact. By simulating the operation of an advanced nuclear reactor, this project seeks to foster greater public awareness of the technological sophistication and inherent safety of modern nuclear energy systems.

The Virtual Reality (VR) Blood Donor Experience

Poster #6 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Diana Baidoo

Research Mentor(s): Joy Li

Building on our recently published pilot study showing that an immersive VR blood-donor experience significantly improved satisfaction (82%) and donation willingness (64%) among young adults while reducing anxiety, this follow-up investigation addresses next-generation challenges revealed during playtesting, particularly the need to detect fluctuations in user awareness, stress, and engagement in real time. Although participants responded positively to interactive and educational scenes such as the arcade and art gallery, varying emotional arousal, occasional disorientation, and cybersickness (41%) highlighted the importance of adaptive systems capable of recognizing a user's physiological and cognitive state. This study therefore explores how integrating eye-tracking and multimodal physiological sensing can enable consciousness detection, including the automatic inference of attention and awareness levels within immersive donor simulations, to personalize feedback and maintain comfort. Specifically, the research question is: to what extent can real-time eye-tracking metrics (e.g., gaze, fixation, pupil dilation) combined with auxiliary bio signals (EEG, ECG, GSR) accurately classify donor consciousness and stress states during VR immersion? A literature-driven analysis of studies from 2019–2025 was conducted, examining eye-tracking accuracy, sampling rates, and multimodal classification performance. Results indicate that video-oculography systems such as Vive Pro Eye, Tobii, and Varjo achieve spatial precision of 0.5° – 1.1° and, when paired with additional physiological channels, can reach recognition accuracies above 85%. These findings underscore the feasibility of embedding consciousness detection into VR donor environments to enable adaptive engagement, improve user safety, and advance anxiety-reducing donor technologies.

Radow College of Humanities and Social Sciences

English

A Black Woman's Story: A Series Pitch and a Brief History of Black Women Television Creators

Virtual Presentation (Microsoft Teams)

3:00pm – 4:00pm

Undergraduate Student(s): Uriah Williams

Research Mentor(s): Anna Weinstein

In this presentation, I will discuss several topics related to the entertainment industry and the pitching process for television writers, focusing on the lack of representation for Black women writers and the challenges for these writers to bring their stories to the screen. I will share statistics on the representation of Black people both on and offscreen—particularly Black women—and will highlight historical and current trends. I will break down the pitching process and discuss the pathways available to emerging writers seeking meetings with studio executives. Finally, I will present the television series pitch I am developing for my FILM 3125 (Intro to TV Writing) course this semester, sharing my writing and development process as well as my goals for the project. Centered on a Black female protagonist, my ultimate goal is to create a series that can spark conversations around identity, self-discovery, and personal evolution, while also contributing to a larger push for industry inclusion and authentic storytelling.

Estranged: A Television Series

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Undergraduate Student(s): Milan Parker

Research Mentor(s): Anna Weinstein

In this presentation, I will share my pitch deck for the television series I am developing in my FILM 4125 course this semester. My series examines a complex mother-daughter relationship, following a young woman who returns home when her mother's cancer progresses. Ever since I began writing, I have been interested in exploring the emotional tug-of-war in mother-daughter relationships—particularly, the battle between a daughter's innate love for her mother and the harm her mother inflicts. With this presentation, I will detail the lead characters, setting, and emotional arcs for my characters, and I will also detail my creative process in developing my television series.

The Evolution and Impact of the Token Black Friend Trope in American Media

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

1:00pm – 1:50pm

Undergraduate Student(s): Sophie Rice

Research Mentor(s): Kurt Milberger

This research explores the history of the token Black friend trope in American media and how these misrepresentations continue to influence popular culture and negatively impact Black Americans. Historically, the token Black friend stereotype singles out Black characters to fill gaps in the plot through comedy, intelligence, or self-sacrifice, all while being excluded from the white protagonist's larger narrative. The prevalence of this trope is apparent through several contemporary and classic examples, which are used to evaluate the effects of the token Black friend trope on American culture. To deconstruct these misrepresentations, this essay supplements these examples with scholarship from academic journals and medical studies to survey the psychological impacts racist media has on Black Americans and how social interactions, both online and in-person, are influenced by this perpetuated stereotype. In addition to these sources that discuss the consequences of these tropes, this project also details solutions that audiences can implement in their everyday media consumption to heal from and combat the prejudice present in American stories. The conclusions from this research inform viewers on the influence of problematic tropes while also asserting that the awareness and criticisms of these tropes directly counteract stereotypes in American media and its influence on the public.

World Languages and Cultures

Defining the European Union's Top Public Health Priorities: What Can be Gleaned From Its Multi-State Interdisciplinary Systems?

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

1:00pm – 1:50pm

Undergraduate Student(s): Mattie Frascella

Research Mentor(s): Thierry Legér

Delineation of the European Union's (EU) contemporary public health agenda is examined within the evolving architecture of a 'European Health Union.' Five interdependent domains are synthesized: climate and planetary health, digital transformation, resilient systems and workforce development, non-communicable disease (NCD) prevention, and cross-sectoral and global leadership. Mutual reinforcement is essential for achieving equitable outcomes. The climate pillar reframes environmental disruption as a public health emergency, embedding adaptation, mitigation, and Planetary/One Health approaches across EU initiatives. The digital

pillar examines the European Health Data Space and adjacent tools (telemedicine, e-prescribing, mobile health) as infrastructure for secure interoperability, research, and quality improvement. System resilience is enhanced through lessons learned from the COVID-19 pandemic, emphasizing surveillance, medical supply chains, surge capacity, and a sustainable, ethically recruited workforce. NCD analysis emphasizes the need for coordinated policies addressing tobacco, alcohol, diet, physical activity, environmental pollution, and mental health, underpinned by the EU's current framework. A health-in-all-policies lens connects transportation, agriculture, housing, education, and social protection to health equity, while the Global Health Strategy positions the EU as a diplomatic and regulatory actor aligned with the World Health Organization (WHO) and regional partners. Collectively, the findings characterize an anticipatory, data-driven, and solidarity-based model that links domestic reform to action, policy, and security, demonstrating that progress depends on governance mechanisms that integrate evidence across directorates, cohesion instruments, and robust evaluation of distributional effects to prevent widening inequalities among member states. Policy coherence, interoperable data ecosystems, workforce investment, and meaningful civil-society engagement emerge as necessary conditions for durable gains, while transparency in digital and emergency measures remains an ethical guardrail for legitimacy. These recommendations provide a roadmap for resilient and inclusive European health governance.

(Mens) Fashion & Style in the Renaissance

Poster #20 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Kristen Alexander

Research Mentor(s): Frederica Santini

The Renaissance period was a major time in history where it was known for its awakening out of the Dark Ages. There were also many notable people that were celebrated in its time and throughout modern history. These people were known mostly by their works, however, the ways people would know who another was, was mostly by their fashion and their styles they wore. Men's fashion and styles in particular, told others about their culture, their profession, social class, etc. The overall purpose of this research study of men's fashion in the Italian Renaissance is to examine portraits and paintings of the time, and analyze the men's fashion and certain styles, to gain a better understanding of how important appearance and style were to how people lived in the Rebirth Era. Texts will be studied and about 3 portraits and paintings will be displayed to gain better visual understanding as well. It is expected that through analyzing historical paintings and portraits, it can connect the learning in how to study a specific time in Historical Italy and its society. Cultural conclusions will be made in defining the culture of its time by using the portraits and paintings.

Geography and Anthropology

Crowned in Stone: Legacy of the Ancient Maya Queens

Poster #25 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Veronica Roman

Research Mentor(s): Terry Powis

The Maya civilization was an impressive Mesoamerican culture that is still one of the most well-known pre-contact societies amongst people today. They are known for several of their developments and achievements within astronomy, mathematics, and architecture. They also notably created one of the most advanced writing systems in the Americas. While much is known about their civilization, there remains some mystery and avenues that have yet to be explored, and I will be expanding into one of those avenues. We know of their society and how they were organized into powerful city-states that were ruled by kings; however, they were also ruled by the occasional queen. While there were significantly more kings, there is still archaeological evidence of female rulers that haven't been investigated or researched just as thoroughly. This preliminary project will be looking into these neglected queens by analyzing artistic renderings of them and comparing them to the Maya kings to see if there is any difference in representation between the two, as well as investigating just how much power they held within the Maya society.

Playa Lakes Play a Vital Role in the High Plains Ecosystem

Poster #11 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Hilly Hover

Research Mentor(s): Nancy Pullen

The High Plains Region of the United States, extending from Southern South Dakota to West Texas, is home to vast grasslands and playa lakes—shallow depressions that form temporary wetlands. These playa lakes are vital for recharging the High Plains Aquifer, also known as the Ogallala Aquifer, one of the largest sources of freshwater in the country. Despite limited rainfall, this region has historically supported rich grassland ecosystems and remains crucial for both global agricultural production and migratory bird populations traveling the Central Flyway. My poster explores the ongoing depletion of the playa lakes and grasslands due to over-irrigation and land conversion, an often-overlooked issue with wide-reaching environmental consequences. These changes threaten biodiversity, disrupt the water cycle and pose a threat to long term agricultural production. The aim of my project is to raise awareness among the general public,

who are often unaware of the critical ecological role of the High Plains Region. One of the biggest challenges I faced during this project was locating usable shapefiles to visually represent grassland to cropland conversion. My initial attempts to show grassland conversion were complicated by overly detailed cropland data. Eventually, I shifted focus after finding an irrigation shapefile which showed a much clearer visual of the use of water in the area. The other part of the story is told by the Greater Prairie Chicken, the Lark Bunting and the Cassin's Sparrow. The three species of birds rely greatly on the playa lakes as a means for survival throughout breeding and migratory journeys. With personal ties to the southern High Plains, I hope this poster brings attention to the ecological importance of this region and inspires more informed land-use decisions.

Sharpening the Past: Analysis of Pre-Contact Stone Tools from the Cummings Site, Bartow County, Georgia

Poster #13 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Kelsi Merkel

Research Mentor(s): Terry Powis

This archaeological study presents a technological and morphological analysis of formal lithic tools recovered from excavation at the Cummings site (9BR710) in Bartow County, Georgia. The Cummings site is located about three kilometers northwest of the Etowah Indian Mounds in Bartow County, Georgia, and is nestled about 500 meters from the Etowah River. Radiocarbon dating and analysis of ceramic material recovered from the site indicates prime occupations during the Early-Middle Woodland (1000 BC - AD 500) and Middle Mississippian (1250 - 1375) periods, but typological analysis on lithic tools has yet to be done. For my research, a total of 85 lithic artifacts from the Cummings site were systematically categorized through metric and qualitative data collection and raw material characterization. Comparative analysis with regional assemblages was used to determine tool type based on morphology and metric measurements. Through analyses and typing of these lithic materials, my goal is to provide evidence on the period of occupation at Cummings, spatial occupation of the site, and production strategies.

Spatial Patterns in County-Level Mortality Rates for Drug Use, Mental Illness, and Suicide and Their Associations with Risk Factors in Georgia

Virtual Presentation (Microsoft Teams)

3:00pm – 4:00pm

Undergraduate Student(s): Lauren Collop

Research Mentor(s): Jun Tu

As reported by the CDC, suicide is the second leading cause of death for people aged 10 to 44 years old, accounting for 17.2% of deaths for people aged 10-24 and 9.8% of deaths for people aged 25-44 in the United States in 2023. In Georgia, suicide accounts for 12.1% of deaths for people aged 10-44 and drug overdoses account for 14.8% of deaths for people aged 10-44 years old as of 2024. These “deaths of despair” are usually credited as a result of mental illness, but only one-fifth of people who commit suicide are diagnosed with mental illness in the U.S.. Previous studies have identified many socioeconomic variables as the risk factors of suicide and substance abuse, such as poverty, barriers to healthcare, and social isolation. In Georgia, drug overdoses and suicide exhibit considerable urban-rural disparities: rural areas have a significantly higher rates than their urban counterparts. Thus, a good understanding of the spatial patterns in drug overdose, mental illness, suicide, and their associated risk factors is necessary for making effective preventive measures. This project aims to explore the spatial patterns in county-level mortality rates of drug use, mental illness, and suicide, and their associations with risk factors in Georgia using GIS (Geographic Information System) and statistical analyses. GIS analysis is used to map and compare the spatial patterns, especially urban-rural disparities, in the three mortality rates and risk factors, including median income, social isolation, access to mental healthcare, and ratio of School Social Workers (SSWs) to students. GIS-based hot spot analysis is used to identify the spatial clusters of the three mortality rates and risk factors. Statistical analyses, especially correlation analysis, are used to quantify and compare the associations among them. This study will provide useful information for public health policy making.

Psychological Science

Cognitive Functioning in Emergency Medical Responders: The Role of Depression, Insomnia, and Mental Health

Poster #13 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Mahita Polineni

Research Mentor(s): Kristin Horan

Emergency medical responders (EMRs), including emergency medical technicians, paramedics, and firefighters, operate under conditions of sustained stress and repeated trauma exposure. These demands heighten vulnerability to depression, insomnia, and other mental health challenges that may impair cognitive functioning. The present study examined whether depression, insomnia, and overall mental health were associated with self-reported cognitive limitations among EMRs. Data were drawn from the National Institute for Occupational Safety and Health (NIOSH) Worker Well-Being Questionnaire (WellBQ), a nationally representative

survey of U.S. working adults. The analytic sample consisted of 375 participants who provided information on depression and insomnia history, frequency of poor mental health days, and current symptoms. Cognitive limitations were assessed with a dichotomous measure of serious difficulty concentrating, remembering, or making decisions. Analyses included chi-square tests of independence and Pearson correlations. Depression status was significantly associated with cognitive limitations, $\chi^2(6, N = 304) = 22.47, p < .001$, Cramer's $V = .192$, with participants reporting past or current depression endorsing greater difficulties. Insomnia status showed a similar association, $\chi^2(6, N = 304) = 26.78, p < .001$, Cramer's $V = .210$, with those experiencing insomnia more likely to report limitations. More frequent poor mental health days were moderately correlated with cognitive difficulties, $r(304) = .24, p < .001$, while poorer overall mental health showed a stronger correlation, $r(304) = .54, p < .001$. Findings demonstrate that mental health conditions and sleep disturbance are linked to greater perceived cognitive difficulties in EMRs. Results underscore the importance of addressing depression, insomnia, and overall psychological well-being as interrelated contributors to occupational performance. Incorporating mental health and sleep assessments into wellness programs and organizational policies may mitigate cognitive limitations, reduce cumulative stress, and strengthen both individual well-being and public safety in this essential workforce.

Examining the Role of Podcasts in Increasing Awareness of ADHD

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Undergraduate Student(s): Cinthia Perez-Martinez

Research Mentor(s): Ebony Glover

Between 2% and 8% of college students have a diagnosed case of ADHD, while an additional 10% report experiencing ADHD symptoms without a formal diagnosis. This project examines whether a podcast is an effective medium to spread awareness and understanding of ADHD among college students. The primary goal is to cultivate trust and connection with listeners and to encourage those who identify with ADHD-related challenges to seek appropriate evaluation and support. College students will serve as participants. Podcast episodes will feature discussions of real experiences, expert insight, and practical coping strategies. After listening, participants will complete surveys assessing their engagement, perceived relevance, and knowledge gained. All participants will provide informed consent, and their responses will be anonymized. We expect that listeners will feel more connected to the topics we discuss, gain a deeper understanding of ADHD, and reduce self-stigma related to mental health. Overall, this project aims to demonstrate that podcasts can serve as an accessible and relatable educational tool to promote awareness of ADHD on college campuses. Future work may expand the sample size, include follow-up assessments, and integrate self-tracking tools or expert interviews to enhance impact.

Exploring Employment Experiences and Perceived Trust: Attitudes Toward Short-Term Workers

Poster #15 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Maria Perez

Research Mentor(s): Hansol Rheem & Dianhan Zheng

This research focused on the relationship between employment experiences and the extent to which these individuals trust others to perform a job well. Our goal is to research how different employment experiences shape how we view employment, and the perceived trust towards short-term workers, or “gig workers”, who have become increasingly tied to our everyday lives (Heing, 2021). A sample of 292 undergraduate psychology students were recruited for the study. Participants rated profiles of hypothetical gig workers presented in Qualtrics as if they were on platforms like TaskRabbit. The independent variable in this study is the participants’ work experience which is split into two groups: Individuals who are likely to do gig jobs on a regular basis and those not likely to do so. The first group would consist of individuals employed full-time, in internships, or apprenticeships. The second group consists of individuals who are employed part-time, temporary/contract employees, and unemployed individuals. The dependent variable of this study is each participant’s mean score on the Perceived Trustworthiness scale (Ma et al., 2017). An ANOVA was conducted to determine if there is a significant difference in the mean scores on the Perceived Trustworthiness scale among the two participant groups. Through this research, we aim to identify whether there is a significant relationship between employment experiences of the participants and their perceived trust of others. These findings can ultimately be applied to real-world situations and inform us on how the growth of a “gig economy” may influence implicit attitudes towards others based on employment experiences. The research also provides evidence on how our personal experiences may shape our perceptions and attitudes of the social and professional world around us.

Goal Shielding as an Attention Aid: How Intrinsic and Extrinsic Goals Compare in Their Ability to Increase Focus

Poster #6 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Dexter Clements

Research Mentor(s): Ebony Glover

The increasing presence of electronic devices – and their associated notifications – poses a persistent challenge to maintaining focus. Many individuals struggle to stay attentive without fully removing devices from their workspace, which is often impractical. This study explores a potential middle ground by testing goal shielding as a focus-enhancing strategy. It is predicted that setting a personal goal before completing a task will reduce distraction and improve task

accuracy compared to having no goal, with intrinsic goals being more effective than extrinsic ones. In a within-subjects design, participants (proposed N=34) will complete a memory task under three conditions: intrinsic goal, extrinsic goal, and no goal. Participants will complete a memory task while receiving periodic notifications while their skin conductance and task performance are measured. Informed consent and minimal risk protocols will be followed, and data will be anonymized. It is expected that participants will show reduced distractibility and improved task performance in the intrinsic goal condition compared to the extrinsic and control conditions as tested by a one-way repeated measures ANOVA. These findings would support the role of goal shielding in mitigating distraction and suggest that motivational source of a goal moderates its effectiveness. Broadly, this research contributes to theories of interference control and offers practical insights for improving attention and performance in technology-rich environments.

Intergenerational Impact of Corporal Punishment: Correlating Childhood Experiences to Aggression and Future Disciplinary Intent

Poster #7 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Diksha Ghimirey

Research Mentor(s): Ginny Zhan

The study investigates the long-term psychological effects of Corporal Punishment (CP) administered during childhood. Specifically, the study will examine whether individuals exposed to CP are more likely to (1) display aggressive behavior in adulthood and (2) use Corporal Punishment on their own children, thus perpetuating a cycle of violence. Previous studies related to Corporal Punishment suggest associations between childhood maltreatment and emotional dysregulation, increased aggression, or reduced empathy. The current study is designed to be a cross-sectional survey using self-reported measures; data will be collected through voluntary and anonymous participation with the software Qualtrics. The study plans to recruit university-age adults (18 and up) from a diverse background through the Kennesaw State University student network, through professors, and online messaging. The statistical analysis will be conducted using SPSS to identify patterns and correlations between the variables. Thus, by examining these relationships, the study seeks to deepen understanding of intergenerational cycles of violence and emotional regulation in adulthood.

Magnitude of Gratitude: Journaling Effects on Anxiety, Resilience, and Positive Psychological Outcomes

Poster #5 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Demarese Crosby
Research Mentor(s): Tyler Collete

Anxiety has become a quiet companion for many, affecting everything from mental to physical health, prompting the need for effective management strategies. Gratitude has gained attention in current research as a simple and accessible strategy that affects multiple areas of an individual's well-being, including emotions, outlook on life, and even brain function (Hamka, 2023; Atad & Russo-Netzer, 2021; Kini et al., 2016). Additionally, studies have revealed that the root of gratitude's effectiveness is its ability to increase positive thinking and self-reflection while lessening negative emotions (Hamka, 2023). This practice is especially useful when done intentionally and with application of personal meaning (Atad & Russo-Netzer, 2021). We conducted a longitudinal study to examine whether daily gratitude journaling could serve as a buffer to stress and promote emotional wellbeing. Participants (N = 42) completed three sessions across one week. Sessions 1 and 3 included a stress induction and five minutes of gratitude journaling, whereas Session 2 served as a midweek check-in. In Session 1, anxiety significantly increased following stress induction but returned to baseline after journaling ($p < .001$). By Session 3, the induction no longer elevated anxiety, yet journaling again reduced post-induction anxiety—suggesting emerging psychological resilience. Emotional regulation patterns varied across the week. Cognitive reappraisal decreased from Session 1 to 2 ($p = .001$), while expressive suppression increased initially and then plateaued ($p < .001$), indicating change in how participants may manage emotional expression. Self-efficacy decreased midweek but returned to baseline by Session 3, and self-esteem showed a similar short-term rise and return. Across sessions, total gratitude ($p = .038$) and appreciation of others ($p = .026$) increased, and negative affect decreased ($p = .003$). These findings suggest that even brief, consistent gratitude journaling has the ability to not only relieve immediate stress symptoms, but also promote mental resilience.

EEG Microstate Dynamics Predict Cognitive Functioning in Older Adults

Poster #9 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Drew Ammons
Research Mentor(s): Tim Martin & Voyko Kavcic

Resting-state EEG microstates provide insight into the brain's dynamic organization and have been linked to cognitive efficiency. In this study, we examined whether transition probabilities between specific microstates predicted overall cognitive performance. EEG data were collected from approximately 120 older adults, and Markov transition probabilities were calculated for

transitions between four microstates at both pre- and post-assessment periods. Cognitive performance was measured using the NIH Toolbox Total Fully Corrected T-score. Correlational analyses revealed that post-assessment transitions from B→A were negatively associated with cognition ($r = -.24$, $p = .008$), whereas transitions from B→C were positively associated ($r = .21$, $p = .022$). A multiple regression including both predictors was also significant, $F(2,117) = 4.26$, $p = .016$, Adjusted $R^2 = .05$, and a standard error of 14.98. These results suggest that specific EEG microstate transitions reflect neural patterns linked to lower or higher cognitive performance, with the B→A transition potentially indicating less efficient brain-state dynamics.

Enhancing Mass Casualty Triage Training Through Human-AI Collaboration

Poster #2 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Devin Pledger & Lilly Roach

Research Mentor(s): Hansol Rheem

In mass casualty events, first responders must quickly assess the health conditions of many victims so that those with the most severe injuries receive priority treatment. This process is called mass casualty triaging. Traditional triage training requires realistic mass casualty scenarios to ensure trainees can practice in environments that mimic real-world conditions. However, creating such scenarios for live training is resource-intensive in both time and cost. To address this, game-based simulation has emerged as an effective alternative, showing training outcomes comparable to traditional live exercises. To further enhance the effectiveness of game-based simulation, this study tested a new strategy in which participants learned to triage patients while collaborating with a robot partner. Participants watched a brief training video and then played a triage simulation game in which they assessed ten victims. Participants were randomly assigned to a control group or a collaboration group. In the control condition, the robot only followed participants in the game, while in the collaboration condition, the robot actively worked with them. Training effectiveness was measured through pre- and post-tests. We examined whether participants in the collaboration group achieved greater training effectiveness, showed higher reliance on the AI teammate, especially for difficult cases. We also looked at whether reliance on AI predicted improved performance. Findings are expected to provide insights into how human-AI collaboration can enhance learning, problem-solving, and preparedness in safety-critical scenarios.

Exploring Mental Health Impacts of LGBTQIA+ Experiences on Social Media

Poster #13 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Elise Klepal

Research Mentor(s): Anisah Bagasra

This study examines risk for suicidal ideation and hypervigilance among LGBTQIA+ youth exposed to anti-LGBTQIA+ rhetoric on social media. Previous studies have found that hypervigilance in LGBTQIA+ individuals is associated with depressive and post-traumatic stress symptoms, and lower life satisfaction (Riggle et al., 2021). Research has also found that social media usage is a significant predictor of depressive symptoms in LGBTQIA+ youth (Klinger et al., 2024). An online anonymous survey consisting of demographic questions, Cole et al.'s online social support scale (OSSS), Bernstein et al.'s brief hypervigilance scale (BHS), a suicidal ideation scale (SIS), and questionnaires assessing social media usage and experiences was distributed through Qualtrics Survey Panel. 313 participants completed the survey. Findings suggest that higher amounts of social media usage are positively correlated with suicidal ideation and hypervigilance in LGBTQIA+ young adults. Findings additionally suggest that hypervigilance, suicidal ideation, and higher amounts of social media usage have negative impacts on being "out" as LGBTQIA+ to family and friends in real life. The study found a significant positive correlation between feelings of suicidal ideation and hypervigilance. Hypervigilance ($M = 14.12$, $SD = 4.74$) and suicidal ideation ($M = 6.70$, $SD = 2.52$) levels are moderate in this sample. These results emphasize the need for more extensive hate speech moderation on social media platforms to ensure online and mental wellness for LGBTQIA+ young adults. The results additionally call for expanded suicide prevention and mental health support resources to improve quality of life for LGBTQIA+ individuals experiencing adverse mental health symptoms. Addressing these issues will help promote online, mental, and social wellness in LGBTQIA+ young adults. Future research will involve stimulating social media feeds and measuring participant cortisol levels to assess participant stress, hypervigilance, and suicidal ideation.

P3 and Implicit Bias

Poster #15 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Deedee Otranto & Josh Haley

Research Mentor(s): Tim Martin & Tracie Stewart

Implicit bias is an unconscious, automatic preference or stereotype that impacts our understanding and actions towards others. While involuntary, this bias can influence how an individual makes decisions, particularly how the human brain compartmentalizes information for processing and storage. Utilizing electroencephalogram equipment (EEG), we aimed to measure participants' implicit bias while completing a picture categorization task (PCT). The PCT seeks to classify a picture as Black or White by presenting either a positive or negative word for 100ms, followed by a photo either a Black or White male face. Words ranged from positive or negative traits, such as cheerful or criminal. We then calculated the P3 component of the evoked response potential, a component related to novelty, arousal, and attention. Correlation analyses

for P3 latency and amplitude, and measures of personality (Big Five Traits, social dominance orientation, state and trait anxiety) were conducted through SPSS. Results showed a significant correlation between the Big Five trait of openness and P3 amplitude. Greater P3 amplitude was associated with lower openness to experience.

Research Barriers and Mentorship Quality

Poster #3 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Amelia Baker, Fernanda Aichel Herrera-Candanedo, Coraima Perez, & Abeer A. Kayser

Research Mentor(s): Amy Buddie

Undergraduate research is widely acknowledged as a high-impact educational practice, contributing to students' academic success, professional readiness, and retention (Bhattacharyya et al., 2018). However, disparities persist in access, mentorship quality, and institutional support with many students' reporting uncertainty about how to access opportunities (White et al., 2023). Prior research has found that stipends significantly influence participation, especially among underrepresented students (Edwards et al., 2024; Messier et al., 2013). Other studies underscore the critical role of mentor accessibility and supportive research environments (Behar-Horenstein et al., 2010; Byars-Winston et al., 2023). Little research has examined the impact of these identified barriers on undergraduate students who have and have not engaged in research. This project aims to assess barriers, perceptions, and opportunities surrounding undergraduate research participation across Kennesaw State University. A mixed-methods survey was distributed university-wide to investigate students' experiences with mentorship, awareness of research opportunities, and structural challenges. This project focuses particularly on equity of access, the effectiveness of mentor relationships, and institutional visibility and communication for students engaged in research and those who are not. While data collection is ongoing, preliminary results indicate that student researchers rated their research mentors highly, particularly in serving as positive role models ($M = 4.53/5$) and fostering a welcoming research environment ($M = 4.53/5$). The most reported obstacles to research participation were external commitments ($M = 3.66/5$), lack of time ($M = 3.61/5$), and lack of awareness of opportunities ($M = 3.48/5$), suggesting that competing priorities and limited knowledge of options may hinder student engagement. These findings identify that actionable recommendations to university leadership, such as mentorship training, stipend programs, and centralized research resource directories, can further improve undergraduate research participation. The ultimate goal is to broaden participation, improve student outcomes, and strengthen the culture of undergraduate research at Kennesaw State University.

Developing a Human-Centered App Development for Aging Populations

Poster #7 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Jinju Lee & Nancy Manasreh

Research Mentor(s): Israel Sanchez-Cardona, Luisa Valentina Nino de Valladares, Paola Spoletini, & Maria Valero de Clemente

As older adults become an increasingly large percentage of the global population, more resources and social support systems are needed. With the advent of technological development, it is important not to leave this population behind but to design technology that can elevate their quality of life. Our research goal is to create a software application called SANDRApp that aims to better the daily lives of older adults and enhance their social, mental, and medical well-being. To design users' preferred features and interfaces, our research team first sought to understand the daily challenges and desires of technology in their lives. One-on-one qualitative 30–45-minute interviews were conducted targeting the main demographics of SANDRApp, including older adults, caregivers, volunteers, and service providers. During these interviews, we standardized questions among the four stakeholders. These questions were designed to gather information about each participants' background as well as their expectations and sought out features, current barriers to technology usage, preferred navigation and other design preferences, as well as their overall concerns. From these interviews, we conducted a thematic analysis, where we coded interview transcripts using NVIVO across key domains. These domains included the roles and context of the participant, technology orientation and familiarity, essential daily living support, challenges and barriers, supportive technology, activity and engagement preferences, expectations, barriers to use, accessibility, and privacy and trust concerns. After completing the coding, we statistically analyzed the most prevalent themes occurring throughout the interviews to help formulate the design of SANDRApp. We also compared the thematic analysis of these interviews with the requirements analysis of previous software applications designed for older adults to help identify a gap in the current market. Ultimately, we seek to utilize this thematic analysis research to better create a unique and effective application that best addresses the needs of older adults.

Seeing Robots as Teammates: A Path to More Engaging Triage Training

Poster #9 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Lilly Roach & Devin Pledger

Research Mentor(s): Hansol Rheem

Triaging is a way of categorizing patients so they receive timely care during a mass casualty event. Recent triage training approaches use gamification to increase trainee engagement. Since engagement in training can improve training effectiveness, it is important to design a training

game capable of maintaining user engagement. In this study, we used a novel approach where participants learned triaging by playing a game in collaboration with a robot partner. We examined how this experience influenced user satisfaction and engagement during training. Participants first received basic lecture-based training, completed a pretest, played a computer game where they triaged 10 patients, and then completed a posttest. They were randomly assigned to either a control group, where the robot only followed them, or a collaboration group, where they actively worked with the robot during the game. First, we analyzed whether working with a robot partner increased satisfaction and engagement compared to when the robot was merely following. Next, we explored how collaboration encouraged users to see the robot as their teammate by examining perceived human-likeness, attribution of success or blame, co-presence, emotional connection, shared understanding, and action dependency. Lastly, we tested whether individuals who perceived the robot as a teammate showed higher levels of satisfaction and engagement. Through these analyses, we aim to demonstrate the effectiveness of Human-AI collaborative learning in maintaining learner engagement and satisfaction, and to examine whether perceiving the robot as a teammate contributes to these benefits. The findings will help inform the design of robotic systems that foster trust, engagement, and effective teamwork, contributing to training strategies that support both performance and user experience.

The Effects of Mindfulness on Cognitive Control and Meaning in Life in College Students

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

1:00pm – 1:50pm

Undergraduate Student(s): Cameron Anderson

Research Mentor(s): Ebony Glover

This study examines the relationship between cognitive control, mindfulness, and perceived meaning in life. Research demonstrates a strong relationship between activity in the anterior cingulate cortex (ACC) and performance on various cognitive functions as measured by the Erikson Flanker task (Botvinick, et al., 2001) and that increased activity in the ACC is associated with better emotional well-being and self-reflection (Tang, et al., 2015). Mindfulness, defined as nonjudgmental awareness of the present moment, may enhance these ACC-mediated processes. The purpose of this experiment is to examine whether a guided mindfulness activity can improve performance on an ACC-related task and self-reported meaning in life. We predict that participants who engage in a mindfulness activity will demonstrate faster reaction time and improved accuracy on the Flanker task, demonstrating enhanced efficiency of the ACC, and report higher scores on the Meaning in Life Questionnaire (MLQ) compared to the control group. Approximately 34 participants will be assigned to a mindfulness or control condition in a between-subjects design. All participants will complete the Flanker task and MLQ at baseline

and again one week later. During that time, the mindfulness group will complete a meditation activity, while the control group receives no intervention. It is predicted that the mindfulness group will demonstrate greater improvement in both measures, suggesting enhanced cognitive control and perceived meaning. If supported, these findings would support the role of mindfulness in enhancing ACC-related cognitive control and meaning in life, implicating a greater role of the ACC in these measures for future research.

The Psychology of Student Success

Poster #18 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Josh Haley

Research Mentor(s): Lauren Taglialatela

Several recent events including the COVID-19 pandemic, proliferation of generative AI, and changes in K-12 policies and expectations have affected the high school experience and potentially have ripple effects as students transition into college. This study helps codify how contemporary students measure their own success in college in comparison to traditional measures of college success (e.g., GPA, RPG). Additionally, it examines the relations between students' high school experience with AI use, non-zero grading policies, COVID-19 and academic success in college. Two-hundred-seven KSU undergraduates (GPA: $M = 3.18$, $SD = .82$) completed an online survey designed to evaluate factors that may be related to academic success. Students rated traditional measures of success (e.g., GPA and RPG) highly, but also rated other measures such as career preparation and balancing work, life, and school highly as well. This indicates that collegiate student priorities are evolving. A correlative analysis indicated that lower grades in high school due to COVID-19 are related to greater gaps in preparedness when students transition to college. Relatedly, as preparedness gaps increase, college GPA decreases. Taken together, these results indicate that the pandemic and subsequent disruptions in K-12 are still permeating into higher education. The study found no correlation between what students personally value as "success" and their actual GPA. AI use and non-zero grade policies did not significantly correlate with college preparedness. Contemporary college students measure "success" using a mix of traditional and non-traditional metrics. Understanding this evolving mix of priorities may help inform curriculum, processes, resource allocation, and other pedagogical measures at the collegiate level. It may be valuable for decision makers in academic realms to recognize how COVID related K-12 disruptions have continued to impact students in college.

The Relationship Between Self-Reported Caffeine Usage and Physiological Arousal Measured Through Skin Conductance During the Stroop Test.

Poster #12 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Holly Elizabeth Irwin

Research Mentor(s): Ebony Glover

Caffeine is a stimulant known to increase sympathetic nervous system activity, which plays a key role in attention and physiological arousal. To assess this relationship, this study will use skin conductance as a reliable index of physiological arousal. Understanding how caffeine consumption relates to arousal can provide insight into how substances influence cognitive control and attention during the Stroop test. This correlational study will include a sample of 35 college students (ages 18–23). Participants will complete a self-report survey assessing daily caffeine intake (in mg), time since last consumption, and form of caffeine consumed, prior to testing. Skin conductance sensors will be placed on participants' fingers to record electrodermal activity and arousal levels. Frequency and amplitude of skin conductance responses will be extracted at baseline and compared to responses during the Stroop task. All participants will provide informed consent, and data will be collected anonymously. The projected collection is October and will be analyzed and interpreted. It is expected that self-reported caffeine consumption will positively correlate with physiological arousal during the Stroop test, and that higher arousal will be associated with better task performance (i.e., faster reaction times and fewer errors). Specifically, high caffeine users are predicted to exhibit higher skin conductance levels and improved Stroop performance compared to low or no caffeine users. Participants who consumed caffeine more recently are expected to show greater arousal and better performance than those with longer intervals since their last intake. If supported, these findings would suggest that caffeine consumption is associated with heightened arousal and enhanced cognitive control during attention-demanding tasks. Such results have implications for understanding how caffeine use influences attention and performance in real-world academic settings. Future research could extend this work by examining brainwave activity via EEG and including larger samples with both caffeine and non-caffeine users.

The Role of Emotional Words in Misinformation Retention

Poster #7 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Cara D. Donahue

Research Mentor(s): Ebony Glover

The emotion–memory effect suggests that people remember emotional words more vividly than neutral ones. This tendency may help explain why sensationalized news is often remembered and accepted as fact. The present study examines how emotional language influences the retention of misinformation. We predict that misinformation containing emotional words will be remembered more accurately than misinformation using neutral words. In a between-subjects mixed design,

participants (N = 35) will read a set of 40-word passages that contain either neutral or emotional words, all conveying misinformation. Emotional words will be categorized by intensity (low, medium, or high). Word recall will be assessed through a recognition test, and participants' emotional states (afraid, happy, angry) will be rated on a Likert scale (1 = not at all, 5 = extremely). We will have data by the time the Symposium takes place. We expect memory accuracy to increase with the intensity of emotional language (i.e., highest for passages with highly emotional words, followed by medium and low intensity). If supported, these findings would suggest that emotional words enhance the retention of misinformation, providing insight into the persuasive power of emotional language in media. Increasing awareness of this effect may help improve media literacy and critical evaluation of emotionally charged information. Future research will expand the sample size and include social media-based misinformation contexts.

Theta/Beta Ratio is Associated with Blood Pressure

Poster #16 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Kendall Peay

Research Mentor(s): Tim Martin

Theta/Beta ratio is an electroencephalograph (EEG) reading that has been shown to be a marker of cognitive capacity. A higher theta/beta ratio (TBR) is an indicator of increased central nervous system dysfunction in cortical areas. Blood pressure (BP) on the other hand has been significantly correlated with cognitive decline, specifically in the areas of memory and attention. However, there is less of a relationship between BP, speed of processing, and executive functioning. We intend to bridge this gap in knowledge by identifying the relationship between Theta/Beta ratio and blood pressure and what that may mean for cognitive decline in older individuals. We measured BP and TBR in a sample of 120 older community-dwelling adults, around half of whom were diagnosed with mild cognitive impairment (88 with complete data). Theta/Beta ratio was negatively correlated with blood pressure. This means that higher blood pressure may be an indicator of lower TBR.

Sociology & Criminal Justice

Saving Money or Saving the World? AN analysis of TikTok's #Underconsumption Core Trend

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Undergraduate Student(s): Abigail Underhill
Research Mentor(s): Jason Mueller

The Summer of 2024 was the summer of “Underconsumption Core.” Across TikTok, the #Underconsumption core hashtag was used by content producers to tell the world about their newfound commitment to changing their consumption habits. Were these users looking to change themselves, and then change the world, ushering in a social movement that was committed to radically restructuring our relationships to commodity production, consumption, and waste? Or, was this an exercise in self-branding and self-promotion, where aspiring social media influencers talked of personal growth and change, hoping their video might feed directly into an algorithm-induced viewing bonanza? This project explores these issues, and how they might relate to cross-cutting issues of socio-economic class position, gender norms, and environmental concern. After aggregating and viewing dozens of TikTok videos on #underconsumption, we engage in qualitative data analysis, looking for important patterns and themes that emerged in these videos. We believe that, regardless of the intent of these content creators, the topics directly and indirectly covered in these videos illustrate larger, structural trends in the spheres of US economics, politics, and culture.

Communication and Media

Attitudes Towards Regulation of Children's Smartphone Use and Analysis of Legislation: A Mixed-Method Study

Poster #11 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Mikalah Cloward

Research Mentor(s): Mackenzie Cato

As technology rises, a shift in government is emerging with a substantial number of new laws regulating children's smartphone use. The unprecedented nature of this change raises questions from parents and teachers about what this means. This study uses a mixed method approach to understand what this new legislation signifies, and the sentiment around it. Parents with children ages 9-14 were recruited using the snowball method and interviewed through semi-structured in-depth interviews. Using content analysis, online media such as government reports, news articles, and blog posts were studied. Both the interviews and textual analysis were coded for themes. Three themes emerged from within the parental interviews, (1) Doubt of effectiveness; (2) Support for involvement; (3) Expectations for regulation. Due to the nature of this legislation's recency, very little research has been carried out. This study is the leading investigation into this topic, adding valuable insight to an otherwise under researched subject.

History and Philosophy

Inclusivity in Egypt and the Coptic Christians

Poster #17 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Marshall McNair

Research Mentor(s): Hakki Gurkas

This project takes a look at the difficult issue of inclusivity and national unity within Egypt through the lens of the 2011 Egyptian Revolution. The revolution saw moments of unity, such as when Christians and Muslims came together in Tahrir Square to protest for freedom and social justice. However, this unity was fleeting as only a few months later, 28 Coptic Christians were killed in the Maspero Massacre and over 300 more were injured. This paper argues that the revolution unveiled the persistence of a deeply ingrained Arab-Muslim bias within the structure of Egypt. By examining themes of martyrdom, Coptic claims to pharaonic lineage, and Islamist and nationalist discourse, this project examines how the Copts resisted marginalization and fought for their belonging in a nation that consistently defined itself in Arab-Muslim terms. By examining works from scholars such as Jacques van der Vliet, Arietta Papaconstantinou, Jason Brownlee, Yosra El Gendi, Marco Pinfari, and others, this project situates the Egyptian Coptic experience within both historical and contemporary contexts.

King's Wigwam: Atlanta's Forgotten Black Summer Resort

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

1:00pm – 1:50pm

Undergraduate Student(s): Andrew J. Bramlett

Research Mentor(s): Seneca Vaught

From 1915 to 1920, the only summer resort for Black Atlantans was King's Wigwam, located north of the small farming community of Kennesaw. Situated on over forty acres owned by Auburn Avenue entrepreneur Cornelius King, the summer resort saw a host of notable visitors during its short five years of existence. During the 1919 season, a guest named Bertram Hamilton was falsely accused of rape in nearby Cherokee County. He was taken to the county jail as an angry mob gathered. The county sheriff, who had been part of the mob that lynched Leo Frank four years before, believed Hamilton was innocent and brought him to safety in Atlanta. Because of the attempted lynching, King sold the land and never returned to Kennesaw. The only trace left of the resort is a metal cut-out of a Native American that is now perched on a building on Atlanta's Auburn Avenue. In the 1960s, the site of King Wigwam's became a subdivision whose streets have a Gone with the Wind theme. Previous scholarship about the Wigwam largely

relies on an interview given by King's daughter in the 1970s. Existing work is inaccurate regarding the location of the Wigwam, along with the years it was open. This paper uses several newly uncovered pieces of evidence to shed more light on the Wigwam's story. Hamilton's first-hand account of the attempted lynching provides insight into the resort's closing. Land records allow the Wigwam's exact location to be pinpointed for the first time. Lastly, articles from the Atlanta Independent, Black Atlanta's weekly newspaper, note the identities of notable guests. Overall, this paper offers new insight into recreation among Atlanta's Black elite under Jim Crow, the politics of lynching in Georgia, and the relationship between wealthy, urban Black leaders and the rural counties surrounding the city.

The Death of Isolationism; U.S. Foreign Policy and Afghanistan

Poster #3 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Alexandria Carrier

Research Mentor(s): Silke Zoller

The September 11th attacks ignited a new era of American foreign policy; the Global War on Terror. As the United States sought out punishment of those responsible, it facilitated the creation of a new narrative in which the U.S. played a more centralized role within the deterrence of globalized terrorism. Post-9/11 literature has claimed that the United States was aware of threats from Afghanistan as a result of the 1998 Kenyan and Tanzanian embassy bombings; however, this research argues that terrorism from the nation of Afghanistan was known to the United States government earlier than 1998 and was ignored in a larger effort to maintain political isolationism. While this research does not explain the events of modern political discourse between Afghanistan and the United States, it serves to analyze the pre-existing history between the two nations prior to the September 11th attacks and contribute to existing scholarship about U.S.-Afghan relations.

The Racist Origins of Healthcare Disparities Faced by Black Women

Poster #8 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Kameryn Dixon

Research Mentor(s): Lauren Thompson

Modern medical practice continues to illustrate the disparity that Black women seeking healthcare face. This manifests in many ways including dismissal when seeking diagnosis, negligence, ignorance of the societal and cultural experience of Black women which ultimately affects their health, and blatant physical abuse. This project investigates the historical origins of this disparity; specifically, how white medical professionals who supported slavery and

segregation described and treated their Black patients in the nineteenth and early twentieth centuries. Today, there are those in the medical field who perpetuate this construct of race and racist ideologies. This project uses historical and contemporary records from several archives whose records demonstrate the biases, beliefs, and subsequent actions of white healthcare workers. These sources have also demonstrated the fight for change and equity from Black healthcare workers, those hoping to be in the field, leaders in the Black community, and patients. Secondary source research has also demonstrated the intentional practices and experimentations on Black women that often led to worsening conditions and or death. These sources illustrate the rationalizing language used by physicians and mental health care workers to continue heinous practices. I anticipate finding more evidence regarding certain words and phrases used to describe Black female patients to justify the disparate treatment that Black women have continuously been receiving from the healthcare industry for several centuries. This research has displayed the ways in which racist ideologies have led to abhorrent treatment of Black women in healthcare. Without this research, this issue will continue to go “unnoticed” by some and completely unknown to many. Additionally, Black women will continue to suffer, not only physically but mentally as well. This research intends to add to the literature on medicine, racism, women, and gender in hopes of beginning to fix this urgent issue within this country.

Government and International Affairs

Election Administration – A View from the Trenches

Virtual Presentation (Microsoft Teams)

3:00pm – 4:00pm

Undergraduate Student(s): Charalampos Stathopoulos

Research Mentor(s): Benjamin Taylor & Kerwin Swint

Election administration is one of the most important and increasingly contentious aspects of electoral politics. Recent evidence demonstrates that Georgia, specifically, spends more on election administration than many other states, primarily because of runoff elections. Beyond runoffs, the frequent changes to election rules and administrative procedures have also burdened counties and their administrators, but little is known about how election administrators actually respond to these challenges. This project assesses this “view from the trenches” to understand 1) how election administration has evolved, 2) what burdens election administrators face, and 3) what potential changes could make the process better for all parties. Using in-depth qualitative interviews, we explore these topics while considering the current state of election administration policy in Georgia and consider a comparative perspective with other states in the United States.

Shared Burden or Personal Duty? Public Views on Paying for Medical Care

Poster #10 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Drew Gaither

Research Mentor(s): Benjamin Taylor

Who should be responsible for paying for healthcare in the United States—individuals or institutions? Using data from the 1996 and 2006 General Social Surveys (GSS), this study investigates whether symbolic beliefs about national health spending influence responsibility attribution. It was hypothesized that perceptions of underinvestment would predict support for institutional responsibility, with this relationship conditioned by institutional trust, political beliefs, demographics, and temporal factors. The results only partially support this expectation. While underinvestment influenced the base model, its influence disappeared after controlling for other variables. Instead, perceptions that the U.S. spends too much on healthcare emerged as a more consistent symbolic cue, linked to shifting responsibility away from insurance and toward either government or individual actors—revealing symbolic ambivalence rather than ideological consistency. Political orientation had little impact on the outcomes, while institutional trust showed modest but consistent effects across different models. Temporal and demographic factors were much more influential: respondents in 2006 were approximately 50% more likely to support institutional responsibility, and women and racial minorities consistently differed in their views. Symbolic attitudes remain influential, but within broader structural and demographic contexts.

Technical Communication & Interactive Design

User Centered Design of a Mental Health App for College Students

Poster #14 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Emily Espinoza & Lyn Jung

Research Mentor(s): Kanu Priya Singh

Mental health concerns are an increasingly unmet need among college students. Barriers such as high costs and social stigma often prevent students from accessing well-being support. Digital mental health interventions offer a promising approach to connecting students with mental health resources and enhancing their overall well-being. However, existing mental health applications often lack accessibility, are hidden behind paywalls, or offer limited engagement, which restricts students' ability to access consistent and meaningful support. We conducted a qualitative study to explore the mental health support needs of college students, informing the design of a mobile mental health application that is usable, engaging, and effectively supports students in strengthening their mental health and well-being. Using a participatory design

approach, focus groups and co-design workshops were conducted with 26 college students in Spring and Fall 2025. Students shared their perceptions of existing mobile mental health applications and sketched mobile app templates, visually outlining the features and layouts they would find most helpful for managing their well-being. Analysis of the workshops and discussions revealed four design needs: (1) Customization of the app's content and layout for enhanced engagement. (2) Consolidation of student wellbeing resources on campus, for quick and easy access. (3) Facilitate Community building with updates on campus events and clubs. (4) Tracking personal well-being through features such as a mood tracker and journaling. Our next step is to translate these findings into mockups and conduct iterative tests with students and stakeholders to collect early feedback. College students' perceptions of an ideal mental health tool are shaped by their individual experiences with social and academic pressure in a university environment. Mental health applications for college students may need to connect self-help features and university wellbeing resources into one place to help them cope with isolation and feel a greater sense of belonging on campus.

College of Science and Mathematics

Chemistry and Biochemistry

A New Synthetic Route to Bis(amidinate) Ligands as Flexible Scaffolds for Group 11 Metal Clusters

Poster #18 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Mason Hipp

Research Mentor(s): Michael Stollenz & Tomasz Kruczynski

Polydentate bis(amidinate) ligands have emerged as effective scaffolds for the construction of multinuclear Group 11 metal clusters, capable of promoting closed-shell $d^{10}\cdots d^{10}$ metallophilic interactions. Such clusters yield luminescent assemblies with tunable photophysical properties. Building on prior works of tetradentate bis(amidinate) ligands which generate Cu₁ clusters exhibiting blue to green emissions via precise control of metal–metal distances, this project investigates the synthesis and structural characterization of a new ethylene-bridged bis(amidine) ligand designed to allow for linear geometric Cu₁ cluster formation. This ligand incorporates aryl substituents at the amidine moieties to reduce steric hindrance and promote EE (anti/anti) configurations essential for a linear arrangement of Cu₁ ions. The new bis(amidine) will be characterized by single-crystal X-ray diffraction and multidimensional NMR spectroscopy, complemented by elemental analysis and FTIR spectroscopy to confirm molecular geometry. This investigation aims to deepen the understanding of ligand-controlled metallophilicity and to advance the rational design of molecular Cu₁ wires and photoactive materials relevant to optoelectronics and nanoarchitectures.

Bottom-Up Proteomics Analysis Pseudomonas aeruginosa Under the Effects of Antimicrobial Peptides

Poster #16 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Klaudya Hernandez & Nadia Jimenez

Research Mentor(s): Mohammad Halim

Pseudomonas aeruginosa (P.aeruginosa) is identified by the World Health Organization as a critical multidrug-resistant pathogen. Its pathogenicity is due to Quorum Sensing (QS), a regulatory system that enables communication and coordination in response to population density. QS governs behaviors such as motility, virulence, and biofilm formation, the latter making P. aeruginosa infections especially difficult to treat. Key genes to this system are lasR,

rhlR, and *pqsE* and their protein expression. The aim of this research is to investigate how antimicrobial peptides, including Temporin L and its analogs, influence protein production in *P. aeruginosa*, with a focus on QS gene expression. Peptide-based antibiotics offer advantages such as broad antimicrobial activity, lower toxicity, and reduced risk of resistance development, making them promising candidates for combating multidrug-resistant infections. The methods of this experiment start with antimicrobial activity assessed by determining the MIC (minimum inhibitory concentration) and NIC (lowest concentration slowing growth) of peptides against *P. aeruginosa*. 3mL of culture is grown until an OD of 0.5, representing actively dividing, resistant gene-expressing cells. Peptides at varying concentrations (150 μ L) were introduced, and OD measurements were recorded every 30 minutes until cultures reached an OD of 1.0. Growth inhibition patterns established MIC and NIC values. The cultures were retained for LC-MS analysis. Samples were centrifuged to collect pellets, washed and purified to isolate proteins. Protein samples were prepared for bottom-up proteomic analysis. Preliminary results of Temporin L showed OD (cell growth) values decreasing as peptide concentration increased. Temporin L and TLP-1 both showed significant bacterial growth reduction where TLP-3 showed no inhibition. Proteomics analysis revealed 52 proteins in control samples versus 83 in TL treated samples, suggesting stress-induced protein upregulation. This experiment will be repeated with a variety of other peptides to identify which best target *P. aeruginosa* antimicrobial resistance.

Chemical Synthesis and Characterization of Cosmeceutical Peptides for Skin Care

Poster #3 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Abby Akinleye

Research Mentor(s): Mohammad Halim

As life expectancy continues to grow, humans are looking for a way to prevent or change their looks. The demand for products to tighten skin or get rid of wrinkles opens a market for cosmeceutical industries to produce cosmetics that will enhance the skin. Reasons for skin defects can include sun exposure, genetic makeup, and getting older. While not a new development, more cosmetic formulas include chemicals such as peptides, polynucleotides and alcohols so that consumers can get their desired look. Peptides are made up from a chain of Amino Acids (AA). There is a plethora of amino acids but there are 20 that are essential to the human body. Humans can produce 11 out of the 20, so the other nine need to be acquired by diet. Peptides are used to boost metabolism, wound healing, and promote weight loss. Peptides in skincare are used primarily for skin repair and to reduce the anti-aging process. Peptides regarding skincare are usually extracted from plasma and other sources. The aim of this research is to chemically synthesize some notable skincare peptides (GHK, KTTKS, and GQPR) using solid phase peptide

synthesis approach and test their membrane permeability. These peptides were synthesized using rink-amide resin, then cleaved employing high percentage of TFA, and precipitated with cold-ether. Peptides were characterized by liquid chromatography and mass spectrometry. As these peptides are very hydrophilic in nature, they were eluted at the beginning of the reverse phase chromatography while C18 column was used. GHK showed an intense peak at m/z 340.2 which corresponds to its theoretical mass. Two peptides, KTTKS and GQPR, also demonstrated representative peaks at m/z 563.3 and 456.3, respectively which agree with the theoretical mass. The current research focuses on the membrane permeability of these peptides to ensure and improve skin penetration.

Comparison of Gas Chromatography – Mass Spectrometry and Ultra-High Performance Liquid Chromatography in the Quantification of Amygdalin from Apple Seeds

Poster #6 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Jarod Denman & Ryan Oldham

Research Mentor(s): Christopher Sumner

Amygdalin had been used in anti-cancer treatments in the past but was discontinued due to the cyanide group present in the molecule. This dissociates in vivo from beta-glucosidases, cleaving off the two glucose molecules, which creates mandelonitrile, quickly decomposing into benzaldehyde and hydrogen cyanide. Amygdalin is present in many popular fruit seeds such as apples, grapes, and apricots, but the quantity differs between species. Therefore, analyzing the amount of amygdalin presents itself as a safety standard, and selecting the correct analytical technique becomes significant for quantification of cyanide consumption. The purpose of this experiment is to compare the analytical quantification of amygdalin between gas chromatography mass spectrometry (GC-MS) and ultra-high performance liquid chromatography (UHPLC). Apple seeds were dried, then extracted via Soxhlet distillation. The diluted ethanolic solution was quantified using both instruments. The unknown was compared to an amygdalin standard to discover which instruments' results yielded higher precision, selectivity, sensitivity, and robustness.

Comprehensive Evaluation of Over-the-Counter Magnesium Tablets Using Quality Control Analysis, EDTA Titration, ICP-OES, and UV/Vis Spectroscopy

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Undergraduate Student(s): Eli Briggs, Gabriella Erickson, Adam Fair, Madeline Miller, Avery Morlot, Benita Okafor, Aidan Sonra, Jade Valeris, & Kylar Williams

Research Mentor(s): Marina Koether

Over-the-counter supplements are often underregulated by the FDA, causing the label claims made by manufacturers to be inaccurate. The objective of the research was to determine the accuracy and uniformity of the API in over-the-counter supplements. In this study, a pharmaceutical analysis of magnesium tablets was performed according to USP guidelines. Three brands of magnesium oxide tablets were analyzed. Friability, disintegration, and dissolution testing were conducted. The dissolution test was performed to investigate the rate of drug release when in conditions similar to the human stomach. Two dissolution tests were performed, one in degassed water and one in degassed 0.1 M HCl. An initial assay of the tablets was conducted through an EDTA titration, and additional assays were done using UV/Vis and ICP-OES. One brand of tablets failed the friability test, while the other two brands passed. All three tablet brands passed the disintegration test. For all three tablet brands tested, the assay using EDTA titration indicated that the actual amount of magnesium was close to the label claim. Further results will be described.

Computational Study of C2-C10 Carbon Cluster Stability via HOMO-LUMO Gaps Analysis

Poster #4 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Alexis R. Ross, Anna James

Research Mentor(s): Martina Kaledin

The exploration of linear and cyclic carbon clusters has been a topic of widespread interest in recent years, particularly in materials discovery and nanotechnology. Previous studies of small linear and cyclic carbon clusters (C2-C10) have produced experimental data, and newer theoretical research provides frameworks for further exploration and potential experimental applications. The study of the HOMO-LUMO gaps in carbon clusters of various sizes, as the number of carbons, n , increases, is crucial for understanding their molecular properties and potential uses. In this project, HOMO-LUMO gaps of C2-C10 carbon clusters are calculated using Density Functional Theory (DFT) with the Becke 3-Parameter Lee-Yang-Parr functional (B3LYP) and the augmented aug-cc-pVTZ (AVTZ) basis set. After optimizing the geometries of the clusters, we calculate their HOMO-LUMO gaps, along with structural parameters and vibrational analyses, to verify the global minima and transition state geometries using Gaussian 16 and GaussView 6. Our goal is to identify trends in the HOMO-LUMO gap and cluster stability as the number of carbons increases from $n=2$ to $n=10$, and to explore how aromaticity and anti-aromaticity may influence the gap and properties such as stability and conductivity. C_n clusters (where $n < 10$) have ground state linear geometries, while C_n ($n=10$) has a cyclic ground state with a global minimum energy. HOMO-LUMO gaps for each C_n cluster ($n=2-10$) are calculated at singlet (M1) states, and SOMO-LUMO gaps at triplet (M3) states. The gaps will

be analyzed, and we will investigate how these gaps behave across different cluster sizes, conformations (linear or cyclic), and during isomerization pathways.

Cyclic Peptides as Competitive Inhibitors of the 3CL Protease in Human Rhinoviruses

Poster #4 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Elizabeth Larson-Tillman

Research Mentor(s): Mohammad Halim

Human rhinoviruses (HRVs) cause the most common cold and millions of infections worldwide each year, and they often exacerbate asthma, chronic obstructive pulmonary disease (COPD), and other respiratory diseases. No effective antiviral therapies exist yet. The viral 3CL protease (3CLpro), a cysteine protease required for polyprotein processing, has been recognized as a crucial therapeutic target. High specificity and low systemic toxicity make peptide-based therapeutics particularly effective, but they suffer from challenges, mainly poor metabolic stability and susceptibility to proteolysis. Cyclic peptides help remedy many of these flaws by conferring conformational rigidity, enhanced protease resistance, and improved binding affinity. We synthesized two peptide variants using solid-phase peptide synthesis (SPPS) on a Liberty Blue system with high-swelling Rink Amide resin (0.6 mmol/g, 100–200 mesh). To begin with, we synthesized the sequence SAFWQWFSKFLGR as a linear control. We subsequently performed the synthesis, including cysteine residues at each terminus to generate CSAFWQWFSKFLGRC, designed to allow for head-to-tail cyclization. After cleavage from the resin with a trifluoroacetic acid–based cocktail, peptide was precipitated in cold ether, dissolved in acetic acid, and lyophilized it. Liquid chromatography (LC) confirmed the purity of linear and cyclic products. Mass spectrometry confirmed this linear peptide, finding peaks at m/z 553.95 ($[M+3H]^{3+}$), 830.43 ($[M+2H]^{2+}$), and 1660.93 ($[M+H]^+$). Mass spectrometry (MS) confirmed cyclic peptide peaks at m/z 622.63 ($[M+3H]^{3+}$), 933.43 ($[M+2H]^{2+}$), and 1867.22 ($[M+H]^+$). Future works will focus on testing the inhibition efficiency of these peptides against the 3CLpro of Rhinovirus.

Design and Development of Pi-Pi Staple Peptides Targeting Alpha-Synuclein for Parkinson's Treatment

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

12:00pm – 12:50pm

Graduate Student(s): Zainab Noor

Research Mentor(s): Mohammad Halim

Parkinson's disease (PD) is a progressive neurodegenerative disorder marked by pathological aggregation of α -synuclein, an intrinsically disordered protein. Peptide-based inhibitors offer a promising therapeutic strategy to block α -synuclein aggregation. This study aimed to design, synthesize, and evaluate peptide candidates with inhibitory potential. Twelve peptides were initially screened from SynPEP-DB using molecular docking to predict binding interactions with α -synuclein. Five top candidates with favorable docking scores were synthesized via solid-phase peptide synthesis (SPPS) and characterized by LC-MS. Binding affinities were quantified using selected ion monitoring mass spectrometry (SIM-MS), which confirmed strong peptide–protein interactions. Three peptides showed nanomolar affinity with dissociation constants (K_d) of 22.98, 63.53, and 65.57 nM. Structural analogs were also evaluated, and an α -methylated peptide exhibited the strongest binding (K_d = 21.49 nM). On the other hand, α -synuclein fibril reduction was evaluated using the Thioflavin T fluorescence assay. The α -methylated analogue exhibited a significant 89.2% reduction in fibril formation, compared to other top candidates showing reductions ranging from 66.6% to 87.8%. These findings validate computational predictions and demonstrate that methylation effectively enhances peptide activity. This integrated computational–experimental approach provides a rational framework for peptide drug discovery targeting α -synuclein aggregation. The combined SIM-MS and ThT fluorescence results offer proof-of-concept that α -methylation improves fibril reduction, supporting the potential of pi-pi staple peptides as inhibitors of α -synuclein aggregation for Parkinson's disease (PD) Treatment. Future work will aim to further enhance peptide stability and activity through structural modifications such as cyclization and targeted methylation.

Designing a Green, Multistep Synthesis with an Intramolecular Diels-Alder Reaction for the Undergraduate Teaching Laboratory

Poster #8 (Event Center)

4:00pm-4:45pm

Undergraduate Student(s): Alex Provost & Ryan Oldham

Research Mentor(s): Animesh Aditya

Multistep synthesis is a key learning objective for the undergraduate organic chemistry teaching laboratory. Yet, there is a notable gap in chemical education literature where multistep synthesis laboratory modules are embedded with green chemistry principles. The objective of this research endeavor is to develop a novel, multistep synthesis laboratory module that includes previously unexplored intramolecular Diels-Alder reactions. Our three-step synthesis utilizes bio-sourceable reagents—vanillin, furfurylamine, maleic anhydride—where each step is conducted under mild reaction conditions to enhance energy efficiency and minimize waste. The final product generated via an intramolecular Diels-Alder reaction reveals an unusual stereochemical outcome. This multistep synthesis confers high pedagogical value—allowing students to explore

a stereospecific, intramolecular cycloaddition where each step is evaluated against the 12 Principles of Green Chemistry. In conclusion, this laboratory module offers a scalable model for sustainable synthetic practices in the undergraduate organic chemistry teaching laboratory.

Developing Scorpion Venom Based Antiviral Peptides Targeting 3-Chemotrypsin Like Protease of SARS-CoV-2

Poster #17 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Lillian Schwartz, Cecilia Le

Graduate Student(s): Funsho Afolabi

Research Mentor(s): Mohammad Halim

Since the development of COVID-19, a disease caused by SARS-CoV-2, there has been a need for the development of an innovative solution to increase the bioavailability of inhibitors of SARS-CoV-2. COVID-19 has decreased the global life expectancy by 1.6 years from 2019-2020. Peptide therapeutics are effective because of their high affinity with receptors and low toxicity.

Additionally, they can reduce off- target side effects because of their heightened target specificity and potency. Scorpion's venom contains a mixture of peptides and proteins with varied bioactivities and receives great attention due to their potential application in peptide drug design and development. However, due to their hydrophobic nature, these peptides are difficult to synthesize chemically. The aim of this research is to synthesize scorpion venom peptide using chemical synthesis and test their effectiveness on inhibiting the 3-Chemotrypsin Like Protease of SARS-CoV-2. The scorpion peptide was synthesized using solid phase peptide synthesis protocol with a high swelling rink-amide resin with a loading capacity of 0.6 mmol/g and mesh size of 100-200. After the peptide synthesis, the peptide-resin complexes were cleaved with 95% TFA, 2.5% H₂O, and 2.5% Triisopropylsilane. The cleaved peptides were filtered and precipitated by adding cold ether. The purity and identification of the peptide was confirmed by liquid chromatography and mass spectrometry. Three charge states of the peptide detected at m/z 1732.04, 866.52 and 578.02 which correspond to [M+H]⁺, [M+2H]²⁺ and [M+3H]³⁺ charge states, respectively. The inhibition efficiency of the peptide against 3CLpro was tested using FRET assay which demonstrated an IC₅₀ value of 12.32 micromolar, indicating that 3CLpro activity was decreasing with an increase in peptide in inhibitor concentration.

Development of Anti-Inflammatory Drug-Based Deep Eutectic Solvents for Ointment Formulation

Poster #24 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Saniya Samura

Research Mentor(s): Mohammad Halim

Topical drug delivery is often limited by poor solubility and bioavailability of active pharmaceutical ingredients. Deep eutectic solvents (DES) have emerged as promising green alternatives that enhance solubility, stability, and penetration, making them attractive for topical formulations. This study focused on the design, synthesis, and characterization of DES systems using two widely used anti-inflammatory drugs, ibuprofen and aspirin, with various hydrogen bond donors to evaluate their potential application in ointment bases. Ibuprofen DES were prepared with different co-formers, while aspirin DES were synthesized with menthol in a 1:3 molar ratio. The prepared DES mixtures were analyzed using Attenuated Total Reflectance–Fourier Transform Infrared (ATR–FTIR) spectroscopy, which confirmed hydrogen bonding interactions and functional group shifts, indicating therapeutic DES formation. Ibuprofen-based DES displayed significant broadening of O–H stretching bands ($3100\text{--}3400\text{ cm}^{-1}$) and a downward shift in the C=O stretching peak from $\sim 1720\text{ cm}^{-1}$, while aspirin-based DES showed O–H broadening and shifts in both the ester C=O band ($\sim 1750\text{ cm}^{-1}$) and the carboxylic acid C=O band ($\sim 1680\text{ cm}^{-1}$). These results confirm stable therapeutic DES formation for both ibuprofen and aspirin, demonstrating that each drug can be successfully incorporated into eutectic systems to yield stable formulations capable of improving drug solubility and delivery. Overall, this work highlights the pharmaceutical potential of c DES systems for enhancing the therapeutic efficacy of anti-inflammatory drugs in topical applications, with future research directed toward evaluating biological activity, storage stability, and clinical relevance.

Development of Peptide Therapeutics to Reduce Fibril Formation of Alpha-Synuclein in Parkinson Disease

Poster #19 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Melike Ozcelik

Graduate Student(s): Zainab Noor

Research Mentor(s): Mohammad Halim

Parkinson's disease (PD) is the second most prevalent neurodegenerative disorder worldwide and the fastest growing in terms of death and disability, as reported by the World Health Organization. The disease is driven by the progressive loss of dopaminergic neurons in the substantia nigra, primarily caused by the aggregation of misfolded α -synuclein into oligomers and fibrils that form Lewy bodies. These aggregates disrupt neuronal function, impair motor control, and lead to cognitive decline. Current PD treatments are largely symptomatic and do not address the molecular pathology, highlighting the need for disease-modifying therapeutics. This study aimed to design and evaluate peptide analogs capable of binding to α -synuclein and inhibiting its aggregation. Previously computational modeling was employed to design and screen multiple analogs based on theoretical binding affinity and strong interaction between

peptide and Alpha Synuclein. The top analog 8 (AP8) and parent peptide (PP) were synthesized using solid-phase peptide synthesis (SPPS) and verified with liquid chromatography and mass spectrometry. The binding assay revealed that both peptides significantly reduced α -synuclein oligomerization and fibril formation compared to controls, with AP8 showing superior efficacy. In addition, AP8 exhibited a dissociation constant (K_d) of 018.89 nanomolar (nM) indicating strong binding affinity and achieved a 67% reduction in fibril formation. These findings underscore the potential of structure-guided peptide optimization to inhibit α -synuclein aggregation.

Effects of π - π Stapling on the Inhibitory Activity of Antimicrobial Peptides Against SARS-CoV-2 Mpro

Poster #16 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Julia Franz

Research Mentor(s): Mohammad Halim

Peptide-based therapeutics offer high potency and site selectivity but are often limited by poor bioavailability due to enzymatic degradation and short circulating half-lives. To address these challenges, peptide analogues are typically designed with enhanced structural stability through cyclization or the incorporation of bulky hydrocarbons. However, π - π stapling, exploits side-chain interactions by substituting specific amino acids with α -methyl-L-phenylalanine residues and prevents the need for additional covalent bonds. The methyl group at the α -carbon restricts side-chain flexibility, promoting π - π interactions between aromatic rings and stabilizing α -helical conformations. This increased conformational rigidity enhances the overall stability of the peptide backbone. In this study, the antimicrobial peptides TLPL3 and DRAMP03064 were selected for their reported inhibitory activity against the main protease (Mpro) of SARS-CoV-2, a positive-sense RNA virus composed of 16 nonstructural, 4 structural, and 9 accessory proteins. Viral replication relies on Mpro, which cleaves nonstructural polyproteins into functional units essential for replication and transcription. All peptides were synthesized using automated Fmoc solid-phase peptide synthesis (SPPS) and cleaved from the resin with 95% trifluoroacetic acid. Inhibitory activity was assessed using a selected ion monitoring (SIM)-based LC-MS assay to determine the half-maximal inhibitory concentration (IC_{50}). Results revealed markedly reduced inhibition efficiencies in the stapled analogues compared to their linear counterparts, with DRAMP03064 exhibiting the most significant decrease in activity (IC_{50} shifting from 430 nM to 38 nM).

Effective Removal of Antibiotics from Water Utilizing Deep Eutectic Solvents

Poster #21 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Saxxyun Soberanis

Research Mentor(s): Mohammad Halim

Improper disposal of antibiotics is a growing concern. Antibiotics that are improperly disposed of can contaminate water, causing huge environmental problems and health challenges for humans and animals. Water treatment is a routine practice to help purify water. Although water is treated routinely, the water treatment does not guarantee the complete removal of these antibiotic pollutants from water. Deep eutectic solvents (DESs) are classified as green solvents and have the potential to extract contaminants from water. Deep Eutectic Solvents (DESs) has the ability to interact with different contaminants. This study aims to investigate whether deep eutectic solvents (DESs) are effective in removing antibiotic pullulations from water. In addition, this study aims to investigate how effective Deep eutectic solvents (DESs) are in removing antibiotic contamination from water. Various DESs including Choline Chloride: Urea (1:2), Menthol: Thymol (1:1) and Menthol: Camphor (1:1), and Menthol: Octanoic Acid (1:1) were synthesized. IR Spectroscopy was used to confirm DES synthesis. Ciprofloxacin, a well-known antibiotic, is used as a model antibiotic for our study. The calibration curve of Ciprofloxacin was generated using various concentrations and running these solutions into liquid chromatography and mass spectrometry. To evaluate the removal efficiency, Ciprofloxacin was mixed with Deep Eutectic Solvent (DES) and stirred for one hour. The concentration of Ciprofloxacin remaining in the aqueous layer was measured using LCMS, which allowed for the calculation of the removal efficiency. Among all the tested DESs, the combination of Menthol and Thymol showed the highest removal efficiency compared to the others.

Efficient Removal of Polyfluoroalkyl Substances from Aqueous Solution Using Hydrophobic Deep Eutectic Solvent

Poster #22 (Event Center)

2:00pm – 2:45pm

Graduate Student(s): Momena Begum

Research Mentor(s): Mohammad Halim

Per- and polyfluoroalkyl substances (PFAS), fluorinated compounds containing at least one fully fluorinated methyl or methylene carbon atom, are widely used in industrial applications and in consumer goods production owing to their resistance to grease, oil, water, heat, and degradation, including use in beauty and hygiene items, non-stick cookware, air fresheners, cleaners, firefighting foams, photographic, food packaging, and textile applications. PFAS are released into the environment through point sources, including industrial effluents and wastewater treatment plants and nonpoint sources. PFAS and their salts have been detected in industrial wastewater, drinking water, effluents, and landfill leachates and are considered a global concern due to their

persistence in the environment, toxicity, and bioaccumulation. Traditional filtration processes such as reverse osmosis, granular activated carbon, and electrocoagulation for removing PFAS have shown limited efficiency, are costly, time consuming and often require further treatment using high-energy-intensive methods such as thermal decomposition. Therefore, for the sake of environmental sustainability, it is crucial to develop efficient and cost-effective methods to extract PFAS from contaminated aqueous solutions. Recently, deep eutectic solvents (DES) have been proposed as a potential solution for being more environmentally friendly, affordable, non-toxic, easy to synthesize and biodegradable to separate various compounds. A stock 5 mM solution was prepared and further utilized in serial dilution method to create varying concentrations from 65 μ M to 250 μ M which were then utilized and analyzed by LC-MS to create a calibration curve. Moreover, a series of deep eutectic solvents were synthesized to determine which combinations of hydrogen bond donors and acceptors are efficient for removal of perfluorooctanoic acid (PFOA), a common PFAS, from aqueous solution. DESs showed an efficiency rate between 69.49% to 98.02%. Menthol and Octanoic Acid DES produced a higher efficiency rate of 98.02%, which is comparable to other filtration processes, but offers a cost-effective method for PFSA extraction from water.

Engineering Polycyclic 1,2-BN-Heteroarenes for Stimuli-Responsive Materials via Electron-Deficient Heterocycle Substitutions

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

12:00pm – 12:50pm

Graduate Student(s): Blaise Williams

Research Mentor(s): Carl J. Saint-Louis

Polycyclic aromatic hydrocarbons are valued for strong absorption and fluorescence, and their modification with B–N bonds yields planar aromatic azaborines with tunable optoelectronic properties. Incorporation of nitro groups ($-\text{NO}_2$) into polycyclic 1,2-BN heteroarenes (PBNHs) produces electron-deficient n-type conjugates that display red-shifted spectra but often suffer from aggregation-caused quenching (ACQ) of emission. We previously showed that twisted molecular geometries suppress ACQ in $-\text{NO}_2$ substituted PBNHs and induce aggregation-induced emission (AIE). However, these designs still exhibited poor solubility and diminished optical performance. In this work, we integrate electron-deficient heterocycles (EDHs), including benzodiazole, benzothiadiazole, and benzoselenadiazole derivatives, into the PBNH scaffold to overcome these limitations. EDH substitution improves solubility, preserves key photophysical features, and introduces multi-stimuli responsiveness. Spectroscopic studies reveal solvatochromism, improved solid-state fluorescence, thermochromism, and halochromism, highlighting their environmental sensitivity. Furthermore, EDH-PBNHs were successfully applied in proof-of-concept stimuli-responsive devices, such as rewritable and self-erasable papers. This study demonstrates a versatile strategy for engineering electron-deficient BN-heteroarenes with enhanced solubility, tunable emission, and multifunctional responsiveness.

These findings expand the potential of BN-based materials for advanced optoelectronics, sensing, and adaptive device technologies.

Enzyme Inhibition and Kinetics by Substrate-based Peptide Inhibitors Targeting SARS-CoV-2

Poster #3 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Heidi Woods

Research Mentor(s): Mohammad Halim

Peptide therapeutics are increasingly important in drug development due to their high specificity and potential as antiviral agents. This study focuses on substrate-based peptide inhibitors targeting the SARS-CoV-2 chymotrypsin-like protease (3CLpro), a critical enzyme in viral replication. Substrate-based peptide inhibitors were synthesized using CEM Liberty Blue peptide synthesizer with automated Fmoc solid phase synthesis protocols. The peptide was synthesized using Rink-amide resin with a loading capacity of 0.58 mmol/g under high-swelling conditions. The process involved repeated cycles of deprotection and coupling. After synthesis, the peptide-resin complex was cleaved with a 95% trifluoroacetic acid (TFA) solution, followed by precipitation and purification using diethyl ester. Mass spectrometry confirmed successful synthesis, showing a prominent peak at m/z 1393.75 corresponding to the expected $[M+H]^+$ ion. To evaluate the peptide's inhibitory activity, a selected ion monitoring (SIM) assay was performed using liquid chromatography-mass spectrometry (LCMS). The peptide demonstrated a consistent inhibitory effect across three trials, yielding an IC_{50} value of 4.10 micromolar. Moreover, LCMS based enzymatic kinetics assay was developed by synthesizing the N-terminal product of the NSP8/9 substrate SFVKLF/NNELSP. Initially, the velocity of the N-terminal product was obtained without adding the peptide inhibitor then various concentrations of the peptide inhibitors were used to monitor the reduction of the product velocity. Our results highlight promising antiviral candidates that effectively disrupt SARS-CoV-2 protease activity and inhibit viral replication, as evidenced by the observed decrease in the product velocity. Once consistent trends are established, we will determine key enzyme kinetic parameters— K_m , V_{max} , and K_i —to characterize the inhibitor's potency and mechanism of action, including whether peptide inhibitors work competitively or noncompetitively.

Functional Analysis of MKNK2 Isoforms in Response to MAPK phosphorylation

Poster #22 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Portia Simpson, Tyreese Spencer, Nellie Abdul-Rahman, & Nya Malone

Research Mentor(s): Carol Chrestensen

MKNK2 is a serine/threonine kinase activated downstream of the mitogen-activated protein kinases (MAPK) pathway. p38 and ERK1/2 are known kinase activators of MKNK2, though MKNK2 is known to preferentially interact with ERK1/2. MKNK2 belongs to the MKNK family, which includes two genes, MKNK1 and MKNK2. These kinases phosphorylate the eukaryotic initiation factor eIF4E, which is a regulator of mRNA translation, cell growth, and oncogenic signaling. In recent years, MKNK2 has been studied for its role in cancer, where phosphorylation of eIF4E promotes tumorigenesis. MKNK2 is alternatively spliced into two isoforms, MKNK2-long and MKNK2-short. The long form has been reported to act as a tumor suppressor, while the short form functions as an oncogene. In this project, we purified GST-versions of both MKNK2 proteins and performed a kinase assay to test the ability of both isoforms to be a substrate of ERK or p38 MAP kinase, and if the short and long isoforms can phosphorylate kemptide after activation. The information from these experiments could help with the development of targeted inhibitors of oncogenic pathways.

GC/MS Analysis of Limonene as an Allergen Present in Perfume Samples

Poster #2 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Ariana Mitchell & Caitlyn Salmon

Research Mentor(s): Wei Zhou

D-Limonene (R-(+)-limonene, C₁₀H₁₆) is a naturally occurring fragrant terpene found in fruits, flowers, and aromatic herbs, responsible for the characteristic fresh citrus scent of oranges, lemons, and related fruits. It is widely employed in perfumes, colognes, soaps, shampoos, and cleaning products for its bright, uplifting aroma. Both D-limonene and its oxidized derivatives are recognized as potential allergens in fragrance products. Along with coumarin, linalool, benzyl alcohol, and other compounds, D-limonene is among the 26 fragrance allergens identified by the European Union Cosmetics Regulation; these substances must be declared on product labels if their concentrations exceed 10–100 ppm. However, no regulatory limit exists for their maximum allowable concentration in the EU or under U.S. FDA regulations. In this study, we quantitatively analyzed D-limonene in various commercial fragrance products using gas chromatography–mass spectrometry (GC/MS). A 25-minute elution protocol was developed and applied to both standard D-limonene solutions and diluted perfume and cosmetic samples. Here, we present a comparative summary of D-limonene concentrations across different products.

Installing Modified Phenylalanine to Improve Peptide Therapeutics for Alzheimer's Diseases

Poster #24 (Event Center)

11:00am – 1:45am

Undergraduate Student(s): Ryan Boutcher & Iona Alatar

Research Mentor(s): Mohammad Halim

Alzheimer's disease is characterized by progressive neurodegenerative decline through the reduction in someone's ability to recall information and regulate behavior. The pathogenesis of Alzheimer's is correlated with a build-up of Amyloid- plaques within neurons. These plaques cause neurons to undergo oxidative stress and inflammation which in turn, causes the membrane to leak, leading to cell death. Since the issue is the buildup of amyloid- β plaques, the question is posed as to how the buildup of these could be prevented through the dissolution of conjoined amyloid- β plaques. The aim of this research is to test how modified methylated phenylalanine containing peptide interactions with amyloid- β . In this research, methylated phenylalanine was utilized for its ability to stabilize peptide structure to improve binding affinity, proteases stability and fibril reduction. Four peptides were synthesized using solid phase peptide synthesis with Fmoc protecting the amino acid side chains. These four peptides were synthesized using amide resin and cleaved with the use of cocktail R due to the presence of multiple arginine amino acids. Cold ethyl ether added to the peptide solution allowed the peptide to precipitate. Acetic acid and water were added to the pellet, and frozen to be lyophilized. All four peptides were synthesized and identified by liquid chromatography coupled with mass spectrometry which showed the accurate molecular weights for each charged state (m/z). The preliminary results showed that methylated peptides strongly bind with amyloid beta and significantly reduced the amyloid- β fibril formation.

Investigating the Inhibitory Potential of the Frog-Skin Derived Peptide DRAMP01292 Against the SARS-CoV-2 Main Protease

Poster #2 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Cara Erickson

Graduate Student(s): Funsho Afolabi

Research Mentor(s): Mohammad Halim

The COVID-19 pandemic was caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), resulting in millions of deaths around the world and still imposes a global health burden. Current strategies for targeting SARS-CoV-2 are focused on vaccines and small-molecule antivirals. However, these methods can have limited efficiency due to drug resistance and off-target toxicity – highlighting a need for other approaches. Peptide therapeutics are an excellent alternative as they are highly selective, can be chemically modified, and interact with a

larger surface area. This study investigated the frog-skin derived peptide DRAMP01292 for its use in inhibiting Mpro activity. DRAMP01292 was synthesized using Fmoc-based solid-phase peptide synthesis (SPPS). Deprotection and cleavage from the resin were performed with the use of TFA. The crude peptide was then purified using reversed-phase high performance liquid chromatography (RP-HPLC). Liquid Chromatography–Mass Spectroscopy (LC-MS) analysis confirmed the expected molecular weight (2113.533 Da), with the peptide eluting at 1.30 min on a C18 column. The mass spectrum displayed peaks at m/z 1057.08 ($[M+2H]^{2+}$), 705.05 ($[M+3H]^{3+}$), and 529.04 ($[M+4H]^{4+}$). To assess the inhibitory efficiency of DRAMP01292 against SARS-CoV-2 Mpro, a Fluorescence Resonance Energy Transfer (FRET) cleavage-based assay was performed. The assay measures fluorescence upon substrate cleavage, providing information on Mpro's enzymatic activity in the presence or absence of the inhibitor. The initial FRET reading resulted in an IC_{50} of 21.95 μ M, meaning the concentration required to inhibit enzyme activity by 50%. Although this value represents moderate inhibition compared to small molecules, it shows that DRAMP01292 can inhibit Mpro, and further testing can result in increased inhibition efficiency. Overall, this study highlights the potential of peptide therapeutics to strengthen and diversify existing antiviral strategies against SARS-CoV-2.

Mapkap kinase 2 Protein-Protein Interactions Using the Yeast Two Hybrid Assay

Poster #9 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Nyriah Johnson & Brooke Ekstrom

Research Mentor(s): Rajnish Singh

MK2 or MAP Kinase – activated protein kinase 2 is an enzyme involved in the regulation of the cell cycle and DNA repair. MK2 is known to be notably critical in oncology, and the prospective inhibition of MK2 can lead to possible cancer treatment. MK2 has two isoforms – a long and short isoform. The short isoform has little research on it while the long isoform has a multitude of research. In this study, we will be confirming the protein-protein interactions between MK2 short and two potential protein interactors identified using a yeast two hybrid screen. This screening was done using a Human cDNA Library. In the Yeast Two-Hybrid screen, MK2-short isoform was used as bait and the library of cDNA as prey. Sequencing analysis of positives identified two promising proteins: SMADL9, a tumor suppressor protein, and ZNF302 a transcription factor. The Yeast-to-Hybrid Assay was used to confirm the interaction between MK2-short isoform and SMADL9 and ZNF302. Blue colonies in the assay confirmed the interaction between MK2-short isoform and SMADL9 and ZNF302.

Membrane Permeability of Temporin L and NAP Peptides

Poster #13 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Ella Stimson

Research Mentor(s): Mohammad Halim

Peptide therapeutics are expanding immensely due to their ability to reach target proteins, high specificity, low cost, and minimal toxicity. Today, there are over 80 therapeutics approved, and 150 that are in clinical trials seeking approval to treat a wide range of diseases and conditions. However, one of the inherent disadvantages of peptide is they have poor membrane permeability. This research aims to test the membrane permeability of some well-known peptides employing liquid chromatography and mass spectrometry. Two widely used peptides such as Temporin L and NAP were synthesized using solid phase peptide synthesis using rink-amide resin, cleaved with high concentration of trifluoroacetic acid and precipitated with cold ether. After lyophilization of these peptides, they were characterized by LCMS to confirm their purity and identity. Two calibration curves were generated from two peptides varying their concentrations and obtaining their abundance using LCMS. To better validate the methods, the limit of detection (LOD) and the limit of quantification (LOQ) were calculated. Both peptides showed high sensitivity with the LOD/LOQ values being smaller than 50 picomolar. Membrane permeability was tested using Octanol-Buffer system. Peptide was mixed in the buffer solution, and octanol was added to the system and rotated for about an hour. After centrifugation, the peptide was collected from water layer and obtained their abundance using LCMS. The preliminary results showed that around 90% of Temporin L was transferred from the buffer into the octanol phase.

Mixed Anion Effect in a Cobalt Chromite Spinel Family

Poster #22 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Rosia Jones

Research Mentor(s): Madalynn Marshall

Spaniels, with the formula AM_2X_4 are a large family of materials that feature the pyrochlore lattice on the magnetic M site. Recent research has focused on investigating the magnetocaloric candidates within the chromite and ferrite spinel families. Selenide spinels contain a largest X²⁻ anion, exhibiting competing antiferromagnetic and ferromagnetic orders due to stronger FM Cr-X-Cr super-exchange interactions the increasing lattice contains of the larger X²⁻ anions making this effect more pronounced in selenides, while weaker in oxides. This allows us to explore a unique avenue to generate a large magnetocaloric effect (MCE) through the use of highly frustrated magnetic materials where the ground states are infinitely degenerate and the spins are field polarized under an applied magnetic field, resulting in a large magnetic entropy change. In this talk I will present the structural analysis and magnetic behavior of the mixed anion spinel materials $CoCr_2S_4-xSex$. These results provide insights into the effect of the magnetic behavior

on the MCE in this chromite spinel family, and subsequently how the MCE can be further tailored through magnetic frustration.

New Electron-Rich Polycyclic 1,2-BN-Heteroarenes with Phenyl SPacer: Synthesis and Photophysical Properties

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

12:00pm – 12:50pm

Undergraduate Student(s): Lilianna Kocai

Research Mentor(s): Carl J. Saint-Louis

Incorporating a B–N bond into polycyclic aromatic hydrocarbons generates planar azaborine scaffolds with unique optoelectronic features, including high photochemical stability, strong absorption, high fluorescence quantum yields, large Stokes shifts, and tunable emission. These attributes make BN-substituted heteroarenes promising candidates for applications such as organic light-emitting diodes (OLEDs) and related optoelectronic devices. However, enhancing electron density and controlling conjugation without compromising stability remain significant challenges. To address this, we designed and synthesized new electron-rich polycyclic 1,2-BN-heteroarenes incorporating strong electron-donating groups, including carbazole and dimethylaminodiphenyl, attached through a phenyl spacer. This design improves conjugation, introduces steric modulation, and enables control over charge-transfer interactions while mitigating aggregation-caused quenching (ACQ) of emission. Using palladium-catalyzed cross-coupling method, we successfully synthesized two target compounds featuring extended π -systems and enhanced donor–acceptor character. We propose that the phenyl spacer and bulky substituents reduce ACQ, improve photophysical stability, and yield tunable optical responses with potential multi-stimuli responsiveness. These structural modifications highlight a versatile strategy for tailoring BN-based heteroarenes. Beyond OLEDs, such multifunctional chromophores hold promise for chemical and biological sensors, adaptive optoelectronic systems, and security applications, expanding the utility of BN-embedded materials in next-generation technologies.

Positional Effects of Electron-Deficient Heterocycles on the Emission and Aggregation Behavior of polycyclic-1,2-BN-heteroarenes

Poster #21(Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Skylor Seetaram

Research Mentor(s): Carl Saint-Louis

Incorporation of a boron–nitrogen (B–N) unit into polycyclic aromatic hydrocarbons generates azaborines, a versatile class of heteroarenes that combine strong absorption, high photochemical stability, and tunable emission. Among them, nitro-substituted polycyclic-1,2-BN-heteroarenes

(PBNHs) have emerged as promising electron-deficient n-type frameworks for organic optoelectronic devices. However, the introduction of $-\text{NO}_2$ groups often promotes strong $\pi-\pi$ stacking, which induces aggregation-caused quenching (ACQ) and severely compromises fluorescence efficiency. To overcome this limitation, we designed and synthesized a series of PBNHs incorporating electron-deficient heterocycles at distinct positions on the pyrrolidinone hemisphere. By systematically varying heterocycle placement and introducing sterically demanding substituents, we sought to distort molecular planarity, suppress intermolecular stacking, and induce aggregation-induced emission enhancement (AIEE). Comprehensive spectroscopic studies revealed that the positional orientation of electron-deficient heterocycles exerts a pronounced influence on photophysical behavior, modulating emission efficiency, spectral response, and aggregation tendencies. Several derivatives exhibited reduced ACQ, and in select cases, clear AIEE activity while preserving favorable absorption and stability. These findings demonstrate that positional control of electron-deficient heterocycles is a powerful strategy for tailoring the optical properties of BN-based chromophores. This design principle enables the development of next-generation electron-deficient AIE-active azaborine materials with significant potential in sensing, adaptive photonics, and optoelectronic applications.

Preserving Protein Using a Proline-Urea-based Deep Eutectic Solvent

Poster #25 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Vahreena Kong

Research Mentor(s): Mohammad Halim

Deep eutectic solvents (DES) remain a relatively new concept in the chemical world. The word 'eutectic' is originated from Greek 'eu' meaning 'well' and 'τήξις' meaning 'melting'. These solvents show characteristic melting point (MP) depression. This is accomplished through acquiring the correct stoichiometric ratios in order to obtain the deep eutectic point, where the melting point is at its lowest. Current studies of DES have focused on multiple different applications (e.g., drug delivery and metal processing), including the application of DES to preserve proteins or prevent their unfolding. For this study, a DES composed of a 1:2:2 molar ratio of L-proline, urea, and water (called Pro-Urea DES for simplicity) was synthesized and tested with lysozyme (in phosphate buffer), a protein and enzyme that provides defense for the immune system. Characterization of the Pro-Urea DES and the observations of the Pro-Urea DES on lysozyme were completed using Fourier-transform infrared spectrometry (FTIR) and differential scanning calorimetry (DSC). The IR spectra revealed interactions between the DES and protein at the amide I region, in which an increase in peak intensities was observed. With the thermal profiles obtained from the DSC, the effect of the Pro-Urea DES on the lysozyme demonstrated an increase in the temperature at which lysozyme denatures, by a difference of

nearly 10°C. In the future, other enzymes will be tested with the Pro-Urea DES to determine the consistency of this data.

Removal Efficiency of Herbicide Simazine from Water Using Eutectic Solvents

Poster #24 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Sarah Tapp

Research Mentor(s): Mohammad Halim

Traditional solvents are one component solvents, and they are toxic, expensive, and not biodegradable and environmentally friendly. However, the deep eutectic solvents (DESs) contain two components, interact non-covalently and thereby the melting point is decreased. DES's are biodegradable, cost-effective, and less toxic than traditional organic solvents used for extraction. These characteristics make DESs more sustainable alternative to other solvents. DES's may therefore be a great option for the removal of contaminants (e.g. pesticides) from water. Simazine, a pesticide used on many crops to control weeds, is sparingly soluble in water and can therefore persist in the environment. The presence of Simazine in water can be an issue, as Simazine is a known endocrine disruptor, posing a threat to humans and animals. The aim of this research is to synthesize a variety of DES solutions and measure their removal efficiencies of simazine from water. First, a series of different DES's were synthesized. These include Menthol: Thymol, Menthol:Camphor, Thymol:Camphor, Menthol:Octanoic Acid, Menthol:Oleic Acid, Choline Chloride:Urea, and Menthol:Lauric Acid. The IR of each DES and their individual constituents were taken using a Thermo Scientific ATR-FTIR spectrometer to confirm DES formation. Next, serial dilutions ranging from 32 μM to 500 μM were created to generate a calibration curve using LCMS. A 100 μM solution of Simazine was then prepared and combined with a DES to remove the pesticides from water. This was done for each DES previously synthesized. The DES-Simazine mixtures were stirred for one hour at 600 rpm and then centrifuged for 30 minutes. The LCMS intensity was used to determine the concentration of Simazine left in the aqueous layer and thereby calculate the DES's extraction efficiencies. Among all DESs, Menthol:Camphor demonstrated the highest extraction efficiency of 99.5%. and Choline Chloride:Urea did not extract Simazine from water.

Removal of Chemical Pesticides from Water Using Hydrophobic Deep Eutectic Solvents

Poster #18 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Gabrielle Mills

Research Mentor(s): Mohammad Halim

Chemical pesticides, herbicides, fungicides, etc. have been used for decades throughout the agricultural industry. These pesticides are frequently used by farms belonging to large corporations and having a high demand for products leads to an increase in pesticides usage. Most pesticides contain hydrocarbon bonds which contribute to their hydrophobic characteristics which increases the probability for them to end up in local water supplies due to run-off. This can damage neighboring ecological systems and disrupt a community's drinking water. However, regardless of the hydrophobic tendencies of most pesticides, they still are slightly soluble in water, which makes them difficult to remove. Past procedures have been used but tend to be more expensive, tedious, and the materials used are not easy to dispose of. Deep Eutectic Solvents (DESs) and Hydrophobic Deep Eutectic Solvents (HDESs) have been studied over recent years as a more cost effective and green alternative to extracting a multitude of synthetic compounds. The goal of this study is to analyze multiple DESs in their efficiency to remove different pesticides from a water sample using Direct Analysis in Real Time Mass Spectroscopy (DART-MS) as a more time effective method. In preparation, eight HDESs involving different combinations of Menthol, Camphor, Thymol, Octanoic Acid, and Lactic Acid were synthesized by stirring two components with or without heat for one hour. The solutions for the pesticides Dodin and Metolachlor were prepared in HPLC water and, for extraction, were combined with the HDES in 1:2 ratios (w/w). The HDES:pesticide solutions were then centrifuged for one hour at 10,000 rpm in order to form a distinguished bilayer with the HDES being the top layer and the aqueous layer as the bottom layer. A small sample was collected from the aqueous layer and analyzed using the DART-MS in order to determine the amount of pesticide extracted by the HDES layer. Calibration of the pesticides was constructed using the DART-MS with serial dilutions ranging from 6 ppm to 200 ppm. Initial results displayed the menthol:octanoic acid HDES to be the most efficient in extracting both pesticides from water. The HDESs containing thymol, camphor, and lactic acid had varying results between the two pesticides and will be further tested.

Removal of Textile Dyes from Water using Deep Eutectic Solvents

Poster #22 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Tylus Moore

Research Mentor(s): Mohammad Halim

Textile dyes are known to become harmful and hurt aquatic life. Within day to day and common use this can be mainly found within countries with more manufacturing textiles and food packaging. Developing countries like China, India and Vietnam are some of the places that have a strong hold on the textile industry. When these dyes are no longer of use or deemed out of date in some of these other countries often these are improperly disposed of into lakes and rivers, that can increase pollution and weaken water quality. Deep Eutectic Solvents (DESs) are a potential green sustainability solvent that contains a hydrogen donor and acceptor. The overall purpose of

this study was to synthesis various types of Deep Eutectic Solvents and to test their performance on removing dyes. Menthol:Thymol, Camphor:Thymol, Camphor:Menthol and Methnol:Octanoic Acid DESs were prepared with 1:1 ratio by heating at 50-80 °C and stirring at 600 rpm. The synthesis of DESs were confirmed by ATR-FTIR spectroscopy. A model dye, methyl orange, was used in this study. A calibration curve was developed using LCMS and various concentrations of methyl orange. To assess the dye removal efficiency, DES was mixed with dye, stirred for about an hour then centrifuged and analyzed by LCMS. Preliminary results showed that some DESs can moderately remove the dye from water.

Selected Ion Monitoring Based Liquid Chromatography Coupled Mass Spectrometry as a New Tool to Study Enzyme Kinetics

Poster #15 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Jiselle Jackson & Ishrat Prokreety

Research Mentor(s): Mohammad Halim

The characterization of protease inhibitors is essential to the process of assessing the efficacy of novel drug candidates and is an emerging field of interest for clinical researchers. Studies to provide data on the inhibitory effects and enzymatic activity of peptide inhibitors typically rely upon Förster Resonance Energy Transfer (FRET) assay as the industry standard; however, this assay are known to suffer from low signal to noise ratio (SNR) and complications that arise from the use of fluorescent labels, driving up costs and affecting the accuracy of key data to quantify therapeutic potential. Assays analyzed using selected-ion monitoring (SIM) based LC-MS is a promising low-cost, accessible alternative due to the improved specificity and SNR in comparison to the FRET-based assays. Research to further analyze the candidacy of antimicrobial peptides effective in their inhibition of the main protease (Mpro) of SARS-CoV-2 has been necessary given the global impact of COVID-19. In this study, a new SIM based LC-MS assay was developed and tested for characterizing the mode of inhibition and kinetics of two Temporin-L analogues, TLP-1 and TLP-3. The Michaelis-Menten kinetics results showed that the velocity of the product formation significantly decreased at the concentration of 6.25, 10 and 12 μM for the TLP3 with a K_i value of 2.31 μM . Lineweaver-Burk plots were used to obtain V_{max} and K_m . The analysis of the Lineweaver-Burk Plot revealed a steadily decreasing V_{max} value as the concentrations of TLP3 increased. However, K_m values remained unchanged. This result showed that TLP3 peptide can act as a noncompetitive inhibitor which can bind to free enzyme 3CLpro as well as the 3CLpro-substrate complex. In either case, the binding of peptide prevents the formation of product. Moreover, the noncompetitive inhibition of the peptide toward 3CLpro enzyme cannot be overcome by increasing substrate concentration.

Small Dimer Peptide Therapeutics Targeting Beta Amyloid Fibrils in Alzheimer's Disease

Poster #22 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Mia Burford & Caroline Rakestraw

Research Mentor(s): Mohammad Halim

Alzheimer's disease (AD) is a progressive neurodegenerative disorder and is the most common cause of dementia, responsible for up to 70% of dementia cases. Memory loss, impaired judgement, and mood changes, to name a few symptoms, are a result of AD. AD is characterized by neurofibrillary tangles and amyloid plaques that form spontaneously due to beta amyloid (A β) in the brain, according to the widely accepted amyloid hypothesis. The development of A β -peptide analogues is an effort to prevent fibril tangles, as these peptides are expected to bind to A β , thus disrupting fibril formation. The goal of this study is to develop monomeric and dimeric A β -derived peptides and compare their affinities for A β and the ability to inhibit fibril formation. It is expected that peptide dimers will exhibit high binding affinity to A β and will disrupt fibril formation. Four small monomeric peptides were synthesized using solid-phase peptide synthesis protocol employing Liberty Blue peptide synthesizer. In the protocol, a rink-amide based high-swelling resin with a loading capacity of 0.58 mmol/g and a mesh size of 115, was used for synthesis. After synthesis, peptides were cleaved from the resin using a cocktail solution containing copious amounts of trifluoroacetic acid. The cleaved peptide was filtered and precipitated from solution using cold ether. Peptides are then freeze-dried to a powder-like form for analysis. Liquid chromatography-mass spectrometry (LC-MS) is used to confirm purity and mass of the peptides. For the monomer peptide AD1 (KLVFWAK), revealed two prominent peaks at m/z 445.77 and 890.54 corresponding to [M+2H]²⁺ and [M+H]⁺, respectively. AD2 (RGKLVFFGK), AD3(LPYFD) and AD4(LPFFN) were also successfully synthesized. A dimer peptide (KLVFWA)₂K was also synthesized successfully. A similar procedure will be followed to develop other dimer peptides, and they will then be assessed for their ability to bind to A β and reduce fibril formation.

Structural Determination of Putative Lytic Transglycosylase Inhibitor IVY-P2 through X-Ray Crystallography

Poster #22 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Skylar Hamric & Brett Bippert

Research Mentor(s): Thomas Leeper

Pseudomonas aeruginosa is a pathogenic Gram-negative bacterium with the potential to cause serious illnesses, notably lung infections in immunocompromised individuals. The formation of

biofilms and pervasive multiple drug-resistant strains, makes treatment of *P. aeruginosa* with traditional antibiotics difficult. Therefore, research into potential drug targets and development of novel treatment options are of paramount importance for controlling deadly infections. One potential drug target, IvyP2, is a homolog of lysozyme glycoside hydrolase inhibitor IvyP1 and is purported to be an inhibitor of *P. aeruginosa* lytic transglycosylases. While the structure of IvyP1 is known (Abergel) and the structure of IvyP2 is not, there are conflicting observations about the mechanisms for molecular recognition in this family. To define the details of molecular recognition that govern specificity and potency, the structure of IvyP2 was studied to enable comparison to structures of IvyP1. A structure of IvyP2 determined by X-ray crystallography revealed significant structural homology with notable divergence at the N-terminal alpha helix between IvyP1 and IvyP2. While prior structural work on IvyP1 suggests that the key inactivation loop is the predominant driver for molecular recognition, our data suggests that additional surface contacts are required. A thorough understanding of the specifics of molecular recognition within the IVY family may answer some of the persistent questions regarding peptidoglycan synthesis and remodeling.

Studies of Sand Sizes and Trace Metal Analysis of Various Sand Samples from a Man-made Lake

Virtual Presentation (Microsoft Teams)

3:00pm – 4:00pm

Undergraduate Student(s): Jarod Denman

Research Mentor(s): Marina Koether

Trace heavy metals in the environment come from various sources, such as runoff and illegal dumping. However, for man-made lakes, sediment in the form of sand is deposited on the shores to create beaches. This sand comes from locations with various levels of trace heavy metals. In addition, they have variable particle sizes such that some areas have a different distribution than another area based on the source of the sand. The purpose of this study is to determine the trace heavy metals concentration in the sand around a man-made lake. In addition, the purpose of this study is to determine the particle size distribution of the sand and their subsequent trace heavy metal concentrations. The methods of the study involve collecting sand samples in January 2024 from six locations around a man-made lake. The samples were dried, and the bulk was tested by x-ray fluorescence (XRF) for trace metals using the soil analysis calibration. Subsequently, the bulk sand was separated based on size using a sieve shaker, and each size was analyzed by XRF for trace metals. The results show that the distribution of the sand particle sizes and trace metals, in those different sizes, varies by location. Explanations for the differences are based on location of the collection sites.

Synthesis and Characterization of Bismuth-based Bicyclic Peptide Inhibitors Targeting Main Protease of SARS-CoV-2

Poster #18 (Event Center)

11:00am – 11:45am

Graduate Student(s): Funsho Afolabi

Research Mentor(s): Mohammad Halim

The emergence of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus and the resultant COVID-19 disease represent the most significant public health crisis of this century, exerting a profound impact on the global economy, as well as human health and lives. The main protease (Mpro) is a vital protease that facilitates viral replication. Inhibition of this viral protease enzyme blocks the formation of functional viral proteins required for the viral life cycle. Small molecules have been shown to improve antiviral activity, but with lots of side effects. Peptide therapeutics, in contrast, are highly attractive due to their selectivity, tolerability, and fewer adverse effects. However, they aren't without limitations, which include poor metabolic stability, membrane permeability, and oral bioavailability. Bicycling has been found to improve these limitations. Solid-phase peptide synthesizer was used to synthesize the linear peptides 3CTLP1 and 3CTLP2. After the synthesis, the peptide-resin complex was cleaved with 82.5% trifluoroacetic acid. The cleaved peptides were filtered, precipitated, lyophilized, and characterized. The linear peptides show strong peaks at m/z 1658.58 and 830.42, 1865.00 and 933.42, respectively, corresponding to the +1 and +2 charge states. These linear peptides were further synthesized into Bismuth-based bicyclic analogs by adding tris(2-carboxyethyl) phosphine (TCEP)-NaOH and Bismuth (III)bromide. A pale-yellow coloration indicated the formation of a bicyclic product, which was centrifuged, reprecipitated, lyophilized, and characterized. The bicyclic peptides, Bi-3CTLP1, show strong peaks at 1865.71 and 932.86 (corresponding to +1 and +2 charge states), and Bi-3CTLP2 shows strong peaks at 1035.94 and 690.96 (corresponding to +2 and +3 charge states). Future work will be focused on their FRET, LC-MS SIM, and gastrointestinal assays of these analogs.

Synthesis and Characterization of Cysteine-Based Dimer Peptides to Enhance Its Therapeutic Ability to Combat Alzheimer's Disease

Poster #26 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Yohana Fuentes Martin & Tehila Adetuberu

Research Mentor(s): Mohammad Halim

With a staggering six million Americans currently living with it and it being the seventh leading cause of death in the United States according to the CDC, Alzheimer's disease (AD) is quite a scourge in modern therapeutic drug research. The biological basis for AD is quite profound, as sticky clumps of β -amyloid protein accumulate between neurons to form amyloid plaques, leading to widespread neuronal death and decreased cognitive function. The goal of this research is to design and develop dimer peptides using two peptides (NAPVSIPQ and IIGLMVGGVVIA) which showed to inhibit β protein aggregates. The interest of dimer peptides is the potential to be less susceptible to degradation by proteases when compared to their monomer counterparts. In addition, biological activity such as target affinity and potency can also increase because of dimerization. These peptides were synthesized using Liberty Blue peptide synthesizer using solid peptide synthesis protocol. High swelling ProTide resin with a loading value of 0.6 mmol/g was employed to support the growing peptide chain. To remove protecting groups, a cleavage cocktail containing 82.5% trifluoroacetic acid was added to synthesized peptide, then placed in a hot water bath. After filtration of cleaved peptide, cold ether was added to allow peptide precipitation and lastly centrifugation. The precipitated peptide was dissolved with water and acetic acid and finally freeze dried. To confirm target peptide was successfully synthesized, prepared peptide sample solutions were analyzed by Liquid Chromatography-Mass Spectrometry. Successful synthesis of peptide analog with added cysteine residue (CNAP), was confirmed with intense peak at m/z at 927.48, corresponding to $[M+H]^+$. The linear peptide IIGLMVGGVVIA also synthesized and detected at m/z 571.35 and 1141.70, numbers that correlated to $[M+2H]^+$ and $[M+H]^+$ charge states, respectively. These peptides will be further modified to develop dimer peptides and test their efficiency on fibril reduction and binding affinity.

Synthesis, Characterization and Fibril Reduction Assay of Glycine-rich Peptide Targeting Alpha-Synuclein Aggregation in Parkinson's Disease

Poster #19 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Khang Tran & Nataly Barahona

Graduate Student(s): Zainab Noor

Research Mentor(s): Mohammad Halim

Various neurodegenerative conditions like dementia, Alzheimer's disease (AD), and Parkinson's disease (PD) cannot be easily treated using current medical technology. Currently, over 55 million individuals suffer from dementia worldwide, with more than 10 million new cases diagnosed every year. The impact of dementia extends far beyond the individual, also affecting

the lives of their families, friends, and caregivers by causing memory loss, behavioral changes, and social reclusion. In recent studies, scientists have uncovered a link between alpha-synuclein (α -syn) and Parkinson's disease. The misfolding and aggregation of alpha-synuclein are extremely difficult to eradicate, which suggests a new therapeutic strategy. As a result of their high target specificity and potency, peptide therapeutics are designed to bind specifically to certain proteins or receptors, leading to enhanced efficacy and minimizing the risk of eliciting immune responses, a disadvantage of small-molecule drugs. This study aims to design glycine-rich peptide analogs to inhibit alpha-synuclein aggregation. A series of analogs was computationally designed. Subsequently, using molecular docking, the binding affinity with the alpha-synuclein protein was determined for each analog. Based on the docking score, four analogs were synthesized using solid-phase peptide synthesis protocol. In this protocol, high swelling rink amide resin (ProTide) with a loading capacity of 0.58 –0.60 mmol/g and 100-200 mesh size was used. The resin-peptide complexes were then cleaved using a cocktail containing a high concentration of trifluoroacetic acid (TFA). The cleaved peptides were filtered and precipitated using cold ether. Analogs 5, 6, 8, and 10 were characterized by LCMS. For analog 8, one intense peak was noticed at m/z 707.40, which corresponds to $[M+H]^+$. For analog 10, one intense peak was detected at m/z 503.3, which corresponds to $[M+2H]^{2+}$. Both agreed with theoretical mass. These peptides also significantly reduced (91.41%) the in-vitro fibril formation of alpha-synuclein.

Synthesis of MKNK1 in BL21 Bacterial Cells and Purification by GST Tag Affinity Chromatography

Poster #4 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Imran Dabdoub, Mishelle Mulko, & Nedgina Nemorin

Research Mentor(s): Carol Chrestensen

Kinases are a class of enzymes that specialize in the transfer of a phosphate group to a target molecule, which is typically a protein. Kinases are critical in the regulation of various cellular processes, the activation or deactivation of specific enzymes, and cell signaling. MKNK1 is one such kinase, with three known isoforms of short, medium, and long lengths. MKNK 1 phosphorylates eukaryotic initiation factor 4E (eIF4E) through its interaction with eukaryotic initiation factor 4G (eIF4G), this phosphorylation alters protein translation but is not necessary for the process. Overexpression of MKNK 1 has been linked to several cancers, including stomach, endometrial, lung adenocarcinoma, and bladder cancers. Understanding how these isoforms function and interact with different substrates may provide insight into cancer-related signaling pathways and identify potential therapeutic targets. So far, DH5 alpha bacterial cells have been used to make copies of plasmid DNA, which encodes for the three isoforms of MKNK 1

with a GST tag. Gel electrophoresis analysis was then performed to ensure that the plasmid of interest was what was replicated in the bacterial cell. The same plasmid DNA was then transformed into BL21 cells for protein synthesis, and GST affinity chromatography was then used to purify MKNK 1 and its isoforms, respectively. To assess kinase activity, a PepTag assay was prepared using Kemptide, a synthetic peptide substrate known to be phosphorylated by MKNK 1 and PKA. The assay also requires ERK or p38 kinase-mediated phosphorylation. Our work intends to determine if these two kinases activate the three isoforms differently in vitro.

Two-Year Collection, Isolation and Counting of Microfibers and Measuring of Trace Metals in Lake Allatoona Sand

Poster #3 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Daniel Farris

Research Mentor(s): Marina Koether

Microfibers and trace metals are present on all beaches. In Lake Allatoona, a man-made lake, one of the greatest contributors is a wastewater plant upstream. The increasing concentration of microfibers and trace metals are an environmental concern. The purpose of this study is to determine any year over year increases in microfibers in Lake Allatoona and trace metals. In addition, the purpose of this research is to find any trends as to where microfibers are found in Lake Allatoona. The methods begin with obtaining sand samples. Sand samples are taken from six beaches at the start of every year during low water levels in a spot that would be underwater during high water levels. The sand is stored in a fridge and then dried in an oven before use. Three samples are portioned out for each beach site. The samples are flooded with a salt solution and run through a series of sieves, density separations, oxidation reactions, and placed inside a gravity funnel. Liquid not containing microfibers is discarded, and the remaining solution is filtered through filter paper using a vacuum filtration system and the filter papers containing the microfibers are stored in a petri dish. All microfibers are counted on the filter paper using a microscope. The results will include all microfiber concentrations and correlations between years and location. X-Ray Fluorescence (XRF) sample pucks are filled with the unused original dried sand and scanned using an XRF instrument. The XRF measures the composition of all trace metals in the sample. Trace metals of interest will be documented in our findings. Year-over-year changes will be presented with potential explanations.

Vitamin C Quantification in Fresh and Dried Produce Using UV/Vis Spectroscopy

Poster #20 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Jade Valeris & Joy McLeod

Research Mentor(s): Wei Zhou

Ascorbic acid, also known as vitamin C, is an essential nutrient that supports human physiological functions and aids in maintaining overall health. Fresh oranges are commonly known for containing a high amount of vitamin C. People may assume that dried fruit contains less vitamin C than fresh fruit because the compound degrades with time and decomposes at high temperatures. We are interested in quantitative comparison of vitamin C's content in different fruits and vegetables, dried or fresh. In our study, UV/Visible spectroscopy is used to measure the absorbance of potassium permanganate around 525nm after a standard solution of potassium permanganate has reacted with the vitamin C present in a test solution. A calibration curve using a standard potassium permanganate solution and a set of ascorbic acid solutions of various concentrations is constructed. After a fruit or vegetable sample solution has reacted with the standard solution of potassium permanganate, the absorbance is measured, and the concentrations of vitamin C in the sample are calculated using the calibration curve. Both fresh and dry samples of oranges, guavas, kiwis, kale, grapes, and bell peppers (green, red, and yellow) are being analyzed in this experiment. The main objective is to test which type of produce may contain more vitamin C than others. We also aim to analyze if drying at ~60 degrees Celsius for 8 hours will significantly degrade the amount vitamin C in each sample. This can be valuable information for improving human health, especially for those in need of an increased level of vitamin C in their diet.

Ecology, Evolution, and Organismal Biology

A Preliminary Evaluation of Environmental DNA for Detecting Many-Lined Salamanders

Poster #10 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Kameryn Kimbrough

Research Mentor(s): Todd Pierson

*The many-lined salamander (*Stereochilus marginatus*) is a rare and secretive species whose behavior makes it difficult to monitor using traditional field surveys. Environmental DNA (eDNA) offers a promising, non-invasive tool that may provide higher detection probabilities and allow researchers to identify habitats where this species persists. This study evaluates the potential of eDNA as a method for locating many-lined salamanders and guiding future monitoring strategies. Water samples were collected from a site where the species has been documented previously by colleagues from the Florida Fish and Wildlife Conservation Commission (FFWCC), who filtered samples to preserve DNA material. We then extracted eDNA from these filters in the laboratory. Next, we made metabarcoding libraries using two sets of primers: one custom-designed for lungless salamanders and one targeting all vertebrates. We*

analyzed sequence data using QIIME2 and a reference database. Our goal was to determine whether eDNA can serve as a reliable method for detecting many-lined salamanders in habitats where they are known to occur, thereby validating its use in broader surveys to uncover new populations. If eDNA proves effective, it could provide a valuable tool for conservation biologists by improving monitoring efficiency and expanding the ability to track the distribution of this little-known amphibian.

How Does the Presence of Shade Influence the Development of Rudbeckia fulgida?

Poster #12 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Kayla Smith

Research Mentor(s): Mario Bretfeld

Orange coneflower (Rudbeckia fulgida) is a plant species native to northern Georgia grasslands that is threatened by habitat loss due to increased human land use. The species often co-occurs with royal catchfly (Silene regia) which has shown preference to growing in partial shade in Georgia. Gathering information on how the presence of shade influences the development of R. fulgida can support the protection of its habitats and inform its conservation across Georgia. We planted 30 plants at the KSU Field Station at various distances from a tree line that provides afternoon shade. From June 11 to July 22, 2025, we measured height of the tallest stem (cm), number of stems, ambient light conditions, stomata conductivity (Gsw), and the efficiency of photosystem II (PhiPSII) weekly. Our goals were to whether plants growing closer to the tree line (i.e., increased shading) exhibit more growth and altered physiology (Gsw and PhiPSII). Plants midway from the fence had an average final height of 76.9 ± 8.8 cm, representing a 13.35% and 22.67% increase compared to plants along and furthest from the fence. Plants adjacent to the fence had a mean stomata conductivity of 0.248 ± 0.02 mol m⁻² s⁻¹, delineating a 32.86% and 60.38% increase compared to plants midway and furthest from the fence. Plants along the fence had an average efficiency of photosystem II of 0.70 ± 0.09 , portraying a 35.29% and 91.67% increase compared to plants midway and furthest from the fence. Despite being a grassland species, our results suggest that R. fulgida benefits from partial shade, similar to S. regia. By collecting additional data of R. fulgida's shade tolerance, we can effectively manage its habitats and inform its conservation across Georgia.

Investigating Environmental Effects upon Alternative Reproductive Tactic Frequencies in an Urban Salamander

Poster #24 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Sanaa Harden, Martina Fields, & Sacred Luke

Research Mentor(s): Todd Pierson

*A major challenge in biology is understanding the mechanisms maintaining genetic and phenotypic variation. Genetically determined alternative reproductive tactics—discrete, intrasexual variation within populations—provide a unique opportunity to investigate this question. In Southern Two-lined Salamanders (*Eurycea cirrigera*), two male tactics are determined by a Y-linked genetic polymorphism and coexist in metro Atlanta: “searching” males have mental glands and cirri used in terrestrial courtship, while “guarding” males have enlarged jaws for mate-guarding in aquatic environments. As part of a Team Research course, we evaluated how spatial heterogeneity in environmental variables influences the frequencies of searching and guarding males. We collected environmental data from streams and tissue samples from larvae, extracted DNA, and used three qPCR assays to genotype samples from 26 streams across metro Atlanta. We then modeled how environmental variables (e.g., substrate type, stream size, microhabitat, and land cover) influence tactic frequency. We hope that our results provide insight about how urbanization influences the frequency of searching and guarding male *Eurycea* and, more broadly, how spatial heterogeneity supports the maintenance of genetic and phenotypic variation.*

Investigating Environmental Effects upon Alternative Reproductive Tactic Frequencies in an Urban Salamander

Poster #6 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Hailey Lupton, Emilee Cardwell, & Christian Smith

Research Mentor(s): Todd Pierson

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Investigating Environmental Effects upon Alternative Reproductive Tactic Frequencies in an Urban Salamander

Poster #26 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Aaliyah Reid, Nathan Corrigan, & Macy Hills

Research Mentor(s): Todd Pierson

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Investigating Environmental Effects upon Alternative Reproductive Tactic Frequencies in an Urban Salamander

Poster #20 (Event Center)

1:00 – 1:45pm

Undergraduate Student(s): Michelle Laury, Kaitlyn Stahl, Kamill Thompson, & Brandon Rovolis

Research Mentor(s): Todd Pierson

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PFAS in Insects: A Scoping Review

Poster #7 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Layne Buttram

Research Mentor(s): Andrew Haddow

Per- and polyfluoroalkyl substances (PFAS) are pervasive environmental contaminants with significant ecological and public health implications. This category of chemicals has been linked to endocrine disruption, immune suppression, and other deleterious effects. Insects are ecologically important indicators and contribute heavily to bioaccumulation of toxic compounds. PFAS contamination is ubiquitous in nature, and these substances are found in the breeding sites of many freshwater insects. This review provides an assessment of the current literature concerning the bioaccumulation and physiological effects of PFAS in insects. The scope of this review is limited to 9 PFAS ruled by the EPA as hazardous constituents.

Temporal Effects of Climate Change on Georgia Freshwater Parasite Diversity

Poster #3 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Christian Smith

Research Mentor(s): Whitney Preisser

The long-term effects of climate change on biodiversity are becoming increasingly relevant. There have been observations of declines in species richness and abundance across many taxa, from insects to fish to birds. However, there seems to be a lack of representation in the literature about how these temporal environmental dynamics affect parasite diversity, despite them being vital parts of ecosystems and indicative signs of ecological stress. With this study we examined how long-term climate change influences the diversity of freshwater parasites in Georgia. To analyze this, we paired parasite diversity data collected by our lab with long term temperature records, for which the preliminary data will be presented. By inspecting temporal patterns between parasite biodiversity and climate trends, this study aimed to identify potential correlations

between warming freshwater ecosystems and changes in parasite community diversity. In total we hope to seek to showcase how parasite diversity responds to climate changes and gauge the potential of parasites as signs of freshwater ecosystem health.

The Role of Temporal Heterogeneity in Shaping the Frequency of Searching and Guarding Male *Eurycea wilderae* Salamanders

Poster #7 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Alyssa Dance

Research Mentor(s): Todd Pierson

*Understanding how genetic and phenotypic variation are maintained across generations is a key goal in evolutionary biology. One possible mechanism is temporal heterogeneity, which includes changes ecosystems experience over time, such as weather and food availability. Another mechanism is negative frequency-dependent selection, where a trait becomes more beneficial when it is rare. Alternative reproductive tactics, different ways males of the same species reproduce, are traits influenced by these factors, and we can study them more closely by examining the frequency of each tactic in a population. Our research focuses on the population of Blue Ridge Two-lined Salamanders (*Eurycea wilderae*) in Highlands, North Carolina. This species exhibits two alternative reproductive tactics: searching and guarding males. Searching males look for mates in the forest on rainy nights, while guarding males stay in streams and “guard” mates. Previous research shows that the difference in phenotypes is genetic; a Y-linked genetic polymorphism determines whether a male is searching or guarding. For the past four years, we have collected data on the number of guarding and searching males by sampling salamander tail tips and extracting DNA. We then tested for a relationship between the amount of rainfall in the previous year and the percentage of each male type present in the current year’s population; we hypothesize that temporal heterogeneity impacts the fitness of each phenotype and thus the frequency of these genotypes among offspring. Because searching males seek mates on wet nights, we predict that increased rainfall during the mating season will lead to a higher frequency of searching male larvae the following year. This study will help us understand whether the genotypic frequency of each male changes over time, and which mechanisms influence the maintenance of genetic polymorphisms. The more research conducted on this topic, the better we understand how genotypic and phenotypic diversity are maintained.*

Understanding Bat Diets by Using Guano DNA to Analyze Insect Consumption

Poster #24 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Rylie Shultz

Graduate Student(s): Laura Henderson
Research Mentor(s): Thomas McElroy

Bats play an essential ecological role in insect control, pollinating, and dispersing seeds. In the United States alone, an estimated 53% are at moderate to very high risk of going extinct within the next 15 years. Bat guano is an easily accessible and non-intrusive source of Bat DNA as it contains undigested insects, the prey of over 70% of the bat population. By analyzing bat DNA through guano, we identify the insects that the bats are eating and monitor the partition of their resources. We did this through polymerase chain reaction, known as PCR, gel electrophoresis, and DNA barcoding. PCR was used to amplify a single DNA sequence into millions or billions of copies, which allowed us to analyze these previously tiny amounts of genetic material. Gel electrophoresis was then used by taking the amplified DNA fragments, inputting the DNA into an agarose gel, and then separating and visualizing them to be read to see if insect DNA was present. Next, we used DNA barcoding to determine our samples' insect order and species. The data indicates that bats' diets shift between species and seasons. With the increased endangerment of bats, non-invasive DNA collection and understanding of their dietary habits can be used in future conservation efforts. By understanding what insects' bats eat, we can identify important prey insects to ensure bats have access to necessary food sources and improve our conservation efforts to protect bats.

Mathematics

Lattice Paths and the Triangulations of an $n+3$ -gon

Poster #15 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Emma Hansen

Research Mentor(s): William Griffiths & Steven Edwards

The Delannoy numbers are a doubly-recursive sequence that enumerates many different mathematical objects. One of these objects is the number of 'Queen's Walks', the number of ways the Queen chess piece moves around the board. We study a generalized version of these numbers, which enumerates lattice paths similar to these chess moves. The Generalized Delannoy Numbers also enumerate certain regions found in a polygon with non-intersecting diagonals. Our methodology involves combinatorial enumeration and bijective analysis to compare these lattice paths with regions formed by non-intersecting diagonals in polygons. We investigated by visually constructing lattice paths and $n+3$ -gons. We used exploratory combinatorial reasoning, mainly through diagram representations, relabeling, and structural pattern recognition to be able to compare these paths with unique regions from the $n+3$ -gons. Our work denotes progress

in finding a direct relation between lattice paths and these regions. Through this process, we made progress in identifying a bijection between the Generalized Delannoy lattice paths and the triangular regions of an $n+3$ -gon. Each unique lattice path was able to directly correlate to one unique region of an $n+3$ -gon for each set of polygons where $n \geq 2$. These findings can help us better understand how recursive sequences can be scaled and the implications of doing so.

Numbers with Four Close Factorizations

Poster #18 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Laura Holmes, Michael Liu, & Jose Villarreal

Research Mentor(s): Tsz Chan

Consider $n = 99,990,000$, a number that has two close factorizations: $10,000 \cdot 9,999$ and $11,000 \cdot 9,090$. Generalizing this to k close factorizations, we have $n = AB = (A + a_1)(B - b_1) = (A + a_2)(B - b_2) = \dots = (A + a_{k-1})(B - b_{k-1})$ where $1 \leq B \leq A$ as well as $1 \leq a_1 < a_2 < \dots < a_{k-1} \leq C$ and $1 \leq b_1 < b_2 < \dots < b_{k-1} \leq C$. Here, C is our closeness measure. Our faculty mentor, Dr. Tsz Chan, previously studied numbers with three close factorizations and identified an optimal ratio $R_3 = A / C^3 \leq 0.25$. The scope of our project this summer was to expand on his work and study numbers with four close factorizations. The optimal closeness ratio here was calculated to be $R_4 = A / C^3 \leq (6 + \sqrt{6}) / 9(2 + \sqrt{6})^2 = 0.04742\dots$. Arriving at this ratio involved proving identities and inequalities, deducing intermediate lemmas, transforming our original question into a generalized Pell-type equation, determining which numbers should be entered into that equation, and eliminating cases that we knew would yield no solutions.

Molecular and Cellular Biology

Agrobacterium-Mediated Transformation with Chitinase and Glucanase genes Against Aspergillus flavus in Georgia Peanuts

Poster #15 (Event Center)

4:00pm – 4:45pm

Graduate Student(s): Saima Shafique

Research Mentor(s): Premila Achar

Aflatoxin contamination caused by Aspergillus flavus poses a major threat to global peanut (Arachis hypogaea) production and food safety. The development of genetically engineered

peanut varieties with enhanced fungal resistance provides a promising strategy for mitigating aflatoxin accumulation. This project focuses on development of transgenic peanut plants via *Agrobacterium*-mediated transformation using chitinase and β -1,3-glucanase genes, and quantification of aflatoxin B1 (AFB1). Peanut embryos of Georgia-12Y strain were co-cultivated with *A. tumefaciens* using binary vectors harboring the respective genes under the control of a constitutive promoter. Transformed embryos were cultured on Murashige and Skoog (MS) media containing 3mg/L of 2,4-D for callus induction, followed by shoot and root regeneration on media supplemented with 1mg/L Benzyladenine (BA) and 1mg/L Indole-3-Butyric Acid (IBA), respectively. Untreated samples served as control and experiments were done in replicates. Experimental set up was incubated at 28°C for 14 days. Selection was performed using 25mg/L kanamycin and 250mg/L cefotaxime to identify putative transformants and suppress bacterial overgrowth. Quantification of AFB1 will be done by LC-MS. So far, our results demonstrated successful callus induction and regeneration of shoots and roots that survived antibiotic selection, suggesting potential transgene integration. Confirmation of stable integration of the resistant genes by Polymerase Chain Reaction (PCR) and expression of these two proteins by Western Blot are in progress. Subsequently, quantification of AFB1 will indicate the extent of resistance conferred by these resistant genes. Our molecular and biochemical data will ultimately indicate the role of these PR proteins against *A. flavus* defense mechanisms. This research not only advances current understanding of host–pathogen interactions in peanuts but also contributes to the development of sustainable genetic strategies to reduce aflatoxin B1 contamination in peanut production in Georgia and other peanut growing states.

Decoding Early COVID-19 Responses Using Mathematical Modeling of Social Distancing Strategies Across Multiple Countries

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Undergraduate Student(s): Suki Lewis, Sri Gunturu, & Katelyn Nguyen

Research Mentor(s): Asma Azizi

During the early stages of the COVID-19 pandemic, before vaccines were available, countries implemented diverse combinations of social distancing (SD) measures, reflecting distinct cultural norms and levels of public acceptance. These variations produced different outcomes in controlling viral spread, offering valuable lessons for improving preparedness for future health crises. In this study, we conducted a reverse engineering analysis of early COVID-19 case data from five countries—India, Vietnam, Italy, Finland, and the United States—chosen to represent diverse sociocultural contexts and initial prevalence levels. Using mathematical modeling and data fitting, we inferred the proportions in which each nation applied three key SD interventions: face masking, quarantine, and isolation of infected individuals. We then applied an efficiency framework to compare their epidemiological impact and cost-effectiveness, integrating metrics for infection reduction and economic efficiency. Our results indicate that relying heavily on a single

SD measure is suboptimal; instead, a balanced combination of masking, quarantine, and isolation yields the highest joint epidemiological and economic benefits. This comparative analysis underscores that moderate, well-coordinated applications of multiple non-pharmaceutical interventions can maximize both infection control and resource efficiency—an insight critical for pandemic response planning.

Discovery and Characterization of Arsenic-Containing Ribosomally Synthesized and Post-Translationally Modified Peptides (AsRiPP): A Potential Novel Antimicrobial Peptide from Roseimarinus sediminis

Poster #18 (Event Center)

9:00am – 9:45am

Graduate Student(s): Kayla MacDonald

Research Mentor(s): Masafumi Yoshinaga & Mohammad Halim

Arsenic, a widely recognized environmental toxin, surprisingly shows promise in medicine. Antimicrobial resistance poses a global health crisis, highlighting the urgent need for new potent antimicrobials. Notably, bacteria leverage environmental arsenic to synthesize unique antibiotics, as represented by arsinothricin (AST), a recently identified arsenic-containing antibiotic. AST is effective against multiple pathogens while exhibiting low toxicity on human cell lines, demonstrating the potential of arsenic-based natural products as antimicrobials. This project aims to identify additional novel arsenic-containing antibiotics. AST biosynthesis involves two arsenic-biotransforming enzymes, ArsL and ArsM. arsL/arsM-guided genome mining identified several prospective biosynthetic gene clusters (BGCs) for new arsenic-containing antibiotics. Among them, this work focuses on the arsM-containing BGC from Roseimarinus sediminis. The BGC contains genes for a SPASM-domain radical S-adenosylmethionine (SAM) enzyme, which is often involved in biosynthesis of ribosomally synthesized and post-translationally modified peptides (RiPPs), along with a short gene that is predicted to be for a RiPP precursor peptide. Its most distinctive feature is the presence of arsM, encoding an arsenic SAM methyltransferase. It is therefore hypothesized that this cluster produces an arsenic-containing RiPP, named AsRiPP, where methylated arsenic species produced by ArsM is incorporated into the peptide during maturation. When R. sediminis was cultured with arsenite, an unknown arsenic species was produced. This compound, which was crudely purified through column chromatography, exhibited antibiotic activity, suggesting that R. sediminis produces a novel arsenic-containing antibiotic, presumably the AsRiPP. Further purification and analyses will be performed to identify the compound. In parallel, Escherichia coli strains expressing the precursor peptide gene solely or co-expressing it with the other AsRiPP gene(s) were constructed, and some of the gene expression was successfully confirmed. These constructs are being analyzed to elucidate the biosynthetic pathway and verify the association between the AsRiPP BGC and the bioactive arsenic compound produced by R. sediminis.

Discovery and Characterization of Arsenic-Containing RiPPs: A Novel Antibiotic Family Against Multidrug Resistance

Poster #22 (Event Center)

11:00am – 11:45am

Graduate Student(s): Md Tanjil Islam Shovon

Undergraduate Student(s): Shifa Jiwani

Research Mentor(s): Masafumi Yoshinaga & Mohammad Halim

*Alarming rise of antimicrobial resistance threatens global public health, calling for discovery of new antibiotics with novel chemical scaffolds and mechanisms of action. Although arsenic is traditionally viewed as a toxic compound, history demonstrates its therapeutic potential—from its use in traditional Chinese medicine, to Paul Ehrlich's Salvarsan for syphilis, and, more recently, the arsenic trioxide in leukemia treatment. Arsinothricin (AST), recently discovered organoarsenical antibiotic, exhibits potent antimicrobial activity against various pathogenic bacteria and even protozoan parasites with minimal cytotoxicity, further highlighting promises of arsenic-based compounds as antimicrobials. Our objective is to build on this foundation and discover further arsenic-containing antibiotics. To this end, genome mining was employed using the AST biosynthetic gene *arsM* as a molecular probe, and a novel biosynthetic gene cluster (BGC) were identified in *Microbispora rosea* strain. In addition to *arsM*, the BGC contains a gene for SPASM domain radical S-adenosyl methionine (rSAM) enzyme, which is often involved in biosynthesis of ribosomally synthesized and post-translationally modified peptides (RiPPs), along with a putative gene for a precursor peptide. RiPPs are known for diverse bioactivities, including antimicrobial activity. The gene composition, therefore, strongly suggests that the BGC encodes a RiPP that uniquely contains methylated arsenical, and we name the prospective product an arsenic-containing RiPP (AsRiPP). When cultured with arsenite, *M. rosea* produced an organic arsenic species. The organic arsenic species crudely purified from a large culture exhibited antibiotic activity, supporting our hypothesis that the strain produces an arsenic-containing antibiotic, presumably the AsRiPP. In parallel, *Escherichia coli* cells expressing genes from the *M. rosea* BGC, either solely or in various combinations, were constructed. These constructs are being used to elucidate AsRiPP biosynthetic pathway. These approaches will be continued to clarify the association of the AsRiPP's BGCs and the discovered organic arsenic species.*

Discovery of a New Arsenic-Containing Antibiotic: A Derivative of Arsinothricin (AST)

Poster #19 (Event Center)

10:00am – 10:45am

Graduate Student(s): Rajia Sultana

Research Mentor(s): Masafumi Yoshinaga & Mohammad Halim

The rapid emergence and spread of antimicrobial resistance (AMR) present a critical public health challenge, highlighting the urgent need for novel antimicrobial agents. Arsenic, despite its toxicity, has a long history in medicine, from traditional Chinese remedies and Paul Ehrlich's Salvarsan for syphilis to modern arsenic trioxide therapy for leukemia. A notable example is arsinothricin (AST), an arsenic-containing non-proteinogenic glutamate analog produced by Burkholderia gladioli. AST inhibits the growth of various pathogens while sparing human cells, further demonstrating the therapeutic potential of arsenic. Building on AST as a model, we aimed to discover additional novel arsenic-containing antibiotics. AST is biosynthesized via two steps catalyzed by two S-adenosylmethionine (SAM)-dependent enzymes ArsL and ArsM. arsl-guided genome mining revealed that various bacterial species possess arslM-containing biosynthetic gene clusters (BGCs) with gene compositions distinct from the AST BGC. Among them, this study focuses on BGCs from Alicyclobacillus acidocaldarius and Deinococcus misasensis, both of which commonly contain two additional genes, ars1 and ars2, annotated to encode 4-carboxymuconolactone decarboxylase and biotin carboxylase, respectively. We hypothesize that Ars1 decarboxylates AST while Ars2 carboxylates its amino group, producing an arsenic mimetic of the phosphonate antibiotic fosmidomycin (FMS), provisionally termed methylarsmidomycin (MeASM). Liquid chromatography–inductively coupled plasma mass spectrometry (LC–ICP–MS) analysis showed that, when cultured with As (III), A. acidocaldarius and D. misasensis produce unknown arsenic species in addition to AST, supporting the hypothesis that MeASM is generated via AST derivatization. The unknown species will be purified for chemical characterization and antimicrobial assessment. In parallel, Escherichia coli cells expressing the MeASM structural genes, individually or in combinations, are being constructed to elucidate the MeASM biosynthetic pathway. This study connects a pressing clinical problem to genome-guided discovery, advancing our understanding of arsenic-based natural products and providing a foundation for developing novel therapeutics against AMR.

Glutamate Receptor Modulation by Polysialic Acid in Hippocampal Synaptic Plasticity and Cognitive Function

Poster #2 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Allisa George

Research Mentor(s): Vishnu Suppiramaniam, Erica Holliday, & Kawsar Chowdhury

Glutamate receptors serve as key mediators of excitatory neurotransmission and are fundamental to synaptic plasticity, the cellular basis of learning and memory. Among them, α -amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid (AMPA) receptors drive fast synaptic transmission, while N-methyl-D-aspartate (NMDA) receptors are critical for activity-dependent synaptic strengthening. The neural cell adhesion molecule (NCAM), a transmembrane glycoprotein, regulates neurite extension, cell migration, and synapse formation. Its polysialylated form, containing polysialic acid (PSA), a negatively charged carbohydrate polymer, plays a vital role in modulating cell-cell interactions and synaptic signaling. Although PSA has been implicated in the regulation of glutamatergic neurotransmission, its specific influence on hippocampal long-term potentiation (LTP) and long-term depression (LTD), the major electrophysiological correlates of learning and memory, remains insufficiently defined. In this study, we investigated the concentration-dependent effects of PSA on hippocampal synaptic plasticity. We conducted electrophysiological recordings from hippocampal slices of Sprague-Dawley rats to explore how different concentrations of PSA influence LTP and LTD. Our findings reveal that PSA markedly modulates both LTP and LTD by influencing AMPA and NMDA receptor-mediated transmission, underscoring its pivotal role in shaping synaptic strength. These results identify PSA as a crucial regulator of neuronal plasticity, highlighting its therapeutic potential for enhancing cognitive processes. By studying the molecular mechanisms of learning and memory, PSA emerges as a promising target for treating cognitive dysfunction.

Identification and Characterization of Novel Arsenic-Containing Antibiotics

Poster #12 (Event Center)

4:00pm – 4:45pm

Graduate Student(s): Minh Bao Phung

Research Mentor(s): Masafumi Yoshinaga & Mohammad Halim

*The rise of antimicrobial resistance calls for new and effective antibiotics. Recently, arsinothricin (AST), a novel broad-spectrum arsenic-containing antibiotic, was discovered. AST is a nonproteinogenic analogue of glutamate that is biosynthesized via two steps catalyzed by ArsL and ArsM, unlike its phosphorus mimetic, phosphinothricin, which requires over 20 steps. In light of the effectiveness and high selective toxicity of AST, the aim of this project is finding further novel arsenic-containing antibiotics. arsL-guided genome-mining found that many bacteria have arsL-containing biosynthetic gene clusters (BGCs). Their gene compositions are different from the AST BGC, suggesting the potential to produce novel arsenic-containing antibiotics. The BGCs from *Anoxybacillus calidus* contains two novel genes alongside arsL, named ars1 and ars2, which are annotated to encode 4-carboxymuconolactone decarboxylase and biotin carboxylase, respectively. Given that ArsL converts arsenite [As(III)] to hydroxy AST (AST-OH), the non-methylated AST precursor, it is reasonable to predict that Ars1 decarboxylates AST-OH while Ars2 carboxylates the amino group of the decarboxylated*

intermediate, leading to the production of an arsenic mimetic of the phosphonate antibiotic fosmidomycin (FM). Thus, the predicted organoarsenical is named arsmidmycin (ASM). A. calidus was found to convert As(III) to multiple arsenic species. The detected arsenic species were crudely purified by size exclusion and cation exchange column chromatography. A series of preliminary experiments demonstrate that 1) the mass of the major arsenic species matches the predicted mass of ASM, and 2) the crudely purified major arsenic species exhibits moderate antibiotic activity, supporting our hypothesis. In parallel, ASM biosynthesis is also being investigated using Escherichia coli heterogeneous expression system, where arsL, ars1 and/or ars2 will be solely expressed or co-expressed. Each construct will be cultured with As(III) and the produced arsenic species will be analyzed to not only complement our hypothesis but also elucidate the ASM biosynthetic pathway.

Molecular Visualization Laboratory (BIOL4450): It's Getting Worm In Here, My AcPMT-2 Needs Fixing

Poster #1 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Benjamin Nguyen, Ayana Ramsey, Joshua Owens, Paul Bussler, & Armon Khoshneviszadeh

Research Mentor(s): Soon Goo Lee

Parasitic nematodes pose a significant threat to global human health and agriculture, infecting more than three billion people and costing nations billions of dollars each year. These parasites, such as Necator americanus and Ancylostoma ceylanicum, inflict high rates of mortality and child impairment. Despite its widespread impact on humans, mammals, and agriculture, current treatment is very limited, and resistance to existing drugs continues to rise. The focus of this study in Team Research (BIOL4450) in Fall 2025 is to determine if an enzyme critical in phosphatidylcholine biosynthesis, Phosphoethanolamine N-methyltransferase-2 (PMT-2) specifically in A. ceylanicum, can be structurally and functionally characterized to determine its efficacy as a selective drug target for treating parasitic nematode infections. To combat this drug resistance, research has discovered that these parasites depend on a unique pathway for phosphatidylcholine biosynthesis that is distinct from that of mammals. To test this, we have used site-directed mutagenesis to substitute a single specific amino acid within the enzyme from A. ceylanicum to assess the resulting structural and functional effects. Our goal is to characterize the structure and mechanism of AC-PMT-2 using X-ray crystallography and protein structure analysis through Synchrotron X-ray facilities. To visualize and understand 3-D structure, we will utilize VR and AR tools, PyMOL, and Protein Data Bank (PDB). We expect to find that after changing a single amino acid, the enzyme's ability to catalyze the reaction due to the amino acid playing a key part in the active site will be altered permanently. If we discover findings that support PMT as being a promising therapeutic target, we can impair phosphatidylcholine

biosynthesis in nematodes without disrupting the host's metabolic pathways. This research looks to advance current antiparasitic drug development by determining if AC-PMT-2 is a suitable target for inhibition; opening a new field for potential drug development.

Molecular Visualization Laboratory (BIOL4450): Structural Analysis of Phosphoethanolamine N-methyltransferase from Human Parasite in Augmented and Virtual Reality

Poster #9 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Kareigh Gammon, Luke Hudek, Marylene Ellis, Radhika Gandhi, & Hieu Le

Research Mentor(s): Soon Goo Lee

*Around 24% of the world's population is infected with parasitic nematodes. Parasitic infections in domestic animals cause harm to human well-being, creating economic and agricultural losses. One key human parasite is *Necator americanus*, commonly known as a hookworm. Treatment for *N. americanus* and other parasites includes mebendazole, albendazole, and Pyrantel pamoate. However, the more these drugs are used, the more likely the parasite will develop resistance to them. Therefore, finding ways to treat these parasites is important. Phosphoethanolamine N-methyltransferase (PMT) is an enzyme responsible for phosphocholine biosynthesis and is crucial for cell membrane function. Without it, the cell will execute apoptosis. The purpose of this study in Team Research (BIOL4450) in Fall 2025 is to investigate the structure and function of the *N. americanus* phosphoethanolamine N-methyltransferase-2 (NaPMT-2) enzyme by introducing point mutations. This research strives to better understand the significance of the phosphatidylcholine biosynthesis pathway, which is vital for parasitic nematode survival, as PMT methylates phosphoethanolamine to phosphocholine. With recent developments in Virtual Reality (VR) and Augmented Reality (AR), we can comprehend, develop, and examine the three-dimensional structure of NaPMT-2, apply this knowledge in both real-world and laboratory-based experiments, and understand the fundamental principles and concepts of protein biochemistry using site-directed mutagenesis, X-ray crystallography, and Synchrotron X-ray facilities to determine 3-D protein structures at the atomic level. Protein structures and functions were obtained from the Protein Data Bank and studied using molecular visualization software such as PyMOL. Then, the obtained 3-D structure of NaPMT-2 will be imported to VR for an in-depth analysis. The expected outcome of this lab is the successful integration of the mutations into NaPMT-2. Examining mutations will assist in the structure-function analysis of PMT enzymes in parasitic nematodes, thereby helping to develop selective drug targets for anthelmintics.*

Non-Foliar Stomatal Function in Glycine max

Poster #16 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Mariah Whitley

Research Mentor(s): Tracy Lawson

Understanding how non-foliar tissues contribute to plant gas exchange can reveal hidden opportunities for improving water-use efficiency in crops. This study investigated the presence and function of stomata on foliar and non-foliar tissue, specifically leaf and pods, of Glycine max (soybean). The purpose was to determine whether pod stomata are structurally present, physiologically-active, and if they influence overall water loss and photosynthetic capacity in comparison to leaf stomata. This would be achieved by comparing wild-type soybean plants with variant soybean EPF2 plants, in which the epidermal patterning factor 2 gene results in the over-production of stomata. Microscopy was used to characterize stomatal density and size on both the leaf (adaxial and abaxial) and pod surfaces in wild-type and EPF2 over-expressing soybeans. Stomatal conductance (g_s), chlorophyll fluorescence (Φ_{PSII}), and gas exchange were measured with LI-600 and LI-6400 systems under well-watered and droughted conditions. Our study demonstrated that pods contained fewer but larger stomata than leaves, with abaxial leaf surfaces possessing the highest amount of stomata, in comparison to adaxial leaf surfaces and pod surfaces. Pod stomata were functionally active, with conductance and CO_2 assimilation increasing with light intensity. Droughted tissues showed lower g_s and higher temperatures, reflecting reduced cooling and photosynthetic efficiency. Pod gas exchange showed a negative assimilation rate, but positive stomatal conductance. Thus, pods were found to be respirating more than photosynthesizing, which could impact crop yield. Further studies of variants that produce less pods and examination of water conservation could provide more insight into crop yield potential.

Sigma-1 Receptor Mediated Modulation of Glutamate Receptors Enhances NMDA Channel Activity and Memory Processes

Poster #3 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Hunter Smith

Research Mentor(s): Vishnu Suppiramaniam

Glutamate receptors are key mediators of excitatory neurotransmission and are essential for synaptic plasticity, the cellular foundation of learning and memory. Among these, AMPA receptors mediate rapid excitatory signaling, whereas NMDA receptors are critical for synaptic strengthening and long-term plasticity. Precise regulation of NMDA receptor (NMDAR) function is vital for maintaining neuronal communication and cognitive stability. The sigma-1 receptor ($\sigma 1R$), an endoplasmic reticulum chaperone localized at mitochondria-associated membranes, has been shown to influence glutamatergic transmission and cognitive processes. Activation of $\sigma 1R$ enhances glutamate release and promotes long-term potentiation (LTP)—a

key cellular correlate of memory formation—in hippocampal neurons, thereby supporting the molecular mechanisms of learning and memory. However, the direct impact of σ 1R on NMDAR channel activity remains incompletely understood. We hypothesize that σ 1R acts as a positive modulator of NMDAR function, enhancing receptor-mediated synaptic signaling and contributing to memory processes. To test this, electrophysiological recordings were conducted on hippocampal synaptosomes to characterize NMDAR channel dynamics following σ 1R activation. Treatment with a σ 1R agonist significantly increased both the mean open probability and conductance of NMDAR channels, indicating potentiation of receptor activity. This enhancement correlates with improved synaptic plasticity and cognitive performance. Collectively, these findings identify σ 1R as a critical modulator linking glutamatergic neurotransmission with memory formation and suggest that σ 1R activation represents a promising therapeutic strategy for mitigating cognitive decline and neurodegenerative disorders.

Synergistic Effect of Clove & Cinnamon against Aspergillus flavus in Georgia peanuts

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

12:00pm – 12:50pm

Undergraduate Student(s): Alaina McClelland & Ari Schwartz

Research Mentor(s): Premila Achar

Aspergillus Flavus is a common fungal contaminant in peanuts, producing aflatoxin B1 (AFB1), a potent class 1 carcinogen. Current control methods rely on synthetic fungicides, which pose health and environmental risks. This study evaluated the antifungal efficacy of clove and cinnamon essential oils (EOs), individually and in synergy, against A. flavus and AFB1 production in Georgia peanuts. Peanuts were surface-disinfected, inoculated with A. flavus spores, and treated with cinnamon, clove, or a combined EO blend (250-2000 ppm). Samples were incubated, and AFB1 was extracted and quantified via HPLC-MS. AFB1 levels decreased with higher EO concentrations across all treatments. The synergistic blend showed the strongest inhibition, reducing AFB1 to 1.11E+04 at 2000 ppm, compared to 2.86E+04 (cinnamon), 3.16E+04 (clove), and 5.44E+04 (control). The blend reduced AFB1 by 30% from 250 to 2000 ppm, highlighting enhanced efficacy at higher doses. These findings support the synergistic use of GRAS-status EOs as effective, natural alternatives to synthetic fungicides for controlling aflatoxin contamination in peanuts.

The ADHD Associated Gene *ceh-27/Nkx2.1* is Required for Normal Pharyngeal Development and Pharyngeal Motor Neuron Fate Specification in *Caenorhabditis Elegans*

Poster #5 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Kihaan Patel & Essix Moser

Research Mentor(s): Martin Hudson

*Attention Deficit Hyperactivity Disorder (ADHD) affects roughly 250 million people worldwide. Evidence of a genetic component to ADHD comes from heterozygous mutations in the transcription factor Nkx2.1, which are linked to the development of benign hereditary chorea, which also presents as ADHD in adults. Nkx2.1 codes for a homeobox transcription factor, which plays a critical role in regulating gene expression by binding to specific DNA sequences and controlling the transcription of target genes. Understanding the gene regulatory environment around Nkx2.1 is critical for characterizing its downstream effects on neural development and can help identify other genes that contribute to ADHD. Nkx2.1 is highly conserved across phyla, allowing the use of model organisms to better understand Nkx2.1 function. The nematode *Caenorhabditis elegans* can be used to study Nkx2.1 through its orthologous homeobox gene *ceh-27*. *C. elegans* has an invariant cell lineage, well defined nervous system, and fully mapped genome which makes it ideal for characterizing the role of *ceh-27*. We used timelapse video microscopy, along with genetically encoded pharyngeal neuron and muscle specific marker genes, to observe pharyngeal organogenesis and development of the M4 pharyngeal motor neuron in wildtype and *ceh-27* null mutant embryos. Pharyngeal elongation is defective in *ceh-27* mutants, suggesting that *ceh-27* is required for normal pharyngeal organogenesis. Additionally, *ceh-27* mutants lack the M4 motorneuron, indicating that *ceh-27* may be required to specify components of the pharyngeal neuromuscular circuit. Together, our findings indicate a significant role in *ceh-27*/Nkx2.1 in nervous system and organ development.*

Understanding the Role of hllh-14 and ceh-27 in the M4 Motor Neuron in C. elegans

Poster #20 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Roshni Patel

Research Mentor(s): Martin Hudson

*Attention Deficit Hyperactivity Disorder (ADHD) affects millions worldwide and can shape social interactions, health factors, and overall quality of life. The genetic mechanisms underlying ADHD, however, are not well defined. One gene linked to ADHD, Nkx2.1, plays a key role in neuronal differentiation across mammals. Because these transcriptional networks are deeply conserved, studying Nkx2.1's ortholog, *ceh-27*, in *C. elegans* allows these mechanisms to be examined in a simpler, well-mapped nervous system. The worm's invariant cell lineage and genetic accessibility make it an ideal model for discovering conserved neurodevelopmental pathways. This study investigates the regulatory relationship between *ceh-27* and *hllh-14*, a basic helix-loop-helix transcription factor that promotes early neurogenesis, in the M4 motor neuron. Using *C. elegans* strains expressing *hllh-14::GFP*, fluorescence microscopy will compare *hllh-14* expression in wild-type and *ceh-27* mutant embryos. Spatial and intensity analyses will*

*determine whether *ceh-27* represses or activates *hlh-14* during M4 specification. By defining how *ceh-27* interacts with *hlh-14* in a single, invariant neuron (M4), this research will provide more insight into the transcriptional hierarchies that govern neuronal identity in *C. elegans* and conserved mechanisms relevant to neurodevelopmental disorders.*

Physics

NdGaGe: Magnetic and Electrical Properties of a Rare-Earth Compound

Poster #25 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Tobias Beyer & Lucas Ruth

Research Mentor(s): Chetan Dhital

In my poster, I will discuss the growth and characterization of single crystals of NdGaGe prepared using a high-temperature flux method. I measured the magnetization and electrical resistivity of the crystals to study how the magnetic moments of neodymium atoms interact at low temperatures. The results show a close link between magnetic ordering and electrical behavior. This study helps us understand how magnetism and conductivity are connected in rare-earth materials and provides insights for designing new functional magnetic compounds.

PrGaSi: Crystal Growth and Property Measurements

Poster #10 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Lucas Ruth & Tobias Beyer

Research Mentor(s): Chetan Dhital

In my poster, I will discuss the preparation and study of single crystals of PrGaSi grown using a molten-metal flux technique. I measured their magnetization and electrical resistivity to explore how praseodymium atoms influence the material's properties. The data reveal temperature-dependent changes that highlight the relationship between atomic structure, magnetism, and electrical conduction. This research improves our understanding of rare-earth compounds and their potential use in future electronic and magnetic applications.

Geer College of the Arts

Dance

La Bayadere: An Examination of the Romantic Era in the Modern Day

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

2:00pm – 2:50pm

Undergraduate Student(s): Charlene Font

Research Mentor(s): Autumn Eckman & Kristopher Pourzal

The Romantic Era of art saw a shift from male to female dancers on stage. The female dancer became associated with mysticism and fantasy for the benefit of the male audience. With the onset of mysticism, came the idealization of death which was a common theme in many Romantic Ballets. The ballet, La Bayadère, is a Romantic Era ballet that has been adapted multiple times within the past half-century. However, in an effort to preserve its relevance to the modern-day audience, three ballerinas - Marianela Nuñez, Natalia Osipova, and Tamara Rojo - have altered the original choreography to present the main character, Nikiya, in a more complex light and defy Romantic ideals. Nuñez empowers the female dancer that was previously disempowered and left an object for male fantasy, Osipova breaks the idealistic illusion that life should end gracefully, and Rojo halts the worship of nature and encourages internal examination of the audience.

Music

Creating in Community: A Collaborative Performance Study Utilizing Modern Compositions by Greek Composers

In-Person Performance (Wilson Student Center, Ballrooms)

2:00pm – 2:50pm

Undergraduate Student(s): Brandon Hall

Research Mentor(s): Stephen Wadsack

The genre of contemporary Greek art music is significantly underrepresented and unknown to many individuals globally. This research and creative activity focused on the study, preparation, and public performance of previously unheard Greek works for trumpet (the researchers' primary instrument), which included field research on the island of Corfu, Greece. Research methods included study of primary manuscript sources and consultation with living Greek composers, supervised by the Primary Investigator. The outcome of this research included peer-reviewed

performances of these works in Corfu, Greece, and a subsequent performance is planned in Kennesaw, Georgia, which will be the US premiere of these works.

Theatre and Performance Studies

Latinx Immigrants Working in the Carpet Capital of the World

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

2:00pm – 2:50pm

Undergraduate Student(s): Jane Ramirez

Research Mentor(s): Porntip Twishime

In the 1950s, Dalton, Georgia, a small town in the Appalachian Valley of northwest Georgia, became a global leader in textile manufacturing, earning the title of “The Carpet Capital of the World.” The rapid expansion of the carpet industry created many job opportunities, which spurred an influx of migration from Latin America to Dalton in the 1980s that continues to the present day. Ariel Ramos is one such person who migrated from Acambaro, Mexico, in the 1980s during the first wave of Latinx migration to Dalton. This project is an oral history interview with Mr. Ramos, who shares his story and offers a first-hand account of the growth of the Latinx community in Dalton, a relatively new and understudied population. Mr. Ramos’s story highlights the lives of Latinx workers in the Carpet Capital of the World and the pivotal importance of their labor to the local and global carpet industries. This project builds upon the Crown Cotton Mills oral history interviews conducted in Dalton from the 1920s-1960s about the town’s cotton industry by documenting the shift in Dalton’s labor industries from cotton to carpet and its changing demographics. This oral history project also documents Mr. Ramos’s personal experience living and working as a Latinx immigrant in Dalton, Georgia, which provides a model for further primary source research on this subject.

Southern Polytechnic College of Engineering & Engineering Technology

Electrical and Computer Engineering

Adaptive Electronically Steered Array for Remote Real-Time Water Quality Monitoring

Poster #25 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): William Claypool, Tyler Nagy, Akash Bharati, David Slinkard, Emily Therrell, & Junia Nguyen

Research Mentor(s): Hoseon Lee

This research project presents the design and simulation of a 1×2 microstrip patch antenna array featuring adaptive polarization and beam-steering capabilities. The antenna system is designed to receive continuous, real-time water quality data from bacteria monitoring devices deployed in a body of water. Polarization control is enabled using a 6-bit digital attenuator and a phase shifter, while beam-steering capability is provided by phase shifters in the antenna feed system. Since each water quality monitor is not necessarily centered in the antenna's physical field of view, electronic beam-steering enhances the desired signals coming from the direction of a monitoring site while suppressing noise and interference from other directions. Electronic beam-steering also means that the system is not reliant on any mechanical systems to rotate the antenna in a desired direction for better signal reception. The phase shift values for the desired beam-steering directions are calculated using a MATLAB algorithm. A link between MATLAB and CST Microwave Studio has been established, allowing automated data exchange and simulation control. The antenna, designed as an array of multiple elements, provides higher gain than current single-element LoRa gateways, enabling it to receive weaker signals that may be attenuated by adverse weather, terrain, or long distances. This setup demonstrates the feasibility of integrating algorithmic control with antenna systems.

A Low-Cost Light Beam Induced Current (LBIC) Measurement Apparatus

Poster #12 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Pavan Kannan, Kamran Paracha, & Kevin Kellner

Research Mentor(s): Sandip Das

In an era of escalating climate change and growing energy demands, solar photovoltaics has emerged as a critical technology in the production of clean and sustainable energy. Solar photovoltaic cells allow us to convert sunlight directly into renewable electricity. A key

challenge in realizing high efficiency and reliable solar power plants is to identify the presence of microscopic defects in solar cells which can reduce cells' power output and limit their efficiency. Our project aims to design and develop a low-cost Light Beam Induced Current (LBIC) system to characterize and analyze photovoltaic cells using lasers to identify defective cells. Our LBIC apparatus comprises of a two-axis (X-Y) motion control platform with integrated stepper motors and linear guide rails attached to a cubic mechanical frame fabricated using aluminum extruders. Two NEMA11 stepper motors driven by TMC2209 motor driver modules were used for precision step control through micro-stepping. The core electronic components of our LBIC apparatus include motion control, low-current measurement, and a communication subsystem. An Arduino microcontroller is used to generate digital signals to control the stepper motors' speed and directions. A Tkinter-based graphical user interface (GUI) was created in Python to provide users with real time control and interaction with the instrument. The GUI communicates with the microcontroller through USB serial interface, allowing experiment control, and data acquisition. The LBIC apparatus employs a 532 nm green diode laser for raster scanning of a test solar cell, to map the spatial variations in photocurrent generation. Our LBIC apparatus model was designed in SolidWorks, and it uses low-cost components with an easy-to-build modular approach. Our designed LBIC system promises to lower the cost barrier to advanced solar cell characterization in academic research and education.

AR-fNIRS: Integrating a Functional Near-Infrared Sensing Module with Augmented Reality Glasses for Brain-State-Aware Interfaces

Poster #23 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Sam Kellam

Research Mentor(s): Paul Lee

Functional near-infrared spectroscopy (fNIRS) has gained increasing attention in biomedical research as a non-invasive tool for monitoring changes in blood oxygenation, particularly in the brain. Applications range from assessing stroke risk to identifying regions that may benefit from targeted cognitive training. More recently, fNIRS has also been explored in combination with augmented reality (AR) and brain-computer interfaces (BCIs), enabling systems that adapt to the user's cognitive or attentional state. In prior studies, researchers have primarily used electroencephalography (EEG), which measures the electrical changes in the brain, to predict user intention. Unfortunately, EEG signals are often prone to high fluctuation in frequency, reducing their reliability when used as a measuring device for a BCI. To address this limitation, our study proposes the use of an fNIRS attachment for AR glasses designed to detect user intention more accurately through changes in cerebral blood oxygenation. The system will employ a single-channel, as opposed to the multi-channel systems that have traditionally been used, to reduce size and increase accuracy. Our goal is to use this setup to create a fully functional BCI capable of transmitting the fNIRS data to an AR interface for controlling virtual

environments. By demonstrating that fNIRS can reliably detect user intention in real time, this project lays the groundwork for next-generation brain-aware AR systems. Such systems could enhance training, education, and accessibility by allowing interfaces to respond directly to the user's cognitive goals.

A Wearable Multimodal Sensing System for Classification of Mental and Physical Stress States

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

9:00am – 9:50am

Graduate Student(s): Fariha Alam

Research Mentor(s): Razvan Voicu

Stress is a physiological and psychological state that occurs when the body responds to internal or external stimuli. It can be broadly categorized into mental stress, which arises from cognitive pressure, and physical stress, which stems from bodily exertion or environmental factors. Both forms of stress affect multiple biological systems and can influence long-term health outcomes if not properly managed. This raises the central research question of how mental and physical stress, given their different effects, can be reliably classified to support improved health monitoring, early intervention, and personalized well-being optimization. To address this, a wrist-worn multimodal sensing system is presented that integrates non-invasive sensors such as photoplethysmography (PPG), accelerometer, skin temperature sensor, electromyography (EMG), and electrodermal activity (EDA) within a sensor fusion framework. The fusion algorithm processes these heterogeneous signals through pre-processing, feature extraction, and pattern recognition to identify stress-related physiological changes. It combines synchronized features from both time and frequency domains, providing a more comprehensive representation of stress responses than single-mode sensing. The system operates through continuous monitoring and feature-level fusion, followed by classification into four discrete states, including physical stress, mental stress, combined stress, and no-stress conditions. The proposed model enhances discrimination accuracy and adaptability across varying conditions. Experimental evaluations conducted under controlled physical and mental stress conditions demonstrate its effectiveness in differentiating two stress types and intensity levels. Unlike existing research and commercial-grade devices that employ multimodal sensing mainly for general stress detection by excluding some daily activities to simplify system and maintain generalization, this system introduces a classification-centered framework. The novel approach is optimized for faster and continuous operation, supporting real-time stress assessment in dynamic and everyday environments. This advancement represents a step toward wearable systems, capable of delivering personalized, context-aware, and continuous stress monitoring for proactive health and wellness applications.

Exploring the Silicon Anode in Solid-state Batteries using COMSOL simulation

Poster #1 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Camden Keller, Lily Liu, & Julian Jahde

Research Mentor(s): Beibei Jiang

Nanostructured silicon is a promising alternative to graphite for lithium-ion battery anodes due to its high specific capacity. When integrated with solid-state electrolytes, silicon-based all-solid-state batteries (ASSBs) offer the potential for higher energy density, greater power output, and improved safety. However, the large volume changes associated with the silicon–lithium alloying process can compromise structural integrity and cycling stability. Past research has shown that volumetric expansion can be limited when nanostructured silicon is used as anode. To investigate the size-dependent behavior of silicon anodes, we developed a COMSOL simulation platform for ASSBs incorporating nanostructured silicon particles ranging from 10 nm to 1 μ m. The COMSOL model predicts both electrochemical performance and mechanical performance of the battery, providing insights that will guide experimental validation of the particle size effects on silicon anode performance.

Foreign Object Debris Detection in UAS Based Thermal and RGB Images using AI Assisted Models

Poster #21 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Caleb Caldwell

Graduate Student(s): Owais Ahmed

Research Mentor(s): Adeel Khalid

Foreign Object Debris (FOD) is a major concern for aircraft operations. FOD present on an airplane runway can pose a special hazard. FOD presents many dangers because it can cause harm to an airplane. Damages and delays caused by FOD cost the aerospace industry billions of dollars every year . Lots of research has been done on effective ways to identify and locate FOD so it can be removed. This research aims to introduce a new facet of FOD detection using thermal imaging. In this work, we present the use of thermal imaging sensors mounted on Unmanned Aerial Systems (UAS) to quickly identify FOD. Thermal imaging and the You Only Look Once (YOLO) Artificial Intelligence (AI) based object detector are developed and utilized. To train the AI model, raw images are captured. Then these images are manually annotated, to identify visible FOD. The annotated images are used to train and build a custom YOLO model. We then comprehensively tested the pre-defined and custom-built YOLO models to compare the accuracy and speed of FOD detection between image types, as well as the model efficacy. Initial results

suggest that thermal imaging in general was more effective for most types of debris compared to RGB imaging. Custom built YOLO models were also found more accurate than the previously existing canned models. Future work in this field will focus on monitoring different variables, such as environmental factors like time of day and temperature. More tests will also be run to implement this architecture in real time to better test the system in an airport setting.

Graphene-based Tactile Sensors on Flexible Polymer Substrates

Poster #3 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Brandon Singleton, Mose Williams, & Juan Zepeda Maldonado

Graduate Student(s): Teja Venkata Sai Naveen Vuddagiri

Research Mentor(s): Sandip Das

Graphene has emerged as a promising material for various types of sensor applications. In this project, we have fabricated and characterized laser-induced graphene (LIG)-based flexible tactile sensors suitable for human-computer interface (HCI) applications. Polyimide was selected as the substrate and a 450 nm near-UV diode laser was used to directly create electrode patterns on the substrate. Under strong laser irradiation, the photothermal effect breaks the bonds in polyimide and allows them to reorganize into sp^2 -bonded graphene sheets, thus forming multi-layered graphene on the Polyimide surface. Laser parameters were varied including the laser power level, resolution, and depth. Raman spectroscopy was used to identify the graphene peaks, optical microscopy was performed to inspect uniformity and surface textures, and 4-point probe resistivity measurements were carried out to characterize the electrical conductivity of the fabricated graphene samples. By analyzing the electrical and structural properties, the optimal laser settings that yielded the best quality graphene was identified. An innovative spider-web like graphene electrode pattern was fabricated to evaluate its tactile sensing performance. The fabricated graphene electrodes were then interfaced with an ESP32 microcontroller through a capacitive touch sensor chip for tactile sensing measurements. The fabricated graphene touch sensors maintained stable capacitance changes with consistent touch and release detection. Following, we have interfaced multiple of these graphene sensors to a computer through the ESP32 microcontroller which provided inputs to the computer reliably and reproducibly, thus validating their suitability for human-computer interfacing (HCI) applications. Integration of these electrodes on a glove to create a smart glove for HCI is currently under investigation.

Hardware and Software Platforms for Performance Assessment of Wireless Wearable Health Monitoring Sensors

Poster #15 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Kevin Kellner & Shlok Sohoni
Research Mentor(s): Sandip Das

The growing demand for continuous and unobtrusive physiological monitoring has accelerated research in self-powered wireless wearable sensor technologies capable of operating without battery replacement or charging. However, validating the performance, efficiency, and reliability of these systems in realistic conditions during the research and development phase remains a major challenge. In this work, we designed and developed a hardware–software platform that can facilitate experiments and performance evaluation of thermoelectric-powered wireless wearable health monitoring sensors in a controlled laboratory setting. The proposed hardware platform comprises of a thermally controlled 3D-printed mechanical arm and hand structure that functions as a physical analog of the human forearm. Thermally conductive inserts and embedded heating elements are incorporated to precisely replicate human skin temperature. An array of integrated temperature sensors provide real-time feedback for closed-loop PID control, enabling stable surface temperature of the arm through pulse width modulation. SolidWorks thermal simulations are used to model the temperature distribution and assess the temperature uniformity across the arm surface. The electronic subsystem comprises of a microcontroller with Bluetooth Low Energy (BLE) wireless communication which was programmed to collect and transmit data from multiple sensors with minimal energy consumption, thus enabling reproducible and systematic testing of thermoelectric-powered wearable sensor performance, communication frequency, and energy efficiency. On the software side, a custom web-based dashboard was designed using HTML, CSS, and JavaScript, employing the Web Bluetooth API for direct communication with the microcontroller. The web browser-based user interface displays live sensor values (such as, body temperature) and plots graphs for data visualization. Our developed apparatus provides a versatile and scalable foundation for advancing the technologies for energy-efficient, reliable, and clinically relevant wireless wearable health monitoring systems powered by the heat energy available from the human body.

Microfluidic Device for Infection Testing

Virtual Presentation (Microsoft Teams)

1:00pm – 2:00pm

Graduate Student(s): Viswa Teja Nukavarpu, Connor Bhavsar, Manas Singh, Florentin Toma, & Davian Luna

Research Mentor(s): Hoseon Lee

This research focuses on the early detection of viral infections. We propose a method that utilizes magnetically tagged antigens, which are transported through a microfluidic solenoid channel by a neodymium magnet. The induced voltage signal, measured at the nanovolt scale, presents the

indication of viral presence, potentially allowing for detection prior to the conventional testing methods. Building upon previous studies, our work simulates the dynamic motion of the magnetic beads by integrating magnetic fields with structural mechanics, resulting in more precise outcomes. We use COMSOL Multiphysics to conduct these simulations, demonstrating the feasibility and effectiveness of our proposed approach. In addition to the proposed magnet, the redesigned circuit is an iteration that turns our previous wide-band dual-stage circuit into a precise, three-stage active low pass amplifier. Each LTC2050 stage provides a gain of -100 with 0.39 microfarad capacitors, forming cascaded first-order filters with an overall -3 dB cutoff near 20 Hz and overall gain of 106106 volts/volt. These improvements produced higher signal to noise ratio and enhanced output amplitudes, eliminating the need for digital signal processing. To manufacture the solenoid, the winding apparatus we developed automated the process of winding a 50 nanometer thick copper wire around a 170 micrometer thick optical fiber, a precise task that could not be done manually. We achieved the winding of the optical fiber using 2 stepper motors: one rotated the spindle holding the fiber, the other incrementally translated the stage after each full rotation to control coil pitch and direction. This coordinated sequence repeated for 25 full iterations, which produced a uniform, tightly wrapped coil along the fiber's surface. The automation ensured repeatable, high-quality winding suitable for micro-fluidic detection.

Optical Phantom Mimicking Cerebral Blood for Validation of Speckle Contrast Optical Spectroscopy

Poster #2 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Aster Cheung

Graduate Student(s): Linh Loung & Anurag Paul Ovi

Research Mentor(s): Paul Lee

Monitoring cerebral blood flow (CBF) is essential for understanding and maintaining brain health. Non-invasive optical techniques such as Speckle Contrast Optical Spectroscopy (SCOS) offer a low-cost method for assessing CBF. However, evaluating the depth sensitivity of SCOS systems is limited by the lack of tissue phantoms. Many existing phantoms use bulk liquids or single-layer solids and model a uniform tissue type. To address this, we propose a multi-layer, multi-channel tissue phantom designed to better reflect the optical properties and flow patterns of the skin and skull. A single-layer tissue phantom was fabricated using polydimethylsiloxane (PDMS) with embedded silicone tubing placed 4 mm below the surface to simulate superficial blood vessels. Titanium dioxide (TiO_2) was added to match brain-like reduced scattering properties. A lens system was used to magnify the speckle pattern, ensuring the speckle-to-pixel ratio exceeded 2. The source and detector fibers were placed on the phantom surface at varying source-detector separations. An intralipid solution was circulated through the tubing using a syringe pump to simulate dynamic flow. Video data were recorded by the SCOS system, and

speckle contrast (κ) was calculated as the ratio of the standard deviation to the mean intensity of pixels within each frame. Measurements were taken across different source-detector separations to examine depth sensitivity. At low flow, the speckle pattern appears sharp with high contrast; at high flow, it becomes blurred, indicating reduced contrast. A circular ROI was selected from each frame, and $1/\kappa^2$ increased during flow-on periods and returned to baseline during flow-off periods, demonstrating sensitivity to dynamic flow. While promising, these results are preliminary. A two-layer, two-channel phantom is being developed to further evaluate SCOS depth sensitivity and resolve layered flow. Upcoming experiments will assess the SCOS system's ability to resolve depth-dependent flow changes and support its application for more physiologically relevant measurements.

Skin Pigmentation Effect of NIRS Measured Tissue Oxygenation: Phantom Study

Poster #19 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Michael Ellis

Research Mentor(s): Paul Seung Yup Lee & Zahra Rostampour Fathi

Accurate near-infrared spectroscopy (NIRS) measurements across diverse populations remain an open challenge due to the optical absorption of melanin in the skin. This can bias oxygen saturation (SO₂) estimates. As NIRS becomes increasingly adopted for wearable neuromonitoring and clinical use, understanding and mitigating pigmentation-related signal variation is essential for equitable and reliable brain sensing. This study aims to introduce a controllable, layered tissue mimicking phantom designed to isolate and quantify the impact of epidermal pigmentation on continuous-wave NIRS oximetry. The platform replicates the optical structure of human tissue using PDMS layers infused with nigrosine and India-ink-based absorbers to emulate the epidermis and scalp respectively, while a circulating vessel module containing hemoglobin solution models dynamic cerebral blood oxygenation. Using FlexNIRS, a wearable dual-wavelength oximeter operating at 735 and 850 nm, we systematically varied epidermal melanin concentration, layer thickness, and blood oxygenation levels while recording device intensity signals and oxygenation estimates. This approach enables precise characterization of how pigmentation influences measured optical intensity, signal-to-noise ratio, and SO₂ accuracy. The results will inform the development of pigmentation-aware calibration models and correction factors, ultimately improving the accuracy and inclusivity of wearable NIRS technologies.

SWIR SCOS for Deep Tissue Flowmeter

Poster #1 (Event Center)

12:00pm – 12:45pm

Graduate Student(s): Anurag Paul Ovi & Linh Luong

Undergraduate Student(s): Aster Cheung

Research Mentor(s): Paul Lee

Multiple optical techniques have been explored to non-invasively assess tissue blood flow using the principle of dynamic light scattering. Speckle contrast optical spectroscopy (SCOS) has been developed to exploit the advantages of Laser Speckle Contrast Imaging (LSCI) and Diffuse Correlation Spectroscopy (DCS) and offer more than an order of magnitude improvement in signal-to-noise ratio (SNR) with a lower price for cerebral blood flow (CBF) monitoring. Unlike DCS using a temporal dynamic of speckles, SCOS measures spatial speckle contrasts from the multiple camera pixels that detect photons undergone multiple scattering. However, at source–detector separations (SDS) >2 cm, the SNR remains limiting for adult cerebral measurements lacking accurate quantification of cerebral blood flow. In this study, we aim to explore operating SCOS through the shortwave infrared (SWIR, 900–1700nm) range, particularly, 1064nm which can improve depth sensitivity and SNR due to the known advantages of reduced tissue scattering while retaining adequate tissue transmission and we will compare NIRs SCOS in 852nm using long-coherence length laser (iBeam Smart, Toptica 852nm, 150mW, > 50m,) versus 1064 nm and a SWIR camera (Balser a2A 1280 125um SWIR). Then, we will perform quantitative in-vitro studies through a two-layer microfluidic phantom. This study will provide the technical feasibility of SCOS at 1064 nm to offer a unique opportunity for deeper tissue flow sensing than the NIR region.

Wireless EMG-Driven Realtime Robotic Hand Control

Poster #2 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Aiden Jackson

Research Mentor(s): Coskun Tekes

There are currently thousands of amputees and people who have lost full use of their limbs across America. More often than not, these people have very low income or are in a situation where they cant take extended time off work. Prosthetic technology as we know it now has several limitations that heavily impact people like this the most. Often prosthetics that restore function use of a limb are very cost, requiring thousands of dollars for prosthetics with simple sensors or functions. These surgeries are also often very intrusive and come with lengthy surgeries and recovery times that impede every day life. This study aims to improve current prosthetic norms and technology by using Electromyography (EMG) sensors in limb prosthetics. EMG sensors detect changes in electricity flowing through muscles and using those changes, we hope to see if it can accurately be used to move limbs like hand or feet that a patient may have lost. EMG sensors are completely unintrusive and work through skin contact, unlike may similar sensors that require access to nerves. EMG sensors are also very cost effective and require little setup to be used. This study will test the feasibility of using EMG sensors as an accurate tool for prosthetics by seeing how well 8 EMG sensors connected to the forearm are able to control a

robotic hand remotely. A data glove that measures changes in angles when the fingers are bent will be used to train an AI model that receives live EMG data. This model will then be used to predict the angles of each finger and correctly move the robotic hand accordingly.

Industrial and Systems Engineering

AI Assisted Pedestrian Identification Using Drones

Poster #20 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Reese Pieroni, Brian Hardy, Joseph Stanziano, & Sai Murali

Graduate Student(s): Owais Ahmed

Research Mentor(s): Adeel Khalid

This paper examines research on pedestrian identification and enumeration using drone based object detection frameworks. Potential applications include crowd counting at outdoor events, search and rescue operations to locate missing people, and security monitoring in large open spaces. Our team implemented open-source and enhanced AI models to enable real-time pedestrian detection directly on a computer interface. Using the Skydio X10 drone, we captured original footage to evaluate each model's effectiveness in identifying humans from varying altitudes and varying light clarity. The results indicate that YOLOv12x and YOLOv10x were the most effective models at detecting pedestrians. Our additions to the existing models further enhanced the detectability, and enumeration was added to the model. Testing with footage from the Skydio X10 displayed that these models maintained consistent and strong performance across a wide range of altitudes. However, detection accuracy declined significantly once the drone exceeded 70 feet in altitude. These findings suggest that even though there are numerous practical applications for pedestrian detection under 70 feet, extending reliable detection capabilities beyond this altitude would require more advanced hardware and higher quality imaging systems.

Analyzing Facades at KSU Marietta for Heat Leakages

Poster #4 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Arvind Balakrishnan

Graduate Student(s): Owais Ahmed

Research Mentor(s): Adeel Khalid

Universities experience energy loss through facade leakage, but drone thermography often generates images that are difficult to compare across flights and buildings. This study develops a radiometric UAS workflow that generates repeatable, component-level ΔT metrics, and trains a

small YOLO detector to automate indexing. Flights are scheduled for either full shade, or uniform overcast; information on emissivity is determined by material; and a small coplanar high-emissivity patch is also included in every scene. Capture geometry is held constant near a 45° oblique view, with constant standoff, ~85% overlap, and with paired RGB images for alignment and labeling. For each facade element marked (windows, spandrels, doors, vents), ΔT is defined as the component minus local patch and summarized from component to facade to building; paired flights per facade assess short-term repeatability and examine if drift occurs. The presentation will report evaluation on buildings at Kennesaw State, detector performance (mAP@0.5), agreement between detector-enabled and manual ΔT , and review-time savings from end to end. The intent of the workflow is to reduce flight-to-insight yet maintain the thermal ΔT results are still comparable, across flights and buildings and produce decision-ready leakage metrics for multiple buildings or facilities on campus.

Use of Exoskeletons in Healthcare Activities

Poster #22 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Spencer Daniel, Ricardo Aguilar, & Nicole Schsholm Ortiz

Research Mentor(s): Luisa Valentina Nino de Valladares

The demanding nature of the nursing profession has increasingly outpaced the physical and mental limits that healthcare professionals can sustain while maintaining their well-being. Prolonged exposure to high-stress environments, extended shifts, and physically strenuous tasks such as lifting patients, standing for hours, and responding to emergencies place significant strain on nurses. These challenges are further exacerbated by increasing patient volumes and staffing shortages, forcing nurses to take on additional responsibilities 1, 2. Over time, these demands contribute to musculoskeletal injuries, chronic fatigue, and burnout, ultimately diminishing their ability to provide optimal patient care. Exoskeletons, wearable assistive devices designed to support posture and reduce physical strain, represent a promising ergonomic intervention for the healthcare workforce 3, 4. This initial study explores the feasibility and ergonomic impact of a passive back-support exosuit (the Auxivo Omnisuit), in simulated nursing tasks. A controlled experiment was conducted with six participants performing three simulated nursing-related tasks: 1) overhead object lifting, 2) asymmetric suitcase carrying, and 3) patient transfer using a 40-lb medical dummy, both with and without the exosuit. Movements were recorded and analyzed using Noraxon inertial measurement units (IMUs) to assess changes in joint angles and posture during physical exertion. Results indicated that exosuit use led to consistent improvements in shoulder and spinal joint alignment across all tasks, with participants exhibiting more neutral postures and reduced deviations from ergonomic norms. These findings suggest a potential reduction in musculoskeletal load and injury risk indicating that exoskeleton integration in nursing could improve overall well-being, increase productivity, and contribute to better patient outcomes. Overall, this research supports the viability of passive

exosuits as a cost-effective, noninvasive solution to improve caregiver safety, supporting a more sustainable and resilient nursing workforce and advancing ergonomic innovation in healthcare settings.

Reinforcement Learning Driven Cost-Effectiveness Analysis of Dental Caries Prevention Policies Under Uncertainty

Poster #14 (Event Center)

3:00pm – 3:45pm

Graduate Student(s): Pritam Deb

Research Mentor(s): Christina Scherrer & Lin Li

Dental caries remains one of the most common chronic diseases in American children and young adults. Dental sealants can prevent up to 80% of cavities, yet there is little guidance on when to apply or reseal them. Existing economic evaluations typically compare static strategies or sweep through fixed predictive-model thresholds using finite-horizon markov models or discrete-event simulation, but they do not adapt large-scale data-driven decisions for finding high-risk individuals from a large population. We propose a two-stage framework that integrates machine-learning (ML) risk prediction, microsimulation, and model-based reinforcement learning (RL) to identify cost-effective, state-dependent sealant policies. In stage one, we will train an ML model on NHANES 2011–2016 child data (~6,000 children, ~37% with caries) using demographic, behavioral, laboratory, and dietary predictors to estimate each individual's baseline risk; these individualized risk profiles both initialize and parameterize a microsimulation of tooth-state transitions (healthy, sealed, sealant lost, decayed, filled) using published estimates of sealant effectiveness, retention, caries incidence hazards, service use, and costs. In stage two, a finite-horizon, model-based dynamic-programming RL algorithm (e.g., value iteration) will learn—at six-month decision epoch over a 10-year horizon—whether to seal, reseal, filling or defer in order to maximize discounted net monetary benefit. We will benchmark the learned policy against conventional static and threshold-based comparators, reporting cost per averted decay, cost per disability-adjusted life year (DALY) averted, incremental net monetary benefit, and subgroup results (age and race/ethnicity). By explicitly modeling risk heterogeneity and allowing preventive actions to adapt over time, the study aims to deliver high-performance, interpretable decision rules for preventive dental care that are practical for providers and policymakers and balance costs, health benefits, and equity considerations.

Mechanical Engineering

A Bioinspired Assistive Exoskeleton for Supporting Shoulder and Daily Activities

Poster #24 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): William Thompson

Graduate Student(s): Conner Talley

Research Mentor(s): Ayse Tekes

Strokes are one of the leading causes of long-term disability. Many survivors of strokes experience limited upper-limb mobility. In this field, there is little assistive technologies for daily activities and even little that are inexpensive. In response to this gap, this project presents the design and iterative development of a wearable, cable-driven upper-body exoskeleton. The device mirrors the person's healthy arm using inertial measurement unit (IMU) sensors and operates the impaired arm through Bowden-tube cable transmission. The initial design focused on validation, using wireless sensors and motor-mounted tensioning. The current version introduces a more manufacturable design. The tension system is moved to Bowden tubes. The motors are distributed for better weight balance. The wired forces sensors are being integrated to improve reliability and responsiveness of the signal. This system aims to provide an ergonomic, lightweight, and effective solution to support stroke patients in their daily activities.

Advanced Deep Learning for Pharmaceutical Pill Defect Detection

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Undergraduate Student(s): Joshua Daniel, Moneesh Rajaram, & Hygreev Manikandan

Research Mentor(s): Sathish Gurupatham

Quality assurance in pharmaceutical manufacturing represents pharmaceutical production quality assurance is an important patient and regulatory safeguard. Here, a new application of Detectron2, a cutting-edge deep learning framework that enables instance segmentation, is introduced to streamline the pill defect inspection process. Compared to human examination or general computer vision algorithms, the technique applied is more accurate in identifying various kinds of defects like cracks, chips, coloration, and impurities. The study employed a data set that comprised of 780 high-quality images of pharmacy pills and consisted of 400 training images, 250 validation images, and 130 test images from Kaggle (PudPawat). Defect annotation using the Makes Sense AI tool was performed to have standardized and proper labeling of defect morphologies. The Detectron2 model was selected due to its better ability to perform instance-level segmentation. Performance analysis revealed remarkable figures on different fronts. The model revealed a confidence rate of 99% in detecting defects with a total accuracy of 98.5% and

an average Mean Average Precision (mAP) of 97.2%. Performance of bounding box detection provided an Average Precision (AP) of 41.95 with AP50 and AP75 scores of 68.58 and 44.06 respectively. Most significantly, segmentation performance achieved an AP of 45.14, with AP50 of 68.58 and AP75 of 64.64, confirming the model's capability to accurately define defect boundaries. By eliminating human subjectivity, the system reduces the likelihood of defective products reaching consumers. This research demonstrates that instance segmentation using deep learning is a revolutionary technology for pharmaceutical quality control. The high precision, real-time detection provided by Detectron2 provides manufacturers with an efficient way of keeping high regulatory compliance while achieving high production throughput. This research paves the way for increased AI integration in pharmaceutical production with potential extension into other quality factors and intricate pharmaceutical formulations to create automated quality control systems.

Advancing Radiation Shielding for Human Space Exploration

Poster #5 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Bryan Trejo & Lea Scott

Research Mentor(s): Eduardo Farfan

Beyond the safety of the Earth's magnetic field, out into the treacherous reaches of space, lies a harsh environment of radiation. This study examines radiation shielding strategies for crewed spacecraft operating in various environments, including Mars transit and deep space. Within these environments, ionizing radiation remains a critical challenge to long-duration, crewed space travel. Galactic Cosmic Rays (GCR), high-energy protons and heavy nuclei originating outside our solar system, as well as Solar Particle Events (SPE), highly energetic protons ejected continuously during the 11-year solar cycle, are all analyzed in their unique interactions with spacecraft material and biological tissues. Shielding to prevent high continuous radiation doses and to remain within NASA, ESA, and Roscosmos's standards for biological dose limits is investigated. Acute Radiation Syndrome (ARS), such as cerebrovascular effects, and chronic effects, including cancer or cognitive impairment, in astronauts, are evaluated in conjunction with spacecraft material. Fundamental shielding incorporating both passive, active, and hybrid shielding is essential for continuous travel in deep space and for moderate travel to Mars. Dense materials like lead and tungsten divert and attenuate gamma rays through absorption or scattering, while hydrogen-filled polymer materials can scatter neutrons traveling near the speed of light. Active radiation shielding includes emerging technologies such as electromagnetic shielding using polar magnets and electrostatic fields designed to deflect charged particles. Both concepts are still in their infancy due to their dangerous nature during malfunction, and the heavy power constraints needed to maintain continual use. This study aims to analyze the aforementioned concepts and understand radiation shielding for further research.

Autonomous UAV-Based Inspection Methods for Photovoltaic Arrays Using AI-Driven Defect Detection

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

9:00am – 9:50am

Undergraduate Student(s): Liam Begley

Graduate Student(s): Owais Ahmed

Research Mentor(s): Adeel Khalid

Sustainable energy sources such as PV (Photovoltaic) arrays have expanded significantly over the past century, and now require a new generation of high-fidelity, cost-effective, and mobile inspection methods. UAVs (Unmanned Aerial Vehicles) provide a unique capability to quickly and effectively improve operational linearity in large-scale PV installations. UAVs can access and inspect areas that are difficult to access, and can be equipped with radiometric thermal imaging systems, enabling rapid and accurate assessment of industrial scale industrial sites. In this project, we leveraged radiometric thermal imaging to acquire precise temperature data and apply physical analysis along with computational methods to properly detect and diagnose potential structural or electrical faults in PV arrays. This thermal data allows us to reliably identify defects such as hot spots, microcracks, and conductor failures with considerable accuracy and consistency. The reliability of this data allowed us to properly train AI (Artificial Intelligence) and ML (Machine Learning) programs to automatically recognize and classify these defects. Specifically, we have employed YOLOv12 for automated pattern recognition, identifying defect structures consistent with those included in the training models. By eliminating the need for manual inspections and extensive training periods, our integration of UAV technology in conjunction with AI-driven analysis methods will allow power operators to scale PV installations more efficiently while minimizing energy losses due to undetected faults. Through the methods used in this project, the research team is introducing a promising framework for improving the reliability and sustainability of large-scale PV installations.

Design Improvement of the Telescoping Mechanism for Air Quality Analysis Module Mounted on an Unmanned Aerial System.

Poster #17 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Ramanujam Sudharsanan & Liam Begley

Research Mentor(s): Adeel Khalid

The purpose of this project is to create a Unmanned Aerial System (UAS) for civil engineering applications. The UAV system performs inspections in locations where it is unsafe for in person inspections and utilizes sensors and analytic systems for this task. This project involves both a multi rotor flying system and payload and specifically involves improving the drone payload

with an end goal of a fully retractable probe system. Components utilized for the payload system include stepper motors, stepper motor drivers, go pro cameras, Arduino nanos, and a telescoping probe. In this project the integration of this new payload code and controller board with the existing flight controller and code in one of the present challenges in this project. This project also involves the programming of various components and the improvement of the current telescoping mechanism and its various components to create a fully functional probe for inspections. The final product of this project is a fully extendable and retractable probe housed in the drones payload which can be controlled by a remote operator and can fully extend into a hole in the ground, gather air quality information using the probe/sensors, display that information on the on-board sensor and transmit a live video of this information to the ground station to be used in analysis and inspections.

Effects of Wing Spacing on the Aerodynamic Performance of Tandem Wing Configurations

Poster #8 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Garv Singh

Research Mentor(s): Gaurav Sharma

Tandem wing configurations, which employ two lifting surfaces arranged in series along the flow direction, have gained attention for their potential to improve aerodynamic efficiency and stability in low-speed flight regimes. This study investigates the influence of the spacing distance between two slightly modified SD7003 airfoils on the aerodynamic performance of a tandem wing arrangement. Two-dimensional steady-state simulations were conducted using a pressure-based solver in ANSYS Fluent under incompressible flow conditions at an inlet velocity of 11 m/s. The computational setup employed velocity-inlet and pressure-outlet boundary conditions, with symmetry applied to the top and bottom boundaries and no-slip conditions at the airfoil surfaces. The $k-\omega$ SST turbulence model was used to capture near-wall effects and flow separation accurately. Key aerodynamic parameters, including lift, drag, and lift-to-drag ratio, were analyzed across multiple spacing distances to determine an optimal configuration. The results aim to provide insights into the aerodynamic interactions between the front and rear airfoils, contributing to the design of efficient tandem-wing UAVs and micro air vehicles.

Empowering Student Leadership Through Artificial Intelligence: Enhancing Decision-Making, Communication, and Engagement

Poster #19 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Sina Sehhizadeh

Research Mentor(s): Eduardo Farfan

Artificial intelligence (AI) offers emerging opportunities to enhance leadership effectiveness within student organizations. This study examines how AI tools, particularly Large Language Models (LLMs), can support student organization presidents in decision-making, communication, strategic planning, member engagement, and recruitment. Drawing on interviews, surveys, and practical use cases from university leadership programs, the research explores how AI-assisted tools can streamline administrative tasks, generate data-informed insights, and foster more inclusive and responsive leadership practices. Findings indicate that AI applications can significantly improve efficiency in meeting preparation, goal tracking, and message development, allowing presidents to dedicate more time to mentorship and organizational culture. However, the study also identifies key limitations, including overreliance on automated outputs, ethical concerns regarding data privacy, and the need for digital literacy training to ensure responsible AI use. Ultimately, this research underscores AI's potential as a collaborative partner in student leadership; enhancing, rather than replacing, human judgment, empathy, and creativity.

Empowering the Next Generation of Nuclear Engineers: Large Language Model-Driven Educational Tools for the Nuclear Fuel Cycle

Poster #23 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): William Matherne

Research Mentor(s): Eduardo Farfan

Without the nuclear fuel cycle, nuclear power generation would not be possible. This complex sequence of industrial processes produces the uranium dioxide fuel pellets used in commercial nuclear reactors in the United States. The Nuclear Fuel Cycle course at Kennesaw State University introduces students to each stage of this process, including mining, milling, conversion, enrichment, fuel fabrication, power generation, and the storage and disposal of spent fuel. To help students better comprehend the extensive material, this project focuses on developing concise lectures and chapter summaries that reinforce key concepts and support cumulative learning. Creating comprehensive and accessible educational content that accurately represents the entire fuel cycle demands both time and specialized expertise. To address this challenge, the project explores the use of artificial intelligence, specifically Large Language Models, to generate high-quality, technically accurate lectures and summaries efficiently. All AI-generated content has undergone rigorous review and revision to ensure accuracy and educational value, contributing to a well-structured, multi-chapter curriculum on the nuclear fuel cycle. Chapters and chapter summaries were developed to serve as effective pre-reading materials, review aids, and accelerated learning resources. Students are encouraged to engage

with these materials prior to lectures and assigned readings to reinforce foundational concepts and enhance comprehension. In addition to covering the core stages of the nuclear fuel cycle, the chapters and summaries also address key related topics such as low-level versus high-level waste, reprocessing, nuclear nonproliferation, and environmental impacts. This study also aims to improve both student performance and conceptual understanding within the course. As the nuclear industry is projected to expand significantly by 2050 due to global carbon reduction goals and increasing energy demand, these educational tools will help better prepare students for future careers in the field.

Evaluating Large Language Models in Academic Assessment Design in Nuclear Engineering Education: Precision, Prompt Engineering, and Pedagogical Implications

Poster #25 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Will Jent

Research Mentor(s): Eduardo Farfan

The integration of Large Language Models (LLMs) into academic course development represents a transformative opportunity for higher education, particularly in technical disciplines such as nuclear engineering. These models possess the capability to generate a wide range of instructional materials, including lecture content, summaries, and assessment questions, but their accuracy and pedagogical value require systematic evaluation. This study explores the application of LLMs in generating student assessment questions for two upper-level nuclear engineering courses at Kennesaw State University: Nuclear Reactor Simulation and Nuclear Fuel Cycle. The objective is to assess both the reliability and the educational quality of AI-generated questions in alignment with course learning outcomes. A structured, iterative prompt-engineering approach was implemented to refine the LLM outputs, focusing on technical correctness, conceptual depth, and clarity of phrasing. Preliminary findings indicate that once effective prompts are established, LLMs can consistently produce assessment questions that meet course objectives and maintain technical relevance. However, achieving such precision requires deliberate prompt design, iterative testing, and subject-matter oversight. Occasional factual or contextual inaccuracies were observed, emphasizing the need for human validation and expert review before classroom implementation. This research highlights that the central challenge in leveraging LLMs for academic content generation lies not in the models' computational capacity but in developing effective prompt-engineering strategies and robust validation frameworks. By integrating these tools thoughtfully, educators can accelerate course material development while preserving technical accuracy and pedagogical integrity, offering a scalable method for supporting the evolving demands of engineering education. A portion of this abstract was aided by AI, which is aligned with the nature of the research.

Experimental Analysis of Vibration Mitigation in a Composite Building Prototype Using Fluid Viscous Dampers, Phase II

Poster #1 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Aidan Whipple, Riley Womack, Rishit Jain, & Erick Aranda-Urquia

Research Mentor(s): Simin Nasser, Mohammad Jonaidi, & Salim Kortobi

The second phase of this research focuses on the dynamic behavior of a three-story structural model subjected to vibration analysis, expanding upon the initial phase without dampers. Two scaled 1:10 prototypes have been developed; one constructed with 3D-printed polymeric floors and the other with plywood decks, each framed with steel members and designed to represent mid-rise building behavior. A newly acquired shake table has been installed and integrated with data acquisition components to enable controlled base excitation and real-time response monitoring. The experimental setup now combines the shake table, waveform generator, accelerometers, and vibrometers to record the building's acceleration and displacement under varying input motions. One of the models incorporates fluid viscous dampers positioned diagonally between floors to improve lateral stability and energy dissipation. The vibration tests evaluate the influence of these dampers on frequency response, amplitude reduction, and mode shape variation. Scaling relations for acceleration and frequency have been refined to align the laboratory data with real structural conditions. The compact shake table platform allows interchangeable model mounting for future comparative studies. Overall, this ongoing investigation aims to optimize damping configurations and viscoelastic modeling approaches to advance resilient structural design for buildings in seismically active environments.

From NERVA to DRACO: The Evolving Role of Nuclear Propulsion in Deep Space Missions

Poster #8 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Lea Scott & Bryan Trejo

Research Mentor(s): Eduardo Farfan

This study explores the development and applications of nuclear propulsion for space travel. In the aftermath of the atomic era, concepts such as Nuclear Thermal Propulsion (NTP) and Nuclear Electric Propulsion (NEP) emerged as promising alternatives to conventional chemical propulsion systems. Nuclear propulsion offers several advantages, most notably a significantly higher specific impulse, which translates to improved fuel efficiency and reduced travel time.

These capabilities open the possibility of deep-space missions that are currently impractical or excessively demanding for human crews. This research presents a historical and technical review of nuclear propulsion, examining its scientific foundations in radiation, propulsion mechanics, fuel composition, and reactor design. Additionally, the study addresses the political, economic, and safety implications associated with nuclear-powered space exploration. Data collection and analysis have been drawn upon the Kennesaw State University SuperSearch database, complemented by independent sources dating back to the 1960s. Key performance metrics, funding trends, and safety assessments are analyzed to contextualize both historical programs, such as NERVA and RD-04, and contemporary initiatives including DRACO and DARPA's current projects. Ultimately, this study seeks to identify gaps in current knowledge and evaluate the feasibility of nuclear propulsion as a sustainable foundation for future deep-space exploration.

Improving Classroom Acoustics Through a Low-Cost Noise Reduction Design for an HVAC Fan Coil Unit

Poster #7 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Garrett Kirby

Research Mentor(s): Richard Ruhala

The Mathematics Building at Kennesaw State University was constructed in 1962 and subsequently renovated to include an updated HVAC system. During this renovation, fan coil units were installed in the corners of each classroom. With little room to reduce noise from their operation, noise levels that exceed the ANSI standard maximum weighted sound level by 15 dBA for education spaces are present in several classrooms. This can create communication and learning challenges for students and faculty. This project proposes a cost-effective solution to reduce classroom noise without requiring a full system replacement. Our approach involves designing and testing a noise-dampening silencer to reduce the overall A-weighted and Noise Criteria (NC) levels created by the fan coil units, without a significant increase in airflow restriction. For our prototype, plywood will be used in place of sheet metal, allowing us to test the feasibility of our design at low cost. The inside of the box will be lined with a duct liner to absorb and contain noise generated by the fan coil unit. The duct liner selected has a Noise Reduction Coefficient (NRC) of 0.6, meaning it should absorb 60% of the noise between 250 and 2000 Hz. When testing, we will measure the reduction in sound levels within the classroom and compare them to the regular noise levels without the damper to determine effectiveness. Once results are obtained, we will be able to determine whether the noise-dampening silencer provides an improvement to the classroom acoustics while remaining cost-efficient. If successful, the design could serve as a practical and affordable solution to addressing similar noise issues in other classrooms with similar noise constraints. Ultimately, this project may offer KSU Facilities

a viable option for reducing the noise levels and enhancing the learning environment in the Mathematics Building by improving acoustic conditions.

Numerical Study of Transonic Flow Characteristics Around a Compound Delta Wing

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

9:00am – 9:50am

Undergraduate Student(s): Andrew Marion

Research Mentor(s): Gaurav Sharma

This study numerically examines the aerodynamic characteristics of a compound delta wing, designed with multiple sweep angles to enhance transonic performance. Inspired by the wing planform of the HAL Tejas, the leading-edge sweeps were strategically positioned to reduce wave drag while maintaining lift across a broad flight envelope. Computational fluid dynamics (CFD) simulations were conducted over Mach numbers from 0.75 to 1.1 in 0.05 increments, with angles of attack ranging from 0° to 55° . The Unsteady Reynolds-averaged Navier–Stokes (URANS) approach, coupled with the Spalart–Allmaras (SA) turbulence model, was employed due to its efficiency in capturing external aerodynamic flows at a reasonable computational cost. The numerical model was validated against experimental data by comparing surface pressure distributions and lift coefficients of delta wings. The compound delta wing's performance was benchmarked against a baseline single-sweep delta wing. Results indicate a significant reduction in drag near Mach 1, with decreases exceeding 12% across multiple angles of attack. Although the maximum lift coefficient exhibited a modest reduction of about 5%, the lift-to-drag ratio improved by 7–15% across the transonic regime, with the highest efficiency gain of nearly 14% observed at Mach 1.05. Averaged across the entire range, the compound configuration achieved an improvement of approximately 10.5% in aerodynamic efficiency. These findings demonstrate that the compound delta wing offers meaningful efficiency benefits in the transonic regime, highlighting its potential for application in next-generation aircraft design.

Numerical Validation of the Conical Bidirectional Vortex Engine Geometry

Poster #10 (Event Center)

12:00 – 12:45pm

Undergraduate Student(s): Grant Kuehne

Research Mentor(s): Gaurav Sharma

This study presents a computational characterization of the cyclonic flowfield within a swirl-driven conical combustion chamber under cold-flow, non-reactive conditions. An idealized chamber with a tapered conical section and eight tangential injectors is modeled using a three-dimensional finite volume solver. A tetrahedral mesh is constructed to discretize the domain, ensuring geometric conformity and minimizing skewness near the injectors and cone walls.

Simulations are carried out under steady, incompressible, and inviscid flow conditions to characterize the confined cyclonic motion. The numerical results are validated against the exact Eulerian solution for conical bidirectional vortex motion. The computed swirl velocity profiles exhibit a forced vortex core transitioning to a free vortex tail near the cone wall, showing strong agreement with inviscid Eulerian solution predictions. Both swirl velocity and pressure fields are found to be axially invariant along the conical axis, supporting a key assumption used in theoretical formulations. A parametric study with inlet velocities ranging from 40 to 100 m/s shows that increased injection speeds enhance the intensity of swirl and steepen pressure gradients, especially near the conical surface, while maintaining a stable central pressure. These results demonstrate that inviscid CFD modeling can effectively capture the core features of cyclonic bidirectional flow in conical chambers, aiding in the development of vortex-based propulsion devices and informing future turbulence model refinement for highly anisotropic swirling flows.

Real Time Human Fall Detection with Artificial Intelligence Using an Infrared Camera on an Unmanned Aerial Vehicle

Poster #17 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Joseph Stanziano

Graduate Student(s): Owais Ahmed

Research Mentor(s): Adeel Khalid

The use of Artificial Intelligence (AI) has dramatically increased in the lives of average Americans. This growing use in AI can range from reading articles, answering questions, generating media, or even identifying objects (annotation) within existing media, such as pictures and videos. Research on AI's ability to annotate media has grown in popularity as more open-source models have become publicly available. However, these annotations are limited by the AI model and not being able to reliably identify a subject from varying angles and distances. Kennesaw State University's Aerospace Education and Research Organization (AERO) Lab is researching live, AI-assisted object identification utilizing aerial footage. The researchers are doing this by employing modern Commercial Off The Shelf (COTS), Unmanned Aerial Vehicles (UAV) to provide high quality aerial footage. They use said footage to train an open-source AI model which specializes in object identification known as You Only Look Once (YOLO), to excel in annotating common objects such as people, cars, bikes, etc. from arial pictures and videos. The AERO Lab has been able to use this custom AI to dramatically increase the ability in identifying a wide range of objects, increasing the confidence level of the annotation, giving specified object orientation (sitting, standing, laying down), and the ability to vary angles and distances of the subject in the footage without a significant reduction in confidence level. These tasks are completed while providing the annotations in real time, on a monitor for the user to see. The AI is trained not only in Red, Green, Blue (RGB) sources, but also thermal and infrared, which

allows for use of the model at night and in heavily forested areas. The researchers aim to use this ability to aid in human search and rescue missions, as well as disaster relief for locating survivors.

Strain Effect on Thermal Transport in 3D Nanostructures

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

9:00am – 9:50am

Undergraduate Student(s): Joshua Ellison

Research Mentor(s): Jungku Park

This research is intended to test if a hexagonal boron-nitride compound is a suitable replacement for carbon-based nanomaterials such as graphene as well as other nanomaterials. This research tries to understand the thermal properties of a hexagonal boron-nitride (hBN) junction while deformed and under mechanical strain. In this study we generate hBN sheets and nano tubes with the molecular graphics software VMD, then using MATLAB we code a junction made of these sheets and nano tubes for our research purposes. Once a simulation of this hBN structure is completed, we take the code and use a molecular dynamics software known as LAMMPS, and stretch the structure along the z-axis. While this structure is being stretched, we test the thermal conductivity of the junctions between the hBN nano tubes and the hBN sheets. Expected results based off previous studies on thermal capabilities of hBN are that the thermal conductivity of the junction will decrease a consistent amount proportional to the amount of strain that the structure is subject to.

Robotics and Mechatronics Engineering

AI-Based System to Increase Productivity by Detecting Attention Span

Poster #11 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Aryan Merchant

Graduate Student(s): Fariah Alam

Research Mentor(s): Razvan Voicu & Muhammad Hassan Tanveer

Distraction and cognitive fatigue erode productivity in labs, classrooms, and offices, yet most environments provide only static cues (fixed lighting, generic reminders) that fail to adapt to an individual's moment-to-moment state. This project proposes an AI-driven, multimodal sensing system that estimates attention in real time and delivers gentle, context-aware feedback to help users sustain focus without becoming intrusive. The system combines short-range depth (time-of-flight) vision with a compact thermal module and ambient sensors (light, temperature, acoustics), extracting non-identifying indicators such as blink rate and stability, gaze drift, head

pose, and micro-motions, yawning frequency, posture shifts, noise spikes, and comfort deviations. Features aim to be fused on-edge using a lightweight classification model with adaptive modality weighting so that the most reliable signals in each setting (e.g., gaze under good illumination or posture when lighting degrades) drive the estimate. When a rising distraction score persists beyond a brief window, the system triggers tailored nudges: dimming or brightening task lighting toward a comfort target, proposing a micro-break or breath cycle, suppressing noncritical notifications, or prompting small ergonomic adjustments; all actions are logged locally for user review and tuning. Privacy is prioritized through on-device processing, ephemeral buffering, and no facial identification. The evaluation plan uses a within-subject design comparing baseline sessions to assistance-enabled sessions on timed focus tasks, measuring changes in sustained attention proxies (task completion time, error rate), interruption recovery, and self-reported workload and comfort, alongside stability of the model's estimates across lighting and noise variations. Initial results seek to demonstrate dependable detection of common distraction patterns, timely and acceptable feedback that users do not find disruptive, and measurable improvements in task continuity and perceived effort. Future extensions include few-shot personalization to new users, adaptive schedules that anticipate circadian dips, and opt-in integration with productivity tools to coordinate breaks and deep-work windows.

Application of Thermal Imaging for Search and Rescue Missions Using Unmanned Aerial Systems

Poster #17 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Justin Guye

Graduate Student(s): Owais Ahmed

Research Mentor(s): Adeel Khalid

The use of Unmanned Aerial Systems in recent years has been a constantly evolving technology. It has become very common for various groups to use UASs to complete tasks in a much more efficient way than was possible in years past. Flying machines can be utilized in ways that traditional human efforts can't and can be much more cost effective. The method that will be highlighted in this paper is the use of UASs in search and rescue operations, combined with thermal and infrared imaging. In an emergency, such as when hikers get lost in the forest, time is of the essence and a quick response time can be the difference between life and death. However, these situations can be difficult to maneuver using traditional means. Traditional rescue missions heavily relied on manpower and ground equipment to complete the task, not to mention being extremely costly. Thermal imaging has become a crucial method; however, there can be problems using this method as well. With a standard visible light camera and even a thermal imaging camera, there can be problems when the conditions become difficult to see through. The purpose of this paper is to determine how accurately our UAS combined with Ultralytics YOLO (You Only Look Once) and OpenCV, can detect human beings and determine the forehead

temperature of the person in the image. We took multiple, non-contact radiometric images and compared them using Flyr to compute a per-pixel temperature map ($^{\circ}\text{C}$). Our comparison was between two pathways of YOLOv10 and YOLOv12 to create segmentation for the human head vs Pose estimation for the human forehead. Our results provided qualitative visualizations showing a person's silhouettes, head outlines, and temperature readings. Outputs are saved to the respective approach folders. When radiometric data is present, the overlay reports temperatures in $^{\circ}\text{C}$.

Design and Implementation of an Autonomous Mobile Manipulator for Hospital Logistics

Virtual Presentation (Microsoft Teams)

3:00pm – 4:00pm

Undergraduate Student(s): Azam Shahbaz

Research Mentor(s): Razvan Voicu

A new wave of practical robotics is poised to lighten repetitive, time-critical workloads in clinical settings; one compelling use is a compact corridor courier that shuttles medications, samples, and supplies on demand. The problem is straightforward: staff time is routinely consumed by short-haul deliveries, which adds fatigue, slows care, and can elevate contamination risk, especially during peak hours and after shifts. This research proposes a feasibility study of a small indoor delivery robot that navigates a mapped hallway loop, accepts wireless dispatches, and docks reliably at designated stations. The approach seeks to combine ROS 2 (Nav2) for localization and routing with LiDAR/depth sensing for obstacle avoidance and a lightweight vision pipeline using fiducials and color cues for station identification; a simple top-mounted bin with a servo latch enables quick, touch-light handoffs without full manipulation. A LiDAR measurement test characterizes and validates the unit's distance accuracy under various indoor conditions, ensuring dependable perception and mapping performance demonstrating its feasibility. Simulation in Gazebo precedes taped-corridor trials to tune parameters and reduce risk, while a Wi-Fi interface (MQTT/REST) triggers jobs and logs telemetry for reproducibility. Expected outcomes include end-to-end autonomous runs between two to three delivery points, consistent docking within practical handoff distances, smoother path tracking with fewer manual interventions, safer human-aware behavior in mixed traffic, and clearer baseline metrics for run time, route reliability, and recovery from common failure modes (missed tag, occlusion, lighting changes). The benefit is a tangible reduction in ad-hoc staff errands and a cleaner, reproducible template for short-haul logistics on edge compute. Future work will address dynamic re-planning in congested areas, secure payload handling with chain-of-custody, and multi-floor routing through elevator integration, supporting broader deployment across healthcare and laboratory environments.

Enhanced Temporal and Space Awareness for Edge AI and Multimodal Sensing

Poster #12 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Edward Clarkston

Research Mentor(s): Razvan Voicu

Autonomous indoor environments require continuous awareness of occupants and conditions to maintain safety and comfort, yet many systems monitor limited signals or rely on cloud processing that adds latency and privacy risk. This project develops a real-time environmental and visual awareness module on an embedded edge-AI platform that fuses ambient sensing with on-board computer vision. The hardware stack integrates sensors for air quality, volatile compounds, illuminance, temperature, and acoustics, along with interfaces for bidirectional interaction via voice, text, visual cues, or haptics. Depth perception from structured-light, time-of-flight, or stereo sensors enables person and posture analysis. The software stack uses lightweight, hardware-optimized libraries for device I/O, messaging, and model execution. Each sensor is individually validated for stable drivers, accurate units, and synchronized sampling, feeding a unified pipeline that timestamps and buffers data on-device. A vision module performs person detection and tracks postural cues such as prone states or sudden vertical changes using object detection and temporal tracking. Ambient data provide context for adaptive responses—for example, increasing task lighting under low exposure or flagging air-quality deviations during occupancy. Processing remains entirely on the edge to minimize latency and protect privacy, with optional short diagnostic buffers for debugging. Initial results demonstrate stable sensor readouts, reliable person detection under typical indoor lighting, consistent identification of staged fall events, and coherent multimodal fusion linking environmental shifts with visual observations. Future work includes cross-modal anomaly scoring, confidence-based rechecks under occlusion or glare, local dashboard notifications, and calibrated thresholds across diverse zones. Together, these advances establish a foundation for context-aware safety and comfort in laboratories, clinics, classrooms, and smart-home environments.

Enhancing Elderly Care Through Robotic Companionship: A Hiwonder Dog Application

Poster #12 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Cole Hebert

Graduate Student(s): Fariha Alam

Research Mentor(s): Razvan Voicu & Muhammad Tanveer

This project, developed through the Kennesaw State University First-Year Scholars Program, explores how robotics can enhance independence and safety for elderly individuals. The central research question asks: Can a low-cost robotic companion assist older adults by providing mobility support and personalized reminders? Building on studies in assistive robotics, the

project utilizes the Hiwonder robotic dog to create an interactive system that follows elderly users and offers daily reminders. The robot employs ultrasonic sensors and a camera to maintain a safe following distance, while an integrated speaker delivers reminders about medication, hydration, and incoming family communication. This project demonstrates how accessible robotics can contribute to improving quality of life for aging populations. By merging engineering design with human-centered innovation, it highlights how undergraduate research can address real-world challenges through creative, compassionate technology.

Field-Ready Robotics: Sensor- Based Crop Monitoring and Precision Farming

Poster #1 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Andrea Martinez Angulo, Aiden Kovarovics, & Arielle Charles

Graduate Student(s): Daniel Byers

Research Mentor(s): Muhammad Hassan Tanveer

Monitoring the health of crops is a critical part of ensuring consistent and high-quality output for farmers. A powerful method for evaluating the health of crops is Multispectral imaging, which uses a Red-Green-Near-Infrared camera to extract a variety of visual health indicators known as vegetative indices. Although this approach is effective, it is not available to all farmers as the cost of field ready multispectral cameras can often be out of budget. In our research, we aim to tackle this problem by extracting RGN vegetative indices from Red Green images. We implement an Image Generation Model based on Artificial Neural Networks, using captured Red-Green-Near-Infrared images and their subsequent Red-Green images to train the model. The specific use case evaluated is predicting the Normalized Difference Vegetative Index (NDVI) result of a Red-Green image, as the NDVI is the most common index utilized for visual health monitoring. Ultimately, this generative approach would allow for the use of a consumer grade Red-Green-Blue camera to collect pertinent crop health information. This results in savings for the farmers while still being able to monitor the health of their crops effectively.

PeriSafe: Perimeter Monitoring for Child and Cognitive-Support Safety

Virtual Presentation (Microsoft Teams)

12:00pm – 1:00pm

Undergraduate Student(s): Micah Charles

Research Mentor(s): Razvan Voicu & Muhammad Hassan Tanveer

Unsupervised approach to road edges is a common precursor to pedestrian injury for children and cognitively impaired individuals. This project develops a perimeter-monitoring safety module that observes the area near curbs and driveways, recognizes approach-to-boundary

intent, and triggers layered, non-contact interventions before a crossing occurs. The problem addressed is the lack of timely, context-aware warnings in residential and school-adjacent settings, where attention can lapse and caregivers may be briefly out of view. The proposed solution combines advanced vision with time-of-flight distance and thermal sensing, using deep-learning detection and multi-object tracking to identify people and estimate motion relative to a virtual “no-cross” line. Risk is assessed from approach speed, heading, and dwell near the boundary. When risk is elevated, the system first issues local audible/visual alerts; if approach continues, it commands a small quadruped to adopt a safe, low-speed, path-presence stance that discourages forward motion without physical contact, while preserving clear egress. Processing is performed on-edge to minimize latency and protect privacy; no facial identification is used, and video buffering is limited to short diagnostic windows. The feasibility scope includes curbside mock-ups, day/night calibration, and closed-loop tests of alerting and robot positioning on a marked test lane with varied approach angles and partial occlusions. Initial results seek to demonstrate dependable person detection and approach recognition, timely alerts issued before line crossing, consistent robot positioning that encourages pause/redirect behavior, and observable improvements in reaction time and route compliance versus a no-system baseline. Future development will expand sensing robustness (additional RGB-D or beacon inputs), add geofenced zones and caregiver notifications, introduce confidence-aware rechecks under occlusion or glare, and undertake formal safety, usability, and privacy evaluations to support deployment in residential neighborhoods, school drop-off zones, and community parks.

Precision Agriculture Route Optimization with Crop Row Constraints

Poster #13 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Isaac Gardner, Obaid Irfan, Abdulmajeed Kabala, & Daniel Byers

Research Mentor(s): Muhammad Hassan Tanveer

Route Optimization is an ongoing topic of research for Unmanned Ground Vehicles (UGV) where minimizing task completion time and energy usage are typically considered. In our research, we propose a route optimization method tailored for Precision Agriculture applications in which tasks are located inside planted fields. First, aerial images are taken of the farmland to be processed by a base station. Next, the boundaries of the crop fields, orientation of the crop rows, and UGV task points are extracted from the image. Using these image parameters, a map is created to solve a Traveling Salesman Problem (TSP) with the following constraints: minimize UGV energy usage, minimize UGV travel distance, and travel must always be parallel to crop row orientation within the boundary of a planted field. Finally, the UGV executes the generated route to accomplish all tasks. To evaluate the performance of different TSP approximation algorithms with the given crop row constraints a simulated environment is used. Ultimately,

our framework aims to optimize UGV performance for Precision Agriculture tasks and effectively utilize aerial imaging in air to ground agricultural applications.

Smarter Signals: Predicting the SNR Threshold for Accurate Direction-of-Arrival Detection in UAV Communication Systems

Poster #23 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Sai Prannav Murali, Drew Haase, Joseph Stanziano, Liam Begley, & Michaela Hopfner

Graduate Student(s): Owais Ahmed

Research Mentor(s): Adeel Khalid

Reliable communication between unmanned aerial vehicles (UAVs) or drones and ground stations is crucial to next-generation autonomous systems. However, Direction-of-Arrival (DoA) estimation accuracy, the identification of where a signal is coming from, is strongly dependent on the signal-to-noise ratio (SNR). This project develops a predictive model to identify the "transition SNR," the point at which DoA algorithms switch between unreliable and reliable detection. Using MATLAB simulations and Random Matrix Theory (RMT), we model the evolution of the Mean-Squared Error of angle estimates under noise and confirm those predictions through hardware experiments using LoRa radios, USRP platforms, and Raspberry Pi-based UAV nodes. Beyond signal detection, this work explores RF energy harvesting, scavenging ambient radio signals to power small systems, as a path towards drone flight time extension or powering remotes. By integrating DoA estimation with power-saving communication protocols, we aim to develop smarter UAV-to-ground links that provide more effective use of limited energy resources. This multi-disciplinary project integrates signal processing, embedded systems, and power engineering to improve the efficiency of wireless communications in challenging environments. Our research explains when and why DoA algorithms break down, paving the way for more adaptive and sustainable UAV networks.

SoilBus

Poster #9 (Event Center)

10:00am – 10:45am

Undergraduate Student(s): Saam Haghighat-Grami, Aaditya More, & Emmanuel Allen

Graduate Student(s): Carter Corbin, & Lakshay Battu

Research Mentor(s): Muhammad Hassan Tanveer & Daniel Byers

Data collection and transmission are critical parts of crop monitoring for Precision Agriculture. Current data collection methods can be prone to long range signal difficulties and typically require a sink and source node structure. In our research, we propose an ad hoc wireless sensor

network approach to precision agriculture soil data collection using ESP32 based deployment modules. Each module houses a suite of soil sensors to collect pertinent data to indicate crop performance and stores this data locally. The modules are deployed in a graphical layout, with each deployed module having n number of deployed modules within its ESPNOW communication protocol range. Collective data acquisition is then completed via an Unmanned Ground Vehicle (UGV) with a requester ESP32 node. When the unmanned ground vehicle approaches a deployed module in the graph, the module will systematically discover and chain all other modules in the graph to transmit collected soil data to the UGV. Ultimately, this framework allows for flexible data acquisition as any node in the network can be the destination data acquisition point and aims for more reliable data transmission by using an ad hoc approach.

Engineering Technology

Automated UAS Damage Assessment Using Deep Learning

Poster #5 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Brian Hardy

Research Mentor(s): Da Hu, Md Abdullahil Oaphy, Adeel Khalid, Owais Ahmed, & Sultan Alshafian

Following a natural disaster, many homes are left damaged. A rapid assessment of structural damage to homes is extremely important; however, it can take some time to inspect each home and evaluate damage with only volunteers and disaster relief programs. The purpose of this paper is to integrate vision processing into a UAS (Unmanned Aerial System) to assist in the evaluation of damage to homes, to help automate the process of damage assessment so volunteers and damage relief programs can spend more time tending to people affected by natural disasters. Our methodology consists of first collecting data from a city in Georgia following Hurricane Hellen and annotating the data to train a model on damaged production homes. Each home has been given a label during the annotation process: Destroyed, Major, Minor, and Affected. This system helps relief programs properly evaluate where repairs need to be made to prioritize homes that are severely damaged before homes that may have sustained minor damage. We hope this study will help support relief programs in the future to accelerate relief efforts, which will give relief programs more time to tend to those in need who may have been hurt during the disaster.

Feasibility of TPMS Lattices as a Nuclear Fuel Structure

Virtual Presentation (Microsoft Teams)

3:00pm – 4:00pm

Undergraduate Student(s): Eric Miller

Research Mentor(s): Aaron Adams

Nuclear reactors are among the most reliable, safe, and efficient sources of power generation. While nuclear fuel possesses an exceptionally high energy density, the rate of heat removal from the fuel remains a limiting factor in overall power output. In conventional reactor designs, nuclear fuel is housed in cylindrical rods with low surface-area-to-volume ratios, which constrain thermal transfer and, consequently, energy production. Enhancing the geometry of the fuel to increase surface area relative to volume can significantly improve heat transfer, enabling higher power output without increasing the amount of fuel. Triply Periodic Minimal Surface (TPMS) lattice structures such as Diamond and Gyroid geometries offer a promising alternative, having demonstrated superior thermal performance in heat exchanger applications. This study evaluates the theoretical viability of TPMS based nuclear fuel forms by performing thermal and fluid dynamics analyses on CAD models of Diamond and Gyroid lattice geometries. These analyses serve as a foundational step toward the development and eventual prototyping of advanced nuclear fuel configurations aimed at optimizing reactor performance.

Civil and Environmental Engineering

Dynamic Response and Vibration Analysis of Overhead Highway Traffic Sign Structures

Poster #5 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Jacob Ward

Research Mentor(s): Mohammad Jonaidi & Simin Nasseri

Overhead highway signage structures are essential components of transportation infrastructure, continuously exposed to dynamic aerodynamic loads generated by traffic and wind gusts. The cumulative effects of these cyclic loads, particularly from truck-induced wind pressures, can lead to fatigue cracking. Understanding their vibrational and dynamic behavior is therefore critical to ensuring long-term structural performance and safety. This research investigates the vibration response of overhead sign structures through advanced computational methods. Building on previous analytical and experimental studies of Variable Message Sign (VMS) truss systems and steel hollow-section portal frames, this work reviews prior research conducted on two large-span VMS structures for The Alabama Department of Transportation (ALDOT) and introduces finite element modeling of similar structures in Georgia. Since no comparable research appears to have been conducted in Georgia, this study provides an approximate analysis and foundational reference for such structures in the state. The study employs Finite Element Analysis (FEA) using Mecway software. Modal analysis was first performed to determine natural frequencies and vibration modes, followed by static analysis under wind-induced loading based on

AASHTO guidelines. A parametric study was then carried out by varying member sizes and configurations to assess the influence of geometric parameters on stiffness and frequency response. The results contribute to understanding how design modifications can enhance system resilience and improve overall structural performance. Beyond its technical focus, this project also serves an educational purpose by enriching undergraduate research experiences in structural engineering. It provides students with hands-on exposure to advanced FEA tools and dynamic analysis methods, strengthening their analytical and problem-solving skills while preparing them for graduate studies or professional practice in structural and research-oriented engineering.

From Manual to Machine: Leveraging Deep Learning for Safer Bridge Inspection

Poster #5 (Event Center)

9:00am – 9:45am

Undergraduate Student(s): Allen Yun

Research Mentor(s): Da Hu

The United States faces a critical challenge with its aging infrastructure, as nearly one in three bridges is considered structurally deficient. Millions of daily trips depend on these deteriorating structures, highlighting the urgent need for efficient and reliable inspection methods. Traditional manual bridge inspections are time-consuming, costly, and prone to human error, motivating the development of automated approaches. This study investigates the application of artificial intelligence (AI) and deep learning for detecting structural deterioration in steel bridges. A convolutional neural network (CNN) model was developed to identify cracks in steel components using visual data. A labeled dataset of crack images was collected from publicly available sources, and data augmentation and transfer learning techniques were employed to improve model generalization and robustness. Model performance was evaluated through accuracy and precision metrics, with iterative refinement to optimize results. The CNN demonstrated strong performance and effectively detected cracks in test images, indicating its potential to support faster, more accurate, and cost-efficient bridge inspections.

Wellstar College of Health and Human Services

Exercise Science and Sport Management

Overall and Individual CrossFit Open Workouts Have Differed Between Men and Women Across Every Year of the Competition's Existence

In-Person Oral Presentation (Wilson Student Center, Ballrooms)

3:00pm – 3:50pm

Undergraduate Student(s): Caralynn Doese

Research Mentor(s): Gerald Mangine & Adam Jajtner

To examine CrossFit® Open (CFO) workload requirements in men and women, official scores were collected for all competitors from 2011-2025. A stratified random sample of 500 men and 500 women (18-54 years), who surpassed a predefined minimum score on each workout, were selected from each year. Scores (completion time, repetition count, or load) were decomposed to find repetition counts for each exercise. Total concentric mechanical work (kg·m) was quantified based on each repetition count, prescribed loads (when applicable), and a standard model (man: 85.6 kg; 177 cm; woman: 62.6 kg; 164 cm) with proportional limb masses and lengths. Total work (sum of work for all exercises) and total work rate (total work divided by time, kg·m·min⁻¹) were calculated for all workouts, and then averaged and compared for each year via separate (sex x year) analyses of variance. Individual workouts were classified into three distinct bins via cluster analysis. Significant interactions ($p < 0.001$) revealed variable work and work rate requirements for men and women across each year. The 2025 CFO required the most work and highest work rate for men (+37,030-44,423 kg·m; +2,491-3,192 kg·m·min⁻¹) and women (+27,839-32,969 kg·m; +2,019-2,300 kg·m·min⁻¹) compared to all other years, whereas the least work and work rate varied (men: 2015, 7,089 ± 1,243 kg·m; 2023, 582 ± 71 kg·m·min⁻¹; women: 2016, 3,437 ± 538 kg·m; 2016, 283 ± 62 kg·m·min⁻¹). Three significantly ($p < 0.001$) different cluster ranges were found for men (Bin 1: 3,478-8,556 kg·m, 195-1,238 kg·m·min⁻¹; Bin 2: 8,793-19,310 kg·m, 517-1,839 kg·m·min⁻¹; Bin 3: 19,067-23,879 kg·m, 1,078-1,399 kg·m·min⁻¹) and women (Bin 1: 1,839-13,264 kg·m, 184-663 kg·m·min⁻¹; Bin 2: 3,003-15,965 kg·m, 675-1,048 kg·m·min⁻¹; Bin 3: 2,079-7,728 kg·m, 109-386 kg·m·min⁻¹). CFO workload requirements are different each year, and individual workout programming has led to different requirements for men and women. Their preparation and strategy should acknowledge and reflect these differences.

Health Promotion and Physical Education

Break the Cycle: Analyzing the Impact of Work Status and Stress on Happiness

Poster #25 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Traniece Brown

Research Mentor(s): Kevin Gittner

Happiness is one of the few things in this life that cannot be physically purchased, yet for many, pursuing it comes at a significant personal cost. Previous studies have highlighted the rising concerns about the cost of living and its detrimental impact on health and inequalities. This highlights the influence of often invisible external factors that gradually perpetuate a cycle of poorer health-related quality of life (HRQOL). In this analysis, I explore external factors, such as work status and stress, and their combined impact on emotional wellbeing, specifically happiness. The data used during this analysis consists of a dataset of 3000 respondents collected between 2019 and 2024. The data includes the following variables: country of the respondent, age of the respondent, gender, average hours of sleep per day, diet type/quality, exercise frequency, social interaction level, stress level, pre-diagnosis of a mental health condition, average hours of work per week, average hours of screen time per day, and happiness score. All these variables combined serve as indicators of HRQOL, specifically emotional wellness, occupational engagement, and life satisfaction. I hypothesize that those who work more hours per week combined with experiencing higher levels of stress will face heavier challenges with work-life balance; therefore, will experience lower happiness scores. Univariate analysis reveals a nearly uniform distribution of stress levels across the sample, with each category representing roughly a third of respondents. Happiness scores revealed a normal distribution, while work hours ranged from 20-59 per week. Exploratory data analysis using scatter plots indicates a clear inverse relationship with lower stress levels associated with higher happiness scores. In contrast, no meaningful correlation was found between work hours and happiness, indicated by a near-zero Pearson correlation coefficient. Future research could explore possible interventions that target stress reduction to enhance happiness and overall HRQOL.

Drinking Across the Divide: Rural and Metro Alcohol Consumption

Poster #2 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Courtney Eustache

Research Mentor(s): Kevin Gittner

Alcohol consumption remains a critical public health concern in the United States due to its relationship to negative health outcomes with chronic illnesses, injury, and preventable deaths. Alcohol use patterns can vary due to a variety of factors, one in particular, geographical locations such as whether a person lives in a Rural or Metro area. This study was created to

investigate whether the area a person lives affects how often they consume alcohol. It's hypothesized that there will be significant differences in how alcohol is consumed across a year in different counties. The data was obtained from the 2023 National Survey on Drug Use and Health (NSDUH), a national survey conducted on the Substance Abuse and Mental Health Services Administration (SAMHSA). The study focused on 4 key variables: county type, which described the type of area a person lived, Rural or Metro, the total number of days alcohol was consumed in the past 12 months, participant age, and whether the drink was consumed alone or with others. Individuals who fell under the age of 18 and participants who reported no alcohol use throughout the study were excluded. County type only categorizes participants as living in Rural or Metro areas, as this study is not interested in studying the specific type of Metro/Rural area. The exploratory data analysis revealed that participants consumed alcohol on an average of 78.82 days (SD = 90.26), with older adults consuming alcohol more frequently than younger adults. Most of the participants reported drinking socially, with 68.77% consuming alcohol with at least one other person rather than alone. Metro participants reported a slightly higher average of days of alcohol use compared to Rural participants. This analysis could help researchers identify high-risk groups and create prevention strategies to reduce negative alcohol use-related outcomes.

From Playgrounds to Health, Linking Physical Activity, BMI, and Diabetes in Kids

Poster #16 (Event Center)

4:00pm – 4:45pm

Undergraduate Student(s): Sakina Ahmed & Abisade Adetomiwa

Research Mentor(s): Kevin Gittner

Childhood obesity remains a critical public health issue in the United States, with strong links to diabetes and other chronic conditions. Body mass index (BMI) and physical activity are two key indicators of children's health, as they capture both risk and protective factors for long-term outcomes. Nationally representative datasets, such as the 2022-2023 National Survey of Children's Health (NSCH), provide valuable insights into patterns of BMI and physical activity among children aged 6-17 years. According to CDC, obesity prevalence continues to rise, while disparities in physical activity levels persist across demographic groups. Descriptive analyses of BMI and physical activity, alongside variables such as age and sex, help clarify how these factors interact and contribute to childhood health trajectories. This study uses NSCH data to examine BMI, physical activity, and their relationship with demographic variables. The findings will provide a clearer picture of child health behaviors and highlight patterns relevant for obesity prevention strategies. Additionally, examining disparities in physical activity and BMI across socioeconomic status, race, and geographic location can provide deeper insight into populations

at higher risk. Early childhood behaviors often track into adolescence and adulthood, highlighting the importance of identifying at risk groups early. By recognizing these patterns, public health practitioners and policymakers can design and implement targeted interventions that promote healthier lifestyles, reduce obesity prevalence, and ultimately decrease the long-term burden of chronic diseases across the population. In addition, integrating these findings with school and community based programs can enhance outreach efforts, foster sustainable behavioral changes, and ensure that resources are directed toward the children who need them most.

Relationship Between Smoking Status and Self-Rated Health A BRFSS 2023 Data Analysis

Poster #16 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Jonathan Fugar

Research Mentor(s): Kevin Gittner

Smoking remains one of the leading preventable causes of morbidity and mortality in the United States, with well-documented associations to cancer, cardiovascular disease, and respiratory illness. Self-rated health is a commonly used measure in population health research, strongly linked to morbidity and mortality outcomes . The Behavioral Risk Factor Surveillance System (BRFSS, 2023), a nationally representative survey of U.S. adults, provides a valuable opportunity to explore how smoking status influences health perceptions in a large and diverse population. Previous studies have shown that both current and former smokers tend to report worse self-rated health compared to those who have never smoked, reflecting the cumulative health consequences of tobacco use and its impact on quality of life . This study builds on existing research by using the most recent BRFSS data and incorporating important control variables, including age and body mass index (BMI), which are known to shape health outcomes and may confound the relationship between smoking and health perceptions. The analysis applies descriptive and comparative methods to examine distributions of smoking status, self-rated health, and their associations across demographic subgroups. Self-rated health was assessed both in its five-category form (excellent, very good, good, fair, poor) and in a binary classification (good/very good/excellent vs. fair/poor) . It is hypothesized that current and former smokers will report poorer self-rated health compared to those who have never smoked. Findings are expected to reinforce the connection between smoking and reduced health perceptions, underscoring the ongoing importance of tobacco prevention and cessation initiatives. Future research could build on this study by examining longitudinal changes in self-rated health among individuals who quit smoking, further informing strategies to reduce smoking-related disease burden.

Running from Risk: How Exercise and Alcohol Shape Diabetes in America

Poster #11 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Ebrima Sanyang

Research Mentor(s): Kevin Gittner

Type 2 Diabetes Mellitus is a leading chronic disease across the United States, affecting more than a total of 38 million adults. Lifestyle factors including one's physical activity and alcohol usage are modifiable behaviors that help influence diabetes risk and management. Understanding how these behaviors are associated with diabetes prevalence provides critical insight for developing targeted health interventions. This study examines the relationship between leisure time physical activity, alcohol consumption, and diabetes status among U.S. adults using data gathered from the 2022 Behavior risk factor surveillance system, by the Centers for Disease Control and Prevention. A cross sectional sample of adults aged 18 years and older was gathered and analysed for this investigation. Seven variables were selected for the analysis; diabetes status, leisure time/physical activity, average daily alcohol consumption, body mass index category, age group, education level, and sex. The respondents who reported gestational diabetes were excluded from the primary analysis of diabetes status but were examined separately for later comparison. The final sample represented a broad national distribution by age and sex. 53% female and 47% male. The preliminary descriptive analysis revealed a notable difference in diabetes prevalence across behavioural categories. Individuals engaging in regular physical activity showed lower diabetes rates, while patterns of alcohol use appeared more complex and dependent on context. This study highlights the protective role of physical activity in reducing diabetes risk, while underscoring the needs for nuanced understanding of alcohol's influence on chronic diseases. By examining these different behavioural factors within a large representative dataset, my findings will be able to support public health officials and departments to strategize, prioritising exercise promotion and including alcohol guidelines, as part of a comprehensive diabetes prevention program.

The Influence of COVID-19 in the U.S Emergency Department

Poster #27 (Event Center)

2:00pm – 2:45pm

Undergraduate Student(s): Christian Young

Research Mentor(s): Kevin Gittner

The exposure of COVID-19 has led to an increase in patients leaving the Emergency Department before meeting with a healthcare provider. The purpose of this research is to find and compare the correlation of increased patient discharges and how COVID-19 was a factor that played a role in the data. Research includes the number of patient visits, who left or didn't leave the hospital, and number of patients diagnosed with COVID-19 in the Emergency Department. The 2021

National Hospital Ambulatory Medical Care Survey (NHAMCS) was utilized to analyze the discharged Emergency Department visits with COVID-19 diagnosis. The patients were identified using the International Classification of Disease, 10th Revision, Clinical Modification (ICD-10-CM) code U07.1 to diagnose the coronavirus. The descriptive status was used to analyze the patient demographic and discharge status for further analysis. The (NHAMCS) investigates trends going on in the Emergency Department during COVID-19. The statistical analysis conducted the occurrence of COVID-19 and influenced patients who left without being seen. The results show that 2.8% of the patients were confirmed to be diagnosed with COVID-19. There was a significant relationship found between the patient wait time and an increased likelihood of leaving without being seen. The findings show both Coronavirus cases and an increase in waiting likely contribute to a higher rate of leaving without being seen. There is a strong relationship between the COVID-19 and early patient discharges, and the results will be represented through summary statistics and data models to analyze the increase of patients leaving before seeing a healthcare provider in the Emergency Department.

Nursing

Faculty Perspectives on Interprofessional Education: Insights from a Survey of KSU Health and Human Services Faculty

Poster #21 (Event Center)

11:00am – 11:45am

Undergraduate Student(s): Maria Maldonado

Research Mentor(s): Melissa Osborne, Kandice Porter, & Monica Nandan

Interprofessional education (IPE) is essential for preparing health and human service professional students to work collaboratively in real-world contexts, where teamwork is key for positive patient outcomes (Patel et al., 2025). This study examined current IPE practices of faculty from diverse professions at Kennesaw State University's Wellstar College of Health and Human Services and elicited their recommendations to identify effective strategies and opportunities for programmatic expansion. Faculty play a critical role in promoting IPE; however, Cimino et al. (2022) found that many faculty report limited experiences and low confidence in teaching interprofessional skills. Using a mixed-methods approach, the quantitative survey data from 15 faculty members across four departments were analyzed using descriptive statistics, while qualitative responses were examined through both deductive and inductive thematic analysis. Preliminary findings indicate that 40.0% of participants engaged in IPE through attending workshops or events, and 26.7% through independent learning. In teaching, faculty incorporated IPE into their courses by discussing its importance (33.3%) or by utilizing scenario-based/case-study learning (20.0%). Faculty expressed interest in expanding

IPE opportunities through interdisciplinary simulations (33.3%) and cross-program/course collaboration (26.7%). Sixty percent of participants expressed a need for resources or training to collaborate with professionals outside their discipline, and 53.3% requested support for facilitating IPE activities with students. These findings highlight both engagement and gaps in current IPE practices, underscoring the need for enhanced IPE-related supports. Understanding faculty perspectives can inform strategies to strengthen IPE implementation and better prepare students for effective teamwork in health and human service settings.

Measuring the Burden of Time in Oncology: A Literature Review Informing the Development of the Time Toxicity Index

Poster #26 (Event Center)

12:00pm – 12:45pm

Undergraduate Student(s): Isaac S. Kuhn

Research Mentor(s): Chinomso Nwozichi

Cancer care advancements have extended survival but introduced new burdens, including time toxicity. Time toxicity refers to the cumulative time patients spend receiving care, including travel, waiting, treatment, and recovery. While increasingly recognized, it remains poorly measured and underrepresented in oncology research. This review explores how time related burdens affect diagnosis, adherence, and quality of life, particularly among underserved populations. An integrative literature review was conducted using PubMed, MEDLINE, CINAHL, and Scopus to identify studies from the past five years examining time burden in adult cancer patients. Inclusion criteria required studies to focus on cancer care, patient experiences, and quality of life in relation to time investment. Sixteen studies were selected for thematic analysis, with a focus on informing development of the Time Toxicity Index. Five core themes emerged: the definition and measurement of time toxicity, its influence on patient and caregiver decision making, impact on quality of life and psychosocial outcomes, system level strategies for mitigation, and implications for research and policy. The findings show that patients often weigh time burden as heavily as clinical benefit, and caregivers also experience secondary time costs. Current measurement tools lack consistency and do not reflect the full scope of patient experience. Future research must incorporate in depth patient interviews to personalize and refine the Time Toxicity Index. These qualitative accounts will capture lived experiences, help identify disparities, and ensure the tool reflects diverse values and care contexts. A patient informed index can support shared decision making, improve treatment adherence, and guide policies aimed at minimizing unnecessary time burdens. Understanding and addressing time toxicity will be essential to advancing truly patient centered oncology care.

Preference Regarding Firearm Storage Education Messenger: A Cross-Sectional Study of U.S. Parents

Poster #8 (Event Center)

10:00am – 10:45am

Graduate Student(s): Caroline King

Research Mentor(s): Melissa Osborne & Lauren Matheny

Over 4.6 million children live in homes with firearms stored unlocked and loaded, despite evidence that secure storage substantially reduces risk of firearm injuries. Various professionals (e.g., healthcare providers, law enforcement [LE]) have communicated firearm storage education, and parents' receptivity varies depending on the source of the message. The purpose of this study is to examine firearm storage education messenger preferences overall and by firearm ownership status. We administered a survey with U.S. parents (N=768) recruited through Qualtrics Panels. Parents in 3 firearm ownership categories were recruited: (1) firearm owners (n=306), (2) non-owners with a household firearm owned by someone else (n=157), and (3) non-owners without a household firearm (n=305). We asked participants to select one professional who they would most prefer to receive firearm storage information from a list of 9 options. Analyses were conducted using chi-square tests of independence (SAS 9.4; Cary, NC). Law enforcement officers were the top messenger across all ownership groups, with no significant group differences, $\chi^2(1, N=768) = 2.20, p = .138$. Secondary preferences varied, with owners favoring messengers with proximity to firearms (e.g., gun shop owners over pediatricians). Specifically, 8.2% of non-owners versus 13.4% of firearm or household owners selected a gun shop owner, $\chi^2(1, N=768) = 4.94, p = .026$. LE is a highly preferred source of firearm storage education among parents. Aside from LE, firearm storage messenger preference varies by ownership. This study aids in our understanding of the sources from whom parents prefer to receive firearm safety education. In line with prior research, this study supports the idea that parents prefer messengers with expertise, trustworthiness, and knowledge regarding firearms, with LE ranked highly. By identifying differences in messenger preference, this research aims to inform strategies that enhance storage practices, connect with parents, and reduce firearm injury and death among children.

Prevention: Examining the Theory of Planned Behavior and Its Role in Promoting Firearm Safety in Households

Poster #26 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Allison Martinez & Sharon Pradeep

Research Mentor(s): Melissa Osborne

Firearm injury is the leading causes of death in children in the United States. Nearly 29% of unintentional firearm deaths among children occurred in those aged 0-5 years old (Miller et al., 2025). The Theory of Planned Behavior (TPB) includes three main constructs: attitudes, norms, and perceived behaviors. It assumes that individuals have full control over their actions. It is important to understand TPB in the context of prevention strategies for firearm related injuries. This study considers the factors that shape parents' choices and behaviors around safe firearm storage. We explored how parents' firearm storage behaviors can be described using the TPB. This study used a survey of 768 parents who were recruited through Qualtrics Panels, groups of both firearm owners and non-firearm owners. We descriptively examined storage behavior in the context of each of the TPB constructs. We found that 54% of parents reported that keeping firearms locked was "very good", while an additional 23% rated it as "good". Considering subjective norms, 47%, nearly half of respondents completely agreed that their friends would store firearms securely. Moreover, 63% stated they had complete control over their firearm, while 18% reported almost complete control. However, around 52% of parents explained that they leave guns unlocked and loaded but believed in their child's ability to recognize a real gun from a fake gun (Farah et al., 1999). Parents may be likely to safely store firearms safely when they value safety, feel peer support, and have confidence in their control. This study represents the initial step in linking the TPB to align with intervention strategies to tailor to encourage safe firearm storage and reduce preventable childhood injuries. Future research will follow the TPB constructs in relation to parents' intention to store firearms securely and inform intervention strategies.

Social Work & Human Services

An Overlooked Risk: A Cross-Sectional Study Examining Vehicle Firearm Storage to Reduce Youth Access and Injury

Poster #7 (Event Center)

3:00pm – 3:45pm

Undergraduate Student(s): Mai Vo & Brianne Opoku-Agyemang

Research Mentor(s): Melissa Osborne

Vehicle firearm storage is an often-overlooked pathway for firearm injuries among children, one that complements and sometimes compounds the risks from in home storage. While firearm safety research has traditionally focused on in home storage, far less is known about vehicle firearm storage as a method for unintended access and exposure. Using data from a large survey (N=768), this study examined vehicle storage practices among parents, carrying incidents, and incidental encounters. We found that 56.2% of parents reported keeping a firearm in their vehicle and of those, only 66.5% of them kept the firearm locked. By bringing vehicle storage into the conversation on firearm safety, this research highlights a critical gap in parent health behavior that requires proactive public health innovation. Addressing this alternative setting has

the potential to expand prevention efforts beyond the home, reduce preventable access, and ultimately save lives. This issue is particularly urgent in Georgia and across the South, where firearm ownership is common and unintentional injury rates exceed national averages, making vehicle storage a vital target for interventions that could reduce disparities and save lives.

Early Care - Lasting Impact

Virtual Presentation (Microsoft Teams)

2:00pm – 3:00pm

Undergraduate Student(s): Martine Dambrevil & Karina Gonzalez

Research Mentor(s): Kevin Gittner

Prenatal care has been shown to play a crucial role in the health of both mothers and babies. Research indicates that beginning care in the first trimester leads to better outcomes such as healthier birth weights and lower risks of complications, while delaying care increases risks such as preterm birth and low birth weight (CDC). Even though prenatal care is widely available in the United States, not all mothers receive it early, and differences depending on factors such as smoking, BMI, and access to healthcare. Examining these outcomes influenced helps highlight disparities among mothers who gave birth in 2024. Our study uses the CDC Natality Public Use File, offering a nationwide view of how prenatal care timing and other maternal characteristics connect to birth outcomes. The purpose of our study was to examine the impact of prenatal care and birth outcomes in 2024, using CDC' files of US births. We analyzed various key variables in order to examine if there was a difference in birth rate for mothers in 2024 who started prenatal care in their first trimester rather than their last. Our study researched and collected data on pregnant women in 2024 from their first trimester to their third. The research was done on women based on lab visits and surveys dependent on their daily life styles. We analyzed variables including maternal prenatal care, residence of birth, infant birth weight, cigarette smoking before and during pregnancy, and pregnancies resulting from infertility treatments. In conclusion we will use this data to determine what pregnant women should avoid during trimesters to have a healthy baby and PH researchers will use this data to determine prenatal care of women all throughout their trimesters in order to have a healthy mom and baby.

Uneven Burdens: COVID-19 Hospitalizations Across Urban and Rural Georgia

Poster #6 (Event Center)

1:00pm – 1:45pm

Undergraduate Student(s): Jacquelyn R. Rivers & Oyinkansola O. Soneye

Research Mentor(s): Kevin Gittner

This study examines COVID-19 hospitalization patterns across all 159 Georgia counties during 2022, a year when this pandemic was still new to healthcare systems that were still adjusting to new variants and changing public health strategies. The researchers used data from the Centers

for Disease Control and Prevention to analyze 79,757 COVID-19 cases, grouping them by four age categories (0 to 17, 18 to 49, 50 to 64, and 65 plus years) to better understand how age and location affected hospitalization rates. The main research question asks: How do age and county location influence COVID-19 hospitalization rates across Georgia's different types of communities during 2022? The dataset covers all twelve months of 2022, including the January spike from the Omicron variant. This data set shows that adults aged 18 to 49 made up the biggest share of cases, but how many people landed in the hospital varied quite a bit between age groups. There are also clear differences between urban counties like Fulton and rural ones like Lumpkin, pointing to gaps in healthcare access. The researchers expect to find that older adults (50 to 64 and 65 plus) had much higher hospitalization rates than younger people, with rural and urban areas showing different patterns based on their healthcare systems. The findings should help identify which age groups and counties faced the heaviest burden. This information can help Georgia's public health officials decide where to send resources, plan for emergencies, and create programs for at-risk populations. The study adds to what we know about how southeastern states handled the pandemic. Our future work could look at vaccination rates as well as comparing and contrasting different counties, and study how existing health problems affected outcomes. Overall, this research offers guidance for future and current public health officials by using this health emergency.