Abstract Guide
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Norris Second Floor Map
Designing a Novel Interactive RC Airplane Testbed for Aerospace Engineering Education

To bridge the gap between theoretical and practical aerospace engineering applications, this project aims to design a specialized "testbed" utilizing a modified remote-controlled (RC) airplane platform to facilitate interactive learning for a high school aerospace engineering course. The testbed facilitates rapid prototyping and testing of novel wing configurations through a platform that enables interchangeable wings and the dynamic measurement of various in-flight performance parameters. This approach enhances aerospace education by allowing students to observe firsthand how the design of airplane wings influences aerodynamic performance in a hands-on, cost-effective, and results-driven experimental setting. The methodology for designing and manufacturing the testbed included an iterative design process that involved developing computer-aided design (CAD) models. I utilized engineering software tools, including computational fluid dynamics (CFD) and finite element analysis (FEA), to determine the testbed's optimal weight, strength, and aerodynamic configuration, ensuring safe and reliable flight at low velocities. Initial testing indicates that the testbed meets the project's fundamental requirements for data transmission and flight capability, offering a simple manufacturing and usage protocol for high school students. The initial prototype successfully meets several primary needs, as it is a low-weight (one pound) testbed built at a cost of $400 with a communications range of up to 3 miles. Anticipated outcomes encompass enhanced educational results through experimentation and active learning, potentially fostering interest in aerospace careers and driving innovation in engineering education going forward.

Presentation Format: Oral
Time: 10:30am
Room: Armadillo Room
Number: 116
The Failures of Global Health Imagery: The Continuation of Colonialism in Global Health

The term "Global Health" gained substantial momentum in the early 2000s amid a burgeoning social movement in Western nations advocating for universal access to quality healthcare as a fundamental human right. Despite the initiation of decolonization in the mid-1950s and the establishment of humanitarian organizations, the past colonialistic tendencies of the Western world continues to persist in global health under the guise of "development." The internalized subjugation of global south communities is subtly portrayed through global health imagery. An analysis of the imagery utilized by the Bill and Melinda Gates Foundation and Partners In Health reveals the hypocrisy of such influential humanitarian organizations. The images reveal a shocking portrayal of the global south communities, usually in a demeaning comparison to their Caucasian counterparts, while also placing a visual emphasis on the Western leader’s "selfless" involvement in improving global health, appealing to the Western world’s white savior complex at the expense of the global south. Cultural awareness must be integrated into global health imagery, preventing the perception of health interventions from dehumanizing and reducing the lives of people of color. Alongside decolonization efforts, there must be an active endeavor to shift the focus and priority of global health interventions from Western interests to the lives of the people they aim to serve.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 259
Musculoskeletal Modeling of Locomotor Muscle Synergies in People Post-stroke

Post-stroke hemiparesis, defined as unilateral muscle weakness, significantly impacts walking ability resulting in step length and step time asymmetries, slower gait speeds, and greater metabolic cost. One way to understand the impact of hemiparesis on gait patterns is to use musculoskeletal modeling and predictive simulation to isolate the relationship between muscle weakness and gait dysfunction. My project aims to understand how differing patterns of muscle weakness affect gait by creating personalized musculoskeletal models to replicate the hemiparesis characteristics of nine post-stroke participants. We modified musculoskeletal models in OpenSim to match the peak muscle torques of the hip, knee, and ankle measured on post-stroke individuals. Then, we predicted the resulting gait asymmetries that emerge from each of the personalized models by performing optimal control simulations that seek to generate gait patterns which minimize the sum of the integrated muscle activations squared. Our results suggest that greater magnitudes of unilateral muscle weakness lead to greater step length and step time asymmetries, however the direction of the asymmetry depended on the patterns of muscle weakness. For example, several individuals had greater muscle strength for one or more joints on the paretic side compared with the non-paretic side. The predicted gait patterns for these models displayed negative step length asymmetries, while models with muscle weakness across all joints displayed positive step length asymmetries. These results may help explain the heterogeneous gait patterns in people post-stroke, where we have observed a wide range of either positive or negative step length asymmetries in people post-stroke.
Forward Genetic Screen for a GABA Exporter in Bacillus Subtilis

Biofilms are an association of bacteria that adhere to each other and form an extracellular matrix made of carbohydrates, proteins, lipids, and DNA. Biofilm signaling is largely mediated by small chemical messengers, which can impact community physiology and survival. Bacillus subtilis is a bacteria that is highly genetically tractable and serves as an ideal biofilm model, as well as a basic model organism for studying multicellular communication and cell development and specialization. B. subtilis biofilms produce a significant amount of γ-aminobutyric acid, an amino acid commonly thought of as a human neurotransmitter. Several genes involved in GABA metabolism have been identified in B. subtilis; however, there are no known GABA exporters. Yet preliminary data from our lab suggests such an exporter exists. To identify the protein responsible for GABA export in B. subtilis, forty genes were identified based on homology to known GABA exporters in other species. Mutants were made with each of the genes knocked out individually. These were grown with a fluorescent reporter that shines red in the presence of GABA. Removing the exporter gene will cause cells to accumulate GABA and have higher levels of fluorescence. Strains that appeared bright on the microscope were then sent for metabolite analysis where GABA levels were quantified. Knockout strains of the gene ybgF showed higher fluorescence under the microscope and higher GABA levels. Further experiments will be performed to validate if ybgF is a GABA exporter. Identification of a GABA exporter will help understand how biofilms regulate their communities.
It's important for children from minority groups to see themselves represented in the stories surrounding them. For this reason, I sought to analyze how Muslim youth are represented in middle-grade and young adult fiction-and what messages those stories communicate about their potential. In literature today, there's a trend toward portraying increasingly flawed characters for the sake of improving a reader's ability to relate to them. However, this approach to storytelling often overlooks the value of characters who are not only relatable but are also admirable. To investigate my question, I surveyed 20-30 middle-grade and young adult books with Muslim protagonists. I paid attention to what extent questions of identity drove the plot and made note of strategies for weaving Islamic values into compelling narratives. Many of these narratives began with characters who were adjusting to life in a new environment, which naturally propelled them to find ways to "fit in." Some characters took the route of total assimilation, even at the cost of core values. Others found the courage to stay firm in what they believed in. The latter scenario is especially valuable for Muslim youth to be exposed to. While character flaws are a great opportunity for demonstrating character development, in mainstream fiction, flaws are increasingly normalized as immutable parts of "who you are." These findings indicate a need for Muslim characters who do not simply reflect the status quo, but who are dynamic role models whom young readers can emulate.
The effect of musical tempo, genre, and mode on narrative listening

Recent research shows that narrative experiences while listening to music is common in different cultures (Margulis et al. 2019), but the musical features giving rise to this are still ripe for exploration. Our study takes musical genre as the foundation on which narrative generation during music listening is built; we then examine the influence of tempo and mode on this process. We also examined the difference between imagined scenes and narrative stories. Participants listened to two musical excerpts and record any stories they imagined in response to the music; the compositions were a piano arrangement of El Capitan (Sousa) and Waltz in Ab Op.31:1 (Chopin). Participants heard one version of each excerpt drawn from a 2 (mode, major/minor) x 3 (tempo, original/1.5x/0.66x) set of variants. Results (n=36) show a significant main effect of tempo on ease of narrative generation, as well as an interaction with genre. Participants who listened to the excerpts at the original tempo produced more stories (p=0.031) with greater ease (p=0.01). There was no significant effect of mode or genre on ease of narrative generation. These stories were also more vivid at the original tempo (p=0.009). We hypothesize that our results with respect to tempo are primarily due to participants’ previous experiences with the genres; if pieces were too fast or too slow it was difficult to recall memories with similar pieces, but they were familiar with marches and waltzes in both modes.
Teacher Learning Communities: Its Impacts on Equitable Education

Sustained researcher partnerships between school districts and universities have recently allowed more thoughtful research supporting effective educational practices. Through my work in the Destin Lab, we tested the effects of different professional development opportunities on teachers' beliefs and behaviors related to their students, particularly among students from lower socioeconomic status backgrounds and students of color. As an Emerging Scholar, I explored my interest in teacher experiences by thematically coding Evanston/Skokie District 65 teacher feedback on a professional development opportunity, analyzing their engagement and classroom pedagogies. Throughout the school year, I became involved with the development of the research partnership between Northwestern University and the local school district, also known as The Northwestern-Evanston Education Research Alliance (NEERA). I worked with a local middle school, alongside a postdoctoral researcher, to establish teacher-learning communities, where I facilitated sessions where teachers shared their teaching experiences and strategies. I listened to their concerns and wants for their classroom experiences, and turned their suggestions into student interventions. I adapted a four-week initiative that helped students think about their future selves and goals as middle school students. I developed facilitator guides and student worksheets in partnership with teachers to ensure we use each others' expertise in creating effective educational resources. These partnerships demonstrate a future of providing a space for multiple qualified education voices to collaborate to fill educational inequities. Future research should be done to learn more about teacher self-efficacy and teacher-teacher relationships in these learning communities, which I plan to explore this upcoming summer.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 175
The Acculturative Foodways and Gut Microbiomes of Korean Americans in the New York Metropolitan Area

Korean immigrants experience tensions between acculturation and preserving cultural identity when navigating the food environment of the United States. Few studies have captured this push-and-pull dynamic that characterizes a uniquely Korean American experience. This mixed-methods study aims to determine how Korean immigrants access culturally appropriate food while navigating the American food-based environment. I use the human gut microbiome as an analytical tool to understand the physical embodiment of these relationships. 34 Korean American adults in New York and New Jersey completed food frequency questionnaires, acculturation surveys, and submitted a fecal sample. A subsample of respondents (n = 6) were invited to an interview to discuss themes related to immigration experience and food preferences. American food was a way to integrate into their workforce. Consumption frequency of American sweets was significantly associated with decreased microbial diversity (p = 0.03), suggesting that gut microbial changes may influence Korean immigrant health. Korean food was a defining attribute of the family in America. Consumption frequency of seaweed (p = 0.03) was significantly associated with increased microbial diversity, providing support for the preservation of Korean heritage foods. How often interlocutors frequented Korean grocery stores differed significantly in association with microbial composition (p = 0.04), calling for greater access to Korean grocery stores in the U.S., potentially for smaller Korean American enclaves. This study reveals the dynamic dietary acculturative experiences of Korean American immigrants. Results will be shared with community stakeholders (Korean Community Services), which may guide future research within the Korean diaspora community.
Investigating Individual Differences in Block Assembly Strategies

Spatial cognition involves encoding the position, orientation, dimensions, and location of objects in relation to each other (Newcombe & Shipley, 2015). A common assessment for spatial ability is the Block Design Task (BDT), which requires participants to use colored blocks to recreate a design presented (Dunn et al., 2021). Rather than focusing on the traditional measurement of time and accuracy, we identified and categorized specific strategies that were used to perform the BDT. These patterns were observed from 76 undergraduates who completed seven BDT tasks. Specifically, the study examined the placement of 3-4 blocks. By coding videos of participants’ block building, we identified differences in their strategies and classified them into four categories: row-by-row, column-by-column, four corners, and sub-design. We believe that the patterns identified are due to many factors, such as the participants’ educational and language backgrounds, and how they process each design. Going forward, we hope to further explore differences in strategies employed for the remaining blocks, as well as the influence of presentation order on results, in order to further understand procedural differences in spatial assembly. As a part of a larger ongoing study, using the BDT to understand individual differences in block building strategies will allow for a better understanding of problem solving methods and a further understanding of spatial ability.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 427
Assessing Biocide Efficacy in Inhibiting Growth and Reducing Viability of Microorganisms in Biodiesel

In recent years, biofuels have emerged as a promising alternative to conventional petroleum-based fuels, offering solutions to both environmental and energy security challenges. However, the increased adoption of biofuels, particularly biodiesel, has led to growing concerns regarding microbial contamination of storage tanks, which recent research has suggested contributes significantly to corrosion and fuel degradation within these tanks. This study investigates the efficacy of the widely used biocide BioBor JF in inhibiting microbial growth and reducing cell viability in established microbial communities within biodiesel, focusing on microorganisms previously identified to be key contributors to microbially induced corrosion: *Paecilomyces*, *Wickerhamomyces*, and *Gluconacetobacter*. With BioBor JF being the predominant choice for microbial control in biodiesel storage tanks and the expanding utilization of biofuels, ensuring the effectiveness of such control measures becomes imperative. However, results from this study indicate limited effectiveness of BioBor JF in inhibiting microbial growth and reducing cell viability, particularly when targeting Paecilomyces and Wickerhamomyces. Gluconacetobacter exhibits a more significant response to biocide treatment, albeit with limited effectiveness in reducing established microbial communities. Future research directions include exploring alternative biocides and microbial control strategies and evaluating the impact of microbial growth inhibition on steel corrosion in biodiesel storage tanks. This study underscores the critical need for comprehensive approaches to mitigate microbial contamination and ensure the integrity of biodiesel storage infrastructure.
Non-Traditional Recumbent Tricycle Steering

This research focuses on developing a steering system for recumbent tricycles, specifically designed to improve accessibility for individuals with limited upper body mobility. The study evaluates various sensors to effectively translate human motion into precise steering control. A touch sensor, characterized by its 10 interval precision, was identified as the most efficient, providing quick response and high accuracy, while avoiding issues such as overshooting or settling time. This is in contrast to the joystick, which demonstrated excessive sensitivity and lower precision. The integration of mechanical engineering and computer science in this research presents significant implications for recreational therapy and accessibility. It offers innovative solutions that not only enhance the functionality of recumbent tricycles but also contribute to the broader field of assistive technology. The findings of this study can be used as a starting point in advancing the design of accessible recreational vehicles, emphasizing the need for multidisciplinary approaches to address mobility challenges and improve the quality of life for individuals with physical limitations. This research highlights the potential of adaptive technologies in creating inclusive environments and empowering individuals through improved access to recreational activities.
All or Nothing: Exploring Asymmetric Information and Resource Sustainability

This thesis investigates how different asymmetric information structures impact cooperation and strategy in communal resource sharing scenarios. 176 participants played a resource allocation game involving three players, with varying degrees of information transparency. Findings suggest that total visibility or complete lack thereof fosters optimal cooperation, while partial information leads to suboptimal colluding outcomes. Specifically, free-rider behavior is observed in scenarios where participants believe other players are colluding without them, leading to increased token extraction. These findings suggest that half-hearted coordination efforts may be less effective than no coordination at all, highlighting the importance of comprehensive and committed collective action. By understanding these underlying mechanisms, researchers can gain valuable insights into how to design more effective interventions to promote cooperation and collective action.
A Symphony of Binary Black Hole Collisions: Studying Cosmic Noon with Gravitational Wave Backgrounds

When two black holes merge, they radiate enormous amounts of energy through invisible gravitational waves (GWs). These waves spread across the Universe at the speed of light, shrinking and stretching spacetime itself. Special detectors on Earth, such as the Laser Interferometer Gravitational-wave Observatory (LIGO) measure these waves by determining the relative length difference between the perpendicular 4-kilometer arms of the detector as the GWs pass through them. The yield of this measurement is called strain, which can be simulated and compared to Einstein’s general relativity predictions for distinct binary black hole (BBH) coalescences. The statistical analysis method of Bayesian inference allows for estimating properties of the BBHs such as mass, distance, spin, etc. Although LIGO detects many individually resolvable GW events, those that are either too weak or too far to be confirmed individually, produce a stochastic-or random-background that lets us study and characterize a population of black hole mergers. In this investigation, we simulated a whole symphony of GWs to investigate where the information about this population is coming from. In addition, using a technique called hierarchical Bayesian inference, we infer the distribution of distances where these collisions are occurring. This gives us a glimpse at Cosmic Noon, the time when the most stars were forming in our universe, and what the farthest BBH mergers detectable to us are.
Fostering AI Literacy Amongst Middle Schoolers through Unplugged Activities

(I still wish to revise the abstract before the May 12 final deadline)

As AI becomes increasingly entrenched in the everyday lives of the youth, there is a growing need for the rapid development of K-12 AI learning resources to help engage the youth in discussions around AI and their personal relationship to it. The project is guided by the question of how can we design a set of unplugged activities that empower young adolescent learners to learn about AI through the lens of their own bodies and identities? Thus, the project's goal is to design unplugged (low-tech, paper-based) activities to foster AI literacy amongst middle-school age students. The activities focus on embodied interaction and personal identity as we are engaging middle schoolers who are in the critical process of forming their identities and self-perception while interacting with AI technologies. These activities will function as standalone lessons with detailed instructions and learning objectives that humanities teachers can easily insert into their curriculum. Examples of the current activities being developed will be shown and explained, along with their connection to personal identity & embodied interaction.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 422
Two Studies on Trait Mindfulness, Self-Compassion, and Affective Polarization

Recent research has sought to explore interventions and correlates of affective polarization, the difference between one’s feelings towards their political in-group and their political out-group. The present research explores the relationships between trait mindfulness and self-compassion and a set of affective polarization measures including the canonical “feelings thermometer” as well as “social-distance” items (items measuring willingness to be socially close to members of the out-party) in 2 studies. Study 1 found that trait mindfulness was significantly correlated with “social-distance” measures among both Democrats and Republicans, but not with the canonical feelings thermometer or a “trust” measure. Correlations between the “social distance” items and mindfulness, but not feelings thermometer or trust measure were replicated for Democrats in study 2. There was no significant relationship among Republicans, likely due to a very small sample size. This pattern persisted with a new social distance item and the trait self-compassion measure. The findings suggest that trait mindfulness and self-compassion may be related to willingness to interact with members of the out-party on a personal level, but not the difference between feelings towards in-party versus out-party members broadly. This interpretation is consistent with previous findings that feelings towards members of one’s out-party on an individual level differ from feelings towards the party as a whole or a broad schema of out-party members.
Nothing is Fiction, Everything is Reality: Perspectives on Demons and Spirits in Tibetan Buddhism

This interview-based project investigated perspectives on demons and spirits in Boudha and the Solokhombu valley. It focused on a philosophical understanding of the nature of demons, their role in practice, and implications for culture and worldview. Machig’s explanation served as the basis for a textual understanding of demons and Tibetan Buddhism. The literature review also included a summary of anthropological findings regarding demons and spirits in Tibetan medicine and lay perspectives and applications of practice for a Western audience. Findings conveyed the multifaceted nature of demons in Tibetan Buddhism with a focus on the Tibetan word bdud, illustrating the limitations of the English translation as "demon." They also cover the role of these conceptions in the practice of monastics and laypeople. The findings concluded with an analysis of the relationship between demons and spirits with Tibetan Buddhist philosophy on the nature of reality and its larger implications for differences between Tibetan and Western intellectual traditions.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 505
Help Employees to Help Businesses

Many employees rely on their employers for healthcare coverage and family building assistance because of the lack of universal healthcare in the United States. However, many CEOs don’t see the benefit of offering high quality assistance, and instead see it as a waste of money. The research that I conducted last summer focused on the importance of employee benefits such as Paid Family Leave, Contraceptive Coverage, and Comprehensive Healthcare. As an Emerging Scholar, I analyzed articles that compared numerous large corporations on their ability to secure top talent, productivity, and monetary gain-through the lens of what benefits they provide their employees. I found that many of these benefits-that the CEOs of large corporations see as a waste of money-actually improve many important aspects of their businesses. For example, even though studies have shown that providing paid sick leave saves employers a collective $2.4 billion in productivity losses per year, 34 million workers still do not have access to paid sick leave. I organized my findings into brief and comprehensive one-pagers that focused on how providing these benefits would improve businesses. These one-pagers were constructed with the intention to equip lower level employees-like HR personnel-with a brief overview of why providing these benefits to employees would improve a business. I hope that-equipped with this one-pager-these lower level employees will be more confident and effective when approaching their bosses to ask for high quality benefits and hopefully ignite positive change in their organizations.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 180
Oasis: Using a Dynamic Reward to Study Planning in Mice

Planning is a crucial ability used by mammals to analyze future states of the environment. While previous behavioral paradigms, such as T-mazes and radial arm mazes, have been traditionally used to study this behavior, they fail to model the complex and dynamic spaces and aversive/appetitive agents around which animals normally have to plan. Therefore, we previously developed a task called BotEvade, where mice were tasked to receive water at fixed locations while navigating a large arena filled with obstacles and a robot predator that gave aversive air puffs. While we found evidence of novel behavior, we observed limited mouse-robot interactions, resulting in stereotyped trajectories through the arena. To enhance the dynamic and interactive nature of the task, we created an obstacle with a self-contained water delivery system. By integrating these reward-delivering modules, we developed a new task with a dynamic threat and a dynamic reward we call “Oasis”. Mice have to search among a set of occlusions in order to find a water reward given by a randomly selected module. Unexpectedly, we found evidence of stereotyped paths even with a robot predator present. However, compared to BotEvade, the Oasis task was associated with an increased number of robot interactions, greater coverage of the environment, and lower running speed, suggesting that dynamic rewards can influence behavior. Like BotEvade, we also observed evidence of behavior where mice “peeked” around obstacles. Overall, this setup represents a dynamic task with more naturalistic conditions related to foraging in the presence of a dynamic threat.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 432
Poetry Creating a Pathway to the Past

The purpose of my project is to show Black women the power their voices hold by highlighting the voices of Black women who came before them. Since Black social movement scholarship has primarily focused on Black male activists I wanted to center the voices of Black female activists on a local level. I chose poetry as a medium so it would be accessible and first-person poetry specifically to make it more relatable. Inspired by works like And We Rise: The Civil Rights Movement in Poems and Blood Dazzler, I noticed a gap in first-person poetry from local activists during the civil rights era. During my 8 weeks of research I used oral histories and interviews, searched archives for photographs and letters, and explored poems and books. While observing the oral histories it was important for me to take note of the repeated phrases they used and how spirituality played a role in their lives for example, Septima Poinsette Clark saying "you know" as she is telling a story, and Claudette Colvin, reciting Psalm 23 in jail. Throughout my research I aimed to bring to life these women’s stories by immersing myself in the information I could find on them. I wanted to show Black women the power they hold by connecting them to their ancestral lineage. This work underscores the importance of centering local Black women in discussions of the civil rights movement, recognizing that change was driven by a diverse array of individuals beyond the well-known figures.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 425
The Effects of Overconfidence on Academic Achievement

Research has consistently found that humans are often overconfident in their abilities (Moore and Healy, 2008). Some research has studied the application of overconfidence in academic settings, which can influence factors such as how long a person studies and how they feel about their academic performance (Magnus and Peresetsky, 2018). The goal of the current research is to investigate the factors that influence a college-aged student's confidence levels and how confidence levels influence academic performance. This study also aims to determine if the level of difficulty of material, and knowledge of the performance of others influences an individual's confidence levels and performance. Through an online trivia-based survey, college-aged students were asked to self-report their abilities and confidence levels before and after questions that differed in difficulty. Some participants were informed of how others scored, while other participants were not. The findings indicated that there was no statistically significant difference in participant's levels of confidence and perceived performance due to knowledge of other’s performance. However, there was a positive correlation between people’s performance and confidence, as well as performance and GPA. Finally, it was observed that males were more confident in their performance at the end of the test compared to females, which is in line with this group scoring higher overall on the assessment. The results from this study can provide knowledge to students and educators alike, including whether awareness of others’ performance impacts success, factors that influence confidence levels, and how past academic results influence subsequent confidence and performance.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 355
The Relationship Between Identity and Psychopathology in Late Childhood and Early Adolescence

The rise in adolescent psychopathology symptoms has led to substantial research on older adolescents and young adults in order to understand potential predictors such as identity development based on factors like race/ethnicity, SES, and sex. However, less is known about the relationship between identity and psychopathology and potential factors in younger populations despite intervention efforts being targeted during middle childhood. The current study aimed to understand this relationship. The sample included 184 children ($M_{\text{age}} = 11.95$, $SD = 1.02$) who were assessed on their identity processes and their psychopathology symptoms. Ruminative Exploration and Commitment Making were positive predictors of Internalizing Psychopathology with ruminative exploration also being a positive predictor of Aggressive Behavior. Exploration in Depth was a negative predictor of Somatic Complaints. None of the demographic factors significantly impacted the relationships. These findings suggest that changes aimed at reducing maladaptive outcomes should focus on promoting the thorough evaluation of positive identities instead of simply fostering exploration and commitment of potentially problematic identities.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 418
Skin acts as a semi-permeable protective barrier that regulates insensible water loss, which mainly results from passive diffusion of water vapor through the epidermis, the skin’s top layer [1]. The importance of characterizing ions and amino acids present in transepidermal water loss (TEWL) is significant, as the levels of these molecules can correlate to and potentially prevent skin diseases associated with dry and flaky skin, such as xerosis cutis, atopic dermatitis, and psoriasis. The dryness and flakiness is caused by lowered levels of stratum corneum amino acids, which are natural moisturizing factors [2]. These amino acids maintain moisture within the stratum corneum, decreasing loss of TEWL into the ambient atmosphere. By measuring TEWL volume and amino acid levels, one can then predict if the skin will become dry and flaky, increasing the risk of becoming diseased. Thus, this research study aimed to create a device that can optimally collect TEWL and sense the levels of molecules correlated to skin health to allow for non-invasive early skin disease detection. These devices were developed using a polydimethylsiloxane base and different architectures were explored to optimize efficiency of TEWL collection. By incorporating microposts into the device architecture and placing a cooling hydrogel atop the device, a direct condensation continuous collection process was developed. Ion chromatography mass spectrometry and nuclear magnetic resonance were used along with an Alanine ELISA kit to determine the presence of chloride, fluoride, lactate, and Alanine in the TEWL samples.
Testing the Feasibility of Using Acoustic Sensors for Bubble Detection for the Scintillating Bubble Chamber Experiment

The mystery of dark matter continues to elude physicists despite it being five times more prominent in the universe than ordinary matter, by mass. By searching for reactions between normal and dark matter, we can receive clues and narrow down the possibilities of its mystery. The Fermilab Scintillating Bubble Chamber (SBC) experiment aims to detect these reactions by observing bubbles in a superheated liquid. However, the cameras used to trigger data collection from internal systems interfere with other optical systems. This study explores the feasibility of using piezoelectric acoustic sensors as an alternative to cameras for identifying bubble formation. An apparatus was built to place the piezo into a cryo-chamber that simulates the temperature (~100 K) and pressure (~20 atm) conditions of the SBC. After installing the piezo into the cryo-chamber, the chamber was filled with liquid CF4, and the sensor was connected to acoustic digitization software. The cryo-chamber was subjected to controlled impacts with a metal piece, generating a reproducible acoustic signal. Various background noise and controlled impact samples were collected at pressures between 1 and 20 atmospheres and visualized as spectrograms. The spectrograms displayed distinct patterns between impact and background noise, suggesting the potential for a deep-learning audio classifier to differentiate bubble signatures. This study concludes that it is indeed feasible to use piezos to eliminate the SBC's current reliance on optical imaging. Future research will concentrate on developing the audio classifier to enhance bubble detection efficiency, thereby enhancing the SBC experiment's capacity to explore dark matter interactions.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 556
Isabella Candal

The Effects of Membrane Fluidity on Membrane Protein Folding

Cell membranes serve to create a barrier between the cell and its environment with a bilayer composed of phospholipids and proteins. The composition of a membrane affects the biophysical properties of the membrane, including the ability of the membrane to stretch and enable lateral movement of lipids. The extent to which membrane fluidity affects membrane protein folding remains largely unknown. Membrane fluidity is essential in determining the activity of membrane proteins. To study the effects of membrane unsaturation on membrane protein folding, we employed a genetically modified strain of Escherichia coli that allows for the titratable expression of variable levels of Unsaturated Fatty Acids (UFA) between a range of 15-80%. This project consists of expressing several fluorescently tagged membrane proteins in the E.coli cells with a specific, rhamnose-dependent, plasmid construct and monitoring the fluorescence as a measure of folding efficiency with varying levels of UFA content. With the construction of spheroplasts, further analysis of protein folding with fluorescence microscopy and flow cytometry was achieved. Preliminary results indicate that the percent UFA content alters protein folding and the membrane fluidity level impacts the growth rate of the cells. In an exploration of the role of biophysical properties of membranes on inner membrane protein folding, the objective in the long-term is to identify new strategies to affect protein synthesis and activity in bacterial cells, possibly altering the bacteria’s ability to grow and be infectious. With this new knowledge, we could develop relevant therapeutics targeting membrane proteins.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 521
Political scientists studying nation-states have generally defined modern states as centralized organizations that monopolize the legitimate means of violence within a territory. In addition, sociologists have increasingly argued that modern states also expropriate the legitimate means of movement from demos, i.e., the people. To these ends, undocumented statuses emerge as state-constructed signifiers imposed upon individuals not licensed to freely exercise their movement within the geopolitical borders of modern nation-states. This research project explores what tenuous legal statuses signify and the interests they serve to modern nation-states. I argue that the legal production of undocumented status codifies vulnerability into the law and thus serves the interests of racial capitalism within modern nation-states, such as the United States. As a form of structural vulnerability, undocumented immigrant communities disproportionately work low-wage occupations and endure impoverishment. To maximize the opulence of modern nation states, capitalist structures must exploit vulnerable and often racialized segments of demos. Lastly, undocumented status functions as a significant structural inhibitor as it constrains individuals’ movements and overall opportunities. Ultimately, this project expands scholarly understandings from legal statuses and alternative state-constructed labels to instead center the production of vulnerabilities and invariable capitalistic desires to exploit such vulnerabilities writ large.
Rabbis and Rabble-'Rousers: A Comparative Analysis of Mid-to-Late-20th Century Jewish Activism in the US and South Africa

A comparative-historical analysis of Jewish activism in the mid to late 20th century between the US and South Africa, my study seeks to answer what explains the initially disproportionate representation in both cases as well as the divergence between the levels of involvement. I argue the significance of three cultural factors and the role of exogenous events as the primary determinants of Jewish activism. The tradition of a socio-cultural approach to social movements motivates me to find three factors oriented at collective memories of the past and conceptions of the future of the Jews in each country. In addition, the different perspectives of the 1967 6-day war are found to offer further reasoning for the divergent outcomes. Data are composed of memoirs of prominent individuals and surveys of Jewish organizations that were involved in the movements. The presence of initially similar and progressively divergent outcomes allows for use of the methods of agreement and difference for analysis.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 260
Identifying Epigenetic Influences on Drug Response: MethQTL and eQTM Analyses in African American Hepatocytes

Precision medicine promises to improve patient outcomes by personalizing care to an individual's specific genetic makeup. Because variability in gene expression contributes to differences in drug response, clarifying the roles of genetic and epigenetic variation in regulating gene expression, specifically in genes related to pharmacokinetics, is critical to advancing precision medicine. Because DNA methylation patterns differ between racial groups, epigenomic studies must be performed on diverse cohorts to account for population-specific effects. Methylation quantitative trait loci (methQTL) analysis identifies SNPs associated with changes in DNA methylation at CpG sites across the genome. Similarly, expression quantitative trait methylation (eQTM) analysis identifies CpG sites associated with changes in gene expression. We performed methQTL and eQTM analyses on 78 hepatocyte samples derived from African American donors to identify SNPs associated with differential methylation and methylation sites associated with gene expression in this population. We identified 18,209 SNPs affecting methylation across the genome and 1,017 CpG sites associated with differential gene expression. Of particular interest is the association of rs1332018, a 5' UTR SNP, with methylation differences at 6 promoter CpG sites that affect the expression of GSTM3, an enzyme involved in the detoxification of several drugs. This SNP has large differences in allele frequency and linkage disequilibrium between populations. This study's use of African American samples demonstrates that multi-omic analysis in minority populations can identify factors (genetic and epigenetic) that may affect the pharmacokinetics of currently used drugs. Many of these factors are population-specific and may explain differences in drug response between populations.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 503
Favoritism, Stress, and Clout Chasing: Conservatory Experiences of Music Performance

Several studies have found negative health and social implications of being a music major in a music conservatory (Roy et al., 2016; Schneider & Chesky, 2011; Young et al., 2013). Therefore, especially since conservatories have unique academic and social characteristics in higher education spaces, students’ experiences in conservatory culture - including how these spaces are perceived, navigated, and influential - are worth exploring. Thus, this project seeks to answer the following research question: “How does being a music performance major in a conservatory program impact students’ identity, well-being, and social relationships?”. This case study was conducted in the context of the Bienen School of Music at Northwestern University. 15 music performance majors were interviewed about their academic and interpersonal experiences at the school, with their responses qualitatively coded using a grounded theory approach. Analyses indicated that: 1) The conservatory environment fosters tight-knit relationships experienced in both positive and negative ways. For example, students claim most of their friends are affiliated with the conservatory, but that these close relationships can feel overwhelming.; 2) The conservatory reinforces a sense of scarcity in the classical music world given limited jobs and opportunities. This encourages an emphasis on skill level and interpersonal comparisons that often come with negative mental health implications.; 3) Conservatory study brought new expectations that influenced students’ relationships with music. As a result, some students realized that they didn’t want to pursue music professionally in the future, which came with feelings of identity loss and confusion. These findings provide insight into specific factors that are challenging for students within conservatory study, providing implications for future music education policy and research.

Presentation Format: Oral
Time: 12:30pm
Room: Armadillo Room
Number: 174
Design and synthesis of a nitrogen-free spin-correlated radical pair

Photogenerated electronic spins in molecules have become a promising platform to utilize as quantum bits. An organic spin-correlated radical pair (SCRP) consisting of an electron donor and an electron acceptor is one such system that has the potential for quantum computation and sensing. Previous work has demonstrated that following photoexcitation, spin coherence of a photogenerated radical pair could be maintained for hundreds of nanoseconds by using conjugated donors like phenothiazine and acceptors like naphthalene-1,8:4,5-bis-(dicarboximide). However, these and other commonly used donors/acceptors are nitrogen-containing radical species that possess a large amount of spin density on their nitrogen atoms, leading to strong electron-nuclear coupling that degrades the resolution of the SCRP electron paramagnetic resonance (EPR) spectra, preventing selective addressability of each qubit in the entangled pair. Herein, nitrogen-free electron donor perylene (Per) and acceptor pyrene-4,5,9,10-tetraone (PTO) were found to be suitable for constructing the SCRP, where the formation of the radical pair following photoexcitation is energetically feasible based on their redox potentials and emission spectra. Their respective absorbance spectra also allow for selective excitation of the donor or acceptor, preventing complications in analyzing the excited state dynamics from co-excitation. The new SCRP with a Per-Bridge-PTO structure was successfully made from readily available starting materials in 12 steps. The system was characterized by femtosecond and nanosecond transient absorption spectroscopy, which revealed the charge separation and recombination kinetics of the photogenerated radical pair. These results confirm the potential of the new SCRP to be used as a quantum bit system in further QIS studies.
Simulation Study of Average Convergence Rates of Self Healing Distributed Optimization Algorithm

In networked systems, distributed optimization is crucial due to the impracticality of centralized solutions in applications such as drone swarms, sensor networks, or distributed machine learning. This study investigates the efficacy of a novel self-healing distributed optimization algorithm designed to converge under node failures and high packet loss conditions. We simulated the algorithm on logistic regression problems across various network topologies, focusing on how network connectivity, node degree, and packet loss affect convergence rates.

Using the Julia package Graphs.jl, we generated graphs using Random Hyperbolic Geometric, Barabasi-Albert, Erdos-Renyi, and Watts-Strogatz models. Our methodology explored the impact of the Laplacian-based connectivity parameter sigma ($\sigma$) by adjusting it through scaling edge weights and altering graph topology.

Results indicated that the algorithm’s performance, particularly its average convergence rate, is primarily influenced by the network’s connectivity parameter rather than the number of nodes or their degree. Higher $\sigma$ values, indicating less connected networks, were found to slow the convergence rate. The algorithm exhibited roughly double the efficiency in average cases compared to worst-case theoretical bounds. In addition, the algorithm demonstrated significant resilience to packet loss, maintaining performance with a linear relationship between packet loss probability and convergence rate, showing robustness even at packet loss probabilities exceeding 0.8, far beyond typical thresholds where conventional methods would falter. Notably, the algorithm exhibited phase change properties for convergence times at low sigma values, but the underlying causes are yet to be understood.

Future research may extend to larger datasets and asynchronous implementations to enhance the algorithm’s scalability and efficiency. Refining parameter optimization could further improve performance across various operational conditions.
Investigating the Role of Oncometabolite L-2-hydroxyglutarate in the Chemoresistance of Glioblastoma Temozolomide Therapy

Glioblastoma multiforme (GBM) is the most common primary brain tumor and remains a devastatingly incurable disease despite multimodal treatment with radiation, chemotherapy with temozolomide (TMZ), and maximal safe surgical resection. It is known TET enzymes (TET1/2/3), a family of ten-eleven translocation (TET) methylcytosine dioxygenases that belong to the αKG-dependent dioxygenases superfamily play a critical role in DNA demethylation and GBM pathology. Specifically, TET2 expression is significantly decreased in GBM and is associated with poorer survival. Previous studies have shown that tumor-derived IDH1/2 reduces the production of α-KG for L-2-hydroxyglutarate (L-2-HG) and D-2-hydroxyglutarate (D-2-HG), and that inhibition of some α-KG-dependent dioxygenases by L-2-HG is 5x-10x more potent than D-2-HG. However, the mechanism for TET2 inhibition remains elusive. Western-blot analysis of TET2 expression was performed after treating multiple GBM cell lines (GBM43 and U251) with L-2-HG, D-2-HG under standard timepoints of 3hr, 6hr, 12hr, 24hr, 48hr, and 72hr. TET2 was found to be differentially regulated by L-2-HG and D-2-HG and time-dependent. TET2 expression was lower in L-2-HG compared to the D-2-HG condition up to 12hr. At the 12hr timepoint, TET2 expression was equalized. After the 12hr timepoint, TET2 expression was higher in the L-2-HG condition. Further Western-blot analysis of stemness protein expression (Notch1/Notch3/Sox2/Nanog) showed that L-2-HG increases stemness protein expression more than D-2-HG. These results suggest TET2 inhibition increases stemness contributing to chemoresistance. Thus, understanding 2-HG as an inhibitor of TET2 in GBM cell lines may elucidate epigenetic modifications involved in chemoresistance, ultimately informing novel treatments that improve patient outcomes.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 394
Understanding the Role of Interpersonal mindfulness and Other Foundations of Healing in a Traditional Chinese Medicine encounter: A Qualitative Study

To explore ways in which interpersonal mindfulness and other foundations of healing are manifested during the TCM encounter and how they may affect the practitioner-patient relationship and support health equity and quality of life.

US-based TCM practitioners with the following licenses–L.Ac., O.M., C.H.,–were recruited to participate in a 45-minute recorded Zoom interview about their professional background, practitioner-patient interactions, and the role mindfulness may play in their professional practice. Using a Grounded Theory approach, research team members engaged in open coding to create an initial codebook from the first transcript, and passed an interrater reliability test (Kappa > .70) before coding subsequent transcripts. Group-based axial coding was then used to create higher-order categories and themes from the original codes. Saturation was documented.

In total, 11 TCM practitioners were interviewed, resulting in 168 unique codes. Saturation was met for 81% of the codes. Axial coding yielded 15 higher-order categories, and four overarching themes: 1) Foundations of TCM Healing, which included the roles of the therapeutic relationship, ethics in building trust, emotional balance, mindful awareness, and energy exchange among others; 2) Essentials of TCM Diagnosis, including inquiry, observation, and touch; 3) Bridging Cultural Gaps in Education and Understanding, highlighting TCM’s medical integration and modern acceptance and; 4) Practice Motivators & Logistics for practitioners.

This study offers important insights directly from TCM practitioners on the importance they place on creating an empathic and compassionate environment based on trust, awareness, and connection in order for healing to occur. This is consistent with TCM theory, which emphasizes mindful qualities, supporting holistic healing in physical and mental health.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 161
The Oasis: a New Paradigm to Study Foraging Behavior

Planning is a crucial ability used by mammals to analyze future states of the environment. While previous behavioral paradigms, such as T-mazes and radial arm mazes, have been traditionally used to study this behavior, they fail to model the complex and dynamic spaces and aversive/appetitive agents around which animals normally have to plan. Therefore, we previously developed a task called BotEvade, where mice were tasked to receive water at fixed locations while navigating a large arena filled with obstacles and a robot predator that gave aversive air puffs. While we found evidence of novel behavior, we observed limited mouse-robot interactions, resulting in stereotyped trajectories through the arena. To enhance the dynamic and interactive nature of the task, we created an obstacle with a self-contained water delivery system. By integrating these reward-delivering modules, we developed a new task with a dynamic threat and a dynamic reward we call “Oasis”. Mice have to search among a set of occlusions in order to find a water reward given by a randomly selected module. Unexpectedly, we found evidence of stereotyped paths even with a robot predator present. However, compared to BotEvade, the Oasis task was associated with an increased number of robot interactions, greater coverage of the environment, and lower running speed, suggesting that dynamic rewards can influence behavior. Like BotEvade, we also observed evidence of behavior where mice “peeked” around obstacles. Overall, this setup represents a dynamic task with more naturalistic conditions related to foraging in the presence of a dynamic threat.
The Impacts of Teacher Turnover: A Comparative Study of Public and Charter Schools in Illinois

Teacher turnover may detrimentally impact student outcomes by reducing overall teacher quality, disrupting the learning environment, or forcing diversion of a school's limited resources. However, given variation in operational practices between public and charter schools, effects of turnover may differ; the greater flexibility of charter schools could allow them to more effectively dismiss underperforming teachers, improving teacher quality and thereby student outcomes. Using panel data on school demographics, student performance, and teacher retention from the Illinois State Board of Education over the years 2014 to 2023, I examine the effect of teacher turnover on multiple student outcomes. I analyze heterogeneity in these effects between public and charter schools, as well as between demographic groups. I find statistically significant evidence to suggest that turnover diminishes standardized test proficiency rates in public schools yet has a null effect in charter schools. Effects are heterogeneous by race, with Black and white students being more detrimentally affected by turnover while Latino and Asian students may, in some cases, benefit. In addition, turnover decreases average SAT reading scores in public schools and increases both average SAT math scores and the high school dropout rate in charter schools. Beyond statistical significance, the magnitude of these effects is larger than those found in existing literature, suggesting findings may be economically meaningful and policy relevant.
Decoding K-Pop: A Computational Analysis of Musical Elements

Korean Pop (K-Pop) has emerged as a global phenomenon, celebrated for its extravagant choreography, high production value, and idol branding. However, scholarly attention has predominantly focused on K-pop's sociocultural impact, without conducting any detailed music analysis. My project investigates how musical elements, such as key modulation, chord progressions, formal structures, and timbre, predict the success of K-pop and its unique distinction from Western Pop music.

To address this gap in research, I conducted a corpus study using Spotify's Top 50 Hits datasets for the USA and K-Pop in 2022. I employed computational tools like Python and R to analyze musical features through Spotify APIs. Key-finding algorithms and classifier models were trained on K-pop and Western music corpora to identify trends in key modulation and predict genre classification. Notably, mode confidence emerged as the strongest predictor, followed by liveness and speechiness. Preliminary results indicate an accuracy of 71.3% in distinguishing K-pop from non-K-pop songs. This underscores the significance of tonality in defining the K-pop aesthetic.

My findings contribute to the existing body of knowledge by elucidating measurable stylistic differences, such as tonal ambiguity and instability, that set K-pop apart from Western pop music. Moreover, by highlighting the unique stylistic fingerprint of K-pop, my research offers valuable insights for future endeavors in genre classification and pop music production. This study paves the way for deeper exploration into the multifaceted nature of K-pop and the need for more comprehensive musical analysis in this genre.

Presentation Format: Oral
Time: 10:30am
Room: Rock Room
Number: 387
In this paper, I compare the way slavery is discussed in Macrobius’ *Saturnalia* and in Augustine's *City of God*. These two texts were both either explicitly or implicitly influenced by the changing Roman Empire of the late fourth and early fifth century, both looking to the past for much of their rationale. The sack of Rome and the legal and cultural shift of the Empire toward Christianity changed the way pagans and Christians saw their world, prompting them to write works in, against, or outside of their reality as they saw fit. Macrobius’ *Saturnalia* comprises a dialogue between prominent Roman pagans over several days of the titular pagan festival set at least 47 years before the text was written. Augustine's *City of God* is a text that is concerned in large part with the adversarial relationship between the Christian community and Roman pagans, written by a prominent Christian theologian. Both Macrobius and Augustine utilize arguments stemming from natal alienation in their discussion of slavery, positioning the paterfamilias at the center of the slave's identity. Thus, while Macrobius argues in favor of slavery for the benefit of the master and Augustine argues in favor of slavery for the benefit of the slave, both authors similarly deny the personhood of slaves. By presenting slaves as alienated actors in the household and larger community who are bound by the paternalistic religious practices and beliefs of their masters, these two authors reinforce the oppression of natal association, even as they insist upon the humanity of slaves.
Sound Science: Investigating DPOAE Methodologies for Hearing Diagnostics

Hearing loss is a global health concern that affects people of all demographics and identities. Today, hearing loss is diagnosed through audiometric threshold testing, which assesses hearing abilities by recording an individual’s behavioral response to a series of pure tones from 0.5-8 kHz at different sound levels. Although commonly used, this diagnostic procedure requires participant engagement and tests only a narrow set of frequencies of the human hearing range (i.e., 0.2-20 kHz). A different assessment, called distortion product otoacoustic emission (DPOAE) testing, measures cochlear, or inner ear, health. Contrary to traditional methods, this technique does not require behavioral responses, can record to the upper-frequency range of human hearing, and is sensitive to slight changes in hearing thresholds. DPOAEs can be measured using different recording methodologies, though the potential benefit(s) of using either technique is not fully understood. This study compared DPOAE recordings from two common methodologies and aims to characterize the results from each method to inform research and clinical utility. DPOAEs were recorded from 15 normal-hearing individuals using both methods. Participants were fitted with an earbud-like probe and presented with tones at different frequencies and levels to evoke DPOAEs. It was hypothesized that these methods would behave similarly, yet extracted salient measures were not found to be strongly associated. These results surprisingly suggest that the methods likely lead to different physiological responses. Although these findings complicate the clinical applications of DPOAEs, they expose the intricacies of the physiological processes that lead to their generation.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 208
The role of praise on children's exploratory behaviors during spatial activities.

Praise is often associated with positive outcomes regarding children's learning, academic performance, and confidence. Research shows that praise can enhance intrinsic motivation and increase perseverance, which encourages adaptive performance attributions such as positive beliefs about competence (Henderlong and Lepper, 2002). Praising children for their efforts (e.g. "you must have tried so hard") leads to the belief that learning and accomplishment are a result of practice. In contrast, praising children's attributes (e.g. "you are so smart") may result in adopting a fixed ability framework, where children attribute their successes and failures to fixed traits (Gunderson et al., 2013). Based on this motivational framework, praise can play a role in children's desire to continue engaging in educational activities. Previous studies have investigated a link between praise and behaviors such as scientific inquiry and motor exploration, behaviors that have been associated with children's spatial learning and problem-solving skills (Brummelman et al., 2022, Farran et al., 2022). In this project, we extend praise research to a context in which parents and children work together collaboratively on coding a robot to understand the relationship between praise and successful strategies in coding and computational problem-solving. We examine the relationship between parent praise and exploration by assessing the quantity and quality of parents' praise statements in relation to unique coding attempts, spatial talk, and child's self-reported attitude toward and confidence in coding abilities.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 512
Depersonalization/Derealization Disorder Captured Through Oil Painting

Those suffering from depersonalization/derealization disorder (DDD) experience a “persistent or recurring feeling of being detached from one’s body or mental processes (depersonalization).. and/or a feeling of being detached from one's surroundings (derealization)” [1]. This rupture in consciousness makes it difficult for sufferers to obtain care and leaves DDD misunderstood [2,3]. Awareness is integral to unpacking and destigmatizing disorders like these [4]. Hence, my research shines a light on this underrepresented community. This project investigates how one can gather enough real-life and medical data on depersonalization/derealization disorder to accurately translate that knowledge into visual art, a historically effective medium to capture abstract concepts. In addition to reviewing current/past literature on the disorder, I interviewed seven afflicted people and two leading DDD health professionals. What I discovered was trends in DDD onset, timeline and its status in the medical field. Many viewed it as the irreversible crossing of a threshold reached from stress, profound isolation, predisposition to existential rumination or some combination of the previous. Painting compositions were structured around the paradoxical duality of the feeling of being depersonalized, overwhelming existential feelings, uncanniness and distance. This led to depicting visual themes like empty versus crowded space, oversaturation versus desaturation, radial forms, duality, and obscured figures. I used these themes to produce 9 paintings. Where an unafflicted person may not know the specific symptoms that plague many suffering from DDD, the group of works created serve to embody those feelings tangibly and bring visibility to the disorder.
Investigating Mechanisms of Radioresistance in TYK2 Knockout Head and Neck Cancer Cells

Radiation therapy is the primary form of treatment for head and neck squamous cell carcinoma (HNSCC). However, more than half of patients experience disease progression. To investigate novel therapeutic targets, a CRISPR screen was done to identify genes that are associated with radioresistance. The screening results indicated that loss of two tyrosine kinases, JAK1 and TYK2, resulted in radioresistance in HNSCC. These genes are critical for regulating immune responses and cell signaling cascades. Preliminary data suggests that loss of JAK1 causes an enhanced cell cycle arrest phenotype and genome stability that contribute to radioresistance. To investigate whether TYK2 knockout (KO) caused changes to the cell cycle and genome stability as observed in JAK1 KO, Western blots, cell cycle assays, and micronuclei staining experiments were performed. The Western blots demonstrated that there were minimal changes in downstream signaling between the treatments and the knockouts. Cell cycle analysis via flow cytometry revealed no changes between the control and TYK2 KO cells, potentially corroborating signaling results. This indicates that loss of TYK2 is not responsible for cell cycle arrest. Lastly, micronuclei formation was observed to measure genomic instability. Micronuclei staining revealed minimal differences between control and TYK2 KO cell lines, although there were significant differences between the control and the radiation groups. Radioresistance by TYK2 KO is not caused by changes in cell cycle or genomic instability as demonstrated with JAK1 KO. To understand how TYK2 is causing radioresistance in HNSCC, next steps would be to see if there are changes in proliferation.

Presentation Format: Oral
Time: 10:30am
Room: Lake Room
Number: 302
Aishani Das-Ghosh

Determining Spatial Distribution and Thermal Properties of the Interstellar Medium in the Local Bubble

Our Sun sits within the Local Bubble (LB), a cavity in the Orion Arm of the Milky Way that has been widely studied to ascertain important properties of the local interstellar medium (ISM). Thought to be the result of several supernova explosions taking place over the past 10-15 Myrs, the LB has pushed out the evacuated matter into a dense shell of cold atomic neutral hydrogen (HI) gas and dust. The interior of the LB contains distinct dense and cold interstellar structures representative of general tiny scale atomic structure (TSAS), which has been quantified by changes in depth in atomic neutral hydrogen (HI) absorption measurements towards pulsars. However, HI absorption spectra provide only pencil-beam measurements along a line-of-sight against a background source. We aim to determine the location and spatial distribution of the interstellar gas that hosts TSAS in and around the LB utilizing three-dimensional dust distributions from Edenhofer et al. (2023). In our analysis of five particular pulsars-B0540+23, B0823+26, B1133+16, and B1929+10, and B2016+28—we find good agreement between the number of distinct density components with the velocity information obtained from the published HI absorption measurements. We also estimate lower limits for the thermal pressure and upper limits for the ionization fraction and compare those with theoretical expectations. Our method of using HI absorption measurements with three-dimensional dust data holds potential for broader applications to provide independent measurements of the thermal properties of the neutral ISM.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 245
Self-conceptualising Mental and Physical Health: A Comparative and Outcomes-based Analysis

Modern discourse is preoccupied with the relationship between mental and physical health. A substantial body of literature exists which concerns itself with the ways in which mental and physical health relate to each other via the connected influence of other variables and their influence on each other. What we know relatively little about, however, is how MH and PH are thought of, similarly or differently, as experiences within the context of their lives. This study makes use of Narrative Identity methods, involving thematic coding of 133 participants’ mental and physical health narratives, to compare how mental health and physical health are self-conceptualised as part of the life narrative. Additionally, this study aims to understand how themes in both kinds of health narratives relate to overall psychological well-being.

It was found that mental and physical health were self-conceptualised in mostly similar ways. Additionally, it was found that narrative styles identified in physical health narratives had greater predictive power than those in mental health narratives for measures of psychological well-being. More detailed analysis of coded data reveals an interesting pattern: relationships between narrative styles and well-being outcomes occur mostly in individuals who consciously acknowledge a link between their mental and physical health. These are individuals who talk about their mental health during physical health narratives, or vice versa. This is an important auxiliary finding based on this preliminary analysis, this study makes the argument for further exploration of this potentially crucial distinction.

Presentation Format: Oral
Time: 10:30am
Room: Arch Room
Number: 534
Plastic Recycling with Bacteria at Scale: Dicarboxylic Acid Tolerance of Comamonas testosteroni KF-1

Although recycling is a widely adopted practice, only 8.7% of plastic collected for recycling in the United States is actually recycled, in part due to the low quality of plastics produced through the industrial recycling process. In the conventional mechanical process, plastic goods are melted and mixed vigorously before being extruded into new plastic products. Polymer chains become cleaved, branched, and cross-linked, weakening the resultant recycled plastic. Biological recycling, where bacteria metabolize waste and synthesize new materials, has emerged as an alternative that avoids mechanically degrading recycled materials. Preliminary research has demonstrated that sewage sludge bacterium Comamonas testosteroni KF-1 is able to metabolize dicarboxylic acids, a class of plastic-derived compounds, but the upper limits of C. testosteroni KF-1’s processing capacity remain unknown. In this study, we compared the growth of C. testosteroni KF-1 on dicarboxylic acids of chain length C4 to C10 across various concentrations by computing growth rates from UV-Vis spectroscopy and measuring changes in dry biomass. Our findings suggest that while higher dicarboxylic acid concentrations alter C. testosteroni KF-1’s growth rates, suggesting the presence of metabolic bottlenecks, they do not affect its final biomass, indicating no toxicity. The ability of C. testosteroni KF-1 to process plastic-derived compounds at these high concentrations without experiencing toxicity holds promising implications for scaling up biological plastic recycling to replace current mechanical recycling methods.
Developing Spherical Nucleic Acids as a Brain Cancer Therapeutic

Glioblastoma is an aggressive form of brain cancer and traditional small molecule drugs have shown limited therapeutic capacity and notable side effects when used as a form of treatment. Immunotherapy has emerged as a promising route to treat cancer because it leverages the body’s own immune system to fight off disease. In this study we investigate liposomal spherical nucleic acids (LSNAs) as immunomodulatory agents for the treatment of glioblastoma. LSNAs are nucleic acids arranged radially around a liposomal nanoparticle core, providing them with resistance to nuclease degradation, and transfection capabilities, unlike their linear counterparts. Here we design and test the LSNAs ability to activate an immune pathway known as cyclic GMP-AMP Synthase-stimulator of interferon genes (cGAS-STING), a crucial mediator of inflammation within the body. This pathway responds to sequence specific double-stranded DNA and initiates a cellular response which we can evaluate using in vitro cellular assays. More specifically, we hypothesized that with the right design, LSNAs would be able to trigger the immune system, ultimately leading to an antitumor response thereby both killing and inhibiting the growth of glioblastoma tumors. LSNAs were prepared by conjugating varying nucleotide DNA sequence lengths to liposomal nanoparticles using hydrophobic interactions (cholesterol-modified DNA) or covalent bonds (azide click chemistry). Overall, this research sheds light on the structural influence of LSNAs on immune activation.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 289
Exoskeleton-based rehabilitation holds promise for functional recovery after neural injury. The central nervous system (CNS) recruits motor units (MUs), neurons that innervate muscle fibers, to coordinate generalized muscle movement. Seamless exoskeleton control requires accurate, real-time decoding of the patient's movement intention from motor unit (MU) firing patterns, termed neural drive. Conventional EMG decomposition methods for identifying MU firings are limited in generalizability and speed. While modern advances using deep CNNs do achieve more robust CST inferences, real-time millisecond level force decoding in the ankle joint remains relatively unexplored. The objective of this work is to ascertain whether neural drive can provide generalizable real-time muscle force and joint torque prediction in the ankle joint, across different ankle positions and movements. High-density EMG signals and torque were captured from three ankle muscles during trapezoidal plantarflexion or dorsiflexion contractions at various ankle angles. Neural drive was computed using a CNN and a non-linear model was trained to predict torque. Model performance was measured with R^2 and an RMSE normalized to the maximum recorded torque. Muscle force was also computed with a conventional algorithm using raw HDEMG for comparison. The neural-drive method outperformed the conventional method in R^2, normalized RMSE, and time-to-prediction. These improvements are poised to provide more intuitive control of therapeutic exoskeletons.
Social Influences on Coffee Consumption

Social groups and social norms influence a person's actions and purchasing decisions in goods and services. 185 Northwestern undergraduates are surveyed for their visit patterns to coffee shops and their participation in student social groups. I cluster students in similar majors, minors, demographics, and also student clubs to compare the influence of different social groups on Northwestern undergraduate students in their frequency of visits to Starbucks before and after attending school on campus. Since Starbucks is a multinational corporation with a notable public image and locations on the Northwestern campus, students are likely to be exposed to various media, advertising, and peer influences that either motivate or demotivate their purchasing decisions. For robustness, I also measure the last visits to Starbucks and the frequency of visits to other coffee houses to compare the degree of social group influences. From cluster analysis that takes both the individual influence to others and others' influence to the individual into account, I estimate the individual's personal degree of social influence through individually perceived social norms. I utilize a two-stage, timed regression method to analyze the impact of social influence on the change of student consumption behaviors in cafe purchases. Current results reveal that people who are more indifferent to Starbucks or cafe food alter their behavior more than people who do not like or like Starbucks food. This result points to a further degree of social influence for some individuals than others, pointing to the individual's openness and balance of their own preferences and others' preferences. This study requires further investigation to analyze the impact of student social groups on cafe consumption habits.
High-Throughput Determination of Amino Acid Coupling in Protein Domains

Allosteric interactions were detected via analysis of data from a high-throughput stability assay. Thermodynamic coupling between distant amino acid residues within the same protein was quantified in order to identify potential allosteric pairs. Molecular modeling software was then used in order to hypothesize the mechanisms driving allostery in each case.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 477
Complicating Cottagecore: Nostalgia, Imagination, and the Eighteenth Century

During the COVID-19 pandemic, the cottagecore aesthetic imagined an escape into the quaint European countryside through mushroom-shaped trinkets and billowing dresses. This vision comes from European pastoral art, with scholars and journalists identifying reference points from Ancient Greece to the Arts and Crafts movement. While prior critiques have addressed the visuals of the eighteenth century, the period’s contributions to the perspective of cottagecore remain unexplored. In my thesis, I conduct the first comprehensive study of cottagecore as a style of self-expression built off of nostalgia. I address the methods of looking and imagining in the aesthetic, identifying their roots in the eighteenth-century project of visuality. I compare cottagecore to Dick Hebdige and David Muggleton’s definitions of subculture to emphasize how nostalgic engagement with the past carries embedded meaning into the present, rather than challenging it. Through four case studies: shepherdess costumes, Marie Antoinette, the Strawberry Dress, and the Nap Dress, I discuss how eighteenth-century references in cottagecore carry encoded historical discourses of race, gender, sexuality, and beauty. These ideas are adopted by fans across the political spectrum, who employ cottagecore as a form of imaginative worldmaking to dramatically different ends. I then identify how the Rococo-inflected and Neoclassical-inflected versions of cottagecore’s nostalgic engagement with history, whether whitewashed or seeking to revive those ideals, perpetuates the veneration of whiteness. Ultimately, I aim to reveal how cottagecore’s imagination is built off of eighteenth-century European modes of seeing, flattening the complexities of the pastoral into a glossy vision of “goodness.”
Motivations for Becoming Mothers or Remaining Childless: A Comparative Study of Black Mothers and Non-Mothers in Chicago

This project focuses on the relationship between Black women’s perception of the U.S. healthcare system and their decision to become mothers or remain childless. It asks the extent to which Black women view the healthcare system in a negative light, and explores how heavily this perception impacts their thoughts surrounding motherhood. The study is an attempt to build upon an existing literature in sociology that examines the maternal health of Black women, but does little to explain how knowledge of health disparities and poor patient-provider relationships shape how Black women think about major decisions in their life. To bridge this gap, I conduct thirteen semi-structured interviews with Black mothers and non-mothers in Chicago between ages 23 and 40. I ask about their experiences with the healthcare system, as well as their thoughts on becoming mothers. My results show that most Black women do view the healthcare system in a negative light, and it is a prominent concern for Black women when deciding to become mothers, although other social factors also play a large role. However, I do not find evidence providing strong support for my hypothesis, as negative perceptions of healthcare were not more salient than other factors such as concern for the state of the world and optimism through the fulfillment of social roles. I interpret these results and make suggestions for future researchers in sociology, medicine and policy who might be interested in similar questions.
Levetiracetam Decreases Amyloid-beta Production in Alzheimer’s Disease

Levetiracetam is a commonly used drug to treat epilepsy in humans through a mechanism that remains elusive. Studies have found that chronic levetiracetam treatment in mouse models of Alzheimer’s disease (AD) leads to decreased levels of Amyloid-beta (A\(\beta\)), a toxic protein that plays a key role in the disease’s early stages. This is notable since amyloid-precursor protein (APP), which is cleaved to produce A\(\beta\), showed no such decrease. In this experiment, mice with induced AD were pulse-chase labeled with \(^{15}\)N, an isotope of nitrogen that allows the relative age of proteins to be determined. Purified A\(\beta\) samples were isolated from mouse brain tissue using sucrose-differential ultracentrifugation. Liquid chromatography-mass spectrometry (LC-MS) analysis revealed that levetiracetam-treated mice displayed a decrease in the relative abundance of newly produced A\(\beta\) peptides. This suggests that levetiracetam alters AD pathology by decreasing the conversion of APP to A\(\beta\) in early stages of the disease. Following this, we used the molecule biotin as a marker to label surface proteins on cultured hippocampal mouse neurons. After a biotin pulldown, which captures all proteins on the exterior of the cell membrane, our results found that APP levels increased on the cell membrane in levetiracetam-treated neurons. This suggests that levetiracetam transports APP from synaptic vesicles to the cell membrane, where it is cleaved less effectively. This change in APP protein localization results in decreased A\(\beta\) production. Together, this work strongly suggests that levetiracetam could provide the basis for a novel treatment for AD by decreasing the production of amyloid-beta.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 552
Visualizing Warehouse Locations in CONUS to See Idling Effects from Heavy Duty Vehicles

In the contiguous United States (CONUS) there are over 145,000 warehouses, where heavy-duty diesel vehicles (HDVs) idle, releasing toxic emissions as they wait to be un/reloaded. These emissions cause many adverse health effects, including premature birth, childhood asthma, dementia, heart disease, and strokes. Warehouses have recently been encroaching into minority and low-income suburban neighborhoods, making warehouse locations a vital environmental justice issue since these people do not have the resources to combat the pollution stemming from warehouses. However, idling at warehouses is not currently apart of Environmental Protection Agency (EPA) models and is being significantly overlooked as a source of emission. Using data acquired through CoStar LLC, we created an EPA grade spatial surrogate using the Spatial Allocator Tool of warehouses to address this gap. We used QGIS to convert the data into a shapefile and investigate trends in warehouse building, including when they were built, location, and number of loading docks. Then using the Northwestern QUEST supercomputer, we created a CONUS level surrogate with a 4 km resolution to provide a neighborhood view of the implications of these warehouses. These results about current warehouse location and size can inform policy, regulation, and permitting decisions on where warehouses can be built.
The role of cyclical voluntary exercise in an Alzheimer's disease mouse model

Alzheimer's Disease (AD) is a progressive type of dementia that affects brain functions such as memory, behavior, and even the biological clock, also known as the circadian rhythm. Alterations to this rhythm can in turn worsen the effects of AD symptoms or even contribute to the development of more, and it is therefore important to examine potential strategies to rescue the effects of the AD pathology with consideration of circadian rhythm. However, despite this significance, studies connecting circadian rhythm with AD treatments, such as those involving lifestyle factors, remain limited. In order to gain greater insight into how the biological clock can be utilized in the treatment of individuals with AD, I propose combining exercise with circadian rhythm in a mouse model of AD. Using cyclical exercise, motion monitors, and cognitive testing, my aim was to measure the amount of exercise and movement in general, as well as test the effects of my intervention in memory. I performed this experiment in order to better examine how the relationship between exercise and circadian rhythm influences the progression of the common AD symptom of memory loss in mice. Not only are my findings important for the expansion of non-pharmacological options available to individuals suffering from AD, but they can act as a preliminary foundation for applying ideas surrounding timed, cyclic exercise to other clinical disorders, such as Parkinson's.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 575
Acceptance Takes Practice: Emotional Acceptance and Parasympathetic Activation in Older Adults

Emotional acceptance is an emotion regulation strategy with roots in Eastern philosophy that can benefit well-being and health, especially for older adults. Interestingly, there are individual differences in how people physiologically respond when engaging in emotional acceptance. In this study, we probed the idea that emotional acceptance is a practiced skill where those who are generally more accepting of their emotions would show a greater physiological soothing effect when instructed to regulate their emotions spontaneously. The sample consisted of 129 healthy older adults (age range = 64-83) who viewed film clips depicting loss while their parasympathetic activation was measured continuously. They were instructed to regulate their emotions using emotional acceptance, detachment, or positive reappraisal. Participants also completed questionnaires on how much they habitually use emotional acceptance, detachment, and positive reappraisal in their day-to-day lives (alphas = .83-.88). Regression analyses showed that habitual emotional acceptance (but not detachment or positive reappraisal) was associated with greater increases in parasympathetic activation during lab-based emotion regulation trials, specifically, during emotional acceptance and detachment trials. This effect remained stable when controlling for age, gender, and respiration rate. These findings provide initial insights into the potential health benefits of practiced emotional acceptance in older adults.
Autonomic Activity During Bladder Distension Task Predicts Development of Menstrual Pain

Dysmenorrhea (painful periods) has a prevalence of 50-80%, and is the leading reason that 10-20% of female high school students consistently miss class. Yet the causes of menstrual pain are unknown. Research indicates that women with dysmenorrhea have increased sensitivity in their internal organs and an imbalance in their sympathetic and parasympathetic nervous system activity. To explore the potential role of autonomic activity in menstrual pain development, we conducted a prospective study on 300 adolescents before their first period (baseline visit). We measured their heart rate variability (HRV) during a non-invasive bladder filling task to measure visceral sensitivity. We then collected follow-up menstrual diary data from participants for two years after their first period. Within a year, 85 participants had low menstrual pain scores (<30 on a 0-100 scale), and 98 had high menstrual pain scores (>30). We hypothesized that participants with lower baseline of parasympathetic activity at maximum bladder-filling tolerance level would be more likely to develop menstrual pain within a year. Our results supported this—participants with lower parasympathetic activity were more likely to experience menstrual pain (p=0.046). By the second year, 47 participants had low menstrual pain scores and 64 had high menstrual pain scores. Participants with menstrual pain by year two had higher baseline sympathetic and parasympathetic activity throughout the bladder task (p’s<0.05). However, there was no significant correlation between resting heart rate and blood pressure and the likelihood of experiencing menstrual pain. Thus, visceral-autonomic mechanisms are better predictors of menstrual pain development.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 404
Following or Blocked: College Students’ Perspectives and Utilization of Sexual Health Information Present on Social Media

Social media has quickly become more than a means to communicate with one’s social network, providing an additional space to learn and educate oneself. One sphere of education is sexual health, as more creators touch on topics related to sexual health and young Americans interact with this content. Yet there has been little research into how college students are using social media as a sexual health informational resource compared to the many other resources available. Bringing together sociological scholarship and research on sexual health’s presence on social media, my project examines whether an individual’s social network influences their comfort and use of social media as a resource for sexual health information. Interviewing 25 Northwestern undergraduate students on their sexual health resources, social networks, and use of social media, I did not find evidence that social network is the main driver. Instead, I found some evidence that how an individual approaches social media in general, for entertainment or as a community resource, explains their comfort and engagement in sexual health information communities on social media platforms. These results have specific implications for future research on sexual health education and social media as an educational tool in general. I have a moderate degree of confidence in my results. A larger sample and a more tailored research design should be utilized in future studies.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 219
Biogenic silica concentration is often measured in Arctic lake sediments as a proxy for lacustrine primary productivity by diatoms. Changes in biogenic silica abundance are frequently attributed to changes in regional temperature but can also result from within-lake processes, such as changes in lake level or stratification. To investigate the impacts of regional temperature shifts versus changes in lake level and stratification, we compared the biogenic silica concentration in sediment cores from four small, non-glacial lakes in southernmost Greenland throughout the Holocene.

Three of the lakes show no evidence of lake level changes, and we interpret these lakes as having been hydrologically stable throughout the Holocene. The biogenic silica concentrations of these lakes were relatively constant throughout their respective records - which range from 3,000 to 14,300 cal yr BP - with some larger fluctuations (5 - 10%) in the mid- to late-Holocene and no long-term trend.

The lake level of the fourth lake has fluctuated seasonally within the past decade, and from sedimentary features we infer potential periods of low lake level and summer stratification. The biogenic silica records varied more significantly with time, with large changes occurring during the inferred periods of lake level change and stratification. These results suggest that changes in lake level or stratification can trigger large, abrupt changes to primary productivity in Greenland lakes, which can overwhelm the influence of regional climate shifts. Thus, the influence of these factors needs to be considered as we predict future consequences of anthropogenic climate change in Arctic lakes.
Investigating the Effects of Water and Crosslinking Content on the Mechanical Properties of Mussel Foot Protein 5

*Mytilus galloprovincialis* (the Mediterranean mussel) produces mussel foot protein 5 (fp5), which has extraordinary strength, adhesion, and cohesion properties that allow for adherence to a variety of underwater surfaces. A better understanding of fp5 and its properties aids in its use in synthetic materials that are biocompatible and biodegradable, such as hydrogels (three-dimensional networks of water-soluble linked polymers) and adhesives to promote wound healing at surgical sites. Several chemical and physical aspects of the protein have been attributed to fp5's unique properties, however, the full extent of sequence and molecular contributions to fp5's function are not fully understood. This project simulates atomic and molecular interactions to investigate the effects of the proportion of tyrosine crosslinking and water content of simulations on the mechanical properties of fp5. Simulations were run at 10%, 30%, and 50% water by weight with 10% to 50% crosslinking densities (the proportion of crosslinked tyrosine residues compared to the total number of tyrosine residues in the system). Analysis of simulated tensile tests revealed that toughness and maximum stress of the protein decrease with increasing water content and increase with higher crosslinking densities. Furthermore, strain hardening behavior (increasing the strength of a material through deformation) increases in cases of higher crosslinking densities and higher water proportions. The dependence of fp5's mechanical properties on water content and crosslinking density is a discovery that will influence how fp5 (and other similarly crosslinked protein systems) are modeled to enhance the development of synthetic materials.

Presentation Format: Oral
Time: 10:30am
Room: Armadillo Room
Number: 262
Mapping water insecurity interventions to promote climate-resilient communities in Chicago

Water scarcity, contamination, price, and aging infrastructure threaten not only access to clean water but also the ability of Chicagoans to thrive physically, socially, and economically. Previous literature clarifies the disproportionate impact of water insecurity on communities of color and has established the exacerbating effects of climate change on water insecurity. Thus, the current body of knowledge both demonstrates how water insecurity can act as an indicator of inequality and illuminates the necessity to implement equitable water governance action here and now. Moreover, in February of 2024, the US Federal Government dedicated nearly six billion dollars to clean drinking water and water infrastructure, much of which went to Illinois. However, there is limited published literature that explores comprehensive, forward-looking pathways for water security resilience in Chicago. The objective of this research is to analyze and prioritize water insecurity interventions relevant to communities in Chicago to make possible the implementation of proactive, climate-resilient water governance. In order to create this roadmap, I am using a meta-analysis framework to overlay existing narrative analysis of the multi-dimensional consequences of water insecurity and intervention studies, accounting for both the interventions’ scale and tractability through political and social avenues. A comprehensive and tangible intervention plan to combat water insecurity in Chicago is necessary to tackle this city’s - and more broadly this country’s - water insecurity and infrastructure issues to enshrine equitable water protections in the face of climate change.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 430
Many healthy older adults experience declines in long-term memory (LTM) that can impact their quality of life. As restorative therapeutic interventions for this have yet to be demonstrated, Wais et al. (2021) developed a virtual reality (VR) spatial wayfinding game (Labyrinth-VR) as a cognitive intervention to improve older adults’ LTM. Pilot study results showed improved LTM ability transferred from training with Labyrinth-VR for 12 hours over four weeks, compared to placebo games played on a handheld tablet. The present follow-up study expands on these initial results with three aims. Firstly, to assess the contribution of 3D VR in the intervention by directly comparing post-training tests of LTM ability between conditions that play Labyrinth on a VR head-mounted display (HMD) versus on a handheld computer tablet. Secondly, to isolate the training effects induced by the spatial wayfinding game itself by comparing post-training results between Labyrinth-VR and a VR control game. Thirdly, to assess the feasibility of at-home training in place of in-lab training, where the former offers older adults greater access and scheduling flexibility in their use of a therapeutic application. We discuss the hypothesis for larger training effects with Labyrinth-VR due to greater engagement attained with a 3D VR HMD and the practical implementation of at-home cognitive interventions.
Mechanisms of Steroid Receptor Coactivator Recruitment

Each cell in our body expresses only a subset of genes in our genome necessary to carry out the cell’s functions. Proteins called transcription factors, which directly bind the DNA of target genes, and helper proteins called coactivators, which in turn bind the transcription factors, collaborate to regulate transcription - the first step in gene expression. My research focuses on Nurr1, a transcription factor that serves as a bona fide therapeutic target for Parkinson’s disease (PD), and its coactivator, the steroid receptor coactivator 1 (SRC1).

To study the interaction between Nurr1 and SRC1, I express these proteins in bacteria, purify them, and then use solution NMR spectroscopy (a type of MRI for molecules).

The Radhakrishnan lab has been working on elucidating which portions of Nurr1 and SRC1 interact with each other. Previously the lab showed that a region called AF1 in Nurr1 interacted with a region called PAS-B in SRC1, but this was not a strong interaction. I have found that two SRC1 regions called bHLH and PAS-A unexpectedly interact with each other within the same protein and this 'complex' in turn also interacts with Nurr1 AF1, but only when it is phosphorylated. This second point of contact between Nurr1 and SRC1 could lead to a stronger interaction between the two proteins - a desirable outcome for treating PD.

I aim to further study this interaction at the atomic level to establish its mechanistic basis. This knowledge has the potential to lead to new molecular therapies directed at Nurr1 for treating PD.
Recombinant Production of Cyanophycin in E. Coli

Wastewater is a good source of nitrogen which can be used to make fertilizers, pharmaceuticals, plastics, and textiles. Some of the nitrogen in wastewater turns into nitrogen gas and escapes into the atmosphere. It is then recaptured through an industrial nitrogen fixation process called the Haber process, which greatly contributes to greenhouse gas emissions and requires a lot of energy. A much more efficient route with a much smaller environmental impact for nitrogen capture is producing Cyanophycin, a great nitrogen storage polymer. *E. Coli* with Cyanophycin Synthetase genes from various bacteria were tested in varied temperatures and media to find optimal growth conditions. Unfortunately, this highlighted the consistent issue of the synthetase’s insolubility, which is hypothesized to decrease Cyanophycin output. A great way to increase the synthetase’s solubility is by adding a solubility-enhancing tag, as determined by statistical analysis of protein solubility characteristics. Further work is currently being conducted to enhance solubility and optimize Cyanophycin production.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 298
Elucidating the Mechanism of Toll-Like Receptor 4 Signal Induction

Toll-like receptor 4 (TLR4) is not only important to human anti-microbial immune responses, but it is also implicated in illnesses such as cancer and sepsis. Understanding the mechanism underlying TLR4 activation could enable better control of the magnitude of its signaling, preventing TLR4-mediated tissue damage while leaving anti-microbial protection intact. Traditionally, literature suggested that TLR4 signaling involved two identical protein chains coming together when bound to its ligand, but this model incompletely explains observations around TLR4 signaling. An alternate model proposes that when a ligand binds, a TLR4Inhibitory protein Complex (TIC) releases TLR4 and allows it to signal; however, the potential components of this inhibitory complex remain unknown. A genome-wide screen identified multiple candidate components which require further investigation to evaluate their TLR4 signaling inhibition. We hypothesize that if the silencing of a gene of interest enables ligand-independent TLR4 signaling, the gene may be a component of TIC. To investigate this hypothesis, we are systematically knocking down expression of individual target genes using CRISPR/Cas9 technology and observing the impact on TLR4 activation by using flow cytometry to record fluorescent reporter brightness. Extensive validation work has ensured that the experimental system works as expected (TLR4 is inducible with transient transfection into cells, validation of primer efficacy for gene knockdowns, etc.). Individual candidate knockdowns are in progress. Identifying components of TIC will help close the knowledge gap surrounding TLR4 signaling and therefore enable improved treatments for its associated diseases.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 373
Examining the Relationship between U.S. and Chinese-led Development Aid Commitments and International Political Alignment in Cameroon

The growing political influence of China and the economic development across Africa has led to a unique Sino-African political landscape. China, a comparatively new actor in global development spending, rapidly earned a place as a dominant force, while pioneering markedly different development strategies than the United States. Understanding the role of development aid in relation to foreign influence is crucial amid growing global involvement by China, often viewed as a challenge to U.S. hegemony. This research project aims to understand how Cameroon's international political alignment is influenced by development aid flowing into the country, funded by the U.S. and China.

In light of this aid, Cameroon lies in a particularly volatile position. The aid supplied by both global superpowers suggests that the two states are vying for influence. It is reasonable to assume, therefore, that this developmental aid is not purely altruistic in nature, but strategic.

However, this strategic interest differs greatly between the two hegemons, as the United States largely views aid as a mechanism to spread domestic values, while China maintains primarily economic interests.

This study finds that Chinese development aid to Cameroon does not result in Cameroon increasing its dyadic similarity with China. Of the two relevant metrics, one regression finds a negative correlation between Chinese aid commitments and Cameroon’s alignment with China, and the other is inconclusive. Empirical findings for the United States-Cameroon dyad remain mixed, but these results seem to indicate that the United States has not seen significant political gains in Cameroon.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 378
Effects of Medicaid Coverage of GLP-1 Agonist Drugs on Measures of Racial Disparities

GLP-1 agonists are a class of drugs that treat diabetes, obesity, hypertension, and cardiovascular diseases. Because they have extensive benefits, healthcare policymakers are asking for governmental insurance coverage of these drugs. Current literature shows that Medicare GLP-1 agonists coverage will save future Medicare spending and lower prevalence of comorbidities. This paper extends coverage to the Medicaid population, analyzing benefits of earlier/preventative coverage of GLP-1 agonists. This paper also addresses drug accessibility, as the largest concentration of GLP-1 agonist patients arise from low-income, minority populations who qualify for Medicaid. Right now, because vulnerable populations have difficulty accessing these drugs, healthcare and racial disparities are increasing.

This paper adapts the Future American Model (FAM), a microsimulation run by researchers from CMS, USC, Harvard, RAND corporation, etc., to examine four hypothetical long-term Medicaid GLP-1 agonist coverage plans on economic and healthcare measures such as prevalence of comorbidities, healthcare expenditure, etc. broken down by race. Interventions like Medicaid GLP-1 coverage are implemented to accurately assess long-term coverage effects on the US population.

Although meaningful statistical results have not yet been analyzed, preliminary results show that Medicaid interventions will cause decreased healthcare spending over time and decrease racial disparities. The results of this paper will be pivotal for any future healthcare policies aimed to provide widespread coverage of diabetic and weight loss drugs. Specifically, the results will address whether long-term Medicaid coverage of GLP-1 agonists is economically favorable and can address issues of healthcare and racial disparities.

The Federal Work Study Program (FWS) offers part-time jobs to students that demonstrate extensive financial need. As a case example, over half of students at Northwestern University receive some form of financial aid and roughly one-quarter of all students qualify for FWS. However, while college costs continue increasing, FWS aid has remained relatively stagnant. Consequently, students face increasing financial strain, often resorting to multiple jobs and sacrificing extracurricular and academic pursuits as their academic performance is affected. This research works to answer the following questions: How do individuals who participate in FWS perceive the program? How does FWS influence student identity and experience? What are the perceived costs and benefits of participation in FWS? This project interviewed 15 Northwestern students and used grounded coding to describe and understand their experiences. Findings show that experience is dependent mainly on managers, work environment, and students themselves. The dynamics of the FWS environment allow for increases in belonging, community formation and understanding of self. Both the community formation or lack thereof are positively correlated with overall perceptions and understanding of the experience. Students engaging in FWS are removed from the student experience and are placed into a transactional relationship with the university where they are held to higher standards, impacting their experience and potential opportunities. This contributes to the modern understanding of the FWS program and the intersection with student identity, experience, belonging, and community integration. Understanding these implications can inform the enhancement of FWS, optimizing effectiveness in supporting student development and success.
Synthesis and analysis of layered SiO2/TiO2 photocatalysts for hydrogen fuel release from common organic molecules

Hydrogen is a promising fossil fuel alternative, providing versatility, zero direct carbon emissions, and renewable production potential. However, transporting pure H2 is energy-intensive and technically challenging. Liquid Organic Hydrogen Carriers (LOHCs) provide a solution, allowing safe H2 storage and transportation within common industrial chemicals. Developing photocatalysts for efficient H2 release from LOHCs using sunlight is an active research area. TiO2 is a promising dehydrogenation photocatalyst, however its high activity makes controlling specific reactions (selectivity) difficult. Depositing layered nanostructures on TiO2 surfaces can alter selectivity and reaction rates. This study investigates two methods for synthesizing layered SiO2/TiO2 photocatalysts and their impact on material properties and photocatalytic dehydrogenation behavior.

The first method uses Atomic Layer Deposition (ALD) to deposit thin SiO2 layers from Si and O-containing vapors. The second method uses Chemical Liquid Deposition (CLD) to deposit SiO2 layers on a templated surface, creating artificial nanopores. Nine ALD catalysts (3 temperatures x 3 cycle quantities) and ten CLD catalysts (2 template sizes x 5 cycle quantities) were studied. Catalysts were analyzed for light absorption ability, Si to Ti surface ratio, and total effective surface area. Benzyl-alcohol (a common LOHC) dehydrogenation was used to measure reaction rates, catalyst activation energies, and selectivity. Initial results suggest thicker SiO2 layers improve dehydrogenation rates for ALD catalysts and enhance active site stability for CLD catalysts.

By examining synthesis-structure-performance relationships for layered SiO2/TiO2 materials, this study expands knowledge on TiO2-based LOHC dehydrogenation photocatalysts, contributing to a future where clean hydrogen reduces society's reliance on carbon-emitting fossil fuels.
Processing-Structure Relationships in Battery Coatings

The shift from fossil fuels to renewable energy sources is hindered by the intermittent, weather-dependent availability of renewables. Consequently, batteries capable of supporting entire power grids are necessary to store and release energy on demand, but widespread adoption of such grid-scale batteries is economically unfeasible due to high battery manufacturing costs. Consequently, this project focuses on optimizing the coating process, a critical battery manufacturing step in which a thin film of chemicals is coated onto a metal sheet to form the principal component of the battery. To improve battery quality and reduce manufacturing costs, this work attempts to establish a relationship between processing conditions of thin chemical coatings used in batteries and the small-scale structure of those chemical coatings. Using a benchtop-scale coating machine, this study varied three parameters: chemical dispense rate, sheet velocity, and dispenser-to-sheet distance, to establish their effects on the small-scale structure of chemical coatings. Microscopy (optical and other types) were used to assess the homogeneity and alignment of the coatings produced. Results indicated that higher horizontal velocities improved thin film alignment, supporting existing literature and suggesting the importance of maximizing velocity in industrial battery manufacture. Additionally, variations in composition of coated chemical mixtures were found to cause unexpected defects in coatings, highlighting the need for thorough testing of different mixture compositions to pinpoint the composition yielding ideal coating characteristics. This ongoing work aims to refine battery manufacturing by linking processing conditions to structural outcomes, potentially lowering manufacturing costs and enhancing the feasibility of grid-scale batteries.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 438
Investigating the Relationship Between Personality Traits and Leadership Outcomes in College Students

Leadership is essential in mobilizing others to achieve common goals or overcome challenges; therefore, it is necessary to study what may factor into leadership outcomes (Astin & Astin, 2000). Individual differences, including personality traits, are strong predictors of leadership (Chai, 2015; Judge et al., 2002). The purpose of the current study is to break down the relationship between personality traits and leadership in order to determine what individual characteristics lead to positive leadership outcomes amongst college students. Participants were 67 undergraduate and graduate students enrolled in entrepreneurial programs at Northwestern University. Students underwent a baseline assessment upon entering these programs as well as the three assessments of the Hogan Leadership Forecast Series (LFS). Correlations and regression analyses were conducted between LFS scores and a leadership outcome—the number of leadership roles occupied in student organizations. Results showed that Interpersonal Sensitivity and Colorful scales were positively correlated with the leadership outcome. Interpersonal Sensitivity and Colorful were positive predictors of the leadership outcome while Dutiful was a negative predictor. These findings suggest that traits related to transformational leadership are more common amongst student leaders compared to those of transactional leadership. Given the importance of this skill as a mechanism for social change, it is integral that students are aware of and able to foster the necessary traits to garner successful leadership.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 466
Elijah Huang

Characterizing variability in responses to acute intermittent hypoxia (AIH) using blood oxygen saturation time-series

Intermittent hypoxia (IH) is an intervention with alternating periods of normal oxygen levels and low oxygen levels (hypoxia) and has received attention in recent research due to its potential to elicit therapeutic and harmful effects. It is important to determine relevant IH parameters in order to administer safe doses of hypoxia. Previous studies have typically defined dosage based on a fixed partial fraction of inspired oxygen (FIO2) and duration of hypoxia; however, IH protocols vary in several parameters like the frequency of IH and the dependent variable measured. Therefore, this project aims to quantify intra- and inter-subject variability in the SpO2 response to bouts of acute intermittent hypoxia (AIH). Data was collected from a clinical trial with 18 subjects, each receiving 12 sessions of AIH; hypoxic dose was quantified using the area under a 90% SpO2 threshold, a commonly-used clinical standard for low oxygen saturation. Group averages indicate a larger area under the 90% threshold for bouts later in the session compared to earlier bouts, suggesting that subjects tended to become more hypoxic with successive exposures to hypoxia. Furthermore, substantial intra- and inter-subject variability in the SpO2 response to hypoxia was observed, indicating that the effective dosage received by a participant may not be the same despite using the same hypoxic protocol both between subjects and between different sessions within the same subject. This study can inform future studies using AIH to maintain participant safety and to better standardize dosages, an important step in identifying an optimal dosage of hypoxia for therapeutic purposes.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 273
Tinkering here to there: Parent-child interactions and spatial conversation in home and museum settings

Spatial language between parents and children supports children’s spatial skill development, and these spatial skills are important for future STEM achievement. Spatially rich conversations can arise during construction play activities such as tinkering, a form of open-ended problem solving using real tools and materials. Informal learning environments like museums can facilitate tinkering, and parent-child interactions may differ between various informal learning environments. Thus, I ask how parent-child collaboration and spatial conversations may differ for the same tinkering program between home and museum settings.

Sixty children and their parents completed a tinkering challenge either in their homes or in a museum. Families were recorded while they used everyday materials to construct a ramp to move something “here to there,” and children were interviewed after the activity. Tinkering recordings were coded for verbal and hands-on engagement and nine types of spatial conversations. Transcripts of post-tinkering interviews were coded for spatial word use.

Tinkering in both museums and families’ homes provides rich opportunities for collaboration and spatial conversations. However, the museum, with its wide range of novel materials and tools, supported a wider variety of material use and greater hands-on engagement than the home. At-home tinkering appears to encourage more talk about features and sizes. Overall, results of this study suggest that STEM learning opportunities that engage parents and children while facilitating spatial conversations can be expanded beyond museum settings. Museums, libraries, and other community centers can share ideas and resources for at-home tinkering activities to make tinkering and STEM learning more accessible.
Irrational Beliefs: Cognitive Failure or a Rational Way of Navigating an Irrational World?

Much research on the endorsement of irrational beliefs has focused on the cognitive limitations of believers (e.g., lower probabilistic reasoning abilities). Still, others have argued that irrational beliefs could facilitate coping with uncertainty and stress through control-seeking. However, it is unclear whether (1) different types of irrational beliefs respond to perceived uncertainty differently, (2) individual risk factors, such as baseline anxiety, increase susceptibility to irrational belief, (3) cognitive limitations play a role in this relationship. The present study assessed whether experimentally priming individuals to feel uncertain can predict increased endorsement of irrational beliefs despite sound probabilistic reasoning abilities. Additionally, we add to the literature by exploring the moderating role of baseline trait and existential anxiety in this relationship. Using the randomness priming task introduced by Kay et al. (2010), we randomly assigned 74 individuals to unscramble sentences containing words either related to randomness (experimental group) or with negative connotations (control). Contrary to our hypotheses, the prime did not predict belief in the paranormal or conspiracies broadly construed. However, randomness did predict one subscale of paranormal belief - superstition. Interestingly, existential anxiety was found to predict belief in conspiracies in the opposite direction than expected, and this relationship was mediated by beliefs in the paranormal. Our findings suggest more heterogeneous mechanisms underlying different types of irrational beliefs and complex interactions between them in the face of existential anxiety, whereby adopting one type of irrational belief may deter from adopting another by fulfilling our need for control and order.
In the movie *Contagion*, a blogger promotes a conspiracy theory that a homeopathic treatment can cure the global virus that has killed millions, causing widespread panic and demonstrating the danger health misinformation can have during a pandemic. During our own global pandemic, I became interested in how popular media such as *Grey's Anatomy* and *Borat Subsequent Moviefilm* portrayed the COVID-19 virus and what methods they used to educate audiences about the disease. I performed a content analysis of each project, noting any statements about the pandemic. I then determined whether each data point used observational learning, didactic learning, or neither in educating audiences. Next, I categorized each data point by the topic to which it was related: disease spread, treating infections, consequences of infections, misinformation, vaccines, or contextual information. Finally, I identified the tone of each text as dramatic, comedic, or informational. I totaled the percentages of each category in each media text and used a chi-squared test to search for significant relationships between the variables. For the chi-squared analysis, I ran 3 tests for each combination of my 3 variables (learning type, topic, and tone). These results show a significant correlation between the type of learning, topics addressed, and tones of popular media narratives when discussing the COVID-19 pandemic. The data also showed that observational learning was the primary way in which narratives attempted to communicate information about the pandemic. This research provides insight into how narrative media can be an effective health education tool for mass audiences.
Racial Disparities in San Francisco Arrest Dispositions

In 2020, the Racial Justice Act for All was passed in California, which allows people charged or convicted of a crime to challenge their case by providing proof of stark statistical evidence of systemic bias in charging and sentencing. This project aims to provide statistics for RJA utilization that describe arrest disposition disparities in San Francisco, which notably has the highest Asian population in California. Data on arrests and dispositions between 2011-2021 were sourced from the San Francisco Police department, and cleaned into the three largest racial categories: Asian, Black, and White. An overall analysis suggested that, while all racial groups had similar rates of conviction and dismissal, arrests of Black individuals resulted in a disproportionately high number of cases filed, while arrests of Asian individuals resulted in a disproportionately low number of cases filed. Bivariate analyses revealed that Asian and Black conviction rates were the most dissimilar, while Black and white rates were the most similar. Overall, Black people are overrepresented in the SFPD filing process, constituting ~34% of filed cases despite making up less than 5% of the population, while the opposite is true of Asians, who constitute ~6% of filed cases and ~34% of the population. These statistics, as well as discrepancies in Asian race/ethnicity identification, are useful for challenging systemic racial bias in courts under the RJA. They also provide avenues for further analysis of how Asians are treated by the American criminal/legal system in a Black/white dichotomy.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 495
Perceptions of Aging: Narrative Identity Across Gender, Race, and Time

Narrative identity—an individual’s ongoing process of shaping and being shaped by their life story—has led to a richer understanding of personality development, providing insight into how individuals conceptualize and make meaning out of their lives (McAdams, 2015). However, the narratives of older adults have gone relatively underexamined (Reischer, 2021) due to an inability to adequately serve a rapidly growing percentage of the U.S. populace. This study aims to begin to fill that gap through analyzing individuals’ perceptions of their own aging process.

We investigate potential differences in perceptions of aging across sex, race, and age, looking at both self-report measures and narrative data. Using Life Story Interviews (McAdams, 2008) from a longitudinal study of late midlife adults, we coded 146 individuals’ narratives at two timepoints (M= 60.37 years & M= 64.5 years; 62% female, 38% male; 58% White, 40% Black, and 2% interracial or other). Participants responded to questions about a) personal stability and change from adolescence to late midlife and b) reflections on the aging process. With established narrative identity coding methods (Adler et al., 2017), we coded five narrative themes: agency, communion, closure, self-actualization, and exploratory processing.

This study explores the possible unique effects of age, gender, race, and self-report measures (social well-being, psychological well-being, and physical health) in narratives on aging, as well as possible interactions effects among these variables. 

Presentation Format: Oral
Time: 12:30pm
Room: Armadillo Room
Number: 283
Examining the Nesting Microclimate of Olive Ridley Sea Turtles

Incubation temperatures influence the physical and demographic health of sea turtle populations, with high temperatures producing females and low temperatures producing males. Many studies have examined the relationship between air temperature and beach temperatures to predict how incubation temperatures might be impacted by climate change. However, most studies examine nest temperatures over long temporal scales, and don't examine the environmental variations that influence nest temperatures over the course of incubation. This study monitored nest temperatures of the Olive Ridley sea turtle (L. Olivacea) over the course of their development, and examined the impact of climatic conditions on internal nest temperatures. We used paired data loggers to record sand temperatures at points within relocated nests in the Osa Peninsula, Costa Rica. Both air temperature and rainfall were strong drivers of internal nest temperatures, although their effects were both temporally delayed. Average air temperature of the two previous days was the best model of nest temperature, and the nests themselves experienced a much more narrow range of temperatures over the course of the day (0.51°C) than the air temperature did (6.73°C). Heavy rainfall events (>100cm) were associated with the strongest shifts in nest temperature, and rain typically decreased nest temperatures by approximately 0.02°C per centimeter of rainfall. Nests recovered from these temperature shifts within two days, which is faster than previously reported. Further research into how beach specific characteristics such as albedo and grain size influence the susceptibility of nests to environmental changes will be very important in determining which beaches are at high risk due to climate change.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 297
Fat regulation in Drosophila melanogaster fat body

The *Drosophila melanogaster* fat body serves as a critical source of energy during starvation. We examined intracellular calcium levels in the fat body to determine whether Ca++ serves as a second messenger in this process. Previously, the Adipokinetic Hormone (AKH) and Hedgehog (Hh) signaling pathways have been independently linked to intracellular calcium levels and lipid metabolism. However, it was unknown how they might interact. Thus, we assayed the effects of these two pathways on intracellular calcium levels in the *Drosophila* fat body in response to starvation. *Drosophila* larvae expressing the fluorescent Ca++ indicator GCaMP6S were visualized via fluorescence microscopy. We examined larvae in which the AKH expressing neurons were ablated, treated with RNAi to *Hh*, or carried a loss-of-function (LOF) mutation to the trimeric G-protein-subunit Gαi. In wildtype larvae, starvation induces intracellular calcium pulses that originate from the fat body in the head and propagate into the trunk fat body. After ablation of the AKH expressing neurons, all calcium signals are eliminated. Repressing Hh signaling or Gαi LOF leads to elevated calcium levels with a loss of pulses. These results suggest that Akh is responsible for elevating calcium levels, whereas the Hh signaling pathway reduces calcium levels. These two pathways likely interact to generate the wildtype Ca++ pulses. Furthermore, Gαi may be regulated by Hh signaling to repress intracellular calcium. These studies reveal a novel interaction between Hh signaling and Gαi within the fat body and with AKH signaling from the brain for fat body responses to starvation.

Presentation Format: Oral
Time: 10:30am
Room: Lake Room
Number: 464
Disrupting Antibiotic Resistance: Harnessing Cobalt Schiff base complexes' Inhibitory Effects on NDM-1 to Restore Antibiotic Efficacy

The rise of antibiotic resistance poses a significant threat to global health, necessitating innovative strategies to overcome bacterial defenses. One key mechanism employed by bacteria involves the production of metallo-β-lactamases (MBLs), enzymes capable of hydrolyzing antibiotics like penicillin. The project aims to disrupt MBL activity by introducing cobalt(III) Schiff base complexes (Co(III)-sb) as inhibitors, preventing β-lactam hydrolysis and restoring antibiotic efficacy. The experimental approach involves screening a library of Co(III)-sb complexes to probe their efficacy against the New Delhi Metallo-β-lactamase 1 (NDM-1). The catalytic activity of NDM-1 relies on histidine-bound Zn(II) ions in its active site. However, these zinc ions are displaced by the octahedral cobalt complexes due to the higher affinity of histidines for cobalt. This substitution process is facilitated by the favorable thermodynamics of axial ligand exchange exhibited by the Co(III)-sb. The effects of varying concentrations of Co(III)-sb on NDM-1 activity are examined through the colorimetric nitrocefin assay, allowing quantification of dose-responsive inhibition. These measurements help determine inhibitory constants (IC_{50}), the concentration of cobalt required to achieve 50% inhibition of NDM-1 activity. The results of this analysis will highlight Co(III)-sb's therapeutic potential to reverse antibiotic resistance and guide the design of future complex compounds through valuable insights into the structure-activity relationship. The implications of this research lay the foundation for the development of new inhibitors of MBLs. By inhibiting NDM-1 with Co(III)-sb, this project offers hope for the restoration of antibiotic efficacy.
Assessment of phage susceptibility of CHG-resistant Pseudomonas aeruginosa from hospital ICUs

Antimicrobial resistance has become an increasingly concerning phenomenon. In medical intensive care units (MICUs), chlorhexidine digluconate (CHG) is a common antimicrobial used to disinfect the skin of patients and healthcare providers. Exposure to sublethal concentrations of CHG has resulted in decreased susceptibility in various bacterial species raising concerns about the use of CHG in healthcare environments. Solutions to the rising prevalence of antimicrobial resistance are still being developed. Bacteriophages, or phage therapy has been proposed as a potential treatment option to fight antimicrobial-resistant infections. In this study, the susceptibility to CHG of 509 bacterial isolates obtained from various hospital surfaces was explored. The agar dilution method was used to determine the isolates’ minimum inhibitory concentration (MIC). Of the various surface categories tested, sink drains were shown to have the highest frequency of isolates with high MICs (≥128 µg/mL) suggesting that sink drains may be a potential reservoir for CHG-tolerant bacteria. Of these 37 isolates, two strains of Pseudomonas aeruginosa were identified. Plaque assays were then performed on these strains of P. aeruginosa using DMS3 and JG024 phages. Plaques did not form in the environmental isolates plated with phage indicating that phage infection was unsuccessful. The presence of phage defense systems was investigated using Prokaryotic Antiviral Defense Locator (PADLOC). Five abortive systems were present suggesting that bacterial cells may have sensed phage and died before infection. Although this work is preliminary, the findings from this study begin to show the barriers to the use of phage in resistant environmental isolates.
Pain Without Gain: Intolerable Suffering and Physician Assisted Death

The Canadian government recently delayed the rollout of a law allowing physician-assisted death in cases of psychiatric illness. Given a history of questionable cases of physician-assisted death, the proposed law has drawn criticism and concern. Many scholars have expressed worries that the new law will lead to patients acquiring physician-assisted death who should not be approved. Ultimately, these concerns boil down to one question: how should a physician ethically evaluate an application for physician-assisted death? The standard approach focuses primarily on ensuring that the patient’s autonomy is respected, with only a cursory mention of whether or not the patient’s suffering is intolerable. Bioethicists do not have a standard definition of intolerable suffering, and many leading theorists glaze over a definition of intolerability to focus primarily on respect for autonomy or questions of application. This is a critical error that prevents physicians from evaluating fringe cases such as psychiatric illness. After surveying the existing literature on physician-assisted death to identify this error, this thesis presents a theory of intolerable suffering derived from paradigmatic cases of physician-assisted death and Frederik Svenaeus’ theory of suffering. I argue that intolerable suffering is present if and only if the patient’s coherent life narrative is disrupted and three criteria are present: self-reflection, agent-centricity, and direness. When all three are present, the patient’s suffering can reasonably be understood to be intolerable, fulfilling that part of the physician-assisted death approval process. This thesis will further elucidate these criteria and apply them to cases of psychiatric illness.
Subsquares in random Latin squares and rectangles

Latin squares are interesting objects of study in combinatorics. An order-$n$ Latin square is an $n \times n$ array of $n$ symbols such that each symbol appears in each row and column exactly once. Additionally, a $k \times n$ Latin rectangle is a $k \times n$ array, $k \leq n$ of $n$ symbols such that each row contains each symbol exactly once and each column contains each symbol at most once. We say that a $k \times n$ partial Latin rectangle is $C$-sparse if the number of nonempty entries in each row and column is at most $C$ and each symbol is used at most $C$ times. We prove that the probability a uniformly random $k \times n$ Latin rectangle, where $k < (1/2 - \alpha n)$, contains a $\beta n$-sparse partial Latin rectangle with $\ell$ nonempty entries is $(1 \pm \varepsilon n)^\ell$ for sufficiently large $n$ and sufficiently small $\beta$. Using this result, we prove that a uniformly random order-$n$ Latin square asymptotically almost surely has no Latin subsquare of order greater than $c \sqrt{n \log n}$ for an absolute constant $c$.

This work makes progress on an open conjecture posed by McKay and Wanless in 1999. This research was completed during the 2023 Georgia Tech Mathematics REU and is joint work with Alex Divoux, Tom Kelly, and Jasdeep Sidhu. This project was supported by NSF grants #1745583, #1851843, #2244427, and the GaTech College of Sciences.

Presentation Format: Oral
Time: 12:30pm
Room: Lake Room
Number: 182
Neurobiological Pathway Behind Motion Sickness in the Mouse Model

Around ⅓ of people are highly susceptible to severe motion sickness (MS) which affects people mainly during times of transportation, inducing nausea and vomiting most commonly. The primary symptom of MS, nausea, can adversely impact one’s quality of life. This polysymptomatic illness includes autonomic reactions, lethargy, and fatigue among primary symptoms. There is no cure for MS, and anti-nausea medications are not successful in combating the illness. MS is important to research, as many cancer patients, along with other patients, struggle with severe nausea from chemotherapy related to MS.

In order to uncover the precise etiology of MS, my research with my mentor, Richard Hwang, focuses on discovering the nausea inducing proteins specific to the cerebrospinal fluid (CSF) in the mouse model. I assist Richard in identifying Dorsal Vagal Complex (DVC) neurons activated by MS in CSF and signal molecules secreted into CSF in response to MS. I prepare aCSF and sacrifice then perfuse mice. Then, I dissect their brains to isolate the DVC. Then, I assist in acutely dissociating DVC neurons using papain, and plate the resulting cells. Next, I help develop an assay using these acutely dissociated neurons to screen for reactivity to CSF extracted from mice subjected to MS.

Our hypothesis describes how the induction of MS probably causes secretion of alarm signals into the CSF which communicates with circumventricular brainstem nausea neurons in the DVC. This research is ongoing and effective, holistic results will come with a larger data set.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 489
Constructing the Autistic-Transgender Intersection: A Critical Discourse Analysis

Both autism and transgender (trans) are categories with continually shifting and contested meanings. In recent years, claims of scientific evidence for a relationship between autism and trans identities have proliferated within and beyond clinical research, positioning this observed autistic-trans intersection as a new object of discourse. Considering the divergent potential material and political consequences of this discourse, my study explores how scientific evidence about the autistic-trans intersection has been constructed, contested, and leveraged across multiple social arenas. I use a critical discourse analysis approach to analyze 30 texts corresponding to six major arenas of social interaction, including clinical research, gender-affirming medicine, news and opinion media, state-level policy, social activism, and autistic trans individuals’ lived experiences. I argue that diverse configurations of scientific evidence about the autistic-trans intersection can be understood through four discursive types: psychiatrization, restricting medicalization, medical management, and affirmation and reclamation. These types represent differently patterned ways of 1) explaining medical versus social "causes" of this intersection and 2) evaluating the validity of autism and trans identities as real, mutually inclusive categories. Importantly, I find that each discursive type shapes different possibilities for the social, medical, and legal recognition of autistic trans experiences and promotes different distributions of power among medical authorities, state actors, and autistic and trans individuals. These findings contribute to sociological analyses of how autism and trans identity, as well as disability and gender more broadly, are socially constructed. Additionally, this work extends critical understandings of the relationships between scientific knowledge, discourse, and social reality.

Presentation Format: Oral
Time: 12:30pm
Room: Arch Room
Number: 429
Who Do You Believe?: The Generalizability of Vested Interest Effects on Source Credibility

When a cause is presented for an event, it often sticks in the mind and leads to retractions of the cause being ineffective. This is known as the continued influence effect (CIE). In addition to the traditionally studied source expertise and trustworthiness, recent work has promoted vested interest, referring to when an individual has a personal motive for retracting a cause, as an additional variable influencing CIEs. However, this work only had participants read one story, and its generalizability was uncertain. Our study tested this generalizability using four different stories. We hypothesized that CIEs, represented by belief in the original cause, would be reduced for retractions from experts compared to non-experts and for sources with no vested interest compared to sources with vested interest. 266 participants on the survey platform Prolific read four different reports about investigations into different events. In each report, an initial cause was retracted by an authority figure with high or low expertise and high or low vested interest. Participants then answered questions about source expertise, trustworthiness, retraction believability, and the event's cause. Compared to non-expert sources and sources with vested interest, participants rated expert sources and sources with no vested interest as more knowledgeable and more trustworthy in addition to rating their retractions as more believable. This replicates previous work on vested interest with multiple narratives and extends the generalizability of vested interest effects. Ongoing work will analyze responses to open-ended questions to see if mentions of retracted causes are influenced by these source features.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 242
Understanding Pretest Perceptions and Concept Retention Factors to Enhance Industrial Engineering Program Assessment

Assessment of course learning objectives and mapping to program goals continues to be an important focus area for engineering departments. To analyze course prerequisite knowledge, in 2012, the Department of Industrial Engineering and Management Sciences (IEMS) at Northwestern University implemented a pretest policy for core IEMS undergraduate courses. In 2020, the department transitioned out of Accreditation Board for Engineering and Technology (ABET) accreditation and faculty developed their own Bachelor of Science in IE (BSIE) program learning goals and outcomes. We initially analyzed the 2021-2023 quantitative pretest data based on legacy ABET student outcomes and new BSIE learning outcomes, developing a new mapping system in the process. I identified conceptual areas of weakness and aptitude for students based on various class pretest pass rates. However, said observations were not well-explained by the quantitative data, so I launched a qualitative study to investigate perceptions of the pretest as well as overall contributors to concept retention. I completed 16 interviews with IEMS students and faculty and am currently conducting qualitative analysis on our results via coding and identification of major themes. The findings of this study are a work in progress and will be synthesized in a report and shared with the department. The conclusions will inform revisions to the department’s pretest policy and ultimately contribute to crafting intentional, enriching educational experiences for undergraduate IEMS students.

Presentation Format: Oral
Time: 12:30pm
Room: Lake Room
Number: 337
The Role of Light in Sleep Health and Sleep Disparities

Sleep disruptions affect a large portion of the US population and include inadequate sleep duration and poor sleep quality. These disruptions are due to numerous factors, including environmental factors such as light exposure. Prior work has shown significant adverse associations between light exposure and sleep health. Further, light exposure could partially account for well-known sleep disparities between White and Black adults. The objective of this paper is to identify which characteristics of light are associated with sleep health outside the laboratory. The data are from the CARDIA Study, a large cohort of Black and White adults. Methods to measure light levels and sleep include a wrist activity monitor with a light sensor and a small device placed in participant bedrooms that measures light levels. Both devices were used for ~7 days by each participant (n=320). Measures of light include mean light levels during the sleep period as well as minutes above 0 lux and 10 lux. Sleep measures include duration, fragmentation, and wake after sleep onset. I hypothesize that higher light levels during the sleep period are associated with worse sleep and partly explain racial sleep disparities, and conducting these analyses is the next step. The strengths of the study are the large sample size, real-world data, and 7 days of simultaneous objective measures of light and sleep. The implications of this study could include identification of an environmental factor contributing to racial disparities in sleep health and support the development of interventions to improve sleep.
Encoding within an Abstract Dimension of the Hippocampus using a Mouse Model

The hippocampus, known for its role in memory encoding and predicting future behaviors, has revealed a crucial aspect through the discovery of place cells—specialized neurons that activate in response to specific locations within an environment, collectively forming a mental map. This study aims to investigate whether the hippocampus can encode abstract hierarchies, such as family trees or numerical relationships, using mechanisms analogous to place cells. To address this question, we employed a visual task wherein mice were presented with symbols on the left and right sides of a screen. The mice learned to lick towards symbols with a greater predetermined numerical value to receive a reward, thereby forming associations between specific symbols and favorable outcomes. Behavioral data consistently showed mice choosing symbols with higher values, demonstrating an ability to form abstract hierarchical maps using arbitrary stimuli. These findings set the stage for calcium imaging and optogenetics to isolate hippocampal neurons during task performance. Understanding how abstract relations are encoded contributes to our knowledge of complexities in our memory, which contributes to building artificial intelligence and human-computer interfaces.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 249
Primary cutaneous CD8+ aggressive epidermotropic cytotoxic T-cell lymphoma (PCAETCL) is a highly aggressive skin cancer whose mechanism has yet to be understood. In patient samples, we discovered a possible driving gene mutation STAT3-JAK2: a fusion between two genes, STAT3 and JAK2, involved in cell proliferation. However, therapies inhibiting JAK2 are unsuccessful. This suggests that STAT3, not JAK2, drives cancer. STAT3 has six targetable sections that contribute to overall function: n-terminal (ND), coiled-coil (CCD), DNA-binding (DBD), linker (LD), src homology 2 (SH2), and transactivation (TD). We hypothesize that at least one domain drives cancer. Seven truncated versions of STAT3-JAK2 were generated using molecular cloning technology, with one section deleted at a time. These fusions were expressed in Ba/F3 cells, a model cell line dependent on chemical signal IL-3. Cells expressing each truncated fusion were grown in IL-3-rich and IL-3-deficient conditions. Cells were grown over 12 days. Every three days, cell populations were measured using flow cytometry. In IL-3-deficient conditions, cells expressing the truncated gene without ND grew exponentially. This suggests that ND is not responsible for cancer. CCD may drive cancer, as removal resulted in a sharp decrease in cell population. Further analyses are ongoing to investigate downstream targets of STAT3-JAK2.
Greening Pilsen: Mapping Native Plant Species for Equitable Biodiversity and Green Spaces

I set out to figure out what kind of native plant species are suitable to be planted in Pilsen to increase the biodiversity of native species and green spaces in the community. The Chicago city government's history of inequitable resource distribution and racist rezoning has led to inequity in green spaces between the predominantly Hispanic neighborhood of Pilsen and more northern, white neighborhoods. Native plant species help reduce air pollution more efficiently and protect both ecosystems and soil structures, but they are dependent on the existence of green spaces in communities. My work helps solve this "green" gap by providing Geographic Information Services (GIS) data to Women for Green Space, a community partner, to utilize in their grant applications to plant native species across Pilsen. I gathered data from the Chicago Botanical Garden and the Illinois Department of Natural Resources, who each provided individual recommendations on what native species to plant in urban areas. I then compared it to topographical data from Pilsen, including sidewalk maps, shaded areas from buildings and trees, and proximities to sidewalks, to determine what plants' characteristics would best be suited to plant in a given area. I am still completing this project, but I expect the results to highlight where Women for Green Space can plant native species and expect them to thrive. This project will determine whether a large or smaller portion of the neighborhood would be suitable for native species plantings, thus implicating the need for improved green spaces. The data will add to existing sustainability projects by providing a blueprint to do similar GIS analysis across other neighborhoods in Chicago and address the "green" gap.
Non-Traditional Recumbent Tricycle Steering

This research focuses on developing a steering system for recumbent tricycles, specifically designed to improve accessibility for individuals with limited upper body mobility. The study evaluates various sensors to effectively translate human motion into precise steering control. A touch sensor, characterized by its 10 interval precision, was identified as the most efficient, providing quick response and high accuracy, while avoiding issues such as overshooting or settling time. This is in contrast to the joystick, which demonstrated excessive sensitivity and lower precision. The integration of mechanical engineering and computer science in this research presents significant implications for recreational therapy and accessibility. It offers innovative solutions that not only enhance the functionality of recumbent tricycles but also contribute to the broader field of assistive technology. The findings of this study can be used as a starting point in advancing the design of accessible recreational vehicles, emphasizing the need for multidisciplinary approaches to address mobility challenges and improve the quality of life for individuals with physical limitations. This research highlights the potential of adaptive technologies in creating inclusive environments and empowering individuals through improved access to recreational activities.
Accurate and Sensitive LC-MS/MS Analysis of the Loading of the Anti-Inflammation Drugs Calcitriol and Calcifediol in High-Density Lipoprotein (HDL) and Poly(Lactic Acid-Co-Glycolic Acid) (PLGA) Nanoparticles

The anti-inflammatory properties of the vitamin-D metabolites calcifediol and calcitriol have been used to treat skin conditions such as plaque psoriasis for the last two decades [1]. First evidence also shows that topically applied vitamin D metabolites could provide skin protection and accelerate skin healing in mice exposed to warfare agent sulfur mustard [2]. An electrospray ionization liquid chromatography tandem mass spectrometry (ESI LC-MS/MS) strategy was applied to accurately quantify the loadings of calcifediol and calcitriol in high-density lipoprotein nanoparticles (HDL NPs) and poly(lactic acid-co-glycolic acid) (PLGA) NPs, which are drug-delivery platforms. This strategy was then applied to the evaluation of calcifediol and calcitriol that have been uptaken in vitro by cells. Compared to the commercially available, competitive-enzyme-binding assay ELISA, [3] the LC-MS/MS strategy provides more accurate quantification of the drug loading, with excellent sensitivity (~20 pM/~0.01 ng/mL) and better reproducibility due to the direct comparison against an internal standard. These are major improvements over the commercially available ELISA kit, which yielded lost dependent results with possible nanoparticle component-interference. Notably, this LC-MS/MS strategy can be used to guide the synthesis of more-efficient drug delivery NPs and control NP loading before embarking on in-vivo experiments with mice. In preliminary experiments, calcitriol absorbance on inflamed and naive mice skin was reproducibly quantified by our strategy. Upcoming experiments will include establishing drug release timeframe from the NPs in the treated tissues and correlating the LC-MS/MS data to visual observations of wound-healing process, which will give information on the best drug-dosing schedule.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 247
Investigating N-Movement in English: Presence and Proposals

It's been suggested that Noun heads of NPs in English can move and that N may land in the n head of nP, a proposed functional phrase between Determiner Phrase and NP. However, other proposals suggest that N moves elsewhere. Additionally, there is little evidence for N-movement in English, where, unlike in Romance languages, such movement would occur covertly. If N-movement occurs in English, it should be sensitive to movement constraints, like the Head Movement and Coordinate Structure Constraints. To investigate whether this is the case, I introduce the pseudo-Prepositional Phrase coordination construction (e.g. "the fear1 of John2 t1 of Mary and of David3 t1 of Sarah"), a potential N-movement structure where the heads of coordinated NPs move across-the-board to the same (higher) position. I utilize this construction in a rating experiment, manipulating CONNECTIVE (and vs. from) and GAP (present vs. absent) and anticipating high ratings in gap-absent cases (since neither involves constraint violations). If ATB-N-movement occurs in English, and-gap should be rated lower than the gap-absent cases but higher than from-gap: only the former would observe the HMC and CSC. I found significant effects of GAP (t = 8.2456) and GAPCONNECTIVE (t = -3.8954), demonstrating that my construction involves ATB-N-movement. Further, I show that the moved N lands in n: but this doesn't reflect how other noun types, like non-verb-derived light (e.g. someone) and heavy (e.g. candidate) nouns, move. I suggest that such nouns are treated differently than verb-derived ones, potentially according to other N-movement proposals.

Presentation Format: Oral
Time: 12:30pm
Room: Lake Room
Number: 553
Single Shot Reinforcement Learning in Robotic Hardware

Single-shot learning is the ability for a learning model to train with only one example/object. Essentially, the model is able to learn on the fly, which is important for robots that may encounter novel phenomena not represented in prior datasets. Consider a robot that needs to learn how to pour a glass of water. Traditionally, large data sets of examples are required for the robot to be trained effectively. The data would have to include the task being done with different environmental setups, such as with different types of cups and water pitchers. In various applications, it can be costly, timely, and/or simply unrealistic to collect enough data to train the traditional reinforcement learning models. Within the field of robotics specifically, the environment and robot would have to be reset every time it is trained, which makes multishot learning impractical in many situations. While there have been developments in the field of single-shot reinforcement learning, people have yet to systematically test these models in hardware. Allison Pinosky and Thomas Berrueta developed a method for single-shot learning that they coined maximum diffusion reinforcement learning. This project focuses on designing and implementing the hardware to test their model on a physical robot and explore the applications of their work.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 424
Cradle-to-Grave Life Cycle Assessment of Interventional Radiology MRI, Stereotactic, and Ultrasound Biopsy Kits

Of hospital waste, 20% to 25% is plastic and approximately 91% of that evades recycling and either ends up in a landfill or percolates into ecological environments. Our research has focused on quantifying environmental impacts associated with three image-guided surgical biopsy kits: a magnetic resonance imaging (MRI) kit, a stereotactic kit, and an ultrasound kit. Data sourced from these kits inform the results of a life cycle assessment (LCA) study. In the United States, more than a million breast biopsies are performed annually and the associated surgery kits are oftentimes not recycled. We report cradle-to-grave carbon dioxide emissions and energy usage associated with the three biopsy kits. Preliminary results indicate the MRI kit contributes the most to carbon dioxide emissions of the three kits while the stereotactic kit utilizes the most energy. Emissions associated with the supply chain contribute 67% to 72% of carbon dioxide emissions and 71% to 76% of energy usage. Our results also indicate that packaging materials contribute 13% to 23% of total carbon dioxide emissions and 20% to 26% of total energy usage of the kits. We report the sensitivity of these environmental impacts to kit production capacity, size ratio of sharps waste containers to their contents, and the amount of recyclable components in the kits. These data lead into a discussion of the total environmental burdens and benefits of (1) pushing for the reprocessing of recyclable healthcare waste and (2) substituting certain components made from non-renewable resources with components sources from renewable materials.
Synthesis and Modulation of a Double Network Hydrogel via Cell-Free Expression of the Protein APOL3

Previously, modular synthetic materials, such as hydrogels, have been developed to respond to stimuli such as chemicals, enzymes, and mechanical stress. In contrast to living tissues that can integrate multiple environmental signals and form complex responses, these synthetic materials remain rudimentary in their ability to respond to their environment. However, double network (DN) hydrogels could be the answer to creating materials with increased tunability. They are composed of two interwoven networks allowing for the material’s stiffness, crosslinking, and pore size to be precisely adjusted. Rather than designing a gel that responds to light, pH, or temperature as has previously been explored, the Kamat lab has proposed the integration of biological systems into a DN hydrogel. In aims to accomplish this goal, we’ve employed the method of cell-free expression (CFE) governed by a fluoride riboswitch to produce a detergent-like protein known as apolipoprotein L3 (APOL3) within a hydrogel system. This method allows for a biological stimulus to trigger the CFE of APOL3 that will release molecules that cause secondary crosslinking in the hydrogel, which will change the gel’s material properties. Our experiments so far have proven the efficacy of performing CFE within a hydrogel as well as the ability of APOL3 to release our crosslinking molecules. Ultimately, the results that develop from this project will allow us to uncover key design rules for creating modular hydrogel systems that could see much use in the fields of drug delivery, soft robotics, and tissue engineering.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 488
Sunrise On Faraway Waters: A Transnational Activist Musical

Sunrise On Faraway Waters is a literary, theatrical, and musical work that transcends 35 years of history, told collaboratively by two characters: a Chinese American student activist in the present and her father, who was a participant in the 1989 Democracy Movement, the largest nonviolent protest in China’s history. With my project, I ask the question: How does the 1989 Democracy Movement inspire activism in our communities? Every year on the anniversary of June 4th, there is a sudden surge in media attention in the US, who post footage of the massacre committed against the 1989 Democracy Movement to remind us of our civil liberties and distract us from violence committed against activists and local and global genocides. My parents were 20 years old when they experienced the movement as student activists. I am 20 years old. I see shared vocabularies, strategies, and ambitions between their peers, living and deceased, and my fellow student activists today. Sunrise On Faraway Waters contextualizes the 1989 Democracy Movement in tandem with liberation efforts worldwide. It is a story that sings for activists here and there, then and now.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 257
LGBTQIA+ Identity Exploration and Expression Through Self-Insert Fanfiction

Increasing attention has turned to the influence of fandom communities, which bring together fans of a similar interest, on the identity development, exploration, and expression of LGBTQIA+ (e.g., lesbian, gay, bisexual, transgender, queer, intersex, asexual) individuals. Within fandom, writing and sharing fanfiction, text-based fanwork building on preexisting source material, has been identified as an important source of community and knowledge for LGBTQIA+ individuals. One genre of fanfiction that could bear particular relevance to issues of identity is self-insert fanfiction, in which fans embed themselves in the stories they write and read. The current study explored the ways in which self-insert fanfiction may function as a medium through which LGBTQIA+ fans are able to consider, explore questions about, and express their identity with respect to gender and sexuality. Twenty-one fanfiction readers and writers identifying as LGBTQIA+ were interviewed about their experiences with self-insert fanfiction and fandom spaces, with their responses coded using thematic analysis. Findings indicate that self-insert fanfiction relates to identity exploration and expression along six focal themes: (1) exploration and experimentation; (2) working to self-acceptance; (3) creating visibility and normalizing; and (4) fostering connections. Results also suggest that the self-insert fanfiction serves as a distinct medium due to characteristics such as its immersive nature and writing conventions. The broader fandom landscape is also impactful in how fans engage with self-insert fanfiction. These results offer insights into the processes and practices individuals engage in to support identity development, and contributes to growing research on the role that fandom and fanfiction play for individuals’ understandings of the self.
Spectral Characteristics and Exciton Dynamics of Mixed-dimensional Organic/Inorganic Heterostructures

Van der Waals (vdW) heterostructures, consisting of two-dimensional (2D) transition metal dichalcogenides (TMDs) and zero-dimensional (0D) organic semiconductors, have emerged as promising platforms for optoelectronic applications. In this study, we focus on the (vanadyl phthalocyanine) VOPc/TMD heterostructure to explore its unique photoluminescence and absorption properties. Through systematic investigation, we aim to uncover the underlying principles driving these distinctive changes in spectral characteristics from both chemistry and physics viewpoints. Our findings contribute to a deeper understanding of the fundamental interaction dynamics in mixed-dimensional vdW heterostructures, with potential implications for the development of novel optoelectronic devices.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 370
Online Robotic Gait Learning using Generative AI

We introduce a novel generative autoencoder framework for online robotic gait learning. Given an unknown environment and unknown robot dynamics, our approach learns structured control signals through a feedback pipeline that incorporates active robot walking, latent space reward function and autoencoder training using sparse data. Initial results using Mujoco Ant simulation indicate good gaits are represented in our latent space and reconstruction loss is minimal. Our pipeline has three stages. Initially, we sample the encoder, decoder, and reward functions to effectively characterize minimal loss regions that identify promising gait descriptors for investigation. Next, a chosen minimal loss control signal is executed by the robot in its environment and its reward function is characterized. Lastly, this reward function and reconstructed outputs, back propagate for weight training. Our future work aims to integrate this online learning approach to a physical robot, incorporating more targeted latent space reward functions.
Fat regulation in Drosophila Melanogaster fat body

The *Drosophila melanogaster* fat body serves as a critical source of energy during starvation. We examined intracellular calcium levels in the fat body to determine fat utilization regulation, as Ca++ serves as a key second messenger. Previously, the Adipokinetic Hormone (AKH) and Hedgehog (Hh) signaling pathways have been independently linked to impacting intracellular calcium levels and lipid metabolism. However, it was unknown whether there was crosstalk between the pathways. Thus, we assayed the effects of these two pathways on intracellular calcium levels in the *Drosophila* fat body in response to starvation. Early third instar *Drosophila* larvae expressing the fluorescent Ca++ indicator GCaMP6S were examined via fluorescence microscopy. We examined larvae expressing AKH gene ablation, RNAi to Hh, or a loss-of-function (LOF) mutation to the trimeric G-protein-subunit Gai. In wildtype larvae, starvation conditions induce intracellular calcium pulses that originate from the fat body in the head and propagate into the trunk fat body. After ablation of AKH, all calcium signals are eliminated in the fat body. Repressing Hh signaling or Gai LOF leads to elevated calcium levels with a loss of pulses. These results suggest that AKH is responsible for elevating calcium levels, whereas the Hh signaling pathway reduces calcium levels. These two pathways may interact to generate the wildtype Ca++ pulses. Furthermore, Gai may be linked to Hh signaling to repress intracellular calcium. These studies reveal a novel interaction between Hh signaling and Gai within the fat body and AKH signaling from the brain for fat body responses to starvation.
Investigating mechanism and dosing of BACE1 inhibitors for the treatment of Alzheimer’s disease

Alzheimer’s disease (AD) is a debilitating form of progressive dementia that primarily affects elderly populations. A hallmark of AD is amyloid plaques in the brain, which are thought to be necessary to initiate the disease. These plaques are composed primarily of amyloid-beta (Aβ) peptides. BACE1 is one of the proteases responsible for cleaving amyloid precursor protein into Aβ peptides, and inhibition of BACE1 by small molecule BACE inhibitors prevents the production of Aβ peptides. While BACE1 inhibitors have been clinically tested to prevent future plaque buildup in AD patients, they often come with the side effect of cognitive worsening. This project investigates the effects of different doses of BACE1 inhibitors on behavior and plaque load in a mouse model of AD. PDAPP mice overexpress human amyloid precursor protein, which leads to the buildup of amyloid plaques. Results from the immunofluorescence microscopy staining analysis confirmed a dose-dependent reduction in plaques from the BACE1 inhibitor. Additional staining revealed a decrease in microglia and astrocytes, which suggested a reduction in neuroinflammation. Behavioral tasks were conducted to find relationships between substrate cleavage and cognitive deficits in BACE1 inhibition. Only weak correlations for substrates Sez6 and APLP1 were revealed to correlate with exploratory behavior and memory, respectively, suggesting that there may be other factors aside from these substrates responsible for cognitive worsening. This work contributes to understanding the mechanisms by which BACE1 may induce negative cognitive side effects while reducing plaque load in Alzheimer’s disease patients.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 258
"Its charity shall be as broad and expansive as the firmament of Heaven": How Chicago's First Jewish Hospital Transcended the Demarcations of Faith

Throughout the 1800s and 1900s, the establishment of charitable hospitals was one of the Jewish community’s most significant contributions to Chicago, benefitting both the Jewish community and the city at large. The first Jewish Hospital, opened in 1868, was a prominent institution, yet its story has remained largely untold. The hospital was highly respected, it affected the lives of many Chicagoans, and the principles behind it provided the framework for later Jewish medical philanthropy. In my research, I sought to recover the forgotten story of this hospital, identify the key philanthropists and doctors, uncover the rationale for its establishment, and understand its impact on the city. To accomplish this, I conducted archival research, mainly at the Newberry Library. For my results, in addition to reconstructing the complete story of the hospital and the biographical information of nearly all those involved with the hospital, I made one major finding: that Jewish medical philanthropy was not exclusively Jewish. Many of the hospital’s doctors were not Jewish, and the hospital treated patients of all races and religions. I concluded that Jewish medical philanthropy had always been a collaboration between Jews and non-Jews to improve healthcare in the whole community. This collaboration, not well-recorded in Chicago’s history prior to my research, reveals that early Chicago fostered unification, and citizens put their differences aside in pursuit of bettering the city. My findings allow for a reexamination of assumptions regarding cross-cultural interactions in early Chicago and reframe narratives found in modern studies of Chicago Jewish history.
Kombilesa Palenque: African Legacy in Colombia

This research project provides a comprehensive exploration of the Palenquero community in Barranquilla, Colombia, culminating in the development of an innovative and interactive website. The primary objectives were to delve into the rich history, endangered culture, and unique experiences of this community through ethnographic fieldwork, in-depth qualitative interviews, and an extensive literature review.

The methodological approach combined participant observation, semi-structured interviews with community members, activists, and experts, as well as a review of academic publications and archival materials. The resulting multimedia content, including video interviews, photographs, and footage of cultural events, was integrated into an engaging interactive website emulating a map navigation experience.

Key findings highlight the resilience and cultural preservation efforts of the Palenquero community, the challenges of urbanization and identity negotiation, socioeconomic disparities, growing activism and advocacy movements, and the crucial roles of Palenquero women. The website serves as a powerful educational resource, featuring sections on the community’s origins, language, cultural practices, migration experiences, social mobility challenges, and advocacy efforts.

This research contributes to the broader scholarly discourses on African diaspora studies, cultural heritage preservation, and social justice issues, while also providing an alternative perspective on the experiences of Palenqueros living in urban centers. The interactive website offers an immersive educational experience, fostering greater awareness, understanding, and appreciation for the heritage and struggles of this community.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 288
The Impact of Stressful Life Events on Psychopathology: A Comparative Study of Clinical High-Risk for Psychosis and Major Depressive Disorder

People at clinically high risk for psychosis (CHR) have higher rates of stressful life events, which relates to the severity of attenuated positive symptoms seen in this population. However, there remains a notable gap in understanding how these events contribute differently to the risk of developing psychopathological symptoms in CHR and major depressive disorder (MDD) groups, specifically hallucinations and delusions. This study examined the relationship between the number and types of traumatic life events and the risk of developing psychopathological symptoms in individuals at CHR, those diagnosed with MDD, and healthy control (HC) participants. Measures recorded instances of traumatic life events and symptoms of hallucinations and delusions. Life events were categorized into positive, negative, independent, and dependent events. Analysis of variance (ANOVA) and linear regressions were utilized to examine group differences in the number of traumatic life events and the presence of hallucinations and delusions. The findings revealed significant differences in childhood trauma and stressful life events with MDD and CHR participants experiencing higher levels of stressful life events compared to HC participants, with an insignificant difference between MDD and CHR groups. These results remained consistent across various types of life events. However, CHR participants reported fewer occurrences of positive life events than MDD participants. Traumatic events were positively associated with the severity of hallucinations and delusions across all groups. The findings underscore the importance of considering the impact of traumatic experiences on symptom severity and highlight the consistent association between stressful life events and psychopathological symptoms like hallucinations and delusions.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 125
Jammin’, Jazz, and Jawaiian: "Black Music in Hawai‘i"

Much of the colonial history recorded in Hawai‘i overlooks and misrepresents the Black diaspora on the islands- including the vast ways Black music interacts with Hawaiian culture. In Dr. Nitasha Tamar Sharma’s upcoming book, she outlines the history and arrival of Black music (jazz, reggae, hip hop, rap) to Hawai‘i. Blending together the fields of African American studies, Musicology, and Pacific Island studies, this project explores the unique experiences of Black musicians living in Hawai‘i and how these interactions changed as the conception of race and the sociopolitical environment of Hawai‘i changed. As a research assistant, I conducted archival research based on keywords (eg. Waikiki Beach jazz, Jawaiian) to construct a timeline detailing the arrival of different musical genres to the islands. My process involved organizing and summarizing archival material and academic articles into a chronological timeline dating from 1837 to the present, with notations on musician and performance venue names to formulate my later search keywords. Our research analyzes the cultural intersection of Black music- eg. how jazz introduced by Black soldiers influenced the emergence of Filipino taxi dance halls in Hawai‘i, and how later Jawaiian music in the late 1960s fused Caribbean reggae and Indigenous Hawaiian music- and the role of Black musicians specifically- such as the Royal Hawaiian Band’s first two bandmasters. While colonial accounts may fail to recognize the influence of Black music in Hawai‘i, learning about these stories provides us with a more holistic representation of Black and Hawaiian history and music.
Acquiring Positrons for the Most Precise Test of Matter-Antimatter Asymmetry in Leptons

The Standard Model of Particle Physics (SM) is the current best theory of the universe. It possesses tremendous predictive power over how the tiniest building blocks of the universe, subatomic particles, come together to create the world we live in today. However, despite its great success at predicting subatomic phenomena, the SM cannot explain why we have a universe at all! An explanation for this oversight may be found in probing the most precise prediction of the SM for a new discrepancy between matter and antimatter. Measuring the magnetic moment of the electron (how much it acts like a tiny bar magnet) and comparing it to its SM prediction is the most stringent test of the SM. Furthermore, comparing the measured magnetic moments of the electron and its antimatter counterpart, the positron, would be a sensitive search for a subtle violation of the SM matter-antimatter symmetry. Challenges in accumulating positrons have historically contributed to why the positron magnetic moment is less well known. Positrons are emitted at high energies from a radioactive source, which makes them more difficult to trap. Thus, I will develop a dynamic electrical “catching mitt” to improve the transfer efficiency of positions in our system. To verify that I am accumulating positrons, I have proposed and demonstrated a detection method to see the signal from a single subatomic particle 50% more sensitively than before. With these improvements, we will be a step closer to measuring the positron magnetic moment and testing the limits of fundamental physics.

Presentation Format: Oral
Time: 10:30am
Room: Armadillo Room
Number: 290
Chinese Investments in Kenya: A Local Knowledge Perspective

When my mother retired from her teaching role in 2020, she could not get her pension from the Kenyan government soon enough to become a cashew nut farmer, a venture she had eagerly waited for over thirty-three years that she devoted to her teaching career. She believed her delayed payments resulted from the Kenyan government prioritizing repayment of its Chinese debts over any other obligations. On social media, both frustrations and compliments were attributed to Chinese loans, and I was curious to understand what informed these varied perceptions.

Last year, when I got the opportunity to submit a proposal for a fellowship study at IAS_NUQ, I wanted to explore Chinese investments in Kenya from a bottom-up approach. Rather than focusing on data and expert analysis of Chinese investments, I sought to present the understanding and interpretation of Chinese Investments by local communities across Kenya. I applied the local knowledge methodology where, through interviews, I traveled across four counties: Lamu, Meru, Nairobi, and Mombasa. I talked to 174 Kenyans, from laborers working on Chinese-funded projects and environmental activists to street vendors.

Unlike previous studies that have focused on the advantages or disadvantages of Chinese investments based on data and predicted economic yields, the varied individual opinions from my study presented the unique perceptions held by local communities. Whether positive, negative, or neutral, my study concluded that these conflicting sentiments were equally valid as they presented a nuanced public understanding of the manifestation of Chinese investments within local communities in Kenya.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 576
Exploratory Analysis of Women's Reactions to Body Positive Affirmations

One response to concerns about body dissatisfaction among women is a growing focus on body positivity (Cohen et al., 2020). A major facet of this movement relies on encouraging body acceptance through the use of affirmations (e.g., “You are beautiful!”). However, there is limited research regarding what types of body positive messages women prefer or how women’s body size might shape these preferences (Rucker & Petty, 2004; Engeln, 2020).

In the current exploratory, descriptive study, we explored how women respond to different types of body affirmational messages. Women (all college students, $n = 130$, $M_{\text{age}} = 18.61$, $SD = 0.82$) rated seven affirmational body-related messages and selected their most and least favorite category from a full list of the affirmations and their categories.

Most affirmations were rated positively. However, zero people reported fat acceptance messaging as their favorite category of affirmations and 48% ranked it their least favorite. Heavier women were marginally less likely to believe affirmations like, “My body deserves love and kindness,” $r(35) = -.31$, $p = .06$, and more likely to believe affirmations like, “My body is the least interesting thing about me,” $r(38) = .41$, $p = .008$. Women who selected fat acceptance affirmations as their least favorite type of affirmation tended to be heavier than those who rated anti-diet culture affirmations as their least favorite ($p = .009$). However, the diversity of body sizes in our sample was severely limited: only 21% had a BMI rating considered “overweight” by the CDC, compared to a US average of 47%.

Presentation Format: Oral
Time: 12:30pm
Room: Arch Room
Number: 486
Investigating Neural Modulation in Essential Tremor Through Peripheral Electrical Stimulation

Essential Tremor (ET) is a neurological disorder characterized by involuntary, rhythmic shaking of the upper limbs. It is associated with disruptions in the cerebello-thalamo-cortical loop, a neural circuit crucial for coordinated movement. Such disruptions correlate with the intensity and frequency of tremors, indicating a potential target for intervention using advanced imaging techniques like resting-state functional MRI (rs-fMRI).

In this study, Peripheral Electrical Stimulation (PES) was administered to ET patients under three conditions: no stimulation, open-loop stimulation, and closed-loop stimulation. Open-loop stimulation provided a constant, predefined electrical stimulus, allowing examination of its immediate but temporary effects. Conversely, closed-loop stimulation adjusted parameters in real-time based on tremor severity and frequency, aiming for more precise and prolonged tremor suppression. Brain activity changes were assessed using rs-fMRI scans taken before and after stimulation fMRIprep for preprocessing the scan data. This package will also support further analysis to investigate short-term changes in brain activity following PES.

Preliminary results indicate that while open-loop stimulation provides only temporary relief, closed-loop stimulation appears to induce more sustained changes in brain activity. These changes are quantified by analyzing alterations in neural connectivity patterns and the functional coherence between brain regions implicated in tremor control. This suggests that closed-loop PES might target and modulate the dysfunctional neural pathways involved in ET.

This study’s findings advocate for using fMRI data to study short-term changes in brain activity post-PES administration. Further research could extend these findings to refine intervention techniques, potentially improving therapeutic outcomes for patients with movement disorders.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 510
Circumscribed Race, Space & Place: Transportation & Embodiment in Everyday Cuba

Cuba is often lauded as an anti-capitalist haven whose communist revolution successfully eradicated all societal ills, including racism. Yet, an intersectionality framework that centers the often-ignored experiences of AfroCuban women shows that this is not necessarily the case. I assisted Dr. Alyssa Garcia on her project, *Circumscribed Race, Space & Place: Transportation & Embodiment in Everyday Cuba*, which investigates the experiences of AfroCubanas as they move through public space. In particular we examined the Cuba-specific method of hitchhiking known as *en botella*. This transportation practice emerged during Cuba’s Special Period, an economic crisis that followed the collapse of Cuba’s main trading partner, the USSR, which devastated Cuba’s transportation infrastructure. As an Emerging Scholar, I conducted a literature review related to racial geographies and gendered mobility both globally and within Cuba. I also helped transcribe interviews with Cubans about their day to day transportation practices and experiences. I coded these interviews according to themes such as the risks of *botella* and the gendered differences and dynamics of this practice. These interviews uncovered how AfroCubanas navigate and negotiate racial, gender, class, and sexual cultural codes in multifaceted ways when traveling *en botella* and how Cuban women of color experience both subtle and explicit misogyny and racism in their mobility practices. This study demonstrates how colonial stereotypes of Black female sexuality remain embedded in day to day Cuban life today, revealing the nuances of gendered, racialized embodiment in post-revolutionary Cuba today.
"They made it feel like anything was possible": Exploring the Impacts of High School Mentorship on Black Adolescent Girls in Undergrad

This study seeks to understand how mentorship during high school impacts the success of Black, female-identifying undergraduate students at elite, predominantly white universities. Using intersectionality and conflict theories in education as an initial framework, this work seeks to contribute to the existing literature on the developmental impacts of mentorship on Black youth and the disparities in academic programming between Black boys and girls. To achieve these ends, surveys and semi-structured qualitative interviews were conducted with 10 Black, woman-identifying undergraduate students attending an elite, predominantly white, private university in the Midwest. The survey assessed qualitative measures of success like grade point average, maximum earning potential, and social mobility. The interviews were used to examine quantitative measures of success, like feelings of belonging, self-advocacy skills, and identity development. Findings revealed that mentor relationships positively impacted participants' college experience, regardless of relationship formality or mentor identity, particularly in the development of soft skills such as accountability and relationship-building. However, participants with mentors with similar identities expressed stronger feelings of closeness and trust in their relationship. In contrast, participants who reported having fewer identities in common with their mentor expressed feelings of distance in their relationships. Participants with peer mentors (mentors within seven years of participant age) were also given more specific guidance on college compared to those with older mentors. These findings clarify the positive impacts of access to mentorship for Black adolescent girls but also emphasize the significance of increased access to mentors with which Black girls can identify.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 341
Investigating the Effects of Phoneme Sensitive Period Timing on Language Learning

Sensitive periods are developmental timepoints that allow the brain to become sensitive to external cues for learning to occur. These sensitive periods, triggered by the maturation of inhibitory gamma-amino-butyric acid (GABA) circuits, enhance processing of external stimuli. For instance, from 4-12 months, infants learn to discriminate native language phonemes from non-native sounds by attending to external language cues. Computational and animal models have derived a Spontaneous-Evoked ratio that tracks sensitive period onset, but its translation to human empirical work remains uncertain. This study correlates the spontaneous-evoked ratio with phoneme sensitive period onset and relates it to language learning. Infants receiving general anesthesia (GA) before 2 months (N = 29) were compared to an unexposed control group (N = 50), considering GA’s potential to accelerate sensitive periods. EEG data was collected at 2, 4, and 10 months while infants watched a silent video to capture spontaneous neural activity and listened to native English and non-native Hindi sounds to measure language-evoked activity. The S-E ratio, derived by dividing spontaneous EEG activity by task-evoked activity, was linked to language skills assessed at 24 months. While general anesthesia before 2 months may not affect phoneme sensitive period timing, the S-E ratio effectively tracks sensitive period onset. Furthermore, individual differences in sensitive period timing at 4 months predict language outcomes at 24 months. These findings underscore the translational potential of computational and rodent research in early human development. The S-E ratio holds promise in tracking the trajectory of the phoneme sensitive period in developing populations.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 194
Performance of Social LEAP Estimates Animal Poses (SLEAP) Improves with Visual Distinction Across Different Experimental Situations

Advances in computational vision have transformed the study of animal behavior by minimizing reliance on manual annotation, thus enhancing the efficiency and standardization of data analysis. Social LEAP Estimates Animal Poses (SLEAP), a multi-animal pose estimation software developed by Talmo Pereira, allows researchers to track more than one animal in a frame. However, the extent to which SLEAP can generalize single pose estimation models to multiple experimental situations remains unclear. Furthermore, SLEAP struggles to distinguish visually similar animals. Recent versions of SLEAP utilize identification models that require a visual distinction between animals. We investigated whether we can train a single pose estimation model for several experimental situations and whether bleaching the dorsal fur of mice helps maintain consistent identification. We recorded mice in different experimental situations, engaged in free or separated interactions with or without attached optical fibers. Then, we trained a data model by refining predictions for seven anatomical nodes. We show that bleaching helps SLEAP distinguish individuals across experimental situations. SLEAP performed similarly across all experimental situations in terms of precision and recall. However, performance was worse for mice engaged in free reactions with attached optical fibers than in other experimental situations, which performed similarly to each other. Our results suggest that SLEAP is a viable option for coding social interactions, but more frames need to be trained for mice engaged in free reactions with attached optical fibers. Studies that observe the simultaneous behavior of multiple animals would benefit from utilizing SLEAP to facilitate data analysis.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 470
The Effects of Social Support and Self-Awareness on the Career Decision-Making Self-Efficacy of College Students

Career decision-making self-efficacy (CSMSE), the belief in one’s ability to make effective career decisions, is predictive of a series of positive career outcomes. Previous research has identified multiple factors that influence the CDMSE of adolescents, but few studies have investigated the individual and joint effects of these factors on college students’ CDMSE. The current study aims to investigate 1) how parent support, teacher support, peer support, and self-awareness predict the CDMSE of college students and 2) whether teacher support, peer support, and self-awareness moderate the relationship between parent support and CDMSE. 151 college students were recruited via Prolific to complete a Qualtrics questionnaire. Correlation, regression, and interaction analyses were performed on the data using SPSS. Results showed that 1) there were significant positive correlations between all four variables and CDMSE, with parent support and self-awareness being significant predictors of CDMSE above and beyond parent and peer support. Interaction analysis revealed that 2) teacher support and peer support moderate the relationship between parent support and CDMSE, such that for students with high teacher (or peer) support, higher parent support is predictive of higher CDMSE, while for students with low teacher (or peer) support, higher parent support is predictive of lower CDMSE. These findings illustrate the important roles of teacher and peer support, self-awareness, and personal initiative in promoting college students’ CDMSE above and beyond parent support, and they call for the development of more accessible career-related social support, as well as the culturing of self-awareness and autonomy for successful career decision-making.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 514
The Power of Community Engagement: Investigating Mutual Aid Group Longevity

The COVID-19 pandemic illustrated a proliferation of mutual aid groups that collectively organized to meet the needs of their communities. Unfortunately, while community needs persisted beyond the acute phase of the pandemic, many groups did not. To determine how to promote mutual aid group longevity beyond moments of rapid response, this project analyzed the practices of six mutual aid groups in northern New Jersey and New York City, using data from focus groups and interviews with organizers. When comparing one mutual aid group that deactivated within the first two years of the pandemic to five active mutual aid groups, the study revealed a key finding: compared to the disbanded group, the active mutual aid groups not only served their communities by providing aid, they also interacted with, built relationships with, and involved their communities in the work of the group. These acts of community engagement fueled group programming, led to increased resource procurement, increased organizers’ sense of commitment to the work of the group, and increased group capacity. All things that promote group longevity. This study therefore emphasizes the necessity of considering group-community interactions when researching and pursuing mutual aid group sustainability.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 255
Exploring the relationship between parasocial relationships and human perception of emotionally intelligent AI chatbots

My study investigates human perception of Artificially Intelligent (AI) virtual assistants with emotional intelligence and empathy. Understanding the human-AI relationship is crucial as AI assistants become more integrated into global society and develop greater levels of emotional intelligence. To analyze participant responses to virtual assistants with emotional capabilities, I conducted three separate studies. The first two surveyed 500 and 300 participants, respectively, evaluating virtual assistants' helpfulness, appropriateness, and invasiveness. Results indicated that emotionally neutral assistants were perceived more positively, whereas emotionally intelligent assistants were perceived as more invasive. The second study also explored participants' loneliness and familiarity with AI, revealing a negative correlation between familiarity and loneliness. In the third study, we examined how pre-existing parasocial relationships can predict perceptions of empathetic versus neutral chatbots. With 800 participants, this study found that individuals with stronger parasocial tendencies had more favorable perceptions of the chatbot, regardless of its level of empathy. Unlike the first study, participants in this study perceived the empathic chatbot more warmly and did not perceive it to have negative characteristics or lower competence than the neutral chatbot. This suggests that empathetic chatbots don't diminish perceived competence when they provide emotional support. It also suggests that people with pre-existing parasocial relationships may have a more positive perception of AI chatbots. Thus, empathic chatbots can provide empathetic support to users without necessarily causing negative reactions. More research is needed to discover when and why AI-provided empathy seems appealing versus invasive.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 295
The Latin Mass: Tradition, Family Values and Politics in American Catholicism

Over the past 60 years, the Roman Catholic Church has witnessed a rift between the mainstream church, where the Mass is offered in vernacular languages, and traditionalists, who primarily attend Mass in Latin. While mainstream Catholics are starkly divided on doctrinal and political issues, surveys of traditionalists suggest they are morally conservative, more doctrinally uniform and have more conservative family values. This project was a mixed-methods study of a Latin Mass community in Chicago which sought to investigate their doctrinal and political outlooks. It consisted of a survey of lay parishioners, which garnered about 450 responses, follow-up interviews with parishioners and parish priests, and ethnographic observations at the parish. The results showed that Latin Mass attendees do indeed show a near 100% conformity to the Catholic teachings on which they were surveyed. They also showed an inclination towards more conservative approaches to organizing families overall. Nonetheless, there is a significant amount of diversity in how parishioners interpret and implement these values in their own lives, as well as how they think about broader conflicts within the Church hierarchy. Expanding this research to include other Latin Mass communities would help establish a clearer picture of how traditionalists have come to organize themselves at a national and global level as members of the world’s largest religion.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 513
Exploring Identity and Affiliation: A Comparative Analysis of Inclusion Among International Students in the U.S. Branch Campuses in Education City, Qatar

Exploring Identity and Affiliation: A Comparative Analysis of Inclusion Among International Students in the U.S. Branch Campuses in Education City, Qatar, utilizes a mixed-methods research approach to examine the constructs of belonging and inclusion. The study integrates data from 18 interviews, a cross-sectional survey, and observational analyses by three undergraduate researchers. Set in Education City Qatar, where expatriates significantly outnumber nationals and residency is often linked to temporary employment, this study examines the evolving identities of international students. This research investigates the eight prestigious International Branch Campuses (IBCs) in Qatar and their adaptations to the region, particularly through offering minors such as Middle Eastern Studies and Africana Studies. These adaptations, encompassing cultural factors such as religion and food, along with structural factors including residence, health & sporting facilities, are intended to promote a sense of inclusiveness and facilitate experiences of belonging. Our findings contradicted the expectation that international students feel out of place in Qatar due to the assumption that citizenship is necessary for belonging. The study challenges the traditional belief that legal citizenship is essential for psychological and social integration, highlighting the complex interplay between environment and identity in cultivating a sense of community. We also identified various mechanisms students adopt to deal with exclusions and feeling out of place. Our research offers important insights into understanding how non-citizens strive to experience belonging in a national context characterized by their enduring transience, a reality facing a growing number of individuals in this age of hyper-globalization.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 497
Brokers in Migration from Ghana to Qatar

The migration process from Ghana to Qatar transcends individual choices; it is intricately facilitated by Ghanaian migration brokers, a group that now includes Ghanaians who migrated to Qatar and have transitioned into brokers themselves. Employing an ethnographic approach, I sampled 15 brokers with substantial experience in facilitating migration to Qatar, investigating their inner workings, services, strategies, motivations, and challenges. Findings reveal a clear economic motivation among brokers, who use migration brokerage to boost earnings and mitigate financial risks. However, brokers are also driven by personal migration experiences and empathy for the challenges faced by Ghanaian migrants, aligning with Salt and Stein's (1997) research on how individuals' personal journeys can profoundly influence their decision to enter migration-related professions. They adeptly utilize visitation visas and the Qatar Hayya card system, particularly during major international events such as the 2022 World Cup and the 2024 Asian Cup. Navigating a complex landscape, brokers confront challenges including legal scrutiny, financial constraints, and social stigma. Recent bilateral agreements between Ghana and Qatar have formalized their collaboration, yet my research highlights the importance of addressing the individual agency of migrants and the facilitation and control exercised by brokers within this migration corridor. These aspects, often overlooked, must be accounted for to effectively manage migration between the two countries. This research invites a re-examination of migration governance approaches, fostering environments that recognize migrant agency while ensuring ethical and transparent broker conduct. It challenges stakeholders to embrace holistic understandings of migration dynamics, encompassing perspectives across this global phenomenon.

Presentation Format: Oral
Time: 12:30pm
Room: Rock Room
Number: 343
How does the human ovarian microenvironment change after exposure to alkylating chemotherapy?

Despite significant improvements in childhood cancer survival rates, infertility remains prevalent as common cancer treatments can damage reproductive organs. Currently, ovarian tissue cryopreservation (OTC) is the only fertility preservation option for pre-pubertal female patients, wherein tissue containing primordial follicles (PMFs), which enclose premature eggs, is surgically removed and frozen. Patients can later elect to retransplant their tissue via ovarian tissue transplantation (OTT), restoring fertility. Although OTT patients exhibit live births, successful fertility and hormone functionality is limited to 2-5 years due to a massive depletion of PMFs post-transplantation by causes not yet understood. One hypothesis for mass depletion is that patients sometimes begin chemotherapy before OTC. The Laronda lab hypothesizes this treatment may impact how ovarian blood vessels form and support PMF development upon transplantation. Thus, my project studies the extent of chemotherapy exposure’s impact on ovarian blood vessel growth.

To assess the number and maturity of blood vessels across different chemotherapexposed samples, I stained OTC biopsy samples from Lurie Children’s Hospital with antibodies specific to vessel maturity stages (early, mid-stage, mature). Currently, I have completed 10 of these samples and am adding additional samples to strengthen statistical significance and be able to stratify data by the extent of chemotherapy treatment. These data will provide a better understanding of how chemotherapy impacts ovarian vasculature and potentially PMF activity. If I find a correlation between chemo dosage and vessel abundance and/or maturity, this may suggest prioritizing OTC before chemotherapy onset to improve fertility outcomes for young cancer survivors.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 331
Rwanda's government prioritizes the development of STEM talent as a key element of its strategy to maintain one of Africa's highest economic growth rates. One way Rwanda has done this is by modernizing its math education system and encouraging educators to teach math in new ways. Our project investigates how educators meet this challenge and the degree to which they are successful in engaging their students. We spoke with 12 math teachers and 2 principles in 5 schools across several provinces. To understand educational shifts in mathematics from a policy perspective, we interviewed a senior official at the African Institute for Mathematical Sciences and the first opposition party member elected to Rwanda's parliament in over 30 years. We argue that Rwanda's new math curriculum, paired with other investments in STEM, has helped bolster student engagement, increase performance, and create more collaborative classroom environments. We also found that these gains are not always realized in under resourced schools, and some teachers in these schools feel that the curriculum shifts were not made with them in mind, specifically citing insufficient training and technological resources.
"A Butterfly Turns Orange": Depiction of Pediatric Multiple Sclerosis in Film and TV Without Ableism

Multiple Sclerosis (MS) is a chronic illness that affects the central nervous system. At age 11, my twin sister was diagnosed with MS and one common phrase heard is "Kids don't get MS". This mistaken perception motivated me to write a creative piece, a TV pilot that follows two 12 year olds at different stages of their MS diagnosis, coming into their identities in middle school. Much representation on TV is of adults with MS showing the worst possible outcome, believing death would be better than living with a chronic illness. Additionally, representation on TV of children with chronic illnesses often had tropes where the child had no agency or they somehow "overcame" it. This falls under ableism, or discrimination against people with disabilities. My approach included researching different forms of media depicting illnesses to see how the characters were portrayed and interviewing young people with MS, their families, MS advocates and physicians to get their input on MS representation. Through this process, I learned young people don’t want MS to be the whole identity of the characters' portrayals and that ableist thoughts exist even among people connected to those with MS. The implication is to change perceptions about Kids and MS, there has to be realistic representations on TV of children/families navigating a MS diagnosis without ableism. This project is still ongoing as I want to continue talking to those with MS and sensitivity readers to avoid ableist ideas before the TV pilot can be produced.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 399
The Therapeutic Role of Annexin A6 in Alzheimer’s Disease

Alzheimer’s disease (AD) is an incurable degenerative disease that affects more than 3 million people per year. The two neuropathological hallmarks of AD are amyloid v-peptide (Av) plaques, and neurofibrillary tangles, accumulations of a protein called tau. The build-up of amyloid is hypothesized to damage the cell membrane of the neuron. This membrane-induced amyloid damage causes axons, the part of neurons that conduct electrical signals for communication between neurons, to become swollen and dysfunctional, which is a cause of memory loss associated with Alzheimer’s. By repairing or blocking amyloid-induced neuron membrane damage, this pathology could be inhibited. The protein Annexin A6 protein has a key role in membrane repair in skeletal and heart muscle, as well as in neurons, and when overexpressed from birth in neurons of mice, has a protective effect against amyloid damage. To apply this research in humans suffering from Alzheimer’s, methodologies for achieving overexpression of A6 in adult mice were explored, since humans would only receive treatment for AD in middle or old age.

In order to analyze overexpression of A6 in adult mice, the virus for A6 was injected retro-orbitally, so the virus is immediately carried throughout the bloodstream. The brains of these mice were harvested at 4.25 months biochemically and histologically analyzed. There was only a small change to the swollen dysfunctional neurons because the amount of protein expressed was not high enough. We are exploring methods for expressing higher amounts of A6 protein in adult mice, by injecting the AAV directly into the ventricle rather than into the bloodstream. Preliminary data suggest this method will achieve higher expression.
Advancing Human Neuromuscular Junction Simulation with a Novel Soft Electronic Device

Organoids, artificial cell clusters resembling organs, hold significant promise in organ-on-a-chip technology, particularly for modeling neurodegenerative diseases and pharmacological testing. This project aims to emulate a "neuromuscular junction" by merging neuron and muscle organoids. The objective is to develop devices that serve as a 3-dimensional multifunctional mesoscale framework that provide a superior alternative to multi-electrode arrays, as they can match the geometry of 3-dimensional organoids to collect and stimulate electrophysiological signals from the organoids and provide the ability to modulate the organoids and environment. The muscle devices feature a strain sensor to monitor muscle organoid contractions and relaxations, along with a thermal actuator for temperature regulation. On the other hand, the neuron devices include electrodes and an electrochemical sensor for measuring oxygen levels. These devices are manufactured using microfabrication technology on silicon wafers utilizing spin coating, electron beam deposition, photolithography, etching, and electroplating. Electrophysiological signals from neuronal organoids and strain data from the muscle device by manual deformation have been successfully collected. Current efforts are directed towards integrating the muscle and neuron components, along with incorporating muscle tissue into the muscle device to facilitate the collection of data analogous to that of neuronal electrophysiological signals. Future experiments will explore the potential to trigger muscle contractions or relaxations through artificial signals sent from equipment to the neuronal component.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 218
Identification of Type 4 Secretion System Substrates in S. maltophilia

Stenotrophomonas maltophilia is an emerging multi-drug resistant pathogen. Patients with cystic fibrosis are more prone to an S. maltophilia infection. This pathogen is found in water systems, and patients going through invasive procedures in the hospital are susceptible to infection. S. maltophilia has a type 4 secretion system (T4SS) that facilitates contact-dependent killing of other bacteria, and serves as the only pathogenic model expressing a T4SS. Previous studies concluded that the T4SS has antibacterial activity, and is capable of killing strains of clinical isolates of P. aeruginosa, P. mendocina, and E.coli. Understanding the substrates of the T4SS will give more insight into the molecular and structural basis of infection. The lab previously identified five substrates of the T4SS that bind to VirD4 using a bacterial adenylate cyclase-based two-hybrid assay. VirD4 is the coupling protein that recognizes and guides substrates from the cytoplasm to the inner membrane complex of the T4SS apparatus. This project intends to test the remaining seven effectors that were found to not bind VirD4 as its substrate, by fusing the gene encoding the effectors to the N terminus of the gene VirD4 as opposed to the C terminus which the lab previously tested and got negative results. This is done to ensure that structural properties of the proteins are not hindering any interactions between VirD4 and the substrate.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 377
Adaptive Regression Trees: A Flexible Approach to Regression using Smooth functions and Decision Trees

Decision trees, such as the Classification and Regression Tree (CART) algorithm, are widely used for predictive modeling but often suffer from high variance. While ensemble methods like Random Forests and Gradient Boosting have been developed to address this issue, they typically rely on simple models in the leaf nodes, which may not effectively capture complex non-linearities and interactions in the data. This paper proposes a novel method that combines the strengths of Multivariate Adaptive Regression Splines (MARS) with decision trees to handle datasets exhibiting both smooth non-linearities and piecewise changes in the functional form. Experimental results demonstrate the effectiveness of this method compared to popular alternatives such as XGBoost and Random Forests. An implementation of the algorithm is made available for public use.

Presentation Format: Oral
Time: 10:30am
Room: Armadillo Room
Number: 407
Comparative Histological Analysis of the Ferret, Dog and Mouse Olfactory Systems

Many mammals rely primarily on the olfactory system to sense their environment. Chemical stimuli are detected by olfactory receptor proteins, expressed by olfactory sensory neurons, in the olfactory epithelium of the nasal cavity. The expression of olfactory receptors and the organization of the olfactory epithelium is best characterized in the mouse (*Mus musculus*), but has not been studied extensively in other classes of mammals. The expression of olfactory receptors in mice is zonally arranged across complex folds of tissue called turbinates that are arranged with respect to the airspace of the nasal cavity. However, the anatomical complexity of the turbinates varies dramatically across mammals. Little is known about how the organization seen in mice relates to other species such as carnivores, which rely heavily on olfaction and have very complex nasal cavities. Here, I describe experiments using immunohistochemistry and *in situ* hybridization to characterize the organization of the olfactory epithelium of two carnivores—the ferret (*Mustela putoriusfuro*) and dog (*Canis familiaris*). Despite the increased complexity of the nasal cavity, my results show that the ferret and dog have similar dorsal-ventral gene expression zones in the olfactory epithelium, as seen in mice. However, the proportion of olfactory epithelium that is dorsal is smaller in dog and ferret as compared with mouse. This difference is not accounted for by a difference in the proportion of class I odorant receptor genes (which are selectively expressed dorsally in the mouse) across species. My results also reveal a unique extension of the ventral epithelium into a distinct dorsal compartment in the ferret and dog that is not found in mouse. Overall, my work has revealed similarities and differences between the olfactory systems of rodents and carnivores.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 596
Representation in Voting: The Intersection of Descriptive and Substantive Representation from the Experiences of Black and Latine Communities

Descriptive representation fosters diversity in decision-making, and creates an avenue for substantive representation to be more representative of the needs of underrepresented communities. Professor Tabitha Bonilla, in her study entitled Promises and Identity: How votes interpret the relationship between descriptive and substantive representation, focuses on hearing from people from Black and Latine communities about what is important for them, in terms of identity, when choosing and voting for a representative.

In my role as an Emerging Scholar, I contributed to this project by compiling works that distinguished and discussed the different forms of representation that would be used to form a literature review. I worked on editing, analyzing, and coding transcripts from interviews conducted with Black and Latine Chicagoans about their identities in relation to their representation by political leaders. I listened through interviews to ensure accuracy between what was said and what was transcribed and went through transcriptions to code for identifiers and common themes of the relationship between identity, policies, and perceived representation.

This work reveals that in choosing representatives, a large focus is placed on choosing someone who cares about the same issues as you. Additionally, identity plays a role in what issues are important to a voter, but does not guarantee that an in-group candidate will automatically establish trust with voters of their shared identity. The results of this study implicate that while a shared identity with a candidate may be a factor in the decisions made by voters, what lies at the heart of choosing a representative is the issues they are advocating for and the ways in which the decisions they will make can affect their communities.
How Often Do You Think About the Roman Empire? A Closer Look at the Lives of Romans We Should Think About More

How Often Do You Think About the Roman Empire?
A Closer Look at the Lives of Romans We Should Think About More

It's women's turn to think about the Roman Empire. While many Classicists focus on Latin texts written by and prioritizing the perspectives of elite Roman men, fewer scholars focus on the inscriptions written by freed Romans and women. This project helps fill this gap by examining the case study of one epitaph from Early Imperial Rome whose message was dictated by Pollia Urbana, a freedwoman and hairdresser. Pollia Urbana provides one of the few examples of a Roman woman working outside the domestic sphere in a "respectable" occupation, running a hairdressing shop alongside her (possible) husband Marcus Calidius Apolonius. Through my work analyzing patterns across epigraphic databases, searching for keywords in literary texts, and interpreting the archaeological context of the epitaph slab, I was able to reconstruct the life story of Pollia and Marcus. Based on this evidence, I argue that the epitaph was intended for both Pollia and Marcus, as demonstrated by the word ulla, that they owned a hairdressing shop located in the little-known-about Aemiliana district of Rome, and that they belonged to a funerary club that helped them secure a final resting place, which Pollia herself purchased. This project's reconstruction of Pollia and Marcus' lives expands ideas about the financial power of freedwomen and the social identities of freed Romans. It also pushes for the inclusion of epitaphs dictated by women into the understudied field of Women's Classical Latin.

Presentation Format: Oral
Time: 12:30pm
Room: Rock Room
Number: 420
The Propagation Puzzle: Unraveling Community Clusters in the Stochastic Block Model Network

Community detection is a fundamental problem within machine learning, with applications spanning social network analysis, recommendation systems, and more. Understanding how nodes within a network cluster together can help illuminate the network’s structure and also unveil valuable insights for numerous real-world applications. This project explores the behavior of the popular Label Propagation Algorithm on different regimes of the stochastic block model. For instance, consider a network of labeled nodes, such as a social network where adjacent nodes are friends and labels are people’s dining hall destinations - and friends can sway each other’s opinions! I focus on understanding how different opinions propagate through the network over time: does the entire network converge to consensus (does everyone end up swarming the steps of Allison)? Are there clusters of nodes that all converge to a different label than the rest of the network (perhaps a friendly rivalry between Sarge and Elder)? This behavior depends on both the algorithm used to propagate labels and the underlying structure of the network. I analyze the behavior of two variations of the label propagation algorithm, minRandLPA and minMinLPA, on different regimes of the stochastic block model, a research domain that is currently underrepresented in the literature. I present theoretical analyses of LPA on the stochastic block model with two planted communities under the disassortative, assortative, and Erdos-Renyi regimes, as well as mathematical proofs that provide theoretical insights into the convergence behavior of the LPA. I also provide computational simulations to empirically characterize the behavior of LPA on these regimes.
Sustainable Recovery of Critical Metals using Manganese Oxide Adsorbents

The global demand for metals is increasing due to their key role in technological advancements. Key components of electronic devices, such as batteries, require critical metals but are frequently replaced and disposed of without recycling. These metals, such as cobalt and nickel, are essential to emerging technologies but have a potentially unstable supply due to problematic mining practices and supply chains susceptible to perturbations. The demand for critical metals is on track to outpace its current supply, meaning recovery from secondary sources, such as recycled devices, former mining sites, and landfill runoff, will be essential to meet future needs.

One method of recovery is adsorption, where metal ions attach to the surface of a solid material. For my project, I synthesized and tested an adsorbent of manganese oxide nanomaterials distributed on a cellulosic substrate to achieve a material that readily scavenges metal ions due to its high surface area and affinity for cations. Scanning Electron Microscopy and Electron Dispersive Spectroscopy confirmed the association and adsorption of nickel and cobalt to the adsorbent. Batch and column experiments were performed to find the adsorption capacity of the coating and saturation point of the material within an engineered system. Results showed rapid adsorption and retention of cobalt and nickel within the adsorbent material. The metal can be removed from the adsorbent through acid desorption without damaging the coating, allowing the material to be reused. These results will help to design efficient engineered processes to recover critical metals from waste streams.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 433
Exploring high concentrations of bird collisions with windows on the Northwestern University campus

Biodiversity loss is a massive ecological and environmental issue, with many bird species experiencing some of the most dramatic declines of any group from the impacts of anthropogenic development. Urban development along major migration flyways, like the Mississippi Flyway containing Cook County, poses a direct threat to migrating birds as windows and artificial light disorient and obstruct flight. Mitigating window strikes relies on understanding bird behaviors as well as the spatial circumstances that promote collisions. My ongoing project uses several years of reporting data from Chicago Bird Collision Monitors on the Northwestern campus and landscape information to assess whether the presence of green spaces, raised vegetation, and trees near buildings has a relationship with concentrated collision occurrences. Historical collision data are overlaid with campus building and landscape data to identify collision hotspots, produce corresponding maps, and determine correlations between high collision density and proximity to specific landscape features or types of land cover. Thus far I have found that collisions are most concentrated on specific sides of a small set of campus buildings, particularly the Kellogg Global Hub. I have not found significant quantitative relationships between collision concentration and proximity to external landscape features, largely due to a lack of spatial resolution in collision data, though I argue that visualized trends are present. Currently, I am working to supplement this project with hands-on collision monitoring experience, which will expand practical experience with the collision issue and help to refine the geospatial specificity of available collision data.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 455
Alzheimer's disease (AD) is a neurodegenerative disorder that accounts for 60–80% of dementia cases and is characterized by cognitive decline attributed to the accumulation of two proteins called Aβ42 and Phospho-tau. The build-up of these proteins suppresses synaptic plasticity, the brain's capacity to establish new connections, inhibiting a fundamental process for learning and memory. Restoring synaptic health early in AD is a potential therapeutic strategy, yet current treatments have limited efficacy in altering disease progression. However, our novel molecule, JB13, enhances synaptic plasticity in the brain via the activation of Insulin-like growth factor receptor 2 (IGF2R). When JB13 binds to IGF2R, a significant reversal of both learning and memory deficits in AD mouse models has been observed. However, JB13’s effects on key proteins that modulate this plasticity, or assessment of proteins directly associated with AD remains unquantified. In this study, we have begun to quantify JB13’s impact on synaptic plasticity and protein aggregation in AD mouse models using enzyme-linked immunosorbent assays (ELISA). Relative to control, Aβ42 was robustly elevated in AD mice models, consistent with the literature. JB13 produced a modest reduction in Aβ42 in the highest dose tested. In contrast, phospho-tau levels were reduced by JB13 in a dose-dependent manner. Total tau levels did not change. Additionally, synaptic plasticity biomarker, SV2A was measured to increase in a dose respondent manner. Our results help position JB13 as a potential therapeutic to reverse or significantly delay cognitive dysfunction in AD by increasing synaptic plasticity expression and mitigating harmful protein build-up.
Investigating Individual Differences in Block Assembly Strategies

Spatial cognition involves encoding the position, orientation, dimensions, and location of objects in relation to each other (Newcombe & Shipley, 2015). A common assessment for spatial ability is the Block Design Task (BDT), which requires participants to use colored blocks to recreate a design presented (Dunn et al., 2021). Rather than focusing on the traditional measurement of time and accuracy, we identified and categorized specific strategies that were used to perform the BDT. These patterns were observed from 76 undergraduates who completed seven BDT tasks. Specifically, the study examined the placement of 3-4 blocks. By coding videos of participants' block building, we identified differences in their strategies and classified them into four categories: row-by-row, column-by-column, four corners, and sub-design. We believe that the patterns identified are due to many factors, such as the participants' educational and language backgrounds, and how they process each design. Going forward, we hope to further explore differences in strategies employed for the remaining blocks, as well as the influence of presentation order on results, in order to further understand procedural differences in spatial assembly. As a part of a larger ongoing study, using the BDT to understand individual differences in block building strategies will allow for a better understanding of problem solving methods and a further understanding of spatial ability.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 460
TAMs and hypoxia enhance glioblastoma stem-like cell enrichment and may impact radioresistance

The dismal survival rates of glioblastoma (GBM) patients are due, at least in part, to therapeutic resistance of GBM stem-like cells (GSCs) and their ability to repopulate recurrent tumors. Our goal was to determine if tumor-associated macrophages (TAMs) or hypoxia enhance the enrichment of GSCs in a manner that could impact radioresistance. First, we evaluated whether hypoxia enhanced TAM migration into GBM-brain cortical organoids (GBM-BCOs) by incorporating THP-1 cells into GFP-labeled GBM-BCOs and incubating them for 24 h under normoxic or hypoxic conditions. We found that hypoxia significantly increased THP-1 cell influx into GBM-BCOs. Further, we investigated whether TAMs influenced the enrichment of GSCs in GBM neurospheres and in GBM-BCOs. We found that co-culture of THP-1 cells with either GBM neurospheres or with GBM-BCOs enhanced the CD133+ population after 72 h hypoxia. Next, we established Fluorescent Ubiquitination-based Cell Cycle Indicator (FUCCI), an advanced methodology for monitoring cell cycle phases for investigating the role of hypoxia and radiation on GBM. Flow cytometry analysis of patient-derived GBM cells revealed that the fraction of G1 cells decreased and the fraction of G2/M cells increased 24 h after 3 Gy radiation compared to non-irradiated cells in normoxia. In contrast, GBM cells exposed to hypoxia do not show such cell cycle shifts after radiation and have an enriched population of cells in G0 in both radiated and non-irradiated cells. Our results indicate that hypoxia and TAMs play critical roles in GSC enrichment and may impact radioresistance.
Understanding Space Crew Interactions Through Modeling Dialogue as Networks

The motivation behind this project is to analyze shared understanding within teams, or shared mental models, specifically in the context of long duration space exploration, which provides a different set of challenges in terms of teamwork, such as isolation and dealing with unfamiliar environments. Through this project, we aim to map the evolution of the team's mental models by constructing semantic hypergraphs to analyze dialogue among crew members. We used audio logs parsed from the podcast Houston, We Have a Podcast. The project utilizes the BERTopic model, which is a machine-learning based topic modeling approach.

The results revealed various topics that were prominent in the audio logs, such as team activities and their emotions, and which topics each crew member discussed. These topics and the crew members' use of these topics are highlighted in the various hypergraphs created from the audio logs, as well as how they changed over time. For example, in our results, audio log 1 had every crew member connected to another crew member with at least one hyperedge, with the hyperedge being a shared topic. Meanwhile, in audio log 3, two crew members did not share a hyperedge with any other crew members, suggesting a change in shared understanding within the crew.

These findings have significant implications for communication in isolated environments like space missions, contributing to the broader field with a novel method for analyzing and visualizing communication patterns. This research suggests potential applications for enhancing communication in similar settings in the future.
The present study aimed to investigate a group-singing intervention's effects on the well-being of children globally. Children today show increased stress, serving the impetus for exploring how music, specifically group-singing, can improve children's mental health. The pilot study, done in Evanston, USA; York, England; and Mexico City, Mexico, conducted an 8-week group-singing and breathwork intervention with children aged 9-11 (N=67). Each session used wearable biometric sensors that measured heart rate variability as a proxy for stress; the psychological assessment, the State-Trait Anxiety Inventory; an emoji-based website called www.wellcheq.com that asked about emotional states; and post-session qualitative interviews. The Belonging and Sense of Community psychological scales were administered at the midpoint and endpoint of the study and a focus group was facilitated following the final session. I helped on-site, assisting the children with putting on their sensors and taking the psychological measures in addition to interviewing them. I also transcribed the interview and intervention recordings. Preliminary analysis suggests a small, positive trend in heart rate variability (lower stress) and in positive mood from the start of each session to its end. Next steps include a Spring 2024 trial with two new cohorts in Evanston and one new cohort in Mexico City as well as additional sites in China and Miami during the 2024-2025 school year. An effective group-singing intervention would provide an easily adoptable, affordable program that schools and community centers could implement to reach many children and counteract the stressors they experience in their day-to-day lives.
Machine Learning for Quantum Sensor Data Analysis in Dark Matter Search

This paper presents a machine-learning approach to detecting and characterizing charge jumps in Cooper Pair Box (CPB) qubit scans, with implications for the search for dark matter (DM) particles. Sparse interactions with the Standard Model make DM challenging to detect. Typically used for quantum computing, qubits are being repurposed for sensing capabilities. Charge jumps in qubit charge tomography data are created when particles, such as dark matter, interact with the qubit. Analysis of these charge jumps will tell us about the sensitivity of qubits to dark matter and various backgrounds. Multiple qubits were characterized in an underground facility at Fermilab. To analyze data from these qubits, two feed-forward neural networks are developed, one for classification (whether or not a jump is present) and one for regression (the position of the jump). The accuracy of the models is determined by testing them on simulated qubit data where the position and size of charge jumps are known. The classification model achieves high accuracy and F-score values, .987 and .992 respectively. Errors occurred with smaller jumps and jumps at the edges of scans. The regression model accurately predicts jump positions, with higher errors for jumps near the beginning and end of scans. This analysis framework shows promising results and will be competitive with traditional analysis methods when expanded to handle multiple jumps in a scan. Strategies for improvement include regularization techniques and transitioning to Convolutional Neural Networks (CNNs).
Investigating the validity of automated language sample analysis as a predictor of narrative ability in individuals with co-occurring autism spectrum disorder and impairments in expressive language

Narrative, or storytelling, ability is the ability to organize and share a story by connecting multiple events. Narrative ability is an important predictor of language and cognitive skills, so studying narratives can provide important insight into an individual's communication abilities. However, it is difficult to study narratives of individuals with ASD and lower verbal IQ because of the challenge of acquiring high-quality narratives with complex speech from this group. Currently, hand coding is the gold-standard method for characterizing narrative ability, as it allows for detailed analysis of specific narrative devices. However, hand coding requires significant time and training, so computational measures of language are more practical for larger-scale studies. This study aimed to evaluate methods to study narrative among individuals with ASD and impacted expressive language by determining if two linguistic analysis softwares can characterize narrative ability in this understudied population, and how these methods compare to hand coding approaches.

Narrative samples were obtained from 25 participants with ASD who had a VIQ below 80 as they told a story from a wordless picture book. Each narrative was hand coded and analyzed using computational software to assess language content and structure. Generalized additive modeling was used to determine whether computational variables were predictive of hand-coded measures of narrative ability. Results indicated that descriptions of affect and cognition were best predicted by computational measures, while descriptions of causality were not consistently predicted by computational variables. This study provides evidence that key aspects of narrative quality can be estimated using computational methodologies in individuals with ASD and lower verbal IQs.
Learning to Allocate Fairly

We study a resource allocation problem faced by nonprofits while facing demand that arrives in sequential order and is uncertain. For example, the Greater Chicago Food Depository distributes recovered food from grocery stores to food pantries in the Chicagoland area. Previous studies on this problem aim to maximize the utility of the person who receives the worst allocation. In this study, we relax this strict definition of fairness by considering $\alpha$-fairness, a generalized notion of fairness widely used in economics. Intuitively, $\alpha$ represents how much we care about fairness. Adjusting this parameter allows decision-makers to control the tradeoff between efficiency and fairness. We propose a new algorithm called Projected Proportional Allocation under $\alpha$-Fairness (PPA-AF) that learns the relationship between the uncertainty of the incoming demands and $\alpha$ to maximize the $\alpha$-fairness of its allocations. PPA-AF uses Reinforcement Learning (RL) to estimate the coefficients that characterize the best allocation given an agent’s demand. We evaluate the performance of PPA-AF against a set of baseline approaches using data from Mobile Food Pantries in upstate New York. Results are pending – the computational resources have been provisioned and the code has been written. I expect to have preliminary results by the end of the week. This research helps nonprofits quantitatively adjust their attitudes toward fairness and efficiency for resource allocation problems, potentially reducing waste while maintaining a high level of fairness.
Beabadoobee, born Beatrice Kristi Laus, is a global artist signed to UK based label Dirty Hit; after immigrating from Iloilo Philippines at age three, beabadoobee articulates her struggle with representation in the music industry, cultural rifts, all while coming of age. Celebrities are often solidified as pillars of representation based on their identities; beabadoobee’s diverse cultural background and profession are an exemplification of conceptualizing one’s own representation in a crowded and dissonant media environment. This presentation utilizes chapters from Shani Orgad’s *Media Representation and the Global Imagination* to apply the representational frameworks and language presented in analyzing beabadoobee’s discography and persona as a global artist. Close reading of songs and music videos for “I Wish I Was Stephen Malkmus” and “Glue Song” are examples of beabadoobee articulating identity struggles through music; the two songs, from early to later career demonstrate an arc of the artist’s understanding of her own representation in a media environment. Bedroom-pop, the genre that brought beabadoobee to fame, contextualizes how new media capabilities can facilitate the further proliferation of diverse content—broadcasting beabadoobee’s articulations of her localized experiences to global audiences. The relationship between beabadoobee’s music and identity as a global artist demonstrate the complexities between production of personal narrative and artistic representation—reasserting the value of media diversity and the challenges of an intricate, yet vast, global media landscape in an era of global music distribution.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 548
Ain't Afraid of No Ghosts: Network Analysis and Equity Impacts of CTA Bus Service Disruption During Pandemic

This study sought to analyze the equity implications stemming from the COVID-19 disruptions on the Chicago Transit Authority (CTA) bus network. During the pandemic, CTA bus services experienced a substantial downturn, persisting to the present day. Employing Geographic Information Systems (GIS) and network analysis methodologies, we examined pre-pandemic, mid-pandemic, and post-pandemic census and CTA data to understand the distribution of service disruptions across various demographic and geographic groups. Our examination focused on ridership trends, service levels, and demographic profiles to identify disparities and alterations in service provisioning. This investigation provides critical insights into equity outliers and notable service adjustments within the CTA bus network, offering valuable guidance for policymakers and urban planners seeking to enhance transportation equity in the post-pandemic era.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 435
BDUs to Blazers: The Role of Identity and Interpersonal Relationships in the Transition to Civilian Life

Active duty military personnel are exposed to high-intensity, stressful, and dangerous environments for a prolonged period of time (depending on the length and frequency of deployment). This exposure to combat is a potentially isolating experience; few civilians have had the same kinds of experiences. What does the unique experience of combat exposure mean for military personnel after their service? The present study examines how veteran identity and well-being is influenced by prior life experiences and social identities. Additionally, examining how compounding identities impact a combat veteran's interpersonal relationships. To better understand veteran life outcomes associated with the transition to civilian life, I have conducted 15 semi-structured interviews - focused on narrative storytelling - as well as through the coding of interview responses. I have investigated a) whether or not veterans develop a 'veteran identity' - and how the 'veteran identity' interacts with pre-existing identities, b) interpersonal relationships throughout their service, c) how military service impacted their preexisting relationships, and e) the impact that the 'loss' (i.e., retirement, discharge) of the Army has on identity. Transitioning from military service to civilian life produces a large amount of change. This period of transition, marked by immense change may be mediated by positive identity development and positive interpersonal relationships. In looking at resources beyond the individual, the current study widens potential veteran programming - utilizing a social justice framework that extends throughout the community.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 563
Math Education In Rwanda

Rwanda’s government prioritizes the development of STEM talent as a key element of its strategy to maintain one of Africa’s highest economic growth rates. One way Rwanda has done this is by modernizing its math education system and encouraging educators to teach math in new ways. Our project investigates how educators meet this challenge and the degree to which they are successful in engaging their students. We spoke with 12 math teachers and 2 principles in 5 schools across several provinces. To understand educational shifts in mathematics from a policy perspective, we interviewed a senior official at the African Institute for Mathematical Sciences and the first opposition party member elected to Rwanda’s parliament in over 30 years. We argue that Rwanda’s new math curriculum, paired with other investments in STEM, has helped bolster student engagement, increase performance, and create more collaborative classroom environments. We also found that these gains are not always realized in under resourced schools, and some teachers in these schools feel that the curriculum shifts were not made with them in mind, specifically citing insufficient training and technological resources.

Presentation Format: Oral
Time: 12:30pm
Room: Rock Room
Number: 211
Behind the Swipe: Examining Decision Patterns with Transgender Profiles in Mock Online Dating Simulation

This study explored how transgender identity disclosed in dating profiles influences online dating behavior. Participants (n=217) actively participated in a mock online dating simulation, where they encountered profiles of their chosen gender(s). They were asked to indicate their interest in matching and provide attractiveness ratings for each profile. Within this set of profiles, half of the participants saw a profile labeled as cisgender, while the other half saw the same profile labeled as transgender. Further, the research explored whether the demographic characteristics of the participants, particularly gender identity and sexual orientation, moderated the relationship between a profile’s gender identity and online dating choices. Despite participants rating all profiles similar in attractiveness, participants swiped less on transgender profiles overall. Non-heterosexual individuals showed greater openness to engaging with transgender profiles compared to their heterosexual counterparts, yet still swiped less frequently on transgender identifying profiles. Non-cisgender individuals demonstrated the highest likelihood of swiping on transgender profiles. These results demonstrate the implications of cisgenderism and transphobia within a dating context while also suggesting that dating apps serve as platforms through which non-cisgender individuals may seek community by prioritizing matches with others who share similar identities. These insights underscore the complex interplay of identity and social dynamics in the realm of online dating for transgender individuals.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 565
"These Things Exist, Back to Talking About Hetero Relationships": The Content, Style, and Organization of Gender and Sexual Identity in High-School Health Education

Queer students tend to experience their school-based health education as inadequate and inapplicable to them, but little research has rigorously studied health education that explicitly acknowledges their existence. This study explores the relationship between content, language, and organization of ideas in New Jersey health curricula to identify patterns across the state. Qualitative, semi-structured interviews were conducted with queer alums (n = 19) and health educators (n = 3) of New Jersey high schools, and preliminary findings were thoroughly tested through mixed-methods coding, content analysis, and topic modeling of curricular documents from New Jersey high schools (n = 91). Both methods support that health education tends to be centered on the needs and experiences of cis, straight students and rely on normative frameworks. This study supplements prior literature and informs advocacy goals by extensively describing a diversity of queer-inclusive curricula and recognizing a trend of explicitly queer-inclusive health education that fails to integrate the experiences and perspectives of queer people holistically within the curriculum.
Exploring Activities

Previous research shows that spatial ability is related to STEM ability, particularly in math (Atit et al., 2022; Wai et al., 2009). “Exploring Activities,” an online study coded on Lookit (Scott & Schulz, 2017), seeks to examine the relationship between 5-10 year old children’s spatial abilities and the activities and sports they participate in. The study consists of three components: a mental rotation test, a perspective-taking test, and a spatial anxiety questionnaire. Mental rotation assessments generally focus on object-transformations, whereas perspective-taking assessments allow for investigation of reference-frame transformations (Brucato et al., 2023), which we hope will lead to interesting comparisons. In addition, spatial anxiety has been shown to relate to and potentially affect spatial ability (Ramirez et al., 2012). Lookit was created for remote administration in child research. This requires recreating tasks for an online format and gamifying them for children, requiring a lot of trial and error. However, this format allows for data collection from a more diverse sample while families participate from home and can allow for greater generalization claims. To make this study, I first learned how to use Lookit and its coding language through a tutorial. While Lookit provides example code, some frames needed to be coded from scratch. Figuring out how to make each frame assisted in coding the next, and the process of coding frames became more efficient. Through reading documentation, studying of code, and trial and error, I learned how to code the perspective-taking and spatial anxiety sections from the ground up.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 352
Increasing the adaptive potential of corals to a warmer ocean.

Coral reefs are one of the most diverse ecosystems on the planet and support more than one-quarter of marine organisms while providing important functions to local communities, such as coastal resilience and livelihood. Corals are marine animals that have a symbiotic relationship with photosynthetic unicellular dinoflagellates (algae), which provide the host with organic carbon in exchange for inorganic nutrients and light. However, under-elevated temperatures, the algae symbionts produce toxic products and are expelled by the host (coral bleaching) increasing the likelihood of coral mortality. Due to climate change, increased frequency and severity of oceanic heat events have caused the global bleaching of coral reefs, resulting in over 30% loss of these vital ecosystems. Despite these losses, some corals survive bleaching events (heat-tolerant). Thermotolerance in corals results from genetic factors (e.g., heat-resistant genes) and epigenetic factors (changes in gene expression without changing the underlying DNA). Recent studies in mammalian cells show that changes in chromatin structure (3D organization of DNA and associated proteins that make up chromosomes) and chromatin markers (DNA methylation and protein modifications) regulate gene transcription. Our lab is interested in increasing coral’s adaptive potential to warmer oceans by reprogramming coral’s gene expression to improve their physiological response to heat stress and increase their survival. Here, we optimize an electron microscopy technique (ChromEM) to visualize and measure changes in the chromatin structure of coral cells. The goal is to measure changes in the chromatin structure of heat-tolerant corals under thermal stress and relate that with their transcriptional plasticity.

Presentation Format: Oral
Time: 12:30pm
Room: Lake Room
Number: 406
Dilute Plasmonic Alloys for Photocatalytic CO Oxidation

Plasmonic photocatalysis utilizes optically active nanostructures to convert light into chemical energy, potentially reducing reliance on fossil fuel-powered thermocatalytic processes. Noble metal nanoparticles (NPs) with collective oscillations of electrons upon light irradiation known as localized surface plasmon resonance can enhance catalytic performance, enabling reactivity driven by visible light. Dilute plasmonic alloys, made by combining plasmonic metals (Ag, Au) with small amounts of catalytically active transition metals (Pt, Pd), generate hot carriers upon plasmon decay, leading to enhanced reaction rates and selectivity.

In this study, two synthesis approaches were used: codeposition (modified strong electrostatic adsorption) and colloidal method followed by atomic layer deposition (ALD). In codeposition, metal precursor mixtures with varying dilute limit ratios were added to a basic support solution, generating a strong electrostatic interaction between the positively charged metal complexes and negatively charged SiO₂ support. The product was reduced under H₂ gas to obtain PtAg NPs on SiO₂. In the colloidal method, gold nanospheres (AuNSs) were prepared via a tannic acid-assisted, citrate-stabilized approach and supported on non-porous SiO₂ made with the Stöber method. Platinum was then coated onto AuNSs by ALD with varying Pt loadings.

Products were characterized using diffuse reflectance spectroscopies, X-Ray photoelectron spectroscopy, and electron microscopy. CO DRIFTS was done to investigate CO adsorption and binding modes. Photoresponsive catalytic behaviors were studied using CO oxidation as a model reaction. Platinum is anticipated to form small clusters on the Ag/Au surface with the Pt loadings used. The results demonstrate the catalytic capabilities of bimetallic plasmonic-transition metal structures.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 372
Leah Simon
Faculty Advisor: Sandra Waxman

Analysis of Eye-Tracking Technology for Infant Cognition Research

Utilizing eye-tracking to conduct research provides valuable insights into cognitive processes, particularly in populations where traditional methods might be impractical or insufficient, such as infants, who are unable to communicate verbally about their perceptions and cognitive responses. By precisely identifying the direction and duration of their gaze, researchers gain insights into the infants' visual attention and cognitive processes. Moreover, the eye-tracking data can be combined with other behavioral or physiological measurements to provide a more comprehensive understanding of infant development. Although eye-tracking technology has yielded significant advances in understanding how infants perceive and interpret their surroundings, implementing this technology also brings with it significant costs: it requires specialized expensive equipment and considerable technical skill. An alternative is to code videotaped data manually, but this too is costly: it requires that human coders be carefully trained to ensure high inter-coder reliability. A new, automated eye-tracking system, iCatcher+, may resolve the costs incurred in eye-tracking technology and manual coding. Leveraging deep learning techniques, iCatcher+ offers efficient and accurate infant gaze tracking without requiring manual coding. The goal of the current study is to validate iCatcher+ by comparing its accuracy with traditional manual coding methods. We compare manually coded eye-tracking data and data processed by iCatcher+. The infant data comes from an extensive infant looking-time repository. Preliminary analysis indicates a significantly high level of similarity between human-coded and iCatcher-coded data, supporting the hypothesis that iCatcher+ is a viable alternative in infant gaze analysis. This finding holds promise for enhancing efficiency and scalability in developmental research.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 256
Pandemic Impacts on Parent-Child Relationships

While the COVID-19 pandemic was a (hopefully) once-in-a-lifetime event, the consequences of adversity from the pandemic on young children’s development are unknown. Positive parenting behaviors can buffer the impacts of adversity in a child’s environment but it is unknown how parenting behaviors changed during COVID-19 due to increased stress and new household dynamics. This project asks if there is a relationship between parenting stress from COVID-19 and positive parenting behaviors. In a subsample of 36 participants within a larger study using data from 2021, parenting stress from COVID-19 is measured through the Parenting Daily Hassles survey, the COVID-19 Household Environment scale, and a semi-structured interview. Positive parenting behaviors are measured through coding of parent-child interaction videos using PICCOLO. Majority of participants reported an increase in parenting hassles during the pandemic and reported that both household conflict and household togetherness increased during COVID-19. Pearson r correlations reveal statistically significant negative correlations between change in parenting hassles during the pandemic with PICCOLO scores (r=-0.48) and between change in household conflict with PICCOLO (r=-0.38), showing an indirect relationship between parenting stress during the pandemic and positive parenting behaviors. Thematic analysis of interviews showed prominent stressors (lack of activities & socialization and maintaining child’s health) and benefits (increased time together and better understanding of child’s development) on parent-child relationships during the pandemic. These multifaceted results have implications for early intervention and educational models to better support the development of children and to reduce the potentially lifelong consequences of the pandemic.

Presentation Format: Oral
Time: 10:30am
Room: Arch Room
Number: 207
Evaluating the Effectiveness of Jewish Environmental Education

Religious spaces are a key place where young people shape their values and understanding of the world, and childhood nature education is shown to be one of the best determinants of adult environmental activism. Many Jewish congregations list Tikkum Olam, or repair of the world, as a crucial social justice value of their organization, and recognize the urgency of the climate crisis. Jewish communities value education highly, and fund the creation and distribution of many educational resources. This project surveys a variety of free Jewish educator-resource websites (like chinuch.org, jewishlearningmatters.com, educator.jewishedproject.org), searching using environmental key terms. Two levels of data are being collected. First, how easy is it to find environmental teaching resources in general? And second, of those environmentally-motivated teaching resources, how effective might they be? The model created for this research states that effective environmental education should be: nature-based; adaptable; values-based; critical-thinking-focused; open-ended; engaging; accurate; non-overwhelming; aware of the climate crisis; actionable; age-appropriate; and hope-based. The data has not yet been fully collected or analyzed, but initial searches have indicated that it is remarkably hard to find any environmental resources on most sites. Within these, while there are some nature-based programs that are accurate, open-ended and engaging, there is a general lack of values-based resources that spread hope-based information about the climate crisis and are appropriately actionable. As this research evolves, we will use a grading metric to assess this numerically, and statistically show the lack of actionable Jewish environmental education that’s available online.

Presentation Format: Oral
Time: 10:30am
Room: Rock Room
Number: 423
Advancing ALS Research: Development and Analysis of a Novel Mouse Model for Studying TDP-43 Mislocalization

This research project aimed to connect two seemingly unrelated neurological diseases, ALS and ICH stroke, in an effort to develop a mouse model to study ALS disease. An important but deeply understudied hallmark of ALS disease is mislocalization of TDP-43 protein to the cytoplasm. Previous studies have demonstrated TDP-43 mislocalization as a consequence of ICH stroke. This project aimed to replicate these findings in order to develop a mouse model for the study of ALS disease. The significance of this project lies in its potential to advance ALS research and uncover therapeutic targets against TDP-43 proteinopathy, an area currently lacking a proper mouse model. The study employed a mouse model where stroke was induced via intracerebral injection of collagenase, an enzyme that degrades brain capillaries. TDP-43 expression and localization post-stroke were determined by using Western Blotting to quantify the relative expression of TDP-43 and two inflammatory markers, Iba1 and Claudin5. Fluorescence microscopy was used to visualize the localization of TDP-43 in brain and spinal cord cells. The results indicated that brain and spinal cord cells demonstrated significant upregulation and nuclear localization of TDP-43 post-ICH. While the model did not replicate TDP-43 cytoplasmic mislocalization, significant upregulation of TDP-43 in lumbar motor neurons post-ICH is a novel discovery and merits further investigation. It represents a previously undiscovered connection between ICH stroke and TDP-43 pathology. While further investigation of this model may yield more conclusive results, this project led to the discovery of a novel mouse model for the study of TDP-43 pathology.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 239
Tracking the aryl hydrocarbon receptor in skin's xenobiotic response and differentiation

Many of the skin’s responses to hazardous chemicals are mediated by the Aryl Hydrocarbon Receptor, a cytoplasmic protein that is activated by certain aromatic hydrocarbons, known as xenobiotics, before moving to the nucleus and initiating a metabolic response. AhR has also been linked to skin’s natural regeneration through a process known as differentiation, but this xenobiotic-independent activation of AhR is not well understood. Several questions remain unanswered, including how the localization of AhR changes in vitro when differentiated versus treated.

Over the last two quarters, a series of immunofluorescence and qPCR experiments have been investigating the activity of AhR during skin cells' differentiation and after exposure to xenobiotics, with images' nuclear or cytoplasmic fluorescence analyzed. The identified cytoplasmic localization of AhR in in vivo tissue sections, and the localization to the nucleus after a drug treatment in vitro, confirm its role in chemical metabolism, but the unexpected nuclear localization of AhR in undifferentiated cells in vitro warranted more investigation. An ongoing experiment tracking the live movement of AhR over the course of skin cell differentiation using a fusion AhR-mCherry protein seeks to elucidate how AhR activation is correlated with the stages of differentiation.

If AhR activation is indeed a driver of differentiation, it would be possible that the many skin conditions of dysregulated growth linked to AhR (including chloracne, psoriasis, and atopic dermatitis) are connected to these differentiation and xenobiotic pathways being crossed, meaning that understanding AhR's role in differentiation could open the door to new therapeutic targets and drugs.
Conflicts Arising from Autonomy in Space Teams

Just decades ago, the first humans set foot on the moon, and now we are setting sights on traveling to Mars and beyond. However, extending the scope of the missions only extends the challenges, introducing communication delays and a need for autonomy. Through this project, I seek to understand how increased crew autonomy affects space missions through investigating the relationship between mission control and crew. I work in the Science of Networks in Communities lab to collect the data from the National Aeronautics and Space Administration’s Human Exploration Research Analog (HERA) which simulates the isolation and confinement involved in deep space travel by selecting a crew of four astronaut-like volunteers to spend 45 days in a spaceship-like habitat. My research focuses on survey data collected from three tasks completed every week. I performed a time series analysis to see how crew perceptions of the tasks and team states such as team potency and motivation developed throughout the mission. I also analyzed crew responses to post-mission debrief interviews to gain insight into why the crew members responded the way they did. Rather than falling apart as a team, the team became incredibly tight-knit and started retaliating against the project. The HERA crew started with high opinions of the project, however, their views negatively changed as the project progressed because they felt they were being underestimated. My work helps explain why conflicts may arise from a highly autonomous crew, which will become important as we enter deep space.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 529
Design Optimization of Skin-Interfaced Humidity Sensors for Improved Stability and Accuracy in Skin Barrier Function Assessment

Trans-epidermal water loss (TEWL) is a surrogate parameter for assessing skin barrier function which is an important characterization of overall skin health. Impaired skin barrier function has also been correlated to multiple skin conditions. For example, atopic dermatitis is an inflammatory skin condition that affects 20% of children worldwide. Continuous and non-invasive measurements of TEWL can be achieved through this newly developed sensor device, which forms a sealed chamber over the skin and integrates a humidity sensor. I investigated structural and aerodynamic design optimizations to enhance its stability and accuracy in skin barrier function assessment. I hypothesized that transitioning the device’s structure from a dual-component system to a monolithic form would improve the stability of the measurements. Additionally, I hypothesized that altering the device’s aerodynamic profile to decrease air resistance could maintain natural airflow from the skin surface, thereby improving data accuracy. Following the engineering and fabrication of these design modifications, the device was tested and validated against commercially available TEWL measurement devices. Our validation studies demonstrated that the design modifications resulted in a significantly improved correlation with the commercially available device. Furthermore, the monolithic structure contributed to a significant reduction in signal noise while heightening sensitivity. Optimizing our TEWL sensor device is of interest to dermatological science and clinical practice as it presents a potential alternative method of extracting TEWL measurements to monitor skin health.
Grief Unmasked

Grief, an omnipresent human experience, has been analyzed throughout time through various models and lenses in order to make sense of the abstract concept. One of such models is the Kubler-Ross model, also known as the Five Stages of Grief. This honors thesis delves into the stages of grief, combining Kubler-Ross’s original five stages with her later seven-stage model and the author’s personal experiences to design a comprehensive depiction of the grieving process.

The primary objective of this honors thesis is to explore and demystify the multifaceted experiences of grief, recognizing the individualized nature of grief’s expression. The author’s goal by crafting these masks and sharing them with others through a gallery, featuring the masks and photo documentation, was to shed light on the often intimidating and isolating journey of grief. With this project, they aimed to create masquerade masks that create an experience that is evocative and impactful in a way that is more individualized than just reading about the stages one may go through, answering the question: How can the use of masquerade as an embodied practice manifest and express the various experiences of grief?

Through the lens of personal loss and artistic expression, the author adapts the stages into a unique framework comprising Shock, Denial, Guilt, Anger, Bargaining, Depression, Reconstruction, and Acceptance. Each stage is crafted into wearable masquerade masks, embodying the experiences through personal anecdotes and symbolism. Drawing on interdisciplinary perspectives from psychology, religion, and art, the thesis provides a multifaceted exploration of grief. By merging personal experiences with scholarly insights, the thesis offers a poignant reflection on the universal journey of mourning and resilience.
What Is the Right Way to Talk? Using Master Narratives to Analyze Singaporean Parents' Experiences Speaking Singlish

Singapore Colloquial English, or 'Singlish,' is an English-based creole language spoken in Singapore. Despite being considered a unique marker of cultural identity and an important symbol of Singaporean heritage, the Singaporean government has been trying to eradicate Singlish since the 1970s and condemns it as "poor" or "corrupted" English that is harmful to the economic development of Singapore. Anthropologists and linguists have long challenged the illegitimacy that surrounds World Englishes, but almost no research has looked at Singlish. This project uses a master narrative framework to investigate what Singaporeans think about how they should present themselves in terms of language and why. Through semi-structured interviews, Singaporean parents ($N = 10; M_{age} = 52.8, SD = 8.69$) reflected upon questions that centered their experiences speaking Singlish and talking with their children about Singlish. Qualitative analyses show that: (a) the master narrative characterizes Singlish (and those who speak it) as illegitimate, incomprehensible, and of low status; (b) Singlish can serve as a tool for its speakers to flexibly perform or leverage power within intersectional dimensions of hierarchy related to race, education, and belonging. The findings critically examine how power and agency are obfuscated in the conflict over Singlish and contribute to critical dialogue challenging the presumed and prescribed illegitimacy of creole language overall.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 593
Innate Immune Mechanisms of Transfusion Alloimmunization

Red blood cell (RBC) transfusion is essential for the treatment of anemia caused by acute injury or chronic disease, and is one of the most common treatments in medicine. A serious complication of transfusion is the development of non-ABO alloantibodies to foreign RBC antigens. There are currently no therapeutic interventions to prevent this reaction during transfusion, except screening blood units prior to transfusion and identifying donor blood unreactive to alloantibodies in the recipient's sera. For patients who need repeat transfusions, safe donor blood can be difficult to obtain, interfering with treatment. Despite this, mechanisms of alloantibody formation remain unclear. Storage of mouse RBCs before transfusion increases RBC immunogenicity through unknown mechanisms. We have previously reported that sterile, stored mouse RBCs activate splenic dendritic cells (DCs), which are required for alloimmunization. We therefore sought to transfuse mice with allogeneic RBCs to test whether stored RBCs activate pattern recognition receptors (PRRs) on recipient DCs to induce adaptive immunity. Toll like receptors (TLRs) are a class of PRRs that regulate DC activation and signal through two adapter molecules: MyD88 and/or TRIF. We have shown in mice that MyD88, but not TRIF, is required for the adaptive response against stored RBCs. We are currently determining the cellular requirement for MyD88 using cell specific knockouts and attempting to determine the specific TLR required for alloimmune responses.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 421
Examining the association between traditional working memory performance versus motor-involved working memory tasks in people at clinical high-risk for psychosis

Recent research has greatly improved understanding of the clinical-high risk for psychosis (CHR), particularly in working memory (WM) and motor functioning deficits. However, examining the compounding effects of motor dysfunction and WM deficits in CHR individuals has been neglected. In this paper, we examined how WM performance differs in CHR populations and if this is further impacted by motor dysfunction. In Study 1, we employed a Letter N-back paradigm (Moore et al., 2014) to determine how controls and CHR individuals compare on a traditional WM measure. Study 2 determined how CHR individuals compared to controls on motor-dependent WM tasks. Our first study found no significant differences in WM performance overall. Surprisingly, CHR participants had significantly higher accuracy ($t = -2.61, p < 0.01$) and faster response times ($t = 2.01, p < 0.05$) in the 1-back trials than controls. Our second study found CHR individuals make significantly more gesture-related errors than controls overall ($t = -2.19, p < 0.05$). Further, we find how much CHR individuals differ from controls on WM tasks depends on task difficulty, with no significant differences on our easiest/hardest conditions. Overall, we found the most significant differences on the “mid-range” difficulty on both tasks, and CHR individuals only performed poorer than controls on our motor-dependent gesture memory task, rather than the traditional measure. If trends we observed for nonsignificant findings remain, increased statistical power from ongoing data collection will improve our ability to detect what may ultimately be significant differences between CHR and control groups.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 459
SPORTSWASHING REVISITED: An analysis of international relations principles in the cases of Qatari and Saudi Arabian investment in sport

This thesis examines the interplay of international relations and sports investment, focusing on the phenomenon of "sportswashing" as illustrated by the cases of Qatar and Saudi Arabia. Sportswashing, a term first coined in 2014, describes the strategy used by states to enhance their global image through significant investments in sports, despite potential controversies surrounding their human rights records. This study examines the historical background and evolution of sportswashing, exploring its connection with propaganda and its emergence as a sophisticated form of soft power in contemporary international relations.

By analyzing the 2022 FIFA World Cup in Qatar and the extensive sports investments by Saudi Arabia, this thesis evaluates these two Gulf cases within the context of international relations. The initial part of the thesis explores the origins and definitions of sportswashing, tracing its historical usage and broader implications within the '-washing' metaphor. It then evaluates four key aspects of international relations frequently associated with sportswashing, propaganda, soft power, sports diplomacy, and place branding, to identify similarities, contradictions, and discrepancies between these concepts. Using an analytical framework, the study then explores the cases of Qatar and the 2022 FIFA World Cup and Saudi Arabian investments with a specific focus on the concept of soft disempowerment as proposed by Brannagan and Rookwood (2016). Finally, the study proposes a novel framework to conceptualize the trend of sports investments within the context of international relations.

Ultimately, this thesis aims to provide a nuanced understanding of how sports investments are used as a geopolitical tool, contributing to the broader discourse on the interplay between sports, politics, and international relations.
MrgprD-Expressing Neurons and Mast Cells in Type-2 Diabetic Wound Healing

Poor wound healing is a major health issue in individuals with Type-2 Diabetes (T2D), often necessitating limb amputation, and treatment of diabetic wounds is largely ineffective due to reduced wound area innervation. Mas-related G-protein-coupled receptor D (Mrgprd) - related neurons are a subset of sensory neurons involved in pain transmission, and ablation of these neurons has been shown to lead to diabetic inflammation. Mast cells, a subset of immune cells that cluster in the dermis in response to wounding, show higher degranulation and subsequent inflammation in T2D patients. Our research aim was to better understand the bidirectional communication between Mrgprd-related neurons and mast cells that may cause this increased inflammation. Testing was conducted on skin and wound samples from a mouse model injected with either PBS, the control, or DTX, which ablates Mrgprd-related neurons. Genes v-glut, Mrgprb2, and Mcpt4, which indicate mast cell presence, were tested for through qPCR, and mast cells from both groups were manually accounted for after tryptase staining and imaging. Statistical analyses were conducted to compare mast cell counts and qPCR data from the different conditions, and results indicated increased mast cell quantity in the wounded area when Mrgprd-related neurons were ablated. These results may point to further research on communication pathways between sensory nerve afferents and immune cells, and development of treatment therapies to decrease wound healing inflammation in T2D patients.
As Erik Erikson proposed, it has been well established that the main challenge of adolescence is establishing identity and ‘finding oneself’ (Orenstein & Lewis, 2022). In addition to identity development, it is understood that adolescence is a time of “storm and stress” (Ballard et al., 2022), as our brains enter a particularly sensitive period. Even though these processes co-occur in our teenage years, there is a lack of investigation into the relationship between stress and identity development. As such, in this project I have analyzed the relationship between stress and adolescent identity development using SPSS regression analyses. Results showed that higher stress predicted higher confusion within one’s identity and lower stress predicted lower confusion within one’s identity, both at time one and longitudinally. This suggests that there may be a direct link between life stress and adolescents’ ability to develop their sense of self. This topic is vital to research as both stress and identity have major implications for our overall well being, and it is important to recognize these factors when considering how to best support our children.
Exploring the Impact of Dating App Usage on Mental Health in Adolescents: A Focus on Sexual and Gender Minority Youth

Online dating has become more common in adolescence, particularly for sexual and gender minority (SGM) youth. Past research has provided preliminary evidence that adolescents’ dating app usage was linked to both risks for (e.g. victimization) and protections against (e.g. community building) psychopathology. Building on these findings, the present study obtained dating app usage over 6 months utilizing a mobile sensing app downloaded to participants’ smartphones in 136 adolescents with a wide range of depression severity. There were 24 SGM dating app users ($M_{age} = 17.3, 4.2\%$ male), 39 SGM non-users ($M_{age} = 16.5, 10.2\%$ male), and 73 non-SGM non-users ($M_{age} = 16.2, 35.2\%$ male). Controlling for demographic differences, SGM users self-reported greater depression symptoms and risky behaviors than both SGM non-users and non-SGM non-users at baseline (all $p$s < .014), but groups did not differ in the change in depression symptoms and risky behaviors from baseline to 6-month follow-up. Interestingly, while SGM users were more likely to self-report suicidal ideation than non-SGM non-users at baseline (OR = 5.81, $p = .004$), only SGM non-users evidenced greater increases in the likelihood of suicidal ideation compared to the non-SGM non-user group (OR = 5.97, $p = .033$) from baseline to 6-month, potentially suggesting protective effects of using dating apps for SGM youth. Understanding the harms and benefits of dating app usage in adolescents, particularly SGM youth, can better inform interventions to improve mental health outcomes during this critical developmental period.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 278
Eye Regeneration in the Worm Hofstenia miamia

Regeneration is the process by which organisms replace missing or damaged tissue following injury. While Humans can only regenerate skin and liver tissue, some animals, like the model organism Hofstenia miamia, a worm, can regenerate any tissue, including eyes. Understanding regeneration could have important medical implications in the distant future, but first, the genes and processes involved need to be studied. My project aimed to determine which genes among a list of candidates are involved in eye cell regeneration in Hofstenia. I used three methods: 1) FISH staining, which visualizes the expression patterns of candidate genes; 2) Gene knockdown via RNA interference, which "stops" gene expression, showing if a gene is required for proper eye cell regeneration; 3) A behavioral assay I designed to determine whether any regenerated eye cells function properly after the gene knockdown treatment. Through this project, I identified several genes that may be necessary for eye cell regeneration, includingeya1, rdh10, and shox. These genes were all expressed in the anterior portion of the worm and resulted in lower eye cell counts after gene knockdown. The results of the behavioral assay were mixed but indicated that Hofstenia display phototaxis, or movement toward light. Consequently, the assay could be redesigned and repeated to get clearer results. These findings help illuminate the mechanism behind eye cell regeneration in this emerging model system and enable further, more in-depth study.
Federal Legalization of Sports Betting, Five Years Later - A Dangerous Wager?

In *Murphy v. NCAA* (2018), the Supreme Court invalidate the Professional and Amateur Sports Protection Act, opening the door for states to create legal tax-and-regulation schemes for sports gambling. Over the last five years, sports betting has exploded in popularity, permeating journalism, advertising, and the public imagination. Yet very little research has been conducted to analyze the societal impacts of the broad legalization of online sports betting, specifically on the most impacted cohort, young American men. In this presentation, I will analyze the legal process by which *Murphy* came to pass, as well as the arguments for and against a federal sports betting framework in the Senate hearings held on PASPA immediately after *Murphy*. Then, taking a retrospective look at the last five years of legal sports betting in America, I will explore the public health impacts of the highly consolidated state of the industry, the lack of success of various harm reduction programs, the *laissez-faire* state of advertising regulation, and the addictive applications of AI and machine learning by the nation’s largest sportsbooks. Finally, I will use an economic analysis of data published by the Illinois Gaming Board to contextualize the increasing profitability and popularity of online sportsbooks in Illinois. On the whole, I will show how and why the current anti-federalist approach to sports gambling regulation has consistently underserved young current and future problem gamblers, and argue that to stem the effects of this impending public health crisis, a set of moderate standards imposed by the federal governments should be adopted.

Presentation Format: Oral  
Time: 10:30am  
Room: Arch Room  
Number: 380
Bisexual individuals comfortability with straight and gay potential romantic partners

Research has consistently shown a bias against bisexual people in dating, with evidence suggesting a greater prevalence of this bias among straight individuals compared to gay individuals. This study aimed to explore how these differences influence how bisexual people *feel perceived* by straight versus gay potential partners in new romantic relationships. Specifically, it investigated whether bisexual individuals experience varying levels of comfort with straight versus gay potential partners. To examine this, 369 participants responded to a Qualtrics survey where they read a situation asking them to imagine beginning a romantic relationship with someone after meeting them on a dating app. They were randomly assigned to either see the profile of someone straight or gay. Subsequently, they rated their comfort levels with the potential partner and relationship and answered questions about their own past experiences. Analysis of the data revealed no significant difference in participants’ overall comfort with partners based on their sexual orientation. However, there was a significant difference in their comfortability discussing their sexuality, with participants feeling more comfortable with gay potential partners. Additionally, findings indicated that bisexual women report having an easier time finding relationships with men, yet feel more comfortable overall being in romantic relationships with women. This study contributes to the existing literature by providing further insights into how biases against bisexual individuals impact their dating preferences and comfort levels in relationships with individuals of different sexual orientations.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 506
The Children’s Depression Rating Scale (CDRS): Whether Subscales Track Nuances in Adolescent Depression

Major Depressive Disorder (MDD) is a vital public health concern, especially among adolescents as prevalence rates have dramatically increased in recent years. MDD is heterogeneous in presentation, indeed many symptoms (such as psychomotor retardation and agitation or weight loss and gain) are opposites. Thus, studying the facets is important to see which are most predictive of relapse. The Children’s Depression Rating Scale (CDRS) is a widely used clinician-measured instrument that probes different symptoms of depression. Past research suggests that subscales (i.e. correlated components within a full measure) do exist; however, a consensus on how many or what the subscales may be remains unclear. The present study obtained CDRS scores at two time points (baseline and 6-months) in a sample of adolescents (ages 13-18) with a wide range of depression severity. While analyses are being finalized, the aim of this study is to test subscales of the CDRS at baseline and 6-months through exploratory factor analysis. Subsequently, we plan to run measurement invariance with our sample to capture the psychometric equivalence of the CDRS over time. Overall, these results aim to supplement understanding of possible subscales in the CDRS and may have implications for the way this measure is used to assess depression and further personalize treatment approaches.
Evaluating regenerative dressings in a clinically relevant model

Chronic diabetic foot ulcers (DFUs) pose a significant health and economic burden, demanding innovative treatments for effective wound regeneration. Our study evaluates the efficacy of poly (polyethylene glycol citrate-co-N-isopropylacylamide) (PPCN) and its derivative, A5G81-PPCN, in a diabetic large animal model, the Ossabaw pig. PPCN, coupled with a laminin-derived peptide and synthesized via polycondensation, is functionalized with A5G81 through click chemistry to accelerate wound closure by stimulating keratinocyte and fibroblast proliferation while reducing oxidative stress. Surgical creation of full-thickness wounds and treatment application were then conducted in non-diabetic and diabetic Ossabaw pigs, with wound closure monitored weekly and histological analyses performed post-treatment. Wound closure was assessed by quantifying the percentage of reepithelization over time using digital images of the wound area taken weekly and analyzed with ImageJ software, and the following equation:

\[
\text{Wound closure (\%)} = \frac{\text{Area } T_x}{\text{Area } T_0} \times 100
\]

Results showed that in non-diabetic pigs, A5G81-PPCN-treated wounds achieved an average closure of 87% by week 3, compared to 80% with PPCN, 75% with Prisma™, and 74% with saline. Similarly, in diabetic pigs, A5G81-PPCN-treated wounds achieved 86% closure by week 4, whereas PPCN, Prisma™, and saline treatments reached 76%, 75%, and 63%, respectively. Histological analysis further supported these findings, revealing enhanced epidermal and dermal regeneration with A5G81-PPCN treatment. Thus, PPCN-A5G81 significantly enhanced wound closure in both diabetic and non-diabetic pigs, surpassing the efficacy of Promogran Prisma™. These results underscore the potential of PPCN-based therapies in addressing the unmet clinical needs of DFU management.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 465
Development of a Novel Mouse AMD Model to Study Immune Cell Role in the Disease

Age-related macular degeneration (AMD), the most common cause of blindness in the developed world, is strongly linked with the complement system. Retinal microglia and choroidal macrophages (types of immune cells) express complement system components and contribute to AMD. Microglia highly express Cx3cr1 and are long-lived, self-renewing macrophages. Choroidal macrophages express Cx3cr1 at low levels and are short-lived macrophages replenished by blood monocytes, an immune cell precursor. The purpose of this study was to selectively deplete choroidal macrophages or retinal microglia to better understand AMD pathogenesis. Cx3cr1-creER/+; Csf1r-iDTR (diphtheria toxin receptor) mice were given either 1 tamoxifen injection or 4 tamoxifen injections to stimulate DTR expression over a one-month period prior to 4 daily DT treatments (which deplete DTR expressing cells) or a daily control. Retinal and choroidal tissue was extracted and imaged through immunofluorescence microscopy. Microglia and choroidal macrophage densities were calculated using ImageJ. Retinal microglia were depleted by 42% after 1 tamoxifen injection (p<0.05) and 65% after 4 tamoxifen injections (p<0.0001). Choroidal macrophages were slightly reduced by 8% (p=0.46) after 1 tamoxifen injection and 33% (p<0.01) after four tamoxifen injections. Since retinal microglia highly express Cx3cr1 and are long-lived, one tamoxifen injection is sufficient for microglia depletion. Because choroidal macrophages express low levels of Cx3cr1 and are short-lived, multiple tamoxifen injections over time are necessary to stimulate Cre and DTR expression in choroidal macrophages and blood monocytes, and therefore to deplete them. Further model modifications will improve our understanding of the differential functions of these macrophage subtypes in AMD.
Uncovering Oncogenic Driver Mutations in Non-Hodgkin's Lymphoma

Cancer is a diverse family of diseases marked by uncontrollable cell growth. Through altering the cell's DNA, oncogenic driver mutations disrupt the delicate balance between cell division, differentiation, and death and initiate cancer formation. Driver mutations boost the survival advantage of pre-cancerous cells, leading to their increased recurrence beyond random chance. Recent advancements in DNA sequencing technologies have facilitated the study of mutations at an unparalleled resolution, but the small sample sizes of individual studies often limit their sensitivity to detect rare driver mutations that underlie cancer development. My project sought to address this challenge for Non-Hodgkin's lymphoma, cancer of white blood cells, by collating publicly available mutations from lymphoma samples published in the literature. After standardizing and processing mutations from 11,060 lymphoma samples across 77 papers, we amassed a dataset comprising 282,097 mutations. We applied the principle of recurrence to identify potential driver mutation candidates, subsequently selecting 262 uncommon mutations for further investigation. These nominations set the stage for downstream functional experiments to validate oncogenicity and mechanistic work to uncover how these mutations drive lymphoma progression. These insights hold the potential to broaden treatment options for patients suffering from incurable lymphomas by informing whether existing therapies for cancers with similar genetic profiles can be repurposed for lymphoma treatment, or by facilitating the development of new therapies altogether.

Presentation Format: Oral
Time: 10:30am
Room: Lake Room
Number: 248
Me vs We: How Attachment Style Informs Optimal Distinctiveness in Relationships

There is a great amount of variability in the amount of closeness people desire in their romantic relationships. This variability can be described by optimal distinctiveness theory (ODT), which is the discrepancy between the desire to feel affiliated with versus distinct from others. One theory that may inform one’s preferred level of optimal distinctiveness is attachment theory, which explains the tendency to behave in ways that regulate how close one is to their partner. People who are anxiously attached are inclined to draw closer to their partner in times of distress, while people who are avoidantly attached are inclined to draw further from their partner in times of distress as a way to reestablish their independence and autonomy. As these two theories have never been examined together, this study aims to ascertain if attachment style informs one’s desired level of optimal distinctiveness. We intend to survey a diverse sample of adults currently in a romantic relationship on their attachment style, current and desired optimal distinctiveness, and relationship quality. We hypothesize that those who are anxiously attached will prefer greater levels of affiliation, while those who are avoidantly attached will prefer greater levels of distinctiveness. Lastly, those with a smaller discrepancy between desired and actual optimal distinctiveness will experience greater relationship quality. This work will be the first step to understanding where optimal distinctiveness stems from. As optimal distinctiveness has rarely been examined in the context of relationships, we expect that any results will be informative and generative for future research.
A Closer Look At Coral Bleaching

Coral reefs are essential ecosystems: Providing for around 25% of all marine species, playing a critical role in coastal nations' economies, and promoting ocean biodiversity. Corals attain most of their metabolic needs by exchanging metabolites with endosymbiotic algae residing within their cells. This delicate symbiosis is threatened by rising ocean temperatures caused by climate change, leading to stress events known as coral bleaching. This rapid loss of pigment in coral colonies results from the breakdown of symbiosis between the algal symbionts and their coral host cells, starving the colony, and often leading to death. However, some colonies survive bleaching events and display significantly different gene expression patterns from heat-sensitive colonies, possibly due to epigenetic effects outside of genotypic variability. Epigenetics studies changes in both chromatin structure and in chemical markers and modifications that regulate gene expression. In order to understand the mechanisms behind the survival of heat-tolerant colonies, our lab studies the changes in chromatin structure of heat-tolerant corals during and after stress events and how that affects their transcriptomic response. This study requires transcriptome sequencing, chromatin sequencing, and chromatin imaging techniques. To perform these assays, viable cell suspensions must be obtained from live coral specimens. By optimizing these protocols for cell dissociation, *in vitro* suspension conditions, and cell viability assays, we can greatly advance the study of coral gene expression. Additionally, these viable cell suspensions can be transformed into stable cell lines-allowing for more robust testing of genetic regulation in response to stress conditions.
Antimicrobial resistance (AMR) presents an escalating threat to public health. Particularly urgent is the battle against the virulent bacteria Pseudomonas aeruginosa (PA), which frequently complicates pneumonia infections, leading to increased morbidity and mortality rates. Synthetic bacteriophage therapies offer promising long-term alternatives to antibiotics, and understanding the mechanics of phage infection at the genomic and microbiome level will be foundational to their efficacy. This study investigates factors within PA whole genome sequences predictive of successful phage therapy by conducting infection assays with two candidate therapeutic phage strains DMS3 and JG024. Leveraging data from Northwestern University’s SCRIPT study, 189 PA isolates were acquired from bronchoalveolar lavage of intubated patients with suspected or confirmed severe pneumonia. Computational analysis has elucidated integrated temperate phage diversity in all isolates, in addition to the presence of associated restriction-modification bacterial defense systems. Plaque assays will characterize phage-bacterial interactions using host range and infection efficacy. Statistical regression and cluster analysis will then be employed to group functional genomic profiles based on their infection parameters. Similar methodology could be extrapolated to other bacterial strains and refined for other disease models. By elucidating genomic predictors of phage infection success, this research contributes to the development of targeted treatments for AMR infections, addressing the pressing global health concern of AMR complicated Pneumonia.
Exploring Lewis Acidity and pH dependence of Zirconium/Hafnium-based Metal-Organic Frameworks for Enhanced Nerve Agent Hydrolysis

Nerve agents are among the most toxic forms of chemical warfare agents (CWA), making development and application of hydrolysis capabilities for their destruction an area of interest for public and military safety. It has been confirmed that Lewis-acidic nodes in metal organic frameworks (MOF), porous structures made of metal nodes and organic linkers, can catalyze the hydrolysis of nerve agents. This project aims to investigate the less understood area of hydrolysis rate laws across pH, as there are two possible rate limiting steps. The first is the replacement of the aqua ligand at the metal node with the simulant P=O bond, and the other is nucleophile attack by the hydroxide. To explore this area of uncertainty, two versions of MOF-808 were surveyed across a wide pH range, one with Zr nodes and the other with Hf nodes. It was hypothesized that across the pH range to be tested, Zr nodes would perform at a higher rate due to higher Lewis acidity of its coordinating sites. Hydrolysis rates are based on hydrolysis of dimethyl p-nitrophenylphosphate (DMNP), a nerve agent simulant which possesses the key organophosphorus structure shared in G and V series nerve agents which include sarin, tabun and VX. Hydrolysis occurs via addition-elimination mechanism with the tetrahedral phosphorus center. Ultimately, it was found that the rate limiting step changes based on pH and Hf and Zr MOF-808 have differing pH dependence.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 546
"I'm FGCS": Multivocal Idioms of Wellness, Distress, and Ambivalence Among First-Generation College Students (FGCS)

Although first-generation college students (FGCS) often report higher levels of social, psychological, and academic distress, research surveying the prevalence of biomedically defined mental health disorders among FGCS remains inconclusive. This study employs an idioms of distress model to better conceptualize the mental health of FGCS, paying attention to how such individuals narrate their experiences, construct their sense of self, and define mental health more broadly. Semi-structured ethnographic interviews were conducted with rising or current second-year students at Northwestern University (n = 8) throughout the summer and fall of 2023. All participants identified as cis-gender, women of color who conceptualized their first-generation identity through idioms of distress, wellness, and what I theorize as "idioms of ambivalence." Differences in idiom type depended on the extent to which participants sought help for problems or distress related to being first-generation and, reciprocally, felt helped or understood. Idiom type also influenced whether participants accepted or rejected concepts of a FGCS self or “being FGCS.” By enacting a multivocal idiom of first-generation identity, participants created affordances to (re)negotiate their positions in increasingly heterogeneous college environments and normalize their mental health. Further research should address whether FGCS of different intersectional identities or institution types differ in conceptualizing their experiences. Health- and identity-based professionals should pay special attention to the idiosyncratic, enacted experience of being FGCS or risk individuals cultivating a sense of conflict toward their other identities, which could result in further distress.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 454
Examining the relation between infant irritability and language

While irritable behavior is common in young children, deviations from typical levels might predict future psychopathology. Prior research suggests a link between language development and irritability, indicating that more oral expressive language corresponds with lower levels of irritability, possibly due in part to enhanced emotion regulation facilitated by language. However, there is limited literature on the connection between irritability and communication in early toddlerhood, particularly examining both oral expressive language and gestures. This study aims to examine the relations between irritability, oral expressive language, and gesture use in infants aged 12-18 months across two cohorts. Irritability was measured using direct observation of parent-child interactions, while oral expressive language and gesture use were measured via parent-report. The first analytic sample consisted of 280 children from the When to Worry (W2W) study. First, regression analyses were conducted to investigate whether infant oral expressive language and gesture use are associated with irritability. Next, I examined whether infant gesture use had a moderating effect on the relation between oral expressive language and irritability. These analyses were repeated with 34 children from the Promoting Healthy Brains Project (PHBP). There were no significant correlations between main study variables, and none of the multiple regression models, after controlling for covariates, were significant. This study adds to the growing body of literature on infant irritability, suggesting that the relationship between irritability and language may not emerge until after 12-18 months. Examining oral expressive language, gesture use, and irritability in later infancy is an important direction for future research.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 469
Historically, the world of innovation has not been one of widespread access, as diverse founders face barriers to attainability through racism, sexism, and lack of resources. Innovation incubators serve as assets striving to equalize entrepreneurial opportunities for underresourced individuals. Participation in innovation incubators can supposedly be especially beneficial to female-identifying founders in forming affinity-based cohorts, expanding their networks, and discovering targeted funding outlets. This project emphasizes the female founder experience through qualitative interviews in regards to two sub-groups: 8 current undergraduate founders from The Garage at Northwestern and 5 full-time, Chicago-based alumni founders of Techstars Accelerator programming. We investigated the hypothesis that innovation incubators are most beneficial to female founders who simultaneously possess another underrepresented identity, as they increase investment access from multiple identity-based standpoints. The interviews were analyzed through a semi-structured, grounded coding approach. It was found that, in fact, incubator spaces are productive in their ability to increase female founders' access to investment and venture-related spaces and this access is further amplified when a male mentor is obtained within the entrepreneurship space. For undergraduate female founders, it was uncovered that students are more likely to self-identify as a founder when they participate in affinity-based programming where their female identity is empowered and are thus more likely to progress forward with their venture. With continued research dedicated to this sector, the opportunity gap for women in entrepreneurship can hopefully be dismantled and remedied through intentional mentorship, empowering, affinity-based programming, and more capital funneled to female founders.
Reward and Flow: The Link Between the Reward Prediction Error Model and Sustaining Flow States in a Perceptual-Motor Skill Learning Paradigm

Flow states are hypothesized to reflect an optimal experience of intense focus and motivation during skilled performance. In two pilot experiments using the Serial Interception Sequence Learning (SISL) task, I observed a relationship between subjective ratings of flow and learning rate. In this task, participants practice using a video-game-like interface that produces several measures of performance exhibiting learning. The task operates at an overall speed that is adaptively adjusted to keep overall task accuracy in a targeted range (90%+). The rate of improvement of overall speed was observed to correlate with subjective ratings of flow. This relationship appeared stronger for a more difficult variant where the spatial mapping between visual cues and response keys was disrupted. I hypothesize that flow states may more likely occur in more challenging tasks. Success on a harder task would be more surprising to the participants, potentially leading to a more rewarding experience due to dopaminergic mechanisms that operate by reward-prediction error (RPE). A new study will test this hypothesis directly by randomly assigning participants (projected n = 60) to easy or hard conditions for learning through practice in SISL. All conditions will be tested in fixed speed conditions at an individual level where performance is approximately at ceiling (100%) accuracy. I predict participants succeeding at the more difficult version will more frequently rate themselves as entering flow states during performance. Thus, creating conditions where participants experience positive reward prediction errors can enhance flow states in domains like education and sports.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 386
Stop Selling College as a White Dream to Black Bodies

Most professions are considered to be personal identities meaning they are isolated self constructs that pertain to the individual. However, considering we are social beings who are constantly negotiating social contexts, groups, and values, the idea that personal identities are truly isolated becomes complicated. The goal of the Causeway project is to understand the detailed intrapersonal, interpersonal, and social content and processes and how they shape the development of math/STEM identities among American young adults who are part of underrepresented social groups. Our data source is semi-structured interviews from 18 participants across three cohorts of Northwestern’s Causeway program (a post-baccalaureate bridge program for scholars seeking math PhDs). As an RA, I verified transcripts, wrote memos, and developed and employed the codebook which involves descriptive coding, analysis, and then systematic interpretation of the data. I am currently assisting with the foundational writing of the paper and preparing to present this research at the ISRI conference in June. The synthesis of codes and analysis is still underway but a key finding is that even ‘personal’ identities develop in social contexts. Furthermore, the aspects of these contexts (i.e. financial resources, healthcare, mental health care, familial and educational experience/access) actively shape how these personal identities manifest. These findings are crucial in assessing how educators, parents, and even governments can better support educational outcomes for marginalized students by procuring tailored exposure and support experiences to foster positive identity development.
"What Makes Me an Ethnic-Racial In-group": Exploring the Content Underlying One's Ethnic-Racial Identity

Due to the ethnic-racial diversity and social stratification in the U.S., ethnic-racial identity (ERI) emerges as a particularly salient social identity, particularly among ethnic-racial minorities. The expanding ERI research has disproportionately focused on the developmental trajectory and adjustment outcomes of ERI, empirically neglecting what people know about their ERI, or ERI content. This exploratory, qualitative project addressed this gap by interviewing an East Asian sample about their knowledge on their ERI. One-on-one, semi-structured interviews were conducted with thirty undergraduate students from one Midwest university of various East Asian backgrounds. The analysis utilized an exploratory technique to develop a coding scheme from rounds of close reading of interview data without a priori assumptions -- opening coding. I found that (1) Participants tended to identify by their ethnicity and nationality as opposed to race; (2) ERI can convey seven domains of content: one’s ancestry, appearance, commitment and love for a culture, knowledge of said culture, lifestyle, upbringing, and value system; and (3) Among these domains, most participants deemed ancestry as the most important criterion for anyone to identify as an ethnic-racial in-group, whereas the role and importance of cultural commitment and knowledge varied across participants. These findings suggest that people who belong to the same racial category may have distinct personal identifications and may attribute different meanings to their ERI. The predominant content domain of ancestry suggests that people may police boundaries of their ethnic-racial group by perceptual cues (e.g., appearance) and may stereotype their ethnic-racial in-group.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 117
Exploratory Machine Learning Analysis of the Determinants of Covid Cases, Mortality, and Implication for Effective Governance

The COVID-19 pandemic necessitated immediate and strategic interventions from global governments to minimize the negative effects on public health, economic stability, and societal norms. This paper assesses the key challenges faced by researchers, critically analyzing approaches ranging from traditional correlational studies to Data Envelopment Analysis across various disciplines. The study investigates 1,685 potential factors in 172 countries influencing the outcomes of pandemic prevention using LASSO regression and the Random Forest algorithm combined with various imputation methods. It offers recommendations for effective governance derived from machine learning analyses of COVID-19 infection and mortality rates, and it underscores previously underexplored factors for future research. This research proposes a long-term perspective on how governments can lead efforts to enhance societal resilience against global health crises. By addressing the significant limitations of traditional methodologies in handling extensive, cross-sectional datasets, the study expands the research frontier. It introduces novel hypotheses about the elements of governance and societal structure that influence pandemic management outcomes, taking into account both interaction effects and temporal dynamics. This enhances the relevance and robustness of the findings from data-driven models. By evaluating over a thousand potential variables, this paper identifies critical predictors of pandemic severity and effective governmental responses.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 509
Learning STEM From Analogies: Scaffolding as the Stepping Stone

In modern society, STEM mastery is increasingly important. However, teaching and learning STEM disciplines can be very challenging. One major challenge to gaining STEM mastery is learning complex relational structures such as causal systems. Ample empirical evidence has shown that using analogical comparison can facilitate relational learning, and thus potentially STEM learning. The goal of our research is to improve people’s analogical mapping skills. In the current study, 22 Northwestern undergraduates were randomly assigned to either training (N=11) or control (N=11) condition. In the training condition, the participants received instructions on using scaffolding templates to analyze six scientific analogies and practiced laying out the object correspondences and the common relational structures. Participants in the control condition read the same six analogies and were simply asked to explain them. Both groups were tested by being asked to explain three identical scientific analogies at the end. We are currently coding the test responses by assigning points for correctly identifying object and relation correspondences, and (for some items) for generating inferences. Then, we will compare the scores across the two conditions. If we find that the training group scores higher than the control group, this will suggest that analogical scaffolding has the potential to improve people’s skills in analyzing scientific analogies. This study will shed light on whether and how we can train people to become better at comprehending and using analogies. This is an area where our understanding is currently limited, but which holds significant potential for advancing STEM education.
Preparation and formulation of supramolecular calcitriol as wound-healing agents for skin and eyes

The drug calcitriol, an active metabolite of vitamin D, is known for its role in treating both acute and chronic inflammation. However, high concentrations of calcitriol can lead to excessive calcium absorption, potentially damaging tissues and causing unwanted side effects [1]. As a result, treatments involving calcitriol are currently limited to topical applications on the skin, leaving sensitive organs, such as the eyes, inaccessible [2]. Thus, we aim to deliver calcitriol through controlled and targeted release, allowing for facile treatment of injured critical organs that were previously challenging to access. Our proposed solution incorporates a supramolecular core with multiple attached calcitriol molecules (arms), from which calcitriol can be released in a control manner to avoid toxic high-concentration exposures. These arms are connected through ester and amide bonds, which can be cleaved by corneal esterase/amidase enzymes, causing the active calcitriol to be released in a gradual fashion. To synthesize these supramolecular calcitriol derivatives, we developed a method of using peptide coupling reagents to form multiple ester/amide bonds simultaneously between the calcitriol drug molecules and the supramolecular cores. Using this method, we have been successful in synthesizing 2-arm calcitriol derivatives consisting of polyethylene glycol (PEG) polymer cores. We are applying our method to 4-arm PEG derivatives and derivatives containing smaller organic cores to expand our library of compounds for biological testing. Ultimately, we aim to use supramolecular calcitriol to develop an eye-drop formulation that can quickly alleviate acute eye inflammations from chemical injuries and chronic dry-eye inflammation.
Analyzing the Perception of Public School Resource Officers on Social Media

This study analyzes the social media discourse around school resource officers (SROs) with the ultimate goal of identifying areas of future research and proposing evidence-based recommendations for policy and practice. SROs are sworn law enforcement officers who are placed at schools to enforce disciplinary and safety measures. The National Center for Education Statistics reports that in the 2019-20 school year, 51.4 percent of public schools had an armed, sworn, law enforcement officer.

By examining social media discourse, the study seeks to illuminate nuanced perspectives and experiences with SROs. Additionally, it aims to uncover underlying biases and disparities in public perceptions, particularly regarding race, gender, and regional demographics. For instance, the positive sentiments expressed by white individuals towards SROs may be influenced by the perception that white children face less criminalization and bias compared to their minority peers. Utilizing platforms like Instagram and X, this study meticulously examines user profiles, comments, and trends, analyzing the factors shaping varied attitudes toward SROs. The study will take into consideration recent events, historical context, and media portrayals.

Furthermore, this study aims to propose targeted interventions to address identified areas of concern in schools. These interventions may include community engagement initiatives, diversity training for SROs, and policy reforms aimed at promoting equity and inclusion in school safety practices. Ultimately, this research contributes to the ongoing dialogue on school safety and law enforcement in educational settings, with the overarching goal of fostering safer, more inclusive learning environments for all students.
Hexagonal Boron Nitride Ionogels for Iontronics Applications

Ionogels based on a nanocomposite of ionic liquids and two-dimensional nanomaterials are a new class of materials with promising properties suitable for bioelectronics applications. The ionic liquids, comprised of positively charged organic cations and negatively charged organic anions, allow for a brain-like signal conduction mechanism by leveraging ion transport mechanisms. However, previous efforts in utilizing ionic liquids and a gelling matrix suffer from low mechanical moduli, leading to unstable structural integrity and thus limited device applications. In this study, we demonstrate high-modulus yet ionically conductive gels based on exfoliated hexagonal boron nitride (hBN) nanoplatelets and a selection of ionic liquids and poly-ionic liquids. This selection of ionogels demonstrates a high shear storage modulus ($G'$) in the MPa range while maintaining high ionic conductivity of $> 1$ mS cm$^{-1}$ in typical operating temperatures. Furthermore, these properties are easily tunable by varying the composition of hBN in the gel, opening a wide range of applications in the ionotronic industry such as ionic diodes, printable gate electrolytes for organic electrochemical transistors, and more.
Soft Stewart Platform: a Novel Device for Connecting Material Properties and Robot Learning

Handed Shearing Auxetics (HSAs) are 3D printed compliant metamaterials that can be used for actuation by converting a motor’s rotation into extension and force. Throughout the extension of an HSA, the material properties shift, increasing in axial rigidity, and providing the opportunity to construct variable-stiffness compliant mechanisms. A Stewart platform is a type of robotic system that traditionally uses six parallel linear actuators to manipulate a platform in all six degrees of freedom. By replacing the linear actuators on a Stewart platform with HSAs, and over-constraining the system using fixed supports on both ends of the actuators, we can ensure that all motion of the platform is caused by the HSA’s material properties. This constraint allows for a direct correlation between these material properties and the system’s ability to learn to perform a simple task, such as balancing a ball on the platform. We show that the device can perform while keeping the HSAs mostly in the linear regime. Moreover, the soft platform offers the six-degree-of-freedom motion that a traditional Stewart platform affords, while being robust to substantial mechanical damage. Lastly, the device presents an opportunity to comprehensively quantify and understand the interplay between material selection and robot learning. The ability to preferentially select HSAs for compatibility with robot learning broadens their applications and has the potential for large advancements in the soft robotics domain.
Alex Yu
Faculty Advisor: Dong-Hyun Kim

Synthesis and Analysis of Drug-loaded Microspheres with cannabinoids for potential use in Uterine Fibroid Embolisation

Embolization is often used for the treatment of liver cancers, kidney cancers, and uterine fibroids. Uterine fibroids are noncancerous growths in the uterus that cause pain and bleeding. Although uterine fibroid embolization is effective, patients frequently experience pain due to postembolization syndrome. Commonly used analgesics during UFE are opioids, which are expensive and risk addiction, and lidocaine/bupivacaine, which risks anesthetic toxicity and leads to tachycardia, CNS depression, etc. Thus, cannabinoids were considered for analgesic microspheres to reduce the amount of opioid usage. Loaded microspheres were synthesized using microfluidics via oil-in-water emulsion. The oil phase included varying concentrations of PLGA, THC, and IONC nanocubes in pure DCM. THC was used as a representative molecule of cannabinoids. The water phase was a 2% PVA solution. Optimization of THC-loading efficiency was found at a THC: PLGA ratio of 1:20. Three groups of microspheres were synthesized: B-PLGA+Surface THC, THC-PLGA+No Surface THC, and THC-PLGA+Surface THC. The diameters of the microspheres, uniformity, and concentrations were measured via optical microscopy imaging. Then the release efficiency of THC from the microspheres was experimentally quantified by releasing THC from 0.5mL of microspheres (1mg/mL) for HPLC tests at 220nm. The THC-PLGA+Surface THC microspheres had a faster initial release and more prolonged release, which is promising for UFE pain treatment. These results explore a novel pathway in embolization-utilizing THC as an analgesic in drug-loaded microspheres could benefit UFE as a treatment and alleviate procedural and post-procedural pain while avoiding harmful long-term effects.

Presentation Format: Poster
Time: 1:30pm
Room: Louis Room
Number: 238
Advancing Scientific Replication with NexusGraph: A Novel NLP Approach

Independent researchers emphasize the reproducibility of biomedical research, as the results have a direct impact on patient health. Increasing complexity, inadequate documentation, resource limitations, and environmental variability related to modern research have contributed to a reproducibility crisis. NexusGraph is an advanced NLP solution that creates an inventory of reagents, equipment, and materials that can be used to replicate methodologies. In addition, it offers additional features, including material suppliers, and synthesizes a comprehensive methodology. NexusGraph functions through a 5 component stepwise workflow. The file splitter takes the paper and divides it based on a set of predefined keywords - TITLE, ABSTRACT, METHODS - for a coarse analysis. The features miner extracts the demographic information of the paper and authors. The materials and supplies miner uses a much higher degree of temperature, which allows the miner to infer materials that may not have been explicitly mentioned. The instructor utilizes the highest degrees of temperature to develop a step-by-step protocol to replicate the methodology. The last step in the workflow, the organizer, combines all the outputs of the previous workflow elements into a JSON file and organizes them in a relational database. NexusGraph has been applied to a set of 50 material science papers, during which 163 authors, 50 titles, 473 materials, and 70 suppliers were correctly extracted. NexusGraph showed high precision in extracting metadata, materials, and suppliers. The set of 50 unique protocols showed similarities to manual processing but required additional tuning.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 357
Swarm Robotics Simulator

Swarm robotics, characterized by the coordination of a large number of robots, presents unique challenges in terms of simultaneous operation and control. The practical difficulties of testing swarm algorithms on actual hardware, primarily due to the complexity and cost associated with orchestrating such large-scale experiments, necessitate innovative approaches to development and testing. This work introduces a simulation environment designed for the Coachbot Swarm Testbed—a platform comprising a swarm of 100 robots. This simulator enables developers to validate swarm algorithms before deployment without the need for physical robots, which helps mitigate the risks associated with direct hardware testing. Ultimately, it allows for effective, cost-efficient swarm algorithm development and refinement, with the goal of enhancing the accessibility and scalability of swarm robotics research.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 461
Impacts of Pandemic Instruction Mode on High School Students' Education Outcomes: Evidence from U.S. States

Previous research has established that transition from face-to-face instruction to distance education during the COVID-19 pandemic adversely impacts the academic performance of students in grade 3 through 8. To date, however, little is known if similar effects of instruction mode changes apply to students in higher grade levels. The answer to this question holds profound implications for education policy makers tasked with designing effective strategies to support student learning even in a post-pandemic era. This study investigates this gap by using high school test proficiency and dropout rates data from six U.S. states. Contrary to existing literature, this study reviews that, on average, test performance remained stable during the pandemic, with no substantial widening of achievement gaps among marginalized groups. Additionally, the effect of instruction mode varied considerably across diverse education and social contexts, with some states demonstrating notable benefits from virtual and hybrid learning. Changes in dropout rates exhibit greater variability and less economic and statistical significance, suggesting intricate dropout dynamics influenced by various pandemic-related disruptions beyond mere instruction mode changes. In synthesizing these efforts, this study provides nuanced insights into the impact of instruction mode on high school students' education outcomes, guiding policy makers and prompting further research in fostering an effective and inclusive learning environment.

Presentation Format: Poster
Time: 10:00am
Room: Louis Room
Number: 568