Monday March 24

37th Annual Student Research Forum

University Center Ballroom

Hosted by the Graduate School, Helen Hardin Honors College and the Graduate Student Association.

For more information, please visit:
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March 24, 2025

Dear Students:

On behalf of everyone at the University of Memphis, congratulations on your participation in the Annual Student Research Forum. I appreciate the exceptional effort you have put forth to complete thoughtful, well-designed, and thorough research studies.

It is through inquiry that discoveries are made so that knowledge from those discoveries can be shared with the world. I hope you found your experience enlightening, and that you continue to make discovery a part of your professional and personal life, no matter your discipline.

The University of Memphis, an R1 institution by the Carnegie Classification of Institutions of Higher Education, focuses on basic and applied research that directly benefits our city and the Mid-South region while also reaching beyond our state and local boundaries. Your continued pursuit of research and the presentation of your results in regional, national, and international forums brings honor and recognition to the University. Those efforts do not go unrecognized, and we are proud that you are a Tiger.

Sincerely,

Bill Hardgrave
President

March 24, 2025

Dear Student Researchers,

Thank you for contributing to the 37th Annual Student Research Forum. It is our pleasure to attend this event and learn of the interesting research our students are doing. One of the most critical goals of higher education is to encourage intellectual inquiry and critical thinking. Research provides significant hands-on experience in these areas as you've discovered in your own projects. Whether you pursue a research-related career or not, the skills you have learned in carrying out your projects will serve you well. Research skills are valuable life skills in our increasingly information-rich world. The ability to define a question, to collect and organize information relevant to that question, and to evaluate and ultimately use the new knowledge will be useful in many facets of your lives.

Congratulations on your achievements. Your project is a testament of your hard work, determination, perseverance, and commitment, and a monument to the dedication of your faculty mentors. We hope you enjoy this year's research forum and wish you continued success.

Sincerely,

Deborah Tollefsen, Ph.D.
Vice Provost and Dean of Graduate School

Melinda Jones, Ph.D.
Director, Helen Hardin Honors College

March 24, 2025

Dear Judges,

On behalf of all those involved in organizing and presenting this year's Student Research Forum, and on behalf of the students participating in this year's event, I'd like to thank all of you for giving so graciously of your time and expertise.

The judges for this forum come from a wide variety of disciplines and scholarly traditions. One of the advantages of an event such as this is the opportunity it provides for students to interact with faculty and gain valuable feedback on their projects. Hopefully this experience will also be beneficial to you by providing you with exposure to the wide range of interests pursued by students at The University of Memphis, and by giving you a preview of the future of your respective fields and disciplines.

Again, thanks to each of you for participating in this year's Student Research Forum. Without your cooperation, support, and enthusiasm, our students would miss a wonderful opportunity to interact with and learn from the highly skilled faculty here at The University of Memphis.

Sincerely,

Deborah Tollefsen, Ph.D.
Vice Provost and Dean of Graduate School

Melinda Jones, Ph.D.
Director, Helen Hardin Honors College

Contents

UNDERGRADUATE ABSTRACTS

EDUCATION

New Insights on Dyslexia and its Effect on Mandarin Chinese

Cierra Dennis (Liberal Studies)

Due to the lack of understanding of dyslexia in non-Latin based languages, we find it a challenge to comprehend its effect on Chinese. We lack effective interventions for addressing dyslexia as a complex learning difference. Its effect surpass the disorientation of letters, including energy and behavioral influence (ADHD), writing conditions (dysgraphia), and auditory processing challenges. If we gather existing data on the subject, observe firsthand and secondhand sources, and test our present knowledge to better understand the effect of dyslexia on Mandarin Chinese, then we can come up with a solution to better address dyslexia, language acquisition, and overall education.

ENGINEERING

Comparison of Two Three-Dimensional Imaging Approaches Used in Fluorescence Microscopy

David Adaway (Electrical and Computer Engineering)

This presentation introduces fluorescence microscopy, the study of imaging light-emitting biological samples. An Axio Imager.Z1 microscope was used to image a three-dimensional autofluorescent brine shrimp sample by optical sectioning; to mitigate blurring caused by the microscope's point spread function, two imaging approaches were utilized. In deconvolution, a post-processing algorithm attempts to remove the effects of the widefield PSF from the images. In structured illumination, shifted grid patterns are projected onto the sample to modulate the emitted light. The effects of the two approaches are compared for the benefit of viewers who wish to apply the techniques in their own research.

Advancing road safety; A novel multimodal distract driving detection framework

Noah Bagley (Civil Engineering)

Distracted driving is a significant cause of road accidents and fatalities, requiring effective detection methods to enhance safety. Traditional single-modality approaches lack environmental context, limiting their ability to distinguish distractions from natural driving responses. This study proposes a multimodal framework integrating dual-view video streams, synchronized audio features, and vehicle telemetry data. The system enhances contextual awareness and reduces false positives by combining driver-facing and forward-facing cameras, along with audio cues. This approach improves detection accuracy in real-world conditions, advancing driver monitoring systems through enhanced robustness and a more comprehensive understanding of distracted driving behavior.

Frictional Properties of New Zealand White Rabbit Knees With and Without the Infrapatellar Fat Pad

Davis Ballard (Biomedical Engineering)

The infrapatellar fat pad (IFP), an adipose tissue structure beneath the patellar tendon, may provide shock absorption and lubrication, affecting knee friction and synovial fluid distribution. This study explored changes in knee friction following IFP removal in rabbit knees tested under a 15 N load at three flexion angles (50°, 100°, 130°). Angular velocity was measured and analyzed with linear and exponential decay models under intact, sham, and IFP-removal conditions. While IFP removal did not alter frictional resistance, changes in viscous damping coefficients highlight the IFP's role in damping forces.

Noise Analysis in Hyperspectral Unmixing: Analyzing an Anomaly Detection Pipeline

Gerrell Dabbs (Electrical and Computer Engineering)

Hyperspectral Imaging is an imaging technique which takes 2-dimensional photos at many wavelengths to create 3-dimensional data. This information can be used to accurately identify materials in a scene, making the technique useful in several fields. Hyperspectral datasets sometimes require 'unmixing' when multiple materials occupy the same pixels in an image. Hyperspectral Unmixing is a task which separates materials in the pixels of the image. Some applications of hyperspectral imaging have pipelines to improve the technique's performance for these tasks. This project focuses on how a particular pipeline handles noisy unmixing and the possible solutions to the problems noise cause.

Combining two Multidirectional CT scans to Improve Ultrasound Transducer Optimization

Muhammed Jobarteh (Biomedical Engineering)

Our research focuses on optimizing CT scan integration to yield a digital model of a skull with isotropic resolution; we ultimately aim to translate this to a highly accurate acoustic model for simulation and refinement of enhanced ultrasound transducer array designs for transcranial stroke detection. Two CT scans were combined into a single volume using 3D Slicer. The scans were first aligned through transformations, then registered and merged using specific software modules. The resulting combined volume provides more comprehensive anatomical information, which can help improve precision in ultrasound technology development and enhance medical imaging applications.

Dismantling and Reassembling Drones: Enhancing Autonomous Systems Through Hands-On Research

Soughtout Chijioke Joseph, *Samuel Tettah Ternor*
(Electrical & Computer Engineering)

My research entails taking apart and reassembling drones in a quest to comprehend in detail their electrical, software, and structural aspects. By sequentially disassembling UAVs, I break down their most critical subsystems, including drive mechanisms, sensors, and flight controllers. By disassembling them through hands-on practice, I develop an awareness of optimizing performance in drones, fault diagnostics, and enhancing autonomous guidance. The activity aids in creating smart robotic systems through modularity, fault tolerance, and adaptability in UAVs. It can have an impact in aerospace, surveillance, and AI robots, closing the loop between theoretical and real use in autonomous aerial platforms.

Effects of Biofilm-Inhibiting and Analgesic-Loaded Electrospun Chitosan Membranes on Inflammatory Response of Contaminated Burn Wounds

Michelle Lee (Biomedical Engineering)

Burn injuries trigger a strong inflammatory response that can lead to prolonged healing. This study evaluated the inflammatory response in a murine model of contaminated burn healing using local anesthetic bupivacaine (BUP) and biofilm inhibitor cis-2-decenoic acid (C2DA) released from electrospun chitosan membranes (ESCM). We hypothesized that ESCM loaded with BUP and/or C2DA would minimize inflammation compared to standard treatments. Histological evaluation at three days post-burn suggests that the dressings prevented damage from spreading to healthy tissue at the zones of stasis/interspaces. While not statistically significant, the ESCM+Combo group appeared to minimize the inflammatory response of the burn wound.

Biomedical Approaches in an Agricultural Setting for Intervention in Culling of Sows due to Lameness

Elizabeth Matlock-Buchanan (Biomedical Engineering)

In the swine industry, sow lameness can be an important cause of economic loss for pig producers. Lame sows are typically euthanized resulting in loss of sow and current/future progeny. A primary cause of lameness is infection in cracked and overgrown skin on the hooves, which can lead to osteoarthritis, lesions, and osteochondrosis, among other ailments. Standard of care treatment of foot lesions depends on early recognition and aggressive antibiotic medication before deep-seated abscessation has occurred. Hydrogels and chitosan silver composites have demonstrated efficacy in preventing infection-causing biofilm formation and can form a barrier on the skin, making these composites potentially beneficial as wound treatments. The use of silver-loaded hydrogels has multiple advantages over the standard of care treatment in that gels do not require reapplication for several days, do not contain traditional antibiotics that promote antimicrobial resistance, and form a barrier to support moist wound healing and while preventing further contamination. The purpose of this study is to obtain preliminary data on the utility of hydrogel materials with and without antimicrobials in treatment of lesions in sows. We will follow a small cohort of sows and perform assessments of treated sows.

Ultrasound Transducer Element and Fixture Design to Facilitate Transcranial Imaging

Timothy McDaniel (Biomedical Engineering)

The skull presents a significant barrier to ultrasound transmission, due to high reflection, attenuation, and aberration of wavefronts. In this work, we investigate dual-frequency transducer designs to facilitate superharmonic microbubble signals. Finite element modeling (FEM) simulated transducer behavior to determine resonance frequencies for various element geometries. Peaks in displacement vs. frequency plots revealed thickness- and lateral-mode resonances, which were tuned to 6.0 and 1.5 MHz, respectively. Results indicated that lateral dimensions of 0.8, 1.1, and 1.4 mm should be evaluated experimentally. Next steps include fabricating transducer elements by precisely slicing through PZT ceramic using a dicing saw.

Using MATLAB to Simulate and Reconstruct Ultrasonic Chirp Signals

Yaneli Mora-Antonio (Electrical and Computer Engineering)

The usage of ultrasonic sensors can function to map the passage of microbubbles as it travels through cranial blood vessels. In this work, in order to simulate the response from the ultrasonic signals, we use MATLAB to simulate the low and high chirp signals that will mimic the ideal chirp response. By doing this we can filter the Fourier transform of the pulse compression response signal such that we can observe the filtered signal's inverse chirp response with the usage of Butterworth and filtfilt MATLAB functions.

Ultrasound Wave Propagation Simulation Using the MUI3 ScanningBridge for Medical Imaging

Rohith Rajeev (Electrical and Computer Engineering)

Understanding how ultrasound waves travel through the human body is crucial for medical imaging and diagnostic applications. This project utilizes the MUI3 ScanningBridge system to simulate ultrasound wave propagation by coordinating transducer movement with signal excitation and echo recording. A multi-axis stage, pulser-receiver, and digital oscilloscope were integrated through LabVIEW to capture and analyze wave interactions within a defined 4x4x4-inch scanning volume. The system successfully demonstrated controlled scanning and data acquisition, providing insights into wave behavior in biological tissues. These findings contribute to improving ultrasound-based imaging techniques and enhancing medical diagnostics.

Chirp Signal Analysis for Ultrasound Super Harmonic Microbubble Contrast Imaging

Edith Razo, Carl Herickhoff (Biomedical Engineering)

Medical ultrasound imaging is limited by resolution, penetration depth, and signal clarity due to attenuation and tissue echoes. This research focuses on the analysis of frequency modulated (FM) chirp signals for super harmonic microbubble contrast imaging to enhance axial resolution and signal-to-noise ratio. A MATLAB simulation was used to model chirp signals (1-2 MHz and 4-8 MHz) and analyze their frequency spectrum using the Fourier transform. These findings contribute to the development of more efficient contrast-enhanced ultrasound applications for vascular and functional brain imaging.

Effects of Pendulum Length on Out-of-Plane Motion in a Guinea Pig Knee Model

Amelia Strozier (Biomedical Engineering)

The effects of pendulum lengths on out-of-plane motion and calculated viscous damping were investigated using a short and long pendulum configuration. Gyroscopic data was collected from the pendulums swinging with attached guinea pig knees at 45° and 90°. Processed and smoothed data yielded maximum out-of-plane motion in both X and Z axes and the initial start angle. Each knee underwent five trials, and the average ratio of maximum out-of-plane motion to start angle was calculated. Statistical analysis will determine if one pendulum length produces less out-of-plane motion, informing future studies on the impact of the infrapatellar fat pad.

Evaluating Level of Traffic Stress Methodologies: Standardizing Bicycle Safety and Assessment in Urban Environments

Eleanor Waldron, *Anslee Billingsley, Drew Davis (Civil Engineering)*

This research evaluates Level of Traffic Stress (LTS) methodologies for assessing cyclists' comfort and safety since their introduction. The study identifies 12 factors divided into physical elements (facility type, lanes, surface quality, center lines, medians, parking) and roadway characteristics (speed, volume, slope, lighting, maintenance, freight presence). LTS analysis enables planners to identify stress areas, prioritize investments, and enhance safety protocols for vulnerable road users. The findings will provide a standardized method for comparing cycling conditions across different urban contexts, facilitating best practice identification for the promotion of safe urban cycling.

LIBERAL AND FINE ARTS

Does film have the power to persuade a persons mind about a very controversial topic?

Bishar Ahmed (Communication)

This research explores the persuasive power of films in shaping public opinion on controversial topics. By analyzing a selection of films that address contentious issues such as climate change, political corruption, and social inequality, the study investigates how filmmakers use narrative techniques, visual imagery, and emotional appeal to influence audience perspectives. Through a combination of content analysis and audience reception studies, this project aims to assess the effectiveness of films as tools for persuasion, examining both the intentional and unintentional ways in which they impact viewers' beliefs and attitudes.

The Sleeping Beauty: Gentileschi's Venus and Cupid and the Spectacle of a Goddess at Rest

Addison Cucchiaro (Art and Design)

This research explores the transformation of feminine divinity in Western art, focusing on the shift from powerful mythological goddesses to passive, objectified figures under the male gaze during the early modern period. Analyzing works by male artists, I examine how the motif of the sleeping goddess reflects the growing impact of the European patriarchy. The analysis then shifts to Artemisia Gentileschi's Venus and Cupid, which challenges these conventions. Employing a feminist methodological lens, this research argues that Gentileschi's work offers a reimagining of feminine power, presenting a divine femininity that is not bound by objectification or the male gaze.

Identity Over the Airwaves: The Influence of Radio on Identities in Cilvil War-Era Angola

Molly Yates (History)

Based on research compiled by historians in recent years, there is evidence for the medium of radio being a key factor in the development of political and nationalistic identities in civil war-era Angola. After requisitioning it from Portuguese colonizers, the Angolan people seized radio technology for themselves and utilized it in guerrilla warfare, propaganda production, and as a mode of connecting far-flung supporters as they fought against the Portuguese to end their colonization and amongst themselves for control of the state. As much a tool for entertainment as political control, radio in mid-century Angola was central to post-colonial identity formation.

LIFE AND HEALTH SCIENCES

Epidemiology : Research on how to prevent Breast cancer in women

Mya Janzen (College of Health Sciences)

My research aims to investigate the approaches to prevent breast cancer by identifying high risk individuals and targeting prevention strategies, including lifestyle, habits smoking and eliminated risk factors. I want to help other women to lower risk of getting breast cancer at an early age. I will be focusing on lifestyle changes and modifications ,incorporating evidence based lifestyle interventions like regular exericse, healthy diet and weight managment, and alcohol moderations to mitigate breast cancer risk across all population. My research will play a role in many preventions and eliminating risk factors.

RNU4-2 Recurrent Pathogenic Variant Identified in Severe Pediatric Epilepsy Cohort

Blake Robinson (Department of Chemistry)

RNU4-2 encodes the U4 snRNA, a spliceosome component. DNA variants in RNU4-2 cause 0.4% of neurodevelopmental disorders, including epilepsies. Recently, a recurrent variant (n.64_65insT) was identified in 77% of cases. In this study, we investigated RNU4-2 variants within our cohort of >1,300 individuals with severe pediatric epilepsies using Sanger sequencing of blood-derived DNA samples. We identified 1 individual (0.077%) possessing a known recurrent variant and several others with potentially pathogenic variants. Our findings suggest that while the prevalence of the recurrent variants is lower than previously determined, further work should be performed to fully understand the mutational landscape of RNU4-2.

Self-Care Interventions on the Mental and Physical Well-Being Among Nursing Students: A Review of Literature

Hailey Russell, *Emma Criswell (Loewenberg College of Nursing)*

A growing body of literature indicates that nursing students face high levels of stress, which can adversely affect their mental and physical well-being. Self-care strategies may help alleviate stress and improve overall health. The purpose of this literature review is to examine the effectiveness of self-care interventions on health outcomes among nursing students. A comprehensive literature search was conducted to identify research articles. A total of eight studies examining self-care interventions and their impact on stress, well-being, and academic performance were chosen. Findings suggest that self-care strategies may be effective in fostering resilience and overall health in nursing students.

The Aftermath of The Pandemic: Analyzing the Health Consequences Of COVID-19

Kelsang Sherpa (College of Health Sciences)

COVID-19 (SARS-CoV-2) was an attestation for our generation showing pandemic is not a fictional event confined in our history books but a realistic event that can turn lives upside down. While most of us did come back to normal, the symptoms for some of the patient post COVID is still affecting their everyday lifestyle. This research aims find common signs and symptoms people are experiencing which stops them from going to their pre COVID lifestyle. Research on long covid is effective for finding an treatment and improving their lifestyle.

Delirium on adult ICU patients and nursing implications : A literature review

Amiya Taylor-Hill (Loewenberg College of Nursing)

Delirium is a very big concern in adult icu patients this could cause prolonged stays in the hospitals, higher mortality rates, and possible other long term complications and impairments. This literature review will examine research on adult ICU patients, along with a focus of nursing implications for management and prevention of delirium.This literature review will also look at non pharmacological management approaches and how nursing interventions and training can be improved. Additionally it will discuss how to improve sleep and can also improve symptoms of delirium.

The effects of stress of adult ICU patients : a literature review

Amiya Taylor-Hill (Loewenberg College of Nursing)

Stress a significant issue with ICU patients, especially when it comes to recovery in adult ICU patients. This research looks into the physiological and psychological effects of stress in Adult ICU patients. This study will be using existing written works and collecting data observations of the patients. My findings were that stress can cause more complications in recovery. While doing this study it was also very apparent that there needs to be more research made on stress and how it affects adult ICU patients.

Co-option of two n-alkanes as a brood pheromone modulating foraging preferences in Temnothorax ant workers

Mira Umarova (Department of Biological Sciences)

In social insects, specialized foragers fulfill the nutritional needs of all colony members. This study investigates the chemical cues used by Temnothorax longispinosus ant larvae to increase protein-foraging in foragers. Based on previous chemical analyses, we tested whether two larva-biased n-alkanes function as brood pheromones. Colonies lacking brood were exposed to synthetic versions of n-C27 and n-C29, which are more abundant in larvae than in workers. A combination of n-C27 and n-C29 increased protein-foraging to the same level as full larval Cuticular hydrocarbon extracts, while n-C27 and n-C29 individually did not elicit the same response. n-alkanes can be found across insects and are involved in waterproofing the cuticle. Our findings provide the first evidence that a combination of two specific n-alkanes has been co-opted to additionally function as a brood pheromone in ants, influencing worker behavior to meet larval nutritional needs. This suggests a quantitative mechanism where the relative abundance of these compounds plays a key role. Understanding these chemical communications offers insights into colony homeostasis and social behavior evolution in ants. Our findings contribute to a broader understanding of how chemical signals mediate complex social interactions in eusocial organisms, providing a foundation for future studies on chemical communication.

Rested or Restless? How Sleep Quality Affects Student Mental Health.

Sydney Ward (College of Health Sciences)

Sleep is vital for mental health, but just getting enough hours may not be enough. This study looks at whether feeling rested is a better predictor of stress, anxiety, depression, and overall distress in university students than sleep time. Using survey data from over 1000 students, results show that the students who do not feel rested report significantly worse mental health, even when they get enough sleep. These findings suggest that focusing on sleep quality, rather than just sleep duration, may be key to improving student well-being.

MATH AND COMPUTER SCIENCES

Barrier Effects on the Escape and Pursuit of an L1 Pursuer and L2 Target

Jacob Stewart (Department of Mathematical Sciences)

In mathematical pursuit and escape games, a pursuer (agent 1) tries to catch a target (agent 2) by closing the distance between them. Both pursuer and target can move as long as their movement is unobstructed. The effects of limiting one of these agents to movement measured in the L1 norm and the addition of a finite, straight-line barrier were investigated. It was found that even with lower, an L2 target can escape from an L1 pursuer if the target takes the "optimal" path.

PHYSICAL AND APPLIED SCIENCES

Optimizing Hydrogenation Reactions: Unveiling the Effects of Temperature and Pressure within GC Inlet Reactors

Khawlah Almurisi, *Haagr Nasser (Department of Chemistry)*

This project investigates the hydrogenation of aromatic compounds, including tetralin, cyclohexylbenzene, azulene, and DCP, using a gas chromatograph (GC) injection as a micro-reactor. Platinum (Pt) was used as the initial catalyst, and a series of Pt-Rh mixtures will be tested for higher performance (i.e., complete hydrogenation). Hydrogenation progress was monitored quantitatively via GC using decane and undecane as internal standards. Temperature and pressure were examined as variables to optimize hydrogenation conditions. Results showed that Pt hydrogenated tetralin into decalin, among other reactions. At very high temperatures, some compounds dehydrogenated. Future studies will explore additional catalysts to further enhance efficiency.

PolyCrit: An Online Database and Machine Learning Framework for Polymer Characterization by Polymer LCCC

Dillon Baker (Department of Chemistry)

Polymer liquid chromatography at critical conditions (LCCC) enables molecular weight-independent polymer separation by precisely tuning interactions between stationary and mobile phases. However, optimizing LCCC conditions remains challenging due to fragmented data and complex parameter dependencies. To address this, we developed PolyCrit, a database consolidating 428 experimentally determined critical conditions into a structured and searchable platform. Building on this foundation, machine learning models are being developed to predict critical conditions for different polymers, streamlining experimental workflows and expanding LCCC's accessibility. This work highlights the creation of PolyCrit and ongoing efforts to integrate predictive modeling for enhanced chromatography optimization.

SOCIAL AND BEHAVIORAL SCIENCES

Examining the Effects of Social Dominance on Novel vs. Familiar Social Interactions

Ayler Edmaiston (Department of Psychology)

Social dominance influences animal behavior and social interactions. This study examines how dominance status affects interactions with novel and familiar conspecifics in mice. Mice will be pair-housed for six weeks and assessed using a tube test to classify them as dominant or submissive. Social interaction tests will measure bodily contacts and proximity in an open field with a novel mouse across four sessions, with the final session as a familiar interaction test. We hypothesize dominant mice will engage more in novel interactions, while submissive mice will engage less. Findings may inform treatments for social deficits in psychiatric disorders.

A Mixed-methods Exploration of Racial Disciplinary Disproportionality Among Adolescents using Youth Voice.

Sophia Gonzales (Department of Psychology)

Disciplinary disproportionality refers to the overrepresentation of marginalized students who receive exclusionary discipline compared to their White counterparts. Literature highlights how demographic factors predict disciplinary disparities, suggesting that discipline is driven more by teacher's implicit biases than by actual problem behaviors. Disproportionality leads to adverse social-emotional and academic outcomes for affected students (e.g. academic disengagement and school-to-prison-pipeline perpetuation). Using a mixed-methods approach (e.g. quantitative surveys and inductive thematic interviews), this study aims to identify student perspectives of school climate, safety and discipline. Results provide insight into positive and reparative means of improving school climate through the use of restorative practices.

Examining Anxiety-related Behaviors Induced by Social versus Drug Reward Conditioning

Shaima Issa (Department of Psychology)

Reward processing is disrupted in psychiatric disorders like addiction and depression. Understanding neural and behavioral mechanisms can improve interventions, with animal models offering key insights. Conditioned place preference (CPP) assesses reward by measuring time spent in reward-associated environments. This study examines anxiety-related behaviors on non-reward conditioning days (off-days) during CPP with either cocaine or social interaction. We hypothesize that mice will display heightened anxiety-like behaviors during cocaine CPP to social CPP, and that the occurrence of anxiety-related behaviors are related to reward sensitivity. Findings may clarify the link between anxiety and reward, informing treatments for reward-related disorders.

The Effects of Repeated Exposure to Atypical Antipsychotics on Risky Decision-Making

Julia Jarvholm (Department of Psychology)

Atypical antipsychotics are used to treat disorders associated with psychosis or mania, including schizophrenia and bipolar disorders. Aberrant risky decision-making is a common symptom of these disorders; however, little is known about how repeated exposure to antipsychotics affects risk-taking. We tested the impact of daily, escalating dose regimen of the antipsychotic risperidone on risky decision-making in adult rats. We observed that risperidone evoked a marked decrease in risky choice, latency to make a choice, and overall task engagement. Interestingly, these effects were limited to females, suggest that higher dose atypical antipsychotics cause sex-specific alterations to punishment-driven risky decision-making.

Investigating Mental Simulation and Mental Imagery Using Sentence Picture Verification

Elaine Mooney (Deparment of Psychology)

This study hypothesized a potential underlying similarity between how the mind represents meaning during language processing and deliberate imagination, albeit on different timescales. In a sentence-picture verification (SPV) task, participants read a sentence that implied the visual features of an item, saw a picture of the item that (dis)agreed with the sentence implication, and verified if the item was mentioned in the sentence. To explore the difference between automatic modes of understanding and deliberate imagination, the study manipulated trial time structures across conditions with(out) explicit instructions to visualize the sentence content. Results and implications for language meaning will be discussed.

Differences in Depression Severity based on the Developmental Timing of Trauma Exposure

Sang Nguyen (Department of Psychology)

This study investigated whether depression severity differs among college students depending on when their worst traumatic event occurred (early childhood, middle childhood, adolescence, or adulthood). We conducted a one-way ANOVA with a sample of college students (N = 832). All group means were in the “minimal depression”range and there were no statistically significant differences between groups (p = .293). The developmental timing of students’ trauma exposure was not linked to differences in depression in this sample. This finding aligns with literature proposing that trauma’s impact on depression may be pervasive rather than timing dependent.

Oxytocin Receptor Activation in the Nucleus Accumbens Differentially Mediates Phasic Mesolimbic Dopamine Release

Madiha Syeda (Department of Psychology)

Oxytocin is being researched as a new treatment option for substance use disorder. Substance use disorder is associated with altered reward processing, resulting in drug use despite negative consequences. The mesolimbic dopamine pathway plays a critical role in motivation and reward processing. In this study, we infused the selective oxytocin receptor agonist [Thr4, Gly7]-oxytocin (TGOT) directly into the nucleus accumbens during dopamine recordings. We found that TGOT reduced phasic dopamine release, which drives drug reinforcement. The present findings lend support to the hypothesis that oxytocin's influence on drug reward may be related to its mediation of phasic dopamine release.

Dopamine Release in Social vs Unsocial Mice: possible sex differences ?

Tyras M. Watkins Jr (Department of Psychology)

Dysfunctional social behaviors are linked to psychiatric disorders like addiction, anxiety, and depression. The mesolimbic dopamine system regulates reward behaviors, and our lab's findings suggest social reward preference negatively correlates with cocaine's dopaminergic effects. As social preference increases, the dopaminergic response to cocaine decreases. This study examines how social interaction levels influence dopamine release in male and female mice using in vivo fixed potential amperometry. We hypothesize that social mice will exhibit a reduced dopaminergic response to cocaine. Findings will enhance understanding of social behavior's role in drug reward processing and potential sex differences.

The Impact of Post-Battle Experiences on Post-Deployment Family Emotional Support

Mary Wepfer Baker (Department of Psychology)

Post-battle experiences (PBE) have been associated with psychological distress and interpersonal impairment. We examined associations between PBE, engagement in overt combat, and family emotional support (FES). Then, we conducted a hierarchical regression to determine if PBE explained unique variance in FES. Participants were U.S. OEF/OIF/OND veterans (N = 136, M age = 34.68 years, SD = 10.29; 87.1% male; 57.4% White) recruited from a VAMC. Engagement in overt combat explained 3.8% of the variance ($F(1, 133) = 5.197$, $p = .02$) in FES. However, after the PBE score was entered, the overall model was not significant. Implications will be discussed.

GRADUATE ABSTRACTS

BUSINESS

Flying without flagship: Communication, perceived exploitation and fairness in Ghana's dynamic airline pricing

Vida Boatemaah Asante (Kemmons Wilson School)

Dynamic pricing and perceived price fairness has become a vital topic in consumer behavior which affects consumer behavior and loyalty. In Ghana's context, consumers may feel more vulnerable to pricing strategies due to not having their local flagship airline. This study proposes that communication type can affect perceived exploitation, which in turn affect perceived fairness of dynamic pricing in the airline industry in airline . Findings from this research will help airline industries enact dynamic pricing more efficiently by being transparent about pricing schemes which can maximize customer satisfaction and trust.

The Influence of Existential Insecurity on the consumer behavioral intention

Siddhartha Kushwaha (Marketing)

A consumer is exposed to insecurities in their life. These insecurities range from professional self and social self to physical self. Existential insecurity plays a critical role in consumers' product and service purchase behavior. We postulate in a retail environment the purchase intention for a brand is reduced under the existential insecurity. The effect is moderated by the brand fit such that at a high level of brand fit, consumers have a restored purchase intention for the product. We tested these hypotheses using real-life field data and online survey data. The results of the empirical analysis support these hypotheses.

Encouraging hospitality employee extra role behavior with a ChatGPT-augmented solution

Sushant Marasini (Kemmons Wilson School of Hospitality & Resort Management)

This study explores ChatGPT's impact on the hospitality industry, particularly on employees' roles, workloads, and job behaviors. Using the Job Demands-Resources model and Conservation of Resources theory, it examines whether handling negative comments lowers work engagement compared to positive ones and its effect on extra-role behavior. It also investigates whether ChatGPT mitigates the impact of review valence on work engagement. A 2x2 experiment and statistical analyses will offer insights into ChatGPT's role in service operations and provide recommendations for its integration to enhance efficiency and customer experience.

The Paradox of Prosocial Behavior at the Time of Points Redemption in Customer Loyalty Programs

Rajat Sharma (Department of Marketing & Supply Chain, FCBE)

Reward programs are very common and are widely used to encourage brand loyalty and drive revenues through repeat purchases. At the time of redeeming reward points, companies often provide the option to donate accumulated rewards, in addition to other self-benefits. This study explores how an option to engage in prosocial behavior in loyalty programs influences consumer engagement. It also aims to provide an empirical understanding into the emotional and behavioral responses to prosocial redemption options. Results of the study indicate that providing an option to donate accumulated points leads to disengagement with a loyalty program. This effect is mediated by emotions of guilt and anger.

Mission versus Profit: Mitigating Financial Risk through Strategic Programming for Performing Arts Centers

Joy Truly Brown (Kemmons Wilson School of Hospitality and Resort Management)

Mission-based programming and profit-based programming for Performing Arts Centers differ primarily in their core focus and goals. While both strategies aim to ensure the success of the organization, their approaches and outcomes are distinct. Mission based programming focuses on values, community engagement, and an aim to build emotional connections and inspire ongoing support. Profit based programming emphasizes revenue driven through promotions, ticket sales, and offering customers an enhanced experience looking for entertainment. In the end, both formats are a valuable blend to create a balanced programming plan that supports the mission and financial needs for Performing Arts Centers.

Transition Strategy For Payment Processing Networks From Traditional to Post-Quantum Encryption Algorithms

Sudarshan Raju Venkata, *Josiah Orleans-Lindsay, Kristina Mwangeka, Sai Hemanth Kumar Kattamuri*
(Management Information Systems)

Most of the traditional cryptography algorithms work on the basis of factoring large prime numbers. For traditional computers, the number of computations to brute force typically take decades to decrypt classical algorithms. But quantum computers work on the principle of superposed quantum states. This enables quantum computers to be exponentially faster than traditional computers. Quantum computers have the ability to compromise security systems using RSA and ECC. The report presents a detailed migration plan for a payment processing network organization to quantum safe algorithms in view of potential challenges from advanced quantum computing technologies.

Do you think we need Ladies & Gentleman serving Ladies & Gentleman

Michael Watkins (Kemmons Wilson School of Hospitality)

The introduction of a luxury hotel to Memphis, TN, could impact on the city's tourism industry and overall brand image. This study aims to explore the potential benefits and challenges of a high-end hospitality establishment.The primary research hypothesis is that the perceived value of a luxury hotel/s will lead to increased marketability, making Memphis a more competitive destination in the Southern region. Additionally, this study examines what factors attract high-net-worth visitor intention.By conducting an online survey with hotel guests staying in downtown Memphis, this research will provide insights into the feasibility and long-term advantages of such a project.

EDUCATION

Reframing the At-Risk Discourse: From Deficit to Strength and Resilience

Romana Mathews (Department of Educational Leadership)

This study explores the evolving definition of 'at-risk' students, highlighting its widespread use but lack of universal consensus. It critiques the traditional focus on academic, behavioral, and environmental challenges and proposes a shift toward viewing at-risk students through the lens of resilience. Using grounded theory, the research aims to reframe the concept, emphasizing the importance of resilience in overcoming obstacles and offering a more holistic perspective on these students.

A Comparative Analysis of Adaptive Learning Models: Insights from FSRS-4.5 and Logistic Knowledge Tracing

Hannah-Joy Simms (Department of Psychology)

We introduce and review work in the spaced repetition practice community, which has developed multiple methods for learning facts using trial-based repetition (e.g. flashcards) in multiple learning domains. This cottage industry of educational software providers, existing since long before Duolingo, has developed sophisticated methods of scheduling practice content to maximize user learning. These methods are a subtype of adaptive learning methods more generally, with their special focus on memory effects such as the spacing effect, the testing effect, and forgetting. We outline the history of systems such as SuperMemo in this spaced repetition community. Finally, using data from the AnkiWeb system, we compare one of the most recent knowledge tracing models from these community efforts, the Free Spaced Repetition Scheduler (FSRS 4.5), with a model built with Logistic Knowledge Tracing (LKT), and Bayesian Knowledge Tracing (BKT). Despite its simplicity, the LKT model provides a significantly better fit to the data.

ENGINEERING

3D printing of bio-scaffolds utilizing a novel combination of acoustic-controlled microbubbles with digital light processing

Blake Acree, Yuan Gao (Mechanical Engineering)

Porous scaffolds are essential in tissue engineering, supporting cell attachment and tissue formation by temporarily replacing the extracellular matrix (ECM). Tunable porosity across multiple scales is crucial for mimicking natural tissues, but current fabrication methods lack precision or are time-consuming. This research introduces a novel approach integrating acoustic-controlled microbubbles with digital light processing (DLP) 3D printing. Microbubbles generated in hydrogel materials are patterned by an acoustic field and photo-crosslinked via DLP printing. This method enables precise control of scaffold porosity through foam crystallization at micro levels, allowing customization for various tissue types, including vascular and tumoral structures

Machine Learning-Based Ground Motion Model for Induced Earthquakes in the Central and Eastern United States

Najme Alidadi (Civil Engineering)

This study develops a Ground Motion Model (GMM) using machine learning regression to predict Peak Ground Acceleration and Pseudo-Spectral Acceleration across 17 periods up to 3 seconds. The model is trained on 31,000 induced earthquakes in the Central and Eastern United States (CEUS) with moment magnitudes from 3.0 to 5.8 and hypocentral distances up to 200 km. Machine learning techniques, including Artificial Neural Networks, Kernel Ridge Regression, Random Forest Regression, and Gradient Boosting Regression (GBR), are used, with GBR performing best. An ensemble approach improves prediction robustness. The model outperforms traditional GMMs, offering higher accuracy for small-to-moderate earthquakes in CEUS.

An Improved Resnet50 Model for Predicting Pavement Condition Index Directly From Pavement Images

Anthony Dontoh (Civil Engineering)

Accurately predicting the Pavement Condition Index (PCI) from pavement images is essential for effective infrastructure maintenance. Traditional assessment methods are labor-intensive and subjective, highlighting the need for automated solutions. This study enhances the Residual Network (ResNet50) with a Convolutional Block Attention Module (CBAM) to improve PCI prediction by prioritizing critical image features. The ResNet50-CBAM model achieved a lower mean absolute percentage error (MAPE) of 58.16%, outperforming ResNet50 (70.76%) and DenseNet161 (65.48%). While these findings demonstrate the potential of attention mechanisms in pavement assessment, ongoing refinements could further enhance predictive accuracy.

Creating Pores in Cancer Cells via Acoustic Microbubbles for Enhanced Drug Delivery

Jonathan Faulkner (Mechanical Engineering)

Understanding the effect drugs have on different types of cancer cells is crucial in advancing drug delivery. Recent methods of understanding the effect drugs have on cells is sonoporation. Sonoporation can be accomplished in very few ways but among the most prominent is the acoustic microbubble. This research proposes a simple and effective method of using bubble-based sonoporation. This work focuses on generating and controlling an array of microbubbles to create pores in Propidium Iodide and Calcien AM stained MDA-MB-231 cancer cells. Using an acoustic field, the microbubble array uses fluid shear stress and microstreaming to create pores in cells.

Study of a New Ti-6Al-4V Powder for Fabrication via Laser-Powder Bed Fusion (L-PBF) Method

Zuhanee Khan (Mechanical Engineering)

This study explores a new out-of-spec Ti-6Al-4V powder for fabrication via Laser-Powder Bed Fusion (L-PBF), observes the effect of oxygen distribution, and compares it with commercial grades, ASTM Grade 23 (G23) and Mixed Grade (GM). Metallographic and mechanical characterizations were performed using OM, SEM, EBSD, micro-Vickers hardness, and tensile tests. Results showed comparable microstructures, and mechanical properties were generally in between G23 and GM. This powder would provide more economic feasibility and maximize the benefits of L-PBF. Moreover, this work-in-progress study would provide better understanding of the impact of oxygen homogeneity within the powder and the printed parts.

Investigating Li-ion Batteries Lifecycle Performance Using Real-time Dynamic Load Cyclic Testing

Efat Mohammadi, Alexander Headley (Mechanical Engineering)

The loading conditions under which Li-ion batteries operate profoundly impact their lifecycle. To investigate such impacts, previous studies considered idealized lab conditions with simplified steady-state loading profiles. However, in numerous real-world applications LIBs are subject to dynamic loads. We overcome this limitation of idealized experimental studies by using a state-of-the-art Power-Hardware-in-the-Loop (PHIL) system. Our PHIL system is obtained using a top-notch OPAL-RT real-time simulator that executes real-time conditions of fast dynamics. We determined the impact of load control on cells' lifecycle. Our results can aid the development of more robust electrochemical systems by ensuring effective methods for dynamic load control.

NMR Metabolomics for Investigating the Influence of High-Fat Diet on Glucocorticoid Treated Mice

Laila Obadat (Biomedical Engineering)

The prevalence of metabolic diseases from an imbalanced diet is a growing concern, leading to Metabolic Syndrome (MetS). MetS is characterized by a combination of obesity, insulin resistance, hypertension, and hyperlipidemia. An imbalanced high-fat-diet (HFD) is characterized by a higher ratio of n-6 to n-3 poly-unsaturated-fatty acids (PUFA), which is an attribute of the popularized Western Diet. This imbalance promotes lipid accumulation in the liver and disrupts normal metabolism, which is also the effects caused by chronic usage of Glucocorticoids (GCs). GCs are anti-inflammatory steroids often prescribed to treat immune disorders. Combining HFD and chronic GC use has been shown to increase lipid accumulation in metabolic tissue. Previous studies indicate that the n-3 rich HFD can reduce inflammation and lipid accumulation compared to n-6 HFD. This study aims to investigate the effects of HFD compositions and GCs on lipid metabolism in mouse livers using nuclear magnetic resonance spectroscopy (NMRS). An animal (mice)model was created to assess these effects to harvest the livers for NMRS. The study was able to demonstrate that with the n-3 PUFA diet the levels of hyperlipidemia and markers for MetS were reduced compared to the n-6 PUFA diet.

Prediction of Ultimate Load Capacity in CFRP-Confined Concrete Beams Using Deep Learning

Nasim Shakouri (Department of Civil Engineering)

This study evaluates methodologies for predicting the ultimate load capacity of concrete beams confined with carbon fiber-reinforced polymers (CFRP). Conventional approaches, including design codes (CDCs) and empirical models, are compared with a data-driven artificial neural network (ANN) model. A dataset of 478 CFRP-confined beams without steel reinforcement and 216 with steel reinforcement was compiled. The selected Quadruple Layer ANN-QL-2-3 model showed a strong correlation with experimental data (R = 0.933), outperforming traditional methods. Finite Element Analysis (FEA) validated the ANN predictions, demonstrating consistency with experimental results and confirming the model's superior accuracy.

Transcranial Magnetic Stimulation in Pediatric Models: A Simulation Study on Anatomical Age Differences

Jalyssa Smith (Biomedical Engineering)

Transcranial magnetic simulation (TMS) is a noninvasive procedure that uses magnetic fields to study brain function and diagnose and treat neurological diseases. This study investigated how TMS-induced electric field, volume of activation and focality are affected by anatomical differences in the developing brain in pediatric populations. SimNIBS, an open-source platform, simulated head models focusing on the dorsolateral prefrontal cortex. In both hemispheres, there was an initial increase in the induced electric field from infancy to childhood before decreasing in adolescence with significant differences. A direct relationship was also observed between the volume of activation and age and significant differences noted.

Berberine-Loaded Electrospun Chitosan as a Potential Drug-Eluting Biomaterial for Wound Healing in hEDS

AR Tubbs, Rabeta Yeasmin (Biomedical Engineering)

Matrix metalloproteinases (MMPs) remodel the extracellular matrix and boost inflammation via cytokines like IL-1 β and TNF-α. In hypermobile Ehlers-Danlos Syndrome (hEDS), affecting over 1 million Americans, MMP overexpression impairs wound healing and contributes to disease pathogenesis. Berberine HCl inhibits these MMPs, and delivering it from electrospun chitosan membranes (ESCM) may improve healing. Although berberine has poor solubility because of its hydrophobicity, treating ESCM with the fatty acid decanoic anhydride reduces cytotoxicity and enables sustained release. In this study, we evaluated berberine release from decanoic anhydride-treated ESCM.

Quantifying the influence of material properties on the intensity of cavitation erosion damage

Geoffrey Warberg (Mechanical Engineering)

Cavitation erosion occurs when cavitation bubbles implode on metal surfaces, damaging the surface of the metal. Due to the many variables involved in cavitation erosion, no singular property determines a material's cavitation erosion resistance. Past work uses properties such as hardness to draw qualitative correlations between material properties and cavitation erosion resistance. This poster aims to quantitatively correlate material properties such as hardness and yield strength with cavitation erosion resistance. For a wide range of results, four materials were used for this experiment: 110 Multi-purpose copper, Aluminum 1100, Nickel 200, and C63000 NAB.

LIBERAL AND FINE ARTS

Communication about Mental Health among International Student: Case of University of Memphis

Diana Maame Agyeiwaa Agyei (Communication and Film)

This study explores the mental health experiences of international students at the University of Memphis through an innovative approach using a photovoice methodology. International students often face academic pressures, financial constraints, social isolation, and cultural adjustment challenges, impacting their mental well-being. Findings reveal that international students adopt various coping mechanisms, including engaging in physical activities, attending religious gatherings, and fostering peer support networks. However, institutional improvements, such as tailored counseling services and enhanced financial aid, are needed to support international students better. This study advocates for culturally sensitive university policies to promote a more inclusive and supportive environment.

Racial Diversity of Journalists in America's Blackest City: Memphis Media Diversity Survey

Laura Kebede-Twumasi (College of Professional & Liberal Studies)

Journalism industry leaders have long lamented the lack of racial diversity in American newsrooms. This study seeks to create a baseline of racial diversity among Memphis journalists and measure the journalists' cultural competency and their perceptions of their news organization's cultural competency. Researchers created and disseminated a survey to about 200 journalists in Memphis working at news organizations that publish at least weekly. Survey results revealed white journalists are vastly overrepresented, despite the population of Black journalists being higher than average. Still, journalists of color were just as likely as white journalists to hold a supervisory position.

LIFE AND HEALTH SCIENCES

Factors Associated with Undernutrition, Anemia and Their Coexistence Among 6-59 Months Children in Nepal

Bikram Adhikari (School of Public Health)

We analyzed data from 2022 Nepal Demographic and Health Survey to determine the prevalence of co-existence of undernutrition and anemia and their associated factors among children aged 6-59 months. Among 2335 children, the prevalence of undernutrition, anemia and their co-existence were 33.5%, 43.4%, and 16.0%, respectively. Children from the richest wealth quintile, with mothers having at least secondary education or involved in household decision-making had 51%, 45%, and 37% lower likelihood of co-existence, respectively. Conversely children with malnourished mothers had 90% higher likelihood of co-existence. Targeted interventions are essential to reduce these conditions and improve children's nutritional status.

Sociodemographic Disparities in PAH Exposures: Discrepant Findings from Modeled and Monitored Data

Namuun Batbaatar (School of Public Health)

This study aimed to investigate disparities in polycyclic aromatic hydrocarbon (PAH) exposures in Shelby County, TN, using both modeled and monitored data. The modeled data indicated that ΣPAH concentrations were 15.4 ng/m³ higher ($p = 0.0037$) in areas with a higher concentration of African American populations compared to areas with a higher concentration of White populations. However, the monitored data did not reveal any statistically significant differences. Similar trends were observed when comparing high- and low-income areas. These findings highlight the importance of considering both modeled and monitored data in assessing environmental exposure disparities.

Optimized DNA Methylation Profiling and Pathway Analysis for Advanced PTSD Subtype Classification

Maziar Ganji (Department of Biological Sciences)

Post-Traumatic Stress Disorder(PTSD) is a complex neuropsychiatric condition with different clinical subtypes. Using methylation datasets from military cohorts, we classified severe/non-severe PTSD. We applied machine learning methods, including Random Forest(RF), hyperparameter optimization, batch correction, cross-validation, and molecular Pathway Activity(PA) inference. To improve classification accuracy, we developed a golden standard set of 18,284 methylation probes(GPs) common to Illumina methylation arrays. This enhanced classification performance(AUC)=0.84 compared to complete dataset(AUC=0.80) and reduced feature dimensionality from 450,000 to 18,284 high-confidence probes. Also, using GP-derived probes resulted in AUC=0.855. Molecular PA inference enhanced classification performance and identified key methylation signatures, aiding personalized PTSD medicine development.

Evaluation of a soundfield + virtual environment for listening outcome assessment

Isabel Martin, *Rose Perez (Communication Sciences and Disorders)*

This research tested the feasibility of a new measure that enables clinicians to simultaneously assess speech understanding in noise and localization accuracy. The study was conducted in an anechoic chamber with an array of speakers located in the front hemifield. Participants wore a virtual reality headset and listened to speech stimuli in background noise. They completed two tasks simultaneously: localization and speech understanding. Participants selected the avatar that the speech was coming from. The intensity of the competing noise varied to find the level at which the participant could just follow the conversation.

The Effects of Calorie-Restricted High-Fat Diet on Intestinal Immune Cell Composition and Akkermansia muciniphila Abundance

Jelissa Myers (College of Health Sciences)

Calorie restriction (CR) is known for its metabolic benefits, but its effects in the context of a high-fat diet (HFD) remain unclear. This study examined glucose homeostasis, gut permeability, immune cell composition, and Akkermansia muciniphila abundance in CR-HFD-fed mice. Fifteen male C57BL/6 mice were assigned to Chow, high-fat ad libitum (HF), or CR groups. CR improved glucose clearance and gut permeability compared to HF. CR had fewer colonic CD4+ cells but no other immune alterations. A. muciniphila abundance was preserved in CR but depleted in HF. These findings suggest CR provides limited protection against high-fat diet-induced metabolic impairments.

Assessing the Risk Factors of Female Genital Mutilation Among Under-Five Children in Ethiopia

Michael Arthur Ofori (Epidemiology and Biostatistics, School of Public Health)

Female Genital Mutilation (FGM) also referred to as female genital cutting or female circumcision, has become a global health concern. The study employed logistic regression to examine the association between mothers' educational level and the circumcision status of under five girls in Ethiopia. The study found a strong association between a mother's educational level and the risk of circumcision of under five girls. Additionally, religion (Muslim, AOR: 1.98, 1.55 -2.53), residence (rural, AOR: 1.83, 1.21 - 2.78), and paternal education level (no education AOR: 2.03, 1.24 - 3.35) were also significant factors.

How Typically Developing Infants and Infants Later Diagnosed with Autism Distribute Speech-like Vocalizations in Time

Zahra Poursoroush (Communication Sciences and Disorders)

Endogenous infant production of speech-like vocalizations (protophones) is required for language development since language requires the learning of new vocal categories of sound not in the innate repertoire (cries and laughs). The main protophone categories in the first year are vocants (vowel-like), squeals (high-pitched), and growls (low/mid-pitched). Protophones are not produced randomly; rather, they are grouped in phrase-like sequences. Our research shows 103 typically developing and 44 autistic infants produced clusters of protophones with short gap times, less than 400 milliseconds. The patterns for the groups were very similar with a tendency for gaps to be longer at older ages.

MATH AND COMPUTER SCIENCES

Energy Decay in Nonlinear Second-Order Evolution Equations with Underdamping and Overdamping

Sara Alsuradi (Mathematics)

More damping doesn't always mean faster energy decay. Excessive damping can lead to instability rather than improved stability in dissipative dynamical systems, as observed in nonlinear PDEs. This research develops analytical tools to establish decay rates and stability criteria for hyperbolic systems, such as wave equations and dynamic elasticity models. Our findings reveal that increased damping may counterintuitively destabilize the system. These results advance stabilization theory for infinite-dimensional systems with applications in engineering, physics, and material science. Additionally, similar mechanisms could influence processes in other fields, including tumor decay.

A Study On the Testing Methodologies for Unsupervised Machine Learning

Protyasha Roy (Computer Science)

Finding hidden patterns in datasets is one of the major uses of unsupervised learning (UL). It is important to evaluate the UL algorithms to make sure they produce accurate results. Despite its significance, there are very few studies on testing UL, with only seven papers focused on this topic. This paper provides a review of the testing techniques used for UL systems in comparison with those for supervised learning (SL) and reinforcement learning (RL) systems. More importantly, we aim to address three key questions: (i) Are there any testing methodologies in SL and RL that can be used to test UL systems? (ii) What are the challenges included in testing UL systems, compared to SL and RL? (iii) How effective are the testing techniques in evaluating UL compared to SL and RL?

Pulse-PPG: An Open-Source Field-Trained PPG Foundation Model for Wearable Applications Across Lab and Field Settings

Mithun Saha (Computer Science)

PPG based foundation models are gaining traction due to the widespread use of PPG in biosignal monitoring and their potential to generalize across diverse health applications. In this paper, we introduce Pulse-PPG, the first open-source PPG foundation model trained on raw PPG data collected over a 100-day field study with 120 participants. Existing PPG foundation models are either open-source but trained on clinical data or closed-source. We evaluate Pulse-PPG across multiple datasets and downstream tasks, comparing its performance against a state-of-the-art foundation model trained on clinical data. Our results show Pulse-PPG, trained on field data, exhibits superior generalization across clinical and mobile health applications in both lab and field settings. This suggests that exposure to real-world variability enables the model to learn fine-grained representations, making it more adaptable across tasks. Furthermore, pre-training on field data surprisingly outperforms its pre-training on clinical data in many tasks. To encourage further advancements in robust foundation models leveraging field data, we plan to release Pulse-PPG, providing researchers with a powerful resource for developing more generalizable PPG-based models.

PHYSICAL AND APPLIED SCIENCES

Evaluation of Toxic Metals in Chalk and Their Potential Health Risks on Humans

Tolulope Alaye (Department of Chemistry)

Chalk dust pollution poses an overlooked health and environmental risk due to toxic metal content. This study analyzes metal concentrations in U.S. chalk products, revealing hazardous metal levels of Pb (0.02-0.16 ppm), As (0.0004-0.008 ppm), Cd (0.0002-0.004 ppm), Ni (0.006-0.03 ppm), and Co (0.0007-0.006 ppm). Frequent exposure, even at low levels, can lead to metal accumulation in the body, causing organ dysfunction, metabolic disorders, and hormonal imbalances. These findings highlight the need for awareness and regulation to minimize potential health risks associated with chalk use.

Exploring the Road Improvement Impact on Induced Travel in Tennessee

Jayanta Biswas (Earth Sciences)

Traffic congestion remains a key challenge in transportation planning, often addressed by expanding roadway capacity. However, this can lead to "induced travel", where increased capacity attracts more traffic, offsetting initial congestion relief. This study examines induced travel in Tennessee by analyzing 84 road improvement sites and 130 non-improvement sites using an elasticity-based approach by employing OLS model. Results show VMT and VMT peak hour long-run elasticity 0.69-1.09 and 0.69-1.05 and short-run elasticity 0.66-0.99 and 0.65-0.96 respectively. The findings highlight the need to account for induced travel effects, as capacity expansion alone may not effectively reduce congestion.

Predicting Breast Cancer Metastasis through Characterization of Exosome Surface Proteins

Mitchell Lutey (Department of Chemistry)

Single Vesicle Surface Protein Profiling to Predict Bone Metastasis of Breast Cancer Mitchell Lutey and Xiaohua Huang 2/4/2025 Breast cancer (BC) metastasizes to bones in approximately 70% of Stage IV patients. Recent findings have indicated that extracellular vesicles (EVs) are a primary factor in metastasis and the presence of the integrin proteins αv and β3 on the surface of tumor derived EVs correlates to metastasis to bones. This project combines this knowledge with Single Vesicle Technology (SVT) to create a methodology for assessing the risk of bone recurrence. This method consists of capturing EVs in a gold-coated chamber slide, tagging EVs that express targeted protein markers using gold nanoparticles (AuNPs) conjugated with detection antibodies, and tagging all captured EVs using fluorescent dye. A fully automatic method based on machine learning identifies and quantifies the EV subpopulations with the targeted surface protein markers. By comparing bone-recurrent and non-recurrent BC patients, we determine whether αv and β3 on plasma EVs can be used to predict the bone recurrence.

Multiplexed Integrin Detection and Cancer Cell Classification Using Gap-Enhanced Gold Nanorods and Machine Learning Algorithm

Suprava Shah (Department of Chemistry)

Cancer remains the second leading cause of disease-related mortality worldwide. Accurate biomarker detection and classification of cancer subtypes are crucial for early diagnosis. We developed a multiplexed method using surface-enhanced Raman scattering (SERS) with gap-enhanced gold nanorod incorporating five distinct Raman nanotags to profile surface integrins in breast cancer cell lines. Raman signals were collected and analyzed via classical least squares regression, achieving a 96% classification accuracy with a random forest classifier. By integrating gold nanorods, SERS nanotags, and machine learning, our approach provides a robust, high-accuracy platform for cancer cell profiling and classification, aiding in precise cancer diagnostics.

Continental rift system initiation and reactivation by mantle plumes

Chameera Silva (Center for Earthquake Research and Information)

Geological evidence is ample for mantle plume-assisted continental rifting. In the East African Rift, a mantle plume is believed to have helped the continental rift initiate although the African plate is under compression due to forces from the surrounding mid-ocean ridges. Losing the driving forces due to the plate reconfiguration, the West Antarctic Rift System came to a halt at some point in the past but then was reactivated, at least locally, due to a mantle plume. By constructing numerical models using ASPECT, an open-source code for geodynamic simulations, we study these two cases of plume-assisted rifting. By modeling and analyzing the balance among the involved forces such as far-field driving forces and mantle plume's buoyancy, we aim to determine the key conditions for the rift initiation and reactivation.

Surface Protein Profiling of Exosomes Using Dual Imaging Single Vesicle Technology to Detect Organ-specific Metastasis

Tasnia Siraj (Department of Chemistry)

Single vesicle profiling of cancer-associated EVs is a powerful tool for cancer detection and monitoring. Different types of integrins are linked with organ-specific metastasis, with αvβ3 being associated to bone metastasis. DISVT is capable of profiling and detecting surface markers on individual EVs. A multi-well gold-plated slide is functionalized with antibodies specific to surface proteins, capturing EVs from blood plasma samples collected from both healthy and metastatic patients. Target-specific AuNPs label EVs for dark-field and fluorescence imaging. Additionally, SEDIA is a Python-based program that outputs the expression profiles of targeted surface protein and measures the fraction of EVs expressed.

Single Vesicle Protein Profiling and Machine Learning Based Dual Image Analysis for Breast Cancer Detection

Mitchell Taylor (Department of Chemistry)

Single vesicle molecular profiling of cancer associated extracellular vesicles (EVs) is increasingly being recognized as a powerful tool for cancer detection and monitoring. Mask and target dual imaging has been shown to be a facile method to quantify the fraction of molecularly targeted population of EVs in bio-fluids at the single vesicle level. However, accurate and efficient dual imaging vesicle analysis has been chal- lenging due to the interference of false signals on the mask images and the need of analyzing large number of images in clinical samples. In this work, we report a fully automatic dual imaging analysis method based on machine learning and use it with a dual imaging single vesicle technology (DISVT) to detect breast cancer at different stages. The convolutional neural network Resnet34 was used along with transfer learning to produce a suitable machine learning model which could accurately identify areas of interest in experimental data. A combination of experimental and synthetic data was used to train the model.. Using DISVT and our machine learning assisted image analysis platform, we determined the fractions of EpCAM positive EVs and CD24 positive EVs in the blood plasma of pilot HER2-positive breast cancer patients and compared to those from healthy donors. Our results show that both EpCAM and HER2 markers can detect the HER2-positive breast cancer at Stage II, III or IV. They can also differentiate individual cancer stages except Stage III and Stage IV. Due to the simplicity, high sensitivity, and high efficiency, the DISVT with the AI-assisted dual imaging analysis can be widely used for both basic research and clinical applications to quantitatively characterize molecularly targeted EV subtypes in biofluids.

Effect of Ar Plasma-Induced Buckling on Coercivity of Permalloy Thin Films on PDMS

Debendra Timsina (Department of Physics and Materials Science)

This study investigates the effect of Ar-plasma treatment on the morphology and magnetic properties of permalloy (Py, Ni80Fe20) thin films deposited on polydimethylsiloxane (PDMS) following plasma treatment. The results show that Ar-plasma treatment induces isotropic buckling in the thin film. The buckling density is dependent on the power of applied plasma. This morphological change leads to an increase in the magnetic coercivity of the thin film. Furthermore, results indicate that, plasma treatment suppresses the residual anisotropy present in the film.

SOCIAL AND BEHAVIORAL SCIENCES

Literacy-Tailored Text Messaging Intervention to Increase Prenatal Care Self-Efficacy and Shared Decision-Making Among Pregnant Adolescents

Pauline Adhoch (Loewenberg College of Nursing)

While Canada and the United Kingdom report adolescent pregnancy birth rates of 4 and 13 births per 1,000 females, respectively, for 15-17 and 18-19 year olds, in the United States it is considerably high at 9.3 and 39.8, respectively. Adolescents seek prenatal care late due to socio-psycho-economic problems, and their pregnancies are high risk with complicated outcomes. However, existing prenatal care programs have not supported adolescents with low literacy. This study will test literacy-tailored text messaging to increase prenatal care self-efficacy and shared decision-making using a quasi-experimental one-sample pretest-post study. The protocol of this study will be presented at this forum.

Mx Education: Exploring Homeschooling's Impact on Gender Equity, Gender Identity, and Reproductive Healthcare Access

Hannah G. Badley, *Aeryn L. Longuevan (School of Public Health-Division of Social and Behavioral Sciences)*

Youth in homeschooling communities may face gender-based health inequities and limited access to sexual education and Sexual and Reproductive Healthcare (SRH). This qualitative study explores the intersection of homeschooling, gender identity, and healthcare access using 61 testimonials collected from previously homeschooled individuals by the Coalition for Responsible Home Education. Through Reflective Thematic Analysis (RTA) and an Adapted Gender Analysis Framework (A-GAF), two coders identified key themes including family dynamics, barriers to sexual education and SRH, and the influence of conservative religion on gender identity development. Findings demonstrate homeschooling often resulted in gender inequity and limited access to comprehensive sexuality education.

Perinatal Exposure to Delta-9-tetrahydrocannabinol Alters Behavior and Dopamine Functioning in Wistar Rats

Monica Carbajal (Department of Psychology)

Many pregnant women use cannabis to alleviate morning sickness. Delta-9-tetrahydrocannabinol (THC), the psychoactive component of cannabis, crosses the placental barrier and is secreted in breast milk, exposing the fetus/neonate. The effects of perinatal THC exposure on impulsive and motivational behavior are extremely limited. Therefore, we measured impulsivity and motivation in offspring exposed to THC and examined its effects on dopamine functioning in the nucleus accumbens and medial prefrontal cortex-regions known to regulate externalizing behavior. These results support epidemiological findings suggesting that perinatal cannabis exposure may increase impulsivity and induce amotivation state and mesolimbic dopamine dysfunction.

“Home is Here!“ Or is it?: Place, Politics, and the Dreamer Consciousness

Anna Della Rosa (Department of Sociology)

With a focus on the undocumented Latin American population in the New Latino South, I utilize qualitative, semi-structured interviews to examine how undocumented young adults understand and navigate their identities and sense of belonging in a country that socially, legally, and politically excludes them. I theorize that racialized undocumented Latinx individuals navigate social, political, and legal systems of oppression to understand their identities and belonging through a dreamer consciousness. I find these experiences are influenced by (1) place, both geographically and (2) socially, and (3) through politics-each of which shapes their identity formation and negotiation.

Assessing Reward Preference in Mice: Drug vs. Social Interaction in a Choice Task.

Travis Erickson (Department of Psychology)

Differences in behavioral and neurological mechanisms of reward types is not currently well understood. This study examined the effects of sex on social and drug reward in mice. We used a common behavioral task, conditioned place preference, to assess preference or aversion to chambers associated with social and drug stimuli. Conditioning sets were performed for just social and drug individually as well as social and drug in competition. Results will improve our understanding of factors mediating reward salience and stimuli attenuation.

Discrepancies between anxiety and depression symptoms and antidepressant uses among US community-dwelling older adults

Easter Protiva Gain (Division of Epidemiology, Biostatistics, and Environmental Health)

This study explored the patterns of anxiety/depression symptoms and antidepressants use among community-dwelling older adults in the US. We conducted a longitudinal study using Medicare Current beneficiary Survey (MCBS) data from 2016-2019. Among 18,567 older adults, 1,837 (11.2%) reported any anxiety symptoms, 1,405 (8.6%) reported either depression or loss of interest, while 3,826 (20.6%) used antidepressant medications. About 19% of with at-risk of anxiety or depression were prescribed antidepressants, about 9% not at-risk of anxiety or depression also received antidepressant prescriptions, the adjusted odds ratio: 1.41, (95%CI: 1.22-1.62) for anxiety, and 1.51 (95%CI:1.28-1.76) for depression. Careful consideration is needed.

Long-Term Contact Lens Use: Unseen Effects on Vestibulo-Ocular Reflex

Hanna Kolwyck (Communication Sciences and Disorders)

The vestibulo-ocular-reflex (VOR) stabilizes vision during movement. Abnormalities in VOR can lead to dizziness and imbalance. VOR examination is critical for vestibular assessments in patients with dizziness. A common question that arises is whether to test VOR with or without corrective contact lenses, due to the limited understanding of their impact on VOR. We examined the effect of contact lenses on VOR during various head movements. Ten participants underwent balance assessments with and without contact lenses, revealing no significant differences between the two conditions. These findings and their implications on VOR adaptability from long-term contact lens use will be discussed.

From tweets to treaties: Exploring how Social Media influence U.S. Foreign Policy

Rifat Jahan Loran (Urban Affairs)

This study examines how Twitter use influences public opinion and support for U.S. military interventions, using data from the 2020 American National Election Studies (ANES). Findings show a weak correlation between Twitter use and support for military intervention, with posting political content having minimal impact on opinions. Demographic factors, such as education level and race, have a stronger influence on foreign policy attitudes. The research highlights the limited role of social media in shaping policy preferences, suggesting the need for further exploration of misinformation and ideological biases in online discourse.

The role of cannabinoid receptors in punishment driven risky decision making

Sharoderick Lowe (Department of Psychology)

Risky decision-making is a key feature of disorders like substance use disorder and schizophrenia, often linked to cannabinoid signaling abnormalities. This study examined the effects of cannabinoid drugs on punishment-based risky decision-making in Long Evans rats using the Risky Decision-Making Task (RDT). We tested THC, ACEA (CB1 agonist), rimonabant (CB1 inverse agonist), and AA-5-HT (FAAH inhibitor). ACEA, rimonabant, and AA-5-HT had no effects, but THC impaired flexibility in males, reducing slope across doses, while females were unaffected. These findings suggest that THC alters risky decision-making in a sex-dependent manner, with males more vulnerable to its cognitive effects.

Role of orbitofrontal cortex to ventral pallidum circuitry in sensitivity to immediate and delayed punishment

Zachary Mikkelson (Department of Psychology)

Optimal decision-making requires evaluation and integration of the costs and benefits associated with each option. An inability to properly weigh negative consequences of decisions is a hallmark characteristic of substance use disorder (SUD), and contributes to continued drug seeking in the face of personal, legal, and financial hardship. SUD is particularly challenging to overcome because drug use provides immediate reward, with negative consequences occurring later in time, leading the individual to discount the negative consequences. To understand the mechanisms behind this delay-discounting (DD) of punishment, our lab developed the Delayed Punishment Decision-making Task (DPDT). Previous work has implicated the lateral orbitofrontal cortex (LOFC) in decision-making, and in the delay-discounting of punishment. To further elucidate the role of the LOFC in DD of punishment, we are using chemogenetics to manipulate LOFC circuits, beginning with LOFC projections to the ventral pallidum (VP), a region implicated in reward-seeking, punishment sensitivity, and addiction. Our preliminary data indicates that inactivating the VP makes rats more sensitive to punishment in DPDT, as does chemogenetically inativating LOFC to VP circuitry. This indicates a potential role for LOFC to VP communication in the delay discounting of punishment.

Measuring Cognitive Load to Examine Processing During Different Types of Problem Solving

Camden (Noelle) Patterson (Department of Psychology)

The purpose of this study is to investigate how cognitive load manifests during different types of mathematical problem-solving. Specifically, this research aims to examine the cognitive load experienced by participants when solving algebraic problems under two instructional conditions: worked examples and non-worked examples. This study seeks to determine how instructional design influences cognitive processing and learning efficiency in mathematics. Cognitive load will be measured using a multimodal approach, incorporating both subjective self-report surveys and behavioral indicators, such as time on task. The integration of these measures allows for cross-validation, ensuring a more robust and reliable assessment of cognitive load.

IMPROVING THE ROLE OF EARLY INTERVENTION SERVICES IN TGA HIV CARE CONTINUUM IN MEMPHIS

Veena Priyanka Anand Tatapudi (School Of Public Health)

Background: HIV remains a significant public health issue in the Memphis TGA, a minority-population area. This study evaluates the effectiveness of the Ryan White HIV/AIDS Program's Early Intervention Services (EIS) for people living with HIV (PLWH). Methods: A cross-sectional study analyzed quantitative and qualitative data from a needs assessment survey and performance indicators, including viral load suppression (VLS), ART initiation, and visit frequency, using SAS and Excel. Results: Among 237 PLWH, gaps in mental health and legal services were identified. VLS improved from 2023 to 2024, while ART initiation and visit frequency remained stable. Conclusions: Expanding outreach, partnerships, and social support integration is crucial for improving HIV care.

Examining Effort with Weighted Doors for Drug and Social Rewards in Mice

Marthea Vann-Scott (Department of Psychology)

Effort-based decision-making impacts addiction vulnerability as individuals with substance use disorders demonstrate altered motivation and reward valuation. In this study, we used a task requiring mice to exert effort by pushing a door for one of four rewards: an injection of cocaine, social interaction with a novel mouse, social interaction with a familiar mouse, or no reward. As trials continue, weights are incrementally added to the doors, requiring more effort to obtain the reward. We expect that mice will exert the most effort for the drug reward, then the novel social interaction, and the least for the familiar social interaction.

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