

# HONORS RESEARCH SYMPOSIUM

## POSTER PRESENTATION

### ABSTRACTS



#### COLLEGE HALL

Honors College  
Office of the Dean  
Honors Advising  
Carolyn A. Barros Reading Room  
Honors Academy

Department of Military Science  
Recruiting  
Administration  
Hall of Honor - Sponsored by the Corps of Cadets Alumni Chapter

**NOVEMBER 22, 2024**

**UNIVERSITY OF TEXAS AT ARLINGTON**



**ETHAN BRIGHT, CIVIL ENGINEERING**

Title: *Investigating Life-Cycle Costs of Design Alternatives*

Faculty Mentor: Dr. Stephen Mattingly

The Engineering senior design group proposed a three-span concrete bridge, roundabout intersection, and a single storm conduit system. The honors contribution to this project was analyzing the design's alternative's life-cycle costs to compare the most economic design. The project's cost consists of initial construction, maintenance and rehabilitation, and salvage value. Utilizing Texas Department of Transportation (TxDOT) bid code unit prices, each design alternative is calculated by multiplying each material amount by the unit price then summed. Although the parallel conduit system has a cheaper initial cost, it requires more maintenance during its lifetime, therefore the single conduit system was recommended. Notably, cost analysis is measurable, but other design aspects need to be considered such as safety and sustainability. Although clients want to construct economic alternatives, it is the engineer's responsibility to advocate the value of safe and sustainable designs.

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**CYNTHIA CARBAJAL, ARCHITECTURE**

Title: *Architectural Narrative: Exploring the Convergence Between Architecture and Film in Narrative Structure*

Faculty Mentor: Henry Abosi

This study explores the relationship between architecture and film, focusing on how both disciplines function as storytelling mediums through spatial and visual techniques. This research also analyzes how both fields help shape experiences and the built environment. The methodology employed consisted of analyzing selected films ("Parasite" and "The Grand Budapest Hotel") and specific architectural projects (OMA's Seattle Public Library) to assess the compositional techniques used within these works. The findings revealed a similarity in how architecture and film use cinematic and spatial design techniques to evoke an emotional response and to heighten the depth of a narrative, thereby enhancing the user's experience. This project demonstrates that the relationship between film and architecture has the potential to enhance design and storytelling practices, suggesting that a deeper understanding of this interlinking relationship allows for more meaningful and immersive design in both fields.

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**DON DANG, COMPUTER SCIENCE**

Title: *Exploring Smart Thermostat Implementation: Smart Crib*

Faculty Mentor: Dr. Christopher Conly

The goal of the *Smart Crib* project is to create a single mobile application that integrates smart home appliances. The intricate and complex process of installing smart thermostats, which optimize heating and cooling according to current conditions, is the subject of this study. Smart thermostats have the potential to significantly improve energy efficiency in houses. Regarding compatibility with diverse configurations, such as single-stage and multi-stage systems, this study examines the difficulties in integrating smart thermostats with different HVAC systems. The research establishes a basis for future development by examining existing smart thermostat technologies, assessing compatibility with HVAC systems and looking at secure possible lapses in the protocols used by the thermostat and cloud services to communicate. Although time constraints have prevented full implementation, this roadmap offers significant value, ensuring future teams can effectively integrate smart thermostats into broader smart home systems, contributing to innovation in energy management and IoT applications.

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**AARTI DARJI, DATA SCIENCE**

Title: *Seed Germination Prediction using Machine Learning and X-Ray Imaging*

Faculty Mentor: Dr. Masoud Rostami

Native plant species in the western United States are essential for maintaining biodiversity and ecosystem health, but habitat loss and climate change threaten their survival. Successful restoration efforts depend on selecting high-quality seeds, and understanding seed traits such as shape, embryo size, and seed-to-embryo ratio can improve germination outcomes. This study utilizes X-ray imaging and machine learning to predict seed germination for grass and sunflower seeds. A dataset of 450 seeds was collected, and image enhancement techniques, including Contrast Limited Adaptive Histogram Equalization (CLAHE), were applied. Two transfer learning models—VGG-16 and ResNet-152 were trained to classify seeds as "Germinated" or "Non-Germinated" and evaluated using accuracy, precision, F1 score, and recall. The results show that ResNet-152 performed better than VGG-16 demonstrating potential of this approach to improve seed selection, supporting restoration efforts in native plant communities.

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**CASSANDRA DAVILA, PUBLIC HEALTH**

Title: *Building Community Resilience through Community Participatory Asset Mapping for Emergency Preparedness*

Faculty Mentor: Dr. Denise Hernandez

A community's capacity to prepare, manage, and recover from a disaster determines its level of resilience. The Federal Emergency Management Agency recommends engaging community members in resilience planning to ensure sustainable strategies are implemented. This project uses community-based asset mapping to identify how community participatory methods influence community resilience to combat possible emergency events. An asset map documents a community's existing resources, highlighting its strengths. Focus group discussions in the urban area will be conducted to obtain feedback about existing assets and suggestions for additional resources to include. The expected result of this project is to build a comprehensive map of community-based assets that will more accurately reflect resources that are useful to communities in emergency events and to identify areas of opportunity within the community. A collaborative approach to community resilience building can foster relationships between communities and emergency planners to create sustainable preparedness, response, and recovery strategies.

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**LILLIAN DURAND, BIOLOGY**

Title: *Changes in Head Morphology with Increasing Population Densities in Jamaican Populations of *Anolis Linneatopus**

Faculty Mentor: Dr. Luke Frishkoff

*Anolis* lizards are model organisms for studying natural selection and evolutionary pressures. One trait that has proved advantageous for males is head size, as larger heads lead to an increased chance of outcompeting other males for mates. To further understand how linked head size and intraspecific competition are, the morphology of individual male *A. lineatopus* heads was measured among Jamaican populations with varying levels of density. Population densities were determined by mark-resight surveys. Individual lizards were measured at each site for head dimensions and body condition. The study found that, in males, relative head volume did not change significantly between sites, indicating it is not a selecting trait for survival. While head volume did differ between sites for females, the change could not be attributed to population density. Head size was determined to be more beneficial in higher populations in males and displayed a negative trend among females.

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**DOUGLAS DYER, INFORMATION SYSTEMS**

Title: *The Internet of Earth: Empowering Communities with Data Analysis*

Faculty Mentor: Prof. Scott Johnson

Environmental pollution is a threat to the health of individuals, communities, and the globe at large. This research aims to use data analytics to empower local organizations with impactful context that can improve the efforts of community service. Specifically, the system analyzes big data generated in larger databases, such as the Environmental Protection Agency and the World Health Organization, to identify and grade communities based on predetermined criteria. It then uses this information to recommend solutions to environmental problems. Using the City of Arlington as a case study, this research rated the city's environmental condition as B, averaged across scores for air quality (B), water quality (B), land/soil use (C), extreme weather (B), and green space (A). These results prompted the system to suggest that green infrastructure, sustainable agriculture, and improved weather crisis planning can most directly impact the overall health of Arlington, Texas.

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**ALEX GINTER, EXERCISE SCIENCE**

Title: *Propulsion Patterns and Joint Kinematics in Experienced and Inexperienced Wheelchair Users*

Faculty Mentor: Dr. Tyler Garner

There are many ways to propel a wheelchair, including four main propulsion patterns. However, there are no definitive criteria for a "correct" form. This study investigated differences in wheelchair propulsion between experienced and inexperienced wheelchair users to determine any differences in propulsion patterns, joint kinematics, or speed between the two groups, possibly indicating what contributes to a more mature form. Subjects were recorded pushing a wheelchair for twenty feet, then each video was analyzed using Kinovea, a software for tracking body movements. It is expected that there will be differences in the propulsion patterns between the two groups, and that inexperienced users will push more frequently with a smaller contact angle. These differences point towards a common form that manual wheelchair users push with, which can be used to teach new manual wheelchair users how to properly push their wheelchair while making fewer errors during the learning process.

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**JULIA GLENN, BIOMEDICAL ENGINEERING**

Title: *Determining Evolutionary Conservation of Peptide Dependency in MHC-E and VISTA Interaction*

Faculty Mentors: Dr. Chelsae Watters, Dr. Jon Weidanz

Research in the Weidanz laboratory is focused on cellular molecules which inhibit immune activation, known as immune checkpoints. One example is HLA-E, which can modulate immune responses at homeostasis or in the context of cancer. HLA-E typically acts by presenting short canonical peptides (VL9s) and binding to CD94/NKG2A receptors on NK cells and T cells. The Weidanz laboratory's research has found that in the absence of these VL9 peptides, HLA-E binds to another immune checkpoint, VISTA, instead of CD94/NKG2A. Therefore, the HLA-E/VISTA interaction is peptide-dependent. The current study aims to determine if this peptide-dependent interaction is evolutionarily conserved using the homologous proteins from other species. Specifically, it investigates the interaction between Qa-1b, the murine equivalent of HLA-E, and VISTA. To evaluate this, MHC refolds, resonance sensor technology (ResoSens), ELISA, and Klickmer® technology were employed to analyze peptide-dependent binding interactions. This research has implications for cancer immunotherapy and future clinical studies.

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## **AVERY GRAY, VISUAL COMMUNICATIONS**

Title: *Visual Identity System Implementation in Business and Advertising: A Case Study in Visual Communications*

Faculty Mentor: Lisa Graham

Major problems relating to business branding stem from conflicting company values and ideas. Visual identity systems create cohesiveness and consistency within a brand's identity. This project investigates the development of a visual identity system for a fictional business, focusing on how that system relates to the brand's core values and engagement of a target audience. This project uses an individual case study approach which combines theoretical insights from branding literature with practical design execution. Outcomes are presented through mockups and deliverable products showcasing the visual identity system across the platforms of advertising, website development, and overall brand element creation. The project underscores the importance of visual communication in branding and provides a framework for future designers aiming to create impactful visual systems tailored to specific business objectives. Overall, the study demonstrates that a well-developed visual identity is crucial for the successful positioning of a brand in a competitive market.

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## **HOANG HO, BIOLOGY**

Title: *Investigating the Acute Physiological Effects of Effluent Crystal Violet on the Freshwater Bioindicator Daphnia pulex*

Faculty Mentor: Dr. Matthew Walsh

This study examines the effects of acute exposure to crystal violet (CV) on the freshwater zooplankton *Daphnia pulex* in response to growing concerns over synthetic dyes from industrial runoff in aquatic ecosystems. The primary objective is to assess CV's impact on *D. pulex*'s heart rate, mobility, morphology, and lethality via a series of acute exposure tests. 48-h acute toxicity (0–2000 µg/L), 48-h immobilization (0–180 µg/L), and 9-h heart rate (0–2,000 µg/L) tests were conducted using third generation daphnids, followed by stereomicroscopic examination and statistical analysis. Results showed increasing mortality and decreasing mobility and heart rate with increasing CV concentration; the 48-h LC50 and 48-h EC50 values were 629.4 µg/L and 75.9 µg/L, respectively. This project aims to advance ecotoxicological research and provide insight into the physiological effects of effluent CV on *Daphnia*, offering a model for understanding the broader implications of dye pollution in freshwater environments.

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## **GRACE HOLDSWORTH, ARCHITECTURE**

Title: *Natural Light as a Strategy for Sustainable Design*

Faculty Mentor: Sandra Espinoza

Modern buildings are increasingly reliant on artificial light to illuminate interior spaces, decreasing the importance of natural light in architectural design; however, the adverse effects of climate change, catalyzing blackouts, and rising energy costs, have made this reliance a significant issue. This study aimed to analyze the benefits of daylighting in architectural design and its ability to improve buildings' sustainability. To examine the impact of sunlight on the perception of a space, a light box study model was constructed, and the interior was photographed periodically from sunrise to sunset. This study highlighted the dynamic quality of sunlight, and its ability to express changes in time, season, and climate. Three case studies of innovative daylighting techniques were also examined to analyze the potential of designing with natural light. These studies demonstrated how by designing with natural light, architects can create impactful sustainable architecture.

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**AURUBA ISLAM, ELECTRICAL ENGINEERING**

Title: *Development of a System-level Architecture for a Wireless Terminal User with an Emphasis of PDSCH*

Faculty Mentor: Dr. Qilian Liang

With the ever-growing demand for faster and cleaner wireless communication systems, designs for such systems are becoming more complex as they account for hardware limitations, modulation techniques, and Rician fading. This project is aimed at developing a system-level architecture specifically for a mobile-wireless user, focusing on the Physical Downlink Shared Channel (PDSCH). With requirements and constraints already specified by the advising faculty, a simulation reference system has been implemented on MATLAB for PDSCH subject to Rician flat-fading, while a demodulator with QPSK modulation has been designed. Existing designs with similar focuses were referred to as the system was developed. Setting different values to the Rician flat-fading channel, and the comparison between simulated and theoretical values of the raw bit error-rate were used to judge the performance of the design. It is expected that with repeated iterations and troubleshooting, an optimized design will be determined in MATLAB that meets all requirements.

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**ESHA KASHYAP, PUBLIC HEALTH**

Title: *Examining the Risk of Cardiovascular Disease Among African American College Students at the University of Texas at Arlington*

Faculty Mentor: Dr. Erin Carlson

Many studies examine the risk of cardiovascular disease in African Americans adults compared to other racial and ethnic groups; however, there is limited research that explores the risk factors, discrimination, and food behavior that impact this group. Cardiovascular disease develops over time and certain practices or experiences can increase the risk of this disease; thus, studying the behavior and perceptions of college students is important. Therefore, this research examined whether food behavior and perceived discrimination was higher in African American college students than other racial or ethnic student groups. Utilizing a survey containing both qualitative and quantitative questions, this study expects to find that African American college students are at a higher risk of developing cardiovascular disease at the University of Texas in Arlington.

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**BINITA KC, BIOMEDICAL ENGINEERING**

Title: *Wavelet Coherence Analysis to Quantify Neurovascular Coupling (NVC) for Children Post Cardiac Arrest (CA)*

Faculty Mentor: Dr. Hanli Liu

Cardiac arrest (CA) is a critical condition that affects individuals across all ages, with pediatric survivors facing a high risk of neurological complications. Accurate prognostication of neurological outcomes in these survivors is challenging but essential for accurate clinical decisions and care planning. This study aims to quantify neurovascular coupling (NVC) by employing wavelet transform coherence (WTC) on continuous amplitude-integrated EEG (aEEG) and cerebral tissue oxygen saturation (SctO2) signals during the first 24 hours post-CA. Ten pediatric CA patients were analyzed to determine if abnormal NVC was present. To further interpret WTC between aEEG and SctO2, time-integrated spectral coherence (tiSC) and time-resolved spectral coherence (trSC) were evaluated for two scale ranges based on the significant coherence within the cone of influence. This approach provides insights into non-stationary alterations in NVC, contributing to a comprehensive understanding of brain recovery in pediatric CA patients.

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**EMMA LOU, BIOLOGY**

Title: *Insights into Cerebrovascular Health: Comparative Study of the Common Carotid and Middle Cerebral Artery Blood Flow*

Faculty Mentor: Dr. Matthew Brothers

The carotid artery, responsible for blood flow to the brain, and the middle cerebral artery (MCA), which supplies the cerebrum, are both susceptible to atherosclerosis, a condition that impairs blood flow and can lead to cognitive decline and ischemic strokes. This study investigates whether blood flow and vasodilation responses in the MCA during a hypercapnic challenge are comparable to those in the common carotid artery, which supplies the entire brain. This project aims to address limitations in current assessment methods, such as transcranial and duplex Doppler ultrasonography, to ascertain whether these two arteries exhibit consistent vasodilation patterns under hypercapnic conditions. The findings suggest that carotid artery measurements alone are insufficient to infer detailed changes in MCA functions. Additional parameters or a different measurement approach is needed to gain a better understanding of cerebral perfusion in future studies.

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**DAISY MACIAS, VISUAL COMMUNICATION DESIGN**

Title: *The Process of Creating a Visual Identity System from Scratch*

Faculty Mentor: Ben Dolezal

A visual identity system is a collection of design elements that work together to maintain consistency through various applications. A study of iconic brands clarifies how a design is successfully executed. This creative project began with selecting an industry, writing a creative brief, curating mood boards for visual research, brainstorming a brand name, creating a set of graphics that aid the brand identity, and implementing these graphics together to create a successful visual identity system. For this project, an indie cinema was selected, and based on existing visual research for this industry, the design style referenced contemporary art. The final design includes a stationary set, ephemera, and the landing page of a website. The result of this creative endeavor offers a perspective into the design process and decision-making that occurs during the creation of a brand identity system.

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**JASON MCINTIRE, EXERCISE SCIENCE**

Title: *Trabecular and Cortical Bone Phenotype, Blood Vessel Characteristics, and Endothelial Function in Sickle Cell Diseased Mice*

Faculty Mentor: Dr. Rhonda Prisby

Sickle cell disease (SCD) results in erythrocyte deformation, contributing to vascular and bone complications. This study examined four-to-five-month-old SCD mice (n=6) and age-matched controls (n=6). The descending aorta was analyzed using a wire myograph, while the femoral artery was cannulated and pressurized for endothelial function analysis. Trabecular and cortical bone parameters were assessed via micro-CT, including bone volume (BV/TV, %), trabecular thickness (Tb.Th,  $\mu\text{m}$ ), number (Tb.N, /mm), and separation (Tb.Sp,  $\mu\text{m}$ ). Ossified vessel characteristics were also measured. The study found that SCD mice exhibited lower body and spleen mass. Endothelium-dependent relaxation to acetylcholine was significantly increased in SCD mice, while vasoconstriction responses were similar between groups. Trabecular BV/TV was reduced (5% vs. 12%,  $p<0.05$ ), as were Tb.N ( $1.9\pm0.1/\text{mm}$  vs.  $2.3\pm0.4/\text{mm}$ ), while Tb.Sp was elevated ( $p<0.05$ ). Cortical bone and ossified vessel parameters showed no significant differences between the groups.

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**ANSAH MIRZA, PUBLIC HEALTH**

Title: *Irradiation Enhanced Immune Response in Esophageal Squamous Cell Carcinoma*

Faculty Mentor: Dr. Zui Pan

Esophageal squamous cell carcinoma (ESCC) is a significant challenge due to its limited treatment options and poor prognosis. This study aimed to understand the irradiation induced cellular changes in ESCC cells to search for a better combination of radiotherapy and immunotherapy for ESCC patients through studying the effects of programmed death ligand-1 (PD-L1) and calreticulin (CRT), major cell immunogenicity markers. This research investigated the change in PD-L1 expression, CRT translocation, and how it impacted a cancer cell's immune response. The human ESCC cell line, KYSE-150, was cultured and underwent irradiation. Images of the cells were taken using the Nikon A1R HD25 LSM confocal microscope and a statistical analysis was performed using Prism 5. In the cells, there was an increase in PD-L1 expression and CRT data is being processed. This cellular change indicates an increased immune response and contributes knowledge to expand treatment options for individuals affected by ESCC.

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**MATTHEW MORAN, SOFTWARE ENGINEERING**

Title: *Laser Harp*

Faculty Mentor: Dr. Shawn Geiser

This project presents the design and development of a laser harp, an innovative digital instrument that combines music and technology to inspire interest in STEM education. The harp uses laser beams and phototransistors to simulate the strings of a traditional harp, producing sound when the beams are interrupted. The primary focus of the honors contribution of this work is a custom-built software interface developed with a graphical user interface (GUI) that allows users to easily adjust settings like note range, volume, and the central part of the show, looping notes. The GUI is designed to be intuitive, making it easy to understand while enhancing user interaction and interest. By blending creative expression with hands-on technology, the laser harp demonstrates critical principles of electronics and programming, offering a fun and engaging tool to promote learning in STEM fields while having fun with music.

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**OPE OYEYEMI, PSYCHOLOGY**

Title: *Investigating the Impact of Mindfulness Practice on Quality of Life and Anxiety Levels in College Students*

Faculty Mentor: Dr. Tracy Greer

Anxiety disorders are becoming more common among college students, seriously affecting their academic performance and overall well-being. This study sought to investigate how current mindfulness practices and willingness to engage in mindfulness relate to psychological outcomes in college students. Participants (N=432) were students  $\geq 17$  years old recruited from the University of Texas at Arlington (UTA). Analyses compared differences in levels of anxiety, quality of life, depression symptom severity, cognitive dysfunction, and stress based on participant self-reported willingness to engage and current time spent engaging in mindfulness practices. It is expected that students who currently engage in more mindfulness will report less anxiety symptoms and higher quality of life. By exploring the effectiveness of mindfulness for students, this research hopes to inform policies and practices in educational institutions to ultimately promote student well-being and academic success.

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**HANANI PANKAJ, COMPUTER SCIENCE**Title: *Reinforcement Learning in StarClash*

Faculty Mentor: Kelly French

Developers create video games using Artificial Intelligence (AI) agents to provide a challenging opponent in a single-player game. However, studies show that when Reinforcement Learning (RL) agents are used, they outperform the AI agents. This project sought to test how RL agents would perform in StarClash, a video game without RL agents, using Q-Learning. This was done by creating two Q-Learning agents: a Simple agent and an Advanced (more complex) agent. These two agents were tested against each other and a Random AI agent. As expected, the Advanced agent did better than the Simple agent but only performed slightly better, which was unexpected. Also unexpected, was that both the Simple and Advanced agents only had a win rate of approximately 50% against the Random AI.

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**HETVI PATEL, BIOLOGY**Title: *The Effect of Hyperbaric Oxygen on Splenic Cells During Skeletal Muscle Regeneration*

Faculty Mentor: Dr. Barbara Schneider

Hyperbaric Oxygen Therapy (HBOT) can accelerate the regeneration of skeletal muscle after injury and improve overall recovery. Certain cells of the spleen are increased during muscle regeneration; however, the effect of HBOT on splenic cells during muscle regeneration is not well understood. In other experimental models, HBOT proliferates the proportion of splenic cells. In this study, eight male and nine female mice sustaining crush muscle injuries underwent HBOT at 1.5 atmospheres absolute for 60 min or normobaric hyperoxia (100% O<sub>2</sub>) for 60 min within 2-6 hours of injury for 4 days. The mice were then euthanized at 4- or 8-days post-crush, and the spleen was harvested. The proportion of splenic macrophages, monocytes, neutrophils, and dendritic cells was determined using flow cytometry. There was a heightened splenic cell response in female mice exposed to HBOT. Male mice exhibited a similar splenic cell response when exposed to either HBOT or 100% O<sub>2</sub>.

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**KEN PERRY, BIOLOGY**Title: *Racial Differences in CVMR and Neurovascular Coupling in the Carotid Artery*

Faculty Mentor: Dr. Matthew Brothers

The carotid artery is the only major blood vessel for cerebral blood flow and resistance dictates cognitive function. Non-Hispanic Black (BL) individuals have the highest prevalence of CVD and are 2 times more likely to develop cognitive impairment, Alzheimer's disease, and related dementia. The Integrative Vascular Physiology Lab has shown reduced cerebral compliance in BL Populations as indexed by %CVCI. Little research has been done on cognitive assessments and their metabolic need in the cerebral vasculature. The data from this study shows an increased vessel dilation in the carotid artery during a color word match test, with higher dilation seen in the WH versus the BL Group. Additionally, there was decreased compliance in the carotid artery as indexed by CVMR (Carotid Vasomotor Reactivity). This research is indicative of cognitive decline due to a lack of large vessel compliance in marginalized groups that must be treated adequately with vasodilatory treatments or blood characteristic changes.

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**ASMIN POTHULA, COMPUTER SCIENCE**

Title: *Pixel: AI Chatbot for Clear and Effective Senior Design Assistance*

Faculty Mentor: Dr. Chris Conly

This research explores the development of an AI-driven chatbot named Pixel, specifically designed to assist Computer Science and Engineering senior design students by providing immediate, clear, and accurate responses to project-related queries. While the senior design project focuses on developing a "Senior Design Project Management Tool," this honors capstone project centers on developing Pixel and integrating it into both the project management tool and the CSE Senior Design Knowledge Base. Pixel leverages this knowledge base to offer guidance on tasks such as using lab equipment, performing technical procedures, and troubleshooting common issues, ensuring that students have swift access to relevant information. By delivering clear, actionable answers, Pixel helps students stay focused on project execution, ultimately enhancing collaboration, efficiency, and the overall senior design course experience.

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**BIJAHN PROX, INTERDISCIPLINARY STUDIES**

Title: *Investigating Maternal Mortality for Women of Color and Low-Income Women in a Post-Roe Texas: Studying Abortion Accessibility Via Planned Parenthood*

Faculty Mentors: Dr. Eli Shupe and Dr. Jennifer Woo

Women of color and low-income women are among the most vulnerable parties affected by restrictive abortion policies. This study investigates the impacts of overturning *Roe v Wade* on the maternal mortality rates of marginalized Texas women. The state of Texas' conservative political nature provided a rich landscape to study the effects of preserving restrictive abortion policies and the manifold ways it may exacerbate disenfranchisement among women of color and low-income women. The impact of abortion prohibition in the state of Texas was quantified based on accessibility to abortion services through Planned Parenthood from 2014 to 2023. The collected data was analyzed to wholistically represent disparities in maternal health equity among women impacted by the social determination of their socio-economic status and racial identity. This research builds upon the work of previous scholars who identified how the social determinants of health disproportionately affect abortion access and, subsequently, maternal mortality.

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**NATHAN RATHER, BIOLOGY**

Title: *Defined Spatiotemporal Dynamics of Transcriptionally Regulated WAH-1/AIF Promotes Dual Stages of Non-Apoptotic Corpse Removal*

Faculty Mentor: Dr. Piya Ghose

Programmed cell death (PCD) is essential for proper organismal development and homeostasis. Compartmentalized Cell Elimination (CCE), in the *C. elegans* tail-spoke epithelial cell (TSC), is a form of PCD wherein three different cellular compartments die differently. This study identifies the transcription factor EOR-1/PLZF as promoting CCE. Loss of EOR-1 results in a persisting large soma with enlarged nuclei. It found that EOR-1 regulates the transcription of the Apoptosis Inducing Factor AIF homolog, WAH-1/AIF. This report shows stereotyped and sequential spatiotemporal dynamics of WAH-1/AIF1 during phagocytosis (cell eating), with defined roles at two stages. Mitochondrial to plasma membrane translocation is required for internalization, and plasma membrane to nuclear translocation for DNA degradation. This research expands the knowledge of PCD by describing a previously unreported cell death transition state, a mechanistic contribution of EOR-1/PLZF in PCD, and specific spatiotemporal contexts for WAH-1/AIF function.

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**VIDUSHI SABNANI, PSYCHOLOGY**

Title: *Investigating the Role of Hopelessness in the Stress-Performance Relationship among College Students*

Faculty Mentor: Dr. Angela Liegey-Dougall

This study investigates the relationship between academic stress, perceived stress, and academic performance in college students. It also examines the Yerkes-Dodson law of a curvilinear relationship between stress and performance and the role of hopelessness as a mediator. A sample of 321 participants completed surveys assessing academic stress, perceived stress, hopelessness, and social support, with GPA and engagement serving as performance indicators. The findings showed that stress and performance exhibited a linear relationship, contrary to the Yerkes-Dodson law. Pearson correlations and regression analyses revealed significant associations between academic and perceived stress and academic engagement ( $p < .001$ ). Additionally, hopelessness was found to be a significant mediator between stress and academic engagement ( $p < .001$ ). While higher academic and perceived stress predicted lower engagement scores, they did not significantly affect GPA. These results highlight the need for interventions that address stress management and emotional well-being to enhance academic success among students.

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**BAILEY SAMIDE, ARCHITECTURE**

Title: *Implementing Down Syndrome Accessibility Features through Renovations in the Dallas-Fort Worth Metroplex*

Faculty Mentor: Crystal Maria Portillo

Down Syndrome is a developmental disability that affects all stages of development. To create accessible spaces, demographic information about the users, such as age, must be considered and appropriate features should be added to cater to each stage of development. Appropriate features could include mobility improvements, setting clear spatial boundaries, and utilizing lighting techniques. This study explores the feasibility of implementing Down Syndrome accessibility features through renovations in the Dallas-Fort Worth Metroplex. Using existing literature, a 3D mockup of the more optimal alterations was developed. A heatmap was created based on a variety of data, and ten buildings were selected for the study and placed into three categories: interior changes only, minimal alterations to non-structural elements, and heavily involved structural alterations. Approximately 60% of the buildings fall under the first two categories, meaning that renovation would be a viable option when looking to create Down Syndrome accessible spaces.

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**PRATYANIK SAU, PHYSICS**

Title: *Characterizing 2D materials using positron impact induced electron spectroscopy and development of a novel thin film ZnO-based piezo-photonic detector for cryogenic and MEMS applications*

Faculty Mentors: Dr. Alex Weiss, Dr. Jonathan Asaadi, Dr. Varghese Anto Chirayath

Surface analytical techniques are essential for engineering nano-detectors allowing characterization of their chemical composition, electromechanical properties, and physical structure. The positron impact-induced secondary electron (PIISE) energy spectra and yield from single-layer graphene (SLG) and multi-layer graphene (MLG) grown on a polycrystalline Cu substrate are first presented. Subsequently, an extensive catalog of Positron-Induced Auger Spectra is provided to aid in the analysis of elemental composition. Additionally, a novel detection scheme is demonstrated using the piezo-pyroelectric properties of ZnO thin films for a zero-bias vacuum ultraviolet (VUV) detector. It is shown that stress-induced in ZnO thin films through interface strain engineering can enhance the VUV photoinduced signals, measured both at room and cryogenic temperatures. Such a photodetector can have applications in rare event searches in high energy physics using liquid noble detectors, as a UV detector for space-based sensors, and in other environments where low-power cryogenic performance is needed.

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**ANGELA URIBE, ARCHITECTURE**

Title: *Barcelona as a Blueprint: Integrating Architectural and Urban Identity to Future Urbanism*

Faculty Mentor: Joshua Nason

Barcelona is one of the largest and most recognized European cities on Spain's Eastern coast. Throughout its history, the city has developed a powerful sense of cultural identity through architecture, design, and urban planning. City identity in some modern architectural and urban developments is slowly disintegrating. This is problematic because these historical and cultural aspects help shape the urban and physical environments we live in today. This study focused on Barcelona's specific planning strategies and design elements to ascertain its underlying city identity, which was used as a point of reference for contemporary city development. The results showed that Barcelona's Cerdà plan, modernist architecture, Gothic Quarter historical preservation, and visual symbolism could be used to uncover and enhance the city's identity. Barcelona's development of city identity through planning and the built environment helps form its city personality and can be used as a framework or model for future urbanism.

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**TIFFANY VARGAS, POLITICAL SCIENCE**

Title: *Education Along the Texas Border: An in-depth examination of the educational performance of Latino students across regions of Texas*

Faculty Mentor: Dr. Mark Hand

Recent shifts in immigration policies have intensified deportations, disrupting family structures and creating barriers to Latino students' educational performance. This study investigates how educational performance of Latino students differs between border and non-border regions of Texas. Conducting a secondary analysis of publicly available data that includes test scores (SAT, ACT), economically disadvantaged data, and at-risk of dropping out information, the study compares districts within 0-20 miles of the U.S.-Mexico border (border regions) to those 50-100 miles away (non-border regions). Findings show that students in border districts score lower on standardized tests and face greater economic challenges. T-tests reveal statistical differences in at-risk of dropout rates, SAT scores, and ACT scores between border and non-border districts, with p-values of  $1.04E-10$ , 0.005309, and 0.00333. These results align with previous data highlighting the need for targeted support programs to address educational inequities and improve performance for Latino students in these regions.

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