

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

APRIL 21, 2023

UNIVERSITY OF TEXAS AT ARLINGTON

Ifejola Adebo, Biomedical Engineering

3D Microstructural Characterization of Heart Valve Leaflets

Faculty Mentor: Dr. Jun Liao

Heart valve disease is common in the world today and understanding the anatomical linkages, collagen, and elastin microstructures between the various heart valves is important for developing effective treatments. Four heart valves were gotten from the heart of a pig as they closely mimic the human heart. The purpose of this study was to analyze and compare the properties of the surrounding fibrous microenvironment of the tricuspid, mitral, pulmonary, and aortic valves after tissue clearing and imaging with a light-sheet microscope. The tissue clearing process entails procedures that render the samples transparent for in-depth imaging of the heart valves using the light sheet microscope, a technique that allows one to view the 3D imaging of a structure. Results gotten from these comparisons set the foundation for researchers and medical personnel to study the patterns of the valves for better diagnosis, surgical procedures, and treatment of heart valve diseases.

Fernando Alejandro, Mechanical Engineering

Determination of Sound Absorption Coefficient of Open and Closed Cell Materials

Faculty Mentor: Dr. Raul Fernandez

With the growing development of self-driving vehicles, the issue of passenger discomfort due to noise pollution has infiltrated the automobile industry. The computer driving these vehicles requires multiple fans to maintain optimal temperatures. To reduce the noise level created by the fans, this senior design team was tasked with developing a sound dampening solution that can be implemented to the computer superstructure while maintaining aesthetics, functionality, and accessibility for repair of the computer. This extended project was performed to investigate the sound absorption properties of open and closed cell materials that could then be used to create a solution. The sound absorption coefficient of neoprene foam, charcoal eggcrate foam, and cork were found using a self-made 2-microphone impedance tube and Simcenter Testlab. The results show that the open cell charcoal foam absorbs the most noise while the closed cell neoprene foam absorbs the least noise.

Efe Amrovhe, Biology

*Parthenogenesis Investigation of the F1 Generation from a Cross Between *Daphnia pulex* Tex 23 (Males) and Tex 85 (Females)*

Faculty Mentor: Dr. Sen Xu

Daphnia pulex is a species of *Daphnia* that is capable of both cyclic and obligate parthenogenesis. In this experiment, two cyclic parthenogenetic (CP) isolates are crossed to access the frequency of obligate parthenogenetic (OP) offspring that will be produced. Prior research revealed that OP animals produced from CP isolates are genetically linked through introgression from a sister species, *Daphnia pulex*. If OP animals are produced at a significant frequency, examine this introgression deeper and access its genetic implications. The mating between Tex 23 (male) and Tex 85 (sexual female) isolates creates a new daphnia clone. It is the ephippia produced by that clone that will be dissected to determine the parthenogenesis of the clone. Now, the experiment is still ongoing but a p-value from a t-test will be generated using the results which will determine its significance.

Jacqueline Baeza-Rubio, Physics

Barium Ion Beam Simulations for Barium Tagging in NEXT

Faculty Mentor: Dr. Benjamin Jones

Physicists have long sought out a hypothetical particle known as the "Majorana neutrino." This elusive particle is theorized to be its own antiparticle counterpart. The Neutrino Experiment with a Xenon Time Projection Chamber (NEXT) is a detector searching for this rare species of decay. This decay search is of importance to physicists since, if the neutrino is Majorana, it may illuminate the mechanism that caused the matter dominance in the universe. To advance this search, this research examines the Barium tagging efforts conducted to simulate efficiencies using SIMION of ions species produced in a newly built Barium ion beam. However, no large deviations in efficiencies were found. In addition, optimization of Ba²⁺ production was developed using a Wien filter. With these advancements, the Barium beam will be used as a source for the development of fluorescent chemosensors that respond to barium ions in gaseous environments.

Ryan Bluestein, Electrical Engineering

Suburban Application of Image Processing for License Plate Detection

Faculty Mentor: Dr. David Wetz

Excessive speeding is frequently an issue, particularly through residential areas near high traffic areas. This problem does not have a great solution widely available. By using convolutional neural networks, or CNNs, to isolate license plates within images and to read the characters from the license plate, the plate numbers of speeding vehicles can be stored. The network is being trained and tested using a dataset known as UFPR-ALPR. Based on preliminary results, the networks have roughly 50% accuracy, though ideally with further refinement the network will be able to predict plate locations with upwards of 80% accuracy.

Maaham Chaudhry, Nursing

Symptom Patterns and Their Association with Influencing Factors in Adults with Long COVID – A Secondary Analysis

Faculty Mentor: Dr. Yaewon Seo

Currently available information on the risk factors, manifestation, treatments, and long-term effects of the Long COVID is inconclusive, requiring further research to identify timely interventions that may help treat Long COVID patients, reduce symptom burden and restore functional abilities. This research aims to analyze symptom patterns and their association with influencing factors in adults with Long COVID by examining intercorrelations among symptoms, identifying influencing factors of symptoms, and examining the associations of symptoms with disability and quality of life over time in Long COVID patients. The Theory of Unpleasant Symptoms developed by Lenz et al. (1997) is applied as the conceptual framework to guide the proposed research. The study's goal is to contribute to identifying treatment options and means of prevention for further disability from Long COVID and developing an evidence-based practice guidelines for symptom management in Long COVID patients.

Yuvaram Devarajulu, Computer Science

Living Stream

Faculty Mentor: Dr. Shawn Gieser

The Living Stream product promotes education of the wildlife instreams of the national parks by making the sites accessible to experience nature through augmented reality. A projector would display a simulation of a pond with some animations of native fish and splashing water when interacted with to create a more realistic experience. This would be achieved with the help of Intel RealSense motion sensor and its AR package on UNITY. Using a motion sensor, we provide appropriate feedback like splashing water. The park rangers could upload their own custom fish models native to their park's lakes. This would help the users have a realistic experience of what is out there in wild if they visit these ponds and lakes in person. The fish models will be uploaded to a cloud database, which would enable all the national parks to use the 3D fish models in the database.

Pratikshya Dhakal, Finance and Economics

Impact of Fintech Advancements on the Commercial Banking Industry

Faculty Mentor: Dr. Richard Berard

Fintech are the firms that use new technology to deliver financial services. They have heavily impacted the change in the banking industry. The changes include innovation, social impact, technological advancements, and customer relationships. Commercial Banks have been declining in numbers for the past 35 years. This paper seeks to question the future of traditional banking and how it affects financial inclusion. This paper uses a systematic literature review approach to evaluate Fintech and commercial banks' strategies. It creates concluding remarks on the safety and ethics of the Fintech Industries using the Technology Acceptance Model (TAM). The findings from TAM suggest that Fintech companies and customers' behavior towards acceptance of new technology are going to keep getting advanced. The banking industry can survive and not get completely replaced by Fintech because of the different set of regulations but can take away many banking services and jobs in the long run.

Alexia Diermeier, Architecture

Evolution of Dallas's Old City Hall

Faculty Mentor: Dr. Douglas Klahr

This thesis analyzes the historical preservation of Old City Hall in Dallas, Texas, comparing its preservation processes with other notable preservation projects across the United States. The study aims to evaluate the building's significance as a monument to Dallas's municipal government and civic pride, as well as its importance as an example of early 1900s public buildings in America. The paper examines the best practices for preserving historical landmarks and explores the discipline of historic preservation, including its methods and techniques. The study also looks at the impact of preserving historical landmarks on a city's architectural heritage, cultural spirit, and environmental sustainability. The findings of this thesis will contribute to a better understanding of the significance of preserving historical landmarks and their impact on a city's cultural and environmental heritage, as well as the role of historic preservation in preserving a city's heritage for future generations.

Ai-Vy Dinh, Biology

Effects of Prebiotics, Probiotics, and Antibiotics on the Human Gut Microbiome

Faculty Mentor: Dr. Woo-Suk Chang

The human gut microbiome is a community of microbes in the gastrointestinal tract and its role in immune function and food digestion is a key to human health. In adults, bacterial species may develop over time based on changes in diet, environments, and other factors. A dietary category of interest is that of probiotics and prebiotics. Prebiotics aid microorganisms by acting as “food,” while probiotics are microorganisms themselves. A dataset was extracted from NCBI that included bacterial genera in a study involving antibiotics, probiotics, and prebiotics. Phyla were analyzed for numerical changes and unique properties. Changes in phyla, Firmicutes and Bacteroidetes, have been associated with obesity-related metabolic diseases and gut health. This could provide implications on the way the microbiome can influence a person's overall health and how it can be altered.

Nathan Easley, Mathematics

A Study of Algebraic Structures in Complex, Hyperbolic, and Parabolic Systems

Faculty Mentor: Dr. Barbara Shipman

Most advanced college students are familiar with the fact that an equation $p(x) = 0$, where $p(x)$ is a polynomial of degree n with real coefficients, will have at most n solutions. When the coefficients are complex, the Fundamental Theorem of Algebra (FTA) says that there are exactly n solutions, counting multiplicity. For example, $x^3 - x = 0$ has exactly three solutions, 0, 1, and -1. This thesis investigates how many solutions polynomial equations have in other number systems, such as in hyperbolic or parabolic numbers. Our methods involve looking for how many solutions simple equations, such as $x^2 = k$, possess for different choices of k in these distinct number systems. We then consider general polynomials. Overall, our results demonstrate that there can be more or less solutions than the degree of the polynomial, contradicting the outcomes expected from the FTA.

Farhan Fahim, Art (Animation & Gaming)

Dragonfly Animation in the Style of 'Sakuga' Using Harmony

Faculty Mentor: Benjamin Wagley

‘Sakuga’ is colloquially known to be a style of Japanese Animation (Anime) characterized by dynamism, fluidity, and attention to detail. It helps to make a scene livelier, more realistic, and exciting, and is typically used for action scenes. With RETAS Studio being the dominant animation software in Japan, its Western counterpart, Toon Boom Harmony, does not see much use in the Anime industry. This project attempts to create a short Sakuga animation of a dragonfly in flight using Harmony. The dragonfly's trajectory is initially mapped out in Harmony, followed by sketches of the key frames defining its movement. The in-between frames are then sketched out while making sure there are enough images to achieve a fluid “Sakuga” aesthetic. A motion blur effect is used for the background to convey the speed at which the insect is flying. The end result is compared to existing examples of Sakuga animation, and it is evident that the effect is achievable using Western industry-standard software.

Sana Ashfaq Fatimah, Architecture

Antoni Gaudi: Nature & Geometry

Faculty Mentor: Joshua Nason

Antoni Gaudi believed that architecture is the fusion of nature and geometry. He had the power to unite form and structure and he continued to achieve this in his work which made it hold a special place in the history of Barcelona's architecture. He is known for his work to have changed the way architecture was approached. Although many hated his work at first, it was after his death that they realized how he had the power to unite nature and geometry. To further understand his legacy, collection and analysis of books, journals and scholarly material was undertaken. The study's significance lies in understanding Gaudi's design process, his impact on Barcelona's architecture, and how he has influenced architects worldwide. His legacy continues as the Sagrada Familia is under construction which forever changed Barcelona's architecture.

Noreen Flores, English Law and Legal Studies

Book Banning in the Education System: Books Belong in Shelves

Faculty Mentor: Dr. Kaci O'Donnell

Texas governor, Greg Abbott, recently introduced at a campaign event a "Parental bill of Rights" in which he pushes to ban education books, finding them impermissible based on racial, gender, and sexual identities. While proponents of restricting access to books say that parents have the right to choose what their kids are reading, they are also composing a child's education and development. Several political leaders have also joined these efforts. State Representative Matt Krause, for example, generated an 800-plus list that a growing movement that pushes ideologically slanted visions, needs to be addressed. In order to come together as a community and build an inclusive community to thrive and value people.

Roman Goff, Biology and Biochemistry

An Investigation of the Predictive Accuracy of Polygenic Score for the Big 5 Personality Traits and Math Ability

Faculty Mentor: Dr. Jeffery Demuth

Studies have shown that personality and mathematical ability are heritable traits. In the past, heritability was investigated using genetically identical twins who were reared apart and comparing siblings' traits. Genome-wide association studies (GWAS) have replaced twin studies by combining genetic data with modern computing power. The exponential decrease in cost of human genome sequencing and increase in accessibility has made it trivial to use an individual's alleles to correlate their genome to their phenotypic traits.

In this study, GWASs for the Big Five personality traits and mathematical ability are used to predict the traits of 9 individuals using their single-nucleotide polymorphisms and allele effect sizes. Actual Big Five personality trait values were assessed with an online survey, and participants' self-reported SAT/ACT scores were used as proxy measures for mathematical ability. The study found no significant correlation between predicted and actual values for any of the traits studied.

Angie Gonzalez, Psychology

Implications of Memory Reconstruction on Eyewitness Testimony

Faculty Mentor: Dr. Matthew Robison

Despite its unreliability, eyewitness testimony is a widely used method of prosecution in court cases and is deemed a vital piece of evidence. Although discrepancies in memory accuracy have been highlighted in recent years, and substantial research has shown the faultiness of our memories, it continues to be utilized and involved in most false incarcerations in the U.S. In the DRM (Deese-Roediger-McDermott) test, participants are asked to memorize a list of semantically related words to a critical lure, an item associated with the lists that is never presented. Oftentimes, individuals falsely remember words that were never presented due to their similarity in context. In using this to investigate human accuracy and the creation of false memories, a real-life application was observed using videos of strangers followed by a lineup identification. This study aims to analyze the relationship, if any, between confidence ratings and accurate recall.

Kehari Guice, Nursing

Prenatal Depression and Birth Complications: Comparisons by Race and Age Group

Faculty Mentor: Dr. Cheryl Anderson

Health disparities among Black childbearing women illustrate physical and mental health concerns. The current study compared prenatal depression (PND) rates and birth complications between Black adult and adolescent women and all age Black and White women. This was a comparative study using a secondary analysis of data previously collected from two separate Institutional Review Board (IRB) approved primary studies assessing the mental health of a diverse group of childbearing women. Findings indicated no significant difference between PND rates or birth complications by age for Black adolescents and adults. For all aged women, a significant difference for PND was noted between Black and White women; however, birth complications were not significantly different by race-ethnicity. Lacking differences by age may be due to an older sample of adolescents indicating a need for additional research inclusive of younger teens. Black and White differences suggest attention to health care disparities, causes, and solutions.

Ariana Hernandez, Interdisciplinary Studies

Breaking the Lone Star Ceiling: Texas Woman Political Leaders and Their Portrayal in the 21st Century Media

Faculty Mentors: Dr. Dustin Harp and Dr. Paul Kittle

This study analyzes the portrayal of women in politics within Texas media. Historically, media representation of women politicians has been underrepresented and stereotyped. This study aims to determine if Texas women politicians face similar representation. The research aims to ask how frequently Texas women politicians are mentioned in articles, and how often they are included in headlines and images. The study focused on two women of color, Senfronia Thompson and Judith Zaffirini, who have served in the Texas Legislature for decades. The findings reveal that out of thousands of articles, only 23 had Thompson or Zaffirini as the headline or focus. It is essential to recognize that the way Thompson and Zaffirini are underrepresented in the media is important. The absence of these women in headlines and images within the media maintains the cycle of erasing women from government and leadership.

Jacqueline Hernandez, Architecture

Social Equity Through Design

Faculty Mentor: Julia Lindgren

Historically targeted racialized policies and the continuation of socioeconomic inequality in Dallas have ushered in disparities in the quality of public spaces and amenities. These spaces are significant because they provide cultural representation, economic opportunities, and social integration. This study analyzed five public spaces across the city of Dallas to determine the success or challenges they provided to the community. The observation included accessibility, security, experience, sustainability, and comfort. In addition, the experiment analyzed the demographics and interactions within the space. The results showed how public spaces in predominantly Hispanic and Black communities lacked amenities compared to White neighborhoods. Hence, a public place's success derives from engaging activities and cultural representation. However, because of current and historical socioeconomic inequality, lower-income communities face negligence in the design of public spaces. Thus, designers must empower these communities by promoting equity and inclusion when designing public spaces in Dallas and globally.

Yu Shiuang Huang, Biomedical Engineering

Algorithm Development for Automatic Analysis of Bimodal Optical and Electrical Nanosensing Time-Series Data

Faculty Mentor: Dr. Georgios Alexandrakis

Nanopore biosensors have played an essential role in bio-analyte characterization, but traditional biosensors are limited by short analyte translocation times. Dr. Alexandrakis invented the Self-induced Back Action Nanopore Electrophoresis (SANE) to slow analytes down by optically trapping them as they travel through the nanopore. By collecting optical and electrical data, SANE enables comprehensive bio-analyte characterization. However, the manual analysis of bimodal data is work-intensive, highlighting the need for automated data analysis. This project aims to develop a MATLAB algorithm that automatically identifies positive and negative polarity spikes in current changes when a molecule enters and escapes an optical trap. The computer code will also automatically process the optical signal and calculate features, including each event's duration, beginning time, current change, and more. The significance of this work is the creation of an open-source algorithm that researchers can use to speed up protein-ligand interaction analyses in the field of nanopore technologies.

Mustansir Husain, Civil Engineering

Solar Parking Shade Structural Design

Faculty Mentor: Dr. Tamer Eljufout

The schematic plans discussed will provide a structural and foundational design supporting the solar powered system that will be placed along the parking lot for efficiency enhancement and power minimalization. The system uses industrial 60-cell, 3ft x 5ft, solar panels installed over galvanized corrugated sheets. It utilizes a steel structure supported by HSS, or wide flange beam and 24-inch reinforced columns placed at 18-feet, center-to-center spacing. The dead load includes the system weight and the live load calculations are based on wind and snow load. After determining the distributed load, a STAAD software analysis is conducted to get the recommended sections. The column load is supported by a shallow foundation footing and finally the power output from the panels is calculated. These shades are placed over the North and East side of the parking lot and will be mitigating the environmental and economic impact by reducing energy utilization.

Taylor Huynh, Political Science

The Rise and Fall of High-Profile Issues in America's Modern Society

Faculty Mentor: Dr. Thomas Marshall

New controversies in America's current political environment signal increased social uncertainty. By looking at changing public interest following a significant political event, this research provides an insight into how high-profile issues affect voting behaviors. With a focus on the topic of abortion, the project examines public reactions to the U.S. Supreme Court's 2022 *Dobbs v. Jackson Women's Health Organization* decision as a case study to determine how high-profile issues impact public attitudes. A multi-method approach with regular opinion polls, entrance polls, exit polls, voter turnout data, news endorsements, and media usage patterns is used to examine shifts in public priorities and substantive views. As the results shows, Americans' political attention is usually short-lived, and the saliency of an issue is not stable over time, though issue attention can temporarily increase political participation.

Sylvine Ineza, Biomedical Engineering

A Way to Assess the Impairment of Cerebral Autoregulation in Pediatric Patients Under ECMO with Neuroimaging Abnormalities

Faculty Mentor: Dr. Hanli Liu

Cerebral autoregulation protects the healthy brain by maintaining an adequate cerebral blood flow in face of blood pressure changes. Cannulation of great blood vessels and alterations of pulsatile flow patterns during ECMO (Extracorporeal membrane oxygenation, a life-supporting therapy for critically ill patients with severe respiratory and/or cardiovascular failure) alters cerebral autoregulation. This project provides a reliable methodology that can determine the status of cerebral autoregulation during ECMO therapy and provide early indication of neurological injury. Initially, we used the normal WTC MATLAB code to obtain a time-frequency map. Then we calculated the in-phase percent significance and used the resultant values to determine the Scale Averaged Percent significance of Coherence (SASC) specifically in ranges 0.5-2.5 hour scale. Graphs depicting the comparison between SASC and blood pressure over 24 hours before and after cannulation are shown. Further analysis is underway to examine whether the SASC values correlate with the patients' MRI consensus.

Kyndall Jackson, Psychology

The Influence of Racial Labeling and Gender on Illusory Correlation and Perceived Hireability

Faculty Mentor: Dr. Daniel Levine

Black and African American refer to the same demographic of people, however describing someone as Black can lead to the belief that they are lower in competency when compared to someone described as African American. The goal of this study was to determine whether gender and the use of the racial labels of Black and African American would lead to an illusory correlation, which would affect the perceived hireability of candidates. Participants were given a survey with randomly assigned mock resumes and reference letters to evaluate. Initial findings show that participants remembered more negative traits about female applicants compared to their male counterparts. Negative traits were also more often remembered about female applicants under the racial label Black compared to female applicants where no racial label was used. Based on these findings future research should examine why negative traits are disproportionately remembered about female applicants, especially Black women.

Koosha Jamali, Construction Management

The Demand for Increasing the Number of Construction Management (CM) Programs

Faculty Mentor: Bijan Shapoorian

The Construction Management Capstone project is a process of mock bidding, selling, and delivering a real-world construction project as we were assigned the Beck contract to demolish the Old Parkland Hospital. My role is of the Project Engineer with a focus on abatement. As one of the most profitable industries in the world, the construction industry has been traditional in its longevity. However, many universities lack construction management or construction engineering programs. The intent of publishing this Honors journal is to recognize the opportunity for investing in the vast market of construction management studies. In addition, this research aims to attract attention to the role of a construction management scope-specific university program in improving construction operations. The results of this study exemplify that the teachings of The University of Texas at Arlington's Construction Management (CM) program were incredibly beneficial to the delivery of the Capstone project and that other schools should follow this example. The students practiced many of the vital skills taught in the CM program as the requirements for completing the demolition of the old Parkland Hospital required them to do so. Some necessary classes were Construction Documents, Construction Safety, Construction Estimating 1 & 2, and Construction Scheduling.

Francesca Jaubert, Economics

The Effects of Prison Gerrymandering on Election Results

Faculty Mentor: Dr. Christopher Candreva

This study looks at whether or not there is a correlation between the voting patterns of a county and the presence of prisons within that county. There is a history of prisons being used to inflate population numbers within states to change where voting power lies. Previous research exists indicating a speculative relationship between Republican politicians and increased prison gerrymandering, so this research was developed to reveal if there is a genuine relationship between these two factors. Some of the variables included to better isolate the influence of prison location are per county income, biographical information, total population, voter turnout, if the winner was an incumbent, along with presence and sizes of prisons within counties. Implementing regression models like multinomial logit and first differences I was able to encapsulate all my variables and their effects on voting patterns in order to measure the different relationships between them.

Anisa Kammaz, Microbiology

*Genotypic Result of the Insulin-like Receptor Gene Knockout in *Daphnia pulex* EB1*

Faculty Mentor: Dr. Sen Xu

CRISPR-Cas9 has been used in multiple gene modification studies in various organisms. *Daphnia*, water fleas, are used in ecological studies due to their ability to sense and respond to environmental factors. Their quick life cycles make them prime candidates for gene modification and evolutionary studies. In our experiment, *Daphnia pulex* EB1 were used in the knockout of the *Insulin-like Receptor* gene via CRISPR-Cas9 due to its effect of dwarfism in humans and developmental disorders in mice. Polymerase Chain Reaction (PCR) sequencing was done to compare the EB1 gene of interest to the PA42 reference genome, generating a single guide RNA (sgRNA). There were occasional single nucleotide polymorphisms (SNPs); to overcome this, the sgRNA was designed to match the EB1 sequence. In-vitro testing and gel electrophoresis was performed on the digested sample to confirm the knockout was successful.

Prajita Karki, Nursing

Cesarean Birth and Postpartum Depression: A Comparison Between Adults and Adolescents

Faculty Mentor: Dr. Cheryl Anderson

The impact of cesarean birth (CB) on postpartum depression (PPD) has largely gone unstudied. The purpose of this study was to compare the prevalence of PPD between adults and adolescents following a CB. This cross-sectional comparative study design used secondary analysis of a merged dataset representing two separate studies. The resulting dataset provided data for 336 postpartum women. Additional CB and NICU admission filtering produced final sample sizes of 39 participants, 10 adolescents, and 29 adults. A researcher-developed form assessed selected demographic variables including unplanned pregnancy, age, parity, past trauma, prenatal depression, race-ethnicity, and gestational age. PPD was assessed through the Edinburgh Postnatal Depression Inventory (EPDS). Data analysis revealed no significant difference in the EPDS scores for adults versus adolescents, $t=-.197$, $df=37$, $p=.84$; however, sample sizes were very small. The lack of research findings on this issue and age group suggests additional research to better analyze the effects of CB on PPD.

Tabitha Kelly, Architecture

Boomtowns - Mirage of Paradise: An Investigation of Urban Typologies in the U.S.' Largest Energy Corridor

Faculty Mentor: Dr. Oswald Jenewein

Boomtowns have historically been a vernacular urban typology found in resource-extracting territories across the globe. The Permian Basin in West Texas is a territory with numerous petrochemical clusters extracting, refining, and transporting fossil fuels as part of a dense extraction and distribution network. This work aims to (1) locate boomtown territories, and (2) identify the urban elements of boomtowns to classify this typology based on site-specific studies in the era of anthropogenic climate change. Methodologically, a series of geospatial analysis tools are applied to study the morphology of four West Texas cities. The identified elements of boomtowns serve as a typological guide to locate boomtowns within the perforated landscapes of petrochemical production. Correlations are drawn between the natural, cultural, and built environment in these cities to inform architectural and urban design researchers on adaptive strategies in the age of climate crisis.

Ashley Kevil, ESL Elementary Education

The Efficiency of Writing Workshops in Modern-day Learning Environments

Faculty Mentor: Dr. Kathleen Tice

Many of the artistic aspects of writing are lost in the common lecture-style teaching of grammar and essays. A writing workshop is used to resolve this, acting as a coaching approach to teaching writing in which students move at their own pace. To test the efficiency of a writing workshop in present classrooms, the same student was worked with three times a week. These sessions were performed by beginning with 10 minutes on an aspect of learning, followed by 30 minutes of writing, and 10 minutes of conferencing. After working with the student, it was found that the student's writing greatly benefited from the writing workshop. The writing improved in detail, voice, proper grammar, punctuation usage, etc. The student also commented that writing was much more creative than previously thought. Therefore, it is concluded that a writing workshop is useful in today's classroom environment.

Nibitika Khadka, Public Health

Effects of the Lack of Transportation on Health

Faculty Mentors: Dr. Daniel Sledge and Meghna Tare

Health is affected by a multitude of factors; however, most people do not realize how significant of an impact environmental health can have on the human body. Environmental health is made up of several components, one of the most notable being transportation. In Arlington, Texas, there is a lack of public transportation. Instead, residents rely on ride-share services such as Via, Uber, or Lyft (City of Arlington, 2022). This can cause air pollution rates to skyrocket, as most residents need to rely on their own form of transportation or on someone else's car (whether its someone they know or a rideshare application) (Environmental Protection Agency, 2021). The methods utilized for this research were qualitative methods. The methods were split up into two parts: interviews and surveys. Interviews were conducted either in groups of no more than 10 or one-on-one. Surveys were posted around campus. Results are still pending.

Samantha Landers, Nursing

COVID-19 Patients Who Discharge with Home Oxygen Have Lower Readmission Rates Than COVID-19 Patients That Discharge Without Oxygen

Faculty Mentor: Dr. Deborah Behan

The purpose of this study was to explore what the best care should be at discharge after being diagnosed with COVID-19. This was a retrospective study using data from electronic health records. Patients discharged to home with O2 were less likely to be readmitted within 30 days. Linear Regression was computed to determine variables that could predict if discharge with and without O2 would affect readmission rates. When adjustments were made for co-variants, it was determined that patients having been in the ICU on the ventilator were 2.6 times more likely to be readmitted within 30 days. However, COVID-19 patients needing discharge on O2 had reduced readmission rates. Therefore, O2 at discharge for COVID-19 patients helps prevent readmissions within 30 days.

Mikaela Leevy, Mechanical Engineering

Plastic Bending Analysis of a Pin by Non-Linear FEA and Cozzone Method

Faculty Mentor: Dr. Raul Fernandez

Plastic bending analysis methods are important in understanding the structural capability of a part beyond the elastic range of a material in a wide range of practical applications. In the senior design project, the 3/8 in diameter pin is the main structural component in the maritime mooring cam used to moor boats. By taking the analysis a step further than elastic calculations, the goal of this project is to compare two analysis methods of plastic bending to elastic calculations and experimental data. The two plastic analysis methods used are the Cozzone method and material non-linear finite element analysis with three-point bending boundary conditions. The Cozzone method employs an analytical technique to solve for the plastic moment, while the non-linear finite element model is done in ANSYS software. Additionally, the deflection from the non-linear finite element model is compared to the experimental data of a the three-point bending test.

Aaron Ly, Biomedical Engineering

3d In-Vitro Model to Test "No Space, No Cell" Hypothesis

Faculty Mentor: Dr. Liping Tang

The "no space, no cell" hypothesis states that the binding force of the implanted intra-ocular lens (IOLs) affects posterior capsule opacification (PCO) formation. An in-vitro model was used to test this interaction. Previous findings show that the higher binding force of the IOLs, the less likely there is for lens epithelial cells (LECs) to infiltrate and cause PCO. In this study, proliferation and infiltration test was used to determine the efficacy of each IOL material. The results indicate that acrylic has the lowest rate of cell infiltration and proliferation compared to PMMA, and silicone. The data implies that due to acrylic's high binding force, the distance from the posterior capsule (PC) is minimal, cell infiltration is reduced at the IOL:PLC interface and the rate of proliferation is lowered.

Madison Mitchel, Interdisciplinary Studies

Examining Maternal Health Disparities Through Global Comparison and Stakeholder Perspectives

Faculty Mentors: Dr. Kyras Brown and Dr. Andrew Milson

Maternal mortality is a pressing global public health problem that disproportionately affects Black women. In part one of this mixed-methods study, Black maternal health stakeholders (ages 18+) in North Texas were recruited to complete a 25-item survey to understand their perspectives on community-based approaches to health equity. Survey participants (N=16) reported inadequate financial, human, and social resources for addressing Black maternal health (75%) and that they rarely see local efforts focused on policy, systems and structural changes (70%). In part two, a systematic document review was performed to identify and analyze national maternal health policies and programs among five high-income countries with the highest maternal mortality rates. Document review findings indicate that the U.S. has policies that are equally or more equitable than other high-income countries, despite higher maternal mortality rates. The study findings have important implications for reducing maternal mortality among Black women in the U.S.

Benjamin Noori, Psychology

Cultivating Political Humility: The Effect of Value Framing on Policy Preference

Faculty Mentor: Dr. Daniel Levine

This research project aims to explore the persuasive efficacy of using familiar rhetoric and appealing to familiar values when presenting someone with political arguments. Persuasive efficacy is defined as how much a person's position and confidence is moved after the manipulation, and familiar values and rhetoric are determined by the participant's self-described political affiliation. The participants were asked their position and confidence on four political issues, then asked to fill out an intellectual humility scale. For each issue, they were then shown one of four possible videos of a person giving a political argument, with each video containing a different value frame (conservative or liberal) and position (for or against). Participants were then asked again in a post-questionnaire for their position and confidence on each issue. Participants were persuaded more towards a political position if the video they watched appealed to their political values and used familiar rhetoric.

Jessica Nwankwo, Biology

Media Multitasking and Neuroticism Influences on Sustained Attention as Observed through Pupillometry

Faculty Mentor: Dr. Matthew Robison

Media multitasking is becoming more common, but potentially at the cost of memory and attention. Neuroticism, a Big Five inventory measure, could reveal connections to the influence media multitasking may have on attentional control. The present study aimed to observe the impacts of media multitasking and Neuroticism on sustained attention, as measured by pupillometry. Over the span of 4 weeks, participants completed several tasks, with the Sustained Attention to Response Task (SART) being the most notable, as measures of their cognitive performance. Participants' changes in pupil sizes were recorded, and participants completed a number of survey questions. Results indicated that neuroticism and media multitasking were not significantly associated with each other. Results also indicated that media multitasking and pupil variability were not significantly associated with each other. These findings suggest that there may be other, more determining factors that potentially contribute to attentional deficits beyond media multitasking and Neuroticism measures.

Tolulola Ogundiran, Nursing

Examining Neonatal Opioid Withdrawal Syndrome Through Social Determinants of Health, Race, and Ethnicity

Faculty Mentor: Dr. Kristin Gigli

Neonatal Opioid Withdrawal Syndrome (NOWS) is a serious health issue in which an infant withdraws from intrauterine opioid exposure. Due to the opioid epidemic, the prevalence of NOWS increased in the United States. To determine if there are disparities in the NOWS population, Social Determinants of Health (SDOH), race, and ethnicity were examined, as they have not been studied in NOWS previously. The Child Opportunity Index (COI), assessed SDOH factors on a community level. The data from the 2018-2019 Texas Inpatient Discharge Data set identified 1,262 infants with NOWS. A majority were white (75%), non-Hispanic (60%), lived in urban areas (78%), and had Medicaid (80%). The COI was statistically significantly lower for infants with NOWS who were Hispanic, lived in rural areas, or were not privately insured ($p < 0.01$); but there were no differences based upon race. Future research should explore opportunities to address COI disparities among infants with NOWS.

Reagan Potts, Architecture

Sustainable Megastructures: Examining the Synergy Between Smart Technologies and Eco-Friendly Lifestyles in High-Density Urban Environments

Faculty Mentor: Joshua Nason

This undergraduate thesis delves into the concept of megastructures in architecture, which refers to futuristic proposals and experimental designs in urban development during the early 1960s. The study focuses on investigating the potential social and environmental problems that may arise as megastructures become more prevalent in urban design due to technological advancements. The research is significant as it has the potential to impact the architecture community positively. By presenting well-informed insights, designers can make better decisions and address social and environmental issues that may arise due to the implementation of megastructures. The methodology employed in this research involves a comprehensive examination of existing literature and published knowledge on megastructures, followed by a thorough analysis using the lens of sociology and environmental sustainability. The thesis offers an in-depth exploration of megastructures in architecture, addressing crucial social and environmental issues and presenting a creative solution through a design project.

Prithvidhar Pudu, Computer Science

Identifying a Suitable Machine Learning Algorithm to Predict Vehicle Destinations

Faculty Mentor: Dr. Christopher McMurrough

Route prediction is an important tool in understanding the trajectories of vehicles. This information can be used to make intelligent decisions in city planning such as traffic avoidance and pedestrian safety. Machine Learning can predict these routes by learning common patterns from previous vehicle paths. These vehicle paths are plentiful due to the abundance of IoT devices and advancements in computer vision. The most suitable machine learning algorithm that could accurately predict destinations was determined by passing vehicle data to three popular machine learning algorithms: Decision Trees, ANNs, and Naïve-Bayes. The training data for these algorithms was converted into a suitable format using the pandas python library. Moreover, the hyper-parameters for each algorithm were tuned to maximize the accuracy of the prediction. Respectively, decision trees were observed to provide the highest accuracy of 99% with the Naïve-Bayes and ANN showing 90% and 10%.

Isra Asghar Qureshi, Business Analytics

Can Music and Artificial Intelligence Influence Customer Behavior In-Store?

Faculty Mentor: Dr. Daniel Martinez

Businesses use music to influence consumer engagement and product perceptions. For instance, a retail store in China in 2021 utilized artificial intelligence to manipulate in-store music based on customer facial expressions. This paper reviews the literature on music in retail and discusses how business analytics, such as artificial intelligence, can increase customer satisfaction. The paper focuses on how in-store music and artificial intelligence affect customer behavior. Papers addressing the use of music in retail spaces or artificial intelligence in retail were included. Using Web of Science, I collected 52 papers on in-store music and customer behavior, and 79 papers on artificial intelligence and customer perception. The paper provides a thematic summary of the extant research. Finally, I present directions for future research in using artificial intelligence in retail settings.

Usra Asghar Qureshi, Business Analytics

Is AI in Recruitment Getting Better?

Faculty Mentor: Dr. Ruochen Liao

In recent years, artificial intelligence (AI) has become increasingly prevalent in the recruitment process, with many companies utilizing third-party vendors to streamline their efforts. AI has its advantages, such as enhancing efficiency, reducing costs, promoting inclusivity, and pinpointing the most qualified candidates, but it has also faced criticism for algorithmic prejudice and unfair treatment. These concerns can arise from insufficient training, improper technology use, and inadequate parameter specifications. To better understand the public and scholarly sentiment surrounding AI hiring over the past decade, this study aims to conduct sentiment analysis. We intend to determine, through a literature review, whether advances in technology and an increased understanding of AI have made it mature enough to recruit without bias. The insights gained from these findings could prove highly beneficial in enhancing recruitment processes through AI. In addition, they could serve as a basis for ethical and unbiased AI implementation in future research.

Yousha Qureshi, Management

Employees' Needs - According to Maslow's Hierarchy of Needs

Faculty Mentor: Dr. Jerry Hubbard

The concept of quiet quitting or “withdrawal of efficiency” (Bendix, 2019, p. XLV) is not new but has become more prevalent due to the pandemic, during which employees began to disengage from work without formally resigning. The article, What Is Quiet Quitting and How Is It Linked to Engagement? Discusses causes of quiet quitting like poor management, lack of recognition, and burnout. Quiet Quitting: New Term for an Old Problem in a Changed World is an article by SHRM, it states that Quiet Quitting can be addressed by improving communication and recognition, providing development opportunities, and creating a positive work environment. Several scholarly articles have investigated the concept of quiet quitting, including Green Carmichael's Quiet Quitting: A Conceptual Investigation, which mentions that understanding and addressing Quiet Quitting is important but understudied. This investigation will use a hybrid of quantitative and qualitative method to better understand the impacts of Quiet Quitting.

Elizabeth Rhodes, Biomedical Engineering

Exploration of the Relationship Between the Mean Power Spectral Density of Electrogastrography and Gestational Maturation of Preterm Infants

Faculty Mentor: Dr. Hanli Liu

Feeding preterm infants can be a challenge due to gastrointestinal (GI) immaturity which can lead to feeding intolerance, malnutrition, and poor neurodevelopment. Currently there is no non-invasive and quantitative method to determine GI maturity in infants. Electrogastrography (EGG) provides a non-invasive method of measuring gastric myoelectrical activity and has been used in adults to determine gastric abnormalities. EGG was explored as an option for determining GI maturity in preterm infants by quantifying the power spectral density (PSD) of EGG data and its spectral means. The power spectral density and spectral means was calculated during three gastric rhythm (GR) bands (mPSDgr) pre-, during, and post feeding to explore the relationship between EGG and the GI development process.

Sam Safaei Mehro, Electrical Engineering

Development and Implementation of a 14-Segment Display for a Speed Feedback Sign

Faculty Mentor: Dr. Greg Turner

The speed feedback sign is an instrumental tool in providing feedback to drivers on the road to ensure the safety of all patrons around them by showing said drivers an instantaneous visual comparison to the speed limit. While the entire project involves the creation of a speed feedback sign equipped with a camera to record video of speeding vehicles, the contribution presented here is the display for the sign. The sign will not only provide the numerical vehicle speed, but also a message to flash intermittently at a given vehicle speed. The display on the speed feedback sign must not only adhere to Federal Highway Administration (FHWA) guidelines, but also the sponsor's guidelines. Factoring the cost of all implemented components for the construction of this project, the overall design and product is a fraction of the cost of most current commercial competing products on the market.

Toni-Ann Samuels, Nursing

The Relationship Between County-Level Rates of Obstetrics Care Providers and Rates of Preterm Births in Rural and Urban Texas Counties.

Faculty mentor: Dr. Jessica Smith

Preterm births have been rising for decades in the United States. Texas rural hospital closures are rising, which could contribute to fewer OB-GYNs and poorer birth outcomes. The purpose was to determine correlations between OB-GYNs and preterm births in rural and urban Texas counties using secondary data from the Area Health Resources Files. The design was cross-sectional, descriptive, and correlational. There was a moderate, statistically significant correlation between preterm births and OB-GYNs in both rural ($n=115$, $r_s=0.53$, $p<0.0001$) and urban ($n=72$, $r_s=0.73$, $p<0.0001$) counties. On average, there was 1 OB-GYN per 10,000 female population aged 15-44 in rural counties compared to 3 OB-GYNs per 10,000 in urban counties. Given that more urban OB-GYNs are available, further research is needed to understand factors influencing where rural women deliver babies (rural or urban hospitals), and how factors contribute to preterm birth differences among women residing in rural and urban areas.

Ohitha Reddy Sana, Biology

Life History Fitness of F1 Hybrids of Tex Populations of Daphnia pulex

Faculty Mentor: Dr. Sen Xu

Evolutionary theory suggests that fitness decreases with hybridization as a result of negative epistatic interactions between alleles that rose independently in genetic backgrounds making hybrids incompatible with parents' species. However, heterosis can occur as a result of the deleterious effects of negative epistatic interactions making hybrids fitter than their parents. To examine this, the fitness of F1 hybrids of Tex populations of *Daphnia pulex* was determined using body size as a life history trait. F1s obtained from crossing between seven Tex parental isolates were taken from stock and grown under standard conditions to measure their body size. The body size of F1s was significantly lower than their parents in 37 of 50 hybrids while others performed equally well as the parents. This experiment would be an addition to current research on hybridization to understand genetic changes and effects in hybrids.

Meghna Sharda, Political Science

The International Relations Gender Gap: How Does Gender Shape Topics of Study?

Faculty Mentor: Dr. Brent Sasley

Like many other fields, there is a gender gap within the discipline of International Relations. In this gap, female scholars are pushed to pursue specific areas of study compared to male scholars. This thesis argues that women are marginalized in the IR discipline and will aim to determine whether this is the result of a potential gender gap in the field and if so, what solutions can be offered to overcome the gap. To demonstrate this, this study analyzes journal articles in seven prominent disciplinary journals (*International Studies Quarterly*, *International Organization*, *European Journal of International Relations*, *Foreign Policy Analysis*, *Journal of Conflict Resolution*, *International Security*, and *Millennium*) for 1990-2020. For each article, the data collected includes: topic of study, number and gender of authors, theoretical approach, and methodology. The findings show a prominent gender gap across these areas. I conclude with some suggestions to help close the gap.

Janine Shuman, Psychology

Examining the Impact of Sleep Efficiency and Mental Health on Undergraduate Student's Academic Performance

Faculty Mentor: Dr. Matthew Robison

The present study examined the impact of sleep efficiency, subjective sleep quality, and mental health on college student's academic performance, who are susceptible to sleep and mental health disturbances. Prior research on the impact of these variables on academic performance has yielded mixed findings. Participants wore a Fitbit for 21 days to measure sleep efficiency and completed the Pittsburgh Sleep Quality Index, the State-Trait Anxiety Inventory, and the Center for Epidemiologic Studies Depression Scale Revised, to assess subjective sleep quality and mental health. Participants consented to release their academic records, from which we collected GPA. It was hypothesized that sleep efficiency and subjective sleep quality would mediate the relationship between mental health and GPA. Results revealed no significant mediation effects of sleep efficiency and subjective sleep quality on mental health and GPA. These findings suggest that sleep and mental health may not have direct impacts on academic performance.

Caroline Soliman, Biology

Closing Educational Gaps One Inquiry Experience at a Time

Faculty Mentor: Dr. LeeAnn Burke

Learning is a large component of everyday life, with most occurring in an educational setting. As students navigate the school system year after year, existing educational gaps increase. This study observed inquiry learning techniques in the classroom to assist students in making connections with new and previous knowledge while helping students understand the material. Students across multiple classes in the same grade and school were taught their regularly scheduled lesson plan, but it was designed as an inquiry lesson plan. The students then wrote down what they observed/learned and any connections they made. Those journal entries were graded in a rubric with a scale from one to five points. One showing that work was below grade level and five showing work was above grade level. The results of this study showed using inquiry-based lessons in the classroom helped the majority of students comprehend new information, effectively closing educational gaps.

Jonathan Stokes, Interdisciplinary Studies

The Impact Biodegradable Products Have on the Environment

Faculty Mentors: Dr. Diane Jones Allen and Letora Anderson

There is a growing trend for biodegradable products, which aims to provide awareness of our sustainable development goals. In the public eye, it can have an impact on the way sustainable issues are identified and supported. This thesis expresses the principles of sustainability and strategies initiated to promote sustainable welfare. As broad as sustainability can be, it is important to acknowledge which strategies should be developed to mitigate the effects of today's environmental issues. This research identifies the influence businesses through the development of biodegradable products and environmental behavioral change. The relationship between companies and biodegradable products determines if products are made for good use or not. Not everyone is mindful of using biodegradable products as a sustainable way of life. This lack of awareness influences the effects on society and long-term with the environment. By providing and educating consumers with biodegradable household and retail products, we can help meet our current sustainability goals, meeting economically, environmentally, and socially.

Lillian Storm, Biology

*Efficacy of Different Laboratory Methods to Infect *Leptoglossus phyllopus* with Symbiotic *Caballeronia Bacteria**

Faculty Mentor: Dr. Alison Ravenscraft

The insect *Leptoglossus phyllopus* and some other members of the true bug family must acquire their bacterial symbiont every generation from the environment during their second instar. This poses a problem for researchers wanting to study the bugs *in vitro*. We set out to assess five different methods of introducing the bacteria into the insect's environment. We tested the introduction via inoculated water, broth, plant sprig, potting soil, and uninoculated agricultural soil. No significant difference was seen in average adult weight or the development time between treatments. The method of infection did affect the number of insects that reached adulthood which also correlates to how many insects were infected. Insects infected via inoculated water and agricultural soil were significantly less likely to reach adulthood than insects infected via inoculated broth, plant sprigs, or potting soil.

Matthew Swingler, Aerospace Engineering

Characterization of Mach 5 Scramjet Nozzle Flow Using Numerical Propulsion System Simulation

Faculty Mentor: Dr. Donald Wilson

Hypersonic propulsion utilizing the Scramjet engine has been in demonstration since the turn of the millennium, creating the problem of actualizing and computationally simulating the integrated propulsion systems of hypersonic vehicles. Utilizing computational flow simulation using Numerical Propulsion System Simulation (NPSS) software, it has been shown that a top-down model of different engine configurations can be created to model the system using element-wise cycle analysis methods. This project builds on the prior research of Scramjet inlet and burner characterizations followed by the creation of a nozzle element configuration in NPSS with integrated Method of Characteristics and truncated nozzle optimization processes. On-design tests at Mach 5 were conducted with multiple off-design scenarios considered at higher Mach numbers and altitudes for different missions with a conclusive performance report provided. Possible future work includes higher-fidelity models with the NPSS engine configuration layout provided.

Hunter Temple, Biology*Photodynamic Therapy and its Effects on Copper-Cystamine in Liver Cancer Cells*

Faculty Mentor: Dr. Wei Chen

Cancer cells cause adverse effects and life-threatening outcomes for patients battling it. Within the application of treatments for cancer, new methods are created for greater efficacy to reduce the size of the cancer and prevent detrimental outcomes. One treatment method is Copper-Cystamine (CuCy) nanoparticles and the effects on cancer cells. CuCy enables for increased Reactive Oxygen Species production with Photodynamic Therapy and decreased size of cancer cells. This experiment utilizes Cu-Cy-Iodide and Cu-Cy-Chloride applied to liver cells known as HepG2 cells in observing their success for declining the cellular viability of the cells. The application of both types of Cu-Cy nanoparticles with and without Photodynamic Therapy will be observed including X-ray analysis.

Within the application of treatments for cancer, new methods are created for greater efficacy. One treatment method is Copper-Cystamine Iodine (CuCy) nanoparticles made with water, which creates a water-soluble nanoparticle. This enables for increased cellular uptake with Photodynamic Therapy (PDT). This experiment utilizes CuCy-I applied to liver cells known as HepG2 cells in observing their decrease in cell viability. The application of CuCy-I nanoparticles with and without PDT will be observed including hypoxia effects.

Katherine Tran, Biology*Population of Daphnia Offsprings by Combination of Bacteria*

Faculty Mentor: Dr. Matthew Walsh

Daphnias are water fleas that live in ponds and lakes that play a role as primary consumers for all organisms. They primarily eat algae from ponds and lakes; however, cyanobacteria localizes both areas that can risk their longevity and affect all generations of offspring. To understand how much cyanobacteria can affect the population of *Daphnias*, this study was tested on adult *Daphnias* as they reproduce offspring till its fourth generation. In addition, all adult *Daphnias* were placed in three separate trials: algae, cyanobacteria, and a mixture of cyanobacteria and algae inside of each individual jar per adult. Fifteen jars of *Daphnias* in each trial were tested, a total of 135 of the four generations of offspring were reviewed. Based off from all three trials, it was concluded that cyanobacteria had a decreased trend from all generations. As for algae and the combined mixture of cyanobacteria and algae, it showed an increased trend from all generations in offspring.