UTC Spring Research and Arts Conference 2024 Online Program

Comparison of Microplastic Abundance in Environmental Samples Depending on Sample Collection and Preparation Techniques

Cole White

The prolific use of plastics in society has led to an excess of plastic waste, which is not biodegradable. Instead, plastics degrade into continuously smaller particles over time. Microplastic particles (5mm in size) are known to be an environmental and public health concern. Quantification of microplastics in environmental samples, however, is challenging because of inconsistent methodology resulting from small microplastic particle sizes, inconsistent field sampling, cross contamination, varying techniques used to separate microplastic particle from samples, and different counting techniques between laboratories. The results presented from our study aim to identify the best suited techniques for performing microplastic quantification in environmental water samples. Two water sampling techniques were employed during this research, including singular grab samples from the middle of the stream at the surface and multiple grab samples at specific depths and lengths across the stream. These samples were then processed using three different quantification methods published in the literature. Microplastic particles were removed from the water samples by 1) a saltwater density separation method, 2) a single filtration method that involved evaporation of the sample followed by the addition of hydrogen peroxide, and 3) a double filtration method involving a digestion using hydrogen peroxide. All samples were treated with Nile Red dye and imaged using fluorescence microscopy with a (wavelength) laser within 36 hours of being dyed. Photomicrographs collected on the microscope were stitched together to create high-resolution photomicrograph mosaics, which allowed for counting the fluorescing microplastic particles. The results of each method were compared to highlight the differences between the water sampling techniques and quantification methods to find the best quantification methods to use when sampling small streams.

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Children Diagnosed with Autism Spectrum Disorder Sleep Management: A Survey of Occupational Therapy Practitioners with Children Diagnosed with Autism Spectrum Disorder

Kyle Keck, Lacie Dyer, Katie Coppinger, Carissa O'Harrow, Makamie Garland, Anna Waldecker

With a prevalence of 50-80%, sleep disruption is one of the most common comorbidities in children with Autism Spectrum Disorder (ASD). The purpose of this study was to determine current pediatric Occupational Therapist clinical practices in the evaluation and treatment of sleep in children diagnosed with Autism Spectrum Disorder (ASD). A cross- sectional Qualtrics survey was utilized to determine sleep evaluation & treatment practices, perceived importance of sleep in clinical practice and external factors that influence clinical practices. Results revealed that a lack of knowledge (33.98) and training (33. 83) were major barriers of addressing sleep dysfunction despite 52.83% believing its importance. Occupational Therapists value sleep evaluation and interventions with children with ASD, but do not consistently utilize formal sleep evaluations or the prevailing gold standard for treatment.

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A Tale of Two Crises: The Housing Shortage and Homelessness

Aarav Patel, Rithvik Siddenki, Anna Chen, Brenna Parks, Nate Shore

To the Secretary of the United States Department of Housing and Urban Development, The United States has seen significant increases in housing costs over the past few decades. People's incomes, however, have not increased at a rate high enough to prevent economic pressure on those who may find it difficult to afford rent or mortgage. Affordable housing is difficult to come across, and it is an issue that has reached crisis levels. This crisis regarding housing is closely related to another crisis: homelessness. The largest culprit of homelessness is, in fact, the lack of affordable housing. So, with housing prices still on the rise, the big question is: How can we prevent this issue from progressing further? In order to make a judgment on how to address the housing crisis, it is important to look into the future of the housing supply. The first part of this report predicts the changes in housing supply over the next 10, 20, and 50 years in two cities: Albuquerque, New Mexico, and Seattle, Washington. These results display how the housing supply in these two cities differ from each other, and give an idea of how housing supply will change in each city in the approaching years. In order to do this, we determined the carrying capacity of each city, which are 596,149 and 1,117,764 for Seattle and Albuquerque respectively. We then used these values to help solve for the variable a. Once we had everything, we used the logistic growth model to create a model for each city, giving us our answers. For Seattle, the predictions for 10, 20, and 50 years were 366,754; 391,027; and 455,265 respectively. For Albuquerque, the predictions for 10, 20, and 50 years were 267,283; 281,651; and 327,730 respectively. The other factor that is important to look at is visited in the second part of this report: the predicted increase in homelessness in the next 10, 20, and 50 years. For Seattle these were 11,324; 12,831; and 17,352 respectively. For Albuquerque these values were

1,359; 1,257; and 950 respectively. To do this, we used the regression housing models from part one and the homeless and poverty data from the given data set. We also found extra data on the percentage of housing subsidized for people below the poverty line and the percentage of those people who are homeless. As the housing crisis continues, it is important to look for potential solutions. The third section of this report addresses this problem with a possible resolution. As the situation in Albuquerque is nowhere near as concerning as the situation in Seattle, this section focuses on fixing the issue of homelessness within Seattle alone. Our solution aims to increase the percentage of affordable housing compared to total housing. In addition, our solution will add psychiatric beds in order to take out the constant variable of the mentally ill from the total amount of homelessness.

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Fitness Consequences of Social Organization and Social Structure in Octodon degus
Jessica Morales Valenzuela

Animal social systems consist of four inter-related components including social organization (size, composition of social units; SO) and social structure (non-mating interactions that influence fitness; SS). To understand the current utility of different social system components, we need to understand how SO and SS influence reproductive success (i.e., fitness). Numerous studies have focused on the relationship between fitness and social unit size, but other aspects of SO could explain some variation. Social network analyses (SNS; quantitative measures representing social relationships among individuals) can be used to quantify SS. As large groups enable social bonds to form, an interaction between SO,SS, and fitness is possible. I plan to test multiple hypotheses for direct effects of SO, direct effects of SS, and the interactions between SO and SS influencing fitness in Octodon degu by examining (1) how adult sex ratios and homophily in adult females within social units influence fitness measures, (2) how SNS metrics influence fitness, and (3) the interactions between SO, SS, and fitness. In Aug.-Nov. of 2022/2023, individuals were live-trapped and fitted for radio collars. Night-telemetry determined the locations of individuals' nest sites as the nighttime sharing of burrow systems is the main determinant of social unit main determinant of social unit membership. My study will provide a comprehensive understanding of the evolutionary significance of social complexity by being the first to determine how SO and SS together may influence fitness. Funded by NSF OISE 1854177.

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Participant engagement and satisfaction of the STEM-focused ANGELS summer pilot for adolescent females from communities of color in Southeast, Tennessee.
Wendy Jiang

Title: Participant engagement and satisfaction of the STEM-focused ANGELS summer pilot for adolescent females from communities of color in Southeast, Tennessee.

Authors: Wendy Jiang, BS, Marissa McElrone, PhD, RDN, CPH

Background: ANGELS (Agriculture & Nutrition for Gils while Encouraging Leadership & STEM Enrichment) is a program for female adolescents from communities of color aiming to increase interest in STEM content and careers by complementing STEM-education with experiential agricultural and nutrition activities. The study goal was to measure participant engagement and satisfaction from the ANGELS summer pilot.

Methods: The ANGELS summer pilot was implemented by program staff over 6 weeks in summer 2023 on a university campus in Southeast, Tennessee. Each week of the full-day programming had a different STEM-related theme and activities (e.g., agriculture, leadership, sciences, nutrition). At the end of every week, participants completed self-administered weekly process evaluation surveys through an online survey platform (Qualtrics). The 11-item instrument explored opportunities for programmatic improvement, and participant satisfaction and engagement. Descriptive statistics were calculated in SPSS 29.0. Inductive coding was applied to qualitative data in Excel. Code frequencies were calculated to inform the development of word clouds to visually represent qualitative data.

Results: All participants were 6-8 th grade female adolescents from communities of color (n=16). Participants reported a group mean engagement score of 3.41±.62 for the entire program with the highest and lowest group mean engagement scores reported for the Week 1: Leadership (3.75±.62) and Week 3: Engineering (3.23±.58), respectively. Participant qualitative feedback indicated the popularity of engaging activities such as escape rooms, cooking, and swimming and the need to add more interactive activities during speaker presentations.

Conclusion: Participants indicated overall engagement and satisfaction with the ANGELS summer pilot. Larger scale studies to measure the effectiveness of the ANGELS program to increase interest in STEM content and careers are needed.

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2023 Hamilton County Public Health Survey Findings
Dawn Ford, Laura Baker

The Hamilton County Health Department, the Hamilton County Regional Health Council, and UTC partnered to administer the county's first public health survey in April-June 2023. The objective of the survey was to better understand the health issues and concerns of Hamilton County adult residents. The 35-question survey was administered online and on paper, in English and in Spanish, through electronic distribution, in-person events, and mailers to homes. There were 3,383 valid survey responses, representing all Hamilton County zip codes. Survey responses were mostly from women (64%), married persons (56%), those 65 years old and over (33%), those with a household income >$50,000 (60.2%), those with a Bachelor's degree or higher (63%) and White persons (75%). This poster presents results of the survey.

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A Combination of Modified Stacking Method with Voting Ensemble Technique for Binary Classification
J M Imtinan Uddin

Binary classification is a frequently encountered machine learning problems. Many machine learning algorithms are used to solve binary classification problems. However, all machine learning algorithms are not suited or efficient for solving binary classification problems. In this paper, authors has proposed a approach. The proposed approach is a machine learning algorithm, to solve binary classification problems. Authors has combined modified stacking and voting ensemble machine learning techniques for binary classification problems. Before combining the ensemble techniques, authors has modified the stacking ensemble technique for making the proposed method more robust.

This proposed method was applied on two different binary class data set to generalize. The experimental result of the proposed method shows that it can effectively classify binary class data set with an improved accuracy of 99.63%.

Moreover, it shows better performance than other state-of-the-art machine learning algorithms for binary classification.

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A comparative analysis of plane and avian airfoils.
Ryan Wilson, Elliott Hill

Airfoils are defined as an optimized curved surface, designed to provide the best ratio of lift and drag in flight. Necessary to establish the wings, fins, and stabilizers within the majority of aircrafts, Airfoils are essential to the aeronautical industry. Yet before humans reached the skies, the natural world existed as the only physical representation of flight, evolving through a perfect balance of adaptation and natural selection. In this analysis, we compare avian and manmade airfoils. To do this, we input various airfoils into xFoil, with each foil representing different wing designs, from the soaring albatross to the common seagull and from the Boeing 707 to the Cessna 172. The results helped to distinguish differences from foil to foil, as well as similarities in their properties. Based on the identified aspects of each wing, it is possible to apply the characteristics of birds' wings to airplane wings. For example, airliners have wide leading edges and chambers with narrow trailing edges, allowing for optimal soaring capabilities. Seagulls, proportionally, have a fairly similar shape, as both the plane and the bird need to be able to travel long distances. It would not be a stretch to say that an airliner, or perhaps a new plane, could be inspired off of a seagull's airfoil.

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A Preliminary Vascular Flora of Bark Camp Barrens WMA in Coffee County, Tennessee
Quinn Towery

Bark Camp Barrens Wildlife Management Area (BCB) is a 1,395-ha area located in Coffee County, Tennessee. BCB is owned and managed by the Tennessee Wildlife Resources Agency and is included in the Eastern Highland Rim Prairie and Barrens Conservation Opportunity Area. BCB occurs in the Barrens region of the Eastern Highland Rim physiographic region, an area typified by flat to gently rolling hills and acidic unproductive soils. The Barrens region of Tennessee hosts numerous populations of disjunct Coastal Plain plant species such as *Dichanthelium wrightianum* and *Mnesithea rugosa* (Poaceae). Although the Barrens of the Eastern Highland Rim are floristically diverse and intriguing, few comprehensive floristic studies of this region have been published. When compared to the adjoining physiographic regions of the Cumberland Plateau (10 published floras in TN) and Central Basin (3 published floras), the Eastern Highland Rim only contains 1 published flora, Short Mountain, which isn't representative of the EHR Barrens and more closely resembles the flora of the Cumberland Plateau. It is the goal of this study to catalog all vascular plant species within BCB, create a better understanding of the vascular flora of the Eastern Highland Rim Barrens as a whole, and identify pathways to protect additional Eastern Highland Rim Barren sites within the state. To date we have collected 309 specimens and identified 291 taxa from 70 families and 167 genera. Here we would like to give an update on our progress from the previous field season and showcase our ongoing efforts to create a better understanding of the vascular flora of the Eastern Highland Rim Barrens.

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A Qualitative Examination of Work Demands, Resources, and Barriers for Well-Being in Immigrant Workers
Amira Marquez Moreno

Latino immigrants often work in risky occupations with high social, role-related, physical, and psychological demands. While Industrial and Organizational Psychology and other disciplines are trying to understand the working experience of this population, immigrants continue battling against these challenges at their jobs. The proposed research aimed to identify some of the demands, resources, and barriers Latino immigrants experienced using four focus groups with a sample of 24 participants. The participants were recruited through snowball sampling with the inclusion criteria of being at least 18 years old, working at a manual labor job, and working in the United States for at least one year. The participants answered a semi-structured interview assessing perceived challenges at work, current and desired perceived resources, and barriers to accessing those resources to protect well-being. After conducting a thematic analysis, it was found that immigrant workers experienced daily demands at the social, role-related, psychological, and physical levels. Some of these demands included moral injury, discrimination; workload, time pressure;

learned helplessness and lack of mental recovery; and a series of physical and environmental work hazards. Some of the barriers mentioned were language barriers, lack of training and hazard prevention, and misinformation about the immigration processes. Some resources included building self-efficacy, social support in the workplace, immigration readiness, and resilience, concluding that immigrants experiences more demands and less resources

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A Study of a Variation of BB84 Quantum Cryptography Protocol for Improving Key Rate and Information Security
Matthew Boone

In the modern world, information security relies heavily on encryption via key distribution, ensuring that only a sender and receiver can decrypt a transmission. Despite the implementation of such classical encryption, many algorithms still leave transmitted information susceptible to eavesdropping. To mitigate the effectiveness of eavesdropping, quantum techniques such as BB84 have been developed in the new age of quantum key distribution (QKD). The BB84 protocol allows one to generate a secure key by randomly changing quantum state bases between a sender (Alice) and receiver (Bob). Making use of quantum random number generators (QRNG), the protocol ensures true randomness of key generation. Additionally, eavesdropping (by Eve) is hindered by the probabilistic nature of photonic superposition at the point of measurement. We simulated biasing the choice of basis for a sender and receiver in the BB84 protocol (variation to original BB84) to determine the improvement of key generation rate and information security. Additionally, we also analyzed the effects of an eavesdropper biasing their choice of basis. We demonstrate that a varied BB84 protocol utilizing biased basis can improve key generation rate while retaining information security. Additionally, we found that there exists a bias region where, even with ideal performance of Eve, she is not able to obtain more mutual information than shared by Alice and Bob. This spring, we plan to implement the findings on a quantum network test bed via a quantum node lab on UTC campus that provides access to a quantum network.

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A Caravel Conundrum: Searching for the Lost Ships of Christopher Columbus's 4th Voyage to the New World
Morgan Smith, Andrew VanSlyke

On May 9th, 1502, Christopher Columbus left Spain for his 4th and final voyage to the New World. He was determined to find a sea route to the riches of Asia and attempt to clear his name, sullied by his mistreatment of his fellow colonists in the new-found West Indies. After nearly two years of sailing, Columbus failed to find such a passage and was forced to turn back. But he faced a serious problem. Near the end of the voyage, Columbus's ships were being slowly destroyed by Teredo navalis, a wood-boring worm common in tropical waters.

Having lost the shipwrights and caulkers in a skirmish with natives, Columbus sailed straight for Jamaica with his crew bailing water from the vessels constantly. Columbus ran his ships aground in Jamaica where his crew established a survivor camp and awaited rescue for a year before finally being able to return to Spain. 500 years later, multiple efforts have been made to relocate these caravels, without success. In 2024, a new effort was launched to integrate new technology into the search and build atop previous efforts, in an attempt to locate these long lost caravels. This paper describes the voyage of Columbus, the nature of previous explorations, current and ongoing efforts, and the significance of these ships to the history, people, and culture of Jamaica and the international archaeological community https://symposium.foragerone.com/utc-spring-research-and-arts-conference-2024/presentations/62559

Abundance and Treatment of Microplastics in Surface Water Environments in Greater Chattanooga
Mithu Chanda

Microplastics (MPs) are plastic particles smaller than 5 mm in diameter and are predominantly found in water, soils, and sediment matrices. Their widespread presence in the different media increases the risk of ecosystem functioning, as they are toxic to various species and are considered global threats. However, research on MPs in freshwater environments, particularly surface water sediment, is still marginal compared to other ecosystems. Understanding their abundance in stormwater retention ponds is crucial for pollution control management. Green infrastructure, such as bioretention systems, performs better for stormwater runoff management and can be a good receptor for MPs pollutants. Therefore, in this study, we present the abundance of MPs in the surface water sediment of Chattanooga environments and observe the efficacy of bioretention systems as an alternative for MPs control in the environment. Collected sediment and bioretention samples were divided into different fractions, laboratory analysis was performed, and microplastics were analyzed using an optical and fluorescence microscope after preparation. We quantified MPs concentration in Chattanooga environments. The results revealed that microplastics are predominantly found in the form of fragments in all samples, including sediment and bioretention. MPs concentration was higher in residential sediment samples. Bioretention systems showed good MPs retention for pollution control, serving as sustainable mitigation techniques. Our proposed presentation will not help regulators, scientists, and engineers in MPs control but will provide prospects for research exploring their analytical procedures.

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ACUTE IMPROVEMENTS IN QUADRICEPS RATE OF TORQUE DEVELOPMENT IN YOUNG ADULTS USING MOTOR LEARNING THEORY
Caitlin Gray, Nina Bill, Lenzie Newman

Reinjury rates of anterior cruciate ligaments in the knee are as high as 33%. Quadricep re-education is a one component for these poor outcomes. Rate of torque development is key

in restoring quadricep function in athletic populations as it influences gait and goal directed activities. Optimizing Performance Through Intrinsic Motivation and Attention - Performance, Rehabilitation, Exercise, Play also known as OPTIMAL-PREP is a rehabilitation strategy that uses three pillars of motivation and attention to build a rehabilitation program that takes the focus off of the injury and onto an outside source while giving the participant autonomy.In young adults, using OPTIMAL-PREP intervention can increase quadricep RTD in the dominant kicking leg. The use of OPTIMAL-PREP will lead to greater improvements in RTD of the quadriceps, in contrast to the control condition.

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Addressing Barriers to Improving Health on San Salvador
Laura Baker, Justin Ballew, Ashley Ellis, Dawn Ford

This research aims to address the increasing prevalence of chronic disease due to poor nutrition on a small island in the Bahamas by better understanding the barriers to healthy food access and food insecurities. The small Bahamian island of San Salvador of less than 1,000 people has benefited from public health efforts including local nutrition and chronic disease education for children and adults and a community health survey. The research question of this project is: What barriers exist to improving health due to diet on San Salvador? Our goal is to understand the community's needs better, and the approach to this research topic is qualitative research, which is used in public health to understand community needs better. My project includes an IRB-approved community focus group that facilitates in-depth qualitative discussions surrounding food access and barriers and interest in home gardening. This research will be utilized in constructing a comprehensive strategy aimed at closing knowledge gaps on the barriers among San Salvador residents to healthy food access and building upon a container gardening pilot program designed for rural island communities.

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Addressing Health Equity, Access, & Diversity Through Nursing Simulation Experiences & Partnership Program "AHEAD-RN"
Maggie Duckworth, Brooke Epperson, Rosebelle Peters, Tessa Mullinax-Baker, Jenny Holcombe

Through AHEAD-RN, UTC and clinical partners will improve nursing availability/capacity by focusing on health care needs and improving patient outcomes of rural and/or medically underserved populations utilizing innovative academic practice partnerships to prepare practice-ready BSNs via clinical and simulation experiences that integrate academic and clinical learning and prepare nursing students to provide quality, culturally-inclusive, and inter-professionally collaborative care.

Project activities will include development of the AHEAD-RN; recruitment, preparation, and on-going coaching to support and retain students to practice in rural and underserved areas upon graduation; implementation of standardized patient scenarios, and other learning resources; and clinical learning experiences in dedicated partner sites for trainees. Project leadership and staff will oversee and support all aspects of project implementation while the program evaluation plan ensures the ability to assess the impact of AHEAD-RN activities/interventions and provide continuous feedback to support ongoing rapid cycle quality improvement.

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Advancing Manufacturing Efficiency: Electroforming Nickel onto 3D-Printed Die Plates for Rapid Injection Molding

George Thompson, Mohammad Mahtabi

The traditional method of manufacturing injection mold die plates involves time-consuming processes such as milling and hand polishing. These processes can take over a month to achieve the desired smooth and polished interior surfaces necessary for effective injection molding. This research addresses the critical need for a more efficient method by exploring the interior surface condition of electroformed nickel onto 3D-printed (SLA) materials. The literature reveals a significant gap in the current discourse regarding rapid and cost-effective methods for producing high-quality die plates for injection molding.

This research project aims to determine the feasibility and effectiveness of using electroformed nickel on 3D-printed die plates for injection molding. The specific research question guiding the study is: Can electroforming provide a smooth, hard interior surface that mirrors 3D-printed die plates, with sufficient mechanical properties for tens of thousands of cycles before failure?

The research involves the electroforming of nickel onto 3D-printed die plates using SLA technology. This method is chosen for its potential to significantly reduce the time required for die plate production. The electroforming process is examined for its ability to create a surface that mimics the intricacies of the 3D-printed mold while maintaining the necessary mechanical properties for prolonged use in injection molding.

The anticipated results of this research include the development of a rapid and cost-effective method for creating injection mold die plates. By utilizing electroformed nickel on 3D-printed surfaces, the expectation is to achieve a smooth interior finish that meets the requirements for injection molding. This process has the potential to reduce production time from over a month to just a couple of days, revolutionizing the efficiency of manufacturing.

The significance of this research lies in its potential to revolutionize the manufacturing industry by drastically reducing the time and cost associated with producing injection mold die plates. The successful implementation of electroformed nickel on 3D-printed surfaces

could have profound implications for a wide range of industries relying on injection molding. Future research may explore optimizing the electroforming process further or expanding its application to other manufacturing processes, thereby contributing to the ongoing discourse in advanced manufacturing techniques.

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Adverse Childhood Experiences Effects on Resilience
Peyton Fry, Ansley Atchley, Sunee Mills, Emily Moehlmann, Kendra Spangler

Our project examines the effects of Adverse Childhood Experiences on Resilience. We conducted a research study to examine if there is a correlation between ACEs and Resilience.

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Alkynyl Iodide-Based Halogen-Bonding with Isocyanides to Improve Utility
Nehemiah Antoine

Isocyanides are utilized in synthetic chemistry and are used in multicomponent reactions such as the Ugi and Passerini reactions, but their pungent odor limits their utility. Halogen bonding was found to quell the stench of isocyanides while retaining their original properties, in particular, halogen bonds were formed between iodo-pentafluorobenzene and isocyanides. We are interested in expanding the repertoire of halogen-bonded isocyanides and so have investigated alkynyl iodides, a class of halogen bond donors. We used FOPT calculations with a STO-3G basis set to compare the halogen bond lengths and complexation energies of our proposed scheme, 4-iodoethynyl-nitrobenzene and 2,6-dimethylphenyl isonitrile (3.908 Å and -0.90 kcal/mol), to that of a co-crystal from the literature: iodo-pentafluorobenzene and 2,4,6-trimethylphenyl isonitrile (3.987 Å and -0.29 kcal/mol). Then, we synthesized 4-iodoethynyl-nitrobenzene to co-crystallize with 2,6-dimethylphenyl isonitrile. On the halogen bond donor, the strong polarizing effect of the sp carbons and the electron-withdrawing effect of the nitro group polarize the iodine atom to become electrophilic. Our hypothesis is that alkynyl iodides would suppress the odor of isocyanide due to halogen bonding.

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An Analysis of Algorithms for Customer Segmentation in Custom Marketing
Nandni Patel, Prisha Purohit

Abstract— Effective marketing in today's competitive corporate environment depends on knowing and using consumer behavior. Using advanced clustering techniques like K-means

and hierarchical clustering, this study focuses on the critical role that customer segmentation analysis plays in identifying consumer trends. This study advances our knowledge of successful customer-centric tactics and the various business contexts in which clustering algorithms are applied by utilizing datasets from Kaggle, notably examining Real World Data Sets of Netflix algorithms.

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Analysis of Dynamically Dominant Flow Structures in Turbulent Channel Flow under Stratified and Neutral Conditions
Steven Thompson

The presence of density stratification adds to the complexity of turbulence by affecting the small-scale mixing, the large-scale circulation, and the inter-scale interactions. The density in underwater naval flows depends upon temperature and salinity scalars. A key feature of such flows is the presence of internal waves, which affect its spatio-temporal dynamics. In this study, the spectral and modal characteristics of turbulent channel flow under stably stratified and neutral conditions are examined. We analyze direct numerical simulation datasets at a frictional Reynolds number of 395 and the frictional Richardson number of 0 (neutral) and 60 (stratified). First, the two-dimensional spectra of fluctuations in the vertical velocity, density, momentum flux, and buoyancy flux at different wall-normal planes are obtained to examine the role of buoyancy and shear-generated turbulence. Afterward, the presence of internal waves, a characteristic feature of stratified turbulent flows, is inferred in terms of the phase relationship between the vertical velocity and density fluctuations. Finally, the spatial and temporal structure of the internal waves is examined using the spectral proper orthogonal decomposition technique to obtain the dynamically relevant flow structures.

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Analysis of Vibratory Pile Drivers using Longitudinal and Rotational Oscillations with a Purely Plastic Soil Model
Don Warrington

Driving piles by longitudinal vibrations has been a proven technology since the Gorky dam project in the late 1940's. Shortly after that drivers which included both longitudinal and rotational oscillations were developed for driving tubular piles, both steel and concrete. Recent renewed interest in this technology for large offshore piles has occasioned the re-examination of the analysis of these piles using methods similar to those that Soviet developers used. In this paper a purely plastic model for both shaft and toe resistance is used parametrically to analyse the performance of these machines. Starting with the free-hanging case of no resistance with or without the effect of gravity, a dimensionless, parametric model was developed to analyse the system. Comparison with earlier analyses of a similar kind is included. The results shown an improvement in the movement of the pile

per rotation of the eccentrics but further work needs to be done with improved soil modelling for more conclusive results.

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Analyzing Chattanooga's Tree Ordinance
Samantha Reese

The goal of a tree ordinance is to outline the procedures and guidelines that citizens and businesses must follow to protect trees and improve the local urban forest. Each ordinance is different, with variations in specific objectives that lead to more or less restrictive guidelines. As Chattanooga seeks to improve their urban forest, the aim of this research is to identify effective tree ordinances from two cities and compare them with Chattanooga's in order to highlight possible areas of improvement. For this research, background information was gathered through literature review and criteria for choosing two city ordinances was developed. An ordinance's terms and definitions, permitting processes, purpose and intent, consistency and flexibility, timing, tree care provisions, and enforcement are analyzed and compared to one another. By analyzing the differences and similarity between ordinances, this research hopes to gain information on the type of guidelines and procedures that could help improve Chattanooga's protection of tree health and presence. Urban forests have multiple benefits that could be classified as environmental, economic, and social. These benefits include improving air and water quality, saving energy, managing stormwater, and improving quality of life. As the city of Chattanooga continues to grow and develop, ensuring the protection of greenspaces and the natural environment is essential. Accomplishing this will heavily rely on having clear and effective ordinances and policies implemented.

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Analyzing Stock Market Data with Python
Joseph Ballew

The stock market is a highly volatile and complex system that people have been trying to understand on a deeper level for decades. With the growing popularity of machine learning algorithms and applying computation to complex systems, I tried my hand at applying these techniques to stock market data. For this project I used the python programming language to apply a clustering algorithm to the price movement data of 25 stocks from 5 different sectors to see how well stocks were clustered by sector. I also built a long short-term memory neural network to try and predict stock market closing prices on historical data alone.

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Application of PlanetScope Remote Sensing Data for Flood Mapping: A Case Study from South Chickamauga Creek, Chattanooga, Tennessee
Mithu Chanda

Floods stand out as one of the most expensive natural calamities, causing harm to both lives and properties for millions globally. The increasing frequency and intensity of flooding underscores the need for accurate and timely flood mapping methodologies to enhance disaster preparedness and response. Earth Observation data obtained through satellites offer comprehensive and recurring perspectives of areas that may be prone to flooding. This paper presents the suitability of PlanetScope satellite data for flood mapping through a case study in South Chickamauga Creek, Chattanooga, focusing on the significant flooding event in 2020. Utilizing PlanetScope satellite data, our research aims to provide an efficient and accessible approach to flood assessment. Methodological aspects included image preprocessing, classification algorithms, and accuracy assessment techniques to ensure the reliability of the flood mapping results. By integrating optical and infrared data, we delineated the extent of floodwaters, identified affected areas, and assessed the severity of inundation. Additionally, temporal analysis enabled the identification of flood progression and recession patterns, contributing valuable insights for understanding the dynamics of the South Chickamauga Creek flooding event. The utilization of PlanetScope data serves as a cost-effective and readily available resource for flood mapping applications. Our findings contribute to the local understanding of the flood event in Chattanooga and demonstrate the feasibility of utilizing PlanetScope remote sensing data for accurate and timely flood mapping.

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Applying the ARCS Model in Occupational Therapy Education to Implement Service Learning
Courtney Boren

While the benefits of service-learning in higher education are well established in the literature, overwhelmingly, research has focused on identifying the cognitive and affective student outcomes. Occupational therapy education utilizes fieldwork experiences in various levels and formats, but integrating additional community-based learning through service may be challenging to educators despite the identified benefits. Therefore, how can occupational therapy educators efficiently scaffold service-learning into existing courses? A review of the attention relevance confidence satisfaction (ARCS) model and the benefits of service learning was completed through a review of meta-analyses. This case report will link theory to application by reviewing a course implementing the ARCS model in an associate of applied science occupational therapy assistant program. Results demonstrate the use and benefit of the ARCS model as a means for occupational therapy educators to scaffold didactic learning and implement high-impact service learning into course design. Utilizing the ARCS model for practical implementation of service learning in the occupational therapy

classroom contributes to providing innovative learning experiences and advocating for the profession beyond the classroom walls.

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Assessing the properties of coated biodegradable magnesium alloys
Devin Melton

The area of this subject is oriented to the biomedical field and further researching and testing methods that could be beneficial to this field. The hypothesis I was working with was if coating a magnesium alloy would overall be more beneficial. The overall goal was to find what was higher performing a coated sample or a uncoated sample and record that data.

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Assessing the Relations among Self-Care and Fears of Positive and Negative Evaluation
Byron Russell, Ashley Howell

Introduction: Previous research (Werner et al., 2012) has shown that low levels of self-compassion, a feature of self-care, are related to higher levels of fear of negative evaluation (FNE) and positive evaluation (FPE). However, the literature has not yet explored the relationship between broader domains of self-care, such as grooming, managing medical care, and engaging in enjoyable hobbies, and FPE. I hypothesize that self-care and FPE will be negatively correlated, with individuals who experience a greater FPE conducting less self-care tasks. Using a bivariate correlation, this research poster tests this relationship.

Methods: Our sample included participants (83.3% white, 71.8% female, average age = 29), recruited through a larger, ongoing community-based study (n = 77), who completed self-report measures related to self-care from the Inventory of Psychological Functioning (IPF; Marx et al., 2019) fear of negative evaluation using the Brief Fear of Negative Evaluation Scale (BFNE; Watson and Friend, 1969), and fear of positive evaluation using the Fear of Positive Evaluation Scale (FPES; Weeks et al., 2008). A bivariate correlation analysis was employed to measure the relationship between these variables.

Results: The bivariate correlation analysis between self-care, FPE, and FNE yielded significant results. It found a negative correlation between self-care and FPE, with a Pearson correlation coefficient of -.30, indicating a moderate negative relationship (r = -.30, p = .009). Additionally, a positive correlation was found between FPE and FNE, with a Pearson correlation coefficient of .44, suggesting a moderate positive relationship (r = .44, p p = .112). Overall, these results indicate that individuals who demonstrate higher levels of self-care show lower levels of fear of positive evaluation (FPE), and that the relationship was similar, though not as strong, for self-care and fear of negative evaluation (FNE). Collectively, these findings suggest that individuals who engage in more self-care behaviors demonstrate less fear of evaluation.

Sources: Werner, K. H., Jazaieri, H., Goldin, P. R., Ziv, M., Heimberg, R. G., & Gross, J. J. (2012). Self-compassion and social anxiety disorder. *Anxiety, stress, and coping*, *25*(5), 543–558. https://doi.org/10.1080/10615806.2011.608842

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Assessing the Viability of GeO_2/GeO Redox Thermochemical Cycle for Converting CO_2 into Solar Fuels
Diya Patel

The solar thermochemical process of splitting CO2, known as CDS, is studied here using a redox cycle involving GeO2/GeO. The required thermodynamic data for a second-law-efficiency analysis is obtained from the HSC Chemistry software. The goal of this study is to investigate how different parameters, such as the operating temperatures and molar flow rate of the inert sweep gas, as well as the inclusion of separation units, heat exchangers, heaters, and coolers, can affect the solar-to-fuel energy conversion efficiency of the GeO2/GeO cycle. All calculations assume a constant gas-to-gas heat recovery effectiveness of 0.5. The analysis shows that the solar-to-fuel energy conversion efficiency is lower at a thermal reduction temperature of 1600 K (11.9%) compared to 2000 K. This is because high energy duties are required for heater-2, heater-3, and separator-1 due to the need for a higher inert gas flow rate. After conducting a comparative analysis of the three CDS cycles, it can be inferred that the GeO2/GeO cycle exhibits a significantly higher solar-to-fuel energy conversion efficiency in comparison to the ZnO/Zn and SnO2/SnO cycles across all thermal reduction temperatures. According to the comparison, it is confirmed that the GeO2/GeO CDS cycle can achieve a reasonably high solar-to-fuel energy conversion efficiency of 10% at less than 1600 K. On the other hand, ZnO/Zn and SnO2/SnO CDS cycles require a thermal reduction temperature of more than 1850 K to achieve a solar-to-fuel energy conversion efficiency of 10%.

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Assessment of Microplastics in the Gulf of Cadiz
Sarah Lewis

In our assessment of microplastics in the Gulf of Cadiz, Spain, our main objective was to characterize the plastics at different sampling points by the output of the Guadalquivir river. The chosen samples were taken in 2018 after a series of heavy rains, and we predicted that the rains disrupted particles in the once dry river beds. We considered if the distance to the mouth of the Guadalquivir river determined the distribution or the characterization of the microplastic particles. The samples were collected at points extending away from the mouth of the Guadalquivir outward into the Gulf of Cadiz. In our assessment, we separated samples stored in formol using brackish water from the Rio San Pedro in order to analyze the different types of microplastic particles contained in each sample. This process was

done primarily by hand. Particles were placed in crystallization dishes that were then dried, photographed, and processed through a program called ImageJ, which used algorithms to measure and characterize each particle. We were able to use the data it collected to create a general assessment of the microplastics in the Gulf of Cadiz. We found that the majority of the particles were fragments, between 0.5-1.0 mm in ferret diameter size, and brown in coloration. We predict that the brown coloration indicates potential degradation of the plastics, which supports our hypothesis that many of the plastics originated from the Guadalquivir. However, further assessment needs to be done to confirm that line of thought.

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Assigning coefficients of conservatism to the vascular flora of Tennessee and Kentucky.
Sevyn Brothers

Anthropogenic land-use change and intensification have significantly affected the integrity of our natural ecosystems, causing strong biodiversity loss. Ecosystem integrity is defined as "the extent to which the composition, structure, and function of an ecosystem fall within their natural range of variation," and loss of ecosystem integrity is not restricted to one type of ecosystem. While methods to measure ecosystem integrity exist, years of field-experience are necessary to make accurate assessments. Over the past 20 years, the Floristic Quality Assessment (FQA) has been more frequently used to compare the intactness and quality of sites. At its core, FQAs consist of only two parts: a species checklist and their corresponding coefficient of conservatism (c-value). C-values are bipartite, and they consider how tolerable a species is to disturbance and a species' fidelity to specific habitats. While it is more accurate to assign c-values per species per ecoregion, applying c-values at the state level is common practice due to resource allocations. Tennessee and Kentucky's c-value assignment is incomplete for many reasons. While a small slice of wetland species have published c-values, the vast majority of species have informal assignments. To expedite the process of completing c-value assignment, we are analyzing c-values provided by twelve experienced botanists, published c-values for a small slice of Tennessee and Kentucky's wetland species, and from seven supplementary databases. To date, we have effectively assigned values to 64% of Tennessee and Kentucky's flora.

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Association of Cumulative Training Load and Monotony on Core and Lower Extremity Injuries among College Football Players.
Colt Batie, Dylan Walker

Description-
64 college football players wore catapult GPS trackers that were able to calculate their instant acceleration and direction change loads. Using this accumulated data, multiple variables were used to predict injury risk based on the different parts of a college football

season. When breaking down a football season into different "phases" you can see how these variables have differing predictive power for injury risk.

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Association of Perceptual-Response Training with Injury Incidence among Secondary School Athletes.
Kyle Mether, Zoe Perrin, Samuel Emberton

Description: To assess the potential value of virtual reality for assessment and training of perceptual-response efficiency, including the analysis of a possible relationship to injury occurences among trained and untrained female high school soccer athletes.

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Associations among Concussion History, Psycho-Affective Status, and Dual-Tasking in College Students
Morgan Lambert, Amber Roundtree

To identify potential associations between lifetime concussion history, psycho-affective status, and dual cognitive-motor task performance in healthy college students.

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Beloved Other: A Language of Liberation through Difference and Community
Salem Murray

Queer, intersectional theory has relied on the importance of embodiment for liberation movements, such emphasis on embodiment is a turn towards the body especially within postmodern and poststructuralist theory. But in order to avoid essentializing the body, such theories must not forget the cocreation of the body through and with language. Through my theory, Beloved Other, I offer a praxis of embodiment through the deconstruction of language which understands the potential energy between language and the body as evidence for the importance of story telling within cultural knowledge production. Relying on the theories of Black Quantum Futurisms and a tradition of Queer and intersectional theory, I define Patrilinear time as a mistranslation of Newtonian physics that colonizes space/time and queer futurities and offer a conjugation of Beloved Other in order to help create new worlds of liberation. To emphasis the importance of moving theory into praxis I will showcase a physical artistic text that I have created along side members of my community. I offer my theory, Beloved Other, as a tool for building a world always already aware of how the past has brought us to the present, but knowing that regard for the past does not foreclose future ancestors we may never recognize, but who are our ancestors

nonetheless. This is the beginning of a (re)theorization of the body, through language, to build Queer communities of liberation.

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Beyond the Unknown: A Literature Review on the Consequences of Fear of the Paranormal in the Workplace and Its Impact on Job Outcomes
Endia Butler

Despite considerable research on the impact of workplace fear on employee performance, well-being, and job outcomes, the specific area of fear of the paranormal in the workplace remains largely unexplored. This review aims to synthesize findings from psychology, sociology, and organizational behavior studies to identify the constructs that may be impacted by an employee's fear of the paranormal in their work environment. The methods used in this review included searching ABI/Inform and Google Scholar utilizing key terms such as: "workplace fear," "fear at work," "fear of paranormal," "haunted workplace," and "paranormal work" to find papers for inclusion in the review. The review begins by outlining workplace fear responses and their known impacts on job outcomes. Then, the limited research addressing the effects of fear of the paranormal on life inside and outside of work is explored. The multidisciplinary sources identified in this review exhibit a significant gap in the literature concerning the consequences of fear of the paranormal on employee performance, well-being, and job outcomes. Recognizing this gap in the literature lays the groundwork for future research aimed at understanding the mechanisms underlying this phenomenon and informing interventions to support employees' well-being and productivity in diverse workplace settings.

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Biodiversity from Freshwater Lentic Ecosystems Revealed with eDNA
Zachary Hendren

Lentic ecosystems, encompassing still or slow-moving water bodies like ponds, lakes, and wetlands hold a distinct ecological and biological character when compared to their flowing counterparts such as rivers and streams. The stagnant water characteristic of these ecosystems allows for the accumulation of sediment and organic matter, resulting in diverse and nutrient-rich habitats. These ecosystems play a vital role, contributing to biodiversity, providing homes for aquatic and terrestrial species, storing water, regulating water quality, and supporting various human activities like fishing, recreation, and agriculture. However, these ecosystems are not immune to challenges, including pollution, invasive species, habitat destruction, and the impacts of climate change. These issues pose significant threats to the health and functioning of lentic ecosystems, ultimately affecting human well-being. This study outlines a comprehensive research plan with a specific focus on understanding how human activities, as reflected in population density and land usage, impact the biodiversity of lentic ecosystems. Multiple water bodies in the Chattanooga area are being

studied, and biodiversity is being assessed using an environmental DNA approach. The anticipated findings from this study aim to provide essential information guiding the development of strategies to mitigate the adverse effects of human activities on lentic ecosystems. The ultimate goal is to promote sustainable practices that ensure the ongoing health and usability of these ecosystems for the benefit of future generations.

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Bird Collisions on Campus
Noah Smith

Birds colliding with windows is the second largest, human-caused, killer of birds. Doctor David Aborn has been accruing data on window collisions on UTC campus since 2000. He has found 1,236 casualties with an 85% death rate. Existing windows- without modification- will continue to pose a problem. New construction will likely expand the problem, unless it utilizes bird friendly design.

The aim of my project is to raise awareness of campus's bird strike problem, and garner support for the alteration of certain, problematic windows, such that they no longer contribute to bird collisions. The goal is also to have bird friendly design used on ongoing and future construction projects to prevent expanding the problem.

For that aim, I wrote a petition. To gather petitions, I received permission from professors to conduct in their classes, an oral presentation with accompanying Powerpoint. At the end of the presentation, students had a chance to sign the petition, or join a Groupme. The purpose of the Groupme was to organize students for meetings with facilities later in the semester.

The result of my efforts are over 100 signatures on my petition, a community on Groupme, and two interviews by Mason Edwards of the UTC ECHO news, one with myself and one with Doctor Aborn. The project is ongoing.

It is unnecessary that our campus reduces the population of these valuable creatures. If our university- ironically hosting a bird mascot- is able to reduce or eliminate window related bird deaths, or at the very least, stop expanding that problem, then it should.

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Bone Conduction Communication Pack
Trevor Kight

For my project, I am making a device for deaf communication. This will be a wearable pack for people suffering from conductive hearing loss. The user will give someone they wish to

talk to a lapel microphone. The audio will then play through a bone transducer on the back of the user's head. This will let the deaf person learn how to speak more efficiently.

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BookTok: The Cultural Phenomenon Introducing a Stagnated Industry to a New Generation
Daley Culberson

BookTok, a creator-driven subset of TikTok that promotes and discusses books, gained popularity in 2020. Its emergence has significantly altered the book industry, allowing once-unknown authors to transform into bestselling novelists with the click of a button. Modern romance, fantasy, and young adult novels are typically favored on BookTok. These novels are vastly different from the books in the traditional literary canon, challenging conventional ideals regarding what types of literature could be considered canonical. Additionally, BookTok is primarily driven by younger users, allowing many teenagers and young adults to rediscover the joy found through reading and writing.

This research project focuses on a question regarding BookTok's relationship to traditional literature: "BookTok: Is the social media phenomenon opening the notably gatekept literary canon to a new generation of authors and connoisseurs, or is it creating a new canon entirely?" Through examining evidence from an IRB-approved study distributed to more than 300 avid readers, perusing scholarly research, and conducting an in-depth literature examination of canonical and modern-day novels, we will determine the extent to which BookTok has changed the literary industry. This project will discover whether (1) reading habits are shifting among teenagers and young adults, (2) BookTok is offering new book marketing tactics, (3) canonical novels are different from the novels popular on BookTok, and (4) BookTok is a reliable marketing method.

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CAN JURY INSTRUCTIONS REDUCE THE NEGATIVE IMPACT OF PRETRIAL PUBLICITY?
Skylar Oxford, Jackson Everett, Olivia Taylor, Kerrick Coble, Jenna Puls

The increasing prevalence of pretrial publicity (PTP), media coverage of a case that occurs prior to a trial, raises concerns about fair trials. Jurors may rely on pretrial information rather than trial information to decide the fate of a defendant and may even confuse the sources of the information. While it is difficult to limit jurors' exposure to PTP, jury instructions to improve memory for trial information may limit these effects. Participants (*N*=100) read negative PTP articles about a defendant. A week later, they were randomly assigned to jury instruction conditions (notetaking, question-posing, or standard) and watched a trial video about the case. Mock jurors who took notes and asked questions during the trial video were significantly better at remembering trial statements and attributing trial and pretrial information to its source than jurors who received standard

instructions. However, instruction condition did not influence the number of guilty verdicts rendered.

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Carla: Autonomous Driving Simulator
Noah Ernst, Patrick Bigelow

Our project extends the functionality of CARLA, an open-source autonomous driving simulator, by integrating a Fanatec Clubsport v2.5 wheel, enhancing the realism and control within the simulation. Faced with the challenge of incorporating a non-native steering wheel, we overcame compatibility issues through custom coding, notably utilizing Python and Pygame for input mapping and event handling. This setup, part of a sophisticated rig including a four-screen display and D-Box hydraulics, enables advanced driving simulations. Our efforts now focus on leveraging CARLA's sensor suite for autonomous driving research, with future developments aimed at improving force feedback and hydraulic interaction. This integration not only enriches the simulation experience but also broadens the research capabilities within the CARLA environment.

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Combinatorial Effects of PUFAs and Piscidins on the Membrane Permeability and Antimicrobial Activity in *Vibrio parahaemolyticus* and *Vibrio vulnificus*
Christina Harris

Piscidins are fish antimicrobial peptides (AMPs) that are an important part of the innate immune system due to their potent antimicrobial properties. Piscidin 1 (P1) exhibits strong membrane disruptive properties, while piscidin 3 (P3) targets DNA. These piscidins can experience metalation with copper (Cu^{2+}) which enhances their antimicrobial activity in vitro. *Vibrio parahaemolyticus* is one of the leading foodborne pathogens in humans, causing acute gastrointestinal and immunological disorders. *Vibrio vulnificus* has high mortality (18%) and economic burden ($320 million/year worldwide), causing necrotizing fasciitis and sepsis leading to approximately 100 deaths per year in the United States. To examine polyunsaturated fatty acid (PUFAs) impacts on piscidin activity, we performed permeability and minimal inhibitor concentration (MIC) assays with linoleic (18:2), arachidonic (20:4) and docosahexaenoic (22:6) acids. In *V. parahaemolyticus*, PUFAS raised the MIC for P1 and P1-Cu^{2+} while the opposite effect was observed with P3 and P3-Cu^{2+}. Our data highlights antimicrobial susceptibility differences dependent upon piscidin isoform. Each PUFA caused a distinct change in membrane permeability, while the effects of each piscidin were variable. In *V. vulnificus*, at least one PUFA raised the MIC of each piscidin. All PUFAs lowered permeability, but significant piscidin-dependent effects were observed with P1 only. The data herein sheds light on bacterial membrane dynamics regarding piscidin activity and PUFA-mediated effects.

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Commodifying Euphoria: Representations of online victimization of girls in a television drama
Kayla Edney

Previous literature indicate that television series not only influence our perceptions but aid in the (mis)representation of crime and victimization. While a number of studies has examined issues of sexualization and victimization in popular culture, limited research has focused on the online sexual victimization among teens, particularly girls. Using a mixed methods analysis, the study examines representations of online sexual victimization in the HBO drama, Euphoria, to understand the realities and misperceptions portrayed in the series. This content analysis examines the prevalence of online sexual exploitation, types of online victimization, and the myths used to justify such portrayals. Findings indicate partial support for misperceptions regarding who are victims of sexual violence and the justification of such behaviors. Discussion of the negative impact this may have on consumers of imagery is also discussed.

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Comparison of Traditional Statistical Methods and Machine Learning Methods with Application to Early Onset Colorectal Cancer
Megan McCoy

This study compares traditional statistical methods with machine learning techniques for predictive modeling of mortality and incident of early onset colorectal cancer (EO-CRC). Early-onset colorectal cancer (EOCRC) refers to the diagnosis of colorectal cancer in individuals under the age of 50 and it has seen an alarming rise worldwide over the past two decades. Traditional statistical methods like logistic regression and multinomial logistic regression are contrasted with machine learning based algorithms including decision trees, random forests, K-Nearest Neighbors, and neural networks. We evaluate both methodologies using datasets containing clinical and demographic variables. Performance metrics such as sensitivity, specificity, accuracy, are analyzed, considering interpretability, computational efficiency, and scalability. Preliminary results indicate that while traditional methods offer interpretability, machine learning models demonstrate superior predictive performance, particularly with complex data. They also show potential for uncovering intricate patterns and interactions among variables, enhancing prediction accuracy. This research informs the selection of analytical methodologies in biomedical research, aiding the development of effective predictive models for early onset colon cancer detection and management.

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COVID-19 Detection: Leveraging Variational Autoencoder with Chest X-Ray Images
Mani Sravani Kothapalli

Researchers have concentrated on devising robust and economically efficient detection techniques utilizing Deep Learning for processing Chest X-ray images. However, such models often encounter difficulties in handling highly imbalanced datasets. This work aims to tackle this challenge by employing unsupervised Variational Auto Encoders (VAEs). Initially, chest X-ray images undergo conversion into a latent space. Subsequently, resampling techniques such as SMOTE, SMOTE-ENN, and ADASYN are applied to rectify the imbalance within the latent vector representation. Finally, the modified dataset in the new feature space is utilized to train classification models such as KNN and SVM, enabling the categorization of chest X-ray images into three distinct classes: COVID-19, Pneumonia, and Normal. The results show that the SVM classification model demonstrated superior accuracy compared to KNN, even in the absence of resampling techniques.

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CRNA Education on Safe Syringe Labeling Practices
Olivia Drake, Travis Mitchell

Medication error (ME) incidence is reported to range from 0.5-11% or 1 ME per 10-200 medication administrations. Anesthesia providers face unique risks for MEs compared to other healthcare providers because they are responsible for all steps of the medication administration (MA) process (i.e., provider, preparer, and dispenser). This one-person MA paradigm in anesthesia increases ME risks because there are fewer people to catch errors. Additionally, the intraoperative setting is fast paced, with a culture of time pressure, critical thinking, task overload, and unending distractions. Anesthesia providers make time-critical decisions about high-risk medications (medications that can cause significant harm when used in error) every day. Because many factors such as the OR environment and high pressure cannot be changed, one factor certified registered nurse anesthetists (CRNAs) can practice to reduce the incidence of medication errors is through the proper labeling of drug labels after preparing a medication.

The goal of our quality improvement project is to improve the compliance of CRNAs to best practice recommendation for medication syringe labeling. Assessment of CRNA's current syringe labeling practices was assessed by a pre-implementation survey, followed by an educational presentation about safe medication labeling practices, and then lastly a post-implementation survey was distributed to CRNAs. Statistical analysis comparing the pre-survey to post-survey results will be conducted once all data has been collected.

In conclusion, an educational presentation about intraoperative IV medication labeling best practice recommendations will improve CRNA knowledge and medication labeling compliance. Adherence to these practices will decrease the number of intraoperative MEs that occur, and, ultimately, the delivery of anesthesia will be safer and improve patients' quality of life.

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Crystallographic Characterization: Incorporated into the Classroom and Undergraduate Research Papers
Jared Pienkos

A crystalline lattice is well-ordered three-dimensional arrangement of molecules, atoms, or ions in the solid-state. For instance, rock candy, which is crystalline, is organized sugar molecules. Likewise, powdered organic and inorganic compounds prepared in the research laboratory can be ordered into a crystalline lattice using various crystallization techniques.

Herein, we describe work by Dr Pienkos' and Dr. Lee's research groups, where we have generated various crystal structures of organic and inorganic compounds. Moreover, we will describe how various software programs can be used to analyze these data sets and strategies for publishing crystal structures with undergraduate students. A detailed discussion of how these crystallographic programs have been incorporated into classes and our research groups at UTC will also be presented.

Over the past three years, Dr Pienkos' and Dr. Lee's research groups have published four papers highlighting crystallographic properties. Training in crystallographic characterization is continually being implemented in undergraduate classes and research projects for a technique that is directly and indirectly involved in 29 different Nobel Prizes. Highlights from manuscripts in preparation and strategies for getting students involved in this type of research will also be described as well as the past, present and future of obtaining X-ray crystal structures at UTC.

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Customer Segmentation
Victoria Martino

This research project aims to perform customer segmentation analysis using clustering methods, specifically focusing on K-Means Clustering and Hierarchical Clustering. The primary objective is to identify distinct customer segments based on their purchasing behavior and analyze each segment's characteristics. This study will use customer points from a coffee shop in the same categories to compare the performance of these two clustering methods. The study seeks to provide insights into the effectiveness of each approach in tailoring marketing strategies.

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Customer Segmentation Analysis
Eric Chang

The data set that I will be using is from Kaggle and includes consumer information that will be used to provide a look into consumer behavior and marketing strategies.

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Cutter Drum Automation
Ryan Phillips, Matt Mansel

The task will be to develop a system that combines automation and robotics together to decrease cycle times, by designing a fixture that can clamp parts and hold them, so a welding robot can bond the pieces together for the welding process. This task will be completed by using pneumatics and a toggle start/stop switch to clamp and hold the parts together to run the robot's program to weld these parts together. This fixture must comprise a process that is quick and simple for an operator to perform. As this process is developed just one part will be used, but as the process is proven more parts will be added together to help reduce the cycle times that are required in this process. This will be used by the company Astec Industries.

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Data Analysis of Supernova Light Curves with Python
Jackson Ricketts

Type IIP supernovae (SNe) are a subclass of Type II, or hydrogen (H)-rich SNe, whose classification is based on the presence of signatures of H upon discovery. The "P" in Type IIP SNe's classification denotes the presence of a period of time of near constant brightness, or plateau, in the SN's light curve. A light curve is a graph, inverted at the *y*-axis, of the SN's luminosity over time. In SN analysis, time is usually represented by Julian dates, or days since noon universal time on 1 January, 4713 BCE. In this work, we analyze the apparent magnitude light curves of the Type IIP SN 2017eaw whilst focusing on three specific phases: the plateau, the transition phase, and the radioactive tail. Our analysis has allowed us to determine transition phase height a_0 (mag), the transition phase's midpoint t_{PT} (d) and step phase w_0 (d), the tail's slope and plateau's approximate slope p_0 (mag/d), and the zero point of magnitude at $t = t_{PT}$, m_0 (mag). The objective of our work is to find the Julian date at the end of the transition phase and the beginning of the tail, analyzing the B (blue), V (visible), R (red), and I (near-infrared) apparent magnitude light curves provided by a group of amateur astronomers. Additionally, we analyzed published data sets for each of the four aforementioned bands to check whether the measurements from both data sets are in agreement.

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Data Collection, Preprocessing and Descriptive Analytics of Social Media Data
Zachary Lloyd, Sara Mathews, Elise Williams

Steemit is a decentralized social media site powered by the STEEM blockchain. Traditional platforms operate on a top-down model that benefits their maintainers rather than content producers. Steemit instead passes rewards to the users that provide value to the platform. Users earn one of three cryptocurrencies by posting and performing tasks such as content moderation and community administration.

This is an overview of the data collection process performed in support of academic research related to the network. Data was collected to determine whether unearned status (via cryptocurrency) affected a user's reputation. Initial statistics indicate distinct clusters of users displaying similarly high ranks despite having opposing combinations of currencies and User Engagement (estimated by post comment numbers).

Data was collected via web scraping using Python programs and browser automation software. Next, the raw data was cleaned. Topic modeling and Sentiment analysis were performed on a portion of the data to determine the content and tone of collected posts. The result is uniform, feature rich tables of both continuous and categorical data that can be analyzed or used as training data in machine learning algorithms.

This presentation provides a low complexity framework for the collection and preprocessing of numerical and text data from social media sites. Datasets processed in this way could be used to predict the success of a post based on its topic before publishing. This can provide guidance on how to best spend time and resources contributing to the platform.

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Designing Airbags Using Ls-Dyna
Ashton Biggs, Kate Hankins

This experiment involves the creation and testing of motorcycle airbags using the software, LS-Dyna. LS-DYNA is a finite element code that simulates complex structural problems. It's used for analyzing the nonlinear response of structures Traditionally, motorcycle airbags are worn as a jacket or body suit. However, this does not provide much protection for people's legs, arms, and heads. The goal of this project is to design new models for motorcycle airbags that will be more beneficial for the safety of motorcycle users. By constructing various shapes suited to different body parts and using these shapes as a baseline, an airbag model was created. After that, the model was tested and it was found that it would adequately protect the different parts of the body that we selected.

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Determination of the Representative Gage-Section Volume for Reliable Fatigue Testing of 3D-Printed Metallic Parts
Ward Metcalfe

Fatigue is material failure which happens under a repeated loading of a consistent force. An example of this is the expanding and contracting of metal bridge joists from temperature changes. Most failure in metal parts is due to fatigue failure. Therefore, it is of utmost importance to study and understand this mode of failure. A considerable part of attempts to analyze the fatigue behavior of materials and additive manufactured metals has been made using force-controlled (i.e. stress-controlled) cyclic experiments on standard hourglass specimens. However, one major concern with such specimens is the fact that only one plane of the specimens (i.e., at the root of the curved gage section) is under the controlled stress amplitude of σ_a. We believe that this can affect the results of the fatigue life as such a limited volume of the material may not be a suitable representative of the bulk of the material, in which various imperfections may exist. This is of even greater concern when considering additive manufactured metals since it is a fairly unknown and inconsistent process. Therefore, I propose to experimentally determine the effect of the volume (length) of the gage section on the fatigue life of additive manufactured metallic parts. This will be done using cylindrical bars with a diameter of D_0 = 10 mm and 120 mm long, additively manufactured using laser-based powder-bed fusion (LPBF). The gauge sections will vary from 2 mm to 10 mm, testing which length is needed for the most accurate analysis. In our results we are expecting to find that testing a volume sample rather than a planar sample of the material will result in a shorter fatigue life. An accurate fatigue life is vital for safe application of additive manufactured parts.

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Developing and Validating a Measure of Workplace Recovery Motives
Julia Anglin

“Workplace Recovery” refers to the replenishment of workers' energetic resources which is an important process for bettering workers’ personal life and their organization. Regularly engaging in workplace recovery improves work performance, engagement, and has significant benefits for work and home domains. Yet, there has been little to no research on what motivates employees on an individual level to participate in recovery behaviors. The present study identified individual motivations to engage in recovery through interviews with a variety of employees. Responses were then used to create a Motives for Recovery scale which was then validated in a survey study. A factor analysis revealed three common motivational themes; self-regulation, social and personal development, and externally driven roles. Correlational analyses provided some evidence for the validity of the scale. Self-regulation and social/personal development tended to correlate more with well-being outcomes while externally driven role motives tended to correlate with work outcomes.

Future research can use this scale to identify common motivations for engaging in workplace recovery, which can help aid in relevant recovery interventions.

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Digital Audio (Tyler's Version) – Advanced Waveform Resampling for Superior Audio Quality
Joshua Tyler

Since its introduction as a medium for music, digital audio has received criticism from the community due to its loss of quality when compared to the original studio master track. When releasing music at C.D. data quality rates (a.k.a., 44.1kHz/16-bit), minute, intentional details made by the artists, producers, and engineers may be lost. These reduced versions of the original master track (192kHz/24-bit) contain distortions that interfere with the listening experience. This means that when someone listens to a C.D. or streams an artist's song, they aren't hearing everything that was put into the track in the studio. One way to minimize this loss is to use a streaming service that supports high-resolution audio (i.e., Tidal or Apple Music), but this comes at a significant increase in data usage. To balance audio quality and data usage, a new compression technique, Advanced Waveform Resampling (AWR), has been introduced. Current tests show that AWR can retain up to 99.4% of the original 192kHz track at 44.1kHz and reducing reconstruction error by up to 99.38% compared to spline interpolation. AWR can also be used to upsample audio, enabling high-resolution audio on wireless headphones with no change to existing standards.

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Digital Twinning for Automation Systems
Justin Douglass, Evan Millsap, Michael Tudor

This project presents the development of a Digital Twin for Automation Systems, a system that integrates digital twinning with a physical conveyor/sorting station controlled by a Programmable Logic Controller (PLC). The system is designed to create a digital twin of a miniature production line, employing production line virtualization software alongside a working physical model. Key system requirements include a conventional computer with adequate processing ability, an industrial controller, and a user-friendly GUI for interaction and monitoring. The project is guided by both quantitative and qualitative objectives, such as achieving synchronization between the physical system and its digital twin and developing an intuitive control interface. Constraints considered include economic, environmental, social, political, ethical, health and safety, and sustainability factors.

The concept design features an "L-Shaped" desk setup for ease of access and efficient cable management, with the Control Cabinet including a control screen and emergency stop for easy process manipulation. The project's conclusion synthesizes insights from the system, highlighting its potential to enhance the learning experience in control systems education

through exposure to hands-on learning environments in both physical and virtual modalities. The capstone project encapsulates the principles of innovation in engineering education, offering a comprehensive journey through the planning and analysis phase of creating a system that is technically sound and educationally valuable.

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Discovering Trends in iPhone Sales
Brenden Keel, Ritu Patel

For many companies, it can be useful to have the opportunity to look back on previous years and examine the purchasing habits of customers. These trends can provide valuable information regarding future sales predictions, effective marketing strategies, and market influences which affect sales. In this project, we will use python to generate a time series analysis visualization for iPhone sales. The data will be sourced from a dataset showing iPhone sales information from 2007 to 2016. The data will address the number of units sold per year as well as annual revenue generated for Apple via iPhone sales. The data will be used to create organized, useful visualizations depicting customers' purchasing habits according to time and season. The project will compare two kinds of time series decompositions toprovide clearer insight into how the data shifts over time.

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Discrepancies in Database Loading
Aidan Jeane, Jack Duffy, Kevin Perfect, Thomas Smith, Aydin Kurktchi, Parker Phillips

Every day, Transcard engages in a complex data refresh process that involves loading historical transactions into 60+ tables within their reporting/business intelligence database. This process sometimes has potential issues, as it can silently fail by loading no data, only partial data, or even duplicates/multiple copies of the same data. To address these challenges, our team designed and implemented a series of tests, leveraging stored procedures to automate the verification of data accuracy and integrity across each table. These stored procedures not only streamlined the testing process but also enabled more efficient error detection and handling. After our testing, we reported our findings and results through a comprehensive Power BI report, providing insight into the data and identifying which tables were not processed correctly.

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Edible Landscaping and Native Gardening
Julian Achata, Andrew Bailey

Mayor Tim Kelly has collaborated with the Innovation in Honors community to make Chattanooga conscious and aware of climate change. His goals include supporting historically disadvantaged communities, enhancing our existing parks, building a historical picture of Chattanooga, and showcases Chattanooga's natural resources. When I first began my project for the city, I asked, "How can I contribute to helping Chattanooga's ecosystems?" The Edible Landscaping and Native Gardening project focuses on incorporating educational opportunities, healthier ecosystems, and a stronger community within Chattanooga. Edible landscaping provides disadvantaged areas with food deserts an opportunity for fresh, organic fruits, herbs, and vegetables. Native gardening supports the endemic and native species of Chattanooga, providing food and shelter. When practicing edible landscaping, knowing the native species of the area can prevent invasive species from damaging the ecosystems. My project focuses on finding the balance between edible landscaping and native gardening to strengthen Chattanooga's environmental sustainability.

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Edible Landscaping In Chattanooga
Julia LaDuke, Ava Byars, Isabelle Miller

Our group is focused on the implementation of edible landscaping throughout the city of Chattanooga. We strived to increase awareness of native species, plant care, and the environment.

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Education Day for SRNA Support Persons
Connor Barnell, Erin Cordell, Victoria Hunter

Intro: Student registered nurse anesthetists (SRNAs) experience high stress with adverse effects including substance abuse and suicidal ideation (Chipas et al., 2012). Having a support person (SP) that understands the demands placed on SRNAs can mitigate stress (Conner, 2015). Interventions to improve SP's understanding of nurse anesthesia education are available but not widely used. Additionally, the SPs of SRNAs often have little understanding of the rigors and demands of nurse anesthesia programs, limiting their ability to empathize with their loved ones.

Project Aim: To educate the SPs of new SRNAs about program expectations, aiming to increase SP understanding and support for SRNAs. Short-term goals include 50% SP participation and increased SP understanding post-event. Long-term goals include 75% SP participation and a more knowledgeable support person/systems for SRNAs throughout their anesthesia program.

Methods: Pre- and post-presentation surveys assessed SPs' knowledge before and after an educational session and sim lab tour. Participants attended in person or virtually via Zoom. Recorded presentations were available for absentees.

Results: Eight responses were obtained for both pre- and post-surveys Our goal of 50% participation was not met as we received participation from only 29% of SPs.

Conclusion/Impact: SRNAs face high levels of stress that negatively impact their physical and mental health. Educating the SPs of SRNAs can add to existing wellness programs by including social networks as a supplementary strategy to improve student well-being.

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Effects of Alcohol on Anxiety Among College Students
Abigail Emberson, Kennedy Anderson, Joslynne English

The purpose of this study is to investigate the effects of alcohol use on anxiety among college students. We hypothesized that college students who drink alcohol will likely experience high levels of anxiety. The objective of this study is to examine alcohol consumption levels of college students, accounting for how these consumption levels impact mental state, with a focus on anxiety. Previous studies have shown that students attendings university tend to begin experiencing mental illness issues. (Chow et al., 2021). On top of some students experiencing new mental illnesses, alcohol consumption comes into play as well. Previous studies showed that alcohol use can potentially influence the anxiety among college students. However, the findings about their relationship show mixed findings. Some studies show the reduction of anxiety and its symptoms with consumption alcohol by college students, especially after the COVID pandemic (Pomazal, et al., 2023), while other studies suggested that using/abusing alcohol could increase anxiety and symptoms of anxiety (Chow et al., 2021). There is limited information about the relationship among participants who live off campus or attend online classes. That is where our current study asserts itself, our survey seeks to measure anxiety levels and alcohol consumption in college (students living both on and off campus).

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Effects of Sleep Deprivation on Cognition in Meditators and Nappers
Bahar Folad

The current guidelines for healthy sleep for adults aged 18 – 60 is 7 – 9 hours of sleep. However, one-third of the United States population regularly sleeps fewer than 7 hours, and many professions require employees to work overnight shifts. Chronic partial and total sleep deprivation are associated with poorer performance on cognitive tasks, greater negative emotions, and systemic inflammation. Meditation may be a promising means of ameliorating the cognitive and physiological effects of sleep deprivation by strengthening

cortical inhibition, which can be tested through the Go/No-Go Task and high-frequency heart rate variability. In this prospective cohort study, subjects are asked to undergo cognitive tasks while well-rested and after total sleep deprivation at baseline and two months after learning Shoonya meditation. The study also includes an observational napper group that underwent the same procedure. We report preliminary data for meditators and one napper at baseline when meditators have learned a prerequisite meditation for the Shoonya program but have not yet learned the Shoonya meditation. The average omission rate on the Go/No-Go task increased from 0% to 66% for the napper group (n = 1), and increased from 0% to 0.4% (n = 4) for meditators from a well-rested to sleep-deprived state. The average overall error rate increased from 0% to 33% for the napper and stayed at 1% for the meditators. The average mean reaction time increased from 325 ms to 434 ms for the napper and increased from 336 ms to 347 ms for the meditator group. Although these results are preliminary and for a small number of subjects, they suggest meditators may be more resilient to sleep deprivation than nappers.

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Effects of Stressful Life Experiences and Maladaptive Daydreaming on Selective Attention among Young Adults
Claudia Colpo, Abigail Bickers

Adverse childhood and adult experiences have been connected to negative psychological, physical, and cognitive consequences. Although past studies showed that adverse childhood experiences lead to impairments in selective attention and to the potential use of dissociative coping mechanisms, less is known about how adverse adult experiences affect selective attention, and how maladaptive daydreaming (MD) affects these relationships. The purpose of this study is to examine the relationship between adverse life experiences, MD, and selective attention, as impairments in attention can negatively impact performance on daily tasks. We hypothesize that those who have experienced adverse life experiences are more likely to engage in MD and that they will perform worse on a selective attention task. This study is currently in progress, but we are aiming to recruit 200 individuals between the ages of 18 and 30 who live in the greater area of Chattanooga. Participants are asked to complete questionnaires, asking them about their coping mechanisms (substance use and MD) and their childhood and adulthood adverse experiences. Participants are then asked to complete an Emotional Stroop Task (EST). Participants receive a $5 gift card upon study completion, as well as research credits if the study is taken through SONA. We expect individuals who experienced life adversities to be more likely to engage in MD, and to have higher reaction time in the EST. These results would expand the current literature on MD, and would emphasize the negative effects that life adversities have on attention

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Electric Wheelchair Attachment for Manual Wheelchairs
Jorge Marcano, Aaron Campbell

Electric wheelchairs are expensive with prices ranging from $700 to $3,000. This project aims to create an attachment for manual wheelchairs so they can have the benefits of electric wheelchairs without changing the wheelchair and at a much cheaper price. The goal is to research and create a much cheaper alternative than buying an electric wheelchair.

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Electrophoretic Studies of Naphthoquinone-Induced Modification ofLysozyme at Various pH

Lillian Wooten

Quinones and their metabolites are ubiquitous, found both as byproducts in industrial processes and freely in nature. Various benzoquinones have been shown to induce protein modification by redox cycling, adduct formation, and oligomerization. Due to their similar structure and functional groups, we expect naphthoquinones to induce the same types of modification in lysozyme. This study investigates if naphthoquinones 1,2 hydroxynaphthoquinone (HNQ), 1,2-naphthoquinone (ONQ), and 1,4-napthoquinone (PNQ) can induce modification in the model protein lysozyme at various pHs by electrophoretic studies. Results showed that HNQ induced no visible modifications, while ONQ induced the most modifications. Furthermore, modification induced by quinones was seen to increase with pH.

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Elucidation of the Overexpression of Taf2 in Eukaryotic Cells

Morgan Osborn

Through several studies, Taf2 has been found to be upregulated in various cancer cells. However, the mechanism through which this increased expression of Taf2 occurs remains unknown. As evolutionarily conserved ubiquitin-proteasome system (UPS) maintains protein homeostasis for normal cellular function, we hypothesized that stability of Taf2 may be regulated by this UPS and this UPS may be dysregulated in cancer cells causing overexpression of Taf2. To test our hypothesis, we assessed the role of the UPS in the regulation of the stability of Taf2 by 26S proteasome-mediated degradation. To do so, we performed molecular experiments mainly through two steps: 1st step includes the analysis of the ubiquitination status of Taf2, and 2nd step includes the analysis to see if Taf2 is regulated by the 26S proteasome. As UPS, Taf2 are evolutionarily conserved and are found in both yeast and humans, we conducted these experiments in yeast (*Saccharomyces cerevisiae*). To study the 1st step, 1st we did molecular cloning to introduce the pUB221 plasmid, expressing the hexahistidine-tagged ubiquitin under the *CUP1* promoter, into the yeast strain containing TAP-tagged Taf2. Next, using this strain, we performed Ni^{2+}- NTA-based ubiquitination assay to see if Taf2 is regulated by ubiquitination or not. Notably, for the 1st time we found that Taf2 undergoes polyubiquitination. Generally, if a protein

undergoes polyubiquitination, it is likely to be degraded by the 26S proteasome. To evaluate this possibility, we checked the activity of the 26S proteasome in regulating the stability of Taf2. Briefly, we performed MG132 based proteasomal inhibition assay (2nd step). MG132 inhibits the proteolytic function of the 26S proteasome and therefore, if Taf2 is regulated by the proteasome we would observe increased abundance of Taf2 following proteasomal inhibition by MG132. However, yeast cell can be multidrug resistance. Therefore, to perform the MG132 based proteasomal inhibition assay, we knocked out of the multidrug resistance gene, *PDR5*, in the yeast strain expressing TAP-tagged Taf2, and treat these cells with MG132. Importantly, we found that Polyubiquitylated Taf2 is also targeted for degradation by the 26S Proteasome. Thus, our results showed for the first time that Taf2 abundance is regulated by the UPS. In addition, our bioinformatics suggest that protein overexpression, as opposed to mRNA overexpression, plays a role in several cancers suggesting a mismanaged UPS system. Thus, our results reveal novel UPS regulation of Taf2 with potentials for future therapeutic intervention.

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Elucidation of the UPS regulation of Paf1 in controlling transcription
Joud Sulieman, Matthew Ogle, Maya Minakara

The evolutionarily conserved RNA Polymerase II-associated factor 1(Paf1) plays important role in regulation of transcription and is overexpressed in many cancers. However, it was not known why it is overexpressed in those cancer cells. Recently it was found that the Ubiquitin-Proteasome System (UPS) regulates the abundance of Paf1, thus dysregulation of UPS may be associated with high levels of Paf1 in cancers. Not4 is the E3 ligase involves in the polyubiquitination of Paf1, demonstrating specificity for its substrate, Paf1. However, the molecular mechanism of Not4-mediated UPS regulation of Paf1 is unclear. Our hypothesis is UPS regulation of Paf1 might be involved in regulation of transcription. To test it, we will use western blot and ChIP assay to analyze the transcription at promoters and coding regions of constitutively active genes with or without the Not4 E3 ligase. Briefly, we would analyze recruitment of TBP and RNA Polymerase II to the promoters and coding regions of ADH1,PGK1, PYK1 and PMA1 with or without the Not4 E3 ligase. If UPS regulation of Paf1 is involved in transcriptional regulation, we would likely to observe decreased TBP and RNA Pol II association with the core promoter and coding sequences of these above-mentioned active genes, respectively, in the absence of Not4. The collective results would likely to determine the role of UPS regulation of Paf1 in regulation of transcription, therefore, would help us to understand the basis of increased expression of Paf1 in those cancers.

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Emotional Intelligence and Self-Care
Bernadette DePrez

UTC IRB #21-097 Exempt
Self-care means learning to recognize your own temperament and trying to prepare for your personal limits (Psychology Today, 2018). Emotional intelligence skills can be improved through practicing strategies to manage emotions, manage behavior, and navigate social situations. Improving emotional responses in social and professional situations can contribute to the achievement of positive results in personal and work performance. Emotional Intelligence (EQ) skills positively contribute to job performance and relationship management. (Emotional Intelligence 2.0, 2009). The ability to manage and understand emotions to self-regulate can decrease negative self-talk, and stress to contribute to the improvement of well-being and self-care. EQ requires effective communication between emotions and rational thinking.

This study was conducted using the TalentSmart® Emotional Intelligence Appraisal® pre- and post-survey to assess improvements in scores after education, reflection, and discussion.

Study Question: In faculty and staff at a public university does the implementation of Emotional Intelligence strategies through education, reflection, and discussion, compared to current practice, affect Emotional Intelligence overall appraisal scores, and contribute to well-being and self-care?

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Empowering Discovery: Moments From CUWiP 2024
April Horn, Emery Rutledge

We intend to encourage students to participate in undergraduate research and conferences by sharing our experience as attendees to the 2024 Conference for Undergraduate Women in Physics. To accomplish this, we will highlight key aspects from the keynote speaker and other topics that were discussed by panels, other undergraduate students presenting their research, and provide insight into what graduate students are currently researching in their physics labs. We will do this by sharing pictures, information from memory, and including points from published research in the field pertaining to these topics. We hope that this poster presentation will enable other students to begin participating in undergraduate research by seeing how beneficial events related to their areas of interest can impact them as student.

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Enhanced Biomedical Scaffolds Through 3D Bioprinting
Adrianne Glover

One of the innovative medical treatments in the field of tissue engineering is the integration of bio-functional materials into biodegradable scaffolds that can be effectively integrated into the human body. This study is focused on utilizing the state-of-the-art 3D bioprinting

fabrication method to create biodegradable scaffolds composed of polycaprolactone (PCL) and collagen for potential applications in regenerative medicine and tissue engineering. The research is more focused on studying the effect of the printing process parameters (e.g., pressure and speed) and scaffold features (e.g., pore size and porosity levels) on mechanical properties and biological functionality. The utilization of 3D bioprinting in this study emphasizes the versatility and precision of this technology in creating complex and customized structures that can mimic the body's cellular composition and hence new treatments for a wide range of tissue defects and injuries.

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Enhancing Drug Education: A Critical Evaluation of the D.A.R.E. program and a Proposal for Effective Strategies
Justin Martinez-Aranda, Madeira Davis, Kayla Taft, Jacob Sharpe

The presentation will begin with an in-depth examination of the D.A.R.E. program's curriculum, methodologies, and historical effectiveness. We will review existing research and empirical evidence to assess the program's impact on preventing drug use, reducing substance abuse-related harm, and influencing long-term behavioral outcomes among participants.

Acknowledging the challenges and limitations of the D.A.R.E. program, including criticisms regarding its outdated curriculum, lack of adaptability to diverse populations, and mixed empirical findings, will be essential. By addressing these weaknesses, we can better understand the necessity for innovative and evidence-based approaches to drug education. Drawing upon insights from child psychologists and experts in developmental psychology, the presentation will delve into effective strategies for teaching children about drugs and fostering healthy decision-making skills. We will explore age-appropriate educational techniques, cognitive-behavioral approaches, and social-emotional learning frameworks that align with children's developmental stages and cognitive abilities.

Proposing a more effective solution, informed by contemporary research and best practices in child psychology, will be the focal point of the presentation. This solution will emphasize the integration of comprehensive drug education within broader health and wellness curricula, utilizing evidence-based teaching methodologies, interactive learning experiences, and peer-to-peer support networks.

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Enhancing Military Leadership and Decision-Making through Emotional Intelligence Training: A Narrative Review
Christopher Atkins

The present narrative review discusses emotional intelligence (EI) training in the military by incorporating research from articles concerned with EI training integration and potential in military settings. One of the cornerstones of a successful military is the emotional intelligence of its servicemembers. This skill influences goal setting, leadership effectiveness, decision-making skills, and resilience to adversity or trauma. While underrepresented in existing military coursework and some performance areas, EI training could be more extensive in military education. The review presents multiple studies to support how EI training helps create competitive military decisions, builds resilience, and impacts leadership behavior and creative problem-solving abilities. The review discusses real-life public and private sector EI training approaches from various high-stress professions and explores emotional intelligence training modifications in military settings. Future research may investigate how military peer coaching and mentoring can contribute to the emotional intelligence development of service members. The review proposes the purposeful inclusion of EI training content in military programs to enhance leadership effectiveness, mission success, and service members' psychological resilience and readiness.

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Enhancing the Fatigue Life of Metallic Materials by Manipulating the Grain Structure
Nathanael Moore

Fatigue failure poses a significant risk and challenge in many engineering applications, often leading to structural breakage at stress levels well below a material's yield strength. Extensive research has gone into factors influencing fatigue resistance, the role of grain structure, specifically in pattern welded steel, remains underexplored. This study aims to address this gap by investigating the impact of intertwined grain boundaries on the fatigue performance of pattern welded steel compared to non-layered steel.

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Evaluate AI-powered tools in predicting Large Vessel Occlusion in Stroke care and Treatment
Joseph Duhamel

Stroke diagnosis is a time-sensitive medical emergency where prompt treatment decisions significantly influence patient outcomes. This study evaluates the efficacy of AI tools, specifically Rapid AI and Viz AI, in automating stroke diagnosis by analyzing imaging and clinical data, aiming to expedite treatment decisions. A comparison is conducted between AI-assisted diagnosis and traditional methods (NO-AI tools), considering baseline characteristics such as age, sex, NIHSS, and Pre-mRS ranking, along with stroke risk factors and arrival to NIR time. Additionally, the rate of identifying Large Vessel Occlusion (LVO) cases across the groups is evaluated using multiple metrics. The findings provide insights into the effectiveness of AI tools in enhancing stroke diagnosis efficiency, potentially leading to improved patient care through faster treatment interventions.

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Evidence-Based Sugammadex Utilization in Pediatric Surgical Patients Among Certified Registered Nurse Anesthetists

Julie Gallant, Ashley Mudd, Chelsea Crews

The use of sugammadex for the reversal of neuromuscular blockade in pediatric patients is primarily based on research and anecdotal evidence from adults, despite the unique physiologic and pharmacologic differences of the pediatric population. A gap in practice was identified within the target organization, Anesthesia Consultants Exchange, P.C. (ACE) at Erlanger Health Systems, related to a knowledge deficit that exists with sugammadex use due to its recent approval by the FDA for use in some pediatric patients. This translational project aims to incorporate current literature surrounding best practices for reversal agent selection in the pediatric population, making pediatric anesthesia clinical practice at Children's Hospital at Erlanger more evidence-based and enhancing clinical decision-making, thereby supporting optimal surgical patient outcomes. Following a comprehensive literature review, an educational, quality improvement intervention was created, focusing on three distinct themes critical to sugammadex administration in pediatric surgical patients: medication efficacy, adverse effects, and off-label use in children under two years of age with dosing considerations. Participating certified registered nurse anesthetists (CRNAs) are invited to take a pre-intervention survey consisting of Likert-scale and multiple choice questions to assess baseline knowledge, comfort, and current use of sugammadex in pediatrics. Participants then complete a brief educational module and take a post-intervention survey to reassess knowledge, comfort, and anticipated changes in their practice. The results of this translational project will examine the efficacy of the educational intervention based on the data collected from pre- and post-intervention surveys. The methodology, implementation, and results of this educational, quality improvement intervention can be replicated for safe, evidence-based implementation of newer medications in the future.

Keywords: sugammadex, Bridion, neuromuscular blocker reversal agent, pediatrics, infants, anesthesia

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Examining Corporate Accountability: The Impact of Pharmaceutical Settlements on the Opioid Crisis in America

Glennis Quinones, Madison Van Antwerp, Hunter Fowler, Isaac Scott

The opioid crisis in America has claimed countless lives and left communities grappling with addiction and substance abuse. Pharmaceutical companies, implicated in fueling this crisis through deceptive marketing practices, have faced legal action seeking accountability. One such case involves Purdue Pharmaceuticals, which was found to have violated Oklahoma

law with its misleading promotion of opioid pain medications. Despite a $270 million settlement, Purdue denied wrongdoing and maintained its innocence, only allocating a small fraction of the settlement towards addressing its faults. While the settlement provided funding for addiction treatment and recovery programs, critics argue that it falls short of holding Purdue fully accountable for its role in the crisis. This abstract explores the limitations of such settlements in achieving effective accountability amidst a worsening public health crisis.

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Examining stress mindsets among attorneys
Amanda Lesswing

Previous research has established that attorneys struggle with mental health problems and problematic drinking, but little is known about what is affecting their health and their attitudes toward receiving treatment from a mental health professional. Also, the majority of current research focuses on law students. The American Bar Association has recognized that the mental health condition rates among law students and attorneys are concerning and has reported recommendations to address this concern. However, to fully understand and address this concern, more research needs to be done to understand what impacts attorney's health and their views toward treatment. A stress mindset determines how one responds to stress in one's work life. It has also been related to different physiological responses under stress (Crum et al., 2013). A stress mindset could be influential when investigating an attorney's health. The purpose of our study is to examine the relationship between stress mindset and stress achievement on health and treatment.

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Examining the Impact of a Real Time Crime Center on Homicide Investigations
Sherah Basham, Iyana Harvey, Bella Preston, Ellee Jackson

The implementation of Real Time Crime Centers (RTCCs) throughout US police departments is growing in popularity. RTCCs deploy a variety of technology to provide support to the police both real time and post hoc. However, few empirical studies have assessed the impact of RTCCs on the clearance rates and times for homicide investigations. Using RTCC data from a large midwestern police department for 2015-2022, this study examines the influence of the RTCC on homicide clearance.

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Examining the Impact of Item Desirability on Personality Test Responding: Insights from an Eyetracking Approach

Bailee Smith

This project addresses a critical gap in understanding the impact of social desirability bias on personality test responses—a factor known to distort self-report measures and challenge the internal validity of research findings. Social desirability bias, the inclination to present oneself favorably according to societal norms, complicates the interpretation of personality assessments, particularly those based on the Five-Factor Model (FFM), despite their proven utility in predicting workplace behavior. By presenting participants with personality items of varying desirability levels in a simulated job application context, and recording their eye movements, this study aims to distinguish between the cognitive processes of item interpretation and response. Measures such as saccades, fixations, and run counts (item comparison) will offer insights into attentional allocation, information processing, and decision-making strategies. This research explores the nuanced interplay between social desirability and response behavior, offering implications for enhancing the accuracy of personality assessments in high-stakes settings. Preliminary findings indicate differences in reaction time as a function of item desirability rating. Interestingly, this is a polynomial relationship, with faster reaction times for items with very low and very high item desirability rating, and slower reaction times for items with item desirability ratings closer to the middle. In addition, we see more comparisons between the individual response options as a result of the answer selected.

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Executive Responses To Foreign Journalist Killings and Their Impact on Bilateral Foreign Relationships
Isabella Craig

Within the greater political science literature, there is a wealth of scholarship on American foreign policy, as well as the growing danger to press freedoms and the implications of this expanding phenomenon. However, there appears to be a lack of exploration in the intersection of these two subfields. To begin to address this disparity within the literature, this research poses the following question: How does a president and their administration's response to killings of journalists in foreign nations impact bilateral foreign relationships with these nations? Three cases of journalist killings have been selected, one for each of the three most recent presidential administrations. A mixed-method approach is applied to the three cases, and their respective policy responses from the presiding American executive at that time are compared. This comparative method has been chosen for its usefulness in evaluating each case and the respective variables. The hypothesis of this work is that there is an impact from executive responses to foreign journalist killings on bilateral foreign relationships. Findings cannot fully support this hypothesis, however, and the null hypothesis is retained. Further research may be able to confirm a relationship between the two variables and potentially examine the effects of lenient responses to journalist killings on bilateral foreign relationships, as is observable within the evidence gathered for this analysis.

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Exploring Cardiovascular Disease: A Comprehensive Analysis of Health Indicators Using Python
Laura Baker, Haobo Guo, Hong Qin

Cardiovascular Disease (CVD) stands as the leading cause of death and disability both in the United States and globally. Using the robust dataset from the Behavioral Risk Factor Surveillance System (BRFSS) survey data for 2022, this project aims to analyze the prevalence of CVD and associated health indicators.

This project addresses several key questions:

1. What are the primary risk factors associated with CVD in the BRFSS dataset?
2. How does CVD prevalence vary across different demographic groups concerning age, gender, and socioeconomic status?
3. Is there a correlation between specific health indicators, such as obesity or smoking, and the presence of CVD?
4. Can BRFSS survey questions accurately predict the presence of CVD?
5. How effective is the traditional predictive model in estimating the likelihood of CVD based on health indicators, and can a proposed cross-validation training approach enhance its accuracy?

The project employs a combination of differential statistics and traditional predictive modeling techniques. Differential statistics, including t-tests and chi-square tests, to compare the means and proportions of health indicators between participants with and without CVD. Traditional predictive modeling to build a model predicting CVD likelihood based on relevant features. Enhancements include grouping optimization and a cross-validation training approach to improve model accuracy and generalization. The project outcomes include insights into CVD prevalence across demographic groups, explaining the relationship between health indicators and CVD, and comparing the efficacy of different analytical approaches.

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Exploring Homeless Status Through Clustering Algorithms
Jack Duffy

The primary goal of my project is to compare the effectiveness of different clustering algorithms in uncovering patterns within data related to homelessness. By doing so, I hope to identify distinct groups within the homeless population based on factors such as demographics, health status, and economic conditions. This analysis will provide insights into the multifaceted nature of homelessness and may reveal targeted strategies for intervention.

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Exploring land cover change in the Chattanooga tri-state region using the National Land Cover Dataset
Mimi White, Charlie Mix, Nyssa Hunt

As population increases in the Chattanooga tri-state region, the loss of forest and agricultural land to development is an ever-present concern. This pilot study aimed to quantify past land cover change that has occurred in the region. While not directly investigating areas at risk for development as the region's population grows, the results could potentially inform future research. To accomplish these goals, first, the ArcGIS Change Detection Wizard was used to analyzed National Land Cover Database (NLCD) data in a time series from 2001 to 2021. Next, the results were joined with National Hydrography Dataset (NHD) HUC-12 data for the region, resulting in a graduated color map highlighting subwatersheds that experienced the greatest percent loss in forest and agricultural land cover. Finally, an optimized hotspot analysis, which uses the Getis-Ord Gi* statistic, was performed to detect areas with significant values of change. The result indicated 27 subwatersheds with high levels of forest loss and 15 subwatersheds with high levels of agriculture loss. The results captured with this analysis now serve as the basis for further study using high resolution satellite imagery and deep learning algorithms.

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Exploring the association between child emotional maltreatment and adult family relationships
Heather Eikel

Child maltreatment is associated with adverse outcomes across myriad domains of functioning, including interpersonal relationships and attachment styles (Archuleta et al., 2023; Handley et al, 2019; Kim & Cicchetti, 2004; Kong et al., 2019). Emotional maltreatment is the highest retrospectively self-reported form of maltreatment (Archuleta et al., 2023). Kong and colleagues (2019) found that child abuse histories are indicative of negative outcomes in various dimensions of adult family relationships (e.g., low familial support and greater familial strain). Current research suggests that when one sibling experiences maltreatment, others are also at risk (Donagh et al., 2023; Witte et al., 2018). Additionally, sibling relationships exhibit varied dynamics, where siblings either serve as sources of support and protection or perpetrators of further victimization (Donagh et al., 2023; Katz et al., 2022). Gaps in the literature highlight the scarcity of research on the long-term impacts of child maltreatment on the functionality of family relationships. The current analyses aim to contribute to the literature by examining the relationship between child maltreatment and family relationship functionality in adulthood. To investigate this association, I hypothesized that self-reported child emotional abuse severity and self-reported emotional neglect severity would be inversely related to self-reported family functioning in adulthood. As part of a larger study, adult participants (n=67; 64.5% female)

from the Chattanooga-area community who endorsed interacting with family within the last 30 days completed two self-report measures: the Child Trauma Questionnaire (CTQ) and the Inventory of Psychosocial Functioning (IPF). Correlation analyses revealed significant negative associations between self-reported child emotional abuse severity (=−.29,

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Exploring the Effects of Future Intentions on Academic Performance
Violet Luckart, Tori Sexton

Memory for future tasks, termed prospective memory (PM), is vital in educational contexts. While most PM studies focus on the effects of different variables on the completion of intended (PM) tasks during an ongoing task, our study shifts the focus to the impacts of PM tasks on ongoing task attention. Undergraduate participants will watch two brief lecture videos on obscure historical topics. In one video, they will type given phrases related to the content when certain words are mentioned, while in the other, they will not. Following each video, participants will complete a short quiz on the lecture content, serving as a measure of attention to the lecture. We hypothesize that quiz scores for the video with embedded PM tasks will be higher than those for the control video, indicating increased attention when tasks redirect attention to the lecture. These findings aim to support educators in optimizing content delivery methods and enhancing student attention during lectures. Our study also seeks to contribute to the current theoretical framework for prospective memory, especially the dynamic multiprocess view. Future research will look at the effects of distractions during lectures with embedded PM tasks for populations with attentional deficits, furthering our understanding of prospective memory dynamics in educational settings.

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Exploring the Impact of Residual Symptoms of COVID-19 on Work Participation
Maddy Martin, Jessica Hackathorne, Sara Lum, Katelyn Henderson, Cathleen Mellor, Sydni Owens, Courtney Worley

The COVID-19 pandemic has impacted the lives of many worldwide, and for some, the residual symptoms of the illness continue to impact daily life. In response to the need to understand more about the impact of long COVID, this study analyzed the effects of long COVID symptoms on an individual's ability to meet employment demands. An online survey was shared to multiple social media groups to collect information about the experience of individuals with long COVID as they attempted to return to work. The results showed that long COVID symptoms had an effect on an individual's ability to meet work demands. Before their experience with long COVID, 56% of respondents were working 40+ hours per week, whereas after, only 6% were able to work the same hours. Further, 30% of the respondents were unable to return to work for a period of time after their experience with long COVID, and 25% returned to work with accommodations. Qualitative data analysis revealed a need for increased knowledge of long COVID and advocacy for accommodations, as well as

implications for long COVID rehabilitation. With knowledge of energy conservation principles, psychosocial tools, and chronic disease management, occupational therapists can play a key role in supporting clients with long COVID as they aim to re-engage with the world.

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Exploring the relationship of the Steiner K-Wiener index and graph connectivity, compactness, and density.
Matthew Gentry

Graph theory plays a crucial role in designing wildlife reserves, with a primary focus on creating models that ensure both connectivity and compactness. One specific metric we will explore for this purpose is the Steiner K-Wiener index. By examining its relationship with graphs, we aim to ascertain whether this index can serve as a valuable tool in evaluating whether a proposed model fulfills the essential criteria of being both connected and compact.

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Exploring Trends in Metacritic Game Genres Over Time: A Statistical Analysis
Cristian Quiterio

The evolution of video games from simplistic text-based narratives to complex, immersive experiences has revolutionized the entertainment industry. This study delves into the reception and quality of games over time by analyzing data from Metacritic, a leading aggregator of game reviews. The research aims to elucidate how genre/gameplay categorization influences the reception of games and to forecast emerging trends in the gaming landscape.

Utilizing descriptive statistics and clustering analysis, this study examines a dataset comprising Metacritic scores spanning from 1969 to 2023, encompassing approximately 130,000 entries. Descriptive statistics offer insights into the distribution of scores across different genres and time periods, while clustering analysis identifies overarching trends in game reception. Hierarchical clustering is employed due to its flexibility in detecting trends without presupposing cluster shapes.

While this analysis provides a comprehensive overview of game reception dynamics, it acknowledges potential limitations such as outliers and external factors like viral trends or release dates. Nonetheless, the vast dataset ensures robustness in the findings.

By shedding light on the relationship between genre categorization and game reception, this study contributes to understanding the evolving preferences of gamers and offers valuable insights for developers and industry stakeholders.

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Finger Rehabilitation System
Noah Leiker, Juan Pena, Camron Rockwell

Finger injuries can significantly impact daily life, limiting dexterity and diminishing quality of life. Traditional rehabilitation often requires extensive time, effort, and resources, with limited accessibility and effectiveness for specific injuries. Existing finger rehabilitation devices face challenges with insufficient torque, rigid designs, and limited adjustability. This project proposes a portable, user-friendly, and cost-effective Finger Rehabilitation System. Utilizing continuous rotation DC motors, it delivers targeted and controlled finger movements, personalized to individual needs and progress. The system's adjustability ensures a comfortable fit for diverse finger sizes, while its user-friendly design promotes adherence to rehabilitation protocols at home. The design leverages three continuum robots with adjustable Velcro rings and servo-controlled disks. The Finger Rehabilitation System has the potential to revolutionize finger rehabilitation, offering a more effective, accessible, and affordable solution for individuals with finger injuries and impairments.

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Fraud Detection In Financial Transactions Using Machine Learning
Maneesha Vanga

Financial fraud poses a significant threat to businesses and consumers alike. Leading to substantial economic losses and erosion of trust in financial systems. Fraud can be defined as criminal deception with the intent of acquiring financial gain. Financial fraud, especially credit card fraud, is a significant concern for financial institutions and consumers worldwide. In this project,the aim is to develop a fraud detection system using advanced techniques such as Autoencoder for dimensionality reduction and K-Nearest Neighbors (KNN) for classification.

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Freshman & Seniors: How Different Are They? An Exploration of Well-Being, Resiliency, and Affect
Autumn Mayfield

Purpose: The purpose of this study was to assess if differences exist between freshmen and senior students in engagement, perseverance, optimism, connectedness, happiness, resiliency, positive affect, and negative affect scores.

Methods: Freshmen and senior students (N=138, 41% freshmen, 59% senior, 70% female, 85% white) completed surveys at the beginning of Fall 2023. The 20-question EPOCH: Engagement, Perseverance, Optimism, Connectedness, Happiness Adolescent Well-Being survey (EPOCH), 2-question Connor-Davidson Resilience Scale (CD-RISC-2), and the 20-question Positive and Negative Affect Schedule (PANAS) were completed. Means and frequencies were calculated for all variables. Due to non-normality and small sample sizes, Mann-Whitney U tests were used to assess differences by year (freshmen versus seniors). IBM SPSS Statistics for Windows, Version 29.0 was used for all analyses and statistical significance was set at p

Results: Optimism and happiness levels were higher in seniors than in freshmen (3.51 vs 3.12, p=.008 and 3.74 vs 3.41, p=.021). Seniors had greater resiliency scores compared to freshmen (6.26 vs 5.41, p

Conclusions: Results from this suggest differences between freshmen and seniors in resiliency, negative affect, and multiple well-being constructs. Further research should be conducted to assess if these differences are seen in other college populations. Additionally, longitudinal studies are needed to see if and when these values change.

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Game Pricing Prediction
Adam May

This project aims to explore the changing pricing of video games over time. It focuses on predicting recent trend of game prices with two methods being Time-Series Analysis and K-Nearest Neighbor. Which game prices started in 1990 with the range of $30 - $40 and increased from 2006 to $60. As of now in the year 2020 video game prices increase $10 more with a 14-year span.

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Gamification of Electrical Power Distribution Systems for k-12 students
Madison Knight

Chattanooga is a growing city in Tennessee that is nestled in an optimal area for hydroelectric power. Between the Chickamauga Hydroelectric Dam, the Raccoon Mountain Pumped-Storage Plant, and the Sequoyah Nuclear Plant, the Tennessee Valley Authority maintains large amounts of power to service a growing area of trade and commerce. As the city grows, the city's power usage increases along with the need for increased electrical engineers.

The authors will leverage these major landmarks together with results from research experiences at the University of Tennessee at Chattanooga to teach students about

electrical engineering and motivate them to pursue careers in the field and power the growth of this city and the surrounding area.

Preliminary research results are presented to illustrate how gamification of the grid can help learning using a video game that allows students to manipulate and balance a power grid simulation in real time. In related lessons, student will create physical and digital electric power models.

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GetRite Physical Therapy
Daniel Duggin, Brianna Black, Andres Cavalie, Andres Angel, Halle Olsen, Ethan Craig

GetRite Physical Therapy is a web application designed for physical therapy clinics and practitioners who are seeking an efficient and comprehensive solution to enhance patient care. This is a platform meant to streamline the management of patient's injuries and progress and allow for their therapist to create personalized workouts for each unique patient's needs.

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Global Data Clustering Analysis
Summer Olmstead, Major Schwartz

The data sets we have chosen include global data from 167 countries for the following parameters: GDP (current USD in millions), Mortality Rate in Infants (out of 1,000), Population (in 1,000s), Net Migration, Income per Capita, Labor Force (in 1,000s), and Current Account Balance (in 1,000s). Given these datasets, this paper is going to combine these seven attributes into one large data set given a combined best base year and run different clustering techniques on the data. This paper aims to find patterns and group the data into separate clusters with different methods. After grouping the data into its respective clusters, this paper will explain the meaning of what the data is showcasing.

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Goal-Directed Fluid Therapy in the Perioperative Setting
Matt Vedder, Andrew Hester, Cody Sims

Intravascular fluid volume management in the perioperative setting is an important aspect of patient care that anesthesia providers must consider. Historical methods of fluid volume management have relied upon formulaic methods and static measurements to approximate a patient's fluid volume. Modern advancements in technology allow for the use of

hemodynamic monitoring practices, such as Pulse Pressure Variation (PPV) monitoring, to dynamically assess a patient's fluid volume status and guide the healthcare provider's treatment plan. This updated approach to fluid volume management is known as Goal-Directed Fluid Therapy (GDFT).

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Going Under: Building The Metropolitan Railway
Lucas Walchak

My website project on the Metropolitan Railway, discusses the events leading up to, the construction of, and the effects of the world's first subway. This railway, created in 1860s London, was the blueprint for the modern subway and changed the world for centuries to come.

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Government Responses to Drug Abuse: Philadelphia and Portland as Case Studies
Erin Yenawine, Levi Ellis, Jalil Bowler, Carmen Witt

Historically, responses to substance abuse in the US can be categorized into enforcement/criminalization or treatment. Currently, two cities in the US have taken opposing approaches to the problem of drug abuse. Measure 110 passed in the State of Oregon in 2020, allowing small quantities of all drugs to be consumed, which has had widespread effects on the city of Portland. This measure had broad support from the public, receiving 58% of the vote (Biddle). This law intended to shift away from criminalization, the people of Oregon recognizing that "people suffering from addiction are more effectively treated with health care services than with criminal punishments," as emphasized in the bill text (Measure 110). In Philadelphia, drugs remain illegal and criminalized. Some non-governmental attempts at a harm-reduction based approach have begun and failed here. Safe House, a harm-reduction non-profit organization, based out of Philadelphia attempted to open a safe drug use site in 2019. Overdose rates are of great concern here. In 2022, there was an 11% increase from the previous year. Black individuals' overdose rates increased by 20% from 2021 to 2022, as well. Notably, xylazine, an emerging opioid out of Philadelphia, commonly known as stronger than fentanyl, took up 34% of overdoses in 2022 (Philadelphia Department of Public Health, 2022). From a policy evaluation perspective, the enforcement of both of these approaches have failed to reduce drug use. In Portland, critics have found that prevention and treatment efforts have been slow, and officials on the ground have not put in place measures to support the successful implementation of the policy goals. Increasingly, perceptions of the current state of drug use (Shick & Wilson, 2023). In Philadelphia, police have contained the usage of harder drugs largely to a neighborhood called Kensington. As a result of this negligence, they are seeing negative consequences amid Kensington's open-air drug market on the city at large. In conducting a thorough lit review on these case studies, we aim to answer several questions. What are the

goals for differing policy approaches to drug abuse? How do they affect the local economy? Are treatment-based responses feasible in fighting substance abuse? We will research treatment-based responses to analyze their effects, efficiency, and overall feasibility. Understanding how these policies have failed to achieve the written policy aims is critical in formulating future drug policies in these cities and others.
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GrocerySaver
Clint James, Garrett Walker, Noah Dillon, Caroline Warner, Nathanael Byrkit, Mitch Wood

GrocerySaver is an online web application that tracks the number of items and their expiration dates. This project aims to create an item that would be presentable to shareholders in a realistic scenario in the software development world. Ultimately, this project served as our group's capstone project and had the explicit goal of preparing our group to go and apply the hard and soft skills that we learned in our other courses at UTC. To build GrocerySaver, our group used a variety of programming languages that were explicitly chosen to complete the task of making an efficient web application that would accomplish the goal that we set out to achieve in producing a useful productivity tool. As a result of this project, we created a finished product that we are proud of that accomplishes the goals that we set out to achieve.

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Health - Related Quality of Life of Caregivers for Children with Developmental Disabilities
Tessa Baker, Stephanie Forbert, Sydney Baker, Blair Shelton, Sarah Tindall, Cindy Poole

Purpose: The purpose of this study was to examine the perceived mental and physical health related quality of life (HRQOL) for caregivers of children with developmental disabilities to understand the caregiver experiences that impact holistic occupational therapy (OT) pediatric care.

Design: This study used information from a quantitative, cross-sectional, U.S. survey which was targeted to individuals in the Southeastern United States.

Method: A 2021 retrospective cohort study of 1,549 self-reported caregivers of children with DD was obtained from the Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS). Data was analyzed using SPSS 28.0. Nine survey questions addressed HRQOL including “how many days [mental or physical] health were not good” and “number of days poor health impacted CG activities” of daily living (ADL) compared to non-caregivers in the past 30 days.

Results: Caregivers were predominantly female (74.1%). The percentage of caregivers of children with developmental disabilities that reported poor mental health (14 or more days per month) was significantly greater (20.6%) than non-caregivers (12.1%), p **Conclusions:**

Caregivers of children with developmental disabilities had significantly more days of poor mental and physical health which has impacted personal ADL performance than non-caregivers.

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Hook-up Culture and Self-esteem in Young Adults
Kaitlyn Evans, Anna Bernstein, Emma Shavers, Corah Davidson, Jaycie Sewell, Maggie Redpath

The purpose of this research is to examine the correlation between young adults' self-esteem and their participation in hook-up culture. The research will test our hypothesis that a higher rate of participation in hook-ups will lead to a lower perception of self-esteem in young adults. This study is a quantitative and exploratory research project. Our independent variable is participation in hook-up culture and our dependent variable is self-esteem measured by four questions in the anonymous survey. Our participants are young adults ranging in age from 18 to 26 years old. From our data we will be able to address our research question: Does hook-up culture have a negative impact on young adults' self-esteem? Based on the results, it was found that those who participated in hook-up culture had a lower self-esteem than those who did not participate, but those who had a higher frequency of hook-ups had better self-esteem than those with a lower frequency of hook-ups.

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How Does COVID-19 Affect Women's Pregnancy Experience
Ricky Stout, Shaquita Stalmaker, Melba Jones

Our research project is about "How COVID-19 affects women's pregnancy experience?" This research focuses on the experience pregnant women had while having COVID-19. The significance of this research is to educate people on how detrimental COVID-19 was/is to pregnant women. How influential COVID-19 can be on a woman's health and placenta, and how vital the first trimester of a woman's pregnancy is vulnerable to diseases and viruses.

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Hypothetical Protein Linked to Meningitis: A Protein Functional Analysis
Alexander Garrott, Rizwaan Kadir

Bacterial meningitis is a life-threatening bacterial infection of the protective covering of the brain and spinal cord. *Haemophilus influenzae* is a specific type of bacteria that leads to meningitis. Recently a hypothetical protein (EWA93_01400) in *Haemophilus influenzae* has

been discovered that could potentially lead to meningitis. Hypothetical proteins are uncharacterized proteins in which their function is completely unknown. The current structure and function of the hypothetical protein (EWA93_01400) is unknown. Here we try to understand the hypothetical protein's structure and function using different bioinformatics tools. The further understanding of this hypothetical protein's structure and function can potentially aid in further therapeutic development helping treat and prevent meningitis.

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Identification of microplastics in sediment deposits along a commercialized and non-commercialized segment of Raccoon Mountain Caverns: a tale of two tours
Quillen Thornton

Microplastics have recently been identified as a threat to freshwater and marine ecosystems. Identification and quantification, however, have proven to be a challenge in the mitigation of microplastics. Several methods have been explored to examine microplastics in sediment samples across depositional environments, and only a few studies have investigated the extent of microplastics in cave sediments and karst aquifers. Using previously described methodologies, Balestra and Bellopede (2022) developed a microplastic detection technique to identify microplastics in cave sediments. Our study expands on their technique and provides the unique opportunity to compare the quantity of microplastics in a local commercial cave and its associated wild cave. Raccoon Mountain Caverns, which is approximately 6 miles west of Chattanooga, Tennessee, has a walking tour available for tourists that includes a simple pathway that has been modified for walking. The company also provides wild cave tours that invite smaller groups to explore the non-commercialized sections of the cave. Using sediment samples collected from the commercial tour and the non-commercialized tour, microplastics were filtered and separated by density separation and dyed with a Nile Red technique. The microplastics were then identified using UV microscopy. Samples from the commercial section of the cave are compared to the non-commercial section of the cave to explore the difference between microplastic pollution in the sediments less often exposed to tourism to the sediments along the walking tour.

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Impacts of Caregiver Support on Child Development: A Literature Review
Celena Thomas, Ally Wilson, Emma Roach, Jim Tucker

The impacts of the relationship between caregivers and child development has been a longstanding topic of research across multiple professional disciplines. This review focused *caregiver* under the National Association of School Psychologists definition of *parent*, whereas a *parent* "May be defined in law or district policy, and can include the birth or adoptive parent, an individual acting in the place of a natural or adoptive parent (a

grandparent or other relative, stepparent, or domestic partner), and/or an individual who is legally responsible for the child's welfare" (NASP, 2022). Common themes we intend to address are brain development and sensitive periods, caregiver mental health factors, external factors such as ACE's and SES, as well as general relational attachment between the child and their caregiver. This literature review intends to identify links within existing research and suggest future directions.

National Association of School Psychologists. (2019). *School–family partnering to enhance learning: essential elements and responsibilities* [Position Statement]. Bethesda, MD: Author.

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Implementation of an Evidence-Based HPV Counseling Program for Primary Care Providers in Rural Health Departments in Tennessee to Increase HPV Vaccination Rates
Casey Brooks

Introduction: Approximately 85% of sexually active individuals will contract HPV in their lifetime (Vaillancourt, 2021) and there is a growing incidence of HPV-related cancers meriting increased attention and stressing the importance of enhanced efforts to increase HPV vaccination (Pratt, 2018).

Aim: Recognizing the role of healthcare provider's recommendation as a driver for vaccination, the aim of this quality improvement pilot project is to leverage provider-focused interventions to overcome barriers and vaccine hesitancy to ultimately increase HPV vaccination uptake.

Description: An evidence-based multicomponent intervention has been developed and will be piloted within selected rural Tennessee Department of Health departments. Health Department primary care providers will participate in a formalized HPV counseling program supplemented with a provider toolkit. Providers will be assessed for increased knowledge concerning HPV and HPV vaccination, and vaccine communication confidence prior to training, immediately post training and at 1,3, and 6 months.

Impact: The successful implementation and dissemination of this translational project is expected to result in increased provider knowledge and confidence concerning HPV counseling. Ultimately, HPV vaccination rates will increase and increase in herd immunity to HPV.

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Implementation of Statewide Drug Treatment in the U.S. Carceral System
Gracee Smith, Brandon Denley, Heidi Maradiaga, Andrew Antcliffe, Kristina Thompson

U.S. carceral drug treatment programs are disproportionately implemented nationwide despite proven success in studied programs offered by states such as California. This lack of implementation is attributed to several factors that vary statewide including the state's local and regional politics, budgets, and broad socio-cultural landscape.
Historically, treatment within the carceral system has been de-emphasized in favor of punitive measures. Key states like New Mexico, Louisiana, California, and New York approach drug treatment in state prisons through different methods. New Mexico and Louisiana's prison treatment programs generally center their treatment methods around punishment rather than public health and rehabilitation. States like New York and California, however, generally approach prison treatment from a health-based approach, providing more access to treatment resources like one-on-one therapy, extracurricular activities, and education. In examining the disparity between treatments state-wide, we hope to paint a comprehensive picture of the barriers facing states' implementation of carceral drug treatment programs and why implementation varies so widely.

This question will be explored through extensive literature reviews focused on the political environments of state prisons. Through this research, we hope to provide a stable foundation from which to advance future research on the implementation of carceral drug treatment and provide focused areas of improvement to ensure future accessibility and widespread implementation of these drug treatment programs.

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Improved Hamilton County Health Dashboard
Lindsay Easterwood, Gabrielle Beckett, Brady Moore, Victoria Martino, Cody Whitt, Cody Major

Our team is partnering with the Hamilton County Health Department to expand and improve their health data dashboard. This work will involve a landscape analysis of capacity for additional data collection, analysis, visualization, and communication activities that will improve the response to infectious diseases. This project also involves creating, adapting, and enhancing tools/products using already collected data, with a focus on infectious disease. This work will specifically result in an improved data dashboard.

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Improving Registered Nurse Burnout and Retention
Shannon Adams

Abstract: Nursing continues to face staffing shortages, negatively affecting patient care and satisfaction. High registered nurse (RN) turnover increases nurse-patient ratios and the on-call burden of operating room (OR) RNs, negatively affecting intent-to-stay. This project will answer the following question: Among operating room registered nurses in an acute care setting, how does the implementation of employee engagement initiatives, including a

standardized orientation and mentor program, compared to current practice, impact employee engagement, intent-to-stay, and work-life balance in 6 months? The OR needs an RN orientation and mentor program and retention strategies to increase staff morale and improve employee engagement and work-life balance. This project will utilize qualitative data, such as stay interviews, and quantitative data, such as employee engagement surveys. After benchmarking and tracking RN turnover, an orientation and mentor program for all new-hire RNs will be implemented. The implementation process is five steps: education of the project steering committee, administering pre-assessment surveys and scheduling one-on-one rounds, implementing the orientation and mentor program for any new hire OR RN, administering the mid-project assessment survey, and administering the post-survey assessment. All new hires OR RNs will receive an orientation and mentor program sustaining this project. Quarterly engagement surveys will be administered to all RNs, scheduled bi-monthly rounding will be continued, and engagement touchpoints will be held at 30, 60, and 90 days.

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In Situ Sampling Device for Microplastics Tracking in Water Sources
Kara Kimes

Assessing the concentration of microplastics (MPs) in stormwater runoff is crucial for comprehensively understanding the global impact of microplastic pollution. This initiative is driven by the objective of effectively capturing and quantifying MPs within local stormwater conveyances. To attain this objective, with funding support from the U.S. Environmental Protection Agency, we are researching to design a specialized device capable of separating solid particles from the continuous flow of stormwater. The incorporation of an enhanced sampling device will guarantee consistent performance, yielding a highly mobile testing platform. This platform can be deployed across various locations, facilitating repetitive usage and generating MPs concentration data. The accumulated dataset will be instrumental in determining the overarching environmental accumulation of microplastics. We are currently in the development stage and have successfully designed and made a functioning prototype of the sampling device.

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Incorporating Diversity, Equity, and Inclusion within Community Nursing Simulation
Savannah Kelley

Undergraduate nursing institutions face difficulties providing learners with community and public health nursing clinical opportunities. An opportunity existed to improve a senior-level undergraduate community and public health nursing course by developing alternative clinical teaching-learning experiences which promote diversity, equity, and inclusion. Utilizing theory and evidence-based practice, a simulation emulating a community home health visitation allowed learners to function as members of a healthcare team who provide

care for a family in their home setting. The results indicate that all learners met project objectives, and 88% of learners reported increased self-efficacy related to the project's topics after implementation. Learner reflections offered their perception of the experience. A community and public health nursing teaching-learning project provided learners with clinical hours by completing a simulation learning experience incorporating diversity, equity, and inclusion through exposure to patient inequities within the LGBTQIA+ community.

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Inquiry-Based Learning in an Introductory Forensic Science Course
Derek Boyd, Kylie Williamson

This presentation reports and reflects on inquiry based experiential student learning in an introductory forensic science course (ANTH1600: Bodies of Evidence: The Science of CSI) in the Department of Social, Cultural, and Justice Studies. Thanks to generous funding from the Walker Center for Teaching and Learning High Impact Practices Grant, materials for several hands-on learning activities were purchased, including equipment for evidence recovery, blood spatter analysis, fingerprint analysis, and bite mark analysis. Throughout the fall semester, students were introduced to various facets of forensic analysis, and given the chance to practice such analyses in several classroom activities. Each activity consisted of pre-lab and post-lab questions meant to gauge preconceived notions of forensic science based on crime TV and reflect on a more realistic understanding of the capabilities of forensic science. Upon completion of the course, students were asked to reflect on how their participation in course activities influenced their prior beliefs and knowledge of forensic science and identify newly acquired strengths and skills that can be applied as continuing learners and future forensic practitioners. Overall, the course was successful with most students responding that the hands-on activities improved their engagement with course material and dispelled some of their previous beliefs regarding the realities of forensic science.

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Insect Abundance Sampling on UTC's Urban Greenway
Miranda Lighter

This study delves into the practicality of using bicycles for mobile insect abundance surveys along the University of Tennessee at Chattanooga Urban Greenway. We aim to understand how well this sampling approach works in urban green spaces. Assessing insect populations in such areas is crucial for understanding the health of local ecosystems and the effects of urban development on insect populations. We suggest that future studies expand to greenways in less urbanized regions to see how insect populations compare in different environments. We intend to determine if our method is comparable to studies conducted analyzing the frequency of insects found on vehicular windshields. In our study, we attach a large sticky trap to the front of a bicycle basket and set up five stationary traps in

predetermined areas throughout the greenway. After the bicycle ride, the number of insects measured on the bicycle trap was counted and averaged with the numbers from the stationary traps. Initial findings show that the bicycle-based method captures more insects than the traditional stationary approach, although the data has shown significant variations. Factors that may contribute to these variations are the frequency of biking, weather patterns, and the time of day. This highlights the need for further research to standardize our methods and confirm whether biking is a reliable way to measure insect numbers in urban green spaces.

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Integration of Decentralized Graph-Based Multi-Agent Reinforcement Learning with Digital Twin for Traffic Signal Optimization
Vijayalakshmi Kumarasamy

Machine learning (ML), especially reinforcement learning (RL), has garnered significant attention for optimizing traffic signal control in intelligent transportation systems. However, existing ML approaches face scalability and adaptability challenges, especially in large traffic networks. This paper proposes an innovative solution by integrating decentralized graph-based multi-agent reinforcement learning (DGMARL) with a Digital Twin (DT) to enhance traffic signal optimization, aiming to reduce traffic congestion and network-wide fuel consumption associated with vehicle stops and delays. DGMARL agents learn traffic state patterns and make informed decisions on traffic signal control, further facilitated by the Digital Twin module simulating real-time traffic behaviors. Evaluation utilized PTV-Vissim, a microscopic traffic simulation platform, focusing on the MLK Smart Corridor in Chattanooga, Tennessee. Comparative analysis against an actuated signal control baseline showed significant improvements, with a remarkable 55.38% reduction in Eco_PI over 24 hours. In a PM-peak-hour scenario, the average Eco_PI reduction reached 38.94%. These findings underscore the effectiveness of the proposed approach.

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Integration of Exoskeleton Glove and Hand Tracking Camera for Hand Rehabilitation
Jason McDowell, Brenden Lippard, Katie Collins

Each year in the United States almost 800,000 people have a stroke, which may severely affect hand function. Rehabilitation following a stroke is crucial for restoring strength, range of motion, and neural control. Wearable robotic systems for passive-assisted motion therapy, active-assisted motion therapy, and robotic mirror therapy improve motor recovery and functional abilities for patients and allow user-directed therapy at home. Popular pneumatic gloves for home-based rehabilitation are limited by their lack of fine-grained control and data analytics to track progress effectively. This project introduces a method of using a hand tracking camera to provide continuous monitoring and control of finger movements within a rigid exoskeleton glove. The exoskeleton glove uses linear

actuators to control the position of each finger independently, based on the angle of the fingers measured by the hand tracking camera. The system can track both the hand wearing the exoskeleton glove and a different hand, enabling several robotic therapy modalities and a broader range of rehabilitation exercises. This mobile system enables data collection and detailed analytics of exercises to allow for evaluations of progress and adherence to a rehabilitation program at home. This hand tracking exoskeleton glove demonstrates a rehabilitation technology that can transform the recovery process for patients by monitoring progress over time and putting control of the rehabilitation process in the user's hands.

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Intelligent Reconfigurable EV Battery Management: A Dynamic Graph-Based Deep Reinforcement Learning Approach
Cristian Quiterio, Brent Lewis, Cuinn Owens, Rick Larson, Dylan Quarles, Michael White

Electric Vehicle (EV) batteries, composed of thousands of cells, undergo variable charging and discharging cycles, leading to diverse cell behaviors. The fixed structure of current battery designs poses challenges such as limited operational lifespan due to cell imbalances and failures. Reconfigurable battery designs offer a solution, but existing methods lack scalability for large-scale EV systems.

This study proposes an Intelligent Reconfigurable EV Battery management system, leveraging a dynamic graph model where cells and modules are nodes, and connections represent edges. By integrating Graph Neural Networks (GNN) with Deep Reinforcement Learning (DRL), the system dynamically adjusts cell connections based on real-time data, design constraints, and performance needs. This approach addresses the complexities of large-scale battery systems, offering adaptability to various demands, resilience to imbalances and failures, and optimal energy conversion efficiency.

The research aims to model individual cell properties, develop dynamic graph-based DRL algorithms, and conduct simulations alongside real-world testing. Ultimately, the proposed system seeks to revolutionize EV battery management, ensuring efficient and reliable performance across diverse operational scenarios.

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Interdiction in America: The Rise of Fentanyl
Breyer Hankins, Stephen Curtis, Sierra Mitchell

In analyzing the Biden Administration's interdiction policies, a complex web unfurls through historical and contemporary political narratives. The War on Drugs has created a cycle of illicit substances gaining and losing national popularity based on which drug is more easily

available. Through current policies, interdiction addresses supplier-based forms of fighting the opioid crisis.

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Interdisciplinary Team Rounding – Implementation of a Standardized Nurse-Led Rounding Technique to Improve Nurse Self-Efficacy and Patient Length of Stay
Tina Nguyen

In health care, interdisciplinary team collaboration is critical for ensuring the delivery of holistic, individualized, and quality patient-centered care. One capacity in which interdisciplinary healthcare teams can effectively communicate, coordinate, and collaborate on patient care in an acute care setting is through the practice of interdisciplinary rounds (IDRs). This healthcare quality improvement project focuses on implementing a standardized nurse-led interdisciplinary rounding technique in an academic tertiary care setting to address barriers hindering nurse participation in interdisciplinary rounds (IDRs). The intervention aims to enhance communication, collaboration, and decision-making, impacting nurse self-efficacy and patient length of stay. Using quantitative measures, surveys adapted from validated tools will assess nurse self-efficacy pre- and post-intervention, while patient length of stay data will be analyzed between pre- and post-implementation periods. The project targets a 50% and 75% increase in nurse participation in nurse-led IDRs within one and two months, respectively. Within three months, the goal is to reduce the average patient length of stay by 0.5 days, and within six months, by one day. The initiative aspires to achieve 90% nurse participation and physician support in nurse-led IDRs within six months. This project has the potential to advance healthcare knowledge and practice by emphasizing the importance of standardized rounding techniques and interdisciplinary collaboration. Successful implementation and dissemination may extend nurse-led IDRs to other patient care areas, improve team perceptions of collaboration, enhance nurse self-efficacy, increase nurse satisfaction, retention, and performance, decrease patient length of stay, and improve the quality of care delivery and patient outcomes.
Keywords: interdisciplinary rounds, nurse-led, rounding tool, self-efficacy, length of stay

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Intolerance of Uncertainty Relates to Lower Friendship Quality in a Chattanooga Community Sample
Elisha Seifferth

Uncertainty impacts the physical and social environments of young people (Schweizer et al., 2023). Those with high intolerance of uncertainty (IU) perceive uncertainty as threatening due to elevated levels of anxiety and worry (Morse et al., 2021). High IU can increase the effects of insecure attachment styles, such as anxious and avoidance, affecting interpersonal relationships significantly (Eruyar & Yilmaz, 2023). I hypothesize that self-reported tendencies of IU will inversely relate to self-perceived quality of friendships. Data were collected from an ongoing community-based study in Chattanooga, TN. There were 76 participants (65 women) with a mean age of 32.57 – 71 of which completed a self-report 12-item Intolerance of Uncertainty Scale (IUS-12) and the Interpersonal Functioning Scale – Friendship Subscale. Using a bivariate Pearson Correlation analysis, there was a significant, moderate, negative correlation (r = -.45, p

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Intrathecal Dexmedetomidine in Obstetric Anesthesia
Preston Gray, Cheyenne Lovell, Abby Brown

Introduction: Anesthesia providers must develop a comprehensive anesthetic plan for obstetric patients. While vaginal birth is the more common and preferred method of

delivery, certain conditions such as prematurity and malpresentation necessitate a cesarean delivery. Neuraxial anesthesia is recommended over general anesthesia for patients undergoing cesarean deliveries to allow the mother to participate in the delivery and reduce the risk of neonatal and maternal complications. However, side effects such as hypotension, nausea/vomiting, and shivering may occur. Shivering occurs in over 50% of parturients who receive neuraxial anesthesia for cesarean delivery and is associated with detrimental effects for both the mother and fetus including increased oxygen consumption and carbon dioxide production, pain, PACU stay, and maternal discomfort. The AANA provides practice guidelines for the management of obstetric patients but does not include a specific prevention or treatment protocol for hypothermia and shivering.

Research Question: The following research question has been developed to guide this project: In anesthesia providers that specialize in the delivery of care to obstetric patients undergoing cesarean deliveries with neuraxial anesthesia, does implementation of an education session, compared to provider knowledge prior to the education session, enhance provider knowledge and improve pre-intervention questionnaire scores on the safety and efficacy of utilizing intrathecal dexmedetomidine in this patient population?

Methods: This project aims to utilize the implementation of an in-person educational session with accompanying pre-education and post-education surveys to assess CRNA's knowledge of intrathecal dexmedetomidine use and assess their willingness to implement change within their own practice. The results from the surveys will be analyzed using statistical analysis tools via Qualtrics to assess how beneficial the educational session is.

Results: In the short term, the authors expect to see that anesthesia providers who received the aforementioned education have an increase in their knowledge regarding the safety and efficacy of low-dose intrathecal dexmedetomidine as well as an increase in knowledge about the physiologic consequences of obstetric shivering. In the long term, we aim to see around a 25% decrease in the amount of post-neuraxial shivering in obstetric patients.

Conclusions: Post-neuraxial shivering in obstetric patients is a prevalent issue affecting over half of this population and is accompanied by a myriad of untoward side effects. This study will help increase CRNAs' awareness of these consequences, show them a viable option for prevention with intrathecal dexmedetomidine, and therefore decrease the rate of obstetric shivering that occurs.

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Investigating Healthcare Provider Knowledge and Treatment of the Non-Motor Symptoms of Parkinson's Disease

Sierra Sturken, Hanna Horchi, Mia Lawson, Ryan McDaniel, Ivy Olinger

Parkinson's Disease (PD) is a neurodegenerative condition affecting thousands of older adults in the United States (Poewe et al., 2017). It is characterized by a combination of motor symptoms and non-motor symptoms (NMS) (Bhat et al., 2018). The NMS of PD have

the biggest impact on the individual's quality of life, however, they are often dismissed by healthcare providers (Yilmaz et al., 2023).

The data for this exploratory study was collected via an online survey. Potential participants were required to work in healthcare treating patients with PD, be above the age of 18, and agree to a statement of informed consent. The survey consisted of 20 questions about place of work, years of experience, and habits related to treatment of patients' NMS.

25 respondents completed the survey. 96% of participants are aware of PD related NMS but only 50% believe that their patients are aware of possible NMS. 64% of participants spend at least 20 minutes per visit discussing motor symptoms with patients, while only 22% of participants spend at least 20 minutes per visit discussing NMS. The majority of participants address NMS on an as-needed basis. 48% of participants reported that they lacked a protocol for addressing NMS.

Our results confirm that healthcare providers recognize the prevalence and negative impacts of NMS related to PD. However, there continues to be a gap in treatment of NMS. More research is needed to determine specific barriers to treatment of NMS and effective methods for clearly delineating each discipline's role in treatment of PD.

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Investigating Park Programming in Chattanooga's Underserved Areas
Margaret Blevins, Ailene Le, Annie Harrison

This conference proposal aims to present a comprehensive approach to addressing inequities in park programming by focusing on underserved areas in Chattanooga, Tennessee. Utilizing Geographic Information Systems (GIS) mapping technology, our research identifies current programming initiatives and their spatial distribution, highlighting areas that lack sufficient recreational opportunities. By analyzing this data, our project aims to uncover disparities in access to park programming and propose strategies for enhancing inclusivity and equity in Chattanooga's recreational landscape. Through collaboration with community stakeholders and local authorities, our initiative seeks to bridge the gap between underserved neighborhoods and existing programming resources, ultimately fostering a more equitable and accessible park system for all residents. This presentation will offer insights into our methodology, findings, and recommendations, with the goal of inspiring similar initiatives in other communities striving for equitable access to recreational amenities.

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Investigating the Intensity of Urban Heat Island in Chattanooga, TN Using Satellite Imagery and Field Measurements
Azad Hossain

Since the City of Chattanooga, TN is one of the fastest growing cities in Tennessee it is very important to understand the intensity of urban heat island (UHI) effects on sustainable development efforts in this area. Remote sensing technology has been used successfully to study UHI effects for many large cities in the United States and the rest of the world. Using thermal images acquired by NASA's Landsat 8 satellite during the summers of 2018 and 2019, a recent study conducted in the GERS-Lab at UTC found that the City of Chattanooga indeed behaves like an UHI, and its effect is significant. Recently we installed 8 temperature measuring stations across the City of Chattanooga, TN to acquire air temperature at 2 m (~ 6ft) height from the ground. We have been acquiring temperature data every 10 min (24/7) since March 2023. This project aims to incorporate ground measured air temperature with the ongoing remote sensing-based study to better understand the intensity of UHI effects. This project is ongoing. The preliminary results and analysis will be presented and discussed.

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Investigating the Mineralogy of an Interesting Rock from Harrison Bay
Roxanne Adkins, Eliza Clark

Several samples of a rock of unknown origins or composition were dug up by a homeowner in the Harrison Bay area near Chattanooga, TN. Our group analyzed the rock to determine its mineralogical makeup. The rock was analyzed visually first and appears to be brecciated with an iron-rich matrix and very small circular inclusions. It was partially crushed to a powder and observed under a stereoscope to further prove the observation of the iron-rich matrix. A sample was prepared and sent off to Florida International University for Scanning Electron Microscope analysis. The results of the analysis showed that the matrix of the rock consisted of iron oxides, and there were circular layered structures within the rock that were high in silica. It was concluded that the matrix of the rock was made up of iron oxides, and the circular structures observed were concluded to be silicious dolomite ooids. These conclusions were further supported by information from scientific publications reporting the geology of the area.

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Investigating the Relationship Between Hybrid Work, Job Burnout, and Job Satisfaction in Higher Education
Mariah Perry

This study investigated the relationship between hybrid work, job burnout, and job satisfaction in higher education. Amid the 2020 coronavirus (COVID-19) pandemic, many organizations began shifting their workplace model to encourage hybrid work. This research gleaned insight into the administrative staff perspective to provide data-informed support for higher education leaders when continuing or implementing hybrid work. Two measurement instruments were utilized, including the Maslach's Burnout Inventory –

General Survey (MBI-GS) and the Job Satisfaction Survey (JSS), along with demographic questions and three open-ended questions for hybrid-staff only. The combined survey was electronically administered to staff employed with three public higher education governing offices or coordinating bodies in one southeastern state. Virtual interviews were also conducted with hybrid staff. Quantitative methods were utilized to understand differences and relationships between the independent variables, including mode of work, length of service, job type, and salary, and the dependent variables, JSS and MBI-GS subscale scores. Length of service and the MBI-GS burnout dimension of emotional exhaustion were positively correlated. There were no significant differences in job satisfaction or burnout dimensions by mode of work, or evidenced relational effects based on the remaining attribute variables. The rich qualitative data provided suggestions for how higher education organizations can increase job satisfaction and support staff.

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Is there a correlation between transportation access and social inclusion in the college student population at UTC?
Chasity Phillips, Allison Davis, Oliver Rahn, Kerstyn Rader

The prevalence of social isolation in the United States is rising due to such disparate causes as COVID-19, increases in the cost of living, and the introduction of new technologies (Kannan & Veazie, 2023). Although experiencing social support and inclusion during the college years contributes importantly to young adults' feeling valued, loved, and belonging to a community (Arslan et al, 2018), young adults in college are reported to be one of the highest-risk populations for depression, social isolation, and mental health issues (Elliott, 2021). The nationwide Healthy Minds Survey found that two-thirds of nearly 33,000 students surveyed at schools around the United States reported significant experiences of loneliness and isolation, and over 83 percent of students reported that emotional or mental health issues had significantly impacted their academic performance (Eisenberg et al., 2020).

We hypothesize that transportation access issues are a significant driver of social isolation. Murphy et al. (2022) found that 25 percent of respondents in a nationwide study experienced transportation insecurity daily. While the relationship between transportation access and well-being has been studied in some populations (Banister & Bowling, 2004; Currie & Delbosc, 2010; Mollenkopf et al., 2005; Delbosc & Currie, 2011.), few of these studies have focused on the effects of lack of transportation on rates of social isolation, and there is a lack of data on transportation issues among college students. This gap is the driving force behind our research.

We collected survey responses from 100 UTC students to determine how secure their access to transportation was and how frequently respondents participated in a variety of social activities. Using the Transportation Security Index (TSI) to assess reliable access to transportation and the Australian Community Participation Questionnaire (ACPQ) to

quantify social inclusion, we determined that there was no significant correlation between transportation access and overall social inclusion in our sample.

Investigating the ways that transportation access impacts the social lives of UTC students helps us better understand the flow of life in Chattanooga as the city grows and changes. Our hope is that the results of this study can help guide future research in this area, and that our results will inform policy conversations surrounding transportation access. Our results are of interest to UTC as an indicator of the extent to which our campus population needs transportation reform policy.

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Law Enforcement Websites and Autism Spectrum Disorder (ASD): Awareness, Advocacy, Information, and Interactions
Autumn Brymer, Andrew Denney

There is a substantial amount of evidence that shows that police need to be trained on ASD confrontations as well as any mental health disorders. This study analyzes the presence of ASD on law enforcement websites. The study conducted a thorough analysis of police websites on the top 200 most populated cities in the United States. It is important for there to be a predetermined analysis of the research that has already been conducted regarding our topic, and programs that are being implemented in police departments in major cities around the world. The goal of the study is to assess what information these websites have and analyze the relationships between the types of information found and the city, police chief, and mayoral characteristics of the top 200 cities in the US, and what can be done to improve both officer and community knowledge. The results show that the majority of the cities do not have information regarding ASD, and those that do have very little. As diagnoses of persons with ASD continue to increase, ultimately, interactions with such persons will continue. Similar to relations with racial/ethnic minority communities and LGBTQ+ continue, police departments must do a better job at communicating their policies and interactions with persons with ASD.

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LGBTQ Interactions with the Criminal Justice System and it's Actors
Brenda Zaragoza

The purpose of this research is to thoroughly investigate and analyze the systemic biases and discriminatory practices experienced by the LGBTQ+ community throughout the criminal justice system and by its actors. The study aims to uncover the complex factors that contribute to ongoing acts of injustice by examining historical prejudices, legislative responses, interactions with the criminal justice system, and the lived experiences of LGBTQ+ individuals. The primary purpose is to contribute a deeper understanding of the challenges faced by the LGBTQ+ community considering their historical experiences of discrimination by the criminal justice system, from the criminalization of same-sex relationships to the present-day issues regarding biased policing practices. This research aims to raise awareness to the treatment received by LGBTQ+ individuals from the justice system and the actors therein. In particular, we will focus on experiences individuals have with police, court professionals, and within correctional facilities.

Conducting a secondary analysis on the 2015 U.S. Transgender Survey, the most current iteration of this survey, will provide more information on how this vulnerable community interacts with the criminal justice system and what the criminal justice system can do to improve these interactions.
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LiDAR as a Conservation Tool: Enhancing Suitability Models for the Green Salamander (*Aneides aeneus*)
Sean Jones, Finn Basler, Dakarai Carr, Noah Croy, Dominick Hazeltine, Carter Jordan, Timothy Morris, Thomas Wilson

The green salamander (*Aneides aeneus*), a species with a unique niche habitat within the Appalachian region of the United States, and known populations southern Appalachia, faces significant threats from habitat disruption and climate change. Characterized by its distinctive marbled black and green coloration, this species relies on moist, shaded areas, rocky crevices in forests for survival, making it particularly vulnerable to the impacts of changing environments. As climate change alters their niche habitat, the need for precise conservation efforts becomes critical. In response, this research employs advanced Remote Sensing and Light Detection and Ranging (LiDAR) technologies to identify potential habitats and refine conservation strategies. By combining LiDAR data with Geographic Information System (GIS) techniques, along with climatic, soil, land use, geology, elevation, and biological data, we aim to create a multidimensional habitat suitability model. This model is designed to detect the microtopographic features essential for the salamander's survival and to evaluate the species' distribution and ecological preferences within Tennessee and surrounding region. The use of LiDAR in this context, capable of penetrating forest canopies to reveal detailed terrain features, and identify vertical surface features, represents a novel approach in amphibian conservation, offering a way to map out vital habitats with increased precision. Our project not only addresses the need for targeted conservation plans in the face of climate change but also demonstrates the potential of pairing LiDAR with other well established remote sensing tools and processes in the identification and preservation of niche habitat species like the green salamander.

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Life history and social factors influencing social network structure in Octodon degus
Logan Platt

Animal social systems consist of four interrelated components: social organization, social structure, mating system, and parental care. Social structure influences the fitness of individuals, and this is evident in many species. Social structure may change due to different motivations, like mating behaviors or behaviors that contribute to parental care of offspring. **I hypothesize** that sexual preference influences social structure based on the life history stage of the species. During mating season, the interactions of an individual will likely be

motivated by mating behaviors. During rearing season, motivation may shift to parental care behaviors. **I also hypothesize** that group membership and composition (social organization) influence social structure. Social interactions are expected between individuals that are familiar and/or that are closely related. In groups with non-kin, familiarity of individuals and selection for direct benefits of cooperation may facilitate affiliative interactions. In some mammals, group formation is associated with morphotypes, like the degree to which individuals were masculinized during development. The link between morphotype and social structure has not yet been described. **The objective of my study** is to investigate the influences of homophily according to morphotype, social organization, and life history stages on social network structure in degus (*Octodon degus*). The degu is a communally-breeding rodent endemic to central Chile. I will accomplish this by utilizing social network analysis. Network analyses involve creating networks using interaction data between individuals to infer weighted associations. Network metrics can be calculated and utilized in analyses to find connections between social network structure (SNS) and individual. The results of these analyses will be forthcoming soon. This project is significant because it will be one of the first to analyze connections between individual morphotype and social network structure. Funded by NSF OISE 1854177.

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Living Learning Communities: A Literature Review
Jason Harville

This literature review explores the characteristics of effective living-learning communities (LLCs) and their impact on student success. LLCs can positively impact the success and retention of residential students. Resource allocation and faculty and staff engagement impact the effectiveness of communities, beginning with recruitment and continuing through assessment. Communication is pivotal in the recruitment of participants. The Best Practices Building Model (BPM) for Living-Learning Communities (Inkelas et al., 2018) serves as the foundation for outlining how an effective community is created, sustained, and assessed.

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Logical Sense in the Skeptical Self-Refutation Problem
Stacy Cunningham

N/A

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Loneliness in Higher Education: Implications for Faculty Self-Care and Teaching

Randy Evans

Increasingly alarming headlines about workplace loneliness are gaining traction in the popular press. In this piece, loneliness and its implications for business faculty in higher education are examined. First, the construct and prevalence of loneliness are summarized, as well as various physical, mental, and psycho-social outcomes associated with feeling socially isolated at work, using relevant evidence from the academic and practitioner literatures. Practical resources for faculty self-care are highlighted, and given the escalating accounts of students' loneliness, we also create a CARE Model providing faculty with concrete teaching-related recommendations.

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Magnesium Coating and The Effect on Corrosion
Abdelrahman Amin

Bone fractures are increasingly common nowadays with innovative surgical solutions emerging such as the utilization of biodegradable metallic implants instead of permanent fixation implants. Failure to remove the currently in-use permanent implants may lead to problems such as infection, bone resorption, or stress concentration on the fixation locations. Magnesium and its alloys exhibit a biodegradable nature in aqueous environments, rendering them appealing for diverse biomedical applications where permanent existence in the body is not advisable. In addition, magnesium alloys offer superior biocompatibility and mechanical properties, which resemble those of natural bones compared to other biodegradable metals. The main challenge facing the utilization of magnesium for bone fracture repair appears in maintaining its mechanical integrity due to its rapid corrosion rate and hence the release of corrosion byproducts in the physiological environment. In this study, we have formulated various composite coatings and conducted a comprehensive assessment of their properties including corrosion rates. Experimental testing was used to compare between uncoated and coated samples in corrosion rates.

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Mapping Invasive Winter Honeysuckle and Oriental Bittersweet for Management and Removal at Reflection Riding Arboretum and Nature Center
Allie Boldizsar, Kel Kaczmarek, Bliss Murphy

The invasion of plants at Reflection Riding has been a war fought since before the 1800s. After settlers roamed these lands, ornamentals became bold invaders and savagely seized habitat once possessed by native plant tribes. In Fall of 2023, an army of Ecology Lab students led by Monica Miles raided the uphill trails, in search of Oriental Bittersweet and Winter Honeysuckle. ArcGIS Field Maps was used to document occurrence locations, allowing our troops to know where future battles must be fought. Reflection Riding will be using this data to assist their volunteers with future removal efforts.

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Mathematics in Music: Predicting Harmonic Tones with Bayesian Statistics
Joseph Duhamel

Musical consonance and dissonance for years has predominantly been determined by psychoacoustic methods which provide a measure the harmonic noise between two notes. These notes are constructed of frequencies which are numerically calculatable. The numerical data can then be transformed into the tension and dissonance of the tone. Thus, it is theoretically possible to use the numerical musical note data to calculate a psychoacoustic harmonic similarity score. We conducted research to create such an equation using a predictive machine learning model that harnesses Bayesian inference methods in a Markov Chain Monte Carlo algorithm. Our research focuses on the extrapolation of such an equation with emphasis on the mathematical methods used to derive the data and the computational science used.

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Meiofauna Biodiversity in Ponds with Varying Levels of Exposure to Animal Waste
Aiden Lopez

Meiofauna, a hyper-diverse community of organisms measuring less than 2 mm, are a vital force in maintaining ecosystem health and trophic balance but are overlooked within freshwater environments. To address this gap in the Southeastern United States, our study aims to assess meiofauna biodiversity in ponds located in Cleveland, Tennessee. We investigated sites with varying exposure to animal waste, proposing the hypothesis that increased exposure correlates with diminished biodiversity. Quantitative sampling was conducted across three pond sites using a plankton net. Specimens were preserved and stained, then taxonomically identified under light microscopes. Biodiversity metrics were employed for quantification. The sites were as follows: Site 1, a lower elevation pond near a farm with animal waste runoff; Site 2, a man-made pond with no apparent waste exposure; and Site 3, a pond with undetermined exposure. Despite variations in abundance, richness, and biodiversity indexes among sites, statistical analyses did not reveal significant differences in biodiversity (p-value > 0.5). Contrary to the hypothesis, heightened animal waste exposure did not correlate with reduced pond biodiversity. The findings challenge existing assumptions and emphasize the necessity for broader studies. A larger sample size and quantitative pollution measurements could enhance understanding of the effect of human activities on biodiversity. This study serves as a contribution to the ongoing discussion on environmental sustainability and potential impacts of animal waste on freshwater biodiversity.

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Micro vs Macro Level Simulation: A Comparative Analysis in Intelligent Transportation Systems
Vijayalakshmi Kumarasamy, Ritu Patel

This paper compares micro and macro-level simulation approaches within the context of intelligent transportation systems (ITS). Micro-level simulations model individual vehicle interactions, while macro-level simulations capture system-wide dynamics. We assess their performance, computational efficiency, and applicability in addressing ITS challenges such as traffic management and traffic signal timing optimization. Additionally, we explore hybrid approaches combining both paradigms. Our findings offer insights for researchers and practitioners in selecting suitable simulation methodologies for ITS applications.

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Modeling Species Distribution Using MaxEnt Algorithm with genus *ophisaurus*
Mckensie Clay

This experiment explores the application of the MaxEnt algorithm in modeling species distribution patterns for the genus *ophisaurus*. MaxEnt, a powerful machine learning tool, utilizes environmental variables to predict the potential geographic range of a species. The project involves extensive data on environmental factors. The MaxEnt algorithm is then applied to generate distribution models for selected species. The methodology involves the acquisition of species occurrence data from *INaturalist* and relevant environmental variables, followed by model training and validation using MaxEnt. The program can be evaluated to find the most relevant bio-variables and explore future applications with endangered species.

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Modeling Subnational Conservation Status Ranks for Tennessee Vascular Plants
Julia Prins

Conservation status ranks measure the potential risk of extinction for species taking rarity, threats, and species population trends into account. These ranks impact development initiatives, guide land management practices, and help establish conservation priorities, it is therefore important to have a completed list of conservation status ranks for all species. It is equally important that these ranks are generated using a standardized system to reduce bias and misranking. The NatureServe ranking system has been in use since 1978 and generates ranks from critically imperiled to secure. NatureServe uses a standardized rank calculator with ten criteria each weighted a unique amount. The goal of this project is to generate subnational status ranks for all 3,036 vascular plants in Tennessee using two analyses to get an estimate of rank, which will then be compared against ranks generated by

three tools based on NatureServe's rank calculator. The first analysis looks at s-ranks assigned in the states surrounding Tennessee and the second is based on the percentage of counties the species is present in. The three systematic tools being used are a Feature Manipulation Engine workflow, a series of expressions written in Arcade on ArcGIS Pro, and a Shiny app called RareCat. Each tool uses occurrence data from SERNEC and GBIF to calculate range extent, area of occupancy, and number of occurrences from which an s-rank is determined. Using these various tools, we will progress towards a complete list of s-ranks for Tennessee plants, tremendously assisting conservation efforts.

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Modeling the dynamics of product adoption and abandonment
Lingju Kong

We introduce a new compartmental differential equation model to examine the dynamics of user adoption and abandonment within a product context. This model features a nonlinear adoption rate and encompasses two distinct abandonment dynamics: infectious abandonment stemming from interactions among current and past users, and noninfectious abandonment induced by mass media, advertisements, or the emergence of new products. Our exploration encompasses discussions on the existence and stability of model equilibria, as well as the derivation of a critical threshold quantity that regulates the model dynamics. Additionally, we establish criteria for backward and forward bifurcations and various forms of Hopf bifurcation. Detailed scrutiny of an associated optimal control problem is undertaken, starting with the establishment of the existence of an optimal control pair, followed by the determination of the requisite system conditions for this control pair. Extensive numerical simulations are conducted to validate the theoretical findings. Finally, we showcase the model's efficacy by fitting it to historical data on Facebook's daily active users, employing the derived parameter values to predict future user counts.

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Molecular Modelling of Rarefied Gas Flows with Surface Reactions
Ege Ek, Murat Barisik

Chemical vapor infiltration (CVI) is used for manufacturing materials like fiber-reinforced ceramic composed. CVI is based on material deposition on porous surfaces with reactants carried by a gas flow. Despite the widespread use of CVI, the interaction between the reactant gas and the surface is not well understood. As a part of our on-going Department of Energy (DOE) project, we examined the gas flow and gas-surface reactions. Low pressure porous gas flow during CVI process develops dominant non-equilibrium in gas dynamics. Therefore, classical computational fluid dynamics becomes inapplicable, hence we performed numerical solution of Boltzmann Equation using Direct Simulation Monte Carlo (DSMC) technique. For the DSMC solver, open source dsmcFoam+ code is used. We focused on the flow around a cylinder at varying rarefaction levels and surface conditions to

determine transport and resulting deposition. Results are important for optimizing CVI conditions to produce higher quality materials in a shorter time.

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Monogamy, Who? Cheating in the Animal Kingdom
Madison Roberts

Animal social systems have four interrelated components, two of which are social organization and the mating system. One way to represent the mating system is through multiple paternity, which is defined as the percentage of litters with more than one father. This research project looks at variables that might influence multiple paternity including evolutionary relationships, litter size, female body mass, sexual size dimorphism, and male social organization. Results support the literature that multiple paternity increases with increasing litter size. While not significant, multi-male groups seem to have more influence on multiple paternity than other male social organization groups. Lastly, there was no evolutionary relationship to multiple paternity which may be due to behavioral traits not being genetically inherited.

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Mrs. Amber Gordy, MS student in Computer Science in Cyber Security.
Amber Gordy

Credit card fraud remains a significant concern in the realm of financial security, prompting the need for robust detection mechanisms. This study delves into an extensive exploration of credit card fraud detection, with a specific focus on machine learning algorithms, particularly Random Forest and Support Vector Machines (SVM). Unlike conventional studies, this research not only aims to compare algorithms but also endeavors to propose enhancements to existing methods, thereby pushing the boundaries of fraud detection. Through an evaluation of effectiveness, proposal of enhancements, and a comparative analysis, this project seeks to contribute novel insights and practical solutions to combat credit card fraud effectively.

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New Teacher Induction Program for Mathematics and the Natural Sciences
Deborah McAllister, Jennifer Lynberg, Jason Gordon, Lisa Wilkes

The induction program focused on classroom activity. Several topics were based upon Danielson's Framework for Teaching. Induction activities were drawn from the framework's four domains: planning and preparation, learning environments, learning experiences, and

principled teaching. In addition, reading topics included high-impact teaching strategies, misconceptions in mathematics, and classroom management. Another induction segment was exploration of public science projects. Themes across responses were noted. For classroom management, common themes included all students being capable of learning, each student learns in different ways, and building strong relationships with students is critical. For lesson preparation, the most common area of strength was learning environment due to scholar confidence in relationship building, while the most common area of weakness was planning and preparation due to a lack of experience. With regard to challenges that may occur with a public science project, scholars believed that a lack of prior student knowledge or a lack of student interest could hinder the implementation of the project. Beginning the project with an informational introduction and splitting the class into groups could lessen these difficulties. Enhancing teacher effectiveness can have a profound impact on student outcomes, including the strengthening of student STEM self-efficacy and increased STEM achievement. Secondary STEM teachers have historically been shown to prepare and motivate students to achieve in STEM and, possibly, consider STEM career fields.

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Onboarding Experience and How It Impacts Organizational Commitment and Quit Intentions
Utamu Lackey

Introduction: Retaining nursing staff is essential for healthcare facilities as they strive to care for the patients in the communities they support. Ensuring nurses have a strong foundation is critical to the onboarding experience and influences their turnover intentions.

Project Goal: The goal is to assess the socialization or onboarding experience, determining if the onboarding experience impacts an employee's future engagement and organizational commitment.

Methods: This article's methods include peer-reviewed journal articles published in the last five years related to clinicians in the healthcare setting and non-clinicians in other settings.

Results: Research shows that organizational members who are recognized, feel as if they make a difference, are engaged in their work, and have a positive relationship with their managers will have increased organizational commitment, resulting in decreased quit intentions.

Impact: For healthcare leaders to manage staffing shortages and retain nurses, leaders and nursing staff must create engaging environments in today's competitive market. Organizational leaders must also obtain skills to ensure they know how to support nurses.

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Pandemic Driven Cybersecurity Threats: An Analysis using clustering Algorithms
Jeb Irvin

This research investigates the impact of the COVID-19 Pandemic on cybersecurity using clustering algorithms to analyze patterns. Two primary datasets were used, one from CISSM Cyber attack database, talking about publicly acknowledged cyber events, and another that recorded COVID-19 case numbers from Our World in Data. The project used K-Means, DBSCAN clustering algorithms, which revealed concentrated attacks during the early pandemic months and during surges of cases.

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Pantolution: A Turning Point in Women's Fashion
Anna Shaw, Catherine Fields

The annual theme this year was “Turning Points in History”. When we heard the theme, we went straight to brainstorming. We thought about wars, political movements, culturally significant events, important leaders–pretty much anything that could possibly be a turning point. We ended up deciding we wanted to do something around the Women’s Rights Movement; however, we wanted something more specific–not something everyone would be doing their project on. After many discussions, we finally decided to focus on the first time a woman wore pants. This topic influenced the entire future of women’s clothing because of the practicality and health benefits. There were so many sources that explained the benefits and how helpful the outfit was, so we knew we would have plenty to talk about, making us confident in our decision. Pants not only influenced future fashion choices for women, they also drew attention to the Gender Equality Movement that helped women achieve a victory in the end. This is truly a turning point as it made women feel more empowered. When women’s clothing changed, the women’s rights movement changed as well.

To begin researching for our skit, we used the internet to find out who actually wore pants for the first time (Elizabeth Smith Miller), her life, and her intentions for wearing it, along with how pants for women became popular (because of Elizabeth Cady Stanton). Next, we looked for contemporary reactions to the outfit in newspaper clippings, letters, and articles. We were able to take a field trip to UTC and use their research materials and databases to gather more primary and secondary sources. We ended up with over 60 sources outlining causes, effects, and the major impacts of women wearing pants. After reading through all of this, we began to write our script. We included information about fashion of the past, a little background information on Elizabeth Smith Miller and Elizabeth Cady Stanton, the story of them wearing pants, and the impact of them doing so on the Women’s Movement. We reread, revised, and practiced our script dozens of times. Next came costumes and props. We got all the necessary objects, like costumes, a top hat, mustaches, a bonnet, and the paper dresses and then continued rehearsing. Finally, we completed our bibliography, the

title page, and this paper. This project wasn't easy, but we are finally finished and are excited to see the outcome.

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Parental Leave Policies as Structures of Inequality
Elizabeth Weems

Parental leave policies should be a key aspect of ensuring reproductive justice for all families as they choose to expand. Unfortunately, in relation to university policies, the reproductive health of birth givers in the United States is not ensured and takes a backseat to the needs of the business rather than their employees. When Parental Leave policies are created to further the investment and protection of the college, complex terminology takes over what should be an understandable document. When work-based policies are unclear or do not cover the full range of birth and family outcomes, inequality reaches new heights in the workplace. To investigate this issue, I have compiled and coded a corpus of parental leave documents for universities in the United States to analyze their independent discrepancies. Finding these modes of injustice within education based policies furthers the claim of reproductive health being categorized as an inconsequential aspect of parental leave. The process of rhetorical policy analysis enables the compilation of injustices in the education administration when it comes the reproductive rights and well-being of university employees.

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Parties or Outside Interest Groups: Which is making Globalist Environmental Policy Go Extinct?
Andres Ramirez

Comparative Analysis of major factors contributing to environmental policy decision-making in the United States.

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PEDESTRIAN-INVOLVED TRAFFIC SIGNAL OPTIMIZATION USING DECENTRALIZED GRAPH-BASED MULTI-AGENT REINFORCEMENT LEARNING
Vijayalakshmi Kumarasamy, Joseph Duhamel

In urban transportation systems, integrating pedestrian movements into traffic signal timing optimization is crucial for smooth and safe traffic flow. This study investigates the Decentralized Graph-based Multi-Agent Reinforcement Learning (DGMARL) method for signal timing optimization, considering both pedestrian and vehicle traffic states. Evaluating

fixed and adaptive pedestrian accommodation strategies, the study assesses their impact on traffic flow and signal timing. Using a Digital Twin microscopic traffic simulation model of the MLK Smart Corridor in Chattanooga, Tennessee, the approach's effectiveness is analyzed. Results show that the strategy of signal timing optimization with adaptive pedestrian request improves Eco_PI by significantly compared to fixed pedestrian recall methods.

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Penalties and Their Effect on Goal-Scoring
Anja Christensen

The NHL is North America's top ice hockey league – each team will play 82 games throughout the regular season, potentially followed by up to 28 playoff games for the chance to win the Stanley Cup. The winner of a game is determined by who scores the most goals by putting the puck into the net, using a hockey stick while skating on ice.

The question I am most interested in for this project is: how much does the number of penalty minutes taken by a team affect the number of goals scored? Statistics are increasingly becoming an important part of sports, and finding co-relations between aspects of the game is a developing field.

I will be using two methods for this analysis: K-means clustering and hierarchical clustering. For both methods, I will utilize visualization through both Python and R, using both graphs and heat-maps to determine whether there is a co-relation between the two variables. The independent variable will be the penalty minutes, and the variable that will be examined as possibly dependent will be goals scored by the same team that received the penalty. I will plot the independent variable (penalty minutes) along the x-axis, and the assumed-dependent variable along the y-axis.

I will then reason based on my findings whether there is a clear, inconclusive, or no correlation between penalty minutes and goal-scoring. My current hypothesis is that there is a co-relation and the higher the penalty minutes are, the lower the goal-scoring. I will evaluate whether this was proved or disproved in the conclusion.

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Perceptions of Disabled Instructors
Joe Carpenter, Amanda Lesswing, Sarah Alarcon

Negative perceptions can lead to social and professional exclusion of disabled individuals. Negative perceptions of disability are especially detrimental to disabled academics (Brown & Ramlackhan, 2022). Research specifically examining the perceptions of disabled instructors is lacking. This study reviews factors influencing student perceptions of people

with disabilities and provides insight for promoting the individual and professional development of people with disabilities in instructional roles in higher education. We recruited 109 undergraduate college students to participate in this study. Participants completed the study on-line using the Qualtrics platform, and they were randomly assigned to one of two conditions. For the experimental condition, the video displayed a 12-minute lecture in which the instructor appears to be blind. For the control *condition, the video displayed the same lecture presented by the same instructor, without the* instructor appearing to be visually impaired. Following the video, participants responded to a brief attention and comprehension check. Then, participants completed measures evaluating professor competence and warmth (Smith & Anderson, 2005; Anderson & Kanner, 2014), as well as affective and cognitive evaluations of the lecture. Finally, participants responded to a measure of overt ableism, the Interactions with Disabled Persons Scale (Gething, 1991; Thomas et al., 2003). Students who observed the disabled instructor (*m* = 23.79, *SD* = 4.297) lecture reported significantly higher levels of perceived competence then students who viewed the able-bodied lecture (*m* = 22.19, *SD* = 4.67), *t* (107) = -1.859, *p d* = -.356. There was no difference between the two groups on perceived warmth, or evaluations of the lecture. These findings are inconsistent with previous literature showing individuals with physical disabilities being perceived as less competent than their able-bodied counterparts (Minks et al., 2024). These findings could be affected by social desirability bias. Replication of this study should include a measure of social desirability. This study should also be replicated using examining behavioral or developmental disabilities as the literature suggests that the public has more positive perceptions of individuals with physical disabilities.

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Pneumatic Actuated Wearable Soft Robotics System for Mirror Hand Rehabilitation
Juan Pena

Problem: Stroke and other neurological conditions can significantly impair hand function. Traditional rehabilitation methods can be time-consuming and lack user comfort.
Solution: We present PneuExoHand, a novel wearable soft robotics system designed to improve hand rehabilitation.
Benefits:

- **Comfortable and Safe:** Soft, flexible gloves prioritize user comfort and safety compared to rigid exoskeletons.
- **Comprehensive Therapy:** PneuExoHand supports both mirror therapy (utilizing the unaffected hand) and task-oriented therapy for the affected hand.
- **Advanced Sensors:** Resistive touch sensors detect finger motion, while EMG sensors monitor muscle activity for therapy optimization.
- **Pneumatic Actuation:** Soft robotic actuators assist with finger flexion and extension movements.
- **Intelligent Control:** A finite state machine interprets sensor data and controls the rehabilitation process based on user gestures.

Impact: PneuExoHand offers a user-centered and technologically advanced approach to hand rehabilitation, potentially leading to improved therapy effectiveness and patient outcomes.

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Poisonous or Edible? A Mushroom Classification Challenge
Hayden Hunley

In the realm of mushroom classification, the creation of a tool to discern the toxicity level of fungi holds indispensable power. To untrained eyes, many mushrooms might look identical. However, one might be a renowned culinary delicacy with the other being the last thing you ever eat. Proper mycological knowledge is required to even begin to think about digesting wild mushrooms. Because of this, mushrooms have held a near-taboo status culturally for centuries.

The creation of a model to differentiate between poisonous and edible mushrooms enables any person to differentiate between a wide variety of mushroom species without much prior knowledge in the area, and with greater accuracy overall. A model like this could hold a spot as a fundamental resource for studies ranging from fungal ecology and toxicology to culinary applications. By using different classification and regression models, I hope to break apart and see through this complex landscape to navigate unseen patterns and correlations that are inherent to the mushroom kingdom.

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Policies & Politics Matter: Understanding LGBTQ+ Inclusivity in State Policies, Politics, & Public Universities
Shyla Khan, LC Marlatt

About 2 million LGBTQ+ youth live in states without statutory protections against sexual orientation and gender identity discrimination in education (Conron, 2020; Kull et al., 2016). Researchers have found a tie between LGBTQ+ related policies and reports of school-based discrimination (Jaekel, 2021), mental health concerns (Hatzenbuehler et al., 2009), and health (Nelson et al., 2023) in the LGBTQ+ community. The current study hypothesized: (1) There is a significant difference in LGBTQ+ legislative friendliness in states with Republican-dominated state governments compared to states with Democratic-dominated state governments, (2) Universities residing in states with Republican-dominated state governments will have significantly lower LGBTQ+ friendliness ratings, and (3) There is a significant positive relationship between university LGBTQ+ friendliness and LGBTQ+ equality by state. Using data collected in 2022, our measures included: LGBTQ+ friendliness ratings of 100 public, four-year institutions in the US; Movement Advancement Project (MAP) ratings of LGBTQ+-related state laws and policies; state political party dominance determined by the party majority in the house, senate, and governorship. Our results found

that more pro-equality legislation and universities exist in Democrat-dominated states. We will outline pro-equality advocacy and policy recommendations for students, faculty, staff, and administrators. Specifically, we will discuss the need to support and advocate for the LGBTQ+ community at the campus, municipal, state, and federal levels.

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Politically Correct Politically Incorrect Humor: A Consequentialist Examination of Stereotypes within Jokes
Mychael Allen-Fennessee

Since the evolution of man, humor has been a fundamental aspect of human behavior. While this method of leisure and communication has itself evolved as a form of entertainment and art, theory surrounding humor and the literature around the subject has struggled to catch up. In recent years, an increasing number of superstar comedians have come under intense media scrutiny for the jokes they tell that contain stereotypes.While some argue that such jokes can offend and perpetuate negative sentiments, others view the absurdity and offensiveness as essential elements of comedic expression and political correctness as a barrier. Delving into humor theory and philosophy, I explored questions surrounding the consequences of telling stereotype-laden jokes and the responsibility of comedians. While consequentialist philosophy offers insights, it falls short in addressing prosocial uses of such humor. Drawing from psychology, sociology, and rhetorical studies, I aim to provide a framework that allows comedians to push the boundaries of political correctness without needlessly offending social sensibilities.

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Polyunsaturated fatty acids (PUFAs) amplify the killing effect of peptide antibiotics in *Aeromonas hydrophila*
Meredith Grant

One of the top global threats to public health is antimicrobial resistance. There is an urgent need for development of novel therapeutic regimens that can bypass existing microbial mechanisms of antibiotic resistance. Previous research has established that exogenous polyunsaturated fatty acids (PUFAs) are assimilated into the membrane phospholipids of gram-negative bacteria, thereby altering membrane permeability and susceptibility to antimicrobials. Introducing membrane vulnerability may create opportunities for antimicrobials to diffuse through the outer and inner membrane of gram-negative bacteria. In this study, combinatorial treatment of the human pathogen *Aeromonas hydrophilia* with seven PUFAs (linoleic acid [18:2], alpha- linolenic acid [18:3a], gamma-linolenic acid [18:3g], dihomo-gamma-linolenic acid [20:3], arachidonic acid [20:4], eicosapentaenoic acid [20:5], docosahexaenoic acid [22:6]) and 4 antimicrobials (polymyxin B, colistin, ampicillin, and imipenem) was evaluated using broth dilution minimum inhibitory concentration (MIC) assays. Significant changes in MIC were observed, particularly with the cyclic peptides

polymyxin B and colistin, wherein most PUFAs significantly lowered the MIC by a range of 4 - 64-fold. Minimal changes to MIC were observed for ampicillin and imipenem, antibiotics that access bacteria through a protein-mediated process. Collectively, this data highlights not only PUFA-mediated bio membrane effects, but also the potential for PUFAs and membrane-attacking antimicrobials to synergistically target gram- negative infections.

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Polyunsaturated fatty acids (PUFAs) cause changes in growth, membrane permeability, biofilm formation, motility, and phospholipid structure in the human pathogen *Aeromonas hydrophila*
Gillian Morton

Aeromonas hydrophila is a gram-negative bacterium commonly found in warmer, freshwater climates. This bacterium typically infects humans and fish through contact with contaminated water, causing skin and tissue infections, gastritis, and septicemia. It is becoming increasingly evident that gram-negative bacteria utilizes polyunsaturated fatty acids (PUFAs) for membrane remodeling and phenotypes associated with virulence. This study explores the effects of physiologically relevant PUFAs on *A. hydrophila'*s growth, membrane lipid assimilation, permeability, swimming motility, and biofilm formation. Supplementation of PUFAs during growth in minimal media revealed inhibitory effects of alpha- and gamma-linolenic acids. Variable growth effects were observed over 12-hour growth curves for *A. hydrophila* in the presence of PUFAs. Interestingly, several PUFAs (18:2, 20:3, 20:4, 20:5, 22:6) supported growth as the sole carbon source, with all showing significant evidence of fatty acid utilization as a carbon source. Thin layer chromatography indicated assimilation of PUFAs into the major phospholipids of *A. hydrophila.* Uptake of the hydrophobic dye crystal violet was significantly increased when 18:3y, 20:4 and 22:6 were supplemented, which increased the membrane permeability of *A. hydrophila* by 50-60%. 18:3α increased permeability by 30%. Swimming motility was variably affected by PUFAs. Assessment of biofilm formation revealed increased biofilm formation for all PUFAs. Collectively, the data highlights *A. hydrophila*'s ability to utilize exogenous PUFAs for physiological and behavioral purposes.

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Predicting Enrollment in a Metropolitan University in Southeast Tennessee
Cindy Williamson

Institutions of higher education are tasked with making decisions that will impact their students, faculty, staff, and other stakeholders. Some of the risk associated with decision-making could potentially be eliminated by using a strategic way to predict which data points have meaningful impact on student enrollment. This study used data collected for six fall semesters to develop enrollment prediction models for the institution. MarcovChain Monte Carlo (MCMC) simulation allowed for a more instinctive way to derive statistical methods by

enabling probability estimation. Linear regression demonstrated there were specific sets of predictor variables for institutional enrollment and for four academic programs' enrollment. It was determined that the MCMC simulation models were able to accurately predict enrollment for specific semesters but not for all semesters. Using readily available data and considering variables not typically utilized provides away to develop robust models for use at the institution.

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Preliminary Evaluation of the Impact of Foot Position on the Rubber Foot Illusion
Max Teaford, Shyla Khan, Tanner Greene, Marlene Mejia, Madison Murray, Pauline Deyo, Landon Gaines, Jacqueline Lawshe

The Rubber Foot Illusion (RFI) is an illusion in which one experiences a model foot as their own through synchronous visuo-tactile stimulation. Previous research suggests that the conditions in which the RFI can be elicited under are similar to those of the Rubber Hand Illusion (RHI). However, it was unclear whether the RFI can occur with the model foot in an anatomically implausible position (i.e., rotated 90 degrees relative to the participant's foot). Based upon past research on the RHI we expected that if the model foot was in an anatomically plausible (i.e., toes facing the same direction as the participant's) position, participants would experience the RFI; whereas, if the model foot was in an anatomically implausible position, they would not. To test this hypothesis, 21 individuals (20 female) experienced 6 different types of visuo-tactile stimulation. Before each type of stimulation, participants made judgements about the position of the midline of their foot. After 90 seconds of each type of stimulation, participants made another judgement about the midline of their foot and answered questions about their experience. It was found that participants experienced the illusion in the anatomically plausible condition. Namely, questionnaire scores were higher in the synchronous stimulation condition than in the control conditions (i.e., asynchronous and visual only; all p values

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Prevalence of PI*Z and PI*S alleles of alpha-1-antitrypsin deficiency in Tennessee: A Study on Hardy-Weinberg Equilibrium
FOSTER OPOKU

The α1-Antitrypsin (AT) functions as the primary serum inhibitor of proteolytic enzymes, including neutrophil elastase. The presence of these abnormal alleles disrupts the normal functioning of α1-Antitrypsin (AT), leading to Alpha-1 Antitrypsin Deficiency (AATD). Homozygotes for type Z experience a substantial reduction in serum AT concentration, increasing the risk of pulmonary emphysema or hepatic cirrhosis. Homozygous S alleles and heterozygotes of type SZ exhibit a less severe reduction in serum AT concentration. Clinicians suggest that even though the reduction is less severe, it may still lead to Mild AAT Deficiency.

The primary objective of this study was to enhance our understanding of the frequency of the Z and S alleles, enabling accurate estimates of the prevalence and count of PiZZ and PiSS genotypes within the state of Tennessee, USA.

We present the analysis of data collected from the Tennessee population. We study the prevalence of homozygote (ZZ) AAT, heterozygote AAT deficiency, and the relationship to lung function, and potential risk of Chronic Obstructive Pulmonary Disease (COPD) in hospital admission, readmission and all-cause mortality.

The findings presented here may serve as a valuable resource for healthcare professionals, researchers, and policymakers involved in respiratory health and genetic disorders.

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Prioritization of cognitive and motor components during dual-task activities
Lauren Bartlett, Beth Pfaff

In this project, we wanted to look at prioritization in dual-task activities and determine if the addition of a cognitive task will make the motor or cognitive task worse because they are prioritizing one over the other. Our hypothesis is the addition of a cognitive component will cause the participant to prioritize the motor at the detriment to the motor component. We looked at 36 UTC ROTC cadets and took them through a series of test that included the following in order; single task Flanker game, single task tandem gait walk, dual task tandem gait plus the Flanker game, single task balancing, and dual task balancing plus the Flanker game. We then determined cost for variables associated with each task. Our results showed that participants either got worse on tandem gait and better on Flanker or worse on both tasks. From this we can determine that individuals tend to prioritize the cognitive over the motor or they show no prioritization between the two.

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Promoting Self-Acceptance Among LGBTQ+ Individuals: Investigating the Impact of Religious, Spiritual, and Mystical Experiences
Makayla Hall

Religiosity, spirituality, and inclusivity-centered mysticism may facilitate LGBTQ+ self-discovery and acceptance. This journey involves embracing sexual orientation, overcoming internalized stigma, and fostering a healthy self-connection. Previous research shows LGBTQ+ individuals' complex relationship with religious and spiritual beliefs. While some find strength and comfort in these aspects, others harbor negative emotions due to past trauma and discrimination. This study aims to assess how religious, spiritual, and mystical experiences may promote self-acceptance among LGBTQ+ individuals, considering personal beliefs and experiences. Eight LGBTQ+ participants, aged 18 or older, with prior experiences,

were recruited. They completed a demographic questionnaire and underwent an in-person interview assessing their prior religious, spiritual, and mystical experiences. It is hypothesized that spiritual and mystical experiences may enhance LGBTQ+ self-acceptance, while non-inclusive religious practices may lead to negative experiences. Understanding these dynamics can help guide the promotion of positive religious, spiritual, and mystical experiences that foster self-acceptance for LGBTQ+ individuals.

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Putting Pride in Your Writing Center
Max Hill

LGBTQ+ students in the South can experience whiplash figuring out if any room on campus is safe for them, and writing centers can and should do more to make their spaces inclusive for them. Utilizing recent scholarship in writing center studies and queer studies, this presentation explores how these welcoming strategies can be implemented, without compromising our professional nature. With a conscious effort to broadcast both in-person and online that writing centers are safe spaces for *all* writers, the center as a whole will thrive and writers will feel even more confident just making that first appointment (Eller and Wood).

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Quantification of Uncertainties in Operating Conditions on the Features of High-Pressure Turbulent Premixed Flames Using Surrogate Modeling Techniques
David Brown

Turbulent premixed flames observed in energy conversion and propulsion devices encounter uncertainties that arise from various factors such as operating conditions, chemistry, turbulence, and turbulence-chemistry interactions. Such uncertainties pose challenges to the numerical investigation of such flames in terms of reliable predictive capabilities. Uncertainty quantification (UQ) is an effective computational strategy to quantify such uncertainties. UQ study can be performed either using direct or surrogate modeling techniques. While the direct Monte Carlo (MC) sampling technique is popular and accurate, it tends to be computationally prohibitive for the investigation of practically relevant configurations. To this end, surrogate modeling techniques offer a computationally tractable approach. In this study, three popular surrogate modeling techniques, namely, polynomial chaos expansion (PCE), stochastic collocation (SC), and Gaussian process (GP) are assessed for their capabilities for the investigation of freely propagating laminar premixed flame. In this study, a non-intrusive forward UQ strategy is considered to examine the effect of the uncertainties in the operating conditions on the features of premixed flames. First, we consider freely propagating laminar premixed flame to assess the accuracy and efficiency of PCE, SC, and GP techniques in comparison to the MC approach, where the

pre-exponential factor is considered as the uncertain parameter. Afterward, the optimally performing surrogate technique is used to examine the uncertainty of equivalence ratio on the features of high-pressure turbulent premixed flame.

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Quantifying and Identifying Microplastics in Stormwater & the Integration into STEAM Education
Tiffany Cash, Jasmine Johnson, April Ross

This Problem-Based Learning (PBL) initiative integrated diverse disciplines to address the issue of microplastic pollution. Through a multifaceted approach encompassing Chemistry, English, and Robotics, students engaged in laboratory experiments and analyzed microplastic composition, conducted thorough research to understand its environmental impact, wrote field reports, and collaborated on robotics projects aimed at implementing innovative solutions to reduce microplastic usage. Combining scientific inquiry, effective communication skills, and technological innovation, this PBL empowered students to actively contribute to mitigating the global challenge of microplastic pollution.

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Quantum Chemical Study of Hydrocarbon Interactions with Silicon Carbide
Atal Bhowmik

Chemical vapor infiltration (CVI) is used for manufacturing extreme-condition materials with enhanced properties. However, reactive surface gas interactions yielding material deposition into the porous system are not well- understood. As a part of our ongoing Department of Energy (DOE) project, we studied the dynamic properties of heterogeneous reactions between silicon carbide (SiC) and various hydrocarbon molecules during the CVI process. The precursors generated by the thermal breakdown of methyl trichlorosilane (MTS, CH3SiCl3) were studied in this work. The surface reaction consists of multiple steps. In the beginning, we focused on two reactions: the dissociation of Ethane and Ethlyn on the SiC surface. The Density Functional Theory based Vienna ab initio Simulation Package (VASP) was used as the calculation tool. The reaction barrier for hydrogenation was calculated using the Transition State Search. Understanding the activation energy barriers related to the precursor molecules' adsorption, surface diffusion, and chemical reactions on the substrate is the key to optimizing CVI conditions to produce higher-quality materials in a shorter time.

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Raspberry Pi Arrays as Agents in Distributed Energy Markets Optimization: an Integration into STEM Education
Joy Baker, Matthew Craig

Project-Based Learning (PBL) is an inquiry-driven approach where students tackle real-world challenges. PBL fosters metacognitive learning, with teachers as facilitators. According to the Buck Institute of Learning, effective PBLs incorporate: a driving question, sustained research, real-world relevance, student autonomy, reflective practices, iterative feedback, and a publicly presented product.

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Recommendations for Infection Prevention and Control in Outpatient Physical Therapy
Daniel See, Michael Raddick, Abby Langley, Rogerio Rodrigues, Caitlin Crews-Stowe, David Levine

Introduction: Healthcare-associated infections (HAIs) continue to be a major cause of concern for outpatient (OP) health care settings causing emotional, financial, and medical consequences for both patients and healthcare providers. Infection Prevention (IP) has only one standard in physical therapy school curriculum, and with half of all physical therapists working in OP settings there is an urgent need for education in OP clinicians.

Specific aim: The purpose of this research is to provide needed guidelines for OP practice so that physical therapists minimize spread of HAIs through knowledgeable and risk-reducing practices.

Methods: The information in this study contains recommendations from the Centers for Disease Control, the American Physical Therapy Association guidelines, previously established IP practices, and published works focused on prevention of HAI spread in OP settings. Topics such as standard and transmission based precautions, environmental disinfection, hand hygiene, and considerations for COVID-19 are compiled in a brief but descriptive way meant as education and reference material for OP clinicians.

Conclusion: With increased clinician exposure to IP education, there will be a greater emphasis on strategies to reduce outbreaks of HAIs in the OP setting.

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Reviving MySpace - A Modern Approach
Damion Mason, Chandler Matheny, Jay Bamnelkar, Conner Fulford, Eric Chang, Judson Hester, Jon Luke Kesler

Background Information: This project revisits the concept of MySpace, aiming to fill the gap in current social media by providing a space dedicated to creative expression, nostalgia, and community.

Hypothesis: This project hypothesizes that a modernized MySpace can cater to the needs of millennials seeking nostalgia and Gen Z users looking for a platform that prioritizes creativity and personal expression over curated personas.

Methods: Utilizing the PERN stack for development, the project involves creating a prototype that incorporates customizable profiles, music and art sharing capabilities, and community features such as groups and event listings.

Expectations: Preliminary feedback from user testing sessions indicates a strong interest in customizable profiles and the ability to discover and share music and art, suggesting that the platform could successfully fill a current gap in the social media landscape.

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Rivers that Deliver

Jessica Hobbs, Britain Meyers, Kyleigh Harner

The "Rivers that Deliver'' project brought an exciting opportunity for residents of low-income, underserved areas, to connect with nature and experience the joy of outdoor exploration. Our project was aimed to create an inclusive space where community members could come together, enjoy recreational activities, and forge lasting memories regardless of their socioeconomic status. Currently, within Chattanooga there is a lack of programming within low income areas along the rivers of our city. So, we identified potential river access points within underserved areas that we want to activate to provide more abundant and accessible programs. Our event centers on offering free kayak and canoe tours that set out with a new group every 30 minutes, allowing participants to embark on guided journeys along the South Chickamauga Creek. We partnered with Outdoor Chattanooga, who is providing us with the staff to ensure this event could be put on safely and smoothly. This event will introduce participants to the joys of kayaking, while also fostering a deeper appreciation for local waterways and the environment. The future success of this initiative will inspire communities and the city to consider similar events in the future, emphasizing our commitment to inclusivity and the belief that everyone should have the opportunity to engage with and enjoy water sports, regardless of their economic background.

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Robotic Squat Machine

James Young, Josiah Joy

Lifting weights in a gym the conventional way with heavy plates and a bar can be dangerous when attempting to lift loads that approach and exceed an individual's failure limit. Muscles increase in size when there is hypertrophy in their cells, which occurs when they are pushed to the limit and tear. A solution to achieve max lifting capacities that approach failure safely can be by designing and implementing an essentially weightless piece of exercise equipment, the particular solution we are focusing on is an electro-pneumatic solution.

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Rooted in Health: Building Towards Sustainable Food Gardening in a Rural Island Community
Ashley Ellis, Laura Baker, Dawn Ford

This project showcases the continuation of public health efforts on the rural island community of San Salvador, Bahamas and is an application of UTC's URaCE SEARCH award. As an isolated island, many residents of San Salvador maintain a heavy dependence on imported food items from the U.S. and Nassau—limiting the community to cheap, unhealthy foods that contribute to the prevalence of chronic illness and food insecurity. The research objective is to utilize a community survey that gauges health information as well as barriers and interest into home gardening to aid in discovering best practices for a successful gardening program on the island. Implementing a gardening program hopes to aid in food access and related issues such as food insecurity, nutrition, and chronic illnesses. Although the focus of this presentation is the application and results of the community survey, its role in the implementation of a container gardening program will also be discussed. The results of the community survey will help to capture the needs and concerns of the community both as a whole and pertaining to home container gardening. This project will use the community survey to build a big picture strategy to the continuation of this gardening program and showcase unique research designed for rural island communities.

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San Salvador Bahamas Student Field Projects, BIOL/ESC 4400: Tropical Marine Ecology
Dawn Ford, Laura Baker, Ashley Ellis

This poster presents 6 projects associated with the spring 2024 Tropical Marine Ecology course and field experience at the Gerace Research Centre on San Salvador island, The Bahamas. Students participating in this course are: Joseph Cognac, Jennavieve Dickson, Alex Garretson, Caleb Kulon, Ailene Le, Tree McEver, Will Meyer, Isabelle Payne, William Pollard, Mae Mae Reneau, Jack Roberts, Kassidy Robertson, Justin Spencer, Grace Tang, Colin Whitlock, Laura Baker, and Ashley Ellis.
A special thanks to Nicholas Lathrop, Sabrina Novak, and Mary Elizabeth Goodman for their assistance in the field.

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Saying It and Making It: Engaging Student Expertise to Encourage Writing Confidence
Mia Speller

Despite the *subjectivity* intrinsic to the writing practice, students frequently write themselves off as *objectively* poor writers. In worrying over the details of their composition, students may lose confidence in not only their writing, but their general academic abilities. In light of student concerns, and in addition to the writing center's intrinsic role in student writing development, how can tutors build a student's certainty in their assignment, their writing ability, and in their academic authority? In engaging a student's academic expertise, as well as their own, tutors can encourage student confidence within writing sessions.

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Single Droplet Combustion
Karah Powell

Due to an increase in emissions, alternative fuels are often being considered for fuel reliant systems. Biomass-derived fuels have the potential to serve as alternatives to fossil fuels because they are renewable and can substantially reduce exhaust emissions and greenhouse gases. Third-generation biofuels such as microalgae-derived fuels are of great interest. Biofuels produced from microalgae are considered with great potential to be used as "drop-in replacement" for conventional fuels. However, the physical properties such as volatility, viscosity, surface tension and chemical composition of these fuels can be significantly different from conventional liquid fuels.

Single droplet combustion experiments in previous works have used fuels such as diesel, ethanol, aviation fuel, and biofuel. This is useful in that the burning rate and overall combustion behavior have been analyzed. In this study, we examine the single droplet combustion characteristics of various vegetable oils using spherical droplet flames. Most of previous studies of vegetable oils and oil blends were to understand the combustion characteristics at engines. Few have focused on droplet combustion.

In this study, single droplet combustion is investigated using the suspension method. A droplet was produced using a syringe and was suspended on silicon carbide fibers. The droplet was ignited using two 36-gauge kanthal hotwire loops that were placed on either side of the suspended droplet. The hotwire loops were soldered to copper based flexible wires and connected to a DC power supply. To keep the hot wire system from interfering with the flame upon ignition, a linear actuator retraction system was employed. Each hotwire loop was mounted onto a micro linear actuator. The entire process was captured using a high-speed camera and macro lens. An Arduino UNO control system was implemented to control the timing of events. Data was obtained from the high-speed camera using post image processing. Spotlight image processing software was used to

process the frames obtained from the camera. Critical parameters were extracted such as the initial droplet diameter, diameter reduction, flame behavior, and total burn time. The droplet was assumed to follow the D^2 law of combustion.

By observing the combustion behavior of various fuel types, the factors influencing combustion rate were analyzed including the ignition time, burning rate, and flame behavior. These findings can contribute to a better understanding of droplet combustion, and aid in the optimization of combustion systems. The droplet-burning experiments extract fundamental information of bio-derived fuel combustion that cannot be easily generated from full-scale engines to evaluate the burning characteristics of bio-derived fuel in the context of transportation fuels and the response of fuels through blending in a fundamental way.

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Social Interaction Anxiety, Emotion Regulation, and Substance Use Behaviors: A Scale Development Project
Erin Prince, Griffin Randolph

Rationale: Social interaction anxiety (SIA) is anxiety caused by daily social interactions and a fear of scrutiny and judgement. SIA increases the potential to engage in risk-taking behaviors, such as substance use. Emotion regulation is more difficult for individuals with SIA, resulting in disruption of effective coping strategies instead engaging in avoidance. The purpose of this study was to develop a scale measuring young adults' propensity to use substances to emotionally regulate and cope with SIA during social interactions.

Methods: Participants completed 69 questions about their use of alcohol, nicotine/tobacco, and cannabis in specific social contexts. Responses from college students aged 18-39 (n= 191, female 85.3%) were analyzed using principal components analysis, reliability analyses, and correlations.

Results: Principal component analyses indicated three factors within the new scale, with six items cut due to failure to load or cross loading. Principal components analyses were repeated, producing three factors with no cross loadings. Reliability analyses were performed with results indicating excellent reliability (Cronbach's $\alpha = .98$). Correlational analyses were conducted for convergent and discriminant validity using the Brief Fear of Negative Evaluation and the HEXACO Honesty-Humility Subscale. Convergent validity was not sufficiently demonstrated, but discriminant validity was established, $r = -.18$, p

Conclusions: Overall, the new scale sets the foundation for assessing the interaction between anxiety disorders and substance use behaviors. The results of our study indicate good consistency between questions developed for each subscale. Future iterations should seek to refine items for greater assessment of the interplay of social interaction anxiety, emotion regulation, substance use behaviors among young adults.

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Soft Robotics Application for Finger Rehabilitation
Ron Cox

Continuum robotics offers unique advantages in terms of flexibility, adaptability, and precision, making it a promising technology for various applications in health science. As the field continues to advance, we can expect further innovations and integration of continuum robots in medical procedures, ultimately leading to improved patient outcomes and enhanced healthcare practices. As compared to other hand or finger rehabilitation designs with other robots or actuation systems, the continuum robot offers targeted rehabilitation for each finger joint and movement, due to the degrees-of-freedom provided by the continuum robot design.

For future progress on this project, the apparatus will be tested using a participant, as to calibrate it to the size and movements of the user.

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Source Engine Texture Tool (SETT)
Wesley Hicks, Abraham May, Adam May, Kenzy Young, Kara Twombly, Adrian Viney

The Source Engine Texture Tool, or SETT, is a program designed to streamline the conversion of images into high quality textures for use in the Valve Source Engine. The Source Engine Texture Tool was created to allow for rapid prototyping of textures that have advanced requirements without using several programs. SETT accomplishes this by combining aspects of existing image manipulation applications, such as ImageMagick and Crunch/crnlib, with our new UI to allow for file creation through one interface. In conclusion, the Source Engine Texture Tool significantly decreases the effort required to create new textures for the Valve Source Engine.

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Spatio-Temporal Analysis of Algal Blooms in Lake Pontchartrain Using Remote Sensing
Breann Larson

Located in New Orleans, Louisiana, Lake Pontchartrain is the second-largest brackish estuary in the United States and is connected to the Gulf of Mexico. The elevation of New Orleans varies from -13 feet elevation to 328 feet, averaging 3 feet of elevation. This makes New Orleans susceptible to flooding events from the Mississippi River. This susceptibility to flood events led to the Bonnet Carré Spillway (BCS) building in 1937. The purpose of the BCS is to divert flood waters from the Mississippi River into Lake Pontchartrain. The BCS aids in

preventing significant flooding events but leads to major changes in water quality in Lake Pontchartrain. Among some of these changes are excess nutrients and organic matter, which leads to eutrophication and algal blooms. Algal blooms can significantly affect the delicate marine ecosystem. Since the building of the BCS in 1937, it has been opened 15 times; since 1997, the BCS has been opened 8 times. With an increased frequency of BCS openings within the past 25 years and climate change leading to changes in atmospheric conditions, we can expect to see even more BCS openings occurring. With remote sensing and NDVI, we can assess historical algal blooms in relation to the BCS openings. This study uses Landsat 5 and 8 data and NDVI to derive a thematic map of algal blooms near the BCS opening dates to assess changes in algal content in Lake Pontchartrain. Results show that algal blooms are detectable using NDVI in non-turbid waters.

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Student Perceptions: A Missing Component of Curriculum Design?
Cherry Guinn, Jenny Holcombe

The world of nursing education is constantly changing to address emerging professional needs. When implementing programmatic changes, the focus is to address the identified needs and effectively prepare students to enter the profession. A longitudinal data collection endeavor began in Spring 2019 in anticipation of programmatic changes within a traditional BSN program. Objective and subjective student data was collected and aggregated by cohort. Students across cohorts consistently rated their perceptions of confidence and competence lower in two specific areas – comfort knowing what to do for a dying patient and confidence communicating with physicians. This finding also highlights a discrepancy between objective and subjective measures; given consistently high first-time pass rates across cohorts, the objective assessment is not sensitive to student perceptions. Together these results indicate the need for curricular adjustments targeting student confidence and competence in these target areas. Continued analysis of ongoing longitudinal student data collection will allow for evaluation of curricular adjustments and their impact on student perceptions.

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Study of Selective Binders to Single-Stranded d(CCG) Repeats with Implication for Repeat Contraction
Ethan Duck

Stable secondary structures of single-stranded DNA can lead to DNA extension/contraction through the DNA slippage processes during DNA replication or repair. Expanded trinucleotide CGG/CCG repeats cause Fragile X-Associated Disorders (FXD), incurable genetic diseases. Potentially, selective binders that stabilize the secondary structure of d(CCG) repeats can induce DNA slippage to reduce the number of the toxic expanded repeats. Here, selective binders to d(CCG) repeats were identified from the chemical library of the

compounds collected through a similarity search approach. In the self-priming DNA elongation assay, the binders shift the equilibrium toward forming the secondary structure of the repeats. The enhanced melting point of d(CCG) repeats by the binders indicates that the binders stabilize the secondary structure of the repeats upon their binding.

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Study of the Relationship Between Interoceptive Sensibility and Distress Tolerance in Community and College Samples
William Moore

Interoception encompasses the sensing, integration, and interpretation of internal bodily signals, primarily involving cardiovascular, pulmonary, or gastrointestinal systems. Dysfunction in interoceptive processing has gained recognition as a clinically significant component across various neurological, psychiatric, and behavioral disorders. Distress tolerance is defined as the ability to endure and withstand negative psychological states. This study investigates the relationship between self-reported interoceptive sensitivity and one's capacity to tolerate stressful events. The study will involve approximately 150 college student participants in one sample and around 40 community participants in another. Employing the Body Perception Questionnaire - Short Form (BPQ-SF) and the Distress Tolerance Scale (DTS), we aim to assess the extent of overlap between bodily awareness and distress tolerance constructs. We hypothesize a positive correlation between scores of interoceptive sensibility (indicative of higher salience or attention to internal sensations) measured by the BPQ-SF and scores of poorer distress tolerance (indicative of higher difficulty in coping with negative emotional states) measured by the DTS. If our findings support this relationship, it will offer further evidence for interoception's involvement in emotional regulatory processes and may underscore the utility of body awareness interventions as coping mechanisms.

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Subanesthetic Ketamine for Postoperative Pain
Lauren Evans, Lindsey Pope, Bethany Earhart

Subanesthetic Ketamine for Postoperative Pain
The opioid crisis became recognized as a public health emergency due to increasing opioid-related deaths; prescribing opioids at discharge has become an independent risk factor for opioid dependence and chronic use (Thota et al., 2019). Providing adequate analgesia intraoperatively directly affects the amount of opioid consumption in the postoperative period.

The primary purpose of the quality improvement project was to educate providers on the benefits of utilizing subanesthetic dosing of ketamine intraoperatively. The SRNA researchers hope education will increase intraoperative ketamine administration; lead to

decreased pain and reduction in opioid consumption in the postoperative period. Overall, the SRNAs hope to decrease provider contribution to the opioid epidemic.

The quantitative quality improvement project used 20 articles utilizing the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, Science Direct, and Cochrane Library search engines. The study population consisted of adult patients over 18 years old undergoing general anesthesia. A pre-educational survey, PowerPoint, and post-educational survey will be utilized to assess knowledge and provide education on subanesthetic ketamine.

Subanesthetic ketamine improves pain scores and reduces opioid consumption (Gorlin et al., 2016). The significance of the quality improvement project is to assess the willingness of CRNAs at NMMC to alter anesthesia practices and provide opioid-sparing analgesics. The results of the study will dictate interventions and actions that need to be taken at NMMC.

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Supervised Machine Learning Models for Prediction of 30-day Readmission of Stroke Patients
Monireh Rahmati

Reliable prediction of patient readmission within thirty days of hospital discharge can positively impact the care provided to the patient and the financial burden on the healthcare providers and insurance companies. This importance is signified by the US government's Hospital Readmission Reduction Program, which started in October 2012, and includes financial penalties for readmission to hospitals due to various conditions. Among different readmission cases, acute stroke has been one of the most critical factors for which the 30-day readmission is critical. In this work, we have developed predictive models based on supervised machine learning approaches for the readmission data from Erlanger Hospital. Various methods of oversampling and undersampling and machine learning models were employed, and the results were compared based on Recall metric. The results show that a suitable combination of sampling method and adoptable ML model can provide optimized results for hospital readmission.

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Surveying the Membrane Permeability Effects of Unsaturated Fatty Acids on *Vibrio cholerae*
Carli Todd

Many Gram-negative bacteria possess the intriguing ability to utilize exogenous fatty acids from their environment for physiological and behavioral purposes. *Vibrio cholerae* has been shown to scavenge an array of polyunsaturated fatty acids for incorporation into membrane phospholipids, thereby affecting permeability and antimicrobial resistance. *V. cholerae*

encodes several homologs of proteins involved in the uptake and assimilation of fatty acids into phospholipids. This study performed an initial survey of unsaturated fatty acid handling in *V. cholerae* by conducting permeability assays with a library of commercially available fatty acids. Using the hydrophobic dye crystal violet, we determined the membrane permeability impact of 24 unsaturated fatty acids, ranging from 18 to 22 carbon lengths and 1-6 unsaturation(s). 20-carbon fatty acids followed a pattern of increased permeability with each added unsaturation. Longer carbon lengths generally led to more significant changes in permeability. Overall, regardless of carbon length, polyunsaturation resulted in significant changes to permeability. Up to 20-30% fluctuations in permeability were observed compared to the control. Collectively, data suggests a wide repertoire of fatty acids can alter membrane permeability in *V. cholerae*. These membrane changes could represent strategies i) for bacterial survival via lipid homeostasis or ii) for introducing bacterial vulnerability to membrane-perturbing abiotic (e.g., temperature and pH) and biotic (e.g., antibiotics and antimicrobial peptides) factors.

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Sustaining Smart Cities: Benchmarking Success Factors for High School Education
Lora Taylor

As Chattanooga strides towards becoming a thriving Smart City, it is imperative to evaluate the academic achievement and graduation rates of Hamilton County students. Chattanooga's Smart City growth relies on assessing Hamilton County schools' academic and graduation outcomes. This research project focuses on benchmark data gathered from two magnet schools - STEM School and Tyner Academy - to understand high school achievement drivers. The research aims to guide policymakers, educators, and stakeholders to enhance graduation rates and educational quality. Ultimately, the goal is to prepare students for success in a tech-centric economy, supporting Chattanooga's sustainable development through informed educational strategies.

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Sustaining Smart Cities: Benchmarking Success Factors for High School Education
Lora Taylor

As Chattanooga strides towards becoming a thriving Smart City, it is imperative to evaluate the academic achievement and graduation rates of Hamilton County students. The sustained growth and success of our city depend on equipping our students with the necessary skills to excel in a technology and manufacturing-driven economy. To gain a comprehensive understanding of the factors influencing high school success, our research focuses on benchmark data gathered from two magnet schools: STEM School and Tyner Academy.

By analyzing the performance and graduation rates of students in these institutions, we aim to identify key determinants of academic success and address potential challenges hindering progress. Our research strives to provide actionable insights for policymakers, educators, and stakeholders to develop targeted interventions that can bolster graduation rates and foster an environment conducive to educational excellence.

Through this investigation, we aspire to contribute to the long-term sustainability and prosperity of Chattanooga, ensuring that our students are well-equipped to thrive in the dynamic landscape of the modern workforce. By combining rigorous research with real-world applicability, we endeavor to facilitate data-driven decision-making for educational advancement, forging a brighter future for our students and our Smart City as a whole.

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Synthesis of Pt(II) compounds containing the N-oxide functional group and investigation of their properties.
Matthew-Josiah Akama

Hypoxia, or low oxygen concentration, is a defining marker for cancer cells. Visualizing hypoxia using imaging agents is beneficial because it can aid in the treatment of various cancers. Recently, Chan et al. utilized an organic dye containing the *N*-oxide functional group to image tumor cells. In this species the nitrogen-oxygen bond of the *N*-oxide functional group is cleaved in hypoxic conditions providing a visual marker for hypoxia. Moreover, transition metal compounds have suitable properties for imaging agents and have also been utilized for hypoxia imaging. We are developing transition metal-based imaging agents that exploit the *N*-oxide functional group. Herein, we report the synthesis of novel *N*-oxide containing Pt(II) compounds and investigate their properties to determine how the *N*-oxide functional group impacts the properties of these species. The compounds [(ppy)Pt(m-Cl)]2 (where Hppy = 2-phenylpyridine) and [(dfppy)Pt(m-Cl)]2 (where Hdfppy = 2-(2'-4'-difluorophenyl)pyridine) were prepared by previously reported literature methods. Pt(C^N)(N^O) derivatives (where C^N = ppy or dfppy and N^O = 5-methylpyrazine-2-carboxylic acid 4-oxide or 5-methyl-2-pyrazinecarboxylic acid) were prepared in high yields >60% from their corresponding chloro-bridged-Pt(II) dimer. Herein, we present how the properties of Pt(II) species (e.g., 1H-NMR spectra) are impacted by the presence of the *N*-oxide functional group.

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Synthesizing Single Chain Polymer Nanoparticle Networks by Reinitiating RAFT
Dallas Donovan

Polymers exist in many aspects of our everyday lives but are often in situations where they are placed under stress. If too much stress is applied, they may fail. An emerging strategy to prevent this is to store length in the polymer chains that form the network. We have

identified Single Chain Polymer Nanoparticles (SCNPs), which are linear polymers that are folded using intrachain crosslinks, as a potential platform for storing length in a polymer. To achieve this, we are synthesizing SCNPs by reversible addition fragmentation chain-transfer (RAFT) polymerization using a bifunctional chain transfer agent. Following intrachain crosslinking, RAFT polymerization will be reinitiated to synthesize a polymer network around the SCNP. We will report progress towards the synthesis of networks with this topology and the characterization of the material behavior.

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Synthetic and Computational Design of Single-Chain Nanoparticle Polymer Networks
Kelly Hooper

N/A

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The Correlation Between Eating Disorders and Disordered Eating Behaviors in Early Adolescence and the Development of Gastrointestinal Issues After Recovery
Rebecca Zagami, Braden Wilson, Megan Savage, Ashley Byrd, Ian Murphy, Mae Cartwright

Previous studies have found that comorbid conditions, such as IBS, IBD, and Corhn's, often develop during Eating Disorders (ED) and Disordered Eating Behaviors (DEBs), and a strong correlation between severe EDs/DEBs and declining gastrointestinal (GI) health has been determined (Eating Disorder Statistics, 2023). However, a gap has been identified in the lack of research regarding the exploration of the long-term impacts of EDs/DEBs and how symptoms of poor digestive health may become present well after the recovery from EDs/DEBs (Eating Disorder Statistics, 2023).

The purpose of this study is to explore the correlation between ED/DEBs and the GI issues that may develop after recovery. Project hypothesis: There is a strong correlation between an individual having an ED/DEB and developing gastrointestinal issues later in life.

We collected data from an anonymous survey through Qualtrics and analyzed that data through SPSS software. Through our collected data, we were able to dissect the possible relationship between ED/DEB and gastrointestinal issues by running several different analyses that show the correlation between the variables.

Results: Data collection is ongoing.

Impact Statement: Our goal with the study is to specify the possible connection between the variables and potentially uncover any gaps that are present in existing research while contributing to existing research on this topic.

Eating Disorder Statistics (2023, November 8). ANAD: National Association of Anorexia Nervosa and Associated Disorders. https://anad.org/eating-disorders-statistics/

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The Creation of an Expert-validated Clinical Skills Video on Focused Assessed Transthoracic Echocardiography for Novice CRNAs
Taylor Lenard, Sam Berry, Nellie Thomas

The Focus Assessed Transthoracic Echocardiogram (FATE) protocol can be used by the Certified Registered Nurse Anesthetist (CRNA) conducting a preoperative, perioperative, and postoperative cardiac assessment. The use of the FATE protocol is widely underutilized and misunderstood by novice CRNAs and SRNAs. There is a gap in education as this protocol is not taught extensively in schools and hospitals. The objective of this translational project is to assess the evidence pertaining to the FATE protocol and to write a script and produce an expert-validated instructional video for novice CRNAs and SRNAs desiring to learn more about the FATE protocol. A group of experts on FATE and point-of-care ultrasound (POCUS) will validate the script using the Delphi method in successive rounds of evaluations. The benefits, risks, limitations, and methods of the FATE protocol will be explored in this project.

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The Crusades; A Bloody Stain On Fine Linen
Ransom Lander

This essay is about the Crusades and how they've impacted people's views on Christianity. It focuses on the First Crusade and its events, then shifts focus to the modern day. The essay utilizes a mixture of accounts from during the Crusades and the present, to create a balanced view of the subject matter. The essay takes a look at the use of various Crusader symbols in the modern day, and what they mean. The essay addresses the contradictions between the actions of the Crusaders and Christianity, and emphasizes the distinction between Christians and Christianity. By doing all of this, the essay shows that the actions of individuals are not always a good representation of what they say they are acting on behalf of.

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The development of N,N-trans-spanning ligands
Barbara Higgs, Matthew Josi Akama

Recently, it has been shown that coordination complexes with N,N-trans-spanning ligands can catalyze cross-coupling, C-H activation, and cyclopropanation reactions. Despite this,

trans-bidentate ligands with N,N-chelators are rare with the archetypical example being the 1,2-bis-(2-pyridylethynyl)benzene system. Herein, we describe the synthesis and characterization of analogs of 1,2-bis-(2-pyridylethynyl)benzene where the pyridyl binding sites or the benzene core has been modified with different heterocycles. Whenever possible, the coordination complexes of these species with Pd(II) or Au(III) were characterized by single-crystal X-ray diffraction. For instance, we synthesized 2,3-bis(pyridine-2-ylethynyl)pyrazine from 2,3-diiodopyrazine and 2-ethynylpyridine utilizing a Sonogashira coupling reaction. This ligand was coordinated to PdCl 2 using Pd(CH 3 CN) 2 Cl 2 as the Pd(II) source and the resulting compound was characterized by single-crystal X-ray diffraction. In this species, the coordination of the Pd(II) is square planar with nearly linear N-Pd-N, and Cl-Pd-Cl bonds with angles of 179.15º and 178.35º, respectively, indicating 2,3-bis(pyridine-2-ylethynyl)pyrazine acts as a N,N-trans-spanning ligands.

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The Effect of Positive Childhood Experiences (PCEs) on College-Aged Adults Perceived Flourishing in the Presence of Adverse Childhood Experiences (ACEs)
Taylor Gauthreaux, Gabby Wessels, Shawnise McCane, Annie Duran Perez

The purpose of our research is to provide a comprehensive understanding of the effect of Positive Childhood Experiences (PCEs) on college-aged adults' perceived flourishing in the presence of Adverse Childhood Experiences (ACEs). The majority of research on ACEs concentrates on how often these events will have negative impacts on well-being in the future rather than on the positive outcomes that individuals may experience despite them. Previous research suggests that those who have experienced ACEs are at a higher risk for developing mental and physical health risks (Chang et al., 2019). This is true due to the nature of the experiences and how they can impact childhood development and the development of coping behaviors (Felitti et al., 1998). Previous researchers have concentrated their studies on young people in community settings as well as young adults living outside of the US. Since college-aged individuals constitute a distinct category of young adults who endure additional pressures in their everyday lives, the proposed study seeks to close the literature gap in this area. The present study aims to answer the question: Do positive childhood experiences (PCE), in the face of ACEs, have a positive relationship on self-reported flourishing on enrolled college students at the University of Tennessee, Chattanooga (UTC)? For this study, we will be using a survey that measures the respondent's ACE score, PCE score, and self-reported flourishing.

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The Effects of Covid on Adolescent Bullying and Suicidal Behavior
Chelsea Andrews

This research project aims to explore the influence of the COVID-19 pandemic on adolescent bullying and suicidal behavior, utilizing data from the Youth Risk Behavior Surveillance

System (YRBS) collected in 2019 and 2021 waves. With COVID-19, adolescents have experienced disruptions in their daily routines, social interactions, and mental health support systems, potentially exacerbating existing challenges such as bullying and suicidal ideation. By analyzing the results from the YRBS surveys, whether or not Covid had an impact will be identified.

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The Impact of Artificial Intelligence in Employee Onboarding Programs
Julie Brown

The onboarding phase is one of the most impactful moments in an employee's life cycle (Kumar & Pandey, 2017). High turnover is costly, so an effective onboarding program may help increase employee retention and in turn reduce costs associated with replacing and retraining employees (Blount, 2022). There is a vast amount of research on how artificial intelligence (AI) is being used to create efficiencies in various processes. Through research, I will examine emerging human resources (HR) trends and better understand how AI is being used to advance HR initiatives and programs, particularly in new employee onboarding programs. Trends from a broad perspective will be captured with a focus on how AI is used in HR to improve the new employee onboarding experience (Timmins & McCabe, 2005). This research will identify practical applications and opportunities for further research involving the use of AI in different HR functional areas. This research topic will be the foundation of my project of practice which will involve evaluating the current onboarding program at the University of Tennessee at Chattanooga (UTC) and developing a more effective and engaging program with the use of AI.

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The Impact of Covid-19 on Chronic Absenteeism in Public Schools in Hamilton County.
Hannah Davis, Amy Stollenmaier , Lilly Dyer, Kelli Webber, Joel Tate

The purpose of this study is to investigate if there is a correlation between increased rates of chronic absenteeism and the Covid-19 pandemic, and to examine possible causes of chronic absences in public schools in Hamilton County, TN.

Chronic absenteeism is a growing concern due to the many complications and issues it can create for chronically absent students (U.S. Department of Education, 2016). As of 2016, it was estimated that roughly one in six students missed three or more weeks of class (U.S. Department of Education, 2016). A primary issue related to chronic absenteeism is that chronically absent students tend to have lower test scores and lower academic performance as compared to their peers who attend school regularly (Gottfried, 2014).Those exhibiting chronic absenteeism are likely to have reduced job opportunities later in life as well as increased likelihood of involvement in the criminal justice system (The White House, 2023). Chronic absenteeism has a history of disproportionately affecting minority students and

disabled students (Gee, 2018). Economically disadvantaged students also have an increased risk of being chronically absent (Sosu et al., 2021). When considering the effect of the Covid-19 pandemic on the issue of chronic absenteeism, it is helpful to understand the effects of previous pandemics. For example, the Influenza pandemic of 1918-1919 caused students to have higher rates of absenteeism due to new barriers and lack of support (Camara & Ecar, 2021). There is limited research related to the impact of Covid-19 on chronic absenteeism. Through researching the relationship between chronic absenteeism and the Covid-19 pandemic, it is possible to find ways to reduce chronic absenteeism and help fill the gap that currently exists in research related to the effects of the Covid-19 pandemic on chronic absenteeism.

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The impact of electromagnetic frequencies on living organisms
Ruby Brahmbhatt , Kaylee Cantrell

A magnetic field is generated whenever electric currents travel through wires, and when positive and negative charges are switched, electromagnetic waves are born. Electromagnetic waves are present in every corner of the spectrum and impact all living organisms. This experiment is designed to measure the effects of electromagnetic frequencies on living organisms, focusing on technology present in almost every home. Drosophila and plants will be placed in proximity to cell phones and television sets. We will measure the fertility and death rates of drosophila in proximity to a variety of frequency ranges. The sensitivity of plants, namely the pansy, to electromagnetic frequencies will also be measured through their comparative growth rates at different proximities to different frequencies. The goal of this experiment is to assess the true effect of electromagnetic frequencies on living organisms.

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The Impact of Executive Foreign Policy Rhetoric on Minority Communities in the United States
Andrew Hoffman

Carter's model of socially marginalized populations explains how "racial encounters" can lead to trauma for racial minorities and high stress reactions. Furthermore, the amount of hate crimes against those perceived to be Arab or Muslim increased by 1,700% in the years after 9/11 (Abu-Ras et al., 2009). While events such as 9/11 or Covid-19 have been shown to increase hate crimes and instances of racism, research has failed to identify the executive rhetoric associated with these increases. In order to identify what kind of rhetoric leads to more hate crimes, we must ask, "How does executive rhetoric toward foreign nations impact the experiences of minority communities in the United States?" A quantitative research method will be conducted in which members of impacted populations will answer questions based on their experiences pre and post 9/11 or COVID-19 (depending on the

relevant event). Their experiences during various presidencies will be compared. If one or more presidencies have statistical relevance, then the rhetoric attached to one or more presidents will be examined in order to identify commonalities. The results will most likely indicate a pattern in rhetoric and comfortability among those surveyed. This research is significant in that it examines racial bias through the lens of executive foreign policy rhetoric. The research will allow for a better comprehension of how the language of different Presidents impacted minority communities after two specific historical events.

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The Impact of Multidisciplinary Rounds
Hannah Alexander

Patient care consists of numerous services and teams working together to create an individualized care plan for patients. One of the biggest challenges in healthcare is assuring all disciplines are informed of all details of the patient's care without each discipline reading the patient's entire electronic medical record. Given the time constraints of high patient volumes, solutions to strengthen this communication are constantly sought after to improve patient care. Multidisciplinary rounding (MDR) is a communication tool that can potentially contribute to solving this problem. This project will evaluate the impact of implementation of multidisciplinary rounding on length of stay, communication, and self-efficacy on the cardiac surgical population.

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The Implementation of an Educational Opioid-Free Anesthesia Tool to Assess Practice Perceptions in Certified Registered Nurse Anesthesiologists
Alex Stevenson, Charlie Jeffries, Brett Roth

The opioid crisis in the United States has prompted a reassessment of conventional pain management strategies within the arena of anesthesia. Opioid-free anesthesia (OFA) may yield potential patient safety and treatment benefits without the adverse effects of opioids. This abstract explores the emerging data about OFA as a promising alternative to traditional opioid-based approaches, which may also help mitigate the deleterious risks associated with opioid consumption. Data suggests that anesthesia providers do not routinely practice OFA. Therefore, this DNP project aims to examine the thoughts, perceptions, and education levels of Certified Registered Nurse Anesthetists (CRNA) about OFA. An OFA educational tool that included pertinent data related to OFA benefits and education was produced by student registered nurse anesthetists (SRNA). A pre-survey evaluating the thoughts, perceptions, and education level of OFA was distributed to CRNAs at a local hospital. After the pre-survey, the OFA education tool was provided, followed by a post-survey that aimed to re-evaluate possible changes in thoughts, perceptions, and education levels of OFA. As the results of this study are pending, the data revealed by this project may help identify barriers to the implementation of future OFA practice guidelines, allowing practice guideline

creators to construct feasible OFA practices that may decrease opioid consumption and healthcare costs, increase patient satisfaction and provider satisfaction, and help curb the opioid crisis.
Keywords: opioid-free anesthesia, opioid crisis, healthcare

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The Influence of Partying Culture on Undergraduate Academic Performance
Faith Burkhardt, Kei'Zanay Alexander, Saeri Goins, Anneliese Thorne, Leslie Wallin

The phenomenon of partying culture on college campuses has historically played a part in the social culture of most college students. This topic has seen a wide range of interest for research due to the concerns of the potential risk partying culture has on the academic performance of undergraduate students. However, a comprehensive examination of the intersectionality of individual, social, and institutional factors has yet to be researched. The purpose of this paper is to examine the intersectionality of these factors to deliver a more comprehensive understanding of the negative effects that partying culture has on the academic performance of undergraduate students. We will be using an anonymous cross-sectional study to gain quantitative data on the academic performance of undergraduate students in their sophomore year and above. The goal of this study is to provide a comprehensive understanding of the intersectionality of these factors to provide research that universities may utilize when implementing intervention strategies.

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The Phonograph, A Revolution in Sound
Greyson Palmer, Nathaniel Shore

A trifold poster describing the history and impact of the phonograph had on our world, made to the prompt of turning points in history. Also, a homemade phonograph is included in the presentation as well.

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The Relationship Between Viscosity of E. Coli Suspensions andIncreasing Antibiotic Resistance.
Olivia Ziemer

Antibiotic resistance in bacteria has become an increasingly significant issue in modern medicine. Despite the regularity of antibiotic resistance, there is still much we do not yet know about the mechanisms employed by resistant bacteria. One of the mechanisms ampicillin uses to attack E. Coli is to prevent the synthesis of the cell wall. Several studies,

using an Atomic Force Microscope, have discovered that the cell walls of E. Coli become stiffer when they are made to be resistant to antibiotics. Here we measure the rheological properties of E. Coli with and without ampicillin in a motility buffer. We hypothesize that the increased stiffness on a cellular level will manifest as a collective property, changing the shear stress, viscosity, and modulus. Our results taken from the rheometer display an increase in viscosity as the bacteria become increasingly resistant to ampicillin.

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The Role of Occupational Therapy in ICU Recovery Clinics
Brittany Work

Introduction: Patients are leaving the intensive care unit (ICU) with new functional impairments they did not have previously. Post-intensive care syndrome (PICS) is described as new or worsening physical, cognitive, or mental health impairments occurring after critical illness, persisting beyond the acute care hospitalization. Intensive care unit recovery clinics were designed to evaluate PICS and improve the outcomes for survivors of critical illness through an interprofessional team approach.
Specific aim: Provide evidence that the addition of occupational therapy (OT) to the ICU recovery clinic multidisciplinary team may contribute to improved functional outcomes.
Methods: A review of the literature was conducted to examine the existing research on PICS, ICU recovery clinics, and the role of rehabilitation while identifying any existing gaps. Collections were searched through the Eskind Biomedical Library at Vanderbilt University using various combinations of relevant keywords, including “PICS,” “ICU recovery clinics,” and “rehabilitation.” The search was limited to both data-based and conceptual peer-reviewed articles published within the last fifteen years.
Results: There is wide variability in how ICU recovery clinics are organized and managed. Given the potential impairments in physical, cognitive, and mental health function, a rehabilitation specialist can serve as a driver for informing the patient’s healthcare team about PICS-related issues. Since these impairments can lead to dysfunction in basic and instrumental activities of daily living (ADLs), OT practitioners can provide significant value as they specialize in enhancing or enabling participation in ADLs.
Conclusions: Survivors of critical illness are at risk for developing impairments in physical, cognitive, and mental health after their ICU stay. Intensive care unit recovery clinics have been established to help manage the needs of this patient population. Occupational therapy practitioners are in a unique position to enable these individuals to improve their engagement in the domains of physical, cognitive, and psychological functioning.

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The State of Herbaria in Tennessee
Meredith Woodward

Most of the herbaria in Tennessee were the focus of National Science Foundation awards to facilitate the digitization of the state's herbaria between 2016-2019 (NSF #1410069, NSF #1410087, NSF #1756382). Today, twelve of TN's thirteen herbaria house more than 887,230 specimens that are digitized to varying degrees and can be accessed through SERNEC. Utilizing the DarwinCore .csv files for each herbarium, this work aims to summarize the herbaria individually and collectively for the first time to provide an update on the content and features of each institution. Furthermore, it will provide insight on gaps within the data, three of which will be showcased in this presentation: 1. Missing data in important DarwinCore fields, such as date, collector, geographic coordinates, or municipality, 2. Collection biases across Tennessee that have resulted in over- or under-collected counties or regions of the state, and 3. Variation in taxonomy across time and taxonomic concepts that complicates summarizing the floristic composition of each of the herbaria and the state as a whole. Ultimately, we anticipate this summary of the state's herbaria will contribute to highlighting the substantial and long-standing resources that are our state's herbaria and how workers may guide more focused field collection and digitization efforts to enhance our state's botanical data in more useful directions.

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The Study and Analysis of the Functional Performance of Steel after Hybrid Laser-Arc Welding
Holland Luttrell

This summer I looked at the surface integrity of S355 steel that had been welded using hybrid laser arc welding processes. We conducted our research by welding plates of steel together at different settings of welding. After welding we cut the sheets into testing probes and preformed a number of tests to determine the surface integrity of the material after it had been welded. We preformed tensional tests, fatigue life tests, residual stress tests, and micro hardness tests on the welded material.

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The Third War on Drugs Fentanyl Misinformation
Cheyenne Holland, Grace Bowden, Garret Engle, Andres Rafael

Fentanyl is used in Health Care for anesthetic and severe pain. However, in recent years, there has been an increase in Fentanyl misinformation, overdose, and addiction which is creating a third wave of the War on Drugs. This research is going to investigate the reason why the misinformation about fentanyl has grabbed the attention of people. To answer this question, we will be conducting qualitative and quantitative research. The results will demonstrate the historical similarities, public concerns, distribution context, and mitigating factors that show the harmfulness of misinformation to fuel the third War on Drugs. For instance, of the 108,000 deaths involving drug overdoses, people who used a synthetic opioid (i.e. fentanyl) resulted in 75% of those deaths (CDC, 2024). This study suggests that

the misinformation is distracting from the real issue of needing drug reform policies to provide adequate treatment and furthers the political divide among Americans.

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Theoretical studies of hydrogen abstraction from fluorinated propanone and fluorinated propanal
Laurel Washburn

Per- and polyfluoroalkyl substances (PFAS) are a class of thousands of industrially used compounds that are called “forever” chemicals because of their slow degradation process leading to accumulation in soil, dust, drinking water, and the body. PFAS are used for their grease and water resistance properties but some of these compounds are toxic at extremely low levels. To better understand the effects of these types of compounds, the main pathways of their degradation need to be further investigated. This study analyzes computationally the hydrogen abstraction reactions by both hydroxyl radical and oxygen atom for all possible fluorinated propanones and fluorinated propanals. Hybrid density functional theory calculations (mPW1B95-based functional in conjunction with 6-31+G(d,p) basis set) were used to determine the location of the saddle points as well as energetic parameters for all possible reaction pathways to ultimately gain a better understanding of the reactivity of these molecules. Comparisons were made among all fluorinated propanones and fluorinated propanals. All computations were carried out using Gaussian 2009 software.

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TouchTalk
Aaron Matthews, Rizwaan Abdulkadir, Elvin Hernandez, Neva Tilley, Miscily Bravo-Bussey, Brandon Hahm, Krish Patel, Pharris Pollard

This device will be used by a blind student who is having a hard time learning how to speak which will in turn serve to help them learn how to speak properly. To achieve this, we are developing a communication device that is easily clickable, has tactile feedback through a click when the button is pressed, relays the word/phrase that is saved on that button, and can change what each button will say. The reason that this is important to us is that it will be very beneficial to anyone who is blind and has a hard time speaking clearly to learn new words and how to properly use these words in complete sentences. We are focusing on how we can achieve this goal without spending lots of money and get this device to preform correctly by researching other devices that are already on the market. We are also seeing what works well for those devices, and what other issues that the device must improve on in our own design. We hope that we can find a great way to build and improve on all the other designs that are already on the market to help anyone who is blind to be able to have a greater way to communicate with anyone else around them.

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Towards Smarter EV Charging Solutions: Leveraging Data for Demand Forecasting
Sima Ashayer

The accelerating adoption of Electric Vehicles (EVs) demands a parallel evolution in charging infrastructure, driven by the urgency to reduce the environmental footprint of transportation. Our study, "Towards Smarter EV Charging Solutions: Leveraging Data for Demand Forecasting," spearheads this endeavor through the development of a hybrid predictive model. By integrating Long Short-Term Memory (LSTM) and eXtreme Gradient Boosting (XGBoost) algorithms, we aim to forecast demand at EV charging stations with heightened precision, thereby facilitating the strategic deployment of infrastructure. This approach is underscored by a comprehensive data preparation and analysis phase, which leverages transaction records and infrastructure features to illuminate usage dynamics and inform model development.

Our findings reveal that the hybrid model, combining LSTM's temporal pattern recognition with XGBoost's capability to parse complex data relationships, surpasses the predictive accuracy of individual algorithms. This is evident in the model's improved Root Mean Squared Error (RMSE) and Mean Absolute Error (MAE) across several charging stations, highlighting its potential to adapt to varying demand patterns and site-specific factors. However, the variability in model performance across different stations suggests the need for further refinement to capture local nuances more effectively.

Conclusively, our project not only advances the methodology for EV charging demand forecasting but also contributes to the broader goal of sustainable transportation infrastructure development. By showcasing the potential of advanced analytics and machine learning, we underscore the importance of a data-driven approach in optimizing charging station deployment, ultimately supporting the global transition towards electric mobility.

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Transcendence in Kierkegaard and Barth
Andrew Myrick

The relationship between Søren Kierkegaard and Karl Barth is significant but much debated. This paper examines the influence of Kierkegaard on Barth throughout Barth's theological development. The relationship between Barth and Kierkegaard is then examined in light of George Pattison's work on Kierkegaard. Andrew B Torrance and Alan J Torrance's work in their 2023 book *Beyond Immanence* is then critiqued using Pattison's hermeneutical approach to Kierkegaard.

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Two Tasks One Brain: Dual Task Cost and Motor Performance During Serial Sevens and Agility T-test
Jaimin Rasmussen, Candace Ricketts, Rebecca Sullivan, Blake Wright

Background: Research involving dual tasks is common in geriatric and neurological populations, yet little research investigates its application to athletics and return to sport.

Research Question: We compared how healthy subjects performed a complex cognitive task of subtracting 7 from a random number consecutively (serial 7s task) and an agility T-Test (physical task) individually and when performed simultaneously as a dual task. We hypothesized that the dual task would cause mutual inhibition, meaning that performance of both tasks would be worse when compared to each task individually.

Methods: Healthy subjects were recruited (n=46) with a median age of 23.5 years. Each subject performed the serial 7s tasks followed by the agility T-tests as fast as possible. Finally, the dual task required subjects to run the T-test while subtracting 7s. We compared the time to complete the agility drill and the latency for the cognitive task under both conditions with a Wilcoxon signed rank test and calculated the dual task cost.

Results: There was a significant increase in time to complete the agility test (p

Conclusion: Single task assessments may be inadequate to evaluate functional capacity in complex situations. Further research may demonstrate applications in diverse populations and those with concussions.

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Undergraduate Students' Awareness of Bullying on College Campuses and Bullying Prevention Programs Through The University
Rebecca Landfare, Maggie Maples, Elaina Swallow, Angel Brewer, Amy Wood

Bullying is something that people experience throughout every stage of their lives whether that is through victimization, perpetration, or just by observation (Marraccini, 2018). There seems to be many studies that have been conducted on bullying among elementary, middle, and high school students (Zhong, 2021, Roberts, 2013, Klomek 2013), but we found very few studies that focus specifically on college students. Most of the research we did find on bullying victimization among college students focused on the mental health issues connected to bullying. According to researcher Xuexue Huang (2023), “bullying victimization is of great concern because of the negative health consequences it brings, including physical and psychological symptoms such as sleep disorder, self-harm, lack of appetite, anxiety symptoms, and depressive” (Huang et al, 2023). Huang’s study shows that bullying can lead to serious issues with an individual’s mental, emotional, and physical well-being. Based on the research literature, it is clear that bullying victimization can lead to many physical and psychological issues in young adults. However, the research isn't clear on the extent to

which bullying occurs on college campuses and how aware students are of bullying on their campuses

The purpose of this study is to examine the extent to which college students are aware of bullying that occurs on their college campus and the support offered by the university for victims of bullying. Understanding the extent to which bullying actually occurs on college campuses can inform university staff and officials in creating effective strategies for bullying prevention on college campuses. While understanding that not all college students have experienced bullying, this study will allow researchers to have a better understanding of how frequently this problem occurs within a college campus.

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Understanding how NtrZ affects NtrY in *Caulobacter crescentus*
Zayda Dominick

Bacteria frequently employ two-component systems to detect and respond to various stimuli and environmental changes. In a typical model of these signaling pathways, a histidine kinase undergoes autophosphorylation in response to an environmental signal, and subsequently transfers its phosphoryl group to a response regulator. The addition of the phosphoryl group to the response regulator induces changes in gene expression. While this is the common process for a two-component system, many of these sensory systems are more complex. For example, *Caulobacter crescentus* uses two-component systems, such as the NtrYX system, which participates in nitrogen metabolism, redox sensing, and cell envelope maintenance. Previous genetic analyses of the NtrYX system identified a phosphatase inhibitor, NtrZ, that interacts with NtrY. However, the physiological implications of this interaction remain unclear. Thus, the objective of this project is to investigate the interaction between the periplasmic domain of NtrY and NtrZ by employing (I am not sure how to word my methods or what to include, so while ur tearing my draft apart, plese help me with this :)). A deeper understanding of NtrZ activity will provide valuable insights into the mechanisms of NtrYX signaling in *C. crescentus* and related species.

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Understanding the overexpression of Tafs in eukaryotic cells
Jannatul Ferdoush

TATA-binding protein (TBP) and TATA box-binding protein-associated factors (Tafs) comprise RNA Polymerase II (RNA Pol II) pre-initiation complex, a universal component that is involved in regulation of transcriptional initiation. Two of the Tafs, Taf2 and Taf13, also play an important role in the regulation of RNA Pol II transcription initiation which is evolutionarily conserved from yeast to humans. It is found that Taf2 is upregulated in both hepatocellular (HCC) and ovarian carcinoma (HGSC) cells while Taf13 is upregulated in

thyroid carcinoma (TC) cells. However, the molecular basis of upregulation of these proteins in these cancers is not clearly understood. Our hypothesis suggests that targeted degradation by the 26S proteasome via ubiquitylation (UPS) may be the mechanism that regulates the stability of both Taf2 and Taf13 for normal cellular function. To test this possibility, we evaluated the role of UPS on the stability of both proteins in yeast (*Saccharomyces cerevisiae*). Importantly for the first time, we found that both Taf2 and Taf13 undergo polyubiquitylation. Moreover, we found that polyubiquitylated Taf2 is targeted for degradation via the proteasome, however, Taf13 is not found to be regulated by the proteasome. Thus, our results reveal novel UPS regulation of Taf2 and Taf13 with potentials for future therapeutic intervention.

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Understanding the Overexpression of TATA box-binding protein-associated factor 13 (Taf13) in Eukaryotic Cells
Selin Kaplanoglu

TATA-binding protein (TBP) and TATA box-binding protein-associated factors (TAFs) comprise RNA Polymerase II (RNA Pol II) pre-initiation complex, a universal component that carefully controls the transcriptional initiation process. One of the TAFs, Taf13, also plays an important role in the regulation of RNA Pol II transcription initiation which is evolutionarily conserved from yeast to humans. It is found that Taf13 is overexpressed in thyroid carcinoma (TC) cells, while the exact mechanism that is responsible for this overexpression is unclear. Our hypothesis suggests that targeted degradation by the 26S proteasome via ubiquitylation (UPS) may be the mechanism that regulates the stability of Taf13. To test this possibility, we evaluated the role of UPS on the stability of Taf13 in yeast (*Saccharomyces cerevisiae*). Importantly for the first time, we found that Taf13 undergoes polyubiquitylation and is regulated by the 26S proteasome. In the case of our hypothesis being supported by experimental results, therapeutic intervention could be possible for future patients of thyroid cancer.

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Unlimited Influence: The Citizens United Dilemma
Ruby Phillips, Blaine Chubb

My partner and I chose to research the Supreme Court case *Citizens United v. FEC (Federal Election Commission)* because of its profound impact on American democracy and its ongoing resonance in political and legal spheres. The case stands as a pivotal moment in the intersection of money and politics, reshaping the landscape of campaign finance and electoral dynamics in the United States. As we explored the complexities surrounding the decision, including its implications for free speech, the role of corporations in democracy, and the perceived erosion of fair and equal representation in elections, we were convinced that it truly was an important decision with grave repercussions.

The theme for this year's History Fair is “Turning Points in History,” and the *Citizens United* Supreme Court case clearly defines a significant turning point in U.S. history regarding campaign finance and the role of corporations in elections. The ruling determined that political spending by corporations, associations, and labor unions is a form of protected speech under the First Amendment, in turn allowing these entities to spend unlimited amounts of money to support or oppose political candidates.

My partner and I obtained and analyzed our primary sources, such as court documents, transcripts of oral arguments, and the Supreme Court's decision itself. We then dove into scholarly articles, books, and academic papers that provided analysis and historical context surrounding the case. We also conducted interviews with our student peers and our teachers to find out what they knew about campaign finance. Case studies and real world examples of how the *Citizens United* decision has shaped political campaigns, fundraising practices, and the broader landscape of American democracy helped us better understand the topic. Finally, we took public opinions and debates into consideration to gauge diverse perspectives and ongoing discourse surrounding *Citizens United*.

When it came to creating our documentary, our faculty sponsor provided us with a computer software known as “Davinci Resolve” to edit and produce our documentary. With the software, we then chose to incorporate visual elements, multimedia content, and graphics to enhance the storytelling and convey complex legal and political concepts in an engaging manner. This included infographics, commercials, and archival videos relevant to the case. In creating this documentary, our overarching argument is that *Citizens United v. FEC* undeniably altered the trajectory of campaign politics in the United States by fundamentally reshaping the landscape of campaign finance laws. By combining the research methods and film technique with our broad argument, a documentary known as “*Unlimited Influence: The Citizens United Dilemma”* was born.

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Untargeted metabolomics approach for the screening of endometrial cancer
Baker Garrison

Endometrial Cancer (EC) is the most common malignant tumor of the female reproductive tract. Currently there are no methods for effectively screening EC, but one method that is thought to be useful in screening EC is untargeted metabolomics. Metabolomics involves the analysis of metabolites which are low molecular weight inorganic and organic chemicals that are substrates, intermediates, and by-products of enzyme-mediated biochemical reactions in the cell. Previous research shows that the metabolic signatures of EC patients are discernable from those of healthy subjects. To aid in the development of an effective screening method for EC, blood, urine, and saliva samples of EC patients and controls (n=200) enrolled in a clinical trial at the University of Tennessee College of Medicine at Chattanooga Department of Gynecological Oncology were collected. These will be analyzed following method development using gas chromatography-mass spectrometry (GC-MS). For each sample, the metabolites will be extracted, purified, and derivatized before untargeted

GC-MS analysis. The obtained signatures will be used to build multivariate classification models in an effort to distinguish EC patients from healthy controls, thus providing a non-invasive, affordable screening test for EC.
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Utilizing Green-Kubo Theory to run simulations of Argon in LAMMPs
Holland Luttrell

The Green-Kubo (GK) Theory utilizes an equation to relate the heat conductivity and the ensemble average of the heat flux auto-correlation function. This theory has been proven accurate for solid elements; however, there has not been much research to determine if this theory can be used for elements in a gaseous state. In this research project I utilized the LAMMPs program to determine if the GK theory and equation could be applied to Argon in its gas state. The correct thermal conductivity for Agon is 0.018W/Km. Thermal conductivity is not dependent on the density; therefore, as the density changes the thermal conductivity should remain the same. This study evaluated how we can utilize Green-Kubo's Theory to accurately determine the thermal conductivity of Agon as a gas.

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Utilizing Water Quality Metrics for Predicting Water Potability in Random Forest and Logistic Regression Models
Ashley Ellis, Haobo Guo, Hong Qin

Clean and safe drinking water is a fundamental requirement for environmental health yet is becoming a global concern. This data analytics course project aims to leverage machine learning methods to predict the potability of drinking water based on a comprehensive water quality dataset. The data utilized for this project is a public dataset from Kaggle and provides water quality metrics that allow machine learning models to predict the potability of water. The objective of this project is to implement and compare the performance of two methods to determine not only the more efficient method for the chosen dataset. This analysis will also provide insight to each method's potential application to similar environmental health data in determining safe drinking water parameters within our ever changing environment. The project will specifically focus on comparing the performance of two prominent machine learning models: the random forest model and logistic regression method.

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Water lead testing initiative: Addressing environmental health for child care centers in four Tennessee counties
Ashley Ellis, Dawn Ford, John Tucker

Ensuring safe drinking water is a top priority of environmental health, regardless of existing environmental and social disparities. Children are especially vulnerable to contaminated drinking water because even low dosages of lead have been linked to childhood developmental issues. EPA's Voluntary Lead Testing in School and Child Care grant program introduces testing that protects day care-aged children from the environmental risk of lead in their drinking water. Through partnership between the University of Tennessee at Chattanooga (UTC) and the Tennessee Department of Environment and Conservation (TDEC), this program was implemented in four Tennessee counties. The lead testing program follows EPA's 3T's guidelines consisting of Training, Testing, and Taking Action. This project is an assessment of the real-life application of these guidelines. A Master of Public Health student employed outreach and education methods to recruit child care centers to participate, collect water samples in correspondence with a state laboratory, prepare remediation efforts in the event of elevated lead levels, and to keep an updated record of efforts for a UTC advisor and state partners. This project uncovers best practices in the application of EPA's program. At the end of this project, TDEC and EPA will be able to utilize this assessment to successfully implement water lead testing programs into other Tennessee counties through our findings and recommendations.

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Wetland Protections After Sackett v. EPA and the Role of States in Filling the Gaps
Austin Stiltner

Wetland protection in the United States has been a highly contested and litigated issue for several decades. Numerous Supreme Court decisions have altered and lessened the scope of existing protections under the Clean Water Act since its conception. The most recent decision, Sackett v. United States Environmental Protection Agency, has reduced the scope of the Clean Water Act most dramatically, effectively cutting federal regulations for all isolated wetlands. The aim of this research is to identify specific changes to the Clean Water Act that have occurred since its conception, and to identify strategies that can be used to protect and regulate wetlands through the government. Here, I examined the current status of federal wetland protections and the notable court cases that have shaped them. Using this information, I identified gaps in federal wetland protections and examine three states-- Tennessee, Georgia, and North Carolina-- that currently have differing levels of wetland protections to identify strategies lawmakers can use to fill the gaps left by the recent ruling. This information will be useful for policy makers and conservationists who have invested interest in protecting wetlands, which are some of the most valuable and ecologically significant hydrographic features.

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When Confirming to Society can Become more Important than One's Religious Beliefs
Brandon Pruitt

An essay analyzing three books: *Pious Fashion* by Liz Bucar, *WIth Respect to Sex* by Gayatri Reddy, and *Embroideries* by Marjane Satrapi; and discussing how these three books have a similar theme of societal pressure and conformity when one is making religious decisions.

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Working With What We Got: Housing Affordability Through Underutilized Parking Lots
Emma Anderson, Landon Schuster, Marvel Attipoe, Lillian Walters

Affordable housing is a complex issue with many facets affecting many people. The research focuses on addressing this problem by looking at underused parking lots in Chattanooga, and the processes needed to purchase, rezone, and redevelop these lots into housing units. We worked with various groups including the City of Chattanooga and the Chattanooga Design Studio to propose a hypothetical solution for turning specific underused parking lots into housing. We look at factors such as location, cost, use, and size to determine the most suitable lots and then use resources from our partners to weigh cost versus amount of housing units gained for each hypothetical lot. Many things affect affordable housing, but by repurposing underused land in urban areas, we can build denser cities and lower the cost of housing.

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µLex - Corpus-Based, High-Productivity, Global Language Input Systems
Dan Mailman

µLex selects text items for transmission to computer applications (e.g., word processors). Although µLex can transmit individual characters, letters, symbols, &c., this study focuses on increasing productivity in the selection of lexemes - text versions of semantically-bound, possibly multi-word (e.g., for English) or multiple graphically complex character (e.g., for Mandarin) sequences of unicode characters. Example common internet lexemes: “I love you” and “” (/àolìgěi/, “awesome(slang)”).

Recent increases in the variety, availability, and quality of lexeme frequency lists produced from global language corpora make it feasible to rapidly create and experiment with µLex applications to increase productivity in the creation and editing of large, complex, or specialized documents.

Among the goals in the development of µLex is increasing productivity measured as gestural efficiency (GE). The current study quantifies GE using lexemes per gesture (LPG) and relates it to selection of longer lexemes with fewer (e.g.,) keyboard or mouse gestures.

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“The Juice is Not Worth the Squeeze”: Cracking the Code of College Persistence by Exploring Factors Influencing Student Retention in Higher Education
Shyla Khan, Erin Prince, Griffin Randolph, Skylar Oxford

The repercussions of COVID-19 continue to impact US college students. Feelings of isolation, depression, and stress heighten with continuous classwork demands across course modalities (Marler et al., 2021). Past researchers have found education value, student engagement opportunities, university policies, and enrollment costs to be factors influencing student retention (Burke, 2019; Thomas, 2010). Although Russell and colleagues (2022) found the pandemic changed factors influencing students’ decisions, the quantitative nature of their study prevents nuanced understanding of what supports and inhibits student retention and persistence. The focus of the current study was to address this gap. Respondents were recruited through student emails at three campuses within a large southeastern public university system examining the following Qualtrics questions: (1) In a sentence or two can you tell us what is the biggest support to maintaining enrollment at [university name]? and (2) In a sentence or two can you describe what has been the biggest barrier to maintaining enrollment at [university name]? Using applied thematic analysis, students highlighted the importance of connection to campus, psychological and motivational factors, social and external support systems, and financial accessibility. We conclude with recommendations for strategic interventions, policies, and practices aimed at enhancing student success within universities.

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Navigating Uncertainty: A Study on Multiobjective Integer Programming and Decision Making
Chathuri Aththanayake

Encountering uncertainties in the input data of mathematical optimization problems is a frequent occurrence with significant implications for both solution quality and the risks involved in decision-making. Despite the ongoing research in this domain, we propose a novel method that specifically targets the identification of uncertain decisions. While uncertainties in optimization problems can appear in various ways, our primary emphasis lies in addressing uncertainty related to the coefficients of the objective function. Our method begins with a reference set, where each solution corresponds to an uncertainty set in the objective space. Leveraging set optimization techniques and statistical distributions of points in the objective space, we identify uncertain scenarios in the decision space. Additionally, our approach introduces a mapping technique that indexes decisions, providing a measurable representation of the associated risk level. This targeted exploration enables us to effectively address and manage uncertainties, thereby contributing to an improved decision-making process in optimization scenarios.

Keywords: Mapping Index, Multi-objective Optimization, Risk Bounds, Sensitivity Region, Uncertainty

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