UTC Spring Research and Arts Conference 2023 Online Program

Comparing State's Gun Laws to Firearm Offenses
Amy Johnson

On July 1, 2021, Tennessee implemented a new law permitting individuals to carry firearms without a permit [1]. In 2020, Tennessee ranked 29th in a list of Strictest Gun Laws by State and has a "Strictness Grade" of D-, with the 21 states below it ranked as F. Meanwhile, only 11 states had a ranking between A and B. In 2021, Tennessee's rank dropped to 37 with an F ranking; however, 15 states in 2021 had a ranking above a C [2].

This project will compare the violent crimes, specifically with a firearm, of a state per capita using the most recent five years of available data from the FBI's National Incident Based Reporting System (NIBRS), with the state's respective ranking of their gun laws for those years as well as the property crimes for those states and number of crimes overall to see if a state with many violent crimes has a generally higher crime rate, or if the offenses with firearms specifically are higher. Data will also be retrieved from the Tennessee Bureau of Investigations' Crime Insight downloads for 2021, to compare the first half of the year, before the permit-less carry law took place, to after. This data will also be used to view the number of firearms stolen for the first half of the year to the second half after the law was enacted and compare those offenses to crimes such as burglary from a motor vehicle where firearms are likely to have been stolen.

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Continuum Robot for Finger Rehabilitation
Thomas Platt, Erkan Kaplanoglu

The Continuum Robot for Finger Rehabilitation is a multi-jointed wire-actuated apparatus that can be used for practicing individual finger joint movements, as to improve the muscle memory

and motor movement of the user's finger. The specific criteria required by this project includes individual finger segment actuation, finger size adjustability, abduction/adduction finger movement, and fully engaging the user finger muscles for full movement rehabilitation.

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Household Pulse Survey - A Finger on the Pulse of a Damaged Nation
William Chavers

When the Coronavirus Pandemic began, the United States sent out a 'pulse' survey to keep its finger on the pulse of a nation in turmoil. The survey asked many questions to the surveyees including inquiries about their employment, financial, and most importantly, mental status. Using multiple analytical methods, we can see changes in the United States citizen's state of mind over time. This shows how well America is recovering from the pandemic.

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A RECIPE FOR BALANCE OR CONFLICT: FACTORS RELATED TO WORK-NONWORK DYNAMICS AMONG CHEFS
Sophia Vlass

The availability of quality information is critical to making informed career decisions. Presently, there is a void of information regarding the level of job demands that impact work-nonwork balance and conflict in various occupations. Although raw data on job demands are available through resources such as O*NET, a source that frames these occupation-specific demands in terms of their influence on the likelihood of experiencing balance or conflict between work and nonwork roles has yet to be established. This study proposed that these limitations may be overcome by also improving a person's ability to make career-related decisions that are less likely to lead to WNC and more likely to facilitate WNB for that person's unique work and nonwork reality. This study examined the relationship between work-nonwork conflict (WNC) and work-nonwork balance (WNB) and various occupational factors and personal factors among chefs and head cooks and found that occupational demands generally had stronger relationships to outcomes of WNC and WNB than personal factors. The findings outlined from this research suggest that occupational demand information, as it relates to work-nonwork dynamics, is largely generalizable to most individuals regardless of their personal factors. This implies that framing occupational demands relative to WNC and WNB likelihoods and providing that information publicly through an information source such as O*NET could be effective in aiding career-related decisions for prospective job incumbents.

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CIA Documentation of the Spanish Transition to Democracy
Owen Reed

This project analyzed files in the Central Intelligence Agency's (CIA) archives available through the Freedom of Information Act. Using historical research methods to contextualize the information, archival techniques to analyze the files, and statistical data to organize and analyze the distribution of documents and information, nearly 100 files were analyzed, developing an understanding of CIA documentation of this time in history as well as building upon models of analysis for documents from covert agencies.

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Collective-Optimized FFTs
Evelyn Namugwanya

In this project, our goal is to make HeFFTe faster by improving communication in HeFFTe with better collective communication methods in MPI-Advance.

Beatnik is a benchmark for global communication based on Pandya and Shkoller's 3D fluid interface "Z-Model" in the Cabana/Cajita mesh framework.

The Beatnik library uses HeFFTe, which calls MPI_Alltoallv. This routine was our main focus for optimization using MPI-Advance.

MPI-Advance is a collection of MPI extension libraries showcasing new APIs or optimizations of current MPI APIs.

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Positive Effects of Covid-19 on College Students.
Cecelia Cameron, McKenzie Houchin, Chyna Tyus, Gabriella Wilkey, Natalia Varela, Justine Johnson, Jessica Frye

College students have personal experiences that enhance researchers' understanding regarding whether or not Covid-19 has any positive effects on habits regarding education, mental health, social health, and physical well-being.
Our goal is to work towards filling the gap of knowledge regarding the positive effects of Covid-19 in the United States.

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PREDICTING THE TRENDS IN FOODBORNE DISEASES USING THE CDC FOODBORNE DISEASE OUTBREAKS, 1998-2015 DATA

Tracy Ann Bruce-Tagoe

There is a school of thought that believes that the spike in foodborne diseases is a result of more people drifting away from the traditional home cooked meals towards minimally processed, ready- to-eat meals.This project is going to use the 2 major clustering methods together with the measure of center and spread, as well as some data visualization techniques to make sense of the "foodborne disease outbreaks, 1998-2015" data and use regression to analyze which aspects require more attention. The dataset contains the number of illnesses, the food they were obtained from, the states they were reported in, the type of pathogen causing the diseases and the time frame within which the infection was reported (month and year). This is to ascertain whether there were more foodborne disease outbreaks from food eaten outside (restaurants, fast food) or food eaten at home, helping to focus the campaigns and interventions for food safety in the right places and to the right groups of people.

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Spiral Solutions of PDE's in Quantum Mechanics

James Cummins

Partial Differential Equations (PDEs) are used to describe Quantum-Mechanical systems. Some of the most popular PDEs in Quantum Mechanics are the Complex Ginzburg-Landau equation and the Nonlinear Schrödinger equation. We will discuss a method of solving the Nonlinear Schrodinger equation, and the Complex Ginzburg-Landau equation. Where their respective solutions are in the form of a complex-valued solitary spiral.

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Statistical Analysis of Stroke Patients with Large Vessel Stroke Detected by AI

Oleg Collins , Lan Gao

Mechanical thrombectomy is a highly effective treatment for large vessel stroke (LVO). Rapid detection of LVOs and notification of neurointerventionalist (NIR) is imperative. The utilization of artificial intelligence in the detection of LVOs holds great promise for expediting identification and treatment. In this large and multi center study, acute telestroke consultations seen by TeleSpecialists, LLC physicians at 166 facilities (17 states) utilizing VIZ AI software (AI) vs did not use AI software ("non-AI") from December 1, 2021 through March 31, 2022 were extracted from the TelecareTM database. Facilities in which neurology does not initiate NIR contact were excluded. A statitical analysis of the full data as well as subset analysis is conducted on this large multicenter data. The result shows 39.5 min faster timeline for patient Emergency Department arrival to contact with NIR. A greater than 30 minute reduction in

notification to NIR was found despite thrombectomy center status demonstrating the power of AI software utilization in all centers.

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A Comparative Study on Viral Fitness Among Influenza Virus Strains Across Different Periods and Locations

J.M. Imtinan Uddin

Influenza viruses, in 1918, 1957, 1968, and 2009 causing pandemics of contagious respiratory illnesses, have taken away millions of lives worldwide [1][2]. Still, many influenza virus strains are circulating worldwide, infecting people in the USA and other countries [3]. Furthermore, influenza viruses are constantly changing, called "antigenic drift"[4]. These circulating influenza virus strains in humans present a potential threat to another pandemic, like the SARS-CoV-2 pandemic. For this reason, We must revise our risk assessment and preparedness plans to mitigate the risk of another pandemic and should continue to put surveillance on influenza virus strains on different hosts [5]. For surveillance, Estimating the viral strengths or fitness of current circulating virus strains over one another is essential for future disease management and improving the preparedness plan to avoid the next pandemic. Different viral fitness measurement techniques can be adopted to understand the virus epidemiology [6]. In this comparative analysis method, the "**Pairwise Differential Population Growth Rate**" is calculated with influenza virus strain data of a specific period to estimate the relative pairwise viral fitness of the influenza virus strains. The study considered the different time frames to understand and compare the influenza virus's viral fitness. This study will help in the predictive analysis of influenza data, improve risk assessment and preparedness plans, and compare the current virus trend with the trend during the pandemic. To measure the fitness of one viral strain over another, we have used a log-transformed growth ratio along with other fitness-measuring techniques to capture additional fitness insights. To perform this study, we have collected the virus sequence data country-wise and continent-wise in various time frames. GISAID provides the dataset for this study, a platform to provide genome sequence data of humans and animals [7]. We have used influenza genome sequence data from humans to conduct this study. This study considers only the sequence's subtype, location, and collection date. After collecting the data, we separated the data according to location. The data are grouped to obtain weekly frequency data. Then pairwise viral fitness is obtained by calculating differential population growth rate using a log-transformed ratio among different subtypes. Our analysis reveals significant variations in pairwise viral fitness across different subtypes and regions. We observed that the relative pairwise fitness of influenza virus strains can change rapidly, indicating the need for ongoing surveillance and preparedness and protect public health.

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A Comparison of Data Science Salaries in the US and Other Countries
Kara Twombly

Data science has become a rapidly growing field due to the increasing demand for professionals with expertise in advanced analytics techniques and scientific principles. The rise of big data and artificial intelligence has led to the need for data scientists who can extract valuable information from data for business decision-making and strategic planning. There has also been an exponential increase in the amount of data generated by businesses, leading to more demand for different types of professionals within the field. As a result, data science has become one of the fastest-growing fields in the tech industry.

With the high demand for data scientists, the competition to attract and retain talent has led to a substantial increase in salaries. The purpose of this study is to explore the differences in salaries for data scientists in the US and other countries, as well as the factors that are most strongly associated with salary. By analyzing the data, we can provide valuable insights into the global trends in data science salaries.

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A Comparison of Neural Networks and XGBoost Applied to the Prediction of Wine Quality From Physicochemical Properties
Cody Whitt

Using a publicly available dataset containing various physicochemical properties and a quality score for different red and white wines, attempts will be made to derive quality from the physicochemical properties using two popular machine learning techniques: MLP neural networks and XGBoost, in order to compare the performance of these two methods in the context of this data/prediction task.

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A Composite Tool for Peripheral Nerve Block Assessment: A Translational Project
Bryan Tanner

Up to 75% of surgical patients experience acute postoperative pain. Multimodal analgesia techniques such as peripheral nerve blocks (PNB) can mitigate postsurgical pain. Peripheral nerve blocks reduce opioid consumption, thereby decreasing the number of prescribed opioids. The complexity of acute postsurgical analgesia is complicated by rudimentary assessment tools like numeric pain scores to determine the effectiveness and duration of interventions such as peripheral nerve blocks. As a result, researchers default to conventional measurement instruments while examining non-conventional interventions to achieve satisfactory, safe analgesia. Despite the limitations of assessment tools, researchers endorse specific methods for

assessing the quality and duration of peripheral nerve blocks. Postoperative analgesia assessment should be comprehensive and customized for patients with PNBs. Patient education about peripheral nerve blocks should also be standardized to manage block expectations. The aim of the translational project is to develop a composite tool for peripheral nerve block assessment, which can then be integrated into an electronic medical record.

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A Cost-Effective Approach to Mapping Submerged Landscapes
Tyler Mullins

Underwater archaeology is notoriously expensive. To study underwater landscapes requires, at a minimum, a vessel and a suite of remote sensing instruments that can easily tally a start-up cost of ~$60,000 at an entry level. As a result of this, few academic institutions can offer the students with experience in this growing sector (Breton 2009) (Figure 1). To combat this, we experimented with using commercially available fish finders to map underwater landscapes using the Tennessee River as a case study (Figure 2). As underwater archaeology increases due to offshore oil, gas, and renewable energies, innovation is needed for students to master fundamental skills to enter this job market without the logistical and financial burdens placed on academic departments. Additionally, cost-effective means of mapping could lead the way for more routine studies and pioneering research to be conducted underwater if methods of doing so are more approachable by a variety of academic, government, and industry groups.

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A Healthy Chattanooga
Catherine Hatfield, Emily Pinson, Anna Breed

The city of Chattanooga excels in many areas but falls short in some others. Issues like food insecurity, lack of food education, and insufficient multi-modal transportation are all hurdles that, if overcome, would make Chattanooga a healthier city overall. Researchers will present findings on potential recommendations based on work with local organizations as well as background investigation.

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A Hybrid Approach to Automated Fact-Checking
Spencer Arnold

In the era of information overload and rapid dissemination of misinformation, automated fact-checking has become a crucial tool to assess the veracity of claims. This paper presents a novel hybrid approach to automated fact-checking that integrates document retrieval, evidence extraction, and knowledge base verification, leveraging state-of-the-art natural language understanding techniques and multiple data sources. Our fact-checking pipeline encompasses four key components: (1) Elasticsearch for document retrieval, (2) a BART-based extractive summarizer for evidence extraction, (3) a BERT-based model for sequence classification to verify claims, and (4) a spaCy-based claim parser for knowledge base verification. Preliminary experiments demonstrate the feasibility of our approach, with comprehensive evaluations and comparisons with existing techniques planned for future work. The proposed method aims to address challenges such as information redundancy, claim ambiguity, and scalability, contributing to ongoing efforts in combating misinformation and advancing the state-of-the-art in automated fact-checking.

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A LEGO Watt Balance: a Simple Model of an Apparatus to Determine the SI Unit of Kilogram Using the Fundamental Planck's Constant
Landon Boone, Lillian Gensolin

In 2019, the International System of Units' unit of mass, the kilogram, was redefined based on the fixed value of the fundamental Planck's constant, therefore eliminating the need for the International Prototype of Kilogram, the
platinum-iridium cylinder that was forged in 1879. The Kibble Balance, an apparatus that allows to realize the kilogram based on the Planck's constant has been constructed at the National Institute of Standards and Technology (NIST). It is built on the idea of Bryan Kibble to balance the weight of the object by the electromagnetic force generated by the current-carrying coil immersed in a magnetic field. In 2015, a simple LEGO model of the Kibble Balance machine was constructed by NIST scientists [1]. The LEGO model does not utilize the Planck constant in the same way that the actual machine does, but rather serves as a demonstration of the ideas the actual machine is based on. The University of Tennessee at Chattanooga's Society of Physics Students
(UTC-SPS) chapter constructed, calibrated, and put to action a LEGO-based model of the Kibble Watt balance. The project was funded by a SPS National research grant. Overall, the construction of the project allowed us as a chapter to improve our experimental skills and generate interest in both our SPS chapter and the Physics Program.

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A Post-Internship Reflection on Gender Based Violence, Public Health, and Education in Cameroon, Africa
Katelyn Myers

This presentation provides an in-depth summary of a virtual internship in women's rights and resilience in conflict situations in Cameroon, Africa. Since at least 2016, Cameroon has been in a state of crisis with a conflict between francophones (French speaking persons) and anglophones (English speaking persons). The conflict is known as the Anglophone Crisis. Certain Cameroonians face extreme levels of internal displacement, deeply rooted gender-based violence, cut offs from education, and appalling cases of sexual and physical violence. It was the goal of this internship to work with a non-profit, civil society organization in order to conduct research on how to reflect on and then improve such dilemmas. Over the course of ten weeks, a series of assignments were completed including PowerPoint presentations, grant proposals, educational flyers, and organization reflections. Various research questions were asked and answered specifically about Cameroonian women such as how they can impact peace dialogues, what kind of challenges they face, and how they can be empowered through entrepreneurship. Through a partnership with Actions for Community Development – Cameroon (ACDEV-Cam), instructions and guidance were given for each set of assignments. Presentations were expected weekly along with feedback from ACDEV-Cam coordinators. From this point forward any mention of ACDEV will refer to the Cameroon sector specifically. The conclusion of the research assignments is that, yes, Cameroon is functioning in a frightening state, but there are signs of hope, and through the efforts of peace organizations such as ACDEV – Cameroon, change will come about.

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A small stem assay using hypovirulent *Cryphonectria parasitica* to screen *Castanea dentata* backcross F2 families may set the stage for long-term survival
Trish Nguyen

By combining the results of blight resistance breeding and the application of hypovirulence as a biocontrol, populations of resistant hybrid trees could be deployed together with a less pathogenic strain of *Cryphonectria parasitica* (Murr.) Barr. I used a small stem assay to screen seedlings in thirteen half-sibling backcross F2 families with an attenuated strain of *C. parasitica c*ontaining the *Cryphonectria parasitica hypovirus-1* (CHV-1) Euro7 virus. The experiment was set up as a randomized complete block design in 2-gallon containers. Measurements of canker length and morphology were gathered at 90 days post-inoculation. Although statistically significant differences were seen between canker lengths in *C. dentata* and *C. mollissima* control groups, no statistically significant differences were seen between any of the hybrid families as shown by Duncan's multiple range test. Phenotypes elucidated using the SSA should not be used to make selections within families, but the SSA can verify that parental selections were accurate. All surviving trees will be planted in an experimental orchard in middle Tennessee to create a potentially long-lasting population of disease resistant trees.

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A Study of the Topology of the Sars-Cov-2 Spike Protein
Achok Alier

Viral glycoproteins attain specific 3-dimensional conformations that are important for their function. We are using Mathematics to study the 3-dimensional conformation of SARS-CoV-2 spike proteins. We use properties of topology, writhe, a measure of the complexity of curves in 3-space, and linking number, a measure of the linking of two closed curves in 3-dimensional space. These properties were applied to spike protein conformations and their domains to characterize the complexity of SARS-CoV-2.

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A Thematic Analysis of Mystical Experience
Christian Ishak, Caroline Bowden, Tony Padalino

Mystical experiences occur interculturally and have been occasioned through spiritual practices, music, nature, psychedelic substances, and even spontaneously. Dr. Ralph Hood is a prominent researcher in the field of psychology of religion who has developed a framework for understanding mystical experiences. Dr. Hood's M-Scale is the most widely used instrument for assessing mystical experiences, and according to his framework there are eight qualities of the mystical experience.

Critics of Dr. Hood's mystical experience framework claim it reduces the mystical experience and may not be representative of all mystical experiences. The purpose of this research project was to determine if accounts of mystical experience align with the eight qualities of mystical experience assessed by the M-Scale.

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About UTC's Institute of Contemporary Art
Rachel Waldrop

Learn about UTC's Institute of Contemporary Art. The ICA at UTC presents challenging, curious, and adventurous encounters with contemporary art and artists. The ICA is always free and open to the general public as well as to our UTC campus community.

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Academic Preparation for Sleep Instruction in OT and PT Programs
Kirsten Todd, Chelsea Cutler, Courtney Yarborough, Hunter Brandon, Jenna Stork, Cindy Poole, David Levine

Sleep has an important role in the prevention, protection, and promotion of healthy functioning (Ramar et. al., 2021). Sleep impacts cognition, mood, memory, cardiovascular health, and cerebrovasculature (Ramar et. al., 2021) (Duss et al., 2016). Because of sleep's influence on learning and memory, it is assumed sleep is essential for occupational therapy (OT) and physical therapy (PT) interventions. However, neither discipline is required to include sleep evaluations or interventions in their respective curriculum (ACOTE, 2020) (CAPTE, 2020). The purpose of this national study was to determine the level of preparation and types of instruction OT and PT academic programs provided to entry-level clinicians on sleep evaluation and interventions to promote health. Respondents (n=96) completed a 22 question survey regarding discipline, geographical location of the program, characteristics of sleep content currently taught (number of hours, types of sleep evaluations and interventions). Survey results indicated 50% of OT respondents and 46% of PT respondents currently include sleep content in at least one course. Of the respondents 66.67% of OT and 50% of PT programs indicated 1-2 hours in the curriculum dedicated to sleep instruction. The most frequently reported formal sleep evaluations were the Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale, Insomnia Severity Index, and Functional Outcomes of Sleep Questionnaire. However, the majority of respondents (~88%) indicated informal sleep evaluations included in the curriculum (sleep history, sleep diaries, occupational profile, etc.). The most frequently reported interventions are limiting screen time, limiting substance use, sleep diaries/logs, meditation strategies, bed positioning, and environmental adaptations. Though continued research is warranted, occupational and physical therapy accreditation programs may consider the implementation of standards specific to sleep instruction to promote a holistic approach to patient evaluation and intervention in future clinicians.

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Aggression, Self-Esteem, and Interpersonal Dependence: Correlational Analysis.
Bree Rust

Previous research has categorized aggression into proactive and reactive types. (Buss & Perry, 1992) The correlation between aggression, interpersonal dependence, and low self-esteem has been examined through inmate or offender populations. (Wigman, Kevan, & Archer, 2008) (Garofalo et al., 2016) My hypotheses were that: 1. Aggression will be positively correlated with low self-esteem. 2. Reactive aggression will positively correlate to interpersonal dependence and low self-esteem. 3. Proactive aggression will not be correlated with interpersonal dependence. 4. Proactive aggression will be positively correlated with low self-esteem. Using a pre-existing database, participants were Ohio University students. Each participant completed the Reactive-Proactive Aggression questionnaire and the Interpersonal Sensitivity measure.

Pearson r correlational analysis was used. The results showed that both forms of aggression scored separately were positively correlated with low self-esteem. With the combined aggression scores, there was a mild positive correlation towards low self-esteem. While reactive aggression was positively correlated to interpersonal dependence, proactive aggression was negatively correlated. With the combined aggression scores there was still a mild positive correlation with interpersonal dependence.

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All presenters present are members of the 2023 BSW Social Work cohort.
Chara Smith, Alexis Thomas, Thalia Perez, Kerry Webb, Charles Davidson, Anna Smith

The goal of our research is to identify and examine the factors that most influence attitudes about marriage with a primary focus on how generations differ in their perception of marriage. The problem our research addresses is how to effectively support upcoming generations in their decision to marry or not to marry.

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Allergy Protocol and Emergency Preparedness for University Health Services
Hannah Barger

Abstract
The goal of the translational project is to develop an allergy protocol and improve emergency preparedness for an outpatient college health clinic. To improve care and treatment of patients presenting with allergy symptoms, provider self-efficacy will be measured pre- and post-implementation. To improve provider self-efficacy, education modules on diagnosis and management on systemic allergic reactions and anaphylaxis will be provided.

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Amphibian Pet Trade Affecting Appalachian Mountain Biodiversity: APublic Service Announcement
Seth Little, Emma Madewell

The Southern Appalachian Mountains, regarded as the salamander capital of the world as well as a global biodiversity hotspot in general, are being severely impacted by the loss of amphibian abundance. Multiple factors contribute to the declining populations of amphibians in this region. However, this informational piece seeks to bring to light the exploitation of various amphibian species through unsustainable means, which can be defined as any direct or indirect alteration, removal, or destruction of amphibian species or their habitat at a rate that depletes

resources and populations faster than they can be replenished. Specifically, topics regarding the amphibian pet trade will be described. The pet trade is a form of unsustainable exploitation of amphibian species due to a range of etiologies, including the initial removal of animals from their natural habitats, which can subsequently lead to the spread of illness, parasites, and invasive species should an infected or compromised amphibian be released into a non-native habitat by a pet owner. On a systemic level, several solutions are considered, including preventative and corrective measures, as well as limitations on amphibian commerce. However, it is also important to provide resolutions on a personal or local level. For this public service announcement, primary literature published within the past two decades was analyzed regarding unsustainable use and the pet trade in the Appalachian region so that the information can be explained to those uninformed on the subject, specifically what you can do. Additionally, multiple steps can be taken to avoid contributing to unsustainable exploitation, such as avoiding collecting or releasing amphibians in the wild, buying from reputable and ethically based sources, and properly disposing of tank water containing potentially dangerous pathogens or parasites that could affect other species in their native habitats.

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An Analysis of The Reporting of Sustainable Development Goals(SDGs) in a Governmental Context
Mary Bennett

The purpose of this research was to better understand the reporting of Sustainable Development Goals (SDGs) in a governmental context. A comprehensive investigation was performed on each of the United Nations' 17 SDGs to understand the relevance, theories, and commonalities of the ways that the SDGs are used by local governments. The inquiry was done via individual analyzations of 66 US governments' websites with metropolitan populations of 300,000 or greater. Conclusions were then drawn as to what extent reporting was being done, as well as which Sustainable Development Goals (SDGs) were being focused on. The importance of this research is to inform society at large of the status of governmental reporting in the United States. With these results, further discussion can take place as to where, which, and how city governments are currently, and should be, focusing on Sustainable Development Goals (SDGs).

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An Assessment of Entropy-Based Data Reduction for SEI Within IoT Applications
Donald Reising

The research community remains focused on addressing Internet of Things (IoT) security concerns due to its continued proliferation and use of weak or no encryption. Specific Emitter Identification (SEI) has been introduced to combat this security vulnerability. Recently, Deep

Learning (DL) has been leveraged to accelerate SEI using the signals' Time-Frequency (TF) representation. While TF representations improve DL-based SEI accuracy–over raw signal learning–these transforms generate large amounts of data that are computationally expensive to store and process by the DL network. This study investigates the use of entropy-based data reduction applied to "tiles" selected from the signals' TF representations. Our results show that entropy-based data reduction lowers the average SEI performance by as little as 0.86% while compressing the memory and training time requirements by as much as 92.65% and 80.7%, respectively.

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An Evaluation of Discipline in Students with Disabilities
Celena Kirby, Emma Roach, Alicea Davis, Christina Craig

Punishing students with disabilities is a frequent source of contention within the field of special education. Pokorski, et al. (2021), states that children with disabilities are three times more likely to be mistreated, and therefore, important ethical consideration must be made when making appropriate disciplinary decisions for children with disabilities. Exclusionary punishment should be considered only in the most severe cases, as this form of punishment has serious consequences on the learning of students with special needs (Anderson, 2021). Disciplinary action and special education share an intricate relationship in educational practice and policy. Data gathered from school districts across the U.S. bring attention to special education students' increased likelihood of experiencing various forms of discipline, including suspension, referral to
law enforcement, and restraint and seclusion, when compared to students who do not receive special education services. For the Hamilton County 2021-2022 school year, 5,744 students were identified as students with disabilities. Of these students, 6.5% received In-School Suspension (ISS) and 8.7% received Out-of-School Suspension (OSS) (Tennessee School Report Card, 2022). Misuse of school disciplinary procedures and lack of mental-health staff in schools have lead to adverse effects for students with disabilities.

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An Evaluation of K-MEANS and DBSCAN Clustering Methods for Learning Equality and Curriculum Recommendation and a Proposed Improvement
Kristin Davis

Aligning educators and students with relevant learning materials is a challenge that many refugee learners and teachers face especially due to the school closures that were put into effect during to the COVID-19 pandemic. Current attempts to align learning materials demand time, resources, and expertise which requires an efficient and scalable process. However, as new materials are made available, the demands of this effort can become exhaustive and made

even more difficult due to the varying curriculum and educational structures of different countries. Currently, there are no algorithms or other inventions to address the constraints of curriculum alignment or the organization of educational resources to fit standards. Therefore, it is important that there exists a method to create, adapt, and distribute open educational resources across the globe, so that the right to a quality education is guaranteed to everyone. The objective of this project is to evaluate the efficiency of two separate clustering and association methods: K-Means clustering and DBSCAN, in the effort to to streamline the process of matching educational content to specific topics in a curriculum through development of an accurate and efficient model in Python. This project will also attempt to explore improving upon these two methods using the DBSCAN-GM technique.

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An Examination of Best Practices for Structuring and Operating Public Relations Teams in Higher Education Settings: A Review of Current Literature
Peggy Reisser

No longer able to rely solely on legacy academic reputations, higher education institutions are increasingly looking to internal public relations teams to amplify their brands with various publics, including students, faculty, donors, and other supporters. Much has been written about the structure and operation of successful public relations organizations in the corporate setting. However, as more universities move public relations from a supplemental role to a management function contributing to institutional decision making as they build their brands, it appears there is room for additional insight into best practices for structuring and operating these public relations teams for maximum effectiveness. This research will examine available literature regarding best practices for building and operating successful public relations teams in a higher education setting. A primary research question to be answered is whether a centralized or decentralized reporting structure is most successful for public relations organizations in higher education institutions, which often have multiple colleges, departments, layers, interests, and audiences. This research is being conducted to serve as the theoretical basis for an eventual evaluation of the public relations organization at the University of Tennessee Health Science Center (UTHSC). The overarching goal of this research and the evaluation is twofold, to assist UTHSC with its public relations organization and outcomes, and to contribute to the existing body of knowledge regarding public relations in higher education.

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An inference on player position based on data analysis
Bryan Lopez

The point of this analysis was to best estimate an NFL players position based purely on their in game statistics. The main method used to estimate these positions was with two different clustering algorithms, k-means clustering and hierarchy clustering. The results of both were then compared to each other to gauge how accurate the results were.

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An Introductory Undergraduate Geology Lab on Radioactivity
Jeremy Bramblett

Radioactivity is often discussed in the context of absolute dating of rocks in years before present in introductory geology labs and compared to relative dating of rocks in which relationships are described as simply older or younger. These traditional lab exercises often focus on the relationships between radioactive parent isotopes/nuclides and their stable daughter nuclides, half-lives, and age calculations. The radioactivity lab that I have been developing and using in Historical Geology Lab at UTC takes students on an interactive journey starting with the discovery of radioactivity. The lab exercises include comparing relative and absolute dating methods; reviewing the structure of atoms; discussing the discovery of radioactivity; describing radioactive decay, half-lives, and alpha, beta, and gamma radiation; using a Geiger counter to measure radioactivity in meteorites, old rocks, uranium minerals/ores, and even human-made uranium-containing objects like glassware and pottery; viewing a graph of neutron irradiation of silver-107 to silver-108 and its decay to cadmium-108; simulating radioactive decay using coins; drawing a graph of the radioactive decay of uranium-238 to lead-206, observing condensation trails produced by alpha and beta particles in a home-made, alcohol-vapor, cloud chamber containing uranium ore, discussing various industrial and scientific uses of radioactive nuclides. The interactive and varied experiences of this lab help spur student interest not only in radioactivity but also the use of radioactivity to better understand Earth's history.

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Analysis of bioluminescent blinking activity in a captive population of Split Fin Flashlight Fish (*Anomalops katoptron*)
Fernando Alda, Gianni Rasnick, Hope Klug

Flashlight fish, also known as anomalopids, are known for their bioluminescent abilities. They have light-emitting organs located beneath their eyes that they use to communicate, attract prey, and navigate in the dark. Some species of flashlight fish exhibit a lunar-tidal rhythm in their activity patterns, in which fish are more active during periods of high tide and during the

full moon phase, and less active during periods of low tide and during the new moon phase. The exact mechanisms behind this relationship are not yet fully understood, but it is thought to be related to changes in the availability of prey and the behavior of potential predators during different phases of the moon. In this study, we aim to test whether flashlight fish also show cyclical activity levels in environments where food is not limited and predators are absent, like a captive setting. We used a captive population of Split Fin Flashlight Fish (*Anomalops katoptron*) in the Tennessee Aquarium and carried out systematic video recordings of their flashing activity (as a proxy of activity level) across ten weeks to test if there is a correlation between activity level and moon phase. We expect that if this behavior is innate, we will observe alternation of high and low activity levels correlated with the moon phase, whereas if this behavior is a response to environmental cues, the correlation will be absent. Our results will contribute to better understand how organisms synchronize their behavior with their environment and its implications for the behavior and ecology of flashlight fish.
This study has been carried out by Brock Scholar students in the class "The Amazing Biology of Fishes".

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Analyzing Self-Reported Online Harassment
Christian Avans

The Pew Research Center released its American Trends Panel Wave 74 in early 2021. This is a nationally representative survey with a sample size of over ten thousand selected respondents, each given a detailed survey that collects both their ideological opinions on contemporary issues and data about socioeconomic factors such as gender, race, and education level. The respondents reported alarming rates of online harassment, with about forty percent of those surveyed having fallen victim. The largest cited reason for that harassment, from the perspective of the respondents, was political – in essence, ideological differences. The massive ideological polarization during this time period, particularly over issues such as the COVID-19 vaccine and the Black Lives Matter movement, should provide ample insight into the relationship between different viewpoints and rates of harassment.
With this analysis, I seek to investigate a variety of socioeconomic factors in addition to ideological factors to see what trends are present for those who do, and do not, experience this online harassment. The poll separated harassment into various types for additional nuance, allowing for more granular analysis of various forms for their distinctions and potentially disparate correlations. Further, I seek to identify if there are any commonalities between those who experienced more severe forms of harassment, such as stalking or physical threats, versus forms such as name-calling or purposeful embarrassment. The ultimate goal is to determine which variables, and combinations therein, truly have the strongest correlation with various forms of harassment.

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Analyzing the Impact of Long COVID on the Pandemic
Jacob Derrick

During the COVID-19 pandemic, the disease has continued to evolve, remaining relevant in the field of mathematical epidemiology. With our increased understanding and analysis of the disease, this paper seeks to add a previously unconsidered element to the existing body of COVID-19 studies and predictions: the concept of "Long COVID". Utilizing data from the state of Tennessee spanning March 2020 to December 2022, we compare the accuracy of predictions generated by multiple standard polynomial regressions to an ordinary differential equation model with parameters for Long COVID. Additionally, we introduce novel optimization techniques to enhance these methods. Our findings will provide insight into whether Long COVID should be considered in future analyses, or if its inclusion is only marginally impactful.

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Applications for Machine Learning for Network Intrusion Detection
Jacob Maniscalco

An investigation of machine learning techniques, consisting of supervised and unsupervised learning, to detect botnet traffic in a network.

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Assessing anthropogenic effects on water quality in Raccoon Mountain Caverns, Chattanooga, TN
Quillen Thornton, Matt Mollica

Racoon Mountain Caverns is a cave system that is located approximately 6 miles west of Chattanooga, Tennessee. The surrounding community has been developing since the early 2000s and the commercial part of the cave has been offering cave tours since the 1930s. Land use change associated with new and ongoing developments and regular foot traffic through the caves may introduce contaminants into the water of the cave. The purpose of this study is to assess the human impact on the groundwater quality of the caverns. At each location water from above the cave, in an active stream within the cave, and in a plunge pool beneath a waterfall in the cave was collected for water quality analyses, including heavy metals, fecal coliform, and fertilizers. A sample was also collected from a section of the cave wall and a speleothem to establish the chemistry of the limestone. This research is ongoing, and the results displayed are preliminary.

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ASSESSING MINDFULNESS AS A MODERATOR BETWEEN TRAIT WORRY AND WORKING MEMORY CAPACITY PERFORMANCE IN UNDERGRADUATES
William Farmer, William Moore

Mindfulness and worry have some antithetical qualities, yet mixed or non-significant findings suggest that practicing mindfulness alone will not disrupt worry. Working memory capacity (WMC) has been implicated in the relationship between worry and mindfulness, with some research showing that the combined practice of mindfulness and WMC test exercises had the greatest impact on reducing worry. The present study sought to test the relationship between worry, trait mindfulness, behavioral mindfulness as assessed by a Mindfulness Activities Questionnaire (MAQ) created by the researcher, and both the verbal and visuospatial domains of
WMC. Worry was shown to be negatively associated with mindfulness. All WM scores showed non-significant associations apart from a weak positive association between verbal WM efficiency and behavioral mindfulness. Both domains of WM predicted similar outcomes in mindfulness. Mindfulness was not shown to moderate the relationship between worry and WMC. Implications and future directions for research are discussed.

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Assessing the effect of the heat treatment on the corrosion properties of the high entropy CoCrNiFeAl alloys
Ahmed Korra

High entropy alloys (HEA) are a relatively new class of metallic materials composed of five or more elements, each typically present in an equal or nearly equal atomic fraction. This complex microstructure has shown great potential for use in extreme environments, such as high temperatures and corrosive conditions due to their exceptional mechanical and physical properties, such as high strength, hardness, and corrosion resistance. HEA can be fabricated using melt casting, mechanical alloying, powder metallurgy, essentially the same as the process for creating conventional alloys. Among the different types of HEA, CoCrNiFeAl have shown promise as potential materials for a wide range of applications, including aerospace, biomedical, and energy storage. Although the microstructure characterization of these alloys was investigated widely previously but still the effect of different environments need to be studied. This study focused on the effects of different heat treatment temperatures from 800℃ to 1100℃ on the microstructure and mechanical properties of these alloys, as well as their electrochemical behavior. The results of this study provide a good insight into the potential of CoCrNiFeAl HEA to be employed in different applications, as the heat treatment improved the corrosion properties and decreased the corrosion rate compared to the as-cast alloys, while the surface hardness was affected negatively by increasing the heat treatment conditions. This concludes that these alloys require further investigation in the microstructure characterization after the heat treatment to understand the changes that occurred to the surface.

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Assessing the Programming Efficacy of Teachers through Workshop Learning Combining Drones and STEM Activities
Deborah McAllister, Jared Glidden

This program focused on work with the DJI (2023b) Tello EDU drone, which is programmable through an app or can be flown with an app or a controller. The DroneBlocks App (DroneBlocks, n.d.) was used for flying through drag-and-drop, block coding, and the DJI (2023a) Tello App was used for flying without programming. Each teacher self-evaluated knowledge and skills, before and after a multi-day workshop.

Balogun and Miller (2022) developed, and pilot-tested, a drone club model for out-of-school STEM learning and career pathway exploration. K-12 educators and subject-matter experts provided feedback for revision. Feedback topics ranged from safety to instruction to assessment. Goodnough et al. (2019) collected data regarding teacher pedagogical content knowledge while presenting a unit using drones to study animal habitats. Teacher efficacy was strengthened as they created inquiry-based, classroom environments to engage learners in science. Tsai et al. (2019) developed a computer programming self-efficacy scale. The five subscales included Logical Thinking, Cooperation, Algorithm, Control, and Debug.

During summer 2022 and spring 2023, 16 teachers provided survey data for the self-efficacy scale (Tsai et al., 2019) and responded to open-ended questions. The goal was to provide high-quality, teacher professional development to increase knowledge and instructional skills for integrating drones into the elementary, middle, and secondary grades classroom. Results showed a significant increase in computer programming self-efficacy and significant increases in sub-scale scores.

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Assessing the utility of high-throughput phenotyping for ecological applications
Annabree Corlew

A phenotype describes the expressed traits of an organism. These traits can provide insight into interactions between an organism and its environment, making them a key focus of ecological research. But the process of phenotyping traits can be tedious to collect for large-scale experiments. High-throughput phenotyping software has the ability to speed up the phenotyping process by allowing multiple traits to be phenotyped at once. However, the utility of this relatively new and continually developing computational tool is still being assessed, especially beyond applications focused on agricultural crops. I investigated the accuracy and efficiency of the open-access high-throughput phenotyping software PlantCV for measuring phenotypic traits in a large common garden experiment designed to investigate the ability of rare vs. common *Helianthus spp*. (sunflower) species to acclimate to a change in light availability. Specifically, I compared PlantCV output to hand measurements of plant height, leaf number, stem number, bud number, and ground cover. I hypothesized that the accuracy of PlantCV would decline as plants grew larger and with more complex architecture. Assessing the utility of high-throughput phenotyping software for ecological research could help to provide ecologists with a tool that could maximize their research efficiency.

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Assessment of ROTC Cadets' Performance Capabilities from Virtual Reality Metrics and Survey Responses
Gunnar Sneed, McKenzie Tucker, Eric Smith

Context: The operational effectiveness of military personnel is reliant on the physical and mental capabilities of that individual. Battlefield decisions require split-second decisions, meaning that prolonged response times can be fatal. Longer response times can result from mild traumatic brain injuries (mTBIs) impairing connectivity among the brain networks responsible for speed and accuracy of decision making. Emotional, physical, behavioral, and cognitive well-being are also linked to brain processing efficiency. Immersive virtual reality (VR) offers precise control of stimuli as well as measure the responses. MTBIs have also been found

to lead to sleep disruption and mood disorders which adversely affect neurocognitive function. The purpose of this study is to determine whether immersive VR perceptual-motor metrics associate with ROTC cadets' subjective ratings of overall wellness.

Methods: This study included 40 college ROTC cadets that completed a survey combining the Overall Wellness Index (OWI) and Sports Fitness Index (SFI) as well as immersive virtual reality tests. Subjects consisted of 30 males and 10 females. Exclusion criteria were based on incompletion of all required methods and injury precluding weightbearing activity. The VR test consisted of 40 trials in which cadets were required to respond to a stimulus indicating to travel the same or opposite way of the stimulus. Measurements for this test included eye tracking, neck rotation, time to place hand in a target based on individual's arm length which gives overall response time. Perceptual latency is a key measurement looking at the slight movements in the respective measurements before a response has been fully planned by the brain. The final measurement obtained was rate correct score.

Results: An OWI score less than ninety was found to represent suboptimal wellness. History of sports related concussion, rate correct score perceptual latency and the perceptual latency of an individuals neck from trial to trial were the greatest contributors to "suboptimal wellness." The OWI categories that attributed to suboptimal wellness were sleep/stamina, mood/emotional, and body pain. Sleep having the greatest effect of these. Subjects with disordered sleep were found to have less consistent perceptual latency and response time, greater average response times, and longer periods of perceptual latency overall.

Conclusions: Perceptual latency consistency and rate correct score were found to be the most prevalent measurements in those with sleep problems and "suboptimal wellness." Disordered sleep appears to be a sensitive indicator of inadequate clearing of toxic metabolites via the glymphatic system. Immersive VR provides meaningful measurements of perceptual-motor function that can be combined with survey responses to identify individual ROTC cadets who may possess an impairment of brain processing, which might otherwise remain undetected.

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Association of Landing Error Scoring System with Self-Reported Fitness And Wellness Among ROTC Cadets

Towanda Myers-Prescott , Jasmine Jones

The purpose of this study was to assess the potential for using function- and-health-related survey responses to identify ROTC cadets with poor jump landing kinematics

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Associations of Virtual Reality Metrics and Self-Reported Well-Being with Injury Occurrences among High School Athletes

Paige Dill, Kimberly Wynn

Associations of Virtual Reality Metrics and Self-Reported Well-Being with Injury Occurrences among High School Athletes

Wynn, KR, Dill PW: University of Tennessee Chattanooga Chattanooga, TN.

Context: Previous studies have shown that injury risk reduction depends on the ability to identify individuals who have elevated susceptibility. An increased risk of a lower extremity sprain or strain has had an association with history of self-reported concussion, psychosocial stress, and slow neurocognitive reaction time. However, there is a lack of prospective studies evaluating these factors. The purpose of this study was to identify any prospective association of perceptual-motor function, suboptimal well-being, and/or concussion history with the occurrence of a core or lower extremity sprain or strain among male and female high school athletes.

Methods: The data collection was completed in a clinical setting during preseason and postseason of each sport. The participants' injuries were monitored and documented using electronic record keeping for core or lower extremity sprain or strain throughout each sport's season and collected at the end of each season by the athletic trainers of each school. The participants included a total of 68 high school athletes: 41 female soccer players and 27 male football players. The exclusion criteria for this study included current injury for the fact that participants would not have accurate results compared to healthy individuals. A pre-season performance test which was, virtual reality (VR) perceptual motor-efficiency, was used to assess whole-body reactive responses (eyes, neck, arm, and step); a pre-season survey called the Global Well-Being Index (GWBI) was administered, and concussion history was recorded. VR metrics including perceptual latency and response time along with GWBI scores and concussion history were the primary outcome measurements.

Results: Our results were taken from an ROC curve and Cross-tabulations which compared the males and females to determine key factors such as arm response time average(Avg) with an (AUC=.690), (CP= 1.258), (P=.004), (SN= .70), (SP= .69), (OR=5.13), (CI= 1.65,15.96), and step response time standard deviation(IIV) has an (AUC=.652), (CP= 0.301), (P= .005), (SN=.75), (SP= .63), (OR= 5.00), and (CI= 1.55,16.09). Arm response time Avg was 140ms faster for males than females (P=.004). For males, neck perceptual latency Avg has an (OR=9.00). For females, history of 2 or more sports-related concussions (SRC) has an (OR=16.88) and GWBI mood related problems has an (OR=4.28.)

Conclusions: A subtle perceptual- motor processing deficiency may increase one's risk to sustaining a core or lower extremity injury. Injury risk reduction may need to address sex-specific considerations as Males and Females had different strong predictors of CLEI. Intervention is warranted for females experiencing anxiety, depression and stress are especially important in reducing CLEI.

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Atrazine! Why so mean? Atrazine as a stressor to Frog reproduction and life history
Imani gardner, Hunter Smith , Dominick Hazelton , Nelson Goodman, Rhian Schliwa

The common herbicide Atrazine is applied widely as both a specific and broad use pesticide and has been shown especially useful in herbicide resistant weeds. This highly effective herbicide has been shown to have detrimental effects, such as desiccation and infection on amphibian and specifically frog populations. The runoff of the Atrazine spray has been found in a wide range of aquatic environments and has decimated some frog populations. Atrazine has been shown to interact with the bitters organ in frogs which allows male frogs to switch sex into females, skewing frog populations and limiting reproductive events. Increased use of atrazine has also been linked to increasing deformities in larvae of amphibians, especially anurans, and can cause edema in the amphibians exposed to it for extended periods of time. Phasing out the use of atrazine will be essential in recovering frog populations, while still being able to fight invasive and weed species effectively. Other herbicides including natural alternatives like chrysanthemum oil should be substituted as a first option and used minimally to reduce runoff. While alternatives will help reduce further contamination with atrazine, bioremediation will be required at sites of heavy or frequent use. Bioaugmentation or the addition of atrazine breaking microorganisms has been shown to dramatically increase atrazine breakdown in Tennessee soils contaminated with atrazine. With knowledge derived from peer reviewed articles and accredited sources, there is a proven need to decrease the use of atrazine in favor of other herbicide options, along with an increased use of bioaugmentation techniques. Overall, the decrease of atrazine use with supplemented alternatives and the use of bioaugmentation techniques will be essential in reducing impacts on frog populations in Tennessee while keeping land management practices effective and sustainable.

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Authorial Aficionados: The Striking Connection Between Metaphysical Poet John Donne and Modern-Day Music Sensation Taylor Swift
Daley Culberson

Modern-day music sensation Taylor Swift and metaphysical poet John Donne are, at face value, very different entities. One exists in today's society, composing profound lyrics and delivering dazzling performances to sold-out stadiums, while the other crafted brilliant pieces of poetry in the 1500s. Both artists are regarded as experts in their respective fields, but an in-depth analysis of the figures reveals surprising similarities in their stories, despite the centuries separating their lives. This research project examines the literary techniques utilized in a plethora of the authors' pieces, revealing a notable kinship between the seemingly divergent pair.

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Automated Classification of Adventitious Respiratory Sound Using Machine Learning Methods
Monireh Rahmati

Chronic respiratory diseases are among the leading causes of death and disability worldwide, with growth in absolute numbers. Early diagnosis and treatment of adventitious respiratory sounds can help slow down the progression of symptoms and reduce the risk of flare-ups. In addition, it can help patients to manage themselves and maintain their activity level and health condition. In this study, the classification of wheezes and crackles — two types of adventitious respiratory sounds that can be due to pneumonia, heart disease, chronic obstructive pulmonary disease (COPD), bronchitis, and asthma — has been targeted. For this study, the data from International Conference on Biomedical Health Informatics 2017 (ICBHI 2017) Challenge were used. Excessive signal processing, data preparation, and feature extraction based on Mel-Frequency Cepstral Coefficient (MFCC) were performed. Two machine learning algorithms, i.e. K-Nearest Neighbor (KNN with K=3) and Support Vector Machine (SVM with rbf as kernel) were used for the classification. The KNN and SVM models showed accuracy values of 77% and 75%, respectively. The accuracy levels of both models were higher than the highest accuracy of the previously reported models, which had the highest accuracy around 74%, indicating promising results. In addition, this work showed that signal processing and data preparation can greatly affect the accuracy of the classification models for abnormal respiratory sounds.

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Bachmore Shelter: An Analysis of Archaeological Materials Recovered During UTC's 2021 Archaeological Field School
Mikira Claybrook, Noah Croy, Sidney Miller

Bachmore Shelter is an archaeological site located on Signal Mountain in Chattanooga, TN, on the south end of Walden County. The site is located under a sandstone overhang that leaves around 2 meters of standing room at the front and gradually decreases until there is about 20 centimeters of clearance at the back of the shelter. The depth of the rock shelter is about 3 meters from the dripline of the shelter. The floor of the rock shelter is composed of silty clay sediments and a seasonal creek flows beyond the main entrance of the shelter. In the Fall of 2021, ANTH 3350, archaeological field methods, conducted testing at the site. This poster reviews this work.

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Biodegradable Metallic Braided Structures for Biomedical Implant Applications
Vipul Patil

Biodegradable implant materials can be gradually dissolved, absorbed, consumed, or excreted in the human body. Hence, eliminating the need for a secondary surgery to remove implants after the surgery regions have healed. However, most of the biodegradable materials, usually polymers, do not have good mechanical properties to be reliable for bearing the load of the body. Biodegradable metals (magnesium, iron and zinc) are naturally present in the human body and possess significantly superior mechanical properties (i.e., strength and stiffness) compared to biodegradable polymers, making them appealing for load-bearing applications such as for orthopedic trauma. In this work, we worked on creating new, improved, biodegradable material of controlled strength by controlling aspects of the global topology of the porous structures that they form. To this end, we use MD to simulate metal porous media made of self-entangled mono filaments of initial controlled topologies using tools from braid theory. We started braiding the metal wires using a variety of methods such as the Brunnian braid, the alternating braid, the arbitrary braid, and the simple braid. Then we put the system under deformations such as uniaxial stress and the results show that the regular method gives us better strength than the other methods. Our next step is to make a braided lamina using a PLA chloroform solution to identify the optimal braiding and construction techniques for the intended biomedical applications.

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Biomimetic Design of Single Chain Nanoparticle Polymer Networks
Sam Robinson

Polymers make up countless materials that we use every single day; thus, it is a desirable goal to develop new strategies for more durable polymer networks. In this study, we are working to create a polymer network inspired by the muscular protein titin. Titin can unfold under mechanical tension, releasing stored length and making the muscle material extensible and durable. To mimic this behavior, we propose creating a polymer network with similar stored length using single chain nanoparticles cross-linked with phenolphthalein and beta-cyclodextrin. We hypothesize that polymer chains can fold due to the host-guest interaction between the two molecules, resulting in a single chain nanoparticle. These nanoparticles will be used as a crosslinker for the polymer network. When mechanical force is applied, we hypothesize that the interactions between phenolphthalein and beta-cyclodextrin will break, and the single chain nanoparticles will unfold, mimicking the titin protein. Here, we report progress towards synthesis and characterization of these materials

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Biophysical Properties of Ampicillin Resistant Escherichia Coli
Funtino McCoy

The development and high usage rate of antibiotics has led to an increasing number of bacteria with antibiotic resistant genes. As a result, the number of infections with little to no effective treatments has grown substantially. In this study, we focused on *Escherichia coli*, a heavily researched bacterium due to its ease in cultivation and well-characterized genetics. In prior studies, other researchers have also chosen to favor E. coli in studies about antibiotic resistance for the aforementioned reasons. A common result derived from these studies is that Escherichia coli cells become weaker (lower elastic modulus) once exposed to ampicillin, an antibiotic.
Over the length of this study, we observed the long-term effects of E coli's exposure to ampicillin. The potential change in biophysical properties was an answer we hoped to find to the addressed question: are antibiotic resistant bacteria more rigid? We then hypothesized that E coli with more rigid properties have a higher resistance to ampicillin. To test this hypothesis, ampicillin exposed E coli and non-exposed E coli were observed and compared using an Atomic Force Microscope. Force-distance curves were collected and then analyzed by a Python code we developed. Using the Hertz model equation, the program calculated parameters to find the average force necessary to indent the bacteria cell. The results show that bacteria exposed to ampicillin required a far greater force compared to the bacteria grown without ampicillin. This trend supports our hypothesis as E coli with ampicillin resistance grows stiffer in comparison to E coli without resistance.

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Bolstering Professor-Student Rapport: A Conceptual Model and Exploratory Survey Findings
Eleanor Bryant

Professor-student (P-S) rapport has increasingly gained traction in the higher education literature, emanating from various disciplines. This research intends to integrate recently published works to advance a model of P-S rapport that includes literature-supported mediating, moderating, control, and outcome variables.

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Bridging Safety and Community Impact: An Assessment of a Potential Closure of a Highly Trafficked Pedestrian Bridge in a Mid-Sized Southeastern City
Savannah Ward

The Walnut Street Bridge is one of the world's longest pedestrian bridges and is a highly trafficked avenue for active transportation in Chattanooga, Tennessee. It is expected to close for extensive preventative structural repairs and maintenance within the next year. This study

aimed to understand the potential impact on physical activity, identify alternative active transportation corridors, and assess safety concerns of displaced bicycle and pedestrian foot traffic during the closure.

In this cross-sectional study, an anonymous survey was administered through an online survey platform (Qualtrics) among adults who have used the Walnut Street Bridge. Local public transportation system social media accounts (e.g., Twitter, Facebook, Instagram) was used to recruit participants. The 17-item survey explored the impact of the bridge closure on physical activity, active transportation, safety, and preferences for alternative corridors. Descriptive statistics were calculated in Qualtrics and Excel. Qualitative data were coded within NVivo 12, and thematic analysis was used to explore the community's perception of the potential bridge closure and alternative transportation routes.

Participants (n=579) were predominately Chattanooga/surrounding area residents (96%). Many indicated a bridge closure would negatively impact physical activity (61%) and lead to active transportation discontinuation (46%). While 64% reported not feeling safe crossing the Market Street Bridge (alternative car-dominated corridor) in its current state, 71% preferred a temporary reconfiguration (i.e., conversion of car to bike lanes with barriers) of this alternative corridor over other corridors.

This pedestrian bridge closure may negatively impact physical activity and local active transportation; however, there is resident support for temporary reconfiguration of other car-dominated corridors. During highly trafficked pedestrian avenue closures, it is vital for local governments to provide safe alternatives as active transportation promotes physical activity and the reduction of greenhouse gas emissions, air and noise pollution, and demand for non-renewable resources.

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Car-Following and Psychology: A Review of State-of-the-Art Studies and Research Needs
Faiza Khan

Car-following modeling is an area that has been under extensive research to explain how vehicles follow each other through modeling basic vehicle kinematics, incorporating parameters to explain the driver’s perception, or explicitly accounting for parameters that explain the driver’s psychology. Our review shows that basic car-following models rely completely on vehicle kinematics or dynamics parameters with minimal to no consideration of human psychology. The current attempts have limitations as they do not completely explain what triggers specific drivers’ responses from a psychological point of view. Thus, we explain that future research direction should focus on incorporating concepts such as attribution theory and expectancy theory which prove to be crucial in clearing the missing picture of how drivers behave and why they behave in a certain way. Hence, we propose a concept that can

overcome the limitations of existing car-following models and discuss how the concepts of psychology can be incorporated.

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CAROTENOID LEVELS AND SELF-REPORTED FRUIT AND VEGETABLE INTAKE: DIFFERENCES ACROSS AGE, RACE, SEX AND BMI
Gertrude Osei, Eric Onyame

The major purpose of this study was to: assess the carotenoid levels of students, staff and faculty at UTC campus who would like to participate in a scan of their index finger, a non-invasive measurement by reflection spectroscopy (RS) of carotenoids in human skin; provide nutritional information (handout) to participants that align with the 2020 – 2025 USDA Dietary guidelines for Americans; administer the Short Healthy Eating Index (sHEI) developed and validated by nutrition faculty at UT-Knoxville for assessment of nutrient intake and food security and ; determine the impact/relationship of food insecurity among adults on fruit and vegetable intake and carotenoid levels.

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Classifying the SARS-CoV-2 variants with deep learning and exploring their functional regions in deep learning
Parisa Hatami

Since its emergence in Wuhan in 2019, the SARS-CoV-2 virus has undergone ongoing genetic changes and has evolved into various variants as a result of mutation. Accurate diagnosis of these variants is crucial for effective patient treatment. In this study, we used deep learning with Convolutional Neural Networks (CNN) to classify 25880 SARS-CoV-2 sequences. Our model achieved an accuracy of 97%. In addition, we utilized the SHapley Additive exPlanations (SHAP) method to identify which genomic regions were essential for classification. When we applied the selected regions to the model, it was able to classify them with an accuracy of 93.77%. Our results suggest that using selected regions of genetic sequence based on SHAP values in conjunction with deep learning may be an efficient method for quickly identifying the variants of SARS-CoV-2.

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Clustering Algorithm Comparison of Global Fertility Rates
Graham Pennington

Comparing k-means clustering and hierarchical clustering methods on data revolving around global fertility rates, GDP per capita of countries, and infant mortality rates.

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Collective Optimized FFTs
Evelyn Namugwanya

- In this project, we aim to make HeFFTe, a new FFT library for Exascale computing, faster by improving the communication in HeFFTe with better collective communication methods provided by MPI Advance.
- MPI Advance is a collection of MPI extension libraries showcasing new APIs or optimizations of current MPI APIs being designed and developed by the authors and others.
- Beatnik is a benchmark for global communication based on Pandya and Shkoller's 3D fluid interface "Z-Model" in the Cabana/Cajita mesh framework.
- Beatnik uses HeFFTe, an FFT solver, which calls MPI_Alltoallv. This routine was our focus for optimization usi

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College Student's Opinions Towards Therapy
Rachel Batson, Destiny Couey, Annie Kate Boggs, Shelagh Watkins, Amy Raley , Sarah Langley , Chloe Heasley

This study aims to understand UTC College Students' feelings towards using therapy when personally or academically stressed. The research study will explore the opinions and feelings of college students about therapy use alongside the percentage of UTC college students that use therapy for their stress. Our research group is conducting this research because we desire to find out how many people are willing to participate in a resource that is readily available to them. We hypothesize that most college students have a positive view towards using therapy while experiencing stress throughout their lives. Although the source of stress is different for everyone, therapy allows students to have an outlet to reflect and regulate themselves.

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College Students Cognitive Offloading Strategies in Various Task Types: A Naturalistic Approach

Anna Pusser, Kiara Baker

Across two experiments, college students identified 10 goals they intended to complete over the subsequent five days (two per day), and they were required to submit photographs as evidence. In Experiment 1, participants identified one time-specific and one non-time-specific academic goal for each day; in Experiment 2, students identified one academic and one self-care goal for each day. The results revealed that students were less likely to complete self-care goals and time-specific academic goals. Additionally, students were asked to report whether they used external reminders and reasons for their goal completion failures.

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Comparing Artificial Silica-gel Rock Fabric to Diagenetically Altered Stromatolitic Fabrics of the Knox Group

Evan Ritchey

Stromatolitic patterns found in the Proterozoic era are usually associated with early diagenetic deposits of black chert. These chert nodules can contain well-preserved microfossils, but it's unclear if similar deposits exist in the Cambrian period when silica-utilizing organisms evolved. The Copper Ridge Dolomite in the Knox Group, which was deposited in the late Cambrian to early Ordovician, is home to stromatolites that are associated with large nodules and layers of black chert. Unlike older stromatolite samples from the Proterozoic, these Copper Ridge stromatolites in northwestern Georgia do not preserve many individual microfossils. The carbonate of the Knox Group has undergone diagenesis during the formation of the Valley and Ridge province, which involved the injection of multiple, complex episodes of fluids. Stromatolitic patterns contain evidence of silicification and dolomitization episodes, including silica cutting through the surrounding fabric, dolomite rhombs recrystallized as silica, and a rectilinear pattern that suggests a silica gel precursor. This study focuses on the formation of stromatolitic layers through the precipitation of silica by comparing the Knox Group stromatolitic fabrics to the fabrics of lab created silica rock. Correlating these two fabrics can help identify the chemical environment of formation of the Knox Group stromatolites during the late Cambrian and early Ordovician.

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Comparing BERT and DeBERTa for Named Entity Recognition in Patient Note Documentation
Adam Fesmire

This project evaluates the performances of the BERT and DeBERTa language models for Named Entity Recognition (NER) tasks after being trained on a corpus of clinical text documentation.

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Comparing Clustering Algorithms in Python
Adam Hagemeyer

This research project aims to compare the efficiency of four popular clustering algorithms: KMeans, Affinity Propagation, Mean Shift, and Spectral Clustering. The study employs synthetic datasets to evaluate the algorithms' performance in terms of clustering accuracy, computational complexity, and runtime.

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Comparing Housing Inequalities in Paris to American Redlining: An Exploratory Case Study
Alexis Nelson

Minority populations are consistently faced with forms of discrimination that systematically prohibit them from achieving at the same levels as the majority. This study looks at redlining in America as one of those forms of discrimination and compares similar acts of spatial discrimination in France. To achieve this, this study analyzes the demographic statistics of housing, education, and employment from two different countries in cities with similar populations. There is limited literature comparing countries in ways different from GDP, PPP, and Gini coefficients, which is why an exploratory case study was best for this type of research. This information is important not only to assess the country's ability to assist minority populations but so these minority populations know about the type of inequality present.

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Comparison of Multinomial Naive Bayes and Support Vector Machines for Sentiment Analysis of Amazon Reviews
Ahmed Mohamed

The goal of this project is to develop a sentiment analysis model to classify product reviews from the Amazon website. Sentiment analysis is the process of automatically identifying and categorizing opinions expressed in a piece of text, such as positive or negative sentiments. The model will be trained on a dataset of Amazon product reviews, which contains a large number of reviews from different product categories.
To achieve this goal, we will use the Python programming language and several libraries including NLTK and Scikit-learn. The NLTK library will be used for text preprocessing tasks such as tokenization, stopword removal, and stemming. The Scikit-learn library will be used to implement the machine learning models, including the Multinomial Naive Bayes and Linear Support Vector Machine (SVM) models.
The first step in the project is to load and preprocess the Amazon product review dataset. This involves extracting the relevant fields from the dataset, such as the review text and overall rating, and applying text preprocessing techniques to clean and normalize the text data. We will then split the dataset into training and testing sets for model evaluation.
Next, we will implement the machine learning models using Scikit-learn. The Multinomial Naive Bayes and Linear SVM models will be trained on the preprocessed training dataset. We will evaluate the performance of the models using metrics such as accuracy and confusion matrices on the testing dataset.
Finally, we will use the trained models to predict the sentiment of new, unseen product reviews. The models will be deployed as a web application, where users can input a product review and receive the predicted sentiment as output.
Overall, this project aims to demonstrate the effectiveness of machine learning models for sentiment analysis on real-world product reviews. By automating the process of sentiment analysis, we can save time and resources while also gaining valuable insights into customer opinions and feedback.

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Computational Investigation of Aerodynamic Drag over a Model Pickup Truck
David Brown

Vehicle aerodynamics is a key factor, which affects the fuel consumption by the vehicle and is related to the fuel economy. Therefore, a wide range of experimental and computational studies in the past have focused on the assessment of techniques that can lead to aerodynamic drag reductions. While wind-tunnel-based experimental studies can provide results much closer to a practical scenario, such studies often tend to be time-consuming and expensive. To this end, computational fluid dynamics (CFD) as a tool is a promising efficient, and affordable strategy for the design and assessment of novel techniques focused on the improvement of vehicle aerodynamics. In this study, computational investigation of aerodynamic drag over a realistic model of a pickup truck referred to as the Generic Truck Utility (GTU), is performed using the OpenFOAM software. GTU is a realistic representation of a pickup truck and an interchangeable sports utility vehicle for which reference experimental results are available. We employ unsteady Reynolds Averaged Navier Stokes (URANS) formulation to examine the flow field and obtain the resulting aerodynamic drag. The key focus of this study is to establish a computational configuration and strategy, which can be utilized further for the assessment of approaches for improved vehicle aerodynamics. In particular, we examine the role of computational domain extent, computational grid, and wind speed on the resulting drag coefficient. The analysis of the results showed some sensitivity of the drag coefficient to the employed computational domain size, whereas the effects of the grid resolution and the wind speed on the drag coefficient were found to be minimal. As expected, a separated flow region occurs at the back of the truck with a spatially evolving wake, controlling which can be helpful to reduce the aerodynamic drag.

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Computational Modeling of Microtubule Interaction in Plant Cells
Mohammad Murshed

Microtubules (MTs) are fiber-like structures that are present in the cortex of the plant cell. They play an important role in the development of cells. We propose a computational scheme to mimic the MT-MT interaction. Essentially, the model utilizes the idea of fluid-structure interaction to simulate the dynamics of fibers in a water-like fluid. It is demonstrated on fibers in different conditions. The results agree well with the measurements collected from lab experiments.

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Conceptual and Operational Definitions of Nutrition Security Across the Socioecological Model in the US: A Scoping Review
Emory Evans

The goal of the scoping review is to examine the various definitions of nutrition security and compare and contrast the primary nutrition security indicators across the socioecological model. In doing so our team has followed the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR). The inclusion criteria were set to encompass all articles on nutrition security from the United States that were written in English and had been published subsequent to 2010.

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Contamination of Environmental Surfaces in a Neonatal Intensive Care Unit by Select Gram Negative Bacteria
Ezza Zahid, Henry Spratt, David Levine

The Clinical Infectious Disease Control (CIDC) research group at UTC has conducted numerous studies of bacterial contamination of surfaces in both in-patient and out-patient clinics.In a study in a local hospital's neonatal intensive care unit (NICU) contamination by Gram-positive cocci in the genus *Staphylococcus* was found to be widespread. This current study has been designed to monitor Gram-Negative bacteria, notably *Salmonella* sp, *Shigella* sp, and coliforms in this NICU. Swab samples were collected from 10 sites of 7 NICU Pods on five dates from late October to early December 2022. Media inoculated by these swabs (nearly 350 total) included: Eosin Methylene Blue (for coliforms), MacConkey's agar (for lactose + cells),Hektoen Enteric Agar (for Salmonella and Shigella), and Cetrimide Selective Agar (for Pseudomonas). The NICU site most commonly contaminated by these Gram-negative genera was the floors (totaling nearly 60% positive swabs). Of the target bacteria detected, coliforms were the highest percentage. Other sites in the NICU with over 10% positive swabs included the return air ducts and the area around the sink faucet (17% and 11% positive). The only area in the NICU with no coliform contamination was the bed scales keyboard. These results reinforce the high levels of contamination in the NICU found for Staphylococci, particularly for floors. Future efforts to better clean and disinfect surfaces in the NICU to reduce the incidence of these viable bacteria should be part of any infection prevention program.

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Contemporary Learners – Ensuring Success in the Virtual Classroom
Elizabeth Crawford, David Rausch

Traditional and non-traditional labels have been used in higher education to differentiate between the recent high school graduate, residential, full-time student and the contemporary learner who does not live on campus and often pursues a part-time course load. In today's world, after a pandemic and all learners needing to engage virtually, these labels can no longer apply.

The "contemporary" learner is the category of students of any age or experience who believe that they need to take control of how, when, and where they learn, to essentially determine the value of their learning. In the BAS Applied Leadership degree program, course design, content, delivery, and assessment have been developed to support contemporary learners. The key criteria and measurements for success are based on learners' value expectations and creating a culture of demonstrable competence.

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Conversion Therapy: Prevalence and Treatment Utilizing Trauma-Focused Cognitive Behavioral Therapy
Josealyn Pontius, Hayden Crihfield , Cynthia Fallowfield, Judy Taylor

In 2018, an estimated 698,000 LGBTQ adults between 18 and 59 years old in America had endured some form of conversion therapy (Higbee, 2020). Individuals that have undergone conversion therapy are twice as likely to experience suicidal ideation, 75% more likely to plan to attempt suicide, and 88% more likely to attempt suicide resulting in minor injuries (Blosnich et al., 2020). Additionally, Meanley et al. (2020) determined that men who have sex with men that underwent conversion therapy had a higher likelihood of experiencing negative psychosocial conditions in mid- to late-life including depressive symptoms and internalized homophobia. Despite the mounting evidence of harm conversion therapy can do, not a single state in the U.S. has banned conversion therapy in its entirety, as religious leaders, counselors, and advisors are unaffected by state bans placed on licensed counselors regarding conversion therapy (Higbee, 2020).

We propose that Trauma Focused Cognitive Behavioral Therapy (TF-CBT) would benefit individuals that have been traumatized by their subjection to conversion therapy. Several studies regarding the use of TF-CBT in different populations, including transitional-aged youth with interpersonal trauma and youth with complex trauma, have indicated success in resolving or significantly improving participant symptoms (Rice et al., 2021; Mannarino et al., 2012). We will provide treatment limitations and considerations to exemplify the use of TF-CBT with individuals that have been traumatized by conversion therapy.

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Course Registration and Student Success Outcomes
Stacie Grisham

Student success in higher education has been a prominent research agenda for decades, and many institutional efforts center around student experiences and institutional factors believed to influence student progression and degree completion. One of the experiences college students encounter throughout their college journey involves course registration. Course registration is the process of registering for classes in a future term, and the process is influenced by many facets of the institution, including registration timing, class availability, and student needs and preferences. Prior studies address many aspects of course registration and their potential relationship with student success outcomes, such as retention, progression, and degree completion. This research project will summarize the major findings through a comprehensive literature review on course registration and student success outcomes in higher education. The literature review will be conducted using specific search terms, such as course registration and class registration, and reviewing literature accessible through online databases. The specific methodology steps and selection criteria will be documented upon project completion. The final research study will provide an overview of related foundational studies with an emphasis on the most recent research published. This project will identify evidence-based practices for institutions to consider and identify opportunities for future research to deepen our understanding around course registration and potential relationships with student success.

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COVID-19 Wastewater Metatranscriptomics in Tennessee
Caleb Hendren

This project aims to investigate the prevalence and diversity of SARS-CoV-2 variants in Tennessee by analyzing wastewater metatranscriptomes. I used the ARTIC bioinformatics pipeline to process the sequencing data and Freyja to visualize and interpret the results

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Curiosity, Exploration, and Mindfulness on Quality of Life and Affect
Lillian LeStrange, Griffin Randolph

Individuals with higher levels of mindfulness, meditation, and curiosity have been able to minimize their self-discrepancy and increase self-acceptance, which could have beneficial effects to individual wellbeing (Ivtzan et al., 2011). The current study aims to determine the relationships among mindfulness, curiosity, quality of life, and positive and negative affect. To examine this relationship, I hypothesized that (1) curiosity and exploration would positively relate to both quality of life and positive affect and (2) mindfulness would positively relate to both quality of life and positive affect. Participants (n=538) were college students at Ohio University who were compensated with partial course credit. Participants completed multiple self-report measures online: the Curiosity and Exploration Inventory-II (CEI-II), the Mindful Attention Awareness Scale (MAAP), the Quality-of-Life scale (QOL), and the Positive (-P) and Negative (-N) Affect Schedule (PANAS). There was a significant positive correlation between CEI-II and QOL scores (r = 0.29, *p p p= p*

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Dead or Alive? Interactions Between Secular and Primal Beliefs
Spencer Baker, Caroline Bowden, Rachel Pitchford

The purpose of this study was to determine how specific beliefs composing religiosity/spirituality (R/S) and secularism affect the Alive primal world belief and well-being. The Primal World Beliefs are fundamental beliefs about the world, a construct developed by a team led by Jeremy Clifton at the University of Pennsylvania (2019).). The Alive primal is about how much we see the world as full of intention and purpose that is interacting with us and wants our help. Participants were recruited from undergraduates at UTC, N=183. Participants were given a survey with a series of scales assessing beliefs about religion, spirituality, and basic beliefs about the world. Secular beliefs negatively predicted Alive beliefs, and this relationship was moderated by Secular Humanism. The lower a person's Secular Humanist beliefs, the more negative the relationship between Secular beliefs and Alive beliefs. Overall, these results support the concept that some specific beliefs moderate the typical relationships between R/S and secular orientations to Alive, although fewer beliefs than hypothesized were found to do so significantly.

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Decision Tree Learning May Advance Surgical Research: A Narrative Review
Andrew Wilson

Misuses, misinterpretations, and misconceptions of P-values and frequentist statistics have been well highlighted within surgical research; however, practical alternatives have not been established. While a deductive approach is regarded as the preeminent approach to surgical research, a promising alternative is the application of decision tree learning with an inductive and exploratory approach. Decision tree learning is a supervised machine learning approach that uses decision algorithms as predictive models. Though artificial intelligence and machine learning have been extensively reviewed in surgical literature, through 2023 there is a paucity of literature that specifically covers the use of decision tree learning in surgical research. The purpose of this review is to identify and highlight published literature that has effectively used decision tree learning in surgical research and discuss the advantages and disadvantages of using this approach. A MEDLINE search was conducted from the earliest date to 2023 using terms "CART", "CHAID", "ID3", "C4.5", and "C5.0" in the leading 25 surgery journals. A total of 19 articles were queried and results suggest decision tree learning has been effectively used in surgical research and could serve as a valuable alternative for researchers with specific aims of supporting operative decision-making.

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Deep Learning and Panoptic Segmentation for High School Environmental Science
Tiffany Cash, Ramsey Jibrin

Learning in the classroom should be a conduit for learning anywhere and everywhere. The question time and time again from students is, “When will I ever use this again?” Problem-Based Learning provides an overarching answer to this question, as humans will be constantly confronted with new problems that require creative solutions.

PBL is a type of inquiry-based project that allows students to be metacognitive learners, and allows the teacher to step into the role of a facilitator. According to the **Buck Institute of Learning**, a PBL should have seven essential elements: a challenging problem or question, sustained inquiry, authenticity, student voice and choice, reflection, critique and revision, and a public product.

Our goal through utilizing this PBL model is to encourage students to take ownership of their own education by generating research questions that inspire sustained inquiry in school and beyond. We deliver our PBL through the lens of environmental science combined with computer vision and machine learning. From the report prepared by Sam McHugh and James Berry, "Computer vision and object detection offer unique and promising non-contact solutions to civil infrastructure condition assessment."

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Deep Learning-Based Framework for Multi-Vehicle Tracking & Speed EstimationCase study: MLK Smart Corridor in Chattanooga, TN
Yasir Hassan

This study proposes a 3-stage framework for real-time objects (vehicles & pedestrians) detection, tracking and speed estimation in the MLK Smart Corridor in downtown Chattanooga, TN. Initially, YOLOv4 with CSPDarknet-53 backbone is used to detect vehicles and pedestrians. YOLOv4 achieved AP50 of 65.7% on MS COCO dataset. A tracking-by-detection method is followed To track objects, a modified version of the deep sort is applied to associate the same object through successive video frames. In this version of deep sort we replaced their feature extractor which is used in the features similarity calculation, by a Siamese network to better learn to differentiate between similar vehicles. The proposed tracker was tested on MLK Smart corridor data and scored 58.53% MOTA, 2% more than the deep sort when tested on the MLK Smart Corridor data. Further, the number of identity switches have been reduced by 57%. Last step was speed estimation. For that, linear transformation is applied on the original video frame to get a bird-eye view for it, from the resultant view we can easily estimate the meter-per-pixel (MPP) value. MPP value, distance in pixels and frame-per-second (fps) are then used directly to measure the speed. A vehicle with an On-Board Unit (OBU) is used to generate speed ground truth data. The Speed estimator showed an average error rate of 2 mph on average traffic readings in the range of (0-35) mph.

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Detecting Credit Card Fraud Using Machine Learning Methods
Ivy Cartwright

This is a data science project using machine learning methods in the programming language R. The aim of this project is to build a classifier that can detect fraudulent credit card transactions. I used a variety of machine learning algorithms like Decision Trees, Logistic Regression, Artificial Neural Networks and finally, Gradient Boosting Classifier that will be able to discern fraudulent from non-fraudulent credit card transactions. The data set we are using is a credit card transaction data set which contains a mix of fraudulent and non-fraudulent transactions. This project is supported by NSF grant (# 1924278):Collaborative Research: Transforming Data Science Education through a Portable and Sustainable Anthropocentric Data Analytics for Community Enrichment Program.

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Developing a Course-Level Experiential Learning Scale
William Moore, Alexander Moore

Experiential learning is a crucial tool for instruction in which students are able to directly apply course concepts to relevant life experiences. This is typically accomplished through hands-on experiences or activities within a course. The purpose of this study was to examine experiential learning in college academic courses through an experiential learning scale. Currently, there exists one measure for efficacy of experiential learning, developed by leaders in the field, Stock and Kolb (2020); however, this scale does have its limitations in applicability. Stock and Kolb's (2020) Experiencing Scale measures the level of engagement in a single given experience. Thus, the current study modified Stolk & Kolb's (2020) experiential learning scale to reflect students' experiences at the course level, allowing for multiple experiences to be reflected in the measure. A 17-item scale for experiential learning efficacy at the course level was developed by creating survey items that assessed immersion (pure experience) and engagement (empirical experience) based on Stock and Kolb's (2020) scale. Initially, the items demonstrated good reliability (Cronbach's alpha = .88). After removal of 3 problematic items, Cronbach's alpha rose to .89. PCA and parallel analysis indicated 1-3 components within the scale. EFA with Promax at 2 factors supported simple structure after the removal of 2 cross-loading items. This scale has the potential to be utilized within courses and programs across a wide variety of disciplines to better gauge students' experiential learning engagement. Many colleges and universities now have offices for experiential learning, and these scales could be useful in assessing the impact of experiential courses across many disciplines. Moving forward, researchers seek to improve problematic scale items to better reflect the pure and empirical experience factors, and to move toward CFA.

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Developing a Predictive Geospatial Habitat Model for a Rare Species of Salamander in TN: A Case Study for the Green Salamander (*Aneides aeneus*)
Erin Gaylord

Green Salamanders (*Aneides aeneus*) are a secretive and cryptic species that have low detection probabilities which is primarily driven by their occupation of arboreal habitats. This aspect of their life-history makes their populations not well studied throughout much of their range. Our foci are four-fold and include: 1) to locate potential populations, 2) to better recognize habitat parameters, 3) to identify suitable habitat, and 4) to gain insight for future studies on their distribution. Incorporating geospatial tools is a critical yet necessary step in developing predictive models. Such models can aid in determining prime habitat while offering insight on their status. MaxEnt is a geospatial software that can be used for modeling habitat suitability for a variety of species. In short, it requires data on the species occurrence in order to predict suitable habitat. MaxEnt's versatility creates an optimum distribution research application for developing predictive geospatial models for rare salamander species. Our baseline data was provided by the Tennessee Wildlife Resources Agency (TWRA) so that

predictive geospatial models for *A. aeneus* could be generated. After processing the model, we randomized points to focus on natural areas and this yielded 77 potential study sites; and, of those, 49 were surveyed. Each location had the landscape and habitat structure assessed and we searched for the target species. Of the 49 sites, we found 46 to have suitable habitat in the immediate proximity; and of these 18 had confirmed presence for the target species.

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Developing a Predictive Habitat Suitability Model for Barking Treefrog (Hyla gratiosa) in the Greater Chattanooga, Tennessee Region
Nyssa Hunt

Throughout the state of Tennessee, the Barking Treefrog (Hyla gratiosa) has been observed as a habitat specialist with a fragmented population distribution. Past studies have revealed that this species prefers lowland, open canopy wetlands, which are areas often targeted and developed for anthropogenic purposes. Rapid development continues to occur around urban areas, where isolated populations are especially at risk of decline with habitat destruction and alteration, disease, and invasive species. Citizen science efforts have assisted in documenting sightings of H. gratiosa in recent years, allowing conservationists to understand their presence further. As the greater Chattanooga region continues to experience growth and agencies are actively seeking to conserve lands, a greater understanding of the habitats that serve these populations may aid land conservation priorities. The machine learning algorithm MaxEnt was utilized to create a predictive habitat suitability model for this tri-state region, considering observation points from iNaturalist. Model results are aimed to guide conservation efforts and inform regional stakeholders, and further understand species preference and distribution in a region that has variable habitat availability compared to more southern ranges. This model can also be used to ground truth presence and further measure habitat preferences, especially in cases of atypical habitat context.

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Development of a Parametric Model for the Simulation of Impact-Vibration Pile Driving Equipment
Don Warrington

Abstract: Impact-vibration pile driving equipment has been an important part of vibratory pile driving equipment since the early years of development. In the 1960's the VNIIstroidormash institute in Moscow developed a series of impact-vibration hammers; however, the development of these hammers was stopped in favour of the diesel hammers. The emergence of the need to convert construction equipment to electric power due to environmental considerations reopens the possibility that these hammers may once again need to be considered to drive piles, as the original impact-vibration hammers (in common with their early

vibratory counterparts) were powered using specialised electric motors. A model is first developed to simulate the mechanical working of these hammers, followed by comparison to actual designs. The results are generally in line with the original tests (to the extent the results are known) but variances are noted and discussed. Some suggestions for forward movement on the design of this equipment are set forth.

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Development of a Rooted Cutting Propagation Method for *Prunus americana* Marsh. for Germplasm Conservation in East Tennessee
Hannah Nelms

American plum, *Prunus americana* Marsh., is a native tree valued for wildlife and wildland restoration. I tested the seasonal rooting potential of wild-collected P. americana to develop a rooted stem-cutting method for germplasm conservation in East Tennessee. Cuttings were collected from trees in eight locations in May, July, and September and treated with 1000-ppm, 3000-ppm, or 8000-ppm indole-3-butyric acid (IBA) for 5 seconds before sticking in a mist propagation bed with basal heat for four to six weeks. Season and location significantly affected rooting success, and rooting increased with IBA concentration. Cuttings treated with 8000-ppm IBA rooted 49.0% in May, 63.9% in July, and 16.1% in September after four weeks. Rooted cuttings collected in May produced more roots, longer shoots, and had greater transplant success than in July or September. The results of this study show that rooted cuttings are a viable method for the propagation of wild-collected plum.

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Differential Population Growth Fitness: A Pairwise Comparative Approach to Estimate the Fitness Advantage of Major SARS-CoV-2 Clades
Md Jubair Pantho

The first reported case of Severe Acute Respiratory Syndrome, caused by a virus named SARC-CoV-2, was reported in the Hubei province of China, located in the city of Wuhan, after asymptotic pneumonia-like disease surged over a cluster of people. The virus spread widely over continents, infecting millions of people and taking thousands of lives. After its emergence, the world has seen multiple waves of Covid-19 infections due to the rapid mutations of the spike protein sequences. Estimating how strong the emerging or existing variants of the SARC-CoV-2 virus are over one another and the magnitude of advantage is the prerequisite for predicting the pandemic trend, designing effective vaccines, supporting outbreak preparedness, and strengthening public health response. In this approach, a pairwise comparative method, 'Differential Population Growth Rate (DPGR),' is used with a combination of virus variants to estimate the fitness of one variant over another. The log-transformed growth ratio of the two clades is calculated over time to evaluate the strength. As of the time range of the analysis, in

most of the studied regions (Brazil, Canada, Denmark, Germany, Italy, South Korea, etc.), the clade GRA showed advanced fitness over other clades (GRY, GH, GK, GR) which includes the highly infectious Omicron variant. On the other hand, among the sub-lineages of the Omicron variant, the sub-lineage BA.5 exhibits advanced fitness over other sub-lineages of Omicron. To focus on the geographic dominance and the propagation of the SARS-CoV-2 virus, countries with enough sequence submissions are selected to assess the estimation of fitness where various clades emerged one after another. This study will aid the predictive analysis in the future and help improve the testing, treatment, and vaccination programs by taking precautionary steps.

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Discovery of Small Molecules Stabilizing the Secondary Structure of CGG Repeat Expansion
Lukas Wise

Many neurodegenerative diseases are caused by expansions of simple DNA nucleotide repeats. Expansion of d(CGG) repeats (d(CGG) exp) within the FMR1 gene on the X chromosome leads to the development of Fragile X-related diseases, including Fragile X-associated tremor/ataxia syndrome (FXTAS) and Fragile X syndrome (FXS) with severity increasing as the number of repeats increase. These diseases lead to intellectual disabilities and behavioral problems, and FXS is one of the leading causes of autism. The prognosis of these diseases is not clearly understood; however, it is known that the d(CGG) repeats naturally form secondary structures during DNA replication when in the single-stranded structure. Therefore, it is of interest to study ways in which to modulate the secondary structure of these repeats, as biological processes such as replication may be affected by the stabilizing of the secondary structure. Here, we use chemical probes to bind and stabilize the secondary structure of d(CGG) repeats. We screened over 3000 compounds from the chemical library to construct a small group of compounds that bind and stabilize the secondary structure of d(CGG) exp. Utilizing fluorescence indicator displacement (FID), a group of 225 compounds was identified from the first screening. These compounds were further studied by measuring their effect on the melting point of the repeats for the second screening. Furthermore, the selected hit compounds were analyzed to determine affinity and selectivity for the target DNA repeats.

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Ecological Validity of Prospective Memory Experimentation
Anna Pusser

Remembering to carry out a future intention is termed prospective memory (PM). Past research that has utilized the traditional lab experiment has been scrutinized because the findings

suggest performance in the lab is not predictive of PM performance in everyday life. Furthermore, since much of the lab-based PM research has focused on isolating the processes supporting PM, it is unclear if this work translates to PM in everyday life. Therefore, research has been conducted in naturalistic settings to observe PM in everyday environments. However, naturalistic experiments are lacking in experimental control relative to studies conducted in a lab setting. Eye tracking technology could address the ecological validity concerns within lab experiments by providing a more direct measure of strategic monitoring. Strategic monitoring is how we monitor our environment to detect a future intention in order to complete or accomplish that intention. Eye tracking may offer a better direct measure of strategic monitoring compared to traditional lab tasks. Specifically, a recently developed eye tracking paradigm could bridge the gap between lab and naturalistic studies. Hence, the objective of the proposed study is to examine whether this eye tracking paradigm will maintain experimental control and improve ecological validity when compared to both a traditional lab task and a naturalistic task. I have four hypotheses for the proposed study: (H1) I predict that prospective memory accuracy in the eye tracking task will be positively correlated with accuracy in the traditional lab task. (H2) I predict that the measure of strategic monitoring derived from the eye-tracking task will be more correlated to PM performance relative to the correlation observed between PM accuracy and the measure of strategic monitoring derived from the traditional lab task. (H3) I predict that PM performance in the eye tracking paradigm will be more strongly related to PM performance in the naturalistic task relative to the correlation observed between PM performance in the naturalistic and traditional lab task. (H4) I predict that participants will be more accurate in predicting their performance in the standard lab task as well as the eye-tracking task relative to the naturalistic task.

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Effectiveness of Kinesiology Taping on Shoulder Function in Individuals with Hypermobile Ehlers-Danlos Syndrome

Rachel Bragg, Libby McClure, Raven Smith, Sam White, Mary Walker

Ehlers-Danlos syndromes (EDS) are a group of genetic disorders characterized by changes in collagen that results in increased joint laxity. The most common subtype of EDS is hypermobile EDS (hEDS) which is characterized by laxity and pain, particularly in large joints such as the shoulder. The purpose of this study was to examine the effects of kinesiology taping (KT) on shoulder pain and upper extremity function/occupational engagement in individuals with hEDS. Twenty-nine participants with hEDS were recruited from EDS support groups within a 2-hour radius of Providence, Rhode Island. Subjects were seen for an initial evaluation which included completing the upper extremity functional index (UEFI), which is a validated 20-question assessment used to measure function of the upper extremities. At the initial evaluation taping was performed using a standardized technique and participants were seen at 48 hours post-taping to repeat the UEFI. There was a significant improvement in function (p

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Effects of Injection Characteristics on the Particle Deposition within Human Airways
Neka Long

Aerosolized drug delivery through the human airway is an effective strategy for treating many pulmonary diseases. Recent advancements in radiological imaging techniques have allowed for detailed anatomical information to guide treatment procedures, but such information still tends to be limited. Computational tools can provide insight to guide and enhance the efficiency of the treatment procedure. In this study, we employ large-eddy simulation (LES) as a computational tool to investigate airflow and particle deposition characteristics within the upper human airway. LES of one-way coupled particle-laden flow is carried out by using the Eulerian-Lagrangian strategy, where airflow is simulated using Eulerian formulation and particles are tracked using a Lagrangian approach. The airway model considered in this study is adopted from the SimInhale benchmark case where we consider a truncated portion focusing on extrathoracic and part of intrathoracic airways. The computational mesh for this study was obtained using Pointwise. The goal of the present study is to examine the effects of injection characteristics of the particles on their regional and global deposition within the airways. Along with simulating discrete particle sizes ranging from 1 to 10 microns, three different distributions are considered. The airflow features in terms of the instantaneous and time-averaged behavior of the flow field and the results from the polydisperse injection of particles will be discussed, and the global deposition fractions of three models of particle distribution will be compared.

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Effects of introduced predatory fish species on amphibian populations: A Literature Review
Avriel Null, Carter Cook, Nicholas Myers

Through a literature review process, we examined the effects of introduced predatory fish species on amphibian communities. Predatory fish species are introduced by humans for commercial, recreational, or biological control purposes, and have been shown to negatively impact amphibian populations through effects such as altered species assemblages, decreased geographic biodiversity, and adult and larval predation. Populations of introduced predatory fish species such as sunfish (*Lepomis spp.*), rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), common carp (*Cyprinus carpio*), eastern mosquitofish (*Gambusia holbrooki*), largemouth bass (*Micropterus salmoides*), and smallmouth bass (*Micropterus dolomieu*) have been linked to various negative effects on amphibian community health. Data collected through our literature review process will be examined and analyzed to make recommendations to minimize areas of concern. Reduced amphibian populations and potential local extinction due to fish introductions is now considered one of largest widespread anthropogenic threats to aquatic communities. Amphibian populations can recover from such alteration if effective management techniques of introduced predatory fish species are

incorporated by ecosystem management plans. Management approaches of the Tennessee Wildlife Resources Agency (TWRA) could include strategies such as prevention, monitoring, early control, and removal at different life-history stages and spatial scales.

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Effects of Operating Pressure and Temperature on Properties of Laminar Flames
Zakaius Isom

Combustion is observed in many engineering applications, such as gas turbines, aeronautical engines, automotive engines, etc. The burning of fuel is highly dependent upon the operating conditions. Most of the applications operates at higher pressure for a range of operating temperature. The goal here is to assess the effects of pressure and temperature on the properties of flame.

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Effects of pH on Survival of *Daphnia*
Skylar Calkins, Ermaya Wise

The acidity of the world's water systems is escalating at previously unheard-of rates, according to recent studies. As a result, this study used *Daphnia*, a model meiofauna species, to explore the impact of acidification on survival at various pH values. A synthetic culture containing *Daphnia* eggs was constructed and utilized in this study. Solutions with pH levels varying from 5 to 11 were developed to test how *Daphnia* responded to acidic, neutral, and alkaline conditions. This experiment was conducted in three parts, with each part spanning 3 days (9 total). *Daphnia* were observed at 3, 24, and 48 hours after being treated with solution and the number of dead *Daphnia* for each trial was recorded in Excel. After all data was collected, Excel was used to graph the average response of *Daphnia* at each pH level and the graph displayed that *Daphnia* thrived in alkaline environments, where they had the highest survival at pH 11, and that they could not survive in pHs lower than 7. An ANOVA analysis comparing all conditions was run and yielded a p-value of 0.0327. Thus, it was determined that pH was significant in relation to the survivorship of *Daphnia*. It is also important to note that in several experiments with pH 9 or higher, more than ten *Daphnia* were counted post-treatment, indicating that reproduction was still taking place under alkaline conditions. Ultimately, this study contributes to the understanding of how acidification can negatively impact meiofauna.

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Elucidation of the Overexpression of TAF2 in Cancer Cells
Morgan Osborn

TATA-binding proteins (TBP) serve as a significant component within the eukaryotic transcription initiation machinery. Within eukaryotic cells, RNA Polymerase II (RNAP-II) mostly facilitates the transcription of protein-coding genes. In many RNAP-II promoters, TBP operates within transcription factor IID (TFIID), which consists of evolutionarily conserved RNAP-II specific TATA-box binding protein associated factors (TAFs) (Akhtar et al., 2011). Through several studies, the upregulation, also referred to as overexpression by producing increased copies, of TBP has been found to contribute to oncogenesis (Johnson et al., 2003) (Ribeiro et al, 2014). Additionally, numerous studies have provided evidence indicating that TAFs regulate differentiation as well as proliferation states; TAF expression has been observed to be higher in pluripotent cells, and consequently reduced in differentiation (Ribeiro et al., 2014). Significantly, TAF2 has been found to be overexpressed in high-grade serous ovarian cancers (HGSC) as well as hepatocellular carcinoma (HCC), however the mechanism in which this occurs is not known at this time (Reghupaty, 2017) (Ribeiro et al., 2014).
In this study, we will examine the cellular abundance of TAF2. Our hypothesis is that TAF2 turnover might be important to maintain optimal level of TAF2 in yeast cells for normal cellular function. This protein turnover can be regulated by targeted degradation by the 26S proteasome via ubiquitination or non-targeted degradation by proteases. Ubiquitin-26S proteasome dependent proteolysis moderates the selective destruction of few significant proteins including cell cycle regulators, transcription factors, as well as tumor suppressors. Within diverse regulatory pathways, key protein concentrations are managed by post-translational ubiquitination and degradation by the 26S proteasome (Deng et al., 2007). To investigate the cause of upregulation of TAF2 in HGSC and HCC cells, it is essential to know if TAF2 is ubiquitylated and degraded by 26S proteasome.

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Enhancing LGBTQ+ Inclusivity within the University of Tennessee's Master of Public Health Program
Natalie Parks

For this project, the University of Tennessee's (UTC) Master of Public Health Program (MPH) will be evaluated on its inclusivity of LGBTQ+ health disparities. This evaluation aims to identify ways to enhance LGBTQ+ inclusivity in the existing curriculum. This topic has been discussed in PUBH: 5130: Inclusion and Diversity in Community Engagement course readings; however, it was brief. Furthermore, the unique needs of different people within the LGBTQ+ community were not addressed. The inclusion of LGBTQ+ health disparities has already been implemented in several public health programs and medical schools. For example, the University of Colorado School of Medicine implemented a ten-hour elective to improve medical students' confidence in working with the LGBTQ+ community (Minturn et al., 2021). At the end of the elective, students were asked to take a post-survey where they reported higher confidence levels. This is

just one example of how implementing this program can benefit students who want more knowledge on this subject. Additional studies have reported similar results (Braun, et al., 2017; Solotke et al., 2019). However, despite a growing desire to learn more about this topic, there is still a lack of consistency in education. To prepare for working with this population, public health students and professionals must learn about the disparities and barriers to achieving good health in the LGBTQ+ community. Data was gathered using a validated assessment tool that asks medical students' opinions on LGBTQ+ inclusivity in their curriculum (Zumwalt et al., 2022; Appendix A). I have altered the questions to be inclusive so that MPH students, alums, and faculty can answer the questions. The survey was administered electronically via UTC's Qualtrics software. Unobstructed techniques were used to gather data from the survey. I chose this method because having little interaction with participants will decrease the likelihood of invalid data. The information gathered will let us know if continuing this project of enhancing the program's curriculum is worthwhile. If it is valuable, the impact of this project will lead to students' increased sensitivity and awareness of the health needs of the priority population.

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Environmental Factors that Contribute to College Students Concerning Sleep and Physical Activity

Breanna Evans

Depending on one's geographic location, lived experience, and identity, the experiences of college students varies. Differences and similarities exist amongst college students including, but not limited to: managing course workload, sleep management, and incorporating regular physical activity within their lifestyle. The research question for this project will assess which environmental factors contribute to sleeping patterns and regularity of physical activity of college students. More research is needed to determine the correlation amongst physical activity, health behaviors, and sleeping patterns and the impact sleep or lack thereof has on academic performance. This study will compare and contrast personal experiences including environmental factors and habits of college students. From using an analytical framework to assess the participants' responses, results are coded to gather specific details that will help determine the rate at which college students are physically active during a time span of one week. These responses can form correlations between physical activity and environmental factors impact sleeping behaviors. The survey was used to form a regression analysis by finding the number of differences between varying cultural backgrounds amongst students at a university. The purpose of this research is to determine if there is a correlation between environmental factors and physical activity and sleeping patterns of college students. With the differences between genders and ages of students, responses can be utilized to develop applicable health models and inform future research endeavors.

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European Access to Health Resources
Taylor Yates

Understanding when, where, and why access to health varies across European countries is important when considering public health programs. This project seeks to understand why a lack of access to health resources occurs. A cluster analysis was conducted to determine the number of groups within the project, and an ANOVA test was completed to decide which countries go into what groups. Once this was determined, we could try to understand the gaps between the groups. When focusing solely on COVID-19 variables, it seems that countries with lower levels of health literacy were impacted more severely. Further research is needed to better understand the links between health literacy and access to health resources within Europe.

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Evaluating Clinical Judgment in New Graduate Nurse Residents
Lacey Cross

New graduate nurses lack the clinical judgment ability that is necessary to safely enter practice in today's healthcare environment. There is a widening gap between academia and practice in nursing that is perpetuated by disparate stakeholder expectations and perceptions of new graduates' clinical judgment ability. A needs assessment revealed a need for an objective clinical judgment evaluation process in the nurse residency program at a large academic medical center. The purpose of this quality improvement project is to establish a new, evidence-based process for preceptor-driven evaluation of new graduate nurse residents within a nurse residency program at a large academic medical center. Preceptors will receive education on the new evaluation process and evaluation rubric in advance of pilot implementation. A mixed methods pre- and post-test design will employ surveys to capture data reflecting preceptors' perceptions of their ability to objectively evaluate nurse residents and their perceptions of the value of the evaluation process. The project will be theoretically framed around the Tanner Clinical Judgment Model. Anticipated outcomes include increases in both preceptors' perceived ability to objectively evaluate clinical judgment and in their perceived value of the evaluation process, as well as shifts to nurse residents' orientation trajectory based on the evaluation results. Successful implementation of this pilot may result in meaningful application of best practice, enhanced understanding of clinical judgment deficits in new graduates and strategies for improvement, and progress toward closure of the academic-practice gap in nursing.

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Experiential Learning through Human Comparative Anatomy
Kylie Williamson

With generous funding from the Walker Center for Teaching and Learning, several casts of human skeletal elements were purchased to provide students hands-on learning experiences in a human osteology course taught in the Department of Social, Cultural, and Justice Studies (ANTH3999R). Using a modified flipped classroom model, students were encouraged to encounter information through guided exploration of course materials. Students were introduced to important terminology via lecture, then had the opportunity to engage with the material in a hands-on fashion in the form of weekly workshops. In addition to providing students with an applied skillset once they completed the course, the course sought to introduce students to a wide array of bodily forms and broach important conversations about human diversity.

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Experimental and ANSYS Investigation on the aerogel Envelopes for energy saving in Building Sector
Syed Tareq, Matthew Colson, Samuel Friedman, Evan Gildernew, Sungwoo Yang

Energy consumption, specifically in the building sector, is always increasing. One potential way to reduce energy consumption, is to reduce the heat loss in buildings or homes. Silica aerogels have grown in popularity as an insulating material due to their extremely low thermal conductivity. Very often the benefits of transparency as well as strength is ignored due to its brittleness. An effort has been taken to increasing the strength using vacuum seal while maintaining their transparency. To understand the benefits of using silica aerogels as a replacement of glass window or wall in buildings, experimentally validation was carried out in terms of transparency and strength. The heat simulations were performed on the sealed and unsealed aerogel using the Multiphysics software ANSYS Workbench 2023 R2. The simulations helped predict the actual saving benefits of using aerogels as an insulator. Overall, the use of aerogels in the building sector has great potential for energy savings and can be a significant contribution to sustainable building design .

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Exploratory Data Analysis on the Effects of COVID-19
Ned Van Breugel, Ammar Tojaga

This exploratory data analysis aims to examine the relationship between population density and the spread of COVID-19, as well as how the pandemic has impacted Gross Domestic Product (GDP) across the United States. Correlation and regression analysis were used to assess these relationships using data from U.S states. The results showed significant relationships between

population density, COVID-19 cases and GDP. This suggests that areas with higher population densities experienced a more severe spread of the virus. On top of that, the results indicated that states with higher cases experienced more decline in GDP. The results also showed that population density can provide a predictive factor for COVID-19 cases and that COVID-19 definitely had a substantial impact on the economy of the United States. In conclusion, this study provides evidence to support the hypothesis that population density does play a role in the spread of COVID-19 and that the pandemic negatively impacted economic growth. These results can be used to stress the importance of mitigating the spread of the virus and how this should influence policies that address the consequences of future pandemics.

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EXPLORING A POTENTIAL METHOD TO IDENTIFY AND QUANTIFY TIRE PARTICLES FROM OTHER MICROPLASTICS

Caden Powers

Microplastics, any particle that measures in at less than five millimeters in size, are a major pollutant found in both terrestrial and aquatic environments. These highly toxic particulates have been linked to major ecological health concerns. Rubber debris commonly produced as a result of tire wear make up around one quarter of microplastics found in the ocean. However, the quantification of tire particles is difficult in a sample of river water. This is partly because of their size and because they do not fluoresce under Nile Red dye, which has been used to identify other microplastics.

For this study, a tire sample was manually abraded to create similar samples of rubber microplastics. Once the tire sample was manually abraded, 152 particles were then counted and their lengths, widths, and areas were measured using light microscopy. These measurements resulted in an average length of roughly 0.75 millimeters, width of 0.67 millimeters, and area of 0.321 millimeters squared. During the abrasion experiment, particles were separated with tweezers before they were placed on the slide and observed under the microscope; therefore, it is likely that only the larger particle sizes were counted. Measurements will also be performed after a density separation is completed to quantify smaller particle sizes in the abrasion experiment. We will also experiment with a non-polar UV dye as a way to identify tire particles in a natural sample. These experiments will be used to determine whether the dye can be used to cause the rubber to fluoresce under UV, and if so, the optimal conditions for staining rubber particles and distinguishing them from other microplastics.

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Exploring experiences with non-motor symptoms of Parkinson's disease
Christian Thomas, Katie Lancaster, Hannah Carvel, Nicholas Overton, Kaitlyn Springer , Erin Melhorn

This exploratory research study was conducted in order to gain an understanding of the non-motor symptoms that individuals with Parkinson's disease experience, as well as the educational resources provided by healthcare professionals. The Person Environment Occupation (PEO) model was the theoretical base used to guide this study. A 12-question mixed-methods survey was utilized to collect a combination of qualitative and quantitative data regarding participants' self-reported experiences with and education about non-motor symptoms of PD. Over a three month period, participants were recruited via fliers, emails, social media posts, and site visits (most notably, Rock Steady Boxing); a total of 40 participants completed the survey. Exploration of themes and trends among the data revealed several patterns indicating exercise and community programs as important factors in managing Parkinson's disease; meanwhile, it also revealed the relationship of the education provided by healthcare providers. Along with this, it most notably recognized patterns of varying frequencies and severities of non-motor symptoms among participants. This study provides data on first-hand experiences of individuals with PD; therefore, providing occupational therapists and other healthcare professionals with significant knowledge regarding how to address and educate these individuals.

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Exploring potential benefits of computer science related activities in and out of school
Lauren Strickland, Jacob Robbins, Stephanie Philipp

Computer and information technology jobs are estimated to increase by 15% from 2021-2031 (U.S. Bureau of Statistics, 2022). Several education efforts have begun to focus on growing a computer science (CS) workforce using a CS-education pathway that starts as early as elementary school. Accordingly, several education efforts have begun to focus on early elementary CS knowledge and skills. Among these efforts include the use of Fabrication Labs (FabLabs) and project-based learning curricula. However, it has remained largely unexamined as to how students in such curricula perceive their abilities, identify with CS, or their level of interest towards a relevant career. To examine these factors, the current study surveyed fifteen 3rd-5th graders and six teachers who were involved in a project-based learning FabLab course. The data for this pilot study will be analyzed for this paper.

We are studying not only formal classroom CS learning but after-school CS opportunities too, including those targeting underrepresented groups in CS such as females (e.g., Gig City Girls). As a proposed study, we hope to invite students, parents of students, and teachers/club leaders associated with a CS related organization to take part in a series of surveys (students and parents) and a semi-structured interview (teachers). We plan to examine potential benefits of these organizations and how students' feelings, attitudes, and beliefs may change over time

with involvement in these programs. Our proposed study is awaiting site, district, and IRB approval.

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Exploring the need for physical activity monitoring in Chattanooga.
Brooke Rieves, Victoria Norwood, Kara Hamilton

Research has indicated the need for nationwide improved physical activity surveillance. The purpose of this project is to identify current community-level physical activity programs in Chattanooga and explore the feasibility of implementing a systematic physical activity monitoring approach. This project will assist with monitoring the physical activity levels of program participants in Chattanooga, while identifying what program changes might need to take place. The purpose of this project, therefore, is not only to assess physical activity levels, but to improve physical activity levels, which would ultimately lead to a reduced risk of chronic disease of individuals.

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Fabrication and characterization of magnesium-based nanocomposites for bone implant applications
Andre Flores

Biodegradable Implants have been researched to replace the currently used permanent or semi-permanent implants. Due to their numerous issues such as inflammation, infection, and bone fractures and resorption from stress-shielding. Magnesium is a promising material because of its natural degradability and presence in the human body, its similar mechanical properties to human bones, and its superior mechanical properties compared to biodegradable polymers. However, magnesium can degrade quickly and loses its mechanical properties as it degrades. Nano-reinforcements such as Titanium Dioxide, Silica, and Boron Nitride can be added to the magnesium matrix to improve its mechanical and corrosion properties. In this work we will be manufacturing Magnesium nanocomposites through powder metallurgy. A process where powders are mixed, compacted, and sintered to make the desired composite. The Magnesium nanocomposites will be reinforced with Titanium Dioxide, Silica, and Boron Nitride, respectively. The composites tested to evaluate their tensile and compressive strengths, hardness, corrosion properties, and microstructures. The results of testing have shown that TiO_2 and BN will increase the Compressive Yield Strength, while TiO_2 will additionally increase the Tensile Strength of samples. SiO_2 will improve the corrosion behavior of the samples. The conclusions were drawn through microstructural investigations, compressive, tensile, and Vickers's hardness testing. Additionally, to test corrosion behavior Potentiodynamic Polarization testing will be conducted.

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Factual Narrative of Urban Gardening and Its Contribution to Improve Food Security
Sara Churchwell

Urban and peri-urban agriculture has become increasingly more important as urban populations swell. It is unique in that it is practiced in smaller spaces than industrial, rural agriculture. It encompasses horticulture, small livestock, forestry, and aquaculture. Horticulture involves growing fruits and vegetables in containers. Most often small livestock, such as goats or chickens, are raised for dairy and meat products. Forestry involves the use of trees lining the streets for fresh fruit. Also, aquaculture can be utilized simultaneously with horticulture to recycle nutrients and raise fish. Some advantages of urban and peri-urban agriculture include increased food security with a healthier diet and less food expenditures. Its practice potentially provides extra income by selling surplus and a shorter supply chain to businesses, which can become essential in times of crisis. Also, gardening, often through permaculture, leads the way to greener, more environmentally friendly cities. Some disadvantages exist, though. Without education, malpractice can cause environmental hazards as well as health hazards. Without proper funding, competition for resources blocks the way for many poor communities to participate. The most important resources include land, water, energy, and labor. Fortunately, if governments step in to help with education and funding, urban and peri-urban agriculture becomes available to all levels of the socioeconomic scale, and countries' economies can reap the benefits. One prime example of this idea comes from Havana, Cuba, the economic crisis it faced in the 20th century, and how the citizens fought against food insecurity. Today, urban and peri-urban agriculture has picked up steam in social media and more people than ever are actively participating and alleviating food insecurity for millions of people, essentially those living in food deserts and/or food swamps.

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Faculty Research Grant: Collage Residency Scotland
Ron Buffington

In FA22, I traveled to Sanquhar, Scotland to participate in Collage Residency Scotland. This week-long intensive was hosted by MERZ, a hub for a thriving international network of artists, makers, writers, and researchers. MERZ was modeled after the thought and practice of Kurt Schwitters, one of the 20th century's foundational collagists, as it seeks to "strike a balance between 'what was' and 'what is' to inform 'what will be.'" One of the central purposes of Collage Residency Scotland was to bring together a group of international collagists to make artwork that speaks to the rich history of upper Nithsdale. My work reimagined the ghost stories that are so ubiquitous in Scottish folklore. The work we made will be the subject of a film by David Rushton and will be used to illustrate an abridged version of William Wilson's 1904 book *Folk Lore and Genealogies of Uppermost Nithsdale*. Four of my digital collages from

the residency will also be included in an exhibition at the Knoxville Museum of Art called *Mythical Landscape: Secrets of the Vale* on display through May 7, 2023.

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Fake News Detection Using CNN and Logistic Regression
Mohammed Khalifa

The project aims to develop a fake news detection system using machine learning algorithms. The rise of social media and other online platforms has led to the spread of false information, which can have significant negative impacts on individuals, businesses, and society. The project will involve analyzing large volumes of data with text news to identify patterns and characteristics that distinguish between real and fake news. Two models will be developed: one using logistic regression and the other using convolutional neural networks.

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Fatigue life prediction of critical metallic components based on strain energy density
Saeed Ataollahi, Mohammad Mahtabi

The realistic loading condition in most of the mechanical applications is cyclic where fatigue failure is the most possible failure mode. Fatigue failure can occur under the stress levels well below the static strength of the material. Total fatigue toughness is a new energy-based approach for fatigue modeling that has shown promising correlation with fatigue life of engineering metals, shape memory alloys and polymeric materials. In total fatigue toughness method, fatigue damage parameter is defined as the sum of dissipated strain energy density (W_d), which is calculated as the area encompassed by the loading and unloading paths in a stress-strain graph, and tensile elastic strain energy density (W_e^+), which is defined as the maximum linear-elastic strain energy density that is stored in the material per each cycle. In this study, we have investigated applicability of the total fatigue toughness method on fatigue life prediction of popular engineering metals, i.e. steel, aluminum and titanium. To this end, strain-controlled fatigue tests with different strain ratios and maximum strains were conducted on specimens designed according to ASTM standards. For each of the experiments the total fatigue toughness damage parameter was calculated and the correlation with experimentally observed fatigue lives were evaluated. The results showed that the total fatigue toughness damage parameter can closely correlate the experimental fatigue data obtained for three types of materials under different mean strain conditions.

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Fault Tolerance for MPI+CUDA
Grace Nansamba

MPI+CUDA accelerates the performance of parallel applications that are memory intensive and have extremely long compute time on a single node. CUDA provides more computational power within a single node and MPI enables distribution of the work to different nodes. This work describes fault tolerance for MPI+CUDA. Interruption of a long CUDA kernel is a fundamental problem in fault tolerant MPI+CUDA applications. This is because a running kernel cannot be interrupted and thus when failure happens, recovery can only happen after the kernel is complete. This was tested using an MPI fault-tolerance approach, REINIT. From the experiments the application has to wait for kernel completion, save a checkpoint to a file or memory, and then re-initialize. The overall recovery time of the application is affected by a delay as the process must wait for the current running kernel to finish.
Nevertheless, CUDA kernels can be interrupted using signals, which can be implemented by setting a signal on a separate kernel from the compute kernel or using a host API call to set the signal. Investigation of recent CUDA features such as Multi Process Server(MPS) are used for improved signal handling. MPS supports multiple processes to use a single GPU concurrently. Recent additions to the CUDA runtime API allow threads within a kernel to terminate the kernel during the course of execution. This methodology appears promising; terminating from the host-side is also supported for recent GPU architectures.

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Finding Connections Between 2021 State Government Employment and Payroll Data by Comparing Clustering Algorithms
Leah Black

Governments spend a large amount of taxpayer money on various functions, but it's often unclear where this money goes. To address this issue, I conducted a study using the “2021 State Government Employment and Payroll Data” dataset for the state of Tennessee, comparing clustering algorithms to analyze the allocation of funds to different government functions and explore government spending patterns in the state of Tennessee. The dataset contains information on various government functions and their corresponding payroll amounts. To find connections between government functions with similar payrolls, two clustering algorithms, K-Means and hierarchical clustering, were applied to the dataset using the “Government Function” and “Total Payroll” variables as features. The goal was to find clusters of government functions with similar payroll amounts and examine their similarities and differences to find connections. The results were then analyzed to determine areas of government spending that may require adjustment. In choosing which clustering algorithm gave the best results, the results showed that the hierarchical clustering algorithm with six clusters provided the best visual representation of the breakdown of clusters, allowing for a detailed comparison of government functions. The findings of this study offer insights into government spending patterns, aiding policymakers in making timely and informed decisions in the allocation of

resources and funding. Overall, this project demonstrates the usefulness of clustering algorithms in exploring government spending patterns and identifying areas of potential overspending or underspending. By providing a better understanding of where taxpayer money goes, our study has important implications for the accountability and transparency of government spending.

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Food Desert Identification and Elimination System
Sandra Affare, Nyssa Hunt

The purpose of this project is to foster the development of technology-savvy youth by applying modeling and simulation to aid in solving e a real-world problem, limited access to fruit and vegetables in food deserts. The project's outcome will be a food desert identification and elimination system driven by computation and data layers. The computation layer is composed of machine learning algorithms supported by mathematical models and data analytics that can be used to predict food desserts and simulate mitigation techniques to prevent their expansion. The data layer consists of know GIS data sets and remote resources that will be used to simulate ideal food pantry placements.

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Forecasting COVID-19 Outcomes Using Deep Learning LSTM Models with Google Trends
James Pritchard , Lan Gao

Accurately forecasting the number of new COVID-19 cases and recoveries in the short term is crucial for optimizing available resources and slowing the spread of the disease. Deep learning models, including Recurrent Neural Network (RNN) and Long Short-Term Memory (LSTM), have shown significant improvements in handling time-series data in various applications. In this study, we apply LSTM models to forecast COVID-19 cases and deaths using web search volumes of selected keywords from Google Trends, along with confirmed cases and deaths data from the CDC. Our results demonstrate the promising potential of deep learning models in forecasting COVID-19 outcomes, showing superior performance compared to other algorithms.

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FROM STUDENTS TO CITIZENS: THE IMPACTS OF AN INTERGENERATIONAL PROGRAM ON UNDERGRADUATE STUDENT DEVELOPMENT

Morgan Robinson, Makayla Hall

Undergraduate education can strengthen its focus on developing ethical and social literacy in students through incorporating service programs based in experiential learning. Prior research demonstrates experiential learning augments students' learning outcomes, perceived meaning of education, and social competencies. Experiential learning incorporating intergenerational communication promotes understanding of aging, value placed on service, and sheds light on unforeseen skills and goals for students. This study evaluated the impacts of an intergenerational experiential learning program on character social, and educational development outcomes in students. Further, the study explored the benefits of such programs for older adults. Ultimately, the program developed students' character relevant to finding purpose, recognizing strengths, showing gratitude, developing coping strategies, and making goals for the future. In reference social development, the program improved their skills for relationship building, attitudes toward older adults, and perspectives regarding intergenerational interactions. Qualitatively, participants collectively endorsed themes of character development, relational development, and intergenerational transfer.

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From the Ground Up: Exploring the Link between Soil Quality, Plant Health, and Human Health

Tarik Dedovic

The relationship between soil quality, plant health, and human health are interconnected in a complex and delicate web where the actions of one affect the other. Throughout history, this complex yet elegant dance between the three can be seen. It is most notably seen in farming, as humanity has used farming for thousands of years to survive. Understanding the delicate balance between soil quality and plant health has allowed humanity to thrive. In this paper, I intend to explore how soil quality affects plant nutrition and health, ultimately affecting the overall health of humanity. Defining and illustrating the connections between the different groups will provide a greater understanding of the importance of each group and how they affect each other.

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Gaps in Current Wetland Mitigation Policies for Southern Appalachian Amphibians
Rachel Rose, Hannah Fallon, James Anderson, Micheal Fava, Juliana Mynatt

The nation-wide decline of amphibian populations can be attributed to a multitude of anthropogenic and non-anthropogenic sources ranging from disease, pollution, habitat modification, and a multitude of other factors. There are current measures in place to reduce the lost habitat through wetland and stream mitigation practices, but evidence shows that these measures such as wetland credits, riparian buffer lengths, and habitat corridors are not geared to protect amphibian populations from the effects of urban sprawl, habitat fragmentation, and industrial development. The current management policy produced by the Tennessee Department of Conservation (TDEC) and Tennessee Wildlife Resources Agency (TWRA) does not mention the health of amphibian populations in mitigation practices although they are considered a bioindicator species and have a vital role in the aquatic ecosystem. Therefore, the following literature review will focus on local and state policy in conjunction with current scientific data from counties within and around Chattanooga, TN where a multitude of wetlands and freshwater streams occur and have evolutionarily cultivated the highest biodiversity of salamanders in the world. Based on findings in the review, suggestions for reform will be generated for future considerations in amphibian conservation policy.

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Generation of Novel N,N-Chelating,*Trans*-Spanning Ligands
Luke Hair, Nick Ribeiro

The nature of ligand coordination can impact the reactivity and properties of transition metal compounds For instance, it has been shown that Pd(II) systems with trans-N,N-chelating ligands can be more effective at catalyzing cross-coupling reactions and C-H activation reactions than cis-chelating Pd(II) systems. Despite this, very few of these N,N-chelators exist. Our group is currently focused on trans-bidentate ligands that have increased conjugation than the previously reported 1,2-bis(pyridin-2-ylethynyl)benzene system, as well as exploiting metallohinged ligands to form trans-bidentate ligands. To prepare more conjugated N,N-chelating trans-spanning ligands, 2-ethynylquinoline (HC_2Qu) can be prepared in 42% yield from 2-bromoquinoline in two steps. This can then be appended to diiodobenzene through a Sonogashira coupling to afford $Ph(C_2Qu)_2$. This ligand can coordinate to Pd(II) to give $Ph(C_2Qu)_2PdCl_2$. Crystallog. anal. reveals a square planar geometry and a series of weak C-H---Cl interactions and weak C-H---pi interactions that connect neighboring complexes. Synthetic routes to similar, more conjugated ligand systems derived from quinoxaline cores are also described.

Regarding the metallohinged ligands, it has been shown that $Cp^*_2Ti(C_2$2-py)2 (where $HC_2$2-py = 2-ethynylpyridine) can coordinate PdCl2 in a trans fashion. The C-Ti-C bond angle of this compound is 90°, which suggests that octahedral transition metals compounds with cis-bound -

$C_2$2-py ligands could act as trans-bidentate ligands. We describe our initial progress in synthesizing the metallohinged ligand system Cp*Co(PR_3)($C_2$2-py)$_2$.

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Homelessness Factors & Risks
Dylan Bell

The issue of homelessness is one that impacts every country and is present regardless of resources being offered. Understanding where resources need to be directed is a difficult task, and relies on a deep understanding of what causes homelessness. There are a significant number of factors that might lead to homelessness, such as: Age, Gender, Health, and Military Service. Analyzing the ties these factors have on becoming homeless can help direct resources to those who are at-risk for homelessness. By looking at data sets of previous homeless individuals with data analytics methods, such as Cluster analysis and Data Trees, major factors for homelessness can be identified. The data resulting from this analysis will hopefully identify the individuals at the highest risk of homelessness prior to it occurring.

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ICU COVID-19 DATA ANALYSIS ON SIRIO LIBANES' HOSPITAL DATA
Kwaku Boateng

The purpose of this project is to analyze the factors that exacerbate(worsen) Covid-19 symptoms (whether or not it calls for ICU). The project considers factors like gender, age, lifestyle behaviors (such as abiding, or not abiding by Covid Protocols), certain pre-existing health conditions (including immunocompromised states, and comorbidities placed into disease groups: 1 to 6), lab clinical signs, or vitals like lactate, respiratory rate, urea, and others.

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ICU Healthy Work Environment and Empowerment
Derek Free

Healthy Work Environments and Nursing Empowerment correlate directly with Intensive Care Unit (ICU) burnout, turnover, job satisfaction, and mortality. Among nurses, high rates of burnout, lack of communication and collaboration, staffing, climate, and healthy work environments were identified as leading causes of the current nursing staffing crisis and contributed to The Great Resignation. After a review of historical and current literature, a research question was formed and asked, "Among critical care providers and staff, how does the implementation of a Healthy Work Environment Protocol, compared to current practice,

impact Skilled Communication, True Collaboration, and Meaningful Recognition over a six-month period?" A Quality Improvement (QI) project was designed with qualitative and quantitative measures to estimate the health of the ICU work environment utilizing a survey from the American Association of Critical Care Nurses and to measure empowerment with the Sieloff-King Assessment of Work Team/Group Empowerment Within Organizations. Assessments will be administered pre-, mid, and post-intervention after implementing an ICU Multidisciplinary Rounding Tool, twice-daily unit huddle, and a tracker for recognizing staff teamwork with meaningful recognition. Implications for this research include valuable insight into the overall health of the work environment compared to national averages and an understanding of how interventions affect Skilled Communication, True Collaboration, and Meaningful Recognition as a solution to ICU turnover, burnout, and job satisfaction.

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Identifying personal energy and recovery patterns and their impact on well-being
Emma Vosika

The study was designed to examine patterns of personal energy expenditure and recovery, and how these patterns are associated with health and well-being. Data were collected via longitudinal, mixed method survey of a diverse sample of 121 working student and non-student adults. Measures included multiple existing tools, including: the Utrecht Work Engagement scale (UWES), Profile of Mood States (POMS), Recovery Experience Questionnaire (REQ), and items pulled from the National Institute of Occupational Safety and Health (NIOSH) Worker Well-Being Questionnaire (WellBQ). A variety of analyses were used including repeated measures ANOVA and Latent Growth Curve Modeling. Proposed results include identifying "in-sync" and "out-of-sync" patterns of energy levels and quality of recovery that have different impacts on well-being.

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Implementation of a Cardiogenic Shock Protocol
Kristi Boggess

Bedside intensive care unit (ICU) staff are essential in evaluating, caring for, and treating patients with cardiogenic shock. Early recognition and diagnosis of cardiogenic shock by a bedside clinician can prevent further deterioration and improve outcomes. The frontline members of the healthcare team in the Cardiovascular Intensive Care Unit (CVICU) include critical care nurses and extracorporeal membrane oxygenation (ECMO) specialists. It is important to provide resources, protocols, and education to these clinicians to utilize their knowledge, expertise, and skills to escalate the needs of appropriate patients.
The driving question for this quality improvement project to be addressed is in the CVICU registered nurses and ECMO specialists, how does the implementation of a cardiogenic shock

protocol and education program, compare to the current practice, impact the self-efficacy and competency to recognize cardiogenic shock and refer to the ECMO team. The project will evaluate the competency, knowledge, and self-efficacy of the CVICU nurses and ECMO specialists before and after the implementation of a cardiogenic shock protocol and educational program. One goal is to improve self-efficacy and competency in CVICU nurses and ECMO specialists. Another goal of the implementation process is to impact referrals to the ECMO team for advanced cardiac support.
In conclusion, I feel that utilizing a multidisciplinary approach to include the ICU staff may aid in early detection and escalation to the next-level provider. An educational program and cardiogenic shock protocol are expected to increase the bedside clinicians' knowledge, skills, and confidence and guide them in the escalation of care. The combination of education and a standardized protocol to escalate care will be an initial intervention that could lead to improvement in the clinical area. Overall, the outcome of this QI project is to improve patient care and quality for this patient population.

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Implementation of an Evidence-Based Mindfulness Program via CRNA Clinical Faculty: An Improvement in Stress, Burnout, and Self-Compassion for Anesthesia Providers
April Summers

Abstract
Aim
Provide certified registered nurse anesthetists (CRNA) clinical faculty with the needed tool for implementation of a mindfulness program with student registered nurse anesthetists (SRNA) participants.

Importance
Mindfulness is being aware of the current situation without focusing on the past or future events. Equipping nurses with mindfulness exercises and techniques can help develop tools for managing and mitigating occupational stress.

Settings and Participants
University of Tennessee at Chattanooga (UTC) School of Nursing CRNA Program clinical faculty.

Change Theory
Kotter's Eight Step Change Model (Pollack & Pollack, 2014).

Methodology
The UTC CRNA clinical faculty will be educated on how to manage the LEVELHEAD-ED© Mindfulness Program through an educational video, resource guides, and PowerPoint deck. Measurement will include a post training faculty survey and pre and post SRNA participant surveys.

Keywords: nurse, mindfulness, stress reduction, self-compassion, and burnout.

References

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Implementation of an Interdisciplinary Advance Care Planning Education Program in a Value-Based Telehealth Practice

Kami Carlson

The purpose of this project is to establish an advance care planning (ACP) educational documentation protocol for an interdisciplinary team (IDT) caring for high-risk patients via telehealth. The IDT is comprised of nurse practitioners, registered nurses, and social workers who work in a value-based telehealth clinical practice serving 28,000 Medicare and Medicaid beneficiaries across eight states. The IDT will complete a pre-assessment of their advance care planning self-efficacy (ACP-SE)(Baughman et al., 2017). The IDT will complete an educational protocol using an evidence-based curriculum from the End-of-Life Nursing Education Consortium (ELNEC) (End-of-Life Nursing Education Consortium, 2022). The IDT will be coached to document more thorough ACP conversations using a template in the electronic medical record (EMR). Upon successful completion of the ELNEC curriculum, the IDT will be monitored for ACP conversation documentation within the EMR, post-education ACP-SE improvement, and decreased inpatient admissions for the highest-risk patients within the clinical practice. By educating the IDT to elicit goals of care and document end-of-life values conversations for those at high risk for death, patients should experience death with dignity, and the healthcare system should actualize more appropriate healthcare utilization at the end of life for impacted patients.

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Improvement of Perceptual-Motor Performance among Elite Athletes with and without History of Sport-Related Concussion

Gary Wilkerson

Objective: To identify perceptual-motor performance differences between athletes with sport-related concussion history (HxSRC) and those without such history (NoSRC) and to assess the potential for upper extremity (UE) training to improve whole-body (WB) reactive performance.
Design: Cohort study
Setting: Residential training center

Participants: Elite athletes (ages 18-34; 12 males, 8 females); HxSRC reported by 10 (5.6 ±5.2 years prior) and denied by 10.
Intervention: One-minute UE training sessions completed 2-3 times per week over a 3-week period, which involved deactivating randomly illuminated buttons and identifying center arrow direction for 20 flanker test trials (
Outcome measures: Pre- and post-training assessments included UE and WB reactive responses. Key metrics included flanker test conflict effect (CE: incongruent minus congruent reaction time) and composite WB asymmetry (Asym) derived from averaged reaction time, speed, acceleration, and deceleration values for left versus right lateral movements.
Results: Pre-training discrimination between HxSRC and NoSRC was evident for CE 80 ms (79% PPV; 62% PPV) and WB Asym 18% (100% PPV; 71% NPV). Participants completed 6 training sessions, which improved UE reaction time from 848 ±119 to 646 ±68 ms (P
Conclusions: Suboptimal perceptual-motor performance may be a subtle long-term manifestation of HxSRC, which appears to be modifiable through UE training.

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Improving Drinking Water Quality of the Gerace Research Centre, San Salvador, the Bahamas
Dawn Ford

The UTC Honors Students completed a service project at the Gerace Research Centre on San Salvador, the Bahamas. This project involved cleaning the rain catchment basin that is used to collect rainwater for drinking water use. This poster presentation explains the project and the benefits of improving drinking water quality for the field station and island residents.

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Improving Medication Reconciliation in Outpatient Psychiatry: Implementation of an Evidence-based Electronic Health Record Medication Reconciliation Tool and Protocol.
Gina Beckford

The purpose of this Doctorate of Nursing Practice (DNP) Translational Project is to address a gap in practice related to the lack of a standardized process and protocol for performing medication reconciliation among mental health care providers and staff at an outpatient community mental health center (CMHC) in northern Texas. The lack of a standardized process and protocol for performing medication reconciliation increases the likelihood of medication discrepancies and the potential for patient harm associated with adverse drug events (ADE). Several factors increase psychiatric patients' susceptibility to experiencing an ADE, including medical comorbidity, multiple prescribers, polypharmacy, poor insight, and substance abuse, elucidating the importance of this DNP Project. This project aims to address the clinical question, "in psychiatric providers and support staff, at an outpatient CMHC in northern Texas, how does the implementation of an evidence-based EHR medication reconciliation tool and

protocol, compared to current practice, affect medication reconciliation practices, over six months?" Expected outcomes and impacts of this project include: improved accuracy and consistency of medication reconciliation, reduced medication discrepancies, and minimized potential for patient harm caused by preventable ADEs. Kotter's Change Model will be utilized to help guide the implementation of this project and enhance sustainability.

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IMPROVING VANET SIMULATION CHANNEL MODEL IN AN URBAN ENVIRONMENT VIA CALIBRATION USING REAL-WORLD COMMUNICATIONDATA
Ahmed Gammaa

Wireless communication channels in Vehicular Ad-hoc NETworks (VANETs) suffer from packet losses, which severely influence the performance of their applications. There are several reasons for this loss, including but not limited to signal interference with itself after being reflected from the ground and other objects, the Doppler effect caused by the speed of the vehicle, and buildings
and other vehicles blocking the signal. As a result, VANET simulators must be calibrated in order to mimic the behavior of real-world vehicular communication channels effectively. In this paper, we calibrated an OMNET++(Objective Modular Network Testbed in C++)/Veins simulator for VANET's dedicated short-range communications (DSRC) protocol using the field data from the urban testbed in Downtown Chattanooga, TN. Channel propagation models, as well as physical layer parameters, were calibrated using a Genetic Algorithm (GA). The performance of the calibrated simulator was improved significantly in comparison with the default settings in Veins..The final results were compared to the real-world data collected from the testbed and performance shows that the final calibrated channel model performs better than uncalibrated models in simulating the packet delivery pattern of DSRC channels

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In Search of the Time-Dependent Operator in the Dynamic Mode Decomposition
Mohammad Murshed

Dynamic Mode Decomposition (DMD) is a data-driven modeling tool that creates a model based on the spatio-temporal data. The standard DMD uses a mapping matrix or operator that stays constant as new states in time are predicted. We aim to design a variant of DMD that can update this mapping operator over time. Another aspect to be explored is the DMD in the observable space which enables identification of non-linearities in the dynamics. Some numerical examples will be discussed to demonstrate the performance of this time-dependent operator based DMD.

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Integrating Social Determinants to Prepare for Pandemics and Promote Health Equity
Selin Kaplanoglu

The COVID-19 pandemic has amplified the underlying disparity in our current healthcare system and the importance of social determinants of health. It is imperative that we take social factors into the preparation and prediction of future pandemics. Given the prevalent availability of personal digital social and behavioral data, it is also imperative to develop methods and technologies that protect the privacy and improve social trust in pandemics prevention. Here we aim to survey and summarize the current status and trends on using social and behavior information in pandemic prediction and prevention. We will also explore how machine learning techniques can be used to detect mis- and disinformation. We will discuss the potential of the secure federated machine learning techniques that can protect privacy and promote trust.

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Interaction between the FixL kinase and its feedback inhibitor
Emarie Travers

Bacterial cells live in many diverse environments, and thus, must have mechanisms to respond to their surroundings. This sensing is commonly executed using two-component signaling systems (TCSs). TCSs consist of a histidine protein kinase and a response regulator that propagate signal(s) via a phosphotransfer mechanism. In response to environmental stimuli, autophosphorylation occurs at the histidine kinase. The histidine kinase then transfers the phosphoryl group to a cognate response regulator, which elicits a cellular response, often via changes in gene expression. The FixLJ system in *C. crescentus* is a two-component signaling system that responds to low oxygen and can serve as a model for feedback inhibition. Previous research found that FixT acts as an inhibitor of FixL autokinase activity. However, the molecular mechanism by which FixT inhibits FixL is not well understood. Genetic screening has identified specific amino acid residues on FixL that may contribute to the interaction between FixT and FixL. This project aims to analyze the importance of these FixL residues through direct FixL-FixT interaction experiments. A better understanding of the FixT inhibitory mechanism will shed light on biological strategies for histidine kinase regulation. Moreover, as FixL and related kinases play vital roles in pathogens and symbionts, our work may aid in the development of antimicrobial agents.

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Invasive and Native Fish Microbiomes: Identifying and Comparing the Inhabitants of Fish Guts
William Hanson-Regan

Previous studies have provided evidence that different microbiomes may give invasive species an edge over native ones. However, most of the work in this field has examined invasive plants and insects. We hypothesize that the fish microbiome might also play a role in invasive species' ability to rapidly adapt to new environments following introduction. To examine this, we compared the microbiomes of invasive and native minnows across various environmental conditions.

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Investigating the Impact of the COVID-19 Pandemic on Occupational Therapy Practitioners
Hannah Afman, Cynthia Coronel , Mckenna Menard, Kaitlin Crump, Caitlin Murphy

The COVID-19 pandemic significantly impacted healthcare workers in all settings, including occupational therapists (OTs). While the impact of COVID-19 on other medical professions has been studied, limited research has examined how OT practitioners were affected. The purpose of this research was to investigate the factors of the pandemic that led to shifts in practice such as PPE, quality of care, potential for burnout, and implications for practitioners' mental health. We conducted a mixed methods study on 70 survey participants and 11 focus group participants, gathering insight from OTRs and COTAs on their experience of working in a variety of settings during the pandemic. Focus group data was transcribed and analyzed by researchers, and Qualtrics was used for survey data analysis. The emergence of telehealth, use of PPE, and additional OT roles and responsibilities were three major changes in practice. Both institutional support and emotional support primarily from coworkers, but also other healthcare professionals were found to contribute to a positive experience for OT practitioners. This research can be used to identify and implement necessary supports for OTs to ensure successful practice in the face of a continuing COVID-19 pandemic.

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Investigation of Reinforcement Learning in Subgrid-Scale Modeling in Large Eddy Simulation
Amin Amiri

Subgrid-scale (SGS) modeling in Large Eddy Simulation (LES) has gained significant attention in recent years due to its critical role in determining the accuracy and realism of LES simulations. The SGS model is essential in providing an estimate of the impact of turbulence that is not resolved on the resolved scales, enabling the simulation to more accurately predict turbulence-induced mixing and transport of heat, mass, and momentum. SGS modeling also enhances simulation stability and robustness by preventing the buildup of numerical errors.

Reinforcement learning (RL) has been a promising approach for SGS modeling in LES in recent years. The essential advantage of using RL is its ability to learn from a relatively small amount of high-fidelity data or low-fidelity models, addressing the challenge of limited data availability. This work investigates RL's advantages and potential use in SGS modeling in LES.

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Investigation of Reinforcement Learning in Subgrid-Scale Modeling in Large Eddy Simulation
Amin Amiri, Reetesh Ranjan

Reinforcement Learning (RL) presents a paradigm shift in subgrid-scale (SGS) modeling. It offers a data-driven approach to modeling the more minor scales of turbulence rather than relying on assumptions and simplifications.
The traditional approach to SGS modeling has relied on closure models, which are based on empirical or semi-empirical assumptions that may not accurately capture the complex physics of turbulent flows. This often leads to limitations in the accuracy and applicability of the models, particularly in complex engineering systems where turbulent flows are prevalent. This work investigates RL's advantages and potential use in SGS modeling in LES.

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IoT Forensics: A Knowledge Graph Question Answering Approach
Ruipeng Zhang

In this study, we present a novel *Internet of Things (IoT) forensics framework that employs knowledge graph question answering (KGQA)*. Our framework enables investigators to access forensic artifacts and cybersecurity knowledge using natural language questions facilitated by a deep-learning-powered KGQA model. The proposed framework demonstrates high efficacy in answering natural language questions over the experimental IoT forensic knowledge graph.

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K-Means vs. DBSCAN: Analysis with Examples
Jesse Springston

In data science, clustering is the process of dividing data sets into groups, called clusters, in which each point is more similar to the other points inside of the cluster than those outside of it. Two commonly used algorithms for clustering are K-Means and Density Based Spatial Clustering for Applications with Noise (DBSCAN). This project will apply both algorithms to a data set containing the coordinates of water quality monitoring stations in the U.S. State of California, and determine which algorithm divides the data more evenly and efficiently.

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Kokkos-Enhanced ExaMPI
Evan Suggs

Kokkos provides in-memory advanced data structures, concurrency, and algorithm to support advanced C++ parallel programming. MPI provides the most widely used message passing model for inter-node communication. Many programmers use both Kokkos and the Message Passing Interface (MPI) together. In this thesis, Kokkos is integrated within an MPI implementation to obtain performance and functionality benefits both for the MPI itself, and for applications that use both Kokkos+MPI. For instance, it will be possible in this model to pass first-class Kokkos objects directly to extended C++-based MPI APIs.

In particular, efforts to achieve this type of integrated model is expressed using ExaMPI, a C++17-based subset implementation of MPI-4 developed at UTC with collaborators. Working with C++-friendly APIs, and Kokkos extensions, examples of the benefits of functionality and performance are shown. We explain why direct use of Kokkos within the certain parts of the MPI implementation are crucial to getting added performance in addition to expressivity.
We also motivate why making Kokkos memory spaces visible to the MPI implementation generalizes the idea of ``CPU memory'' and ``GPU memory'' in ways that provide for further optimizations in heterogeneous Exascale architectures.

Besides showing the current state of the prototype, we describe future goals, and show how these mesh both with a possible future C++ API for MPI-5 as well as the potential for accelerating MPI on architectures that incorporate accelerators.

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Kyle D. Ford
Kyle Ford

The National Football League (NFL) represents one of the largest professional sports leagues in the world. Its popularity continues to grow, making it one of the prominent sports and entertainment platforms around the globe. As such, the ways in which the game is consumed has changed dramatically with access to technology and other digital services. One of the biggest ways in which the way the NFL is consumed has changed is through the legalization of sports betting in the United States. In 2021, sports betting in the United States became legal at the federal level, opening up massive revenue opportunities for the league and sportsbook companies. A billion-dollar industry was born with the decision to legalize sports betting. With the introduction sports betting came an increased appetite to be able to predict the outcomes

of NFL games. Sports bettors and sportsbooks became extremely interested in any advantage they could gain in correctly picking the outcome of a game. Hence, it can be argued that models designed to predict the outcome of NFL games have never been more in demand, and their accuracy never of more vital importance. This paper will review several currently existing models and evaluate the efficacy with which they predict NFL match outcomes. These models vary in their approach and include linear, logistic, random forest, and stochastic models, among others. Finally, we develop our own logistic regression model using game log data from the 2010-2019 NFL seasons in an attempt to develop a high accuracy model that can predict the outcome of NFL games. Special attention is paid to specific predictive attributes which drive the model.

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Let There Be Light: Developing the Mystical Luminosity Experience Construct and Scale
Jonathan Dinsmore

Light of a transcendental or divine nature is widely described in various mystical and religious traditions, and light with mystical qualities is reported in many nonordinary experiences studied today, most notably near-death and mystical experiences. Despite its significance to contemporary experiencers and much of religion and mysticism, empirical investigation of this phenomenon has been scant and scattered, and its quantitative measure has consisted of small numbers of items on a few scales measuring more general constructs. While the concept that this may be a unified phenomenon appearing in different ways and experiential contexts has been discussed in theoretical and philosophical work, no empirical investigation has yet explored it. This study aims to solidify mystical luminosity experience as a psychological construct for scientific study, by synthesizing existing theory and empirical findings into a working theoretical model and developing and validating a scale for its measurement.

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Market Basket Analysis
Elharith Mohamed

Market Basket Analysis is a data mining technique that examines customer buying habits. The goal of Market Basket Analysis is to identify patterns of product co-occurrence. It helps businesses discover which products tend to be purchased together. This information is used to make targeted marketing decisions, optimize product placement, and develop effective promotional strategies. Market Basket Analysis is a powerful tool for understanding customer behavior and driving business growth.

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Mathematical model and algorithm to identify a hub location
Eric Onyame

This study proposes a novel extension to the smallest enclosing circle problem, which finds the minimum radius circle that encloses a set of circles with known centers and radii. The objective of our research is to determine the optimal feasible number of subgroups on a Euclidean plane that covers a set of demand points and locates the minimum radius circle that encompasses them to build a
healthcare communication hub. We minimize the distance between demand points and facilities using a nonconvex-nonlinear optimization model. We use a conic programming-based approximation algorithm to solve the model.
Our algorithm's effectiveness is demonstrated using diverse hypothetical and real-world scenarios, achieving reduced facility setup costs and optimal minimum radius for the communication hub location.

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Mechanistic Study of Antibacterial Activity by Photoactivated Double-Stranded DNA Cleaver
Alexis Tidwell, Teresa Fraley, and Wang-Yong Yang

The critical role of antibiotics in healthcare is being precluded due to a rise in antibiotic resistance. Every year, drug-resistant bacteria cause over 2 million infections and 23,000 deaths in the United States alone. Because bacteria are evolving to withstand even the most potent of antibiotics, various methods of inhibiting their adaptations are necessary to explore. C-Lysine conjugate, an effective photoactivated double-stranded DNA cleaver, was tested for its potential antibacterial activity, and promising results were observed: 0.5 mM and 7.5 mM of IC_{50}s against the gram-positive strain (*S. aureus*) and the gram-negative strain (*E. coli*), respectively. In this study, we investigated to identify if the compound initiates apoptosis-like cell death, the bacteria version of programmed cell death, and possible mechanisms of DNA damage such as base oxidation.

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Microclimate conditions are important factors to consider when assessing ecosystem function in urban bioretention gardens
Sydney M Gibson

Bioretention gardens are an important type of green infrastructure that can improve wastewater treatment, filtration, and pollutant control in urban areas. Because of the presence of impervious surfaces and harmful chemicals in urban areas, bioretention gardens are being utilized to minimize the harmful effects on waterways and human communities. A study was

done using tea bags to determine the rate of decomposition of a bioretention garden using a four-week and 12-week study. 60 tea bags were randomly placed along sections within the respective garden and decomposition rates were calculated every four and 12 weeks based on changes in tea bag weight after drying for 48 hours. Temperature and rainfall were recorded daily around 12:00pm and compared to the change in weight recorded at four and 12-weeks. It was determined that the change in weight in tea bags from four to 12-weeks in the biorientation garden was significant by comparing the change in tea bag weight of the 30 tea bags collected at four weeks and the remaining tea bags collected at 12 weeks. This supports the idea that the native biodiversity from the bioretention gardens improves rates of decomposition in urban environments which can have positive effects on urban communities.

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MPL: Implementing Support for Asynchronous Communication
Caspar Alsobrooks

MPL is a header only, C++17 based message passing library meant to introduce native C++ bindings for MPI (message passing interface). Our subset of this library, MPL subset, is a compacted version of this library. The goal of MPL subset is to improve the ease of use of MPI for C++ programmers by creating an MPI library that utilizes cutting-edge C++ features and can support many different types of communication. This poster will discuss specifically the implementation of support for asynchronous (one-sided) communication into the MPL subset.

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Multidimensional Analysis of the Global Spread and Evolutionary Dynamics of the Pandemic H1N1 Influenza Virus (pdm09) using GISAID Data
Mohammad Aman Ullah Al Amin

Pandemic H1N1 caused a global pandemic during 2009-2010. GISAID data was used to study a new H3N2 virus with genetic material from swine lineage and to monitor the global spread of the virus.
This research highlights the power of GISAID data in understanding the spread and impact of influenza viruses on different populations and regions. By analyzing demographic factors, geographic distribution, and subtype-specific characteristics, researchers gain insights into which virus lineages affect humans most and how the virus spreads across different regions and populations. These insights can be used to develop targeted prevention and control strategies for future influenza outbreaks. Pairwise Differential Population Growth Rate is being calculated to estimate the relative progression of a specific subtype(A/H1N1) concerning other subtypes using a Log-transformed ratio.

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Nest Competition and Sexual Selection in the Sand Goby
Carter Jordan

Resource availability affects mating dynamics by determining which individuals enter the mating pool. In many species, individuals must first compete for resources that are required for mating, and only after acquiring resources can individuals enter the mating pool and engage in competition for mating opportunities. In a fish with paternal egg care, the sand goby (Pomatoschistus minutus) parental males must compete for, and acquire, nests prior to engaging in competition for access to females. Nest competition has previously been found to impact sexual selection in this species, although we still do not fully understand its impacts on mating dynamics in this system. To explore the effect of nest competition on mating dynamics in the sand goby, we compared nesting and mating success of males in three treatments: 1) two males competed for a nest, and the winner was allowed sole access to females; 2) two males competed for a nest, and the loser was allowed sole access to the nest site and females; and 3) one male had sole access to a nest site and females. We compared nesting and mating success for males across treatments and explored: 1) whether male size is correlated with nesting or mating success, and 2) whether 'loser' males become 'winners' in mating if given access to a nest.

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Next-Generation Learning Laboratories with the Metaverse
Khalid Tantawi, Sean Rascoe

In this work, we present a remote engineering laboratory that provides a hands-on experience for students by running a physical system via interacting with a digital twin of the system in the metaverse. A virtual system that is a replica of physical Start-Stop and Forward-Reverse Control systems of a DC motor was developed. The real and the virtual training systems were built by students of the Electric Machinery course. The user interacts with the virtual system in the Metaverse in a way similar to the interaction with the real system. Current phase of the project is to connect the virtual system via IoT-enabled sensors to the real system to form a digital twin of it.

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Nooga-Plex, Attached Housing Design
Landon Parker, Caleb Traxler, Daron Lyons, Lina Abdelkarim, Robyn Wood, Blake Burba, Jacob Ridenour, Kenisha Gardner

Along with ongoing gentrification in urban areas, Chattanooga, Tennessee has faced an affordable housing crisis, which has become more challenging for low-income urban residents in recent years. Chattanooga Neighborhood Enterprise (CNE), a local nonprofit housing development organization, has been working on low-income urban residents' housing issues. One of CNE's projects includes the development of affordable housing including 2-story attached housing with six units. Our partnership with CNE, proposes NoogaPlex, a new energy-efficient 2-story six-plex structure for the Ridgedale neighborhood, where the average median household income falls around 25K. With low utility costs due to high energy efficiency and passive design, NoogaPlex proposal aims to contribute to stable and viable neighborhoods in Ridgedale.

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Numerical Investigation of Physical and Modal Characteristics of Stably Stratified Turbulent Channel Flow
Steven Thompson

Stably stratified turbulent flows can be found in many flow systems, ranging from engineering applications to environmental flows. The density variation in such flows, particularly that observed in water bodies depends on temperature and salinity fields through an equation of state (EoS). The diffusion of the temperature and salinity fields can differ, which can lead to a differential diffusion phenomenon. This furthers the complexity of stratified turbulence, where the density stratification is known to alter the dynamics of turbulence by affecting the small-scale mixing, large-scale circulation, and inter-scale interaction. We present results from direct

numerical simulations of stably stratified turbulent channel flows focusing on examining the effects of stratification, the role of linear versus nonlinear EoS, and the differential diffusion phenomenon. In particular, we focus on examining the physical and modal characteristics of different cases to understand the behavior of turbulent transport, spectral characteristics, anisotropy, and the internal waves to highlight the role of stratification, types of EoS and differential diffusion.

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Numerical Study of Wall Temperature Effects on Shock-Wave Turbulent Boundary Layer Interaction
Eli Durant

Shock-wave turbulent boundary layer interaction (STBLI) occurs in many high-speed flow applications such as re-entry vehicles, air-breathing engines, rocket nozzles, etc. STBLI is a complex phenomenon that can cause intense thermo-mechanical loading, induced flow separation/reattachment, and low-frequency unsteadiness. In aerospace applications, the effects of STBLI can lead to catastrophic structural failure or loss of control during high-speed flight. The present study investigates the effects of the wall temperature on key features of shock-wave turbulent boundary layer interaction, such as boundary layer development, surface pressure, skin friction coefficient, and separation dynamics. The computational setup closely follows past experimental studies and considers supersonic flow over a 24° compression ramp with a Mach number of 2.9. The effect of wall temperature is examined by performing tests at 3 wall temperatures, corresponding to a cooled wall, a low-degree heated wall, and a high-degree heated wall.

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Nurse Manager Resilience: Unlocking the Ability to Prioritize Personal Wellbeing
Jared Dougherty

Nurse managers are in unique positions to inspire and motivate teams; however, recent strains brought about by the COVID pandemic have contributed to an increasing departure of nurse managers from their roles. This project aims to examine the evidence regarding nurse manager resilience and professional quality of life, review national and organizational nurse manager turnover trends, and evaluate the appropriateness of an educational series as a feasible intervention. The Doctor of Nursing Practice (DNP) student aims to implement a translational project that answers the following question: Among nurse managers in North Texas hospitals belonging to an expansive for-profit healthcare system, how does implementation of an evidence based, resilience-focused educational series, compared to current practice, improve nurse manager resilience, enhance professional quality of life, and decrease intent to leave over a six-month period? The ability to accurately identify nurse manager stressors is critically

important, as is the construction of an educational series that allows for the exploration and mitigation of emotional drain and fatigue as well as the enhancement of perceived support through peer networks. The DNP student's educational intervention is rooted in three primary concepts of resilience: self-care, accountability, and reflection. This project is intended to add to the body of literature regarding nurse manager resilience, identifying meaningful interventions that can positively impact nurse manager resilience and quality of life while mitigating turnover.

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OPTIMAL-PREP MOTOR LEARNING STRATEGIES IMPROVES QUADRICEPS PEAK TORQUE IN PATIENTS WITH ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Ryan Mayfield, Evan Harper, Levi Grace, Jenny Hogg

Employ training strategies to rapidly improve quadriceps function (i.e., strength and rate of force development). Thirteen participants volunteered in a two-treatment crossover design study where a control test, and a motor learning test were implemented. Each participant was instructed to perform a knee extension/knee flexion exercise "as hard an as fast as possible". For the motor learning condition, participants were additionally told that "research shows that if you focus on moving the graph on the screen you will exhibit greater quadriceps output" Additionally, participants were also given the choice to select what graph type they saw while performing the exercise (external stimuli). All exercises were performed on a Biodex isokinetic machine in the HHP building on the University of Tennessee Chattanooga Campus.

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Optimizing Sorbent/Substrate Networks for Enhanced CO2 Scrubbing: A Computational Approach to Improving Carbon Capture with Phase Change Materials
Evan Gildernew, Sungwoo Yang

We optimize sorbent/substrate networks for enhanced CO2 capture and reduced rate-limiting enthalpies. Using Dolfin-adjoint, our optimization framework solves a fluid-structure interaction (FSI) coupled adsorption finite element analysis (FEA) script by iteratively assessing a function of interest and its gradient. This function represents the distribution of a phase change material (PCM) embedded uniformly in the sorbent/substrate, aiming to minimize temperature fluctuations and improve capture/release cycling. By concentrating on CO2 scrubbing, we seek to address the critical need for next-generation designs to achieve effective air purification solutions in recirculated air environments.

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Perceived Stress and Self-Care
Miranda Neuberg, Kelcey Foxx, Kyra Daley, Texas Muckle, Jasmine Joyner, Riana Mahlo

Our study looks at the relationship between perceived stress and self-care. Participants participated in an online survey which included questions from the *Cohen 14-item PSS-14 Stress Scale.* The participants also answered questions regarding self-care and demographic questions. Sample size was 144 with 56% being professionals and 31% being social work students. Ages ranged from 20-73. Mean stress scores indicated moderate stress levels from participants with scores being slightly higher in students that practitioners. 47% of respondents indicated they have an active self-care plan. The average amount of hours per month self-care was practiced was 18. Analysis found that there was significant relationships between age, gender, social work status, highest level of education, years of professional experience, frequency of self-care and perceived stress.

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PERCEPTIONS OF EXONEREES BASED ON RACE AND GENDER IN AN OFFICIAL MISCONDUCT CASE
Skylar Oxford, Kendall Jackson, Jackson Everett, Brooklyn Neilson

Prior research shows that individuals wrongly convicted of crimes and later exonerated may have difficulty reintegrating into society due to negative stereotypes (Blume, 2018), but there are mixed results concerning whether these stereotypes differ by the exonerce's race or gender. This study examined 173 laypersons perceptions of exonerees, differing in gender and race, wrongfully convicted of spousal homicide. The "male stereotypical" crime of homicide was used to build upon prior research using a "female stereotypical crime" of Shaken Baby syndrome. Participants were generally supportive of compensation for exonerees but rated the white female as least deserving. Participants held more favorable attitudes towards female than male exonerees, specifically black ones. but would be more likelv to be hire males tor a lob.

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Performance Enhancement of College Wrestlers through Immersive Virtual Reality Training
Victoria Adams, Lexi Fleming

Background: Training wrestlers has traditionally emphasized strength, flexibility, and cardiorespiratory fitness in the conditioning programs. Speed and precision are important factors when considering the performance level of an athlete and their ability to avoid injuries.

However, the assessment of being able to train an athlete using visual-cognitive and motor responses together to make decision about rapidly changing visual stimulus has not been addressed. Exposure to concussion can have prolonged effects on information processing, and if these impairments are not identified, the athlete may be exposed to an elevated risk of injury. Immersive virtual reality (VR) allows challenges to be administered to assess these possible impairments.
Methods: 24 Division-I Male College Wrestlers were given pre- and post- training assessments using immersive VR and whole-body reactive agility. The immersive VR consisted of 40 successive reaching responses to a visual stimulus to the left or right of the athlete. The whole-body reactive agility assessment was given through the TRAZER which provided 20 visual targets to the left or right of the athlete. In between pre- and post- testing was a three-week immersive VR training program. Twice a week, each athlete would complete 2 sets of 20 trials during each session.
Results: Data was collected for the perceptual latency and the response time for 5 different components: Eyes, Neck, Arm, Step, Rate Correct Score (RCS). Perceptual latency and response time of RCS increased significantly. The average time of the arm responses as well as the intra-individual variability significantly decreased. Lastly, the total distance covered in the whole-body reactive agility assessment decreased significantly.
Conclusion: Cognitive stability or performance consistency is dependent on the integrity of the white matter tracts in the brain. The visual-spatial movement precision of the group is believed to have improved as well as the efficiency of perceptual-motor processes in the brain. It appears that perceptual-motor training has potential for improving athletic performance capabilities. The improved speed and precision were like from improved brain processing efficiency. The excessive focus of muscle capabilities training could neglect the need for enhancing the visual-cognitive component of performance

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Pet Primates: Attacks, Escapes, and the Law
Gale Iles, Sherah Basham, Karen McGuffee

Many homes throughout the United States contain non-human primates that are kept as pets. These private ownerships potentially endanger the pet, their owners, and society as a whole. Using data compiled by the Humane Society of the United States, 238 incidents of attacks and escapes of individuals classified as pets from 2000 to 2020 are examined. More than half of the reported incidents involved primate attacks on humans, 44% of attack victims were strangers, and attacks occurred at various locations suggesting that wherever caretakers of primates reside or take their pets, an attack is likely to occur. A review of state laws reveals no relationship between states with a greater number of incidents and more restrictive laws or states with the least number of incidents and less restrictive laws. Risks associated with keeping primates in private households and ethical concerns about the welfare of these primates are discussed.

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PLAn Project Analysis of Microplastics in Sediments along the coast of Cadiz.
Gabriella Logsdon

The main objective is to determine the abundance and distribution of microplastics on the coast of Cádiz.

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Practices for broadening faculty participationin research commercialization
Jennifer Herrett-Skjellum

The Bayh-Dole Act, enacted in 1980 to facilitate the commercialization of university research, is credited with a substantial increase in patenting, licensing, and start-up company creation at universities across the United States. The commercialization process begins with an invention disclosure. Despite federal and institutional requirements, many faculty fail to disclose inventions or participate in the commercialization process. Lack of time, lack of peer models, and lack of incentives are among the reasons faculty give for non-participation. A review of the literature and professional trade journals was conducted to explore the findings regarding policies and practices aimed at increasing faculty invention disclosures. Based on those findings, this paper proposes a taxonomy of strategies for broadening faculty participation in research commercialization. This taxonomy provides a framework to explore the effectiveness of specific strategies to lower the barriers to research commercialization.

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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 if there was 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. The focus of the study was to determine whether one or more variables could be used to predict undergraduate student headcount at a 4-year university based on one or more student demographic and attribute variables. Markov Chain 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. Subsequently, it was determined that

the MCMC simulation models were able to accurately predict institutional and program enrollment for specific fall semesters, but not for all fall semesters, perhaps due to limitations related to COVID-19. Using readily available data and considering variables that are not typically utilized provides a way to develop robust models for use at the institution. This model can be adapted for individual programs, and it is likely that each academic program would include different predictor variables. Those in leadership positions can benefit from better estimating the number of students to be enrolled.

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Predicting Human driving patterns by utilizing convolutional neural networks for emotion classification
Faiza Khan

Facial Emotion Recognition (FER) is a technology used for analyzing sentiments from different sources, such as pictures and videos. It belongs to the family of technologies often referred to as 'affective computing'. Affecting computing is a multidisciplinary field of research on computers' capabilities to recognize and interpret human emotions and affective states and it often builds on Artificial Intelligence technologies. The emotions classified in our research are; anger, disgust, fear, happiness, neutral, sad, and surprise.

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Prediction of Bike Rental Usage with Linear Regression and K-Nearest Neighbors
Megan McCoy

The goal of this research is to use two methods, Linear Regression and K-Nearest Neighbors (KNN), to predict the total amount of bicycles rented on any given day when considering several different predictors, such as temperature, day of the week, etc. A Bike Sharing dataset from the Capital bikeshare system is used to form the linear regression model and KNN algorithm. The linear regression model will be subjected to experiments in the attempt of maximizing the efficiency of the model. Once the linear regression model has been adjusted accordingly, it will be compared with the output of the KNN algorithm. The goal is that one of these methods will clearly provide a more accurate estimation of the desired prediction value.

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Prediction Using Machine Learning
Christen Bagwell

My hypothesis is to question the effectiveness of machine learning predictions using supervised machine learning algorithms. There are many machine learning algorithms: decision trees, support vectors, and neural networks. I will be attempting to improve the neural network algorithm by regularizing the model. This will ideally prevent the algorithm from being only used on one type of dataset and be more cross functional across multiple data sets.

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Preserving Lentic Freshwater Biodiversity in Hamilton County: An Assessment of Anthropogenic Impacts and Conservation Strategies
Gabrielle Wakefield, Francesca Leasi, Keyle Bryant

Lentic ecosystems, which encompass standing water bodies like ponds, lakes, and wetlands, are ecologically and biologically distinct from flowing or lotic ecosystems, which includes rivers and streams. One of the major differences is that the still or slow-moving water allows for the accumulation of sediment and organic matter, leading to the formation of multiple and nutrient-rich habitats. Lentic ecosystems are important for many reasons, including their role in supporting biodiversity, providing habitat for aquatic and terrestrial species, storing water, regulating water quality, and supporting human activities such as fishing, recreation, and agriculture. However, they can also be vulnerable to pollution, invasive species, habitat destruction, and climate change, which can have negative impacts on the health and functioning of these ecosystems and consequently human health. This study presents and describes a research plan that aims to investigate the impact of human activities, measured as population density and land usage, on the biodiversity of lentic ecosystems. In the Chattanooga Area, multiple water bodies are currently under investigation, with a focus on quantifying their biodiversity through an environmental DNA approach. The findings of this research will be valuable for formulating strategies to mitigate the negative impact of human activities on lentic ecosystems and promote their sustainable use for future generations.

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Prevalent Diseases in Amphibians of the Southeastern United States and How to Minimize Transmission
Crystal Allen, Austin Stiltner, Morgan Griffin, Katie Hemauer

Amphibians are vital to all ecosystems they inhabit for numerous reasons. Their health, diversity, and population status provide crucial information about the future of our planet and how climate change may impact us. With the presence of diseases and parasites impacting them greatly, Amphibian populations are in crisis. This class of animal has been found to play

important roles in the food chain as both prey and predator. Assisting in their survival means maintaining biodiversity and overall health of ecosystems they reside in. It is exceedingly important to find solutions to further reduce human-caused harm and prevent the spread of diseases and parasites. One way this can be done is by making the public aware of the sensitive nature of amphibians and how humans affect them. Stakeholders, who have a vested interest in natural areas should be educated, with easy-to-read signs on how they can minimize the spread of disease and parasites among amphibian populations. Governing officials should encourage stakeholders to take necessary precautions before, during, and after visiting these natural areas. Data from the peer-reviewed literature was searched using keywords such as "amphibian" and "disease", and "transmission". These peer reviewed journal articles were assessed based on relevance to the research topic and sorted into categories pertaining to the two most cited amphibian diseases such as Chytrid Fungus and Ranavirus. This literature review was synthesized into a data matrix that works towards informing the public about the large scale decline in amphibians and how they can help minimize the sixth mass extinction.

Keywords: amphibian, disease, transmission, southeast, conservation

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Problem Drinking, Honor Concerns, and Social Anxiety: Regional U.S. Differences among College Students

Griffin Randolph, Claudia Colpo

Social anxiety (SA) is the persistent fear of being evaluated by others and avoiding social encounters (APA, 2023). A trait of SA is a fear of negative evaluation (FNE), which is characterized by a discomfort or fear from actual or potential negative evaluation (Taylor, 1993). In the U.S., drinking affirms masculine honor (Hunt & Antin, 2017). Masculine honor are traits of toughness, bravery, and aggression, and is more prevalent in the U.S. Southeastern (SE) regions. Research indicates that highly socially anxious college students reported higher reactive, not proactive, aggression in the S.E. compared to the Midwest (Howell et al., 2014). Our aim is to understand the sociocultural factors on the risk of problem drinking among socially anxious college students. We hypothesized that socially anxious college students with concerns of masculine honor would report higher drinking problems in the S.E. Results for variables indicated 1a) region and FNE reports were positively associated with problematic drinking, 1b) model 3 PROCESS Macro analysis revealed FNE relation to problematic drinking was significantly moderated by masculine honor concerns when region further moderated this interaction,1c) it was revealed a FNE was positively related to problematic drinking when masculine honor was high in the S.E. region, oppositely, FNE was positively related to problematic drinking when masculine honor was low in the Midwest. Findings support highly socially anxious college students from the S.E. region with higher honor concerns have higher problematic drinking than the Midwest.

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Protecting Legitimate SEI Security Approaches from Phase-based Obfuscation Attacks
Joshua Tyler

Since its inception–almost thirty years ago–Specific Emitter Identification (SEI) has proven to be an effective means for passively identifying emitters using unique and distinct features that are unintentionally imparted to waveforms during their formation and transmission. Primarily, the assumption is that the emitters being identified are passive devices incapable or unwilling to resist SEI. However, cost-effective software-defined radios and open-source deep learning algorithms are leading investigators to challenge this assumption and show that previously exploited features can be modified to reduce or defeat SEI. Recently, RF-Veil has been proposed to combat such attacks by providing emitters with an active means to obfuscate their waveform features. The result is a robust SEI process to prevent eavesdropping and impersonation attacks. Despite the security and privacy-focused intent of RF-Veil, it is fair to assume that nefarious actors will attempt to abuse it to mask their waveform features to thwart legitimate SEI security processes. Therefore, this work investigates the identification of nefarious emitters that employ RF-Veil to thwart legitimate SEI security processes. The results show that there is an inherent Residual Phase Offset (RPO) present in preambles that is not removed in traditional phase offset correction. Removing RPO not only improves SEI performance when using the phase representation of IQ samples, but also significantly reduces RF-Veil's negative impact on SEI.

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PTSD Symptom Severity and Emotion Dysregulation
Heather Eikel

Emotion dysregulation refers to a deficit in one's ability to manage and regulate intense negative affect states (Powers et al., 2022). Previous research suggests that difficulties with emotion regulation are associated with a myriad of posttraumatic stress disorder (PTSD) symptoms across trauma types (i.e., combat trauma, childhood abuse, sexual abuse) (Pencea et al., 2020; Powers et al., 2021). Additional studies suggest that, among those with PTSD, physiological arousal may play a substantial role in an individual's ability to modulate affective responses (Jin et al., 2022; Shepherd & Wild, 2014). The current analyses aim to extend this research by investigating the relationship between PTSD symptomology severity and emotion regulation difficulties. To examine this relationship, I hypothesized that (1) difficulties with emotion regulation positively relates to PTSD symptom severity and (2) physiological arousal symptoms of PTSD positively relates to emotion dysregulation. As part of a larger study, participants were college students who completed two self-report measures: the PTSD Checklist for *DSM-5*-Civilian Version (PCL-C) and the Difficulties in Emotion Regulation Scale

(DERS). Correlation analyses indicated a significant, positive correlation between overall PTSD symptom severity and emotion dysregulation (r = .62, p

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Quality Improvement of a Community Based Nutrition Class
Furaha Irankunda, Kelsey Gooch

The program evaluation explores a relationship between a university and social service organization. The project focus on Hands-on nutrition education (HONE) activities that have been conducted to actively engage the participants. The program evaluates the quality of the class, budget, perceptions of the cooking class from participants, data from the cooking class surveys, and how the class improved from the fall semester to the spring semester.

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REAL-TIME MULTI-VEHICLE MULTI-CAMERA TRACKING WITH GRAPH-BASED TRACKLET FEATURES
Tuan Nguyen

An essential intelligent transportation systems (ITS) application is multi-target multi-camera tracking (MTMCT), where the target's activity is tracked from different cameras. Although the tracking-by-detection scheme is the primary paradigm in MTMCT, the object association information from the video frames is lost. That is mainly because the multi-camera multi-object matching uses the information from the video frames separately. To solve this problem and leverage this association information, we propose an MTMCT framework, where features are built in the form of a graph and a graph similarity algorithm is used to match multi-camera objects. In this paper, we focus on the real-time scenario, where only the past images are used to match an object. Our method achieves an IDF1 score of 0.75 with an FPS of 14 multi-object matching uses the information from the video frames separately. To solve this problem and leverage this association information, we propose an MTMCT framework, where features are built in the form of a graph and a graph similarity algorithm is used to match multi-camera objects. In this paper, we focus on the real-time scenario, where only the past images are used to match an object. Our method achieves an IDF1 score of 0.75 with an FPS of 14 the target’s activity is tracked from different cameras. Although the tracking-by-detection scheme is the primary paradigm in MTMCT, the object association information from the video frames is lost. That is mainly because the multi-camera multi-object matching uses the information from the video frames separately. To solve this problem and leverage this association information, we propose an MTMCT framework, where features are built in the form of a graph and a graph similarity algorithm is used to match multi-camera objects. In this paper, we focus on the real-time scenario, where only the past images are used to match an object. Our method achieves an IDF1 score of 0.75 with an FPS of 14

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Recommending Manual Frog Call Surveys to Monitor Weather Climate Phenomena at UTC: A Student-Centered Approach
Michelle White, Nicole Cobb, Miranda Lighter, Autumn Love

Climate change is an anthropogenically accelerated phenomenon characterized by increasing greenhouse gasses tied to rising temperatures and shifts in weather patterns, which threatens amphibians. Amphibian physiology makes them especially vulnerable to temperature shifts. Studies have demonstrated links between climate change and habitat loss and between increased UV radiation and the spread of disease, causing amphibian mortality. There is a current need to monitor this impact of climate change on amphibians, which can be done through a phenology monitoring program using manual calling surveys. Phenology, the study of the timing of the seasonal cycles of living organisms, can help observers monitor frog calling activity because of its sensitivity to change. The southeastern United States represents a hotspot of amphibian diversity and a monitoring program at University of Tennessee at Chattanooga (UTC) can provide an estimate of the overall health of the local ecosystem. A long-term phenology program ties in with UTC's overall goals to increase learning opportunities for students and promote collaboration between UTC and the community. The purpose of this poster is to suggest a University-wide frog call monitoring study to expand awareness of climate change impacts on local frog populations. We aim to recommend service-learning opportunities that engage students through increased student research. By focusing on frog populations, students will gain knowledge of the localized effects of global climate change and provide a sounding board to UTC and its partners.

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Regionalization of Conotoxins in the Venom Duct of the Marine Cone Snail: Lautoconus ventricosus (Gmelin, 1791)
Bailee Kusch

The use of venom is one of nature's most primitive weapons. The predatory marine cone snail is an excellent example of an animal that utilizes this toxin. A cone snail will rapidly string its victim with the use of a long harpoon-like tooth, and within a matter of seconds, the prey's nervous system will admit defeat. The toxic proteins within the venom are referred to as conotoxins and they come in a large variety of sizes and functions. With the use of laboratory techniques, Mass spectrometry, and an array of bioinformatical tools, information was gathered to see how the conotoxin expression varied within the organism, specifically the *Lautoconus ventricosus*. My research team and I investigated the spatial distribution of the different conotoxins within the venom duct of this species. We hope to contribute information to this field of venomics because of its applications. The consistent metabolic specificity of

these peptides on cellular membranes, allows pharmaceutical industries to exploit them for use in treatments of a variety of different medical issues varying from chronic pain management to cancer.

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Reinterpretation of Carbonate Structures within the Bangor Limestone Formation at Raccoon Mountain
Samuel Thompson

Raccoon Mountain Caverns is a privately owned cave system located approximately 6 miles east of Chattanooga, Tennessee. The cave system formed in the Bangor Limestone formation, which was deposited during the Mississippian period. Samples with visibly fine lamination were collected from a recently excavated pit near the entrance of the adjoining campground. The samples collected in the lower strata of the pit were markedly different from the overlying dark-gray carbonate strata. They are tan-colored and have irregular, conical to domal shaped layers that appeared to be microbial textures. Although the presence of the algal mats at Hugden's Branch on Raccoon Mountain is mentioned by Bergenback and Lance (1992), the algal textures and associated rocks are not described in the literature for Tennessee.

The original intent of this research was to describe the algal textures and their associated strata, however petrographic analysis revealed characteristics consistent with formation through abiotic processes. We now believe the finely laminated structures aren't algal mats, but instead travertine; a mineral which forms from the rapid precipitation of carbonates in supersaturated carbonate brines in/around hot springs, lagoons, and caves.

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Representation of U.S. states in Psychological Research among Latinx Adolescents
Abigail Hall

The 21st century has seen an increase in the amount and variety of psychological research on Latinx, the largest minority group in the U.S., with great variability from the individual's cultural origin (e.g. ethnicity) to region (e.g. nationality). We were interested in exploring how scientists recruit, conduct and report research on Latinx samples.

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Risk Score Calculation and Analysis for Breast Cancer Prediction using Machine Learning Models

Ezhilvadivu Palaniyappan

The paradigm for the supervised classification model namely logistic regression is employed extensively to predict the risk of diagnosing invasive breast cancer quantitatively using the probability of default formula. The probability of default is estimated based on the Maximum Likelihood Estimation. To diagnose the probability of developing a health condition or disease, the categorical clinical data plays a vital role in determining the outcome. So, it is very important to precisely predict the risk of diagnosing if the breast cancer is spreading or stopped. The weight of evidence and information value of each of the categorical values of the input features are evaluated to actually predict the risk score of health condition diagnosis. In this project, CRISP-DM methodology is followed through the project. The mathematical equations of logistic regression to calculate the log of odds is leveraged to compute the value of the information for a categorical variables. The imputed information value is used to train the logistic regression model for predicting a better outcome without overfitting. Alongside, the imbalanced training dataset was handled using SMOTE to prevent the model to only predict one possible outcome, choosing the best features based on ranks from RFE technique, evaluation of the statistical significance of each feature based on the p_values were implemented. To show that the trained logistic model that uses WoE and IV of the categorical features to predict most accurate risk score, other possible supervised classification models such as support vector machine, decision tree, XBoost gradient and Deep Neural Network namely Multi-Layer Perceptron that uses one-hot encoding to transform the categorical features were built. The metrics of each of these models are evaluated and compared.

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Scenes Along Chessie's Road: Place Imagery in Chesapeake and Ohio Railway Advertising

Craig Laing

Place imagery used in American railroad advertising is most often associated with western railroads using the dramatic mountain scenery of the Rocky Mountains and desert Southwest. But what about eastern railroads that lacked these spectacular western landscapes? For example, the Chesapeake and Ohio (C&O) Railway's mainline stretched from Newport News, Virginia, westward through the West Virginia coalfields, then northward through Indiana, Ohio, and into Michigan. What place imagery did the C&O use to promote business on its railroad? The purpose of this research is to examine the images of place used by the C&O in its advertisements, brochures, and other printed material. After a brief review of the research literature on railroad advertising, a visual analysis is conducted of C&O advertisements found in the C&O Historical Society's digital archives. The C&O's earliest use of place imagery in its advertising was related to passenger train campaigns in the late 19th and early 20th centuries focused on the resort areas in Virginia and Michigan along the railroad's route. By the middle of

the 20th century, C&O's use of place images in its advertising had transitioned to industrial themes.

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Sense of Campus Safety Among UTC College Students
Victoria Boston, Ben Hall, Lexy Clarke, Shayla Hampton, Dajhia Sangster , Hannah Boyd, Kristen Hoyy

This research is being conducted to explore the sense of safety amongst college students on an engaged metropolitan campus, such as UTC. Students will be participating in a survey that will inform our research on what makes students feel unsafe in order to make UTC's campus environment feel safer for all students giving them the ability to have a higher academic success rate.

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Serum Neurofilament Light Chain as a Biomarker in Neurological Diseases
Achok Alier

The presence of Serum neurofilament light chain (sNfL), is considered an indicator of axonal damage and neurodegeneration. By Using Elisa kits to analyze blood samples to explore and understand brain atrophy along with other types of brain measurements. These measurements were applied to patients with Multiple Sclerosis (MS), Parkinson's Disease (PD), and Chronic Migraine (CM). The objective was to find a correlation between sNfL and neurodegenerative diseases.

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Simulating the Brownian Motion of Particles
Emma Crow, Luis Sanchez-Diaz

In order simulate the dynamics of bacteria in a fluid. We perform Brownian simulation of a two-dimensional system of active colloids with hard-disk interactions. In particular, the effect of the self-propulsion velocity and density on the orientationally-averaged fluid diffusivity and structure is discussed. Increasing the velocity of the system, we observe an increase in diffusivity and structure which is a precursor of motility-induced phase separation. Our results provide reference data to be used to study the bacteria dynamics under rheometer.

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Smart Data Analytics on the Edge: Enabling the First Smart Power Grid
Joshua Tyler

This project's effort resulted in code written to run statistical analysis on power signals on the edge. Since its deployment, Digital Fault Recorders (DFRs) continuously record electrical signals to enable Power Quality (PQ) engineers to run grid forensics. These signal forensics are critical in providing analysis to further improve grid operations. The caveat is that these long-term recordings generate between twenty and forty gigabytes per monitor per day. This massive data load limits long-term storage and forensic capabilities. Recently, TVA partnered with UTC to generate code to run signal forensics at the DFR. These forensics include cyclic, residual, frequency, and energy histograms. These histograms are known to hold important signal information while reducing the long-term data by over four orders of magnitude. The code was then optimized to run extremely efficiently using Just-in-Time (JIT) machine-code compilation. This enables power grid utilities to have signal forensics generated autonomously and efficiently on the edge. This project has already seen national interest by power grid software providers for deployment. When deployed long term, these forensics will be used to enable to first truly autonomous smart power grid in the world.

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Solar Fuel Production from CO2 via Thermochemical ZnO/Zn Redox Cycle
Gabrielle Bennett , Rahul Bhosale

The solar thermochemical CO2 splitting (CDS) is scrutinized via a redox ZnO/Zn cycle. The second law efficiency analysis is carried out by acquiring the required thermodynamic data from HSC Chemistry software. The main focus of this study is to explore the influence of reduction temperature (Tred), molar flow rate of inert sweep gas (n˙inert), and energy required for the gas separation on the solar-to-fuel energy conversion efficiency (ηsolar− to− fuel) of the ZnO/Zn cycle. All the calculations are conducted at a constant gas-to-gas heat recovery effectiveness (εgg) equal to 0.5. n˙inert required is recorded to be too high (5050 mol/s) at Tred equal to 1500 K and moderately low (15 mol/s) for Tred equal to 2000 K. The amount of thermal energy required to heat the inert/O2 gas mixture (from CDS temperature to separator-1 temperature) and inert sweep gas (from separator-1 temperature to reduction temperature) has a significant impact on the total thermal energy requirement of the cycle (Q˙ TC). The rise in Tred from 1500 K to 2000 K shows a considerable decline in Q˙ TC from 77417.5 kW to 1161.8 kW, respectively. Consequently, the highest ηsolar− to− fuel (17.0%) is recorded for Tred equal to 2000 K.

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South Africa: Virtual Internship in Diplomacy, Conflict Resolution, and International Relations
Kerry Webb

This presentation is a reflection of my Virtual International Study Abroad Experience. I cover the School for International Training (SIT) program's mission statement briefly. I cover The Institute for Global Dialogue (IGD) and how their values reflect my own, the assignments of research about BRICS, the way that Social Work and International Relations intersects, and what I learned during my time with SIT and IGD.

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South Africa: Virtual Internship in Diplomacy, Conflict Resolution, and International Relations
Sarah MacLean

This presentation will follow the School for International Training's (SIT) summer program "South Africa: Virtual Internship in Diplomacy, Conflict Resolution, and International Relations". This program spanned six weeks going from June 13th through July 22nd, 2022. SIT instructors and program coordinators Dr. Imraan Buccus and Ms. Nonceba Lushaba led our program through current events, history, and foreign political analysis of South Africa. Many of this program's guest lecturers came from our internship's host institution was the Institute for Global Dialogue. Details of this video that will be explored include the host institution (IGD), job tasks, my research, my takeaways, and challenges.

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Species Diversity of Coleoptera Populations in an Urban Garden in Chattanooga, Tennessee
Mallory Anderson

Insects are an essential part of the function of ecosystems. The majority of entomological faunistic research has been conducted primarily in rural areas due to high diversity, space for bulky traps, and less outside influence from human activities. However, the need for time-series insect biodiversity data, in rural areas and urban areas alike, is paramount in the wake of our current sixth mass extinction event. Previous research has shown that the greater Chattanooga area is comprised of a diverse population of insects in the Coleoptera (beetles) order, and as shown in the University of Tennessee at Chattanooga's (UTC) Insect Collection. However, no systematic collection has been done in urban areas within the city limits of Chattanooga. Therefore, in order to fill this gap in data, using a Malaise trap, I collected six months (from March to September of 2022) worth of Coleoptera specimens in the urban garden situated in front of Holt Hall on the University of Tennessee at Chattanooga's campus (35°02'50.4"N, 85°17'46.7"W). This project yielded 352 individuals, with 63 morphospecies identified in 23 families (Appendix I). Out of the 23 families sampled, the families that had the highest frequency during the entire collection period included Coccinellidae (22), Staphylinidae (13),

and Mordellidae (12). Ecological factors including the diets of the beetles collected and the plant composition of the garden during each collection were used to predict why specific families were more prevalent than others.

Without establishing this baseline data, researchers will have a difficult time estimating any changes in or demonstrating progress, recovery, or destruction of Coleoptera populations in the future. The beneficial nature of this study's findings can be maximized through the yearly repetition of Coleoptera collection at this site. Further, expanding this study across more urban green spaces within Chattanooga (and Hamilton County) can give us a greater understanding of what beetles Chattanooga supports, and how time and the continuation of harmful anthropogenic activities are affecting Coleoptera populations.

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Spiropyran-based mechanochromism in polyurethane foam
Kelly Hooper

Spiropyran (SP) is a mechanophore that has been of great interest in recent years for its application in polymeric materials. SP provides a visible response to stress upon scission of the C-O junction leading to the formation of colored merocyanine (MC), providing a warning prior to failure. While this effect has been studied in other polymer materials, to our knowledge, it has not yet been studied in polyurethane (PU) foams. Specifically, we are interested in how the foam structure might influence the mechanochromic response. To achieve this, we developed a strategy to crosslink SP into commercially available flexible PU foam and characterized the color change in response to mechanical stress. Preliminary results indicate that color change occurs in response to large compressions. In comparison, a control material without covalent bonds to SP did not exhibit the characteristic color change of the active SP, indicating that the response is mechanochemical in nature.

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Student Knowledge and Perception of Homelessness
Stephanie Gayle, Shannon Petty, Carolina Phillips, Lydia Burton

College students' perspectives and attitudes towards the homeless population in Chattanooga

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Supervised Learning and Classification of Single-Event Transient Anomalies
Trevor Peyton

A convolutional neural network (CNN) was designed to classify single-event transients (SET) based on the circuit node impacted by ionizing radiation. Nodes within a phase-locked loop (PLL) are identified with over 90% accuracy as demonstrated through two-photon absorption (TPA) laser experiments.

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Surface Roughness and Additive Manufacturing
Adrianne Glover

Additive manufacturing has become a source of creativity and production in the STEM fields, so it is important to study the surface roughness of pieces printed by this technique. Specifically, with my research, we studied the layers of the filament within different sizes and colors of probes generated by 3D printing. With these probes, it was essential to understand the surface roughness of spots within the object. Surface roughness is a measure of the defects and irregularities within the machining process, and it is going to vary with each probe. We were able to use an optical 3D measuring instrument to analyze the patterns of the filament. By creating profiles with single measurements and image field measurements, we found results that were consistent with the filament lines.

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Suspicious or Autistic? Evaluating Responses to a Behavioral Analysis Interview
Kendall Jackson, Olivia Taylor

The Reid Technique of interrogation, commonly used by investigators in the US, begins with a non-confrontational Behavior Analysis Interview (BAI) designed to “provoke” behaviors and responses that indicate truthfulness or deception (Inbau, et al., 2013). The BAI’s conglomerate of innocent or guilty behaviors has been refuted by research as unreliable indicators (Vrij, Mann, & Fisher, 2006) and they overlap with signs of autism, making autistic individuals more vulnerable to police scrutiny and interrogation tactics, increasing the chances of a false confession. College students (n=218) were presented with the case background describing a crime and a suspect along with a transcript of the 15 question BAI. Two autistic individuals answered the BAI questions, one labeled as “blunt” and the other labeled as “naïve” responses. Both naïve and blunt responses were rated significantly less deceptive when an autism diagnosis was revealed. In the no diagnosis condition blunt responses were judged as significantly more deceptive than naïve responses., but the blunt and naïve conditions were rated similarly in the diagnosis contrition.

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Synthesis of Metallo-Hinged Transbidentate Ligands
Nick Ribeiro

We've used various synthesis techniques using cobalt complexes to create metallo-hinged transbidentate ligands. Once synthesized and characterized completely, the ligands will be attached to different metal catalysts to observe and measure the changes in catalytic performance.

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Systematic Use of Patient-Reported Outcomes in Cancer Patients Receiving Immunotherapy
Jaime Pesl

Immunotherapy has become increasingly prevalent in treating multiple cancers. The side effect profile and excellent response rate of immunotherapies lead to extended treatment duration, often spanning several years. However, due to their mechanism of action, immunotherapies can cause many adverse events, ranging in severity, which require close attention and routine assessment. These adverse events negatively impact cancer patients by reducing their quality of life and increasing the need for hospital and emergency department visits, potentially causing treatment delays and adverse outcomes. National cancer guidelines recommend routine assessment for adverse events. However, no standard exists for routine outpatient assessment of patient-reported immunotherapy side effects. This evidenced-based quality improvement project aims to improve the quality of life of cancer patients receiving immunotherapy by systematically and routinely capturing patient-reported outcomes (PRO) attributed to immune-related adverse events. The project is currently in place at an outpatient comprehensive cancer center in northwest Georgia. Patient-reported outcomes are assessed using the National Cancer Institute's PRO assessment tool at baseline before starting immunotherapy and every three weeks after that. Qualitative outcome measures of PRO assessment tool scores, hospital and emergency department visits, and provider use of correlating ICD-10 billings codes will be assessed at three and six months with expectations of improvement in each outcome measure. Enhanced understanding of immune-related adverse events, including their onset, frequency, distribution, and severity, will allow oncology providers to provide better patient-centered care. This project will also help establish a standard protocol for assessing immune-related adverse events, which other cancer centers can utilize.
Keywords: immunotherapy, adverse events, patient-reported outcomes, PRO-CTCAE

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Teaching Students to "Wear Pink": How Athletic Departments Socialize Students to (dis)Engage in Breast Cancer Charity
Madonna Kemp

University athletic departments routinely engage in breast cancer rhetoric during the months of October and February, which is evidenced through past Twitter activity. While the intent behind this rhetoric may be assumed as charitable in nature, rhetorical analysis of actual published tweets containing implied or direct mention of breast cancer, as well as content analysis of the tweet archive as a whole, reveals that the messages lean toward ethos building for the university teams and organizations instead of direct community action that assuredly benefits breast cancer patients in an easily quantifiable way. Through a study of the public messages tweeted by university athletic departments, specifically in the State of Tennessee, I found the breast cancer rhetoric employed to be relatively devoid of direct-action signification. This leads to a serious consideration of how university athletic departments are socializing students to (dis)engage in breast cancer charity, as the main avenue through which they "engage" is promoting the team/school and the wearing and using of the color pink.

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Test-Retest Reliability of Virtual Reality Measurements of Perceptual-Motor Function among Healthy College Students
Courtney Noblett, Caroline Sarris

To assess the consistency of mean and intra-individual variability values acquired from an immersive VR system on 3 successive days

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The Acute Dual-Task Cost on Cognitive and Motor Performance During Serial Sevens Correctness and an Agility T-Test
Sarah House , Kinsey Anderson , Scott House , Jason Logan

This study aimed to describe the relationship between a complex motor and cognitive task, and the effect that one has on the other when performed simultaneously, or the dual task cost. For the motor component, 20 participants completed an agility T-test, and for the cognitive component, participants completed a Serial Sevens test. We measured the participants' latency and accuracy while serial counting alone, their speed in completing an agility T-test as a single task, and then measured both during the dual task. We expected the phenomenon of mutual inhibition to occur with the participants demonstrating a decline in motor and cognitive performance. Preliminary data supports the hypothesis of mutual inhibition, with significant differences in the accuracy and speed of participants in the dual task compared to the single task.

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The Balancing Act: Socio-Cultural Wellbeing
Adriel Poo Armas, Dylan Muccino, Cole Olinger, James Ortiz

This presentation aims to address a variety of social and cultural concerns which address would lead to the enhancement of the individuals involved as well as the people they impact. Throughout our experiences in delving deeper into this research, we aim to specifically improve the mental, social, and cultural well-being of young adults in college. This specific demographic stands at a crossroads of momentous decisions, and aiming to improve the overall welfare of college students helps to lead the way toward success within and throughout their varied life experiences. With all of us also falling into this demographic, we and other partners we have become acquainted with throughout the Chattanooga community will share our cumulative insights into the benefits of raising awareness of foreign language competence, learning how to subdue miscommunication, combatting the consequences of modern media has on young adults, and learning how to better allocate oneself to the different areas of one's life.

Ultimately, our goal is to inspire the young adults which whom we share our findings with to take initiative and seek personal improvement in their lives. Every person has different experiences in life, both in the past and future, but gathering wisdom from various sources helps make a person have a well-rounded approach to life. Laying the groundwork for college students such as ourselves to seek balance and betterment in the face of an ever-changing world.

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The Competent Undergraduate Teaching Assistant: Developing and Validating a Measure of Perceived Competencies Acquired Through Teaching Experience
Amanda Lesswing, Hayden Roberts

The current study details the development and refinement of a scale designed for use with undergraduate teaching assistants (UTAs) to capture perceptions of their own professional competencies. Further, psychometric properties are evaluated and discussed. The need for the Teaching Assistant Competency Scale arose from the expectation that psychology graduates entering the workforce or progressing into graduate programs should possess several essential transferable skills, often termed "soft skills" (Appleby, 2003; Stewart, 2016; Appleby, 2018). Experience through undergraduate teaching assistantships may provide students with the necessary opportunities for development of transferable skills. Research presently supports the claim that UTAs report the acquisition of professional skills through interactions with students and professors (Fingerson & Culley, 2001). Through work as an undergraduate teaching assistant, it is thought that students will develop key knowledge, skills, and characteristics (KSC's) identified as essential by potential employers through the U.S. Department of Labor's

Occupational Information Network (Appleby, 2019). We hypothesize that the survey we have developed will effectively measure growth in UTAs' perceptions of their transferable skills and professional abilities throughout these teaching experiences.

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The Critical Role of Linear Regression
Abraham May

Explaining the importance of using linear regression for data sets.

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The Effect of Carbon Dioxide on Various Climate Change Indicators
Sydney Aites

Increased concentrations of atmospheric Carbon Dioxide (CO2) have been known to affect various climate change indicators such as global surface temperature, sea level, and natural disaster frequency. With this in mind, the goal of my project is to determine which climate change indicator is most affected by atmospheric CO2. Analyzing the relationships between atmospheric CO2 and climate change indicators can not only demonstrate the effects of increased atmospheric CO2, but also predict the strength of these relationships.

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The effect of different types of plastic often found in healthcare facilities on the survival of potentially pathogenic bacteria
Ashely George

This study focused on the survival of different species of bacteria on different types of plastics found in healthcare facilities. Staphylococcus aureus, a gram-positive cocci, and E. coli, a Gram-negative rod both known to have importance as potential pathogens in healthcare facilities, were tested on four types of plastics (polyethylene, polyurethane, PVC, latex) typically found on reusable healthcare surfaces. Known quantities of bacteria were aseptically placed on disinfected plastic surfaces in triplicate, air-dried, and then incubated at room temperature for 30 minutes, 20 hours, and 40 hours. After incubation, samples were collected from the plastic surfaces using sterile swabs and serially diluted before being plated on tryptic soy agar for plate counts. Overall, both species of bacteria survived on the plastic surfaces tested for at least 30 minutes. Bacterial survival on polyethylene/polyurethane was greater compared to PVC, while bacterial survival on latex was lower than for all the other plastics. The relevance of these findings is that depending on the plastic used in healthcare facilities, there may be better

choices of plastics to suppress the growth of unwanted environmental bacteria. Additionally, the potential for the addition of antimicrobial chemicals to plastics to help suppress microbial numbers on these surfaces may help reduce HAIs linked to environmental exposures.

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The effect of high course material costs on UTC students
Laura Baker

The high cost of course materials has been shown to have a detrimental effect on the educational outcomes of students in higher education. This survey explores how high course materials costs affect UTC students at all levels. Preliminary results will be presented, placing UTC within the context of national surveys which have shown that course material costs are a burden to students and play a significant role in academic decisions. Moreover, the effects of high course materials costs have been shown to have a disproportionate impact on historically marginalized populations.

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The effect of perceived union support as a resource on burnout and engagement
Luke Wiley, Kristen Black

While the proportion of workers who belong to a union has declined in the United States, there have been significant recent campaigns to revitalize the labor movement by attempting to organize new industries. Relying on the Job Demands-Resources (JD-R) Model, our study analyzed relationships among common job demands, resources, and corresponding effects (burnout and engagement) for a sample of 73 unionized workers within the building trades industries (e.g., electrical workers, construction workers, railroad workers, etc.). Correlations and regression analyses demonstrated that perceived union support had significant negative relationships with workload, physical demands, work-family conflict, and burnout, as well as a significant positive relationship with engagement. There were no significant moderating effects of union support on burnout and engagement, except one marginal interaction effect found between physical demands and union support on engagement. Counter to the hypothesized relationship, when perceived union support was high, more physical demands related to less engagement. With the renewed public interest in labor unions and their effects, these results suggest the importance that union support as a resource can have for workers, especially as issues like stress and burnout continue to pose formidable risks.

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The Effects of Book Censorship on Elementary Education: A Teacher's Perspective
Amy Day, Grace McAlister, Natalie Clark, Jaylee Rose, Megan Waldrep, Ella Grant, Brailey Angel

Our research purpose is to find the impacts of the censorship of books in elementary classroom libraries. We are interested in the elementary school level of books, as our research question states this. Formally our research question is “How does the censorship of books in public elementary classroom libraries affect the teacher’s ability to teach effectively?”. We hypothesize that we will find an impact on the teaching ability, whether that is positive or negative it remains to be seen. These will allow us to remain centered on the topic of censorship, while allowing the interviews and articles to give us the information unbiasedly.

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The Effects of Kinesiology Taping on Shoulder Range of Motion and Joint Reposition Sense in Patients with Ehlers-Danlos Syndrome
Frank Tudini

Ehlers-Danlos Syndrome (EDS) is a group of inherited connective tissue disorders which predominantly affects women and has a prevalence as high as 1 in 5,000 individuals. Hypermobile EDS (hEDS) is the most common subtype of EDSand is characterized by multi-joint pain, particularly in large joints such as the shoulder. Physical therapy is often utilized to address the pain, physical impairments, and functional loss in patients with EDS. Kinesiology Tape (KT) is an intervention commonly used by physical therapists for treating shoulder pain and dysfunction. Studies related to the effectiveness of KT in patients with shoulder painis equivocal and there are a lack of studies specifically studying the effects of KT inan EDS population.

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The Effects of Phosphorylation on the NtrX Transcriptional Regulator
Taik Dedovic, Benjamin Stein

To survive in diverse environments, *C. crescentus* utilizes multiple two-component signaling systems (TCSs) to sense and respond to intracellular and extracellular changes. In two-component signaling, a sensor kinase phosphorylates a response regulator, which usually displays changes in DNA-binding activity, leading to transcriptional changes. The TCS I investigated is the *C. crescentus* NtrYX signaling pathway. NtrYX is present in many bacteria and plays a vital role in their survival and proliferation, including regulation of metabolism and cell growth. However, it remains to be tested how NtrX may affect transcription with or without phosphorylation. Our recent data suggest that, unlike a typical response regulator, NtrX may

affect transcription in both its phosphorylated and unphosphorylated forms. In addition, we previously established that two genes, *ntrZ,* and *ntrY,* strongly affect the levels of NtrX phosphorylation. We performed RNA-deep sequencing (RNA-seq) to quantify gene expression from each mutant strain. Performing this experiment provided hundreds of genes that are affected by the loss of *ntrX*, *ntrZ*, and *ntrX*. In the future, I plan to validate the RNA-seq data using transcriptional reporters.

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The relationships among adverse childhood experiences, working memory, and stress
Lauren Strickland, Leigh Humphrey, Amanda Clark

This study aimed to explore the relationships among adverse childhood experiences (ACEs), working memory as assessed by an n-back task, and stress. Working memory task demands were manipulated by varying the cognitive load (1-back/3-back) and time limit (standard-paced/time-restricted), and stress was measured both subjectively via self-report and objectively via heart rate and heart rate variability (HRV). Eighty undergraduate participants completed a series of questionnaires and the n-back task while wearing a heart rate monitor. Accuracy was best in the 1-back blocks; however, ACE group differences in n-back accuracy were not detected. This study suggests that those with high ACEs had an elevated experience of subjective stress throughout the task and may have been able to adapt to this stress as reflected by greater HRV and the maintenance of similar n-back accuracy as compared to those with low ACEs.

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The role of personal resources and situational factors in the stressor-detachment model
Brittany Ikner

The recent increase in remote work has led researchers to explore if and how recovery differs between remote, hybrid, and in-person workers and what organizations can do to best facilitate workers' recovery from work. Few empirical studies have identified which individual and situational factors assist or inhibit recovery from work. Using the stressor-detachment model as a theoretical framework, the present study investigated the moderating role of an individual's work arrangement and levels of emotional stability on the relationship between workload and personal burnout via psychological detachment.

Cross-sectional and time-lagged analyses using self-report data from 167 working individuals revealed that detachment fully mediated the workload-burnout relationship in the time-lagged sample; however, no support was found for the mediating effect of psychological detachment in the cross-sectional sample. The primary moderation hypotheses were not supported. Supplemental analyses found a significant interaction between workload and work

segmentation in the cross-sectional sample, such that the workload-detachment relationship was positive for those in low segmentation work arrangements and negative for those in high segmentation work arrangements.

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The Role of Shame in the Relationships Among Childhood Maltreatment History, Fears of Evaluation, and Associated Submissive Behaviors
Savannah Woods

Childhood maltreatment victims may be at higher risk for engaging in maladaptive social avoidance. Social avoidance tendencies associated with history of child maltreatment has been linked, in part, to fears of evaluation, which are commonly associated with negative affective states such as shame. Negative affect-driven social avoidance may be operationalized by self-reported experience, biopsychological responses, and socially submissive behaviors (e.g., eye gaze avoidance). Despite a strong body of research reliably identifying associations among these constructs, the literature is lacking in establishing the exact relationships among childhood maltreatment, fears of evaluation (e.g., fear of negative evaluation; fear of positive evaluation) and shame. The purpose of this study will be to test the roles of trait and state shame as a putative mechanism in the relationship between childhood maltreatment severity and several units of analysis of social evaluation-related distress and submissive behavior. Across Study 1 (i.e., self-report on an Internet survey battery) and Study 2 (i.e., laboratory and Internet self-report assessments) it is hypothesized that: (1) Overall childhood maltreatment severity will positively correlate with fear of negative evaluation (FNE); (2) Overall childhood maltreatment severity will positively correlate with fear of positive evaluation (FPE). For Study 2 only, it is hypothesized that: (3) averages of self-reported state shame, in response to negative evaluative feedback videos, will positively correlate with trait fear of negative evaluation (FNE); (4) trait shame will significantly moderate the relationship between childhood maltreatment severity and (4a) trait fear of negative evaluation (FNE), (4b) trait fear of positive evaluation (FPE), and (5) state social submissive behavior (i.e., reduced eye gaze fixation via eye tracking) in response to (5a) negative and (5b) positive evaluative feedback videos.

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The San Salvador Community Enrichment Initiative
Jillian Saraney, Emory Evans, Abbie Woodson, Taylor Yates

The San Salvador Community Enrichment Initiative is a project developed to increase nutrition security on a small family island in the Bahamas, San Salvador. The initiative includes the creation of a community garden, an IRB approved survey intended to gather baseline data regarding nutrition security and chronic disease prevalence, and a soil analysis.

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The Stifling Statute of Limitations: The Historical Roots and Tragic Implications of the United States' Statute of Limitations—And Evan Rachel Wood's Daring Fight to Change It
Daley Culberson

In November of 2016, actress and activist Evan Rachel Wood brought forth sexual abuse and assault allegations against her former boyfriend, Brian Hugh Warner (a rock singer professionally known as Marilyn Manson). Despite significant evidence of abuse, prosecutors were not able to file any formal charges against Warner for his alleged crimes against Wood. Wood's allegations have revealed a deep-rooted issue in America's criminal justice system: the statute of limitations prevents many victims from pressing charges and receiving fair trials against their abusers. This research study analyzes the historical roots of the statute of limitations, its multitude of consequences, and Evan Rachel Wood's persistent efforts to expand the rights of abuse and assault victims. Results indicate that varying forms of statutes of limitations have existed since the creation of laws, perpetuating gender discrimination, injustices in the criminal justice system, and fears among abuse and assault victims.

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The Synergistic Effects of Polyunsaturated Fatty Acids and Large Scaffold Antibiotics on *Vibrio cholerae*
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 opportunity for or for larger molecules, such as large scaffold antibiotics to diffuse through the outer and inner membrane of gram-negative bacteria. In this study, combinatorial treatment of V. cholera with PUFAs (linoleic acid [18:2], arachidonic acid [20:4], docosahexaenoic acid [22:6]) and large scaffold antibiotics (rifampin, erythromycin, and novobiocin) was evaluated using broth dilution minimum inhibitory concentration (MIC) assays. Significant changes in MIC were observed, particularly with erythromycin wherein all three PUFAs lowered the MIC. Strikingly, growth with 22:6 resulted in an 8-fold decrease in MIC against erythromycin. Variated PUFA-mediated fluctuations of MICs for rifampin and novobiocin were documented. Together, this data suggest potential for synergistic application of PUFAs and large scaffold antibiotics to target gram-negative infections.

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The Temporal Regulation of NtrYX by NtrZ
Autumn Wilson, Benjamin Stein

Many bacteria use Two-Component Signaling to respond to their environment effectively. Two-component signaling systems consist of a histidine kinase, where upon stimulation, phosphorylates the aspartic domain of a response regulator that can then elicit a specific response from activation of the downstream effector domain. Recent research revealed that a regulatory periplasmic protein, NtrZ, seems to affect both the NtrY and NtrX proteins in the freshwater and soil bacterium *Caulobacter crescentus*. Research before has found that NtrY acts as phosphatase, dephosphorylating NtrX and affecting the growth of cells. We have also found that NtrZ works upstream of NtrY, inhibiting phosphatase activity, and therefore increasing NtrX phosphorylation. However, we do not know exactly when NtrZ is active to affect the NtrYX pathway. I aimed to look at the temporal regulation of the two-component signaling system NtrXY by NtrZ in *Caulobacter crescentus.* Looking at different points of exponential growth in NtrX using the three bacterial strains WT, *ΔntrZ*, and *ΔntrY,* suggests that phosphorylation is not occurring in the earlier stages of growth in defined media. Data has also suggested that in comparison of the strains in defined and complex media, phosphorylation of NtrX is not as important in complex media for strains as it is in the defined media. While data has been obtained for interpretation, more replicates to verify our results will need to be done in the future. Looking at the effects of pH on the NtrYX system could also give us more insights into the role of NtrZ and the role time has in regulating the system.

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The UTC IEEE Robotics Team: The Robot Research
Tahjawuan Taylor, John Lazenby, Dillard Hawkins, Deimer Gomez, Thomas Clemmons, Christopher Harmon

UTC IEEE Robotics Team is developing a robot for a competition to be held in the upcoming weeks. The presentation includes information on how the team divided the workload of the subsystems, the results from testing the various subsystems, and overall plans moving forward. The team's spreadsheet discusses the breakdown of responsibilities among the team members, the creation of a test plan, the design of the chassis and intake systems, incorporating computer vision into the design, power distribution, and the creation of a copy of the playing field. The presentation concludes with the team's current progress and plans for future development.

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Tn Reconnect: Impacting Adult Learner Success?
Marci Reiter

A growing demand for a skilled workforce, alongside a statewide goal of 55 percent of its population being educated with some type of postsecondary education, the state of Tennessee launched an adult-focused, last-dollar grant program entitled Tennessee Reconnect (TnR) in the fall of 2018. With the five-year anniversary of the TnR launch approaching, the need to identify the impact on the state's adult learners is necessary for achieving institutional and statewide goals. Adult learners or those students who meet the grant's nontraditional student characteristics in this case, account for a large subpopulation of the state's community colleges and colleges of applied technology. Yet, this subpopulation's needs tend to be overlooked, or simply unknown, by many of these institutions. Therefore, this narrative literature review will seek to identify the most recent literature on both TnR and adult learners, as well as the possible impacts this grant program has had on adult learner's persistence in the state of Tennessee. By conducting this review, community colleges and colleges of applied technology in Tennessee can begin assessing their specific campus subpopulations of adult learners after five years of TnR availability, and identify the impact this grant has had on these learners' persistence and success rates. Subsequently, each specific campus can initiate the establishment of new policies, programs, and objectives in which barriers to adult learner persistence are minimalized.

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Topological effects in Tau-protein aggregation
Masumi Sugiyama

Tau-proteins form aggregates that are associated with neurodegenerative diseases called tauopathies. Tauopathies include diseases such Alzheimer's disease (AD) and chronic traumatic encephalopathy (CTE). Recent research suggests that a hierarchical classification of tauopathies based on their filament conformations. We apply methods from topology to rigorously characterize their confirmations. Our results demonstrate that topological measures will provide insights in global filament conformations and their effect on aggregations of tauopathies. The topological measures also reveal insights in local structures of tau-proteins.

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Toward Implementing Machine Learning Models in Human Activity Recognition for Wearable Devices
Nafiseh Ghaffar Nia, Hong Qin

This study used various machine learning models, including Support Vector Machines (SVM), K-Nearest Neighbors (KNN), and Random Forest (RF) to identify human activities such as walking upstairs, walking downstairs, standing, and sitting. SVM and KNN obtained the highest accuracy.

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Toward Prediction of Prosthetics Hand Orientation for Different Grasps Using Machine Learning Algorithm
Nafiseh Ghaffar Nia, Erkan Kaplanoglu

In this study, we used the machine learning technique based on IMU data to distinguish two prosthetic hand grasps, cylindrical and hook. In order to recognize grasps, we proposed a Deep ANN and achieved a high level of accuracy.

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Traditional vs. AI-Based Sorting Algorithms
Jay Bamnelkar, Jason Joseph

We are interested in comparing traditional sorting algorithms such as bubble sort and quick sort to AI-based sorting algorithms and evaluating their performance in terms of speed.

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Transformation: Exploring the Art of Bookmaking with Barry Moser from Special Collections
Emily Ruiz

Curatorial Statement:

This exhibit will explore the art of bookmaking through Barry Moser's work; although highly prolific throughout his career, the following selections have been chosen as particularly relevant to the themes of creation and transformation: this exhibit primarily pulls material from his illustrations of Narcissus, Frankenstein, and the Pennyroyal Caxton Edition of the Holy Bible (a limited edition 7-volume masterpiece produced by Moser's own printing company). Although he is best known for illustrating literary classics such as Alice: Through The Looking Glass and

Moby Dick, this exhibition will examine the growth of Moser's career beginning in the early 1970s with Narcissus, culminating in his most exhaustive work to date with the illustrated Bible.

This exhibition will explore how book-making reflects larger themes of transformation; the selected literary works reflect larger topics concerning death, transfiguration, and creation. Moser's process from sketch, to practice carvings, to test prints, to final product demonstrates a process of creation that reflects the very themes that these literary works target. As a booksmith beginning to complete the final chapters of his career, these works and accompanying material offer unique insight into the creation of a book—from idea to realization, Moser's artistry is intricately researched, thoughtfully assembled, and entirely himself.

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Treatment seeking among attorneys
Amanda Lesswing

Previous research has established that attorneys struggle with mental health problems and problematic drinking, but little is known about what may affect their attitudes toward receiving treatment from a mental health professional. The purpose of this study was to investigate what may influence attorneys' attitudes toward treatment seeking. We surveyed 131 U.S. attorneys regarding their work experiences, attitudes toward stress, and attitudes toward seeking mental health treatment. We found no significant correlation between an attorney's attitude toward seeking treatment and the average stigma from others and self around handling stress. However, we found that the mean of the average stigma from others around handling stress was higher for those who consulted a health professional versus those who did not. This trend was also found regarding the average stigma from self around handling stress. Those who have a problem could be feeling the stigma more or are recognizing it more. In the open-ended data, several attorneys indicated that there were no barriers when seeking treatment. Those who thought there was a barrier conveyed that those barriers included time to attend, haven't felt the need for treatment, cost of care/ financial concerns, and general stigma/opinions of others. More research needs to be done to examine further why attorneys may not be seeking treatment, such as when they believe seeking treatment is appropriate. Attorneys may be waiting for the problem to be severe before seeking treatment and could benefit from earlier intervention.

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Trembling Troubadours: Preserving the Voice and Bringing Awareness to Parkinson's Disease One Note at a Time
Katherine Goforth Elverd

Improvement in movement, mood, thinking, social connection, & sense-of-self merit older adults participating in group singing. Older adults living with Parkinson's disease (PD) experience enhanced advantage by participating in group singing through improvement in breath control, vocal intensity and voluntary speech production. Trembling Troubadours is a therapeutic choir for those living with PD & their caregivers. The presentation will explore the clinical application of evidence-based music therapy interventions and therapeutic outcomes in the treatment of PD, concluding with impact statements of members of Trembling Troubadours & examples of the choir's education & advocacy work.

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Ubiquitin-Proteasome System Regulation of an Evolutionarily Conserved RNA Polymerase II-Associated Factor 1 Involved in Pancreatic Oncogenesis
Jannatul Ferdoush

The evolutionarily conserved RNA polymerase II-associated factor 1 (Paf1) from yeast to humans regulates transcription and associated processes, and thus, malfunctions and/or misregulations of Paf1 are associated with cellular pathologies. Indeed, Paf1 (also known as PD2 or pancreatic differentiation 2) is found to be upregulated in poorly differentiated cancer cells, and such upregulation is involved in cellular transformation or oncogenesis. However, the basis for Paf1 upregulation in these cells remains largely unknown. In light of this, we have tested here the idea that the ubiquitin-proteasome system (UPS) regulates the cellular abundance of Paf1. In this direction, we analyzed the role of UPS in regulation of Paf1's abundance in yeast. We find that Paf1 undergoes ubiquitylation and is degraded by the 26S proteasome in yeast, thus deciphering UPS regulation of an evolutionarily conserved factor, Paf1, involved in various cellular processes at the crossroads of the cancer networks. Likewise, Paf1 undergoes proteasomal degradation in well-differentiated, but not poorly differentiated, pancreatic cancer cells, hence pointing to the UPS in upregulation of Paf1 in poorly differentiated cancers. Collectively, our results reveal UPS regulation of Paf1 and suggest downregulation of UPS in elevating Paf1's abundance in poorly differentiated cancers.

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Understanding the Impact of Intersectional Victim Identities on Bystander Behavior
Ciara Carl, Erin Prince, Ruth Walker

Victimization rates of sexual assault are often higher for people with marginalized identities. According to the National Intimate Partner and Sexual Violence Survey, Black women reported the highest lifetime prevalence rate of rape (21.2%), followed by White women (20.5%) and Hispanic women (13.5%; Breiding et al., 2014). The prevalence of sexual violence other than rape is alarmingly high, with 46.9% of White women, 38.2% of Black women, and 35.6% of Hispanic women reporting other forms of unwanted sexual contact and coercion. People may have negative perceptions of and behaviors toward victims based on their identities, leading to potential barriers in being an active bystander to help prevent the assault. Vignette research studying sexual assault generally looks at impact of four different effects: (1) victim characteristics, (b) perpetrator characteristics, (c) observer characteristics, and (d) other situational factors (e.g., coercion type, relationship to victim, etc.). The limited research that has been done on victim identity characteristics is inconclusive; for example, researchers have found evidence of differences in victim blaming by victim race (Varelas & Foley, 1998; George & Martinez, 2002).

The present study addresses the following research questions: (1) Does perceived humanity of a sexual harassment victim vary by their race/ethnicity (White, Black, Latina); (2) Do levels of victim blaming and empathy vary by victim race/ethnicity; (3) Does willingness to engage in bystander behavior vary by victim race/ethnicity; (4) Do RQs 1-3 depend on the victim's level of intoxication (low/high)?; (5) What variables significantly predict participants' intention to help? A sample of 564 participants were recruited from Prolific. Participants were predominantly white (77.8%), identified as women (58.0%), and ranged in age from 18-75 years old (M = 35.26, SD = 11.52). After conducted analyses of factorial ANOVAs, we observed no differences in perceived humanity, victim blaming, empathy, or intention to help the White, Black, and Latina conditions. Main effects for alcohol intake was observed, such that more blame was assigned to victims in the high alcohol intake conditions. There was not a significant interaction between ethnicity/race and alcohol intake.

A multiple regression model was conducted to understand the relationship between our variables and participants intention to help victims of sexual harassment and assault. We found that participant level of empathy as well as their perceived humanity explain a significant amount of variance in bystander behavior. These variables predicted over and beyond identity characteristics, which had not previously been studied in the literature. The results of this study help us understand underlying motivations to help potential victims of sexual assault. Overall, our results indicate that, for the participants included in this study, perceptions of victims did not vary by race/ethnicity. This study also highlights the continued importance of including a focus on increasing empathy for sexual assault victims in bystander intervention programs. Further, it demonstrates the importance of considering how humanizing outgroups may help promote intergroup helping behavior (e.g., Cuddy et al., 2007). Additional study implications, limitations, and future directions will be discussed.

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Understanding the Upregulation/Overexpression of TAF12 in Cancer Cells
Julia Mathew

TATA-Box Binding Protein Associated Factor 12 (TAF12) plays an important role in regulation of transcription initiation (7). TAF12 dysregulation is found to be linked to many cellular diseases. Importantly, TAF12 has been discovered to be upregulated in colorectal cancer, Choroid plexus carcinoma, liver and renal(1, 7, 8). However, the cause for upregulation of TAF12 in these cancer cells is not clearly understood. Our hypothesis is that TAF12 turnover might be important to maintain optimal levels of TAF12 for normal cellular function which might be regulated by Ubiquitin-Proteasome System (UPS). UPS controls the protein turnover by targeted degradation by the 26S proteasome. The 26S proteasome is one the most crucial proteasomes in eukaryotes, which controls the fundamental cellular processes like apoptosis, gene expression, and cellular proliferation (3).

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Urban Understandings
Jacob Price

While much research has been carried out on the topic of gentrification over the past several decades, little to no economic research has been conducted on the potential presence of coercion within the process. In this paper, we define coercion as any attempts by third parties, whether government or private entities, to artificially accelerate the natural housing cycle. In studying this, we examine Lincoln Park as a case study, a Chattanooga neighborhood that was once a bastion of culture and security for the Southern African American community, by employing a two-pronged approach. On the qualitative front, we interview community and city leaders, as well as employ investigative journalism in researching the existing literature, including books and newspapers, on the history of Lincoln Park. Quantitatively, we build and conduct a survey among the residents of the neighborhood, allowing us to run empirical analyses upon the data. Combing the two approaches, we construct a holistic study of the potential presence of coercion within Lincoln Park's housing and development process.

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Using Drones in Dense Urban Cores to Transport Medical Supplies in a Timely Manner
Christopher Tompkins

As major cities have their infrastructure struggle to keep up with the density of urban life and the influx of people moving into city cores, the movement of supplies within a city core will become a tangible issue. The delivery drone enables the use of open skies to move critical medical supplies between suppliers and demand points. This will allow healthcare operations to operate smoother while increasing the availability of niche treatment options. This procedure will enable savings in the healthcare industry, as it is easier to move an antivenom to a patient versus moving the patient to a Tier 1 trauma center that carries the antivenom. Diverse mathematical models have been proposed to address this problem. In this study, we use an existing model in the literature and analyze the computational stability using a real test case. Further, we investigate a new model capable of determining optimal distribution center locations and their corresponding service locations by introducing two objective functions.

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Using KMeans and Birch Algorithms to Show How Gender and Smoking Affect Reproduction Rates of Covid-19
Kassie Dover

Using K Means and Birch Clustering Algorithms in Python, I will compare the averages of smokers who get Covid-19 and the reproduction rates thereafter. I will then break this down by gender and compare how the genders(Male and Female) get covid along with the smoking rates.
Questions:

1. How does smoking affect one's reproduction Rate of Covid-19?
2. Does Gender play a role in it as well?
3. On average who has higher chance gender wise?

Results:
Men who smoke tend to suffer a higher reproduction rate of Covid-19 then Women who smoke. Smokers as a whole are higher then non-smokers for risk.

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Utilizing Daily Huddles to Improve Team Vitality
Talisha Troutt

Abstract

Daily huddles for front-line staff are well-established in the healthcare setting and are intended to promote the exchange of ideas, discuss safety concerns, promote a team environment, and improve team communication. The Institute for Healthcare Improvement

recognizes that institutions that put strategies in place to enhance staff effectiveness and vitality demonstrate increased patient and care team satisfaction, reduced staff turnover, and better clinical outcomes. This quality improvement project aims to improve team vitality through the implementation of evidence-based daily huddles. The PICOT question guiding this project: *For providers and staff working in an acute care clinic, how does the implementation of evidence-based daily huddles, compared to current practice, affect team vitality over a six-month period?* Daily huddles will be implemented within a university health center at a state higher education institution. The project will use alternate formats (i.e., Face-to-Face, E-Mail, or Mobile Application) for daily huddles to determine the preferred method for exchanging information. The Healthcare Team Vitality Instrument (HTVI) will be used to measure team vitality as it highlights dimensions related to front-line staff empowerment and engagement, perception of a work environment supportive of safe and high-quality patient care, effective communication, and team collaboration. Utilizing the HTVI, we will measure perceptions of team vitality among clinic staff members at pre-implementation and then again at three-months and six-months post-implementation to evaluate team perceptions of team vitality. *Keywords:* huddles, team vitality, communication, engagement

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Utilizing RN PREP, A Resilience Training Program to Foster Resilience in New Graduate Nurses
Robyn Tobias, Susan Thul, Karen Frank

New graduate nurses (NGNs) have difficulty adapting to their new job due to lack the clinical knowledge, poor transition to the profession, lack of coping ability, and resilience needed to handle high stress situations (Alshawush, et al, 2020). Resilience training/interventions are needed for NGNs. Resilience interventions offer NGNs the opportunity to gain skills to help them prevent stress while building the skills needed to transition into nursing practice and stay in the nursing profession successfully (Stephens et al., 2017).

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Vacuum Sealed Aerogel
Sam Friedman

Silica Aerogel is known for its transparency, its enhanced heat insulation, and its lightweight, porous, fractal structure. While aerogel has many unique advantages, its structural integrity has led to its low amount of usage. On average silica aerogels' tensile strength is very low. Few methods have focused on external ways of strengthening the silica matrix. By compressing the silica matrix, the particles should be pushed closer together causing the resistance to failure to increase. In order to compress the Silica Aerogel, vacuum sealing was used along with a transparent plastic outer skin. It was found that although the transmission was decreased, the strength and resistance to heat transfer were greatly increased.

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Voices of Revolution: Ukrainian War Poetry
Kat Johnson, Isaac Morgan, Madalynn Pendergrass, Mary Klepper

Our group is researching poetry produced over the duration of and in response to the Russo-Ukrainian War (2014-2023). Throughout the course of our investigation, we are attempting to answer the following question: **What can we learn about the human response to war by examining different literary perspectives that relate to the conflict in Ukraine?** We are analyzing Ukrainian perspectives of war with an emphasis on gender, memory, truth, and emotion. This project is the collaborative effort of four honors students currently enrolled in a Modern World Literature course. The anthology *Words for War: New Poems from Ukraine* edited by Oksana Maksymchuk & Max Rosochinsky is the principal resource for our investigation. We chose this anthology due to its variety of relevant perspectives and reactions related to the ongoing Russo-Ukrainian conflict. Our methods involve textual analysis, literature review, comparative analysis, and interpretive criticism. During the course of our research, we have made connections between societal responses to war and the resulting internal struggle. We hope to translate these findings into a broader and more substantial understanding of culture and conflict.

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Well-Defined Cp*Co(III) Complexes Involving Bidentate Chiral Amine Ligands for the Activation of Carbon-Hydrogen Bonds
Bailey Newell

The known catalyst, [CoCp*(CO)$(I)_2$], mediates C-C bond-forming reactions through a C-H activation mechanism involving cyclometalating substrates in the presence of a silver salt. We have prepared a series of complexes of the type [Co(Cp*)(X,X-DPEN)(I)](I), where Cp* = pentamethylcyclopentadienyl anion and X,X-DPEN = S,S- or R,R-1,2-diphenylethylenediamine, via direct ligand substitution from [CoCp*(CO)$(I)_2$]. Furthermore, we have isolated and characterized [Co(Cp*)(X,X-DPEN)(OAc)](OAc) after iodide substitution with silver acetate. All four complexes have been characterized by ^{1}H and ^{13}C NMR spectroscopy as well as single-crystal X-ray diffraction. The crystal structures of the latter acetate complexes reveal a large network of H-bonding between acetate, DPEN, and water molecules, which suggests the proximal acetate could serve as an external base to break unreactive C-H bonds. Results from catalytic screening of [Co(Cp*)(X,X-DPEN)(Y)](Y), where Y = I or OAc, will be described. In addition, attempts to extend from a bidentate amine to a bidentate N-heterocyclic carbene ligand to prepare complexes of the type [Co(Cp*)(NHC_2)(I)](BF_4), where NHC_2= trimethylenebis(N-n-butylimidazol-2-ylidene) or trimethylenebis(N-methylimidazol-2-ylidene), will be presented.

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What Are Public Universities Communicating About LGBTQ+ People via Social Media?
Bella Wills, Sydney Aites, Donya Koshkebaghi, Madeline Charnes, Ruth Walker

The purpose of this research study was to explore and describe what public universities in the United States are communicating to their students about the LGBTQ+ community. A content analysis of 100 public university Instagram accounts was conducted to identify manifest and latent content. Results and implications will be discussed.

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What are the perceived barriers for African American males seeking treatment in the psychiatric healthcare system?
Telicia Robinson

This presentation will inform the audience about the black struggle and how it can effect their mental health.

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What Impacts University LGBTQ+ Friendliness More: Politics or Policy?
Sabrina Grebenstein

The purpose of this research study is threefold: (1) explore LGBTQ+ Friendliness of public universities in republican-controlled states vs. democratic-controlled states (2) understand potential differences in the LGBTQ+ legislation in republican-controlled states vs. democratic-controlled states? (3) to be aware of a possible relationship between the LGBTQ+ friendliness of public universities and LGBTQ+ state legislation.

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When trauma makes you numb: Pain perception in individuals with PTSD symptoms
Byron Russell

Previous psychophysiological and behavioral literature has shown that those who score high on measures of PTSD also differ notably from the general population in their reported pain threshold. Though various amounts of past literature discuss pain thresholds in individuals with PTSD, literature has indicated varying results in how this threshold differs from the general

population. Past literature has found that individuals who endorse higher levels of trauma exhibit a decreased pain threshold (Gómez-Pérez & López-Martínez, 2013), while other literature has found the inverse, with higher levels of trauma being correlated with higher pain thresholds (Defrin et al., 2015). Other past literature has found that certain causes of PTSD may moderate this relationship, such as combat related PTSD or accident-related PTSD (Tesarz et al., 2020). The purpose of this research is to further investigate this link between symptoms of PTSD and individual pain threshold. Participants (n=33) who endorsed at least one lifetime traumatic event self-reported PTSD symptom severity on the PTSD Checklist-Civilian Version (PCL-C). They also underwent a random staircase procedure with mild shock to gauge their discomfort thresholds (for purposes of a larger study about fear conditioning). Using a bivariate correlational analysis PTSD symptoms severity was positively related to pain threshold levels as measured in milliamps, $r = .33$, $p > .001$. When co-varying for gender, weight, and height (all of which can affect pain threshold due to body composition), PTSD symptoms remained correlated with pain threshold, albeit approaching significance at $r (27) = .32$, $p = .09$. To test specificity to PTSD (or anxiety-related symptoms in general) additional analysis found that generalized anxiety disorder (GAD) symptoms were also weakly correlated with pain threshold at $r = .49$, $p > .001$, $n = 86$. When co-varying for gender, weight, and height, GAD symptoms correlated with pain threshold at $r = .27$, $p = .07$, $df = .79$.

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“Engineers Help People”: A Summer Elementary Innovation Experience
Stephanie Philipp, Lauren Strickland

UT-Chattanooga and Hamilton County Schools are partners in developing a K-8 computer science/computational thinking (CS/CT) curriculum pathway that integrates the new Tennessee K-8 Computer Science Standards across the existing elementary curriculum. An initial CS/CT pathway model developed by the partnership features interdisciplinary activities that introduce and reinforce digital literacy, CT, and CS concepts in schools' STEM innovation centers, regular classrooms, and related arts classes. Twenty-two teachers volunteered for professional development in using block-based coding and Lego SPIKE Essential kits. They used this new learning to develop and teach twice-weekly, hour-long interdisciplinary sessions in a free 6-week summer public school program attended voluntarily by 250 rising 1st-6th graders. This presentation will share an evaluation of the summer program and how the evaluation results might impact the teachers' integration of computer science concepts in STEM labs, literacy, and arts curricula during the academic year.

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“Let’s Get Some Power”: Exploring the Impact of the Black Campus Movement on the University of Tennessee at Chattanooga

Alex Furr, Noah Lasley

This project examines the presence and effects of the national Black Campus Movement (BCM) on the University of Tennessee at Chattanooga (UTC). The BCM, lasting from roughly 1965 to 1972, was a dramatic instance of Black student activism at American colleges and universities with an impact that dramatically changed higher education. Historian Martha Biondi writes that through the efforts of Black student activists, colleges were pushed to increase financial aid, formalize and expand their affirmative action policies, and effectively transform “white campuses into multiracial learning environments.” This project investigates how and in what ways this nationwide movement manifested locally and its potential impact at UTC. To address this aim, the study reviews primary source materials from the University Archives, including newspapers, yearbooks, and other records. With this research, a timeline was constructed of University history from 1969 through the 1970s, identifying important moments in Black student history at UTC, centered around the activities of the Black Student Association (BSA) organized in 1969. Special attention is especially paid to the key elements the UTC BSA shared with other national Black Student Unions.

Though the findings suggest this student organization faced significant resistance and opposition from some members of the student body, faculty, and the media, it contributed to the BCM through direct action and advocacy for Black students’ rights, making it particularly vital to Black student life during the national Black Campus Movement era. Crucially, the UTC BSA reflected the same key element that historians like Biondi have identified as most integral to the movement: “leadership in the Black student movement was indigenous and local; students… led their own struggles.” In this presentation, researchers will share preliminary conclusions regarding the BSA’s place within the Black Campus Movement, as well as topics and questions for further study.

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