

**32ND ANNUAL
STUDENT RESEARCH
CONFERENCE AT
SOUTHEAST MISSOURI
STATE UNIVERSITY**

32nd Annual

S t u d e n t

R e s e a r c h

C o n f e r e n c e

APRIL 16TH AND 17TH, 2024

SCHEDULE

April 16

ORAL PRESENTATION SESSIONS

PRESENTERS

8:00 AM - 9:00 AM	Trinity Calinescu (U)* Shahadur Rahman* Jannatul Ferdaous* Moe Toyoda (U)* Jaylen Tinsley. (U)*	University Center Ballroom A
9:00 AM - 10:00 AM	Moe Toyoda (U)* Lacey Drury (U)* TeeJay Hughes Jr. (U)* Kaitlyn Domagni* Alison Venus (U)	University Center Ballroom A
2:00 PM - 3:00 PM	Sydney Lamb* Molly McNabb* Hannah Wolfe (U)* Mercy Lubeju (U)*	University Center Ballroom A
4:00 PM - 5:15 PM	Nora Kilburn (U)* Lucky Atabo* Furba Lama Sherpa (U)* Saurav Ghosh* Josie Fryar (U)* Krishna Thakar (U)*	University Center Ballroom A

*Denotes competing

SCHEDULE

April 16

POSTER PRESENTATION SESSIONS

PRESENTERS

10:00 AM - 11:00 AM	Jennifer Wiesner* Hayleigh Locke (U)* Joshua Haugh (U)* Natali Daum (U)*	University Center Ballroom B
12:00 PM - 1:00 PM	Julie Oni* Riliga Wu* Isabel Phillips (U)* Aaron Christianson (U) Samir Das*	University Center Ballroom B
3:00 PM - 4:00 PM	Sagar Kandel (U)* Isabella Correnti (U) Josh Birke (U) Bailee Cairel (U)* Saurav Ghosh* SM Masfiqur Rahman* Kavya Nikhita Meda* Nweli Sain*	University Center Ballroom B

*Denotes competing

SCHEDULE

April 17

ORAL PRESENTATION SESSIONS

PRESENTERS

9:00 AM - 10:00 AM	Caroline Bowen (U) Allison Roberts Sweden Loke (U) Darnesha Franks (U) Adam Wilson (U)	University Center Ballroom A
10:00 AM - 11:00 AM	Pavan Subash Chandrabose Nara Gwen Squires (U) Meron Tesfaye (U)	University Center Ballroom A
2:00 PM - 3:00 PM	Maddy Stirmell (U) Hannah Edwards (U)* Nick Dietrich (U) Delaynie Spies (U)	University Center Ballroom A
3:00 PM - 4:00 PM	Hossein Shahi*	University Center Ballroom A

*Denotes competing

SCHEDULE

April 17

POSTER PRESENTATION SESSIONS

PRESENTERS

8:00 AM - 9:00 AM	Madison Sniegowshi (U) Maxwell Greenwood (U) Savannah Baker (U) Samuel Shevlin (U)	University Center Ballroom B
3:00 PM - 4:00 PM	Owen Dowdy (U)* Sheanique Syms (U) Logan Dunlap (U)	University Center Ballroom B
4:00 PM - 5:00 PM	Nia Rivers (U) Abrar Saleheen Lillian Neely (U) Erin Lowe (U) Hunter Jackson (U) Madison Bates (U) Lokeshprasanth Gadesula	University Center Ballroom B

*Denotes competing

SCHEDULE

April 16

SPECIAL SESSIONS

11:00 AM - 12:00 PM	Public Speaking Workshop	University Center Ballroom B
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1:00 PM - 2:00 PM	Jane Stephens Honors Program Roundtable	University Center Ballroom B
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SCHEDULE

April 17

SPECIAL SESSIONS

11:00 AM - 12:00 PM	Mastering Time and Notes with Learning Assistance Programs	University Center Ballroom B
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1:00 PM - 2:00 PM	Keynote Address with Dr. Jim McGill	University Center Ballroom B
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6:00 PM - 7:30 PM	Awards Ceremony	University Center Ballroom A
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KEYNOTE ADDRESS



DR. JIM MCGILL

Keynote Address

Wednesday, April 17, 2024

1:00 PM - 2:00 PM

“Can Student Research transform Lives?”

Jim McGill is completing his twenty-first year on the faculty at Southeast Missouri State University. He holds the rank of professor in the Department of Chemistry and Physics and is associate dean of the College of Science, Technology, Engineering, and Mathematics. McGill earned his Ph.D. in chemistry at Kansas State University, his B.S. in chemistry from SEMO, and his high school diploma from the Charleston R-1 School District, in Charleston, Missouri. He is a native of the Missouri Bootheel, growing up in the city of Anniston in Mississippi County. He is a first-generation college graduate. While McGill’s formal education and training is as an organic chemist, he is also an expert in forensic chemistry—specializing in the chemistry of illicit drugs and fingerprints—and worked as a forensic chemist for the Drug Enforcement Administration during a break from his academic career. McGill has helped to secure over a million dollars in federal and corporate funding and donations for forensic chemistry teaching and research at SEMO. His true passion is helping others discover their gifts and their passions and put those together to find their calling and achieve their dreams and helping to create cultures where everybody can likewise thrive.

McGill has held a number of leadership roles at SEMO, including director of the Jane Stephens Honors Program and chair of the Faculty Senate. Recognitions for his teaching, leadership, and service have included the Faculty Merit Award, the Governor’s Award for Excellence in Education, the National Academic Advising Association’s Outstanding Faculty Advising Award, the SEMO PRIDE Award, the Jane Stephens Honors Program Faculty Exempli Gratia Award, and Greek Life Professor of the Year. McGill presented the 2023 spring SEMO commencement address and is also proud to be recognized as one of five Honorary Student Government Senators at SEMO and the only faculty member to hold that distinction.

He and his wife, Jennifer have three adult children—Justin, Hannah, and Bryce—and three rescued dogs—Sadie, Stella, and Sophie.



Graduation - An Honor

Requirements for students graduating with honors changed in the 1993-94 school year, raising standards for honors graduation rights.

The Board of Regents voted in the fall of 1993 to raise the required honor production standard. The change actually went in effect beginning the fall semester of 1995.

To graduate with higher honors, all Summit College students must achieve a grade point average of 4.0 cumulative through Cum Laude or graduation with high

degrees in a variety of areas, but there seem to be several honor students graduating with degrees in business administration, the sciences, and interdisciplinary studies. Two of those students graduate every year with perfect grade point averages.

In 1995, 93 of 644 students graduating completed their college careers with honors. In the fall of 1990, the numbers were 42 of 481 and in the summer of 1985, there were 40 honor graduates out of the 273 seniors. The total of honor graduates for the

in your last two years here."

For entering freshmen the Registrar there is an honors program. Students taking honor's classes will receive a grade but on their transcript, it will show that it was an honor class. It will be understood that a B in an honor class might qualify as an A in a regular class.

Supplies the special classes may make students try harder and will surely improve the quality of a student's education at SEMO. SEMO students can compare them



Celebrating 40 Years of the JSHP!



Honor graduates have written back to share very meaningful letters below that degree about the process of a graduate with a professor with honor's credit.



69



Academic Excellence the honor is worth the effort

most, if you will, a straight A. A picture you developmental of the in the intellectual these people who in our classes, and their academic ex-

worthy of the highly program at SEMO. The in its second year of that kinds it maintaining students might not otherwise being strictly on 30- more student initiative the subject,

more emphasis is placed on methods of research and development, professional activity in the subject, and current issues and problems. By using this approach, it challenges the students to find solutions and make intellectual decisions.

Dr. Jane Stephens, director of the Honors Program, explained the requirements for the program. "To be eligible for the program, you have to rank in the 90th percentile on your ACT test, or have at least a 3.3 cumulative GPA in high school. Students already in college are eligible if they have at least a cumulative 3.25 GPA after two semesters, which must be maintained to stay in the program," she said.

"Honors credit may be earned by taking specific honors courses, or by receiving credit by contract with an instructor.

Under contract, the student takes independent work which satisfies the goals of the honors program, while still meeting course requirements," she said. Honors Program instructors are chosen by recommendations from the department's champion and dean, and must also have a record of excellence in teaching.

There is much reward to being an honor student—the challenge of developing the mind is one that demands much work. However, if you are one who has achieved academic excellence, then you welcome the challenge with open arms and an open mind.

Ashley Gates



Effort Worthy of an Honor . . .

What do honor students do differently than the average person? For one thing, they have their priorities straight. Grades are number one, and they know how much time to allot to study and to good times.

You might think that some people are just born intelligent. Most people do have to work very hard, no matter how smart they are. Cindy James, a junior honor student with a 3.5 GPA, said, "Anytime I'm not at school or work, I'm studying. I don't go out as much as everyone else. I study a lot."

It is true that many times honor students have always excelled, but sometimes it's a matter of effort. Denise Rossen Zuber, with a 3.6 GPA, said that a key factor for her was her third semester at SEMO, when she achieved a perfect 4.0. "Once I started doing well, it motivated me to continue excelling," she said.

Everyone has their own way of studying. Zuber reads her chapters in advance and spends a couple of hours each night studying, while James remembers what she reads well and doesn't go over notes as often.

As we know, honors classes are different than regular classes. "I like it better because there are fewer people and more discussion. More of your interests are discussed," James said.

With the new attendance policy in effect, attitudes among students about being in class may change a little. However, Zuber summed it up with one sentence. "I never miss class," she said. She also suggested talking to professors outside of class, especially if you're having problems.

Ashley L. Gates



Denise Rossen Zuber's grades are very important to her. See page 68-69

JANE STEPHENS HONORS PROGRAM ROUND TABLE



KAYLA MCCAIN

Kayla is a graduating senior at Southeast Missouri State University with a double major in political science and public relations. She has been a member of the JSHP Student Council for her entire academic career. She served one year as the Honors Floor Liaison and two years as the Chairperson.



DR. KEVIN DICKSON

Kevin Dickson was director of the Jane Stephens Honors Program from 2015 to 2017. He is currently department chairperson of the Management Department. He first began to enjoy the Jane Stephens Honors Program in 2004 when he became part of the Faculty Honors Council. He truly enjoys the opportunity to get to know honors students!



DR. SCOTT BRANDHORST

Scott Brandhorst is the current director of the Jane Stephens Honors Program. He has served in this role since 2022 and has worked with students in the program since coming to Southeast in 2008. He currently serves as a faculty member in the Department of Psychology and Counseling. He looks forward to continuing to work with the students here at Southeast.



DR. JANE STEPHENS

Jane Stephens served as Director of the Honors Program from 1985 until 1994. She was also Provost from 2000 until 2009. In the interim she served as Provost at the University of South Carolina Spartanburg until she returned to Southeast in 2000.

FULL ABSTRACTS

A Lack of Sovereignty: Understanding How Treaty Rights Work Against Indigenous Women Through Depictions in Fiction

Lillian Neely; Faculty Sponsor: *Sandra Cox*

Missing and Murdered Indigenous Women and Girls (MMIWG) is a national movement calling attention to the widespread assault or murder of Indigenous women for whom the federal government or Tribal Nations have been unable to secure justice. Some Indigenous authors, like Louise Erdrich, Stephen Graham Jones, and Angeline Bouley, choose to depict these crimes in literature in order to call attention to this injustice. This paper seeks to understand the formal strategies three different authors use to produce an affective response in their readers and how this response implicitly presents some critical claims about how reparative and punitive justice are represented within the settings of *The Round House* (2012), *Antelope Woman* (2016), *The Only Good Indians* (2020), and *Firekeeper's Daughter* (2021). In constructing these representations, the authors seem to be critiquing colonial power and examining how these fictional Indigenous characters are affected by it in order to present a forensic narrative to non-Indigenous readers that raises awareness about these problems. They also highlight how conditions have been created that have normalized violence against Indigenous women and girls so as to provide narratives for resisting that violence by critiquing settler colonialism. Each of the four novels provides a narrative model for resisting or responding to that violence.

Agroecology and Hypoxia with the Mississippi River

Maxwell Greenwood 1 & Indi Braden 2; Faculty Sponsor: *Dr. Indi Braden*

Decomposition of algae can lead to decreasing levels in available oxygen, creating a hypoxic zone. These zones have been noticed within the Gulf of Mexico which is fed via the Mississippi River. Agriculture contributes to the ocean life largely suffering from hypoxic zones as they are deadly for fish, crabs, and other marine life. These effects are mainly contributed from fertilization management of farmland and other leached components into waterways. This literature analysis will provide insight into outcomes that will point mainly towards waste/storm water runoff, nutrient leaching, and other dramatic foreign additions to the Mississippi River way. It is these effects here that will most likely be the main contributing factor to the algae blooms and dense hypoxic zones found in the Gulf of Mexico. Analyzing these hypoxic events through time can allow us to better understand the influencing factors along the Mississippi River that are causing these events to take place. By utilizing an ecosystems services approach, the complex variables involved in eutrophication of the Gulf of Mexico. This will involve looking at multiple frameworks within the relationship of people, plants, animals, and the environment. Understanding this relationship can possibly aid in reversing the harmful effects and better developing the water quality for all.

Alternative Mindfulness Therapies for Patients with Obsessive-Compulsive Disorders

Cosima Trinity Calinescu; Faculty Sponsor: *Dr. Shawn Guling*

Obsessive compulsive disorder (OCD) is characterized by the engagement in repetitive patterns of behaviors to calm unwanted and intrusive thoughts. Per the World Health Organization, OCD is one of the most impairing disorders since it can severely limit people from living a fulfilling life. Methods such as medications, Exposure and Response therapy (ErP) and Cognitive Behavioral Therapy (CBT) have shown promising results but still generate financial and logistical issues for those with OCD. In order to identify more financially sustainable treatment, mindfulness techniques are considered as alternatives to current methods. Mindfulness techniques

have shown promising results in treating OCD. Mindfulness helps people with OCD to regulate their obsessive thoughts and compulsive behaviors through self acceptance and focus on breathing. Mindfulness has also been shown to improve right hemisphere regulation, specifically linked to pre-planning of unwanted behaviors. Examples of mindfulness practices will be further discussed.

An Exploratory Study of Under-Represented Populations' Motivations for Entering the Criminal Justice Field

Allison Roberts; Faculty Sponsor: *Dr. Michelle Kilburn*

In the recent years, there have been many high-profile incidents in the media regarding law enforcement officers and their methods. Much of this attention has been negative, focusing on topics like police brutality and incarceration rates. Despite this attention, individuals continue to enroll in law enforcement academies and criminal justice programs across the nation. This exploratory study is especially interested in learning what factors and influences are encouraging individuals to choose the Criminal Justice Field. By reviewing different studies conducted by fellow researchers, this project is able to provide a comprehensive overview of existing knowledge, findings, theories, and methodologies related to student's interest in the Criminal Justice Field.

Anthropological Analysis of Unidentified Skeletal Remains from Lincoln County, Missouri

Nora Kilburn 1, Maddy Stirmell 2, Shianne Glass 3, & Kennedy Lam 4; Faculty Sponsor: *Dr. Jennifer Bengtson*

On March 30th, 1978, a body was spotted in the Mississippi River near Hatfield's Landing in Lincoln County, Missouri. The coroner estimated the body to be that of a white female aged 30-40 years old. The cause of death was listed as drowning while the manner of death was undetermined. Authorities were unable to identify her, and she was buried on April 5th, 1978. On November 23, 2023, Lincoln County law enforcement along with the Forensic Anthropology Cold Case Team (FACCT) at Southeast Missouri State University exhumed the woman's remains for further osteological and genomic analysis. FACCT students applied osteological methods to refine the biological profile of the unidentified woman. Updated age estimation based on dental formation and epiphyseal fusion suggested that she was actually 16 to 18 years of age at the time of her death. After applying non-destructive screening tests, the most promising samples were sent to a forensic genomics lab, where DNA was successfully extracted and a genomic profile developed. This Jane Doe now has a chance of reclaiming her identity because of proper record keeping, updated osteological analysis, and modern genomic science.

Attachment and Growth of PC12 Neural Cells in Presence of Multifunctional Nanocarriers for Early Detection of Radiation Induced Damages

Malsha B N Nanayakkara 1,2, Austin McGill 1,2, Sagar Kandel 1, Nick Dietrich 1,2, Santaneel Ghosh 1,2; Faculty Sponsor: *Dr. Santaneel Ghosh*

The escalating concern over chronic low-dose galactic cosmic ray (GCR) radiation highlights the urgent need for advancements in the early detection of radiation-induced damages, particularly within the central nervous system. Such radiation exposure is known to precipitate a spectrum of adverse health effects, including but not limited to cardiovascular, cerebrovascular, microvascular damages, and profound impacts on cognition, memory, reaction time, and behavior. A significant gap in the current medical field is the absence of rapid, minimally invasive, point-of-care diagnostic methods that can accurately assess the extent of tissue-specific damages incurred by individuals. Addressing this gap, our research introduces the design and application of multifunctional nanocarriers, specifically Boron Nitride Nanotubes (BNNT), aimed at facilitating neural cell growth and attachment. Unlike Carbon Nanotubes (CNT), which are marred by high toxicity levels, BNNTs emerge as biocompatible substrates conducive to the growth and proliferation of PC12 neural cells. Through a series of experimental protocols encompassing the cultivation and exposure of E.coli and PC12 cells to varying concentrations of BNNT, our study demonstrates that BNNTs, up to a concentration of 300 µg/ml, do not

adversely affect cellular growth or health. These findings not only affirm the biocompatibility of BNNTs but also their potential as an effective growth substrate for neurite outgrowth. Furthermore, the study elucidates the minimal toxicity and remarkable intracellular uptake capabilities of BNNTs, highlighting their viability for novel therapeutic interventions and as a nano-patterned substrate for the early detection of biomolecules and radiation-induced cellular damages. This research, therefore, lays a foundational framework for leveraging nano-bioengineering applications in the realm of theranostics, promising enhanced treatment efficacy, reduced therapy durations, and minimal therapeutic agent usage.

Bang-lish Sentiment Classification Using Deep Learning

Abrar Saleheen; Faculty Sponsor: *Dr. Reshmi Mitra*

Sentiment classification in social media and e-commerce is crucial for understanding people's thoughts and feedback evaluation, but Bang-lish, a Bengali language written with English letters, has received minimal attention. To address this issue, an improved deep learning architecture is proposed in this paper, where Convolutional Neural Networks (CNN) are combined with Gated Recurrent Units (GRU) for even higher gains in sentiment classification accuracy in Bang-lish texts. We are outstanding in the sense that our pre-processing stage has an innovative spell-correction algorithm, using phonetics-based Double Metaphone and Levenshtein Distance to correct commonly occurring misspelled words. The other step, carefully removing Bang-lish stop-words, was meant to optimize the data for analysis. The model's architecture synergizes CNN's robustness in the extraction of features with the efficiency of GRU in processing sequential dependencies. Here, it uses ReLU as an activation function in the CNN layers and uses a sigmoid function in the output layer. This improved the sentiment classification immensely, accruing an accuracy, recall, and F1 score amounting to 89% and a precision of 88%.

Code-switching Patterns among Marma Indigenous Youths and Language Maintenance in Social Media Platforms

Nweli Sain; Faculty Sponsor: *Dr. Sara Dietrich*

This presentation focuses on the code-switching patterns of Marma youths on social media platforms. Marma is the name of a tribal community in Bangladesh which speakers are around 180,600 as of today. The Marma language has been transmitted down from generation to generation in a spoken rather than a scripted form. Most people of this tribe are multi-lingual and academically, receiving formal education in Bengali and English language. This presentation analyses the survey data collected through questionnaires on the engagement of code-switching in social media among young Marma speakers. The research explored why our participants code-switch, the context, situational inappropriateness, lack of education and some other factors behind it. Although many youths found comfort using Marma language online, some expressed hesitation due to concerns about social stigma, also some got to explore their depth of Marma vocabulary knowledge and literacy levels which highlighted the concern for Marma language preservation and revitalization in today's world which is one of the main goals of this research. However, through this presentation, we will also explore how social media can contribute to language preservation.

College Students' Attitudes Toward Prisoners

Josie Fryar; Faculty Sponsor: *Dr. Chasity Ratliff-Pierce*

Attitudes toward prisoners can have a significant impact on individual legal decisions. Previous studies have shown that the general population and correctional officers hold more negative attitudes than prisoners and rehabilitation groups. Studying which factors have strong effects on attitudes can lead to increased positive attitudes and more support for rehabilitation programs. This quantitative, quasi-experimental study focused on surveying college students about the prisoner population and whether prior experiences, major, race and gender

influenced their attitudes. It was hypothesized that students with prior, positive experiences with prisoners would hold more positive attitudes compared to those with no or negative experiences. A sample of 34 participants were surveyed using a 36-question Attitude Toward Prisoner scale to determine their attitudes. Although the results were not statistically significant, findings were trending in the predicted direction and significance would likely be found with a larger sample. Overall, participants held more positive attitudes compared to similar groups in previous studies.

Communication Barriers in Therapy

Alison Venus; Faculty Sponsor: *Dr. Shawn Guiling*

Various communication barriers can negatively impact therapy including hearing loss, bilingualism, and inefficient therapist-client language style matching (LSM). Hearing loss and impairment may lead individuals to be excluded from social opportunities due to a lack of social-emotional skills needed for effective communication. Bilingualism may cause difficulty expressing oneself in a secondary language. Differences in LSM explain how a therapist's inability to match clients' language style can lead to a weaker perceived therapeutic relationship and less successful outcomes of therapy. Potential solutions for improving therapy with clients with communication barriers include engaging in less verbal forms of therapy, such as art therapy.

Communicative Language Teaching in Higher Secondary School English Classrooms: A Study on Implementation Practices in Bangladesh

Shahadur Rahman; Faculty Sponsor: *Dr. Sarah Dietrich*

This qualitative study investigates the implementation of Communicative Language Teaching (CLT) in Bangladesh's higher secondary English classrooms, focusing on teachers' perspectives, practices, and challenges. Through a phenomenological approach, data were gathered from five English language teachers through electronic surveys and classroom observations. The findings reveal a mismatch between teachers' positive views about CLT and their actual classroom practices. Despite acknowledging the effectiveness of CLT, teachers predominantly relied on traditional teacher-centered methods, such as lecture-based teaching and minimal incorporation of communicative activities. Challenges identified include curriculum issues, limited student engagement, inadequate teaching resources, and large class sizes. The study also highlights variations in teachers' confidence levels in implementing CLT effectively. The study concludes with recommendations for policymakers, curriculum developers, and educators to bridge the gap between CLT curriculum principles and classroom practices. Future research directions are proposed to explore more inclusive methodologies and stakeholder engagement for enhancing CLT implementation and improving English language education outcomes in Bangladesh. This study contributes to the broader understanding of CLT implementation challenges and offers insights for improving language teaching practices in similar educational contexts.

Comparison of Soil Microbe Populations in a Riparian Buffer and Cropland Systems

Maxwell Greenwood; Faculty Sponsor: *Dr. Kevin Sargent*

Measurements of various metrics coupled with an understanding of the soil microbes present helps us understand how healthy soil is. We hypothesized there would be differences in the abundance and diversity of soil microbe populations in a riparian buffer zone- an area that essentially dams off water and is left unmanaged- compared to cropland used for planting and harvesting. Three subsurface cores were taken from each site for soil dilutions for plating on agars. A third site, the Haymond layer, was used for cores as the zone formed from parent soil from the riparian buffer and possible floodplain erosion that would yield to fertile cropland. Negative control agars received no soil dilutions and yielded no growth. Preliminarily, the filamentous actinomycetes may be less abundant in the riparian samples than the other two areas. Riparian buffer dilutions demonstrated less growth and fewer colonies on tryptic soy agar and in LB broth. Levine EMB agar appeared to

C yield similar colony size and numbers across all three sample areas. Soil acidity and salinity appear to decrease from the riparian buffer, through the Haymond layer, and into the cropland suggesting a more beneficial environment for soil microbes and, thus, sustaining plant life.

Comparison of Soil Sensor Data to Soil Nutrient and Microorganism Data

Owen Dowdy 1 & Kevin Sargent 2; Faculty Sponsor: *Dr. Kevin Sargent*

The microorganisms present in soil interact with plant root systems to form the rhizosphere which allows for nutrient sharing between the plants and soil microbes. In addition to knowing parameters of the soil such as temperature, salinity, and moisture, understanding the soil microbe population further elucidates the health of the soil microenvironment. We hypothesized there to be differences in soil microbe populations plated on various agar types between fertile soil (where crops have been grown) and less fertile soil (where the E horizon is visible). Negative control agars were not plated with soil dilutions and did not yield growth. Three subsurface soil samples were taken at two locations and diluted for plating. Thus far, there appears to be little difference in the actinomycetes; they comprise approximately 10% of soil microbes, are filamentous and give soil its “earthy smell”. More colonization from the higher fertility soil appears present in LB broth. Likewise, more and larger colonies are present on the tryptic soy and Levine EMB agars from fertile soil compared to less fertile soil. Low salinity and adequate moisture and temperature as indicated by soil sensor also supports a more fertile environment compared to the less fertile site.

Completing the Dimethylbenzoic Acid Crystal Structure Series

Aaron Christians 1 & Dr. Marcus Bond 1; Faculty Sponsor: *Dr. Marcus Bond*

The first crystal structure of a pure dimethylbenzoic acid molecule was reported in 1967 for the 2,6 substituted isomer. Since then, structures for three more members of the isomeric series (2,3-2,4-, and 3,5- substituted isomers) have been reported. However, structures for 2,5- and 3,4-dimethylbenzoic acids have so far only been reported in co-crystals or as ligands—not for the pure compounds. X-ray crystal structures of these are now reported to complete the series. 2,5-Dimethylbenzoic acid crystallizes in monoclinic P21/c with $a = 3.977(2) \text{ \AA}$, $b = 17.747(10) \text{ \AA}$, $c = 11.091(6) \text{ \AA}$, $\beta = 93.35(3)^\circ$, $V = 781.5(7) \text{ \AA}^3$, and $Z' = 1$. Crystal growth and structure determination were routine. Each molecule participates in a typical hydrogen bonded carboxylic acid dimer with an inversion related neighbor. 3,4-Dimethylbenzoic acid crystallizes in triclinic P with $a = 7.3900(10) \text{ \AA}$, $b = 10.9551(14) \text{ \AA}$, $c = 15.749(2) \text{ \AA}$, $\alpha = 79.453(5)^\circ$, $\beta = 83.650(5)^\circ$, and $\gamma = 75.045(6)^\circ$, $V = 1208.3(3) \text{ \AA}^3$, $Z' = 3$. The structure consists of three symmetrically inequivalent molecules, two of which form a dimer pair without formal inversion symmetry and the third a partner in an inversion related pair. Elongated O-H bond lengths indicate more equal sharing of the acid protons within the dimer pair.

Constructed Wetlands: A solution today for yesterday's problems

Logan Dunlap; Faculty Sponsor: *Dr. Indi Braden*

Water contamination through human uses, sedimentation, nutrient loading, or other methods impacts the entire watershed. Along the Mississippi River, sedimentation from soil losses and nutrient loading from runoff or leaching causes concern for water quality. As the water moves down the Mississippi River to the Gulf of Mexico, the contaminants travel with the water into the Gulf. Considering some non-point source nutrients coming from runoff of agricultural fertilizers or animal manure, constructed wetlands offer an option to catch runoff and allow for a filter. Constructed wetlands can offer a method of catchment and filtration of these nutrients. For this study, water samples are collected after rainfall events and sent for lab analysis. Preliminary data provide insight into the impact of a constructed wetland on reducing nutrients in water exiting the wetland. Results from this model could provide an option for reducing nutrients in watersheds along the Mississippi River and, ultimately, help reduce hypoxic conditions in the Gulf of Mexico.

Correlations Between COVID-19 and Socio-economic, demographic Characteristics

Riliga Wu; Faculty Sponsor: *Dr. Nam Hwang*

This research aims to explore the correlations between COVID-19 incidence and mortality rates as well as socio-economic factors across Missouri counties. Utilizing Geographic Information Systems (GIS) for spatial analysis, the study integrated COVID-19 data with socio-economic factors, such as income levels and educational attainment, along with demographic features such as racial composition, across different geographical scales. The findings indicate significant correlations between COVID-19 outcomes and a range of socio-economic indicators. Specifically, there is a positive relationship between lower income levels and educational attainment, and higher rates of COVID-19 cases and mortality. Moreover, demographic factors, particularly a higher proportion of minority populations, were substantial indicators of increased COVID-19 impact, highlighting the unequal distribution of the pandemic's burden on these communities. The study emphasized the crucial significance of socio-economic and demographic aspects in understanding the transmission and consequences of COVID-19. It suggests that targeted public health strategies and policies are essential to address the inequalities exposed by the pandemic. The results are expected to contribute to the expanding body of scholarly work on the social determinants of health, offering useful perspectives for policymakers and public health authorities in Missouri and similar regions.

Drawing the line: Art and the ethics of public depiction of sensitive materials.

Erin Lowe; Faculty Sponsor: *Dr. Jennifer Bengtson*

This presentation explores the ethical considerations surrounding the public depictions of sensitive materials in archaeological papers. This includes human remains, grave goods, and culturally significant artifacts. By using photo-based drawings as an alternative to actual photographs, this study highlights benefits that include reducing sensationalism, promoting respect, and maintaining information integrity. The author includes multiple examples to illustrate the efficacy of photo-based drawings in addressing ethical dilemmas and fostering respect towards sensitive materials while minimizing information loss. The paper concludes with a recommendation to incorporate photo-based drawings into best practices in archaeology to ensure ethical treatment and preservation of cultural heritage.

Early Child Marriages

Mercy Lubeju 1 & Tanaka Nhamburo 2; Faculty Sponsor: *Dr. Shonta Smith*

It is a grave error to marry a minor. Please, for the sake of your child's future happiness, refrain from making them cry. *Breaking Chains* illuminates the widespread but often neglected problem of early child marriages on a global scale. Delving into the shadows of this silent crisis, this research offers insight into its prevalence, underlying causes, and profound effects on individuals and societies. Early child marriages, primarily impacting girls, persist as an entrenched phenomenon worldwide, driven by factors like poverty, gender inequality, religious beliefs, and cultural norms. This study highlights the negative consequences such as decreased educational opportunities, restricted economic potential, increased health hazards, and the continuation of generational poverty cycles. According to UNICEF, about 12 million girls under 18 are married each year worldwide, which translates to 23 girls every minute. Moreover, the United Nations Population Fund (UNFPA) reports that one in every five girls is married before turning 18. However, amid these challenges, there are signs of optimism. By raising awareness, promoting education, empowering communities, and enforcing strong legal measures, we can collaboratively strive to dismantle the silence and constraints of early child marriages, thus paving the path towards a more promising and fair future for all.

Energy Consumption Analysis and Characterization of the Residential Sector in the US Towards Sustainable Development

Samir Das 1, Md. Rasheduzzaman 2, Khaled Bawaneh 3; Faculty Sponsor: *Md. Rasheduzzaman*

The residential sector in the United States accounted for 22% of primary energy consumption in 2022. During that time the residential sector used 35% of the total electricity. There were 142 million housing units in the United States in 2022, which is increasing yearly. In this study, information on energy usage in the United States(U.S.) residential sector has been analyzed and then represented as energy intensities to establish benchmark data and to compare energy consumption of varying sizes and locations. First, public sources were identified and data from these previously published sources were aggregated to determine the energy use of the residential sector within the US. Next, as part of this study, the energy data for five houses in the US in different locations were collected firsthand. The data was analyzed, and the energy intensity of each home was calculated and then compared with the energy intensities of the other homes. The energy intensity for each facility was calculated based on the actual energy bills. Cooling and Heating Degree Days were considered all over the US in the analysis to provide further insights into seasonal variations and energy demand patterns. On average, businesses in the United States spend 2 cents for each dollar of sale on electricity. Furthermore, the study evaluated the carbon footprint associated with residential energy consumption to underscore the importance of sustainable development initiatives.

Enhancing Cybersecurity Education through Integration of AI technologies

Pavan Subhash Chandrabose Nara 1, Dr. Reshmi Mitra 1, & Dr. Indranil Roy 1; Faculty Sponsor: *Dr. Reshmi Mitra*

Cybersecurity, an indispensable aspect of our digital age, often remains elusive to individuals lacking specialized knowledge. This research endeavors to bridge the knowledge gap by integrating ChatGPT, a Large Language Model (LLM), into cybersecurity education. The primary goal is to democratize cybersecurity knowledge, making it accessible to everyone, irrespective of their background in computer science or cybersecurity. Until now, there have been many courses on ChatGPT and prompt engineering. This would be the first paper solely focusing on integrating ChatGPT with cybersecurity and its applications. Currently, we have developed and designed a fishbone diagram for cyber-attacks, consisting of vulnerabilities, followed by skills required to solve them, and then by work roles possessing these skills along with certifications validating these roles. In designing the fishbone diagram, we utilized highly credible frameworks such as Workforce Framework for Cybersecurity (NICE Framework), National Vulnerability Database(NVD), National Initiative for Cybersecurity Careers and Studies(NICCS), and Common Vulnerabilities and Exposures(CVE). Along with some internet articles on cybersecurity, LLMs, and prompt engineering, we also aim to introduce other GPT tools such as ChatPDF, Solidpoint, and DiagramGPT. By harnessing the capabilities of ChatGPT and a user-centric interface, our aim is to revolutionize cybersecurity education, fostering a cyber-resilient community.

Enhancing Cybersecurity in Electric Vehicle Charging Infrastructure: A Blockchain and Fuzzy Machine Learning Approach

Lokeshprasanth Gadesula; Faculty Sponsor: *Dr. Ali Ihsan*

The proliferation of electric vehicles (EVs) signifies a substantial transition towards environmentally friendly modes of transportation, thereby requiring a dependable and secure infrastructure for recharging EVs. Particular cybersecurity challenges confront this infrastructure, such as susceptibility to cyberattacks that may cause service interruptions, compromise user information, and jeopardize the integrity of the grid. The present research paper presents an innovative cybersecurity framework that fortifies the electric vehicle charging infrastructure by integrating fuzzy machine learning with blockchain technology. A decentralized and tamper-resistant ledger is provided by Blockchain, ensuring the confidentiality of user information and transactions. Simultaneously, fuzzy machine learning provides an adaptable methodology for anomaly detection, facilitating

the instantaneous detection and mitigation of cyber threats. A system model is provided to delineate the integration of the framework into a smart charging infrastructure. The model emphasizes the framework's capacity to augment security, efficiency, and scalability. The effectiveness of the framework in attaining elevated levels of energy efficiency, quality of service, scalability, and security rate is evidenced by initial results. This research aids in the advancement of a resilient cybersecurity solution, thereby promoting the expansion of the electric vehicle ecosystem in a secure and sustainable manner.

Enhancing Cybersecurity Through Automated Vulnerability Inspection: An In-Depth Analysis of Our Automated Application

Saurav Ghosh 1, Lindsey Redington 2, Prasad Dama 3, & Sai Pavani Chalamala 4; Faculty Sponsor: *Dr. Reshmi Mitra*

As companies move toward remote employment, ensuring the security of the networks becomes significantly more complex and challenging. This complexity is primarily due to the variety of platforms that are integrated and utilized. Each point of access exposes the system to an entirely new set of security risks and in turn requires preventative measures. In these complex networks, identifying where to start implementing additional security measures can be overwhelming. With Automated Vulnerability Inspection cybersecurity professionals, specifically those responsible for implementing secure practices within the network, are able to obtain general information about vulnerabilities within their system. This inspection utilizes NMAP to identify CVEs within a network and then display the findings in a simplified and more readable format.

Enhancing Security in Peer-to-Peer Networks: A Blockchain-Based Access Control Framework Utilizing Ethereum Smart Contracts.

Saurav Ghosh; Faculty Sponsor: *Dr. Reshmi Mitra & Indranil Roy*

In the digital realm, securing peer-to-peer (P2P) networks, essential for services like online transactions and intelligent devices, poses significant challenges due to their evolving nature. Our research introduces a blockchain-driven approach utilizing Ethereum smart contracts to enhance access control in dynamic P2P environments, primarily benefiting network designers and security professionals. This framework consists of Access Control Contracts (ACCs) for access management based on fixed and dynamic policies, a Judge Contract (JC) for adjudicating violations and imposing sanctions, and a Register Contract (RC) that catalogues ACCs and JC to streamline their interactions. The security model incorporated assesses threats by analyzing their impact and severity following the CIA (Confidentiality, Integrity, Availability) and STRIDE principles, leading to tailored responses. Our development and testing of role-specific ACCs, JC, and RC in a web-integrated environment reveal that our comprehensive blockchain-based system notably bolsters security in P2P networks, offering valuable implications for sectors like the Internet of Things (IoT) and web 3.0 technologies.

Ethical Considerations When Providing Treatment to Foster Children

Savannah Baker; Faculty Sponsor: *Dr. Shawn Guiling*

Foster children represent one large group of vulnerable people in the United States. Around eighty percent of them have some form of mental illness (National Conference of State Legislators, 2014). Because many foster children need mental health services, it is important to understand potential barriers when treating a foster child. One such barrier includes the vast number of legal regulations that a therapist must go through to provide or change treatment for a foster child. This barrier can often inhibit the child from receiving adequate care in a timely manner. Another barrier that can prevent a child from receiving the proper care is lack of training on the part of the therapist. It is important that a therapist be fully competent in trauma informed care so that they can consider complex effects of trauma on a child's mental well-being. Consideration of these and other barriers when working with foster children are important for successful treatment. Further potential solutions will be discussed.

Evaluating the Impact of Game-Based Learning (GBL) in Computer-Assisted Education for Teaching Programming Languages to 4th Grade Students

Hossein Shahi 1, Ihsan Ali 2, & Zahra Zolnourian 3; Faculty Sponsor: *Dr. Reshmi Mitra*

This research evaluates the impact of game-based learning (GBL) within computer-assisted education, focusing on teaching programming languages to fourth-grade students. The study aims to determine whether GBL can facilitate easier and more comprehensive learning of programming fundamentals. First by integrating GBL strategies into the curriculum, we hypothesize that students will exhibit increased engagement, enhanced problem-solving skills, and improved retention of programming concepts. Then by using a mixed-method approach, and combining quantitative assessments of student performance and qualitative feedback from participants, the results will be assessed. The results are expected to contribute to the understanding of GBL's effectiveness in early computer science education and provide insights into optimizing instructional design for young learners.

Experiencing the Learning: Using Project Management Skills to Spread the Word

Sheanique Syms; Faculty Sponsor: *Dana Schwieger*

In this research, the principles of project management and its application to the use of social media to market programs on university campuses will be examined. Project management will be discussed and broken down into how it is utilized to effectively employ social media platforms. I will assess the factors of project management, project management's impact on different sectors, and how students implement project management skills to cultivate social media platforms. Social media continues to evolve and have increasing influence on society. Generation Z in particular, is constantly adapting to social media and utilizing the networks social media creates to connect and empower individuals. Current research shows that student leaders are able to connect to their followers through social media. However, there is little research examining how project management skills can be used by student leaders to enhance social media strategies in the university environment. In this research, a Venn diagram and table are used to illustrate the skills gained by the author in both college courses and experiences to effectively carry out social media projects advertising campus programs using project management skills. This article will connect project management and social media to display an effective set of skills for student leaders wanting to engage with their constituents on social media platforms.

Exploring Therapist-Client Friendships

Isabella Correnti; Faculty Sponsor: *Dr. Shawn Guiling*

The American Psychological Association's Ethical Principles of Psychologists and Code of Conduct is a set of guidelines describing sound actions for therapists to adhere to. One of the main topics in the code is the client-therapist relationship. Clear guidelines prohibit, for example, romantic or sexual relationships with a client. However, there is less guidance about a therapist engaging in a platonic friendship with a client. One concern when it comes to a friendship between a therapist and client is the potential risk of the client terminating therapy, for example, due to embarrassment (Anderson & Kitchener, 1996). This raises the question whether a client can engage in a casual friendship with their therapist, or if there would be an imbalance of power when it comes to the therapy sessions. Current research will explore these topics and possible solutions to this debate.

Factors that Influence Juror Judgements

Hannah Edwards; Faculty Sponsor: *Dr. Chasity Ratliff-Pierce*

Juries are a highly influential part of the trial process. However, jurors themselves can be influenced by a myriad of factors originating from both outside sources and those originating from within individuals. Such outside sources might include pretrial publicity, which can impact the amount of time spent discussing case facts, or the

type of evidence presented at trial, which can impact jurors' perception of events (Ruva et al., 2022; Reyes & Houston, 2019). Alternatively, some influences that originate from the individual could include cognitive depletion, which can affect an individual's ability to refrain from relying on cognitive short-cuts like stereotyping, and juror memory for misinformation, which can affect verdict decisions (Kleider-Offutt et al., 2016; Thorley et al., 2020). Overall, there are many factors that can influence jurors, including factors that are both external and internal to the juror.

Frequency of Occurrence of Native Planktivorous Fishes in Relation to the Establishment of Bigheaded Carps

Maria Brauer 1 & Jennifer Wiesner 2; Faculty Sponsor: *Dr. Adam Criblez & Steven Hoffman*

Over time, river systems have gone through natural changes but also endured anthropogenic alterations and influence. The Upper Mississippi River System (UMRS) has long been an important resource for humans and fishes. To understand how the UMRS has changed temporally, we explore the river's fish community compositions before and after the introduction of bigheaded carps (*Hypophthalmichthys molitrix* and *Hypophthalmichthys nobilis*). Carps easily overpopulate and invade backwater lakes, side channels and main channels, impacting habitat and food availability of native taxa. Species recorded in archaeological data were compared to ones in modern fish sampling data to gauge the effect of the bigheaded carp in the UMRS. The archaeological species differed from modern species in terms of overall absence and presence. The modern data did not show temporal changes with the introduction of carp compared with post carp periods. Additional analysis such as relative abundance, in addition to presence/absence may help us further document other factors influencing this data.

From War Machine to Peacemaker: Duality of AI in Geopolitics

Krishna Thaker; Faculty Sponsor: *Dr. Reshmi Mitra*

This paper delves into the dual roles of machine learning (ML) and artificial intelligence (AI) in modern geopolitical scenarios, focusing on their utilisation in warfare and peace negotiations. With the advancement of technology, autonomous weapon systems powered by ML algorithms are increasingly becoming prevalent in military arsenals worldwide. These systems raise significant concerns regarding the loss of human control over critical military decisions, the potential for indiscriminate targeting, and the escalation of conflicts. Conversely, the paper explores how ML and AI can be leveraged to support peace negotiations and conflict resolution processes between adversaries. By analysing vast datasets and identifying patterns in historical conflicts, AI can provide valuable insights into the root causes of conflicts, potential pathways to peace, and optimal negotiation strategies. Moreover, ML algorithms can assist in predicting conflict outcomes, facilitating early intervention, and designing effective peacebuilding initiatives. Through a comprehensive examination of these dual roles, this research contributes to a nuanced understanding of the complex interplay between technology, warfare, and peacebuilding efforts in the contemporary geopolitical landscape. In the AI growing world, it underscores the importance of responsible AI development, ethical oversight, and international collaboration to maintain world peace and humanity for the better.

High Frequency Magnetic Field and Optical Heating

Nicholas Dietrich 1 & Austin McGill 2; Faculty Sponsor: *Dr. Santaneel Ghosh*

The project is heavily focused on achieving a uniform magnetic field between two Helmholtz coils so we can cause heating in magnetic nanoparticles for medical purposes. In the first portion of this project, we put our main focus on the circuit that can generate the magnetic field required to cause this heating. We worked on an existing circuit that had components that would be able to generate the required field at a high frequency. The main

trouble at the beginning was being able to amplify the voltage so that we could obtain a strong enough magnetic field to achieve heating in the samples. The second focus of this design and experiment was using optical heating to further excite the sample put in between the coils. While testing we did each method separately to gather data on each method of heating before we tried to combine the two approaches. For the optical heating we were able to generate a good heating profile for each type of sample that we tested. Once able to obtain a good heating profile for each method we hope to be able to apply this to medical healing, and destruction of harmful cells in the body.

Hormone Implants Used For Growth Comparison in Beef Steers

Natali Daum 1 & Lacey Drury 1; Faculty Sponsor: *Dr. Samantha Siemers*

Anabolic steroid hormone implants improve average daily gain and feed efficiency and provide a significant financial return for beef cattle producers. The purpose of this study was to determine the difference in average daily gain for weaned beef steers administered an anabolic steroid implant vs. non-implanted beef steers. Revalor-G implant used in the study was composed of 40 mg trenbolone acetate and 8 mg estradiol. A group of crossbred weaned beef steers (n = 6 of 12) received a Revalor-G implant on day 0 of the trial. All steers were moved to a semi-enclosed feeding facility at the David M. Barton Agriculture Research Center where they received a grain ration, ad-lib water, and grass hay. All steers continued to be weighed on a bi-weekly basis for nine consecutive weeks after administration of Revalor-G implant. Average daily gain (ADG) was calculated using pounds gained/day on feed between the steers in the control group and experimental group. Comparatively, ADG of the Revalor-G implanted group was a total of 3.68 lbs/day, whereas the non-implanted (control) group was a total of 4.25 lbs/day. Factors to consider in future research includes length of time between weigh-ins, genetic influence, and nutrient ration intake.

How demographics affect verdicts

Caroline Bowen 1 & Dr. Chasity Ratliff-Pierce 1; Faculty Sponsor: *Dr. Chasity Ratliff-Pierce*

With more police officers facing trial for illegal use of force, it is important to investigate how demographic factors (i.e., juror age and gender) might systematically influence trial judgments. In order to test the hypothesis that older men would be less likely than younger men or women of any age to convict police officers for illegal use of fatal force, an online sample of individual mock-jurors (N=539, 46%-Men, 54%-Women, Mage=42) read a trial scenario of a police officer charged with first-degree murder for illegal use of force. The overall model was statistically significant, $F(3, 530) = 2.742, p = .043, R^2 = .015$. Juror age significantly predicted verdicts, $b = -.020, t(530) = -2.058, p = .040$, such that younger jurors were more likely to convict the officer. Juror gender did not significantly predict verdicts, $b = -.163, t(530) = -.279, p = .781$, nor did the interaction, $p > .05$. Results suggest juror age has a small but significant effect on verdict decisions, with younger jurors being more likely to convict police officers charged with wrongful lethal force. However, juror gender did not independently or interactively with age impact verdict decisions.

How The French Revolution Impacted British Literature

Molly McNabb; Faculty Sponsor: *Joseph Snyder*

Between the years 1789-1795, British novelists and writers wrote about the events that were transpiring in France. The French Revolution had a significant impact on British Literature, within the fiction genre of this time. It brought about the popularization of four new literary genres: Jacobin novels, Romantic novels, Gothic novels, and Anti-Jacobin novels. Jacobin novels were mostly written by philosophers and political thinkers to show their support of the Revolution. Anti-Jacobin novels, in turn, were written to oppose their Jacobin counterparts directly. These novels often used satire to demonstrate the horrors of the Revolution. Gothic novels were also written in opposition to the French Revolution and were used to escape the tragedies of the real world,

by demonstrating worse tragedies through fiction. Finally, Romantic writers of this time supported the ideals of the Revolution and believed in creating a better society. However, they opposed the violence that the Revolution brought with it. Research has been done on the impact of the French Revolution on these four genres independently, but this essay aims to show the importance of considering the Revolution's effect on these four genres as a whole. Understanding the themes within British Literature of this time can help historians better understand the mindset of the British people, as they feared a revolution potentially breaking out in their own country.

Impact of Attorney Fluency and Gender

Bailee Cairel; Faculty Sponsor: *Dr. Paige Northern*

The opening statement in a court case is crucial to the verdict, and attorneys deliver these statements in various ways. Specifically, an attorney can deliver a fluent opening statement (i.e., delivered using appropriate eye contact, and speaking enthusiastically), or a disfluent opening statement (i.e., delivered avoiding eye contact and stuttering while speaking). The fluency of an opening statement can influence the perceptions jurors have on attorneys in various ways, such as their competence and organization (Juneau et al., 2021). Another factor that can influence the perceptions of attorneys is gender. Researchers found that females are more likely to receive lower ratings on competency scales in comparison to males (Collins, Dumas, & Moyer, 2017). Another study discovered that the most successful attorneys consisted of aggressive males and male attorneys are often seen as friendlier than females (Hahn, & Clayton 1996). This proposed study is extremely important to explore the relationship between delivery style of attorneys and gender. The predictions for this study include attorneys who deliver a fluent opening statement will be viewed more favorably compared to those who deliver a disfluent opening statement. For attorneys who deliver a disfluent opening statement, men will receive more favorable ratings compared to women.

Impact of Student Disability Status & Self-Esteem on Educational Accommodation Requests

Moe Toyoda; Faculty Sponsor: *Dr. Shawn Guiling & Dr. Emmanuel Thompson*

Educational accommodations are vital for improved curriculum access. This access to accommodations enhances comprehension, supporting retention in higher education. Examining student hesitations about seeking educational accommodations is crucial for fostering an inclusive learning environment. This study investigates the relationship between the self-esteem levels of students with disabilities and their likelihood to seek educational accommodations within a higher education setting. Utilizing logistic regression analysis, the research evaluates how self-esteem, as assessed by the Rosenberg Self-Esteem Scale, alongside other variables such as housing status, influenced the propensity to request accommodations. Preliminary findings revealed a notable relationship between higher self-esteem levels and an increased likelihood of seeking accommodations. Housing status has also emerged as a significant factor in this context. The research underscored the complexity of factors affecting hesitancy regarding accommodation-seeking behavior. It highlights the necessity for educational institutions to consider individual psychological traits and environmental conditions when developing support strategies for students with disabilities. This study contributes to the broader understanding of how self-esteem and housing conditions interplay in the accommodation-seeking process among students with disabilities, suggesting a need for tailored support mechanisms within higher educational environments.

Is Covert Retrieval Beneficial For Eighth Grade Student's Study Habits?

Joshua Haugh; Faculty Sponsor: *Dr. Paige Northern*

It is important for students to use effective study strategies to foster strong test performance. One such strategy is retrieval practice, which can be done either overtly or covertly. Overt retrieval is taking an action

involved in retrieving a memory, whereas covert retrieval is only thinking about the memory. Previous research has shown that retrieval is an effective tool for learning compared to other strategies, such as restudying material. However, there may be differences in the effectiveness of overt and covert retrieval for adolescents' learning of complex educational materials. In this study, four classes of eighth grade students learned earth-science terms by overtly retrieving them, covertly retrieving them, or restudying them. After 1 week of learning the terms and definitions, they completed a memory test. We found that terms learned using overt retrieval were better remembered compared to terms learned using covert retrieval or restudying. Based upon our results, overt retrieval is an effective learning strategy and should be encouraged to be used among adolescent students.

Just Making Things Up: Sound, Feeling, and Made Up Words in Poetry

Hannah Wolfe; Faculty Sponsor: *Dr. Jenny Cropp*

Have you ever had a feeling, something that sticks deeply with you, but no matter how hard you try you cannot describe it? There are just no words that don't feel cliché or like they don't encompass the depth of everything that you are feeling. Using research into phonetics, I created/am still creating a collection of poetry that talks about the depth of emotions using made up words that are informed by the evoked emotion of phonemes. This presentation will feature research centered around phonetics, how it informed the made up words, and poetry from my collection, Just Making Things Up.

Jury Justifications in Police Fatal Use of Force Cases

Maddy Stirmell 1, Danielle Thomas 2, Sydney Provo 3, & Dr. Chasity Ratliff-Pierce; Faculty Sponsor: *Dr. Chasity Ratliff-Pierce*

Police fatal use of force cases in recent years have been in the forefront of media attention. Jurors with higher levels of authoritarian beliefs and positive attitudes towards police may be more likely to justify officer actions. Those who rate officers with high-legitimacy tend to rate lethal police actions as acceptable when following lethal civilian action (Celestin & Kruschke, 2020). Provenza et al. (2021) found that higher levels of authoritarian beliefs and perceptions of police as legitimate authorities produced greater ratings of justification for shootings and placed blame on the suspect for their death. As part of a larger jury decision making study, mock jurors (N=539, 46% -Men, 54%- Women, Mage=42) who rendered guilty and non-guilty verdicts provided narrative justifications for their verdict decisions. Qualitative theming and coding of narrative verdict justifications was used to test the hypothesis that the extent of force used and attitudes toward police would predict verdict justifications in a fatal police use of force trial. The data showed that most jurors who found the defendant guilty cited the extent of the force used as their justification, while a majority of jurors who found the defendant not guilty based their verdict on authoritarian views towards officers

Knowledge and Importance of Oral Health: A Case Study of Ethiopia

Meron Tesfaye; Faculty Sponsor: *Dr. Emmanuel Thompson*

The study examined the knowledge and perceived importance of oral health among residents of Addis Ababa, Ethiopia. Participants were a purposive sample of 329 (55% male and 45% female) adults from Addis Ababa in Ethiopia. The response variables were knowledge of oral health and perceived importance of oral health. The predictor variables were sex, age, marital status, and educational background. A 10-point Likert Scale was used for data collection. Descriptive and inferential tools used for the analyses were frequency count, percentage, median, first and third quartiles, and interquartile range, Pearson's Chi-squared, Fisher's exact, Wilcoxon rank sum, and Kruskal-Wallis rank sum tests. The results revealed that 55% of respondents had a high level of knowledge about oral health, while 33% had moderate levels of knowledge. Additionally, 81% reported high levels of perceived importance of oral health, while 13% exhibited moderate levels of perceived importance of oral health. The analysis further showed a significant difference in knowledge and perceived importance of oral

health in terms of sex and educational background of respondents. However, age and marital status did not indicate significant differences. The study underscores the significance of understanding the knowledge and importance of oral health in the Ethiopian context. It provides insights into educational levels and perceptions, offering valuable information for public health interventions aimed at promoting oral health awareness and practices among the population of Addis Ababa and potentially across Ethiopia.

Linguistic Hybridity among Bangladeshi Business Users of Facebook

Jannatul Ferdaous; Faculty Sponsor: *Dr. Irina Ustinova*

The prominence of English as a lingua franca is extensive in social media discourse. This research study investigates the discourse on social media platforms like Facebook business pages. The study utilizes 100 samples to determine linguistic phenomena in Bangla and English, such as code-switching, code-mixing, transliteration, and lexical indicators aimed at gender. The samples were collected from the different categories of Facebook business pages, including local businesses, companies, organizations, and brands or products. The findings reveal that code-switching and code-mixing of English and Bangla in Facebook business page advertisements occur in two specific advertisements' structural components: brand names and captions. Monolingual, English-only text, and multilingual, a blend of Bangla and English, is quite evident in Facebook discourse. Also, a minimal incorporation of other languages with Bangla and English exists in Facebook discourse. The typical features of the Facebook discourse include intra-sentential code-mixing, intra-lexical code-mixing, inter-sentential code-switching, and emblematic code-switching. Moreover, linguistic phenomena employed in Facebook discourse, such as using both Bangla and Latin scripts, rely solely on phoneme-based transliteration. The analysis also shows a considerable number of lexical indicators aimed at gender and kinship terms, such as sister-brother, used in advertisements to address the audience.

Long-Term Effects of ABA and Speech-Language Services for Autistic Adults

Madison Sniegowski; Faculty Sponsor: *Dr. Samantha Washington*

When examining the contentious topic of autonomous service provision within autistic communities focusing on the utilization of applied behavioral analysis (ABA) and speech-language services (SLS) is vital for the delivery of patient-centered care. The rationale behind this study stems from recent feedback from the neurodiversity movement about the potential harmful outcomes of ABA as and the similar characteristics that exist between ABA and SLS. Drawing from survey data, this session will analyze the enduring impact of such services on autistic individuals. SLS and ABA providers need to be aware of the intricate interplay between these therapeutic interventions and their potential long-term outcomes, encompassing both advantageous and adverse effects. Participants reported an overall more negative outcome from applied behavioral analysis compared to speech-language services. Results indicated a need for increased implementation and awareness of neurodiversity-affirming practices within the fields of both speech-language pathology and applied behavioral analysis.

Modeling Claim Frequency: A Study of Singapore Male Auto Claims Data

Gwen Squires; Faculty Sponsor: *Dr. Emmanuel Thompson*

In the process of ratemaking in the property and casualty insurance industry, actuaries employ frequency and severity models to predict claim counts and costs, respectively. This study aims to demonstrate how actuaries build predictive frequency models within the framework of generalized linear models to estimate the number of auto insurance claims based on past data. Specifically, we focus on the construction, comparison, and selection of two claim frequency regression models—Poisson and Negative Binomial—using Singapore male auto claims data from the General Insurance Association of Singapore. The Akaike information criterion (AIC) serves as the metric for preliminary model comparison and selection of the best-fitting Poisson and Negative Binomial regression candidate models. Pearson's chi-squared test statistic is then used to determine the overall best-fitting

model from the previously selected Poisson and Negative Binomial regression models. The results of this study indicate that the estimated Negative Binomial regression model with predictors “NCD” (No Claims Discount) and “VAgeCat” (Vehicle Age Category) provides the most accuracy in predicting claim frequencies for insured males in Singapore.

Multilingualism in the Advertising Discourse of Cote d'Ivoire

Kaitlyn Domagni; Faculty Sponsor: *Dr. Irina Ustinova*

In Côte d'Ivoire, where over 60 languages are represented, English serves as a mode of international communication that has penetrated into the advertising discourse of the nation, impacting the use of French as the national and colonial language, and local languages as parts of its sociocultural and sociolinguistic landscape. As a tool for advertising, English serves both interpersonal and innovative functions, acting as a means of creativity, connoting prestige and modernity, and establishing connections between multilingual and multicultural ideologies. However, colonialism and the globalization of English threatens the use of local languages in multilingual nations such as Côte d'Ivoire. This study examines the relationship between multilingualism and Ivorian advertising practices through the sociolinguistic phenomena of borrowing and code-switching to better understand the linguistic interactions that occur in multilingual advertising in a multicultural nation. Analyzing the functions of English in social billboards, commercial billboards, and business signs is significant to current linguistics research because it provides insight into disparities between language use and linguistic inequality in both urban and rural regions of Côte d'Ivoire, further uncovering the relationship between multilingualism as it relates to indigenous African languages, colonialism, and globalization.

Multimodal Sentiment Analysis using Deep Learning

Kava Nikita Meda; Faculty Sponsor: *Dr. Dhananjay Singh*

The prevalence of depression affecting around 300 million individuals worldwide, coupled with an alarming 86% experiencing stress, underscores the pressing significance of mental health awareness today. In this context, one of the primary indicators of mental well-being is emotional stability. To address this critical issue, we propose employing Deep Learning Techniques for Multimodal Sentiment Analysis. This project aims to harness the power of deep learning methodologies to analyse sentiment across multiple modalities, including audio and visual data. By leveraging techniques such as Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks, along with exploring various other features, we seek to provide a comprehensive understanding of emotional states. Through this endeavour, we endeavour to not only identify stress but also predict average arousal and valence levels, thereby offering invaluable insights into individuals' mental health status. By utilizing diverse data sources and advanced computational methods, we aim to develop a robust framework capable of assisting individuals in managing their mental well-being effectively. Ultimately, this project holds the potential to revolutionize mental health care by providing timely insights and interventions to individuals experiencing stress and depression. By harnessing the capabilities of deep learning and multimodal analysis, we strive to create a platform that empowers individuals to take proactive steps towards improving their emotional and psychological health.

Northern Harrier Population Dynamics of the Past 50 Years

Hunter Jackson 1, Cheyenne Nesbit 2, & Drew Vinson 3; Faculty Sponsor: *Dr. Fidel Atuo*

Our research focuses on the research into the preferred habitats used by Northern Harriers, as well as the conservation that would be required to maintain their numbers. The Northern Harrier populations have been fluctuating a large amount in the last few decades, and we wished to understand why.

By finding data from multiple sources such as field studies and official conservation assessments, we have been able to discover and discuss the various conservative actions we can take to continue the support of population growth for this species. We focused on the population dynamics within the state borders of Missouri, but also

had some data of their surrounding habitats in places like Illinois. By identifying priority habitats, as well as addressing emerging threats that can occur from further climate change and habitat destruction, this project aims to identify a long-term conservation effort for Northern harriers and their associated habitats.

Prediction of Extreme Anxiety: A Study of Classification Methods Using IPUMS National Health Survey Data

Moe Toyoda; Faculty Sponsor: *Emmanuel Thompson*

Anxiety is a widespread concern that has gained increased attention in recent years, particularly with the onset of the COVID-19 pandemic in 2020, which has significantly heightened global stress levels. Mental disorders, including anxiety disorders, are known to severely affect quality of life, especially when they remain untreated. This study explores the effectiveness of various statistical machine learning techniques in predicting extreme anxiety using data from the Integrated Public Use Microdata Series (IPUMS) National Health Survey data. The dataset was divided into training (70%) and testing (30%) using cross-validation. Different methods, such as binary logistic regression, generative classification, K-Nearest Neighbors, regularized logistic regression, and tree-based methods, were evaluated. The study objective was to identify the most accurate predictive model for high anxiety levels, thereby enhancing support systems for affected individuals. The study discovered that ridge regression exhibited superior overall predictive performance in terms of area under the curve using testing data. This comparative analysis underlines the potential of statistical machine learning in mental health research and advocates for its integration into mental health support frameworks.

Predictors of Health Insurance Premium Charges in the United States: A Regularized Regression Analysis

Samuel Shevlin; Faculty Sponsor: *Dr. Emmanuel Thompson*

This project investigated the predictors of insurance charges using a US Health Insurance Dataset. [Kaggle](#) served as the main source of data. The dataset comprised 1,338 insured and six predictors: Age, Sex, BMI, Number of Children, Smoking, and Region. Insurance Premium charges in US Dollars on a logarithmic scale served as the response variable; the logarithmic scale was used due to the skewness of the original variable. A regularized regression analysis (LASSO) in combination with variable rankings revealed that Smoking was the most important predictor of Health Insurance Premium Charges; followed by region. In estimating the cost of health insurance, regularized regression has proven to be a useful tool. We recommend its increased usage in health insurance risk underwriting.

Proximity of Nests to Oil Infrastructure can Influence the Reproductive Performance of a Territorial Raptor.

Lucky Atabo 1 & Fidel Atuo 1; Faculty Sponsor: *Dr. Fidel Atuo*

As worldwide energy demand grows, the proliferation of energy infrastructure has inevitably encroached upon the remaining wildlife habitat, and this alteration can significantly impact several species. Severe habitat modifications due to energy extraction activities in mixed-grass ecosystems may pose significant risks to territorial species' reproductive output and breeding success. To understand how energy extraction-related habitat modifications affected a territorial raptor breeding in a mixed-grass ecosystem, I analyzed a decade-long dataset on Mississippi Kite's annual breeding attempts at Packsaddle Wildlife Management Area in Oklahoma, USA. I aimed to investigate how energy infrastructures, such as proximity to oil pads and roads, affected the reproductive output and breeding success of nesting Mississippi Kites within the landscape. The dataset included relevant variables such as nests' location, the status of each nest, the eventual outcome of the breeding attempts (whether a chick fledged successfully), and proximity to oil infrastructure. This dataset was obtained from daily searches and systematic observations of nests during the raptors' annual breeding season (May to

July). The Mississippi kite showed some resilience to the impact of oil-related activities in this area, achieving a 50% breeding success rate. Nest sites close to oil infrastructure were less likely to be successful than nests situated more than 100m away from oil infrastructure. The outcome of this study suggests habitat modifications caused by oil development can impact certain life history processes such as reproduction and recruitment in territorial species.

Quality Analysis of Personal Protective Equipment Provided by Southeast Missouri State University

Delaynie Spies 1, Brent Allen 2, & Darnesha Franks 3; Faculty Sponsor: *Dr. Jim McGill*

Lab participation requires a degree of safety measures that includes a lab-grade protective coat as a form of personal protective equipment. PPE and lab safety protocols reduce the risk of harm associated with various health and safety hazards encountered in the hands-on laboratory setting. Southeast Missouri State University students are encouraged to purchase personal protective equipment from the university bookstore. However, the coats available at Southeast Bookstore do not report the material composition or any information about their protective capabilities. The lack of information provided creates confusion about the durability of the protective coats and poses a risk to the adherence to safety guidelines issued by Southeast Missouri State University. Controlled experimentation mimicking the possible hazards of STEM and culinary courses will be administered to the protective coats with their physical reactions recorded in detail for each type of coat. This study determines the protective capabilities of university issued safety coats when exposed to practically common situations they would be faced with in a university science or culinary course. If the safety coats fail to adhere to safety standards, further questions can be posed to answer what may be done to improve its durability and ensure safety for the students.

Synthesis and study of electrochemical properties of naphthoquinone derivatives containing antiparasitic properties

Josh Birke 1, Jaina Bemis 2, Mary Wachtel 3, SM Tahmid 4, Philip Crawford 5, Sajan Silwal 6; Faculty Sponsor: *Dr. Sajan Silwal & Philip Crawford*

Naphthoquinones and their derivatives have been found to carry anti parasitic properties. This property of naphthoquinones is attributed to their involvement in inhibition of the electrochemical potential of the Leishmania mitochondrion. Several naphthoquinoid derivatives including secondary amines amides, carbamates, and urea in 3-position were synthesized in good yields from 2,3-dichloro-1, 4-naphthoquinone and their redox properties are studied in parotid solvent systems such as dimethylsulfoxide (DMSO) using cyclic voltammeter. Compounds under examination showed electrochemical reduction in DMSO in two successive, reversible, one-electron steps via formation of a radical anion. The relationships between molecular structure, reduction potential, and reported biological activity were examined.

Synthesis of Bioplastics via Extraction of Pectin from Okra Plants

Delaying Spies 1 & Brent Allen 2; Faculty Sponsor: *Dr. Morgan Theall*

Okra is cultivated and eaten globally. However, farming okra produces large amounts of agricultural waste. The stems of the plant are woody, causing problems for farming machinery. The pods must be picked by hand, daily, or the fruit becomes fibrous. One possible use for okra agricultural waste could be using it to synthesize a bioplastic. Bioplastic can be produced from pectin, which naturally occurs in fruits and vegetables including okra. A procedure for making bioplastic from okra has been adjusted from a procedure using dragon fruit. Thus far, using okra to make bioplastic has produced an average yield of 4.38%.

Taxonomic validation of Southeast Missouri Trypoxylon species relationship using Molecular Markers and Bayesian Phylogenetics.

Julie Oni; Faculty Sponsor: *Dr. Robert Ruggiero*

Trypoxylon is a diverse and widespread genus of wasps in the family Crabronidae, with over 600 species of trap-nesting solitary wasps that hunt spiders to feed their larvae. Their abundance and morphological similarities have resulted in many challenges in their systematic characterization. Recent phylogenetic studies using mitochondrial genes have suggested that the taxonomy of this group can be more effectively addressed using molecular methods. Several species of Trypoxylon (*T. lactitarse*, *T. collinum*, *T. texense* and *T. tridentatum*) have been identified in Southeast Missouri based on morphological and behavioral traits. This project aims to characterize the phylogenetic relationships of Trypoxylon wasps found in Southeast Missouri by using mitochondrial gene sequences to create a phylogeny using Bayesian techniques. The molecular characterization of these species will improve the understanding of their geographical distribution and evolution.

The Blending of Languages in Malaysia

Sweden Loke; Faculty Sponsor: *Kelly McEnerney*

Malaysians have a unique way of mixing language in an phenomenon known as Bahasa Rojak. In addition to personal anecdotes and experience, this paper reviews research on the definition and origin of Bahasa Rojak, as well as the specific languages included in Bahasa Rojak. Furthermore, this paper delves into studies on Malaysians' perceptions of English as part of Bahasa Rojak. Some stereotypes are positive, as English is historically tied to better educational and socioeconomical prospects. On the other hand, some Malaysians claim that Malaysian English is subpar and that English destroys ethnic culture. Malaysians who speak fluent English may also feel a sense of "othering." Finally, this paper discusses the cross-cultural advantage of speaking Bahasa Rojak. Though there is much controversy on Bahasa Rojak among Malaysians, Bahasa Rojak is still being used to represent and respect the diverse cultures in Malaysia.

The Effect of Need for Cognition and Attitudes Towards Police on Memory for Case Facts in a Fatal Use of Force Trial

TeeJay Hughes Jr. 1, Kiya Connors 2, & Chasity Ratliff-Pierce; Faculty Sponsor: *Dr. Chasity Ratliff-Pierce*

Many factors can influence jurors' judgments in fatal police use of force cases. For example, need for cognition (NFC) and pre-existing attitudes toward police might alter memory recall of case facts. NFC is the tendency to engage in effortful critical thinking to make judgements, and pre-existing police attitudes are formed through observations of police behavior. Because pre-existing beliefs tend to provide a framework for how jurors interpret evidence and instructions, jurors' pre-trial attitudes toward police might similarly influence memories in fatal police use of force trials. People with higher NFC and positive attitudes towards police tend to have greater memory for case facts. Thus, the effect of NFC on memory for case facts might be mediated by attitudes toward police.

The House of Worth And Cultivating Haute Couture

Isabel Phillips; Faculty Sponsor: *Dr. Amber Cook*

The House of Worth was created by Charles Frederick Worth, standing as an icon of Haute Couture, epitomizing elegance, craftsmanship, and innovation since its inception in the nineteenth century. Renowned for pioneering the concept of Haute Couture, Worth revolutionized fashion by offering custom designs, luxurious garments tailored to individual clients. With Meticulous attention to detail, and a commitment to exquisite craftsmanship, the House of Worth has consistently set the standard for sartorial excellence. From regal gowns for royalty to exquisite evening wear for social lights and celebrities, each creation exudes sophistication and refinement.

Continuously pushing the boundaries of fashion, the House of Worth remains a beacon of creativity, influencing the Haute Couture landscape with its enduring legacy of unparalleled craftsmanship and timeless style.

The Impact of Artificial Intelligence on Employment Dynamics: Myth vs Reality

Furba Lama Sherpa; Faculty Sponsor: *Dr. Reshmi Mitra*

This paper investigates the perception that Artificial Intelligence (AI) threatens the jobs of programmers. We challenge this notion by analyzing the broader implications of AI's impact on employment dynamics. While concerns about AI-induced job displacement persist, we argue that such apprehensions often stem from a lack of understanding about AI's capabilities and its role in innovation. Our research suggests that AI serves as a catalyst for efficiency and innovation across various industries. Contrary to fears of job loss, we find evidence of AI augmenting human labor rather than replacing it entirely. Moreover, we highlight the emergence of new job opportunities and skill sets facilitated by AI-driven automation. Through case studies and empirical data, we demonstrate instances where AI technologies have enhanced productivity and created new avenues for employment. We advocate for a nuanced understanding of AI's transformative potential, emphasizing the need for proactive adaptation and skill development in response to evolving market dynamics. In conclusion, the narrative of AI solely displacing programmers overlooks the symbiotic relationship between technology and human ingenuity. By reframing AI as a tool for empowerment, we can harness its full potential to shape a more inclusive and prosperous future.

The Impact of Cyberbullying Behavior on the Past, Present, and Future

Sydney Lamb; Faculty Sponsor: *Dr. Kristen Sobba*

Cyberbullying has grown in severity over the years to the degree that mental health issues (Eyuboglu et al., 2021) including suicides (Hinduja & Patchin, 2021) have become commonplace. In addition, those who are bullied and cyberbullied often become cyberbullies themselves (Lozano-Blasco et al., 2020) as a way of coping with the victimization which leads to even more abuse. My research examines literature on cyberbullying behavior and perceptions pre- and post-COVID to better understand how cyberbullying has changed over the course of a decade. In addition, pre-COVID secondary survey data was used to assess the association between cyberbullying victimization, cyberbullying perceptions, and demographic characteristics in regard to cyberbullying behavior. The next step would be to replicate the prior study to assess post-COVID cyberbullying beliefs and behavior.

The Not too cute kitty: Reducing the threat of feral cat populations in Missouri and surrounding states

Jaylen Tinsley 1, Katie Lane 2, & Zoie Gonzalez 3; Faculty Sponsor: *Dr. Fidel Atuo*

Feral cats have many negative consequences on surrounding wildlife including predation, disease, and the economy. We investigated these consequences in Missouri and its surroundings, by conducting a literature review using the "Google Scholar" search engine. To narrow our search we focused on two classes of wildlife most vulnerable to cat predation – birds and small mammals. The following terms were used to constrain our search within Missouri and reduce the number of unrelated articles - "Feral Cat" AND "songbird populations" AND "small mammal populations" OR "small rodent populations" AND "Missouri". Our analysis identified four key methods including deterrents, habitat modifications, Trap-Neuter Return (TNR), and Trap and Kill that could curtail the menace that feral cats pose for birds and small mammals in Missouri. Subsequently, we analyzed the opportunities and threats associated with implementing each method in the Southeast Missouri region. Furthermore, we reviewed a critical threat of feral cats as reservoirs of infectious diseases such as Bartonella (Cytauxzoon felis), and Toxoplasma (gondii oocytes) that could further reduce populations of native species. Overall, our synthesis covers methods of cat control, the efficacies of control methods, and the additional threats

of cat-borne diseases. Our research aims to fill the knowledge gap regarding the significance of free-ranging cats to wildlife populations in the Midwest region, where limited information is available.

The Potential Impact of a Demographic Shift in Hunter on Wildlife Management in Missouri

Hayleigh Locke 1, Gabriella Parkhill 2, & Carly Robbs 3; Faculty Sponsor: *Dr. Fidel Atuo*

The decline in human nature interaction is frightening among young people who should be taught the value of a healthy environment capable of supporting future biodiversity and human well-being. There is ample evidence that today's youth are much less engaged in outdoor nature-related activities. In this study, we hardened 8 years of data (2014–2021) collected by the Missouri Department of Conservation to evaluate the demographics of Missouri hunters. Our goal was to understand the number of Missouri youths involved in an outdoor nature activity (hunting) of immense importance to biodiversity conservation in the state. We found that hunting demography was dominated by adult populations with youths accounting for only 16% on average across the 8 years. We also found that the proportion of adult to youth hunters decreased steadily across the years with less youth hunting. In addition to the health and cognitive benefits of outdoor activity like hunting to the youth, a decline in hunting appetite among youth would create a shortfall in the Pittman-Robertson revenue available for conservation. Moreover, by spending more time in nature with nature, young people could gain the emotional and intellectual appreciation needed to advocate the conservation of its beauty and ecosystem services.

The Rise of Feral Hog Population Growth

Jacob Shoemaker 1, Brianna Eads 2, Nia Rivers 3; Faculty Sponsor: *Dr. Fidel Atuo*

Feral hogs, an invasive species known for their aggressive behavior and rapid reproduction, pose a significant threat to the middle Mississippi eco-region and its inhabitants. Here, we investigated the dynamics and impact of feral hog populations through a thorough literature review conducted using the Google Scholar database. Our findings indicate a far from declining rise in feral hog populations across the region, accompanied by severe consequences for both wildlife and human communities. Specifically, feral hogs detrimentally affect resource availability and quality for native wildlife, create significant financial costs due to property damage, and heighten the risk of zoonotic and wildlife disease transmission. As feral hog numbers continue to rise, essential resources necessary for the safety and survival of the region's native biota are increasingly compromised potentially facilitating the decline or extirpation of native species. Whereas relevant government agencies (e.g. Missouri Department of Conservation, U.S Forest Service) have recognized this as an existential threat to a majority of ecosystems in the Middle Mississippi, more is required to ensure effective eradication of feral hogs from the Middle Mississippi region. In conclusion, this study echoes the efforts of government agencies to emphasize the need for all citizenry to join the effort to minimize the adverse impacts of feral hogs on both wildlife and human communities. By understanding the dynamics of feral hog populations, their associated consequences, and removal methods we all can participate in addressing this growing issue and safeguard the ecological and socioeconomic integrity of the middle Mississippi region.

The Technological Panopticon

Adam Wilson; Faculty Sponsor: *Dr. Slavica Kodish*

In our modern, technology-based world, are the devices we use daily increasing our personal freedom, or causing the invasion of our personal privacy? I will be exploring this question, and in my oral presentation I will discuss how our personal data from social media and online browsing are being monitored to a degree only imagined by George Orwell in his 1984. I will look at the history of the panopticon, a prison design with an inbuilt system of control, composed by the father of utilitarianism, Jeremy Bentham, to better understand how we might be captive prisoners to our smart devices without even realizing we are being watched. Finally, I will discuss the trend of modern workplaces implementing surveillance technologies into their office environments, computers,

and employees' personal devices, as well as the moral implications behind those decisions.

Understanding Paycheck Protection Program Fraud: Exploring Geographic and Demographic Influences

Madison Bates 1 & David Yaskewich 1; Faculty Sponsor: *David Yaskewich*

In response to the economic upheaval caused by the Covid-19 pandemic, the Small Business Administration swiftly implemented the Paycheck Protection Program (PPP). This program was an unprecedented effort to offer forgivable loans to small businesses, with less than 500 employees, to sustain operations and staff. While prior research examining demographic factors influencing availability and utilization of loans, less is known about how these factors explain patterns in the occurrence of fraud within the program. This study fills this gap by analyzing elements that contribute to geographic location and demographic factors of fraud using a logistic regression model. Utilizing data from the Department of Justice and the Small Business Administration, and the American Community Survey this research identifies fraud hotspots in specific neighborhoods. The findings reveal that fraud detection is concentrated in census tracts with higher population density or a majority Black population. These results provide insight into the geographic and demographic dynamics of fraud within emergency relief programs. Further analysis with a broader sample of PPP fraud cases will enhance the understanding of fraudulent activity within emergency programs and inform more targeted strategies for detection and prevention.

Unveiling and Understating the Intricacies of Fractal Growth, Neurons And Spiking Neural Networks for the implementation of Neural Computational Model

SM Masfiqur Rahman; Faculty Sponsor: *Dr. Robert Lowe*

This paper marks the initial phase of a thesis exploring the fascinating domains of fractal growth, neuronal development and apoptosis, and the integration of Spiking Neural Networks (SNNs) in artificial intelligence. Delving into the intricate geometric patterns of fractals observed in diverse natural phenomena, the paper explores their principles, emergence in biological systems, and applications in artificial environments. Investigating the symbiotic relationship between fractal growth and SNNs, inspired by biological neurons' spiking behavior, it analyzes how SNN incorporation enhances adaptability, learning, and cognitive capabilities in systems with fractal growth. The research involves a comprehensive literature review, mathematical modeling of fractal growth principles, and SNN implementation in artificial environments. Findings shed light on synergies between fractal growth and SNNs, with potential applications in pattern recognition, machine learning, and cognitive computing. As we unravel the complexities of fractal growth and leverage spiking neural network dynamics, this paper serves as a steppingstone toward harnessing nature-inspired algorithms for advanced artificial intelligence systems, particularly in computational spiking neural networks. Neurons in the human brain, featuring fractal-like dendritic branching, contribute to efficient signal reception and information integration, adding complexity to the brain's architecture. The fundamental goal is to understand the reasons behind fractal geometry's efficacy in the human brain and emulate it in conventional and computational SNNs and Artificial Neural Networks (ANNs).

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S

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