HONORS RESEARCH SYMPOSIUM

POSTER PRESENTATION

ABSTRACTS

COLLEGE HALL

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UNIVERSITY OF TEXAS AT ARLINGTON

AYMAN AL-ZUBI, PHYSICS
Synthesizing Iron Oxide Magnetic Nanoparticles for the Treatment of Cancers
Faculty Mentor: Dr. Wei Chen

Nanoparticles have recently been in the spotlight as an effective way to destroy cancerous cells. In this study, iron oxide magnetic nanoparticles were synthesized and evaluated for their potency as a potential treatment for various types of carcinomas. The magnetic behavior of iron enabled the destruction of cancerous tissue as it generated heat when subjected to high frequency alternating magnetic fields. Furthermore, to maximize cancerous cell destruction, the nanoparticles were coated with copper cysteamine as it generates reactive oxygen species upon treatment with photodynamic therapy and other forms of electromagnetic radiation. Since copper cysteamine was inevitably coated by oleylamine during synthesis, a phase-transfer synthesis was also conducted to make the nanoparticles water soluble. This water solubility simulated nanoparticle integration into the blood stream and into cancerous tissue. Cell studies showed that the new nanoparticles were effective in killing cancer cells.

GABRIEL CANTANELLI, MATHEMATICS
Blowing Bubbles (and Seeing Where They Go): A Study of Partition Spaces and Continuous Functions
 Between Them
Faculty Mentor: Dr. Barbara Shipman

The field of topology is concerned with the study of "topological spaces," mathematical objects used to describe space and change at their most fundamental levels. Within this thesis, a study of a class of topological spaces, called partition spaces, is conducted. Four results concerning such spaces are presented, together with formal proofs and illustrative examples. The first result describes the behavior of limits of sequences in partition spaces. The second result characterizes continuous functions between such spaces. From the second result, a third finding is derived that establishes necessary and sufficient conditions for a function between partition spaces to be a homeomorphism. Lastly, the fourth result relates continuous functions between partition spaces to limits of sequences in their domains. These results are not found explicitly within the mathematical literature and are self-contained in their development. Together, they comprise a basic description of continuous functions between partition spaces.

MARCY DAVIS, ART SCULPTURE
Life Within the Red River Gorge
Faculty Mentor: Darryl Lauster

At the Red River Gorge in Kentucky, fauna and flora above ground are abundant due to it being a National Natural Landmark; however, this is not the same for underground. Caves play an important role in understanding and predicting climate change yet are endangered. Currently, cave features are being destroyed which results in a loss of geological history. An art exhibition called, *Anthropocene*, at the UTA Gallery West was created to enlighten viewers on the significance of caves. Cave art installations of glass blown stalactites, expanding foam flowstone, and textile metal cave coral were installed to visually impact viewers on the geological history within caves. Through this exhibition, viewers relearned the importance of caves history and discovered how they are threatened by climate change. The viewers were also given the opportunity to give feedback on how the exhibition impacted their views on caves.

DARCY GRAY, HISTORY

Domestic Indigenous Life in the Pacific Northwest: Tracing Indigenous Family from Longhouses to Urban Sprawl and Bureaucratic Command

Faculty Mentor: Dr. Paul Conrad

The Coast Salish are a network of families indigenous to the Pacific Northwest whose lifestyles have been challenged by Euro-Americans for generations. This paper engages with an ongoing debate in Indigenous studies, weighing whether scholarship should prioritize discussion of colonizer attempts at Native erasure or rather Native resistance and adaptation to these pressures. Archaeological and ethnographic sources and the extensive body of scholarship on the transformation of the west interpret the evolving politics between Native family networks, frontier enterprises, and the governments of the U.S. and Canada. Using archival sources from the Bureau of Indian Affairs and primary photographic sources, this study focuses on change experienced at the domestic level, exploring pre-colonial longhouses, interracial marriages, and boarding schools for Indigenous children. The transformation of Coast Salish life induced by oppressive power structures illustrates the vital role of family ties in the origins and evolution of Coast Salish culture.

STEPHANIE HOWELL, BIOLOGY

Comparing Prairie Management Methods' Effects on Three Native Texan Grasses

Faculty Mentor: Dr. Heather Arterburn

The Texas Blackland Prairie habitat is under extreme threat. Currently, only 1% of the original prairie remains. Restoration efforts across the state have aimed to address these concerns. This research set out to test the efficacy of the methods used to restore prairies in regard to three grasses. Big Bluestem, *Andropogon gerardii*, Little Bluestem, *Schizachyrium scoparium*, and Indiangrass, *Sorghastrum nutans*, were surveyed to establish their species abundance on two fields in North Texas. Based on their abundance and the history of each field, conclusions were drawn on the efficacy of the maintenance. Seeding was found to be inconsequential for *A. gerardii* and *S. nutans*, while *S. scoparium* appeared inconclusive. Fires, mowing, and brush removal likely benefited *S. scoparium* while having minimal effects on *A. gerardii* and *S. nutans*. Overall, this research has shown the importance of old growth roots and continued monitoring of maintenance efficacy.

ANAMOL KHADKA, ACCOUNTING

Critical Audit Matters in Accounting (CAMS)

Faculty Mentor: Dr. Ramgopal Venkataraman

Critical Audit Matters (CAMS) include any matter arising from the audit of the financial statements that involve especially challenging, subjective, or complex auditor judgments. These matters are material and need to be communicated to the audit committee by the auditor. The research involved identifying crucial accounting areas and industries reporting more CAMS than average and also analyzing the primary factors resulting in high CAMS for the given industries. The top 100 companies by weights from S&P 500 for the fiscal years 2021 and 2022 were studied and analyzed by the accounts, industries, and audit opinions from the Audit reports. It was discovered that the accounting areas which reported more CAMS are Revenue recognition, Other contingent liabilities, and tax liabilities. It was also observed that the Technology, Financial services, and pharmaceutical industries reported 180% more CAMS than other industries due to the substantial assumptions and estimates required.

MANALI KHANDEKAR, CLIS-KOREAN
Pedagogical Uses of Machine Translation to Improve Korean L2 Writing
Faculty Mentor: Dr. Pete Smith

Korean is a challenging language for English speakers due to its typological distance from English, and as such, learning Korean typically requires hundreds or thousands of additional hours of instruction to reach intermediate and advanced levels. One solution this study analyzes is the use of a rapidly improving technology - machine translation (MT). Participants were tasked with producing a short composition in Korean and then trained to use MT-based strategies to improve their writing; participants also completed pre- and post-surveys to gauge their attitudes toward machine translation. Expected results include improvements in vocabulary and correction of common mistakes such as incorrect case markers, honorifics, and spelling, as well as an increase in elements such as connectors and adding complex concepts or constructs. This work extends existing research internationally in MT-based L2 learner strategies, in addition to confirming machine translation as a form of AI with strong potential in language education.

PRABIN LAMICHHANE, COMPUTER SCIENCE
Mining and Summarizing Customer Reviews by Generating Feature-Specific Ratings
Faculty Mentor: Dr. Chengkai Li

This paper proposes a novel method to generate ratings from reviews using a Bayesian technique. One reason for the growing trend of online shopping in e-commerce platforms is its transparent review system, where a customer can review and rate a product that becomes open for others to see. Often, in making a purchase decision, a customer reads reviews to get feature-specific information about a product. These reviews, however, are becoming increasingly incomprehensible because of the large volume. Reading a sample of reviews may create a biased opinion as they do not represent overall reviews. To solve this problem, this project developed a fine-grained, feature-specific rating of a product from the reviews of customers using Bayesian estimation. This task is performed in three steps: (1) mining product features from the reviews of customers, (2) identifying the sentiment of the reviews that describe product features, (3) generating feature-specific ratings using Bayesian estimation.

BRITNEY LE, INTERDISCIPLINARY STUDIES
Pupillometry Reveals Insights into Metacognitive Processes During Encoding
Faculty Mentors: Dr. Hunter Ball and Dr. Subhra Mandal

Metamemory refers to the processes associated with how well we monitor and control our learning. Monitoring is assessed with judgments of learning (JOLs) during learning of cue-target word pairs (e.g., dog – bowl), which are confidence predictions (0-100%) that we will remember the target (e.g., bowl) when later presented with the cue (e.g., dog) at retrieval. Although some research has found that better remembered information is less effortful to learn, recent studies show that more effortful encoding, shown by larger pupil sizes, is associated with *better* memory. For this study, pupil size was measured while participants studied and made JOLs for related and unrelated cue-target pairs. It was found that JOLs, recall accuracy, and task-evoked pupillary responses (TEPR) were all greater with the related word pairs, consistent with the effortful encoding hypothesis. These results have important implications for education, especially for increasing long-term memory.

KAYLA MEYERS, BIOMEDICAL ENGINEERING

Melanoma Chemotherapy Treatment using Modified Cellulose-Based Injectable Hydrogels Combined with Temozolomide
Faculty Mentor: Dr. Young-Tae Kim

In this study, a local delivery method of an injectable modified cellulose nanofiber hydrogel, DNCNF PAA 10%, loaded with the chemotherapy drug temozolomide, TMZ, was investigated to find the most effective therapy window on duke melanoma 6 (DM6) and human dermal fibroblast cells (HDF-α) for the treatment of metastatic melanoma. Loaded hydrogel concentrations of 25μM-1000μM were administered inside PDMS microcurrent devices for 72 hours, removed, cells stained, and quantified. For the long-term study, treatment was administered for 72 hours, treatment removed, and cells recovered for 72 hours. The data was quantified using a fluorescent live/dead cell assay and cells were counted. The long-term melanoma recovery study showed surviving melanoma have possible TMZ resistance. The most effective and safest therapy window was DNCNF PAA 10% 500μM-750μM TMZ. Currently, the treatment therapy window is being studied further via co-culturing. Future studies recommended are TMZ resistance studies and *in vivo* animal studies.

JOSE PEREZ VELA, INTERDISCIPLINARY STUDIES

Supporting Environmental Justice: Transformative Leadership Dynamics of Residents in Informal Subdivisions
Faculty Mentors: Dr. Ariadna Reyes-Sanchez and Dr. Ericka Roland

Residents in low-income informal subdivisions are commonly abandoned by neoliberal municipalities that avoid the financial costs of providing access to essential services, exposing them to environmental and climate injustices. Community leadership is critical for Communities of Color living in low-income informal subdivisions to develop resiliency against environmental injustices that absent governments have intensified. Fieldwork in Floral Farms and a freedmen's town in Southeast Dallas County were used to document the leadership of each community. Historical accuracy was strengthened through interviews with residents in tandem with participatory mapping techniques and historical archives collected from county data. Community relationships developed through the interviews guided research findings and exposed the opportunities community leaders offer informal subdivisions in resisting environmental injustices. By filling in for absent political leaders and inviting everyone to the table, community activism offers low-income Communities of Color a compelling adaptation strategy for addressing precarity and environmental injustices.

PROMISE ROBINSON, EXERCISE SCIENCE

The Relationship Between Demographics and Early and Later Motor Problems in Children with Motor Difficulties
Faculty Mentor: Dr. Priscila Tamplain

A child's achievement of motor milestones could result in later motor problems in children with Developmental Coordination Disorder (DCD). This study aimed to explore potential associations between early and later motor problems and demographic characteristics (such as race/ethnicity) in children with DCD. One hundred and thirteen parents/caregivers of children aged 5 to 18 years with motor difficulties were asked to answer an online survey about early motor milestones, demographics, and current motor problems of children. The proper distribution for minority groups could not be found due to the sample being self-selected, however the focus was shifted to the achievement of ten developmental motor milestones. The results indicated that over 90% of children were suspect for DCD, but most were "on time" for the achievement of motor milestones. With motor milestones utilized as the primary marker for early development by pediatricians, the findings questioned the validity of the ten motor milestones.

Hannah Selvarathinam, Psychology

In Vivo Genetic Analysis of Schizophrenia through a Novel Developmental Cell Death Paradigm
Faculty Mentor: Dr. Piya Ghose

Schizophrenia is a mental disorder that affects a person's thoughts and actions. Compartmentalized Cell Elimination (CCE) is a novel cell death program, where three compartments of the cells die differently. CCE can be used as a tool to address questions about psychiatric illness. Through a forward genetic screen looking for CCE defects, the endoplasmic reticulum (ER) network stability gene *atln-1*/atlastin and microtubule (MT) severing ATPase *spas-1*/Spastin, were found to be linked to Hereditary Spastic Paraplegia (HSP). A schizophrenic behavioral assay was performed on CCE mutants to explore the question of links between developmental cell death and psychiatric illness. The gene *ced-3*, which is essential for CCE, did not show schizophrenia-like behavior. The *atln-1*/Atlastin and *spas-1*/Spastin mutants did show schizophrenic tendencies. This suggests novel links between schizophrenia, the ER, MTs and HSP.

Rocio VegaMartinez, Architectural Engineering

Tree Root Influence on Building Foundations in Expansive Clay Soils in North Texas
Faculty Mentor: Dr. Sahdat Hossain

Coupled with the expansive soil profile and climatic nature of Texas, trees repeatedly damage pavements and building foundations. The drying of tree roots places residential foundations at risk for soil desiccation and displacement. This research seeks to grasp a better understanding of the relationship between Texas expansive soils, tree root growth, and residential foundations in the North Texas area. This paper presents a case study of a residential house in Arlington, Texas, experiencing foundation cracking and settlement with two large trees on the property. Electrical Resistivity Imaging was done to monitor the relationship between the soil and the tree roots. Three imaging sessions in May, August, and October were conducted and the preliminary results indicate root volume is gravitating toward the slab during periods of drought due to moisture changes in the soil. The study revealed that the damage currently experienced can be attributed to the tree roots drying.

Kiera Wingo, Psychology

The Negative Effects of Cannabis on Memory Processes
Faculty Mentor: Dr. Matthew Robison

The purpose of this review was to determine if there was a negative effect of cannabis on memory processes. Specifically, the negative effects of cannabis on short-term, working, and episodic memory were examined within acute or chronic users. Several formal databases and Google Scholar were used to find relevant literature, where key words provided search parameters and narrowed results. A final total of 29 relevant studies found. The resulting literature employed numerous study methods including *N*-back, Sternberg, verbal recall measures, and neuroimaging techniques. The results confirmed a negative relationship between cannabis and memory when participants were acutely intoxicated but showed either adaptation or no effect in chronic users who were not intoxicated during testing. These results confirmed the hypothesis and established a negative association between cannabis use and disruptions to normal memory processing.