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LAMAR UNIVERSITY

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2026 Annual EXPO Conference

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Book of Abstracts

Part II - Poster Presentations



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Glossary:

GR means Graduate student.

UG means Undergraduate student

H – Humanities, Arts, Social and Behavioral Sciences, Education, and Business

S – Science, Technology, Engineering, and Mathematics

UG-H means Undergraduate student in HASBSEB area.

UG-S means Undergraduate student in STEM area.

URG means Undergraduate Research Grant program of the Office of Undergraduate Research at Lamar University.

NSF means National Science Foundation.

McNair, Beck, Welch, and other sponsorship programs are indicated.



OFFICE OF UNDERGRADUATE RESEARCH LAMAR UNIVERSITY

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UG-H / In-progress
U.R.G. Project

POSTER #7

The Impact of AI on the Healthcare Industry.

The goal of this research project is to analyze the impact of Artificial Intelligence on the healthcare industry. AI has grown exponentially over the years and understanding how it affects our lives and health is important. By utilizing the PAAI (Participatory Analysis of Artificial Intelligence) method, we will be able to distinguish the true impact that is brought by AI. Although the research is still in progress, 140, and counting, responses have been anonymously collected. The data shows that majority of the demographic falls between the ages of 18-24 (60%), a relatively young demographic. Results collected showed that our respondents have experienced AI resources in healthcare. For example, 89% have experienced online appointment confirmation, 79% with online scheduling, 55% with online lab results, 40% with digital prescriptions, and more. Of these experiences, 50% have noticed an improvement in the service they receive in healthcare due to the use of AI technologies. Additionally, 53% have stated that they are in favor of AI-powered services when it comes to treatments. Despite the data highlighting the benefits, 73% of respondents have expressed concerns about the usage of AI. The most common concerns were 79% expressing concern about over-reliance on technology, 66% about safety / health liability, 63% regarding accuracy and reliability of AI services, and 60% Fbilladata privacy. Overall, the positive attitude towards AI is present, but as are the concerns that come along with it. The results are preliminary and subject to change with further responses as we collect more data.

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GR-S / In-progress
Welch Foundation Grant

POSTER #33

Design and Development of Fluorescent Probes for Cancer Detection and Inhibition.

G-quadruplexes (GQs) are guanine-rich DNA structures located in telomeric and oncogenic regions that regulate telomerase activity. Stabilizing these GQs can inhibit telomerase, providing a potential anticancer

pathway. However, existing fluorescent probes often show poor selectivity, limiting their diagnostic utility. In this study, a novel fluorescent probe, 4-[1-(2-oxo-2H-chromen-3-yl)-1H-1,2,3-triazol-4-yl] benzoic acid (CTB) was synthesized to selectively bind and visualize GQ DNA. Molecular docking studies using auto dock 4.2 confirmed favorable interactions with G4 structures, prompting synthesis and experimental evaluation. Photophysical and biological evaluations were done to determine optical efficiency and biological compatibility. The probe exhibited high molar absorptivity ($\epsilon = 53,300 \text{ M}^{-1} \text{ cm}^{-1}$) and low quantum yield ($\Phi = 0.00740$), indicating strong absorption with weak intrinsic emission. UV-Vis and fluorescence studies revealed clear pH-dependent behavior. Photostability studies showed no change in spectral shape over time, confirming that the probe is photochemically stable. Overall, these studies make CTB a promising candidate for fluorescence-based GQ visualization and cancer diagnostics.

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UG-S / In-progress
U.R.G. Project

POSTER #53

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Narcissism and Forgiveness: Emotional and Physiological Responses to Prompts.

This study examines how narcissism and situational prompts (apology, no apology, or control) influence emotional and physiological responses to transgression, as well as their willingness to forgive. Approximately 180 adult participants are being recruited and assigned to one of the prompt conditions randomly. Participants complete a scenario based on the prompt condition assigned and report their reactions, empathy, and forgiveness using validated psychological scales. Physiological responses are determined based on heart rate and blood pressure measurements collected at the beginning, middle, and end of the scenario. Data collection is not complete so there are no results currently available. However, it is expected that individuals high in narcissistic traits will show greater physiological arousal, lower empathy, and reduced willingness to forgive compared to individuals low in narcissism. Additionally, participants exposed to an apology prompt are expected to show lower physiological arousal, higher empathy, and greater willingness to forgive than participants exposed to the no apology or control prompts. The findings from this study aim to clarify the interaction between emotional regulation, personality traits, and forgiveness decisions, which could be used for counseling and clinical interventions focused on developing empathy, resolving conflict, and fixing relationships, especially in individuals high in narcissistic traits.

Presenter: **Alice Asamoah** [§]
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UG-S / In-Progress
Departmental Sponsorship

POSTER #41

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Does Farnesol Inhibit the Formation of Ergosterol in *Candida tropicalis*?

Farnesol has been studied as a growth inhibitor of the Candida family of yeasts. The mechanism of this drug is unclear, however, based on previous studies of the sterol metabolic pathway of eukaryotic cells it is possible that farnesol disrupts the ergosterol biosynthetic pathway. To test this hypothesis, Candida tropicalis cells were exposed to different amounts of farnesol. Following extraction, the relative amounts of lipids were evaluated using gas chromatography. Results suggest that while farnesol affects the sterol pathway, it is likely because of a more complex mechanism of activity.

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UG-S / In-progress

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POSTER #3

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Evaluating the Safety and Operational Impact of Proximity Warning Systems and Wearable Sensor Technologies on Heavy Construction Jobsites.

Safety has become a fundamental priority in modern construction, alongside the completion of projects. Over time, the industry has adopted enhanced safety measures to ensure workers return home in the same condition in which they arrive. Traditional practices include designated spotters, audible backup alarms, physical barriers, and clearly marked exclusion zones. However, in fast-paced and dynamic jobsite environments, these measures may become less effective due to human error, shifting equipment routes, and operational constraints.

To address these challenges, proximity warning systems (PWS) and wearable sensor technologies have emerged as innovative solutions aimed at improving worker safety. This study evaluates the safety and operational impact of these systems on heavy construction jobsites. A systematic literature review was conducted, analyzing peer-reviewed studies published between 2001 and 2023, with emphasis on research involving implementation data, controlled field trials, and real-world applications.

Findings indicate that PWS significantly reduces the frequency of near-miss incidents and improves real-time hazard awareness among both equipment operators and ground personnel. Although these technologies demonstrate strong potential to mitigate struck-by incidents, widespread adoption across major construction projects remains limited. Further integration into standard safety protocols is necessary to maximize effectiveness. Information derived from authors Holden, Ruff, Marks, Teizer, Costin, Schoner, Luo et al, Jo et al, Sousa, Almeida, Dias, Baek, Choi, Sakhakarmi, Park, Singh, Kim, Lee, Yang, Huang, Hammad, Zhu, and mastrolemb Ventura et al.

Presenter: Alejandra Castro [§]

UG-S / In-Progress

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U.R.G. Project

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POSTER #31

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Thermal Analysis of Paraffin Based Phase Change Materials for Packaging Applications.

Phase Change Materials (PCMs) can repeatedly absorb and release heat during phase transitions while maintaining at a constant temperature. This feature allows PCMs to capture, store and transport thermal energy; reduce temperature fluctuations and improve thermal protection for sensitive products. In this research project, the temperature history and profile of a paraffin-based PCM was collected under different heating and cooling environments. Slope analysis was used to identify the temperature ranges across the solid, solid-to-liquid phase transition, and liquid regions; and convection heat transfer coefficient (h) during different stages were estimated based on the measured temperature history data. The findings provide insight into the thermal response of the material and help establish a foundation for its use in passive packaging systems. The present work focuses on the preliminary development of thermal and data analysis techniques, while the fabrication and further evaluation and mathematical modeling of PCM packaging inserts will be conducted during the summer as the next stage of the project.

Presenter: Morgan Claxton [§]

UG-S / In-progress
U.R.G. Project

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POSTER #23

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Image Segmentation Using Spectral Clustering and Normalized Cut (NCut) Measure.

Image segmentation is a critical step in computer vision that involves partitioning an image into meaningful regions for analysis and recognition. Traditional segmentation methods, such as the Normalized Cuts (NCut) algorithm, rely primarily on grayscale intensity and spatial continuity to define similarity between pixels. However, these intensity-based methods often fail to accurately segment regions with complex color variations or textures. This research proposes an improved spectral clustering framework that incorporates color information to enhance segmentation accuracy. By using color theory to describe the coupling between pixels, an affinity matrix can be generated and incorporated into the spectral clustering process; the algorithm can better distinguish objects under varying illumination, shading, or texture. The distance metric is calculated in the HSV color space, where hue, treated as a circular variable, is incorporated with saturation and value. This allows HSV to better represent perceptual color differences compared to the standard RGB. This approach is expected to outperform conventional NCut segmentation by capturing both color similarity and spatial coherence, providing results that align more closely with human visual perception. The study aims to demonstrate the computational and perceptual advantages of color-enhanced spectral segmentation through experiments on standard color image datasets.

Presenter: Trinity Cross [§]

GR-S / In-progress
Departmental Research

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POSTER #37

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Differentiating Between Synthetic Fibers: A Forensic Evidence Investigation.

In the forensic field, fibers are commonly used as trace evidence because they are easily transferred from one person to another, or between a person and a place they have been. The challenge is to find physical or chemical characteristics that can help determine the origin of fiber evidence. Synthetic fibers, such as nylon, are difficult to differentiate. To develop a systematic approach in characterizing synthetic fiber, four test samples and a nylon standard were analyzed using Fourier transform spectroscopy (FTIR), differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and gas chromatography (GC). The combination of TGA and GC is promising as a differentiation technique that separates all compounds present in a sample to create a unique fingerprint that could be used to help identify forensic evidence.

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UG-S / Advanced
Departmental Research

POSTER #24

Effect of Substrate and Ferric Iron Amendment on Sediment Microbial Fuel Cell Performance and Biogeochemistry.

Sediment Microbial Fuel Cells (SMFCs) represent a promising technology for generating bioelectricity from natural environments. Electrogenic *Geobacter* spp. in marine sediments utilize fermentative byproducts and extracellular ferric iron (Fe^{3+}) for respiration. In SMFCs graphene fiber serves as the anode by accepting electrons from these microbes. Dredge material from a coastal marsh restoration site was used to test if adding organic substrates (glucose and cellulose) and Fe^{3+} would enhance growth of fermenting bacteria and *Geobacter* spp. to improve electrical performance. Triplicate treatments included an unamended control, Substrates (S) amendment, and a combined $\text{Fe}(\text{OH})_3$ plus the substrates (Fe+S) amendment. After two weeks of incubation with open circuits SMFCs the controls generated a maximum power of 5.44 mW, which was 6.1 and 8.6 times greater than that of S and Fe+S, respectively. Conversely, total cell direct count and bacterial activity as dehydrogenase activity were about 15 and 17 times greater for S and Fe+S treatments than in controls. Both amended treatments were dominated by *Clostridium* spp. (22.3% (S) and 28.4 % (Fe+S)) while the control was dominated by *Thermomarinilinea* spp. (3.94%). The Fe+S treatment enriched for *Geobacter* spp. (4.63×10^5 cells), with cell densities 2.0 and 3.4 times higher than other groups. However, greater voltage and power was observed in the control, suggesting the higher abundance of *Geobacter* spp. in the Fe+S treatment preferentially donated their electrons to $\text{Fe}(\text{OH})_3$ rather than the SMFC anode.

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UR-S / In-progress
U.R.G. Project

Mentor: Dr. Zhifo Guo [§]

POSTER #36

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Rhodamine-Based Fluorescence Probe for Rapid and Selective Detection of Hg²⁺ Ions.

A novel fluorescence chemosensor based on *rhodamine B amidothiourea* was successfully developed for the selective detection of mercuric ions and evaluated for its applicability in biological imaging. The sensor exploits the characteristic ring-opening mechanism of rhodamine derivatives, resulting in a pronounced fluorescence “turn-on” response and a visible color change upon binding Hg²⁺. Spectroscopic studies demonstrated high sensitivity and selectivity toward mercury ions over competing metal ions, confirming the effectiveness of the sensor design. Additionally, the probe exhibited favorable performance in aqueous environments and was successfully applied to imaging Hg²⁺ in living cells, indicating good biocompatibility and cellular permeability. These findings highlight the potential of the rhodamine-based chemosensor as a practical and efficient tool for monitoring mercury in both environmental and biological systems, addressing the need for rapid and reliable detections of this highly toxic heavy metal.

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UG-S / Early-phase

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POSTER #2

Mentor: Dr. Minkyum Kim [§]

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Underground Detention Systems as a Flood Mitigation Strategy for Houston?

Urban flooding is one of the most persistent infrastructure challenges in Houston, Texas. The city's booming urbanization, flat topography, and clay-ridden soil continue to hinder stormwater management capacity. Surface detention ponds serve as the common solution, but land scarcity in dense neighborhoods, particularly in the inner-Highway 99 loop communities, has proven these methods are becoming increasingly impractical. This research evaluated underground detention systems and their efficiency as a flood mitigation strategy in Houston, Texas. The methodology consisted of peer-reviewed field studies and evaluation of international detention systems, a comparison of commercial system types, a review of Houston's regulatory framework, and a hypothetical case study of an HDPE chamber system installed beneath a Houston urban park. The results for our case study came from data provided by Drake et al. (2016) and Lai and Mah (2012). We found the HDPE arch chambers as the most practical system for urban sites, achieving void ratios exceeding 95% compared to 30 to 40% for pipe-based alternatives. We have concluded that underground detention ponds are a proven, efficient flood mitigation strategy for Houston. The underutilization of these detention systems conveys that Houston has the potential to increase efficiency when combatting large-scale flooding.

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UG-H / Early-Phase

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POSTER #16

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Algorithmic Identity: The Shift of Lesbian Archetypes in Social Media.

Lesbian identity has historically been shaped by communities such as bars, activity groups, and queer neighborhoods. In the digital era, social media platforms became primary sites for identity formation. These platforms do not merely reflect lesbian archetypes; they actively reshape them through algorithmic curation, aesthetic trends, and viral content cycles.

Using a qualitative digital ethnography approach, this research investigates how these platforms influence the evolution, visibility, and true meanings of lesbian archetypes (with attention to the rise of micro-labels, performance identity, and the shifting dynamics of perception).

While these platforms expand representation and provide additional avenues for self-expression, they also flatten complex identities, reinforce aesthetics, and marginalize racial-cultural labels. Many users feel pressure to “look gay” in ways that align with online norms, leading to identity policing and self-doubt. This dynamic particularly affects femmes, butches, studs, and older lesbians whose identities may not align with algorithmic experiences. Lesbian identity is now shaped by algorithms in terms of how it is understood, performed, and socially validated. Understanding this dynamic is crucial for identifying how digital media shapes lesbianism.

Keywords: Lesbian archetypes, social media, orientation labels, lesbian history.

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Doctoral-S / In-Progress
Faculty Research Grant

POSTER #22

Nonlinear System Identification of Electronic Assemblies under the Motion Excitation.

Electronic assemblies play a critical role in various engineering applications, where their reliability is essential to prevent high costs and safety risks. These assemblies are often subjected to harsh vibration environments, such as those found in the automotive, aerospace, and industrial automation sectors. Currently, linear vibration models are widely used to assess reliability in these industries. However, these linear models fail to accurately capture system responses at higher excitation levels. As a result, there is a need for nonlinear system identification methods.

In the practical application of electronic assemblies, dynamics usually stem from base motion rather than directly applied forces. This makes it challenging to use traditional force-based nonlinear system identification methods for base excitations available in existing literature. This paper presents a nonlinear system identification framework that utilizes base excitation as the input for electronic assemblies that display weakly nonlinear behavior. The approach presented in this paper combines the restoring force

surface (RFS) method with base excitation to identify nonlinear stiffness parameters based on measured response data, without the need for direct input force measurements. The overall method is validated using an undamped two-degree-of-freedom mass-spring system exhibiting softening cubic stiffness nonlinearity, where nonlinear detection, characterization, and identification are performed. Additionally, the nonlinear system identification is conducted on three-dimensional printed circuit board (PCB) assemblies under base excitation through direct experiments. The nonlinear restoring force is reconstructed from the equations of motion and transformed into modal coordinates. Stiffness terms are estimated via least-squares regression, evaluating their significance with metrics like the coefficient of determination (R^2) and mean square error (MSE).

Experimental results show that the PCB exhibits combined quadratic and cubic nonlinearities, mainly due to geometric effects. This methodology provides a practical tool for identifying nonlinear parameters in base-excited electronic assemblies, enhancing reliability and fatigue modeling applications.

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UG-H / In-progress

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POSTER #8

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Connected: A Lean, AI-Driven Operating System for the Modern College Student.

This project details the development of Connected, a one-stop app that integrates academic, career, and campus life applications for college students. Founded on production Management principles such as lean systems, feedback – loops, and process integration, Connected streamlines the fragmented digital experience of students today. We also developed LAURA AI, a British, emotionally intelligent assistant, that helps students manage tasks, deadlines, and stress. Using user surveys, focus groups, and iterative prototyping, we developed the app's core modules and gather real-world data from Lamar University students to pilot the concept. The project combines technology, entrepreneurship, and applied management theory to drive student productivity and success.

Presenter: Mitchell Fountain [§]

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POSTER #27

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Environmental and Logistical Considerations of Transporting Dredged Materials for Beneficial Use in Southeast Texas and Southwest Louisiana.

As sustainability of coastal ecosystems and waterways become more important, beneficial use (BU) of dredged materials (DM) plays a critical role in the restoration of wetlands as well as coastlines

which help protect vital infrastructure. BUDM also has the added advantage of repurposing materials that would otherwise be wasted after the dredging process. Environmental and logistical considerations are needed when evaluating the feasibility of transporting materials over long distances. Life cycle assessment (LCA) methodology is a way of estimating potential environmental impacts due to the transportation of DM. These estimated impacts can range from impacts to climate, such as global warming potential (GWP), to impacts on air quality, such as smog creation potential (SCP) and human health particulate potential (HHP). The economical and logistical considerations of transporting the DM for BU are evaluated by investigating the various cost components involved in the selected transportation mode. Truck haul is one of the most attractive modes for transporting DM, primarily due to its simple loading/unloading requirements and the abundance of roadways. The cost components involved in this mode are the fixed costs, which are independent of distance traveled, and the variable costs which are distance dependent. In this research, environmental and logistical analyses will be conducted for the transportation of DM via truck haul from placement area (PA) 5 located on the Southwest Louisiana side of Sabine Pass to the Southeast Texas side where it can be used for coastal and wetland restoration.

Presenter: **Kadence Garlington** [§]

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UG-S / In-progress
Departmental Research

POSTER #1

AI & Robotics in Construction.

The topic of this study is artificial intelligence and robotics in construction, and how it is aimed at increasing productivity, efficiency, and general performance in the industry. The focus will be on the changing face of construction through the use of artificial intelligence and robotics and the ways they contribute to project planning, scheduling, tracking of project development, safety monitoring, and automation. The scope of the research will be limited to the construction sector and will include both applications involving artificial intelligence and robotics.

In terms of the research approach, a qualitative methodology will be used with emphasis on literature reviews and case studies. For that purpose, academic publications, industrial reports, and recent examples will be considered and analyzed. The focus will be on the application of computer vision to monitor worker safety, the use of AI in Building Information Modeling to track project progress, AI-based scheduling of projects, and robotics applications in brick laying, rebar tying, and 3D printing.

It was evident from the results that artificial intelligence and robots have the potential to transform the process of building in various ways, including through decision making based on data, accurate planning, automation, and real-time monitoring of the project. They can lead to fewer delays, better safety records, increased productivity, and effective management of resources. The associated issues include implementation costs, specialized skills, and reluctance among other problems. In summary, the research suggests that AI and robots are essential factors contributing to digitalization in construction.

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UG-S / In-progress
Departmental Research

POSTER #28

Effect of *Trichoderma afroharzianum* in rice exposed to drought stress.

Drought stress is a major constraint limiting rice productivity, highlighting the need for sustainable strategies to enhance plant resilience. This study evaluates the role of the beneficial fungus *Trichoderma afroharzianum* T22 in mitigating drought stress in several rice varieties (XB-6, CT6744-2-11-1-M-M, RU2004155, GZ1368-5-4, Presidio) cultivated in the greenhouse conditions for 6 weeks, with an emphasis on genotype-dependent responses. Four treatments were assessed: control (well-watered), drought, drought + T22, and T22 alone. Among the tested genotypes, only XB-6 demonstrated the most consistent positive response to fungal inoculation, suggesting strong host–microbe compatibility. Further analysis revealed that *Trichoderma*-treated plants under drought had significantly higher chlorophyll a and b concentrations in the leaves compared to the drought-stress plants, indicating enhanced photosynthetic capacity. In addition, hydrogen peroxide, a key indicator of oxidative stress, was significantly reduced in inoculated plants under drought compared to drought-only conditions, reflecting improved redox status. Ongoing analyses, including root colonization and nutrient profiling, aim to further elucidate the underlying mechanisms. Overall, these findings demonstrate that *T. afroharzianum* enhances drought tolerance in a genotype-dependent manner by improving photosynthetic efficiency and reducing oxidative stress, highlighting its potential for sustainable rice production under water-limited conditions.

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GR-S / In-progress
Departmental Research

POSTER #5

Detector Response Matrices for Detector-Independent Neutrino Models.

Neutrinos are nearly massless, electrically neutral, fundamental particles which oscillate between three states or flavors. While neutrinos are part of the Standard Model, their nonzero masses and flavor oscillations are not predicted in their original formulation. This oscillatory behavior is the key to understanding new physics beyond our standard model. Long baseline experiments such as Tokai to Kamioka (T2K) have been constructed to detect and measure the properties of neutrinos by detecting neutrinos produced from particle interactions. Reconstruction models are used to formulate neutrino interaction physics based upon detector measurements. These reconstruction models are often detector-specific due to the unique systematics of individual experiments, making analysis between experiments more complicated. To facilitate cross-detector analysis, detector response matrices can be constructed using Monte Carlo data. These matrices contain the unique detector systematic effects and can be applied to simulated data to reconstruct measured data. In this poster, I will describe the methodology used to create such matrices and their use in neutrino interaction model comparisons between different detectors.

Presenter: Lorena Jaquis [§]

UG-S / Early-phase

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POSTER #5

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The Silent Risk in Construction: Mental Health in the Construction Industry.

The construction industry has long prioritized physical safety while largely neglecting the psychological well-being of its workforce. This paper examined mental health as a strategic safety issue in the U.S. construction industry, with the objective of documenting the scope of the problem, identifying its contributing factors, and recommending practical interventions for industry leaders. Research was conducted through a synthesis of peer-reviewed academic literature, government and institutional data, and industry studies. Findings revealed that construction workers experienced elevated rates of depression, anxiety, suicide, substance abuse, drug overdose, and mental health-related absenteeism compared to the general working population. Contributing factors included excessive working hours, job insecurity, project-based employment, physical injury, family separation, and a workplace culture that stigmatized help-seeking behavior. Existing mental health programs were found to be underutilized and rarely designed with the construction environment in mind. These findings indicate that mental health is an organizational risk with measurable consequences for worker safety, productivity, and project performance. This research recommends that construction companies integrate mental health into formal safety programs, cultivate a more supportive workplace culture, and prioritize leadership training, particularly at the foreman level, to enable early identification of and response to psychological distress among workers.

Presenter: Rebecca Jones [§]

GR-H / Advanced
Center for Resiliency

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Mentor: Dr. Priyanka Jaisinghani [§]

POSTER #19

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The Role of Cochlear Implant-Hearing Aid Performance Disparity in Bimodal Benefit.

Bimodal hearing or using a cochlear implant (CI) in one ear and a hearing aid (HA) in the opposite ear, allows users to utilize electric and acoustic stimulation. While many users benefit from bimodal hearing, some report that it is ineffective. This study investigated how performance disparities between CI and HA ears influence bimodal benefit using simulated electric and acoustic hearing in sentence recognition sets for 15 normal-hearing, native English-speaking adults. Residual hearing in the HA ear was held constant while CI spectral resolution was varied to create different levels of performance disparity during sentence recognition tasks. Results showed a significant effect of CI channel configuration on bimodal benefit, and linear mixed-effects modeling revealed that greater performance disparities were associated with reduced

bimodal benefit. These findings support an inverse relationship between bimodal benefit and performance disparity and suggest that the impact of disparity depends on device-specific spectral resolution characteristics.

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POSTER #51

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LLM-Driven Unit Test Generation for Safety-Critical PLC Systems in the Oil, Gas, and Petrochemical Industry.

Southeast Texas represents one of the most concentrated industrial energy zones in the United States, hosting a dense network of crude oil refineries, liquefied natural gas (LNG) terminals, petrochemical cracking facilities, and pipeline control infrastructure. Facilities across the region depend on thousands of Programmable Logic Controller (PLC) programs to govern safety-critical processes including emergency shutdown systems (ESD), distillation control loops, and flare stack management. The correctness of these programs — predominantly written in Structured Text (ST) — is paramount, as an undetected fault in a PLC safety interlock can trigger refinery explosions, toxic releases, or cascading failures across interconnected Gulf Coast operations. Despite these stakes, ST program testing remains largely manual, inconsistent, and dependent on scarce engineers with dual expertise in automation and software testing.

Large Language Models (LLMs) have shown strong promise in automating test generation for mainstream programming languages, yet their effectiveness for the domain-specific ST language remains critically underexplored — a gap with direct consequences for Southeast Texas industrial safety. This paper presents a systematic empirical evaluation of three state-of-the-art LLMs — GPT-4o, Gemini 2.5 Pro, and Claude Sonnet 4.5 — across three prompting strategies: Natural Language (NL), Code Language (CL), and Chain-of-Thought (CoT), evaluated on 11 ST function blocks using Compilation Success Rate (CSR), Statement Coverage (SC), Branch Coverage (BC), and Defect Detection Percentage (DDP).

In the zero-shot setting, Sonnet 4.5 achieves the highest CSR, while Gemini 2.5 Pro delivers the best coverage under CL prompts. One-shot CL prompting yields substantial gains across all models — GPT-4o's CSR rises from 45.45% to 90.91% and all LLMs detect over 84% of injected defects. Compared against PLCAutoTester, a specialized ST test generation tool, LLM-generated tests approach competitive coverage levels but fall short in consistency. For Southeast Texas's energy sector, these results demonstrate that LLM-assisted ST testing offers a scalable, cost-effective path to improving PLC software validation — directly supporting the safety and reliability of the automation systems powering the region's oil, gas, and petrochemical industry.

Presenter: Karson Lamar [§]

GR-S / In-progress

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Mentor: Dr. Rebecca Dibbs [§]

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Students' perceptions of the most meaningful problems in a PBL college geometry course.

College geometry remains largely unstudied in the undergraduate math curriculum. Hence, we know little about how students perceive assignments in non-traditionally taught geometry classes, with methods such as problem-based learning (PBL). The purpose of this case study is to figure out what assignments in geometry are the most meaningful to a student's learning using PBL techniques. This poster highlights some of the assignments in a college geometry course which students found to be the most meaningful to their learning. These assignments were selected based on the criteria of what students got out of them, how much the assignments caused confusion among the students, and if the assignments could be useful in their future careers.

Presenter: Meagan Lafley [§]

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GR-H / In-progress
Departmental Research

POSTER #18

Noise Exposure Risk and Perceived Hearing Loss in Online Gamers.

Chronic online gaming is known to consume the time of enthusiasts. Gamers commonly dedicate multiple hours of their time to even just one session, often resulting in continuous noise exposure for the player. There is a considerable gap in research regarding how gaming affects or does not affect the hearing, both objectively and subjectively measured, of those who frequently participate in different types of gaming. This research seeks to discover the potential impact of self-perceived or subjective measures of hearing for those who habitually play video games. The study was approved by the Institutional Review Board at Lamar University (Approval Number: IRB-FY26-91). Utilizing a cross-sectional survey which was conducted using Qualtrics, an online survey software, this study inquired about personal demographics and details about gameplay habits, particularly console preferences, the frequency and duration of gameplay, as well as preferred loudness levels and preferred methods of listening. Additionally, the questionnaire includes a section specifically about gamers' self perceived hearing abilities, as well as a section about awareness, beliefs and attitudes surrounding noise exposure and listening safety. We postulate that the findings will reveal meaningful associations between frequent extended duration of gameplay at elevated listening levels and reduced self-perceived hearing capabilities. Additionally, we expect to find more deterioration of self-perceived hearing capabilities in gamers who utilize headphones as than in those who use speakers which project into the environment, and that these findings will delineate the need for clearer guidelines regarding gaming and hearing safety.

Presenter: Christopher Lowe ^{§,#}

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UG-S / In-progress
TEAM-UP Grant

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Mentor: Dr. Cristian Bahrim[§]

POSTER #43

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Refinement in Data Processing for Reflectance Measured at the Brewster Angle.

The refractive index of a material characterizes its optical response to an incident radiation, as well as to the environmental conditions, such as the ambient temperature, and in a general sense, the energy background. We assess the changes of the refractive index for flint glass using a method in which the light gets polarized at reflection by the surface. For a normalized reflectance measured in the plane of incidence, the reflectance vanishes at the Brewster angle, thus creating a region of shallow parabolic variation, with a minimum at this specific angle. By running the best parabolic fit through the reflectance experimental data near Brewster angle, one can find this special angle with excellent precision, from where we can calculate the index of refraction of the surface, typically with a remarkable 4 decimals precision. We report results for several background energies set up across the glass (0.4, 0.8 and 1.2V). Using my expertise in extracting accurate values of the refractive index from reflectance and relying on a theory for light-matter interaction developed over the years by my mentor, we plan to continue with two-laser interference on a flint glass surface. We consider that an array of polarized surface dipoles acts as a diffraction grating of characteristic length d . For angles within 5° of the Brewster angles, we predict a sinusoidal reflectance signal with an angular separation between adjacent maxima of $\Delta\theta = \lambda/d$. From preliminary measurements done on our lab with crown glass, the results indicate that d is $19.5\mu\text{m}$ and the angular separation, $\Delta\theta$, is 1.571° . For another glass, we believe that d stays the same because it represents actually the surface area of the silica dipoles irradiated by a TEMoo Gaussian probe laser, but the angular separation $\Delta\theta$ is expected to change due to an increase in the optical density of the surface silica dipoles for flint glasses. My goal is to show experimentally the changes in the interference pattern of two lasers due to an increase in the surface's optical density.

This work in part done under a TEAM-UP grant of the American Institute of Physics and in part a part of a 2025 COAS fellowship.

Presenter: Aiden Ma

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HS-S / Early-Phase
Departmental Research

POSTER #52

MOTION Started with AI-Driven Biomechanical Motion Capture.

Chronic musculoskeletal disorders affect over half of American adults and are the leading causes of long-term disability and loss of functional mobility. The treatment of these conditions requires regular exercise and supervision by a clinician, while simultaneously needing precise real-time feedback. MOTION provides a 3D Augmented Reality (AR) platform that enhances engagement, movement precision, and therapeutic

feedback during rehabilitation for chronic conditions such as scleroderma, osteoarthritis, and degenerative musculoskeletal diseases.

Designed and developed in Unity, MOTION brings together spatial mapping, skeleton modeling, and depth sensing to capture high-accuracy full-body kinematics. This precise body capture enables the use of a gamified "motion-matching" mechanic, in which users align their movements with an optimal silhouette to reinforce correct form. Leveraging Meta's Movement SDK and mapping techniques, the system accurately maps the user's physical body on their avatar in the AR space. Interactive overlays project dynamic exercise targets and visual cues directly into the user's environment via an AR headset, while employing an adaptive feedback algorithm to allow the system to tailor difficulty and pacing in real time.

MOTION also supports multiplayer-enabled rehabilitation sessions, allowing specialists or physical therapists to join users in a shared AR environment and provide direct guidance remotely. Combining visualization, feedback, and accessible motion tracking, the MOTION system redefines the implementation of musculoskeletal rehabilitation.

Presenter: **Laura Martinez** [§]

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Doctoral-H / In-progress
Departmental Research

POSTER #17

Socioeconomic Barriers to Audiological Care Across Emerging Hispanic/Latino Generations: A Pilot Study.

As the largest minority population in the United States, the Hispanic/Latino population remains significantly underrepresented in healthcare, particularly in audiology. Previous literature has highlighted socioeconomic barriers, such as limited financial resources, lack of insurance coverage, and language obstacles, as key factors limiting access to audiological care in immigrant populations and subsequent generations. Despite these findings, there are significant gaps in understanding how emerging Hispanic/Latino adults currently perceive socioeconomic and sociocultural factors as deterrents to seeking hearing healthcare. Therefore, the purpose of this pilot study is to investigate the prevalence and impact of socioeconomic factors as barriers to audiological care across various generations of young Hispanic/Latino adults. This study employs a cross-sectional survey design examining four predominant socioeconomic categories: demographics, sociocultural factors, health literacy, and hearing-care knowledge. Each category includes targeted questions aimed at assessing how these variables influence access to hearing-related healthcare, with particular attention to differences across generational status. We hypothesize that sociocultural factors, health literacy, and hearing-care knowledge will emerge as the most significant deterrents, particularly due to insufficient awareness of hearing health risks and available interventions. Additionally, we expect that second- and third-generation individuals will demonstrate higher levels of general health literacy yet may still exhibit inadequate understanding of specific audiological care needs. Findings are expected to provide valuable insight into generational differences in perceptions of hearing healthcare barriers and inform the development of culturally tailored, community-

based audiological programs aimed at improving access and promoting auditory health among emerging Hispanic/Latino populations.

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GR-S / In-progress
Departmental Research

POSTER #33

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Can Dredge Material Be Used to Remediate Polystyrene Microplastics in Water?

The prevalence of microplastics in the environment is said to be a great threat for both the environment and the health of the population. However, quantifying the levels of contamination in soils, water, and higher-level organisms is difficult. This project aims to treat water with plastic and test against a known standard then filter it with dredge material. Trace amounts of plastics in the samples were extracted using density separation. FTIR analysis of the samples were compared to polystyrene standards. These polystyrene samples were dyed with a fluorescent compound to enhance the detection limit using fluorescence spectroscopy. Results show that different types of soil have the potential to absorb about 50% of microplastic contaminants.

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GR-S / In-progress
Departmental Research

POSTER #35

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Exploring the Antifungal Potential of Titanium Dioxide Nanoparticles Against Candida Tropicalis.

Candida tropicalis is an opportunistic fungus that, under certain conditions, can act as an opportunistic pathogen, penetrating epithelial barriers and causing a multitude of mucosal and systemic infections, namely candidiasis. While several antibiotics exist, understanding the cells' development of antibiotic resistance may lead to better treatment. This study explores the antifungal potential of titanium dioxide (TiO₂) nanoparticles against *C. tropicalis*. Cells were cultured while exposed to different amounts of TiO₂. The cell morphology of exposed samples was observed using optical microscopy, and the lipid composition of the samples was analyzed using gas chromatography (GC). Besides confirming an overall decrease in cell growth, microscopy images revealed the formation of hyphae, first of an aseptate structure, but more of a septate structure at higher TiO₂ amounts. GC results suggest that TiO₂ nanoparticles disrupt the ergosterol biosynthesis pathway.

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Mentor: Dr. Remmy W Kasili [#]

UG-S / In-progress
U.R.G. Project

POSTER #26

[§] Department of Biology, Lamar University

Screening Kenyan Leafy Vegetables for Anti-cancer Properties.

Despite the development of modern medicines, local fruits and vegetables are still used for their traditionally believed healing properties in many countries. Such is the case in Kenya, where leafy vegetables such as Lukhanukhanu, Blackjack (*Bidens pilosa*), Slender leaf (*Crotalaria bividens*), and Nightshade (*Solanum nigrum*) are consumed for nutrition as well as medicinal use. The objective of this study was to determine if anti-cancerous effects are among the medicinal properties of the aforementioned vegetables. If these vegetables are shown to contain anti-cancerous properties, it would be very beneficial to locals who have access to these plants, and especially for those who lack access to more advanced cancer treatments. In order to identify if the listed vegetables indeed have anti-cancer properties, dried leaves from each plant were crushed into powder and made into four extracts each, using the following solvents: water, ethanol, methanol, and hexane at a ratio of 1:1000. The extracts were filter-sterilized and used to select bacterial and treat Hela cell cultures. For bacterial tests, the zone of inhibition was determined by measuring diameter in centimeters (cm) and for Hela cells we counted the number of dead cells using a hemacytometer and compared against a control. We will discuss the preliminary results on the effects of plant extracts on bacteria cells. On Hela we faced a lot of challenges due to persistent contamination. Therefore, due to repeated contamination there were not enough cell cultures to use for each treatment. Overall, the results we got are not conclusive. In the future, more care will be taken to reduce potential contamination to obtain conclusive results.

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UG-S / Advanced
U.R.G. Project

POSTER #48

[§] Department of Computer Science, Lamar University

Large Language Models for An Empirical Study of App Review Classification.

App store reviews are a primary signal for software decisions, yet classifying them reliably remains challenging due to informal language, and overlapping class boundaries. Large language models (LLMs) offer prompt-based alternatives to supervised classifiers that eliminate annotation costs, but three gaps limit their practical adoption: the effect of prompt structure on classification performance is understudied, evaluation on app review datasets is scarce relative to formal specification corpora, and direct protocol-controlled comparisons between prompting and parameter-efficient fine-tuning are rare. This study addresses all three gaps through a systematic, three-phase evaluation. We assess four open-source LLMs—Llama 3 8B/70B, Gemma 3 4B, and Mistral 7B—across three app review datasets (PAN, Maalej, Scalabrino) differing in class granularity and annotation philosophy. Seven structurally distinct prompt templates are compared in a zero-shot exploratory phase, followed by stratified 10-fold cross-validation experiments with shot counts from 0 to 7. The best prompt-based configuration is then compared against QLoRA-fine-

tuned Llama 3 8B and four supervised encoder baselines (e.g., RoBERTa). The definition-based prompt template significantly outperforms all alternatives across every model–dataset combination, with the largest gains on the most fine-grained dataset. Few-shot prompting improves over zero-shot in most conditions, though gains are non-monotonic on datasets with semantically overlapping classes. RoBERTa and QLoRA achieve statistically equivalent performance, and both significantly outperform the best prompt-based configuration on two of three datasets, confirming that lightweight fine-tuning provides a measurable and consistent advantage when labeled data is available. When it is not, investing in prompt structure yields more return than scaling model size.

Presenter: **Mary O'Malley** [§]

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UR-S / Early-phase

U.R.G. Project

POSTER #38

Screening of Residual Solvents in Over-the-Counter (OTC) Analgesics by Molecular Rotational Resonance Spectroscopy.

The presence of residual organic solvents in over the counter (OTC) analgesics poses significant risks to drug purity and stability. These risks include harmful degradation pathways, such as the conversion of paracetamol into p-aminophenol, a toxic impurity. The formation of such compounds can lead to adverse health effects due to their interference with normal metabolic processes. Currently, purity assessment in OTC analgesics relies on Headspace Gas Chromatography (HS-GC). While effective, HS-GC faces limitations when analyzing complex mixtures and detecting unexpected reaction byproducts. This project evaluates K-band Molecular Rotational Resonance (MRR) spectroscopy as an alternative technique for the rapid detection of residual solvents. MRR offers high sensitivity to small, polar molecules, even within complex matrices. Experimental work involved recording MRR spectra of Class 2A solvents dissolved in DMSO, as well as ibuprofen/DMSO mixtures under both ambient and elevated temperature conditions. Analysis of the MRR spectra revealed the presence of methanol among the Class 2A solvents and identified methyl mercaptan (CH₃SH) as a byproduct formed during heating, likely due to reactions between DMSO and components of the ibuprofen matrix. Additional weak rotational features were also observed, suggesting the presence of unidentified species. These results provide compelling evidence for the potential of K-band MRR spectroscopy as a potential new measurement tool in pharmaceutical analysis. The findings also lay the groundwork for future studies aimed at improving detection sensitivity and identifying unknown spectral features.

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UR-S / In-progress

U.R.G. Project

POSTER #34

Exploiting the hydrogen storage properties of ammonia borane with the addition of polyacrylic acid, calcium chloride: Thermal and kinetic.

Ammonia borane is a promising hydrogen storage material, offering a high hydrogen content of 19.6 wt.%. However, its practical use is limited by slow-release rates and high dehydrogenation temperatures. Previous research has shown that modifying ammonia borane can enhance its hydrogen release properties. This study aims to develop a novel bulk composite by combining ammonia borane with polyacrylic acid and magnesium chloride in varying ratios to lower the dehydrogenation temperature and improve hydrogen release kinetics, making it more viable as an alternative fuel source. Characterization and analysis of the composites will be conducted using differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and Fourier-transform infrared spectroscopy (FT-IR) to better understand their thermal behavior and dehydrogenation mechanisms. Preliminary studies on DSC showed a significant decrease in dehydrogenation temperature (106 for 1:2:2 ABPAAA CaCl₂ and 109 for 1:1:1 ABPAA CaCl₂).

Presenter: Blake Ruben Pena ^{§,#}

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GR-S / In-Progress
Departmental Research

POSTER #25

Antibacterial Properties of Selected Kenyan Leafy Vegetables.

Recent advances in Western medicine have significantly improved treatment outcomes; however, these innovations have been accompanied by rising costs that limit accessibility for many patients. In contrast, plant-derived compounds represent a more affordable and widely available alternative with potential therapeutic value. This study investigates leaves from several plant species—Cucurbita spp., Physalis peruviana, Tradescantia spp., 'Lukhanukhanu', Crotalaria bividens, and Vigna unguiculata (cow pea)—commonly eaten as vegetables in Kenya for their antibacterial potential. Dry leaves were processed into a fine powder and subjected to solvent extraction using solvents of varying polarity: deionized water, 70% ethanol, methanol, and hexane. Extractions were performed at a standardized ratio of 0.100 g of plant powder per 100 mL of solvent. Antibacterial activity and spectrum were assessed using both Gram-positive and Gram-negative bacterial species cultured as confluent lawns on agar plates. Sterile paper discs impregnated with plant extract solutions were applied to the bacterial lawns, and zones of inhibition were measured following 48 hours of incubation. Tetracycline was employed as a positive control to benchmark antibacterial efficacy, while solvent-only discs served as negative controls. Preliminary results on Cow pea species dissolved in 70% Ethanol and Methanol are discussed. Further trials with the various extracts from other plant species are ongoing.

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UG-S / Early-phase

POSTER #4

Mentor: Dr. Minkyum Kim [§]

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Risk Management Strategies in Construction Project Delivery.

The construction industry has constantly struggled to deal with risk properly, and this has frequently resulted in construction work exceeding budget, behind schedule and safety problems on the side. This research examines the differences in risk management among the three delivery methods that are typically used: Design-Bid-Build (DBB), Design-Build (DB), and Construction Manager at Risk (CM@Risk), and explores which one is the best at managing risk. To do this, we reviewed existing literature including peer-reviewed studies, industry reports, and research that looked at real project outcomes across all three methods. What we found was that having the contractor involved early, which happens in DB and CM@Risk, makes a big difference in catching and dealing with risks before they become bigger problems. CM@Risk came out on top when it came to keeping costs and schedules on track, while DB was strong in keeping design and construction on the same page. Because risk usually gets overlooked when everyone is working separately, DBB had the biggest problem. Definitely, involving the contractor early on and taking an integrated team approach usually produces better results. Owners may want to consider the risk profile of their project when choosing a delivery method.

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UG-S / Advanced
Faculty Research Grant

POSTER #39

Gas Chromatographic Analysis of Lipid Extracts in *Pinus palustris* Using Reference Compound Comparison.

The lipid biosynthetic pathway is a complex multi-step process occurring in cells that leads to cholesterol formation in mammalian cells or beta-sitosterol in many plant cells. These compounds are essential not only for the stability of the cellular membranes but also as hormones regulating different functions including drug metabolic pathways. We aim to elucidate the relation between the metabolic activity and variations in the lipid biosynthetic pathway. Hydrocortisone, a glucocorticoid hormone, and *Pinus palustris* plant cells were used as metabolized target and eukaryotic cells respectively. Preliminary work focused on the extraction of lipid-based compounds from plant cells using liquid-liquid extraction to develop and refine sample preparation methods. Extracted lipids were analyzed using gas chromatography to observe separation patterns and generate standards. Initial results provide insight into compound behavior, retention characteristics, and method performance.

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UG-S / Advanced
Departmental Research

POSTER #49

Intelligent Degree Direction: Empowering Academic Advising for Student Success at Lamar University.

Academic advising is a critical yet resource-intensive component of undergraduate education. Advisors manually review Degree Works degree audits, verify prerequisite completion, cross-reference course schedules, and apply departmental policies — a process prone to delay and inconsistency as enrollment scales. This research presents the design and implementation of an Automated Course Registration Advising Tool that integrates deterministic eligibility validation with an intelligent Retrieval-Augmented Generation (RAG) Large Language Model (LLM) advisory architecture. The system accepts a student's Degree Works PDF audit and target semester, then automatically identifies eligible courses by parsing completed and incomplete requirement blocks, evaluating complex prerequisite expressions involving AND/OR/grade-threshold logic, applying upper-level mathematics exemption policies, handling transfer credit grade codes, and cross-referencing real-time course schedule availability from Banner. And an AI chatbot, that answers all the department and University level queries of students.

Presenter: Hemish Radadiya [§]

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GR-S / In-Progress
Departmental Sponsorship

POSTER #50

Deep Learning-Based Automated MRI Image Classification System for Brain Tumor Detection.

Detection of tumors within the brain by utilizing Magnetic Resonance Imaging (MRI) is vital for both initial diagnosis and determining appropriate treatment options. Manual review of MRI image data requires considerable amounts of time, as well as expertise. The focus of this research was to develop an artificial intelligence (AI)-based brain tumor classification system based upon a custom-designed convolutional neural network (CNN). This CNN model has been designed to automatically determine whether an MRI image contains either a tumor or no tumor. A total of 3264 MRI images were obtained through public sources. Multiple forms of tumors have been included in these datasets, such as gliomas, meningiomas, and pituitaries. All have been categorized together as "tumors" for purposes of performing a binary classification. These 3264 images have been divided randomly into three groups: a training group, a validation group, and a testing group. All images were resized to be 224 x 224 pixels before being utilized. To enhance the ability of our model to generalize across different datasets, we employed several image augmentation techniques. Our CNN model was trained using the Adam Optimizer and was evaluated using four metrics: accuracy, precision, recall, and the F1-Score. Our experimental findings indicated that our model achieved a level of accuracy of approximately 93%. Moreover, it demonstrated high levels of performance in identifying images containing tumors while demonstrating relatively low rates of false negatives.

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UG-S / Advanced
United States Department of
Energy / NuSTEAM grant

POSTER #

Simulation of Pair-Spectrometer Luminosity Monitoring for the ePIC Experiment at the EIC.

Precise luminosity measurements are essential for accurate cross-section determinations at the future Electron-Ion Collider (EIC). The ePIC luminosity monitor exploits the Bethe-Heitler bremsstrahlung process $e^-p \rightarrow e^-\gamma p$, in which the emitted photon converts into an e^+e^- pair that is separated by a dipole magnetic field and detected in segmented electromagnetic calorimeters based on the Beam Pipe Calorimeter design. We performed a systematic GEANT4 grid scan of the ePIC LumiDirectPCAL using DD4hep/ddsim within the full epic_craterlake detector geometry, firing electron guns at 441 positions across the circular detector face at beam energies of 2.0, 4.4, and 6.8 GeV, yielding 1,323 configurations and 1.3 million events. An analytical calculation based on the spectrometer geometry predicted a detectable momentum range of 1.85–6.78 GeV, which the simulations confirmed. The LumiDirectPCAL responds uniformly across this range with approximately 94% energy capture and less than 1% position-dependent variation across the full circular acceptance ($r = 6$ cm), with a small $\sim 1\%$ accuracy drop at the edges consistent with electromagnetic shower leakage. These results validate the calorimeter's contribution to the Bethe-Heitler luminosity extraction and support precision luminosity measurement for the ePIC experiment.

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GR-S / Advanced
Departmental Research

POSTER #21

Experimental Investigation of Process Parameter Effects on the Mechanical Performance of PETG Components Fabricated Using Fused Granular Fabrication.

This study presents an experimental investigation into how processing parameters influence the mechanical performance of PETG components fabricated using fused granular fabrication (FGF), a pellet-based 3D printing technique. As large-scale additive manufacturing continues to gain attention, it becomes increasingly important to understand how printing conditions affect the structural reliability of fabricated parts. In this work, ASTM D638 tensile specimens were produced in both horizontal and vertical build orientations to examine the effects of process parameters, including printing speed, infill pattern, and infill percentage, on material performance. From tensile tests, important mechanical properties such as Young's modulus, yield strength, and ultimate tensile strength (UTS) were determined. Furthermore, statistical analyses were performed to assess the significance of differences across parameter combinations and

build orientations, thereby providing a comprehensive understanding of the relationships between process properties and FGF-printed PETG parts.

Presenter: **Anas Saleh** [§]

UG-S / Early-phase
Center of Research

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POSTER #20

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Design of a PCB to Connect Multiple Modules for a DC Motor System.

In many electronic designs, using several jumper wires to connect different modules can make the system difficult to manage and less reliable. Using many wires to connect electronic boards can make the system complex, especially when multiple boards are involved. This can reduce reliability and make assembly and troubleshooting more difficult. To solve this problem, a compact Printed Circuit Board (PCB) was designed to connect four electronic boards without using physical jumper wires. These boards include an Arduino Nano, L298N motor driver, power supply module, and signal receiving board. The design was created using the PCB design software KiCad. In typical setups, these boards are connected using wires that link pins between modules. In this design, all connections are made through copper traces on the PCB instead of jumper wires. The schematic and PCB layout were completed in KiCad, then the design was tested and sent to a PCB manufacturing company. After fabrication, the electronic boards were soldered onto the PCB to form one compact system. All connections between the electronic boards were achieved without using jumper wires, resulting in a cleaner, and more reliable design that is ready for physical implementation and testing.

Presenter: **Belinda Reyes Sanchez** [§]

GR-S / In-Progress
Faculty Research Grant

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POSTER #30

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Synthesis and Photophysical Characterization of a Bioisosteric Chromone-Rohdanine/2-thiahydantoin based Probes for Cellular GQ- Detection.

G-quadruplexes (G4s) are noncanonical DNA secondary structures formed by guanine-rich sequences that assemble into planar G-tetrads through Hoogsteen hydrogen bonding. These four-stranded structures are stabilized by monovalent cations such as potassium (K⁺) and sodium (Na⁺). G4s are often located in biologically significant regions of the genome.

Among the various G4 conformations, the parallel topology is one of the most stable and widely studied, especially in telomeric and promoter regions of protooncogenes such as c-Myc, c-Kit, KRAS, and VEGAF genes. This structural consistency makes parallel G4s useful models for investigating ligand interactions and designing molecules that selectively target them.

Fluorescent probes that bind to G4s are valuable for detecting and visualizing these structures. However, creating probes that bind strongly while preserving the native structure of G4s remains challenging. Developing such selective probes could improve understanding of G4 function and support new therapeutic strategies, particularly in cancer research. G4 DNA is present at elevated levels in approximately 85–90% of cancers, suggesting that targeting these structures could allow for more selective detection and treatment of cancer cells.

In this study, based on docking and quantum mechanical calculations we rationally designed, synthesized, and characterized chromonone-rhodanine coupled bioisosteric G-quadruplex detecting probes for biological evaluation. The probes showed green fluorescence emission and less cytotoxicity (at 8 μ M level) and confocal microscopic studies showed nuclear core-localization, which exhibited selectivity towards G-quadruplex DNA.

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GR-S / In-progress
Faculty Research Grant

POSTER #29

Drug Repurposing for Preterm Birth: from Molecular Docking to In-Vitro 3D Screening.

Preterm birth is a major challenge in maternal and neonatal health, as babies born too early are at a higher risk of complications and poor outcomes. Understanding how inflammation contributes to preterm birth is important for finding better ways to maintain homeostasis. Development of new medicines takes over 10 years, but with rapid developments in Artificial Intelligence, this timeline is significantly reduced. However, the fact remains that new molecules still require rigorous testing before being released to the public, creating a paradigm shift from discovering new drug molecules by the practice of drug repurposing (or repositioning), bypassing preclinical and early clinical research. The present work focuses on leveraging a systematic framework that screens 3,113 investigational and FDA-approved drugs in-silico using established ADME and toxicity profiles, focusing on maternal and fetal safety parameters. We performed molecular docking against multiple inflammatory signaling cascades – JAK2, COX2, ERK2, ATG, and NF- κ B. Together with ADME and toxicity scores, a drug library of 260 compounds was selected to perform High-throughput screening on a 3D printed co-culture platform mimicking the Fetal Maternal interface, in-vitro. Our findings suggest that most drugs showed strong cytokine suppression in the Decidua cells. We identified 4 compounds from 10 μ M and 0.1 μ M, and 3 compounds from 1 μ M drug concentration, respectively, as our top hits from our initial screening of 18 compounds. Specifically, Budesonide showed 61% and 70% overall cytokine suppression at 10 μ M and 1 μ M, respectively, as compared to LPS control.

This highlights the importance of identifying the optimal dose that maximizes therapeutic efficacy while minimizing toxicity.

Presenter: Amy Schwartz [§]

UG-H / Early-phase

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POSTER #11

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Health vs. Criminal Framing of Substance Abuse: An Experimental Test Among College-Aged Individuals.

The way illegal substance abuse is framed in public discourse influences attitudes and support for interventions. Yet direct comparisons of framing effects among college-aged individuals are limited, highlighting the need for further research. This study will examine how public health versus criminal justice framing of substance abuse affects behavioral intentions, explicit attitudes, and implicit biases among college-aged people (18–25). Using an online experiment, participants will be randomly assigned to one of four conditions: health framing, criminal framing, combined framing, or a neutral control. Dependent measures will include a questionnaire assessing stigma, policy preferences, and support for treatment versus punitive responses. Two novel behavioral measures will be used: (1) a token budget task, in which participants allocate tokens across treatment and enforcement options, and (2) an effort donation task, offering an optional timed activity to support either health-related or enforcement-related initiatives on campus. Implicit measures will include the Implicit Association Test (IAT) and Go/No-Go Association Task (GNAT) to capture automatic associations between substance abuse and health and crime concepts. Demographic variables will be collected to describe the sample and explore possible moderation effects. Guided by framing and labeling theories, this research hypothesizes that health framing will reduce stigma and increase support for treatment, while criminal framing will increase stigma, support for punishment, and negative implicit associations. As a population especially vulnerable to substance use and responsive to campus policy messaging, college-aged individuals provide valuable insight for informing strategies on stigma reduction, health communication, and policy development.

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UG-H / In-progress

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POSTER #9

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Co-Intelligence in Strategic HRM: Designing a Differentiation Driven HR System for The Coffee Bar.

This project was to show how Generative AI and human expertise can support the design of a Strategic Human Resource Management System for a startup organization. As part of a semester long simulation in MGMT 3330, our team acted as HR Consultants, developing a full HR system for “The Coffee Bar”. A cafe

that competes through a differentiation strategy focused on customer experience. Our approach combined generative AI tools, such as Microsoft Copilot, and our own judgment to create a system that was both creative and realistic.

Throughout the project, AI was used to help brainstorm, draft, and organize parts of the SHRM cycle, but we relied more heavily on our own human judgment to make sure everything fit the cafe's culture, followed legal and ethical standards, and made sense for small business. In this project, formal quantitative data was not collected; however, qualitative data was utilized by reviewing HR practices from companies like Starbucks. The textbook Human Resource Management: Gaining a Competitive Advantage was also used to align ideas more closely with HR practices.

The final HR system emphasizes ideas such as culture-based hiring, structured interviews, internal promotion, and training programs that support the cafe's values. These include quality, community, consistency, innovation, sustainability, and customer experience. Overall, this project shows how co intelligence can strengthen HR system design when AI is used as a supportive tool, and humans guide strategic decisions.

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UG-H / Advance
U.R.G. Project

POSTER #15

Deaf Mentorship for Speech-Language Pathology Patients: Effectiveness and Availability.

Deaf mentorship as an under-researched intervention for the linguistic and sociocultural development of children with hearing loss. Speech-language pathologists (SLPs) are not well equipped to treat deaf patients holistically, incorporating deaf culture and sign language. To understand the impacts and availability of SLPs and deaf mentors for children with hearing loss, 10 individuals with hearing loss from across the United States were surveyed about their experiences with speech therapy and deaf mentorship, their current language skills and preferences, and their sociocultural and self-advocacy skills. This survey was available in both English and American Sign Language to control for language barriers. The purpose of this research is to determine what current intervention options are available for children with hearing loss and assess the impacts of such services. Results indicate that access to deaf mentorship is limited, though these influences are generally reported to be positive. Data trends reveal general dissatisfaction with current speech and language intervention methods, associating these services with identity confusion. No patterns emerged between skills and preferences and services received. Future research is needed in this area to objectively assess the effects of services on this population and initiate more culturally aware interventions for children with hearing loss.

Keywords: deaf mentorship, speech-language pathology, sociocultural skills, American Sign Language, language acquisition.

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UG-H / Advanced
McNair Research

POSTER #12

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Perception of Mental Health in the Latinx Community.

This study investigates the perceptions of mental health within the Latinx community in the United States. The Latinx population is rapidly growing and faces unique challenges in accessing mental health services. Stigma, cultural factors, education, and lack of representation in mental health spaces are significant barriers to help-seeking. The research aims to compare the perceptions of mental health between younger and older Latinx individuals. It explores how age influences perceptions of culture, education, and representation as factors affecting help-seeking behavior. A questionnaire was administered to a sample of Latinx participants to assess their attitudes and beliefs about mental health. Preliminary findings suggest that age may not significantly influence perceptions of culture, education, or representation. However, both younger and older Latinx individuals reported personal experiences with mental health and observed family members struggling with mental health issues as well. The study highlights the need for further research to understand the complexities of mental health stigma and barriers to care within the Latinx community. Addressing these challenges requires culturally sensitive interventions, increased access to mental health services, and greater representation of Latinx professionals in the field.

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UG-S / Early -phase
Departmental Support

POSTER #42

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Study of spherical magnetic obstacle motion in solar wind.

A magnetized cloud of plasma acts as a magnetic obstacle to an external plasma flow. By looking at the forces acting on a static spherical obstacle via an analytical approach, the kinetic analysis of the spherical obstacle can be inferred. Using the assumption of a complete spherical magnetic obstacle, it is possible to model the draping of magnetic fields around the obstacle, as well as the distortion of an external magnetic field due to the obstacle based on several different factors that could affect it. Those factors being angle of the background magnetic field to the trajectory of the obstacle's motion, whether the background magnetic field was uniform or nonuniform, and whether the obstacle had supersonic or subsonic speed. The diamagnetic force that the plasma exerted onto the obstacle and how it differs based on the various factors can be found. This is all under the idealization that the magnetic obstacle has a strong internal magnetic field. This raises the question of "What about cases where an object has a magnetic field but one too weak to be considered a complete magnetized obstacle?" How do the models change if such an idealization is no longer valid? My hypothesis is that the weaker magnetic field of these "semi-obstacles" causes a partial interaction with the surrounding plasma instead of completely excluding it. This could be applied to celestial bodies that don't have as strong magnetic fields as large planets or stars, like some

dwarf stars or moons, and thus cannot be magnetic obstacles giving us the ability to predict how large sums of plasma interact with these smaller bodies

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UG-S / In-progress
Faculty Research Grant

POSTER #46

Design and Optimization of a Pair Spectrometer Luminosity Detector for EPIC at the EIC.

In collaboration with the University of Houston and York University, the Lamar NuSTEAM team is contributing to the design and optimization of a luminosity detector for the EPIC experiment at the Electron-Ion Collider (EIC). This work focuses on the geometric configuration and spatial design of a pair spectrometer used to measure luminosity via the Bethe-Heitler process. Bremsstrahlung photons produced in electron-proton interactions are converted into electron-positron pairs, which are subsequently separated by a dipole magnetic field due to their opposite charges.³

The detector geometry is designed to ensure efficient acceptance and accurate tracking of these relativistic leptons as they traverse curved trajectories within the magnetic field and exit toward segmented electromagnetic calorimeters (ECALs). Key design considerations include the placement and alignment of the converter, magnetic field region, and calorimeter arrays to maximize detection efficiency and energy resolution. Simulations are used to study the impact of geometric parameters and magnetic field strength on particle trajectories and detector acceptance.

This work will present the implementation of the EPIC pair spectrometer model in full Geant4 detector simulations. The EPIC far backward luminosity detector and EIC beam profile parameters will also be included and discussed.

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UG-S / In-progress
SURF Research

POSTER #40

Structure based design of a catecholamine derived ligand (VITALIS) for balanced adrenergic response.

VITALIS is a synthetic, modified catecholamine compound designed to enhance cognitive alertness and physical performance under high stress conditions while minimizing the adverse effects associated with traditional epinephrine and norepinephrine responses, such as tunnel vision and long term cardiovascular strain. Unlike existing catecholamine analogs, VITALIS incorporates a scaffold engineered to promote selective adrenergic receptor engagement while limiting the unwanted signaling responsible for the ill effects seen with other compounds. This research follows a path of rational design, beginning with the creation of two-dimensional molecular structures tailored to meet specific functional requirements for an optimized stress-response. This was followed by computational analysis to evaluate binding affinities and hydrogen bond interactions within target adrenergic receptors. The initial analog produced varied results, while the parent structure showed promising affinity for β_1 and α_2A receptors, it also bound too strongly to the β_2 receptor which needed to be avoided. Furthermore, these findings provided the foundation to design a new series of analogs and begin synthesizing them for biological evaluation to determine whether the computational predictions translate into meaningful physiological outcomes. By filling the gap in receptor targeted stress response strategies that improve performance while avoiding excessive sympathetic activation, this research aims to fill an absence in stress related studies and provide a model for understanding adrenergic roles in conditions such as PTSD and anxiety, ultimately contributing to receptor specific drug development.

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UG-S / Early-phase

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POSTER #6

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Can the Next Generation Close Construction's Skilled Labor Gap, or Will Automation replace American Craftsmanship?

The United States construction industry is facing a growing imbalance between increasing project demand and a declining supply of skilled labor. Aging workforce and limited youth participation in trade careers are factors that raise concerns about meeting labor needs in 2030. At the same time, advancements in artificial intelligence and automation are changing the construction industry by introducing new ways of improving efficiency, safety, and project delivery.

This study will show whether the current labor pipeline can meet projected labor demands, or whether AI and automation will be needed. Using different methods of approach such as research papers and a high school survey and case studies of new technologies, this study analyzed labor shortage and youth career interests.

Findings indicate that workforce development alone is unlikely to meet future demand. While career and technical education can improve labor demand and entry to trades, it couldn't fully make up the deficiency of human labor shortages. Automation seemed to be helping the construction industry not entirely replace human labor, by improving productivity and safety. The study shows the need for a balanced, hybrid strategy that integrates the workforce with AI and automation to sustain industry growth while preserving the need for human labor.

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UG-S / In-progress
Faculty Research Grant

POSTER #32

Helicity and Hydration Effects in PFOA: Insights from PFOA Monohydrate Complexes.

Perfluorooctanoic acid (PFOA) is a persistent, man-made perfluorinated carboxylic acid widely detected in groundwater, raising significant environmental and health concerns. Understanding its structure and behavior in aqueous environments is therefore essential for improving its detection and remediation. In this work, we use Gaussian 16 computational chemistry package to investigate the molecular structure and conformational potential energy surfaces of PFOA and its monohydrated complex. A two-dimensional potential energy surface of PFOA–H₂O was computed at the B3LYP-D3BJ/6-311++G(d,p) level by scanning key dihedral angles. The results reveal two stable helical conformations separated by an energy barrier of approximately 9 kJ/mol. To probe the role of water in modulating helicity, we further explored conformational changes by systematically twisting the fluoroalkyl backbone. Our results indicates that the terminal polar group—whether a carboxylic acid or a hydrogen-bonded acid–water complex—has minimal influence on the overall helicity. Additionally, the analysis along the helical coordinate suggests the possibility of additional conformers, particularly upon inversion of the helix. Notably, the energy barrier for helical inversion (~9 kJ/mol) is comparable to that of dihedral isomerization (~8 kJ/mol), indicating that these pathways may compete dynamically. The work to confirm or deny the presence of helical inversion by characterizing left- and right-handed helices along inversion pathways is underway and the results will be presented in this talk.

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UG-S / In-progress
Hawthorne' Endowment
Lamar Foundation

POSTER #10

Women's Political Participation and Abortion Restrictions in the United States.

The Dobbs v. Jackson Women's Health Organization (2022) decision created significant variation in abortion regulation across states. These variations present a unique opportunity to examine how state-level abortion restrictions impact women's voter turnout and candidacy. Abortion is a highly salient topic and a possible participation motivator for women on both sides of the spectrum. This research uses state-level data from the 2020 and 2024 election to provide a snapshot of women's participation before and after the Dobbs decision. It employs the number of women Congressional candidates and the percentage

of women voters per state for these years. This analysis uses a regression model to assess the relationship between restrictive state level abortion policy and women's political participation. The results suggest that states with more restrictive abortion regulations experience lower levels of women's voter turnout. There was no significant relationship between restrictiveness and the number of women candidates. The post-Dobbs period is also not associated with a strong change in either of these measures. These findings suggest that Dobbs cannot be considered a significant driver of political motivation in women. It also suggests that what motivates women to vote is different than what motivates a woman to run for public office.

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UG-S / In-progress
TEAM-UP Grant

POSTER #47

Arrival times of magnetic clouds generated by solar activities to Earth's orbit.

Solar activities (i.e. flares, filaments, arcs or eruptions) are responsible for Coronal Mass Ejections (CMEs) that generate toroidal shaped interplanetary magnetic clouds (IMCs), which create geomagnetic storms on Earth, with the disruption of power grid lines, having a negative impact on the navigation system of aircraft and low-altitude artificial satellites, etc.

A parameter-based model allows us to predict the arrival times of the IMCs produced by solar activities. Our dynamic model uses the diamagnetic force, the gravitational force and the drag force to estimate the arrival times of the cloud to the Earth's orbit. The characteristics of a toroidal shaped cloud, such as its size, shape, magnetic field, mass, speed, and expansion rate are estimated. The size of this toroidal cloud changes at different rates while the cloud propagates through Heliosphere. The effects on cloud's motion and structure are influenced by the interplanetary magnetic field and solar wind plasma. We take the test case of a solar flare released in May 1997. The maximum speed measured in the Earth's orbit during the cloud passage was 457 km/s, which was relatively low. We calculate the time of travel of the ICM's center-of-mass at the Earth's orbit in 84 hrs, which is very close to the actual reported value of 84.5 hrs.

Work done under SURF grant and published in: **The Journal of Atmospheric and Solar-Terrestrial Physics** **267** (2025), 106416 by E. Romashets, M. Vandas, T. Weaver, and C. Bahrim, "Analytical Model for the Transit Time of an Interplanetary Magnetic Cloud".

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UG-S / In-progress
U.R.G. Project

POSTER #14

Supporting Roles: Perspectives of Neurotypical Peers' Parents in an Inclusive Theater Program.

Inclusive theater programs are widely recognized as beneficial therapeutic interventions for neurodivergent children, using their neurotypical peers as models for social language skills. While research confirms the benefits for neurodivergent participants, there is little research on the experiences of the neurotypical peers themselves, particularly from the perspective of their parents. This study aims to address this gap by examining the perceptions of parents and guardians who serve as peer mentors in the interACT program, an inclusive language enrichment theater program hosted annually by the Lamar University Department of Speech and Hearing Sciences (LU SPHS) and its community partner, Southeast Texas Stages. This study seeks to understand why parents enroll their neurotypical children in such programs, their perspectives of the experience, and any observed benefits for their children. A qualitative design using thematic analysis will be used to identify key themes related to parent perspectives. The findings of this study are expected to provide valuable information about the quality of life (QoL) and perceived benefits for typically developing children in inclusive therapeutic settings.

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GR-H / Advanced
Departmental Sponsorship

POSTER #13

Counseling Skills in Audiology Graduate Education: A Scoping Review of Training and Application.

Counseling remains a primary component of patient care with active listening, empathy, and clear communication. While some programs may be limited in their counseling training, it is essential to examine how counseling skills can be better supported. This scoping review examines the redesign of counseling within audiology programs, focusing on counseling competencies, strategies for advancing student learning, and clinical training. The insights gained from this review highlight gaps in professional development, teaching, and application, showing the need for consistent and structured counseling education in programs to prepare future audiologists for effective patient-centered interaction through enhanced interpersonal communication skills.



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