

4th Annual



**GRADUATE
RESEARCH
CONFERENCE**
AT LAMAR UNIVERSITY®

KEYNOTE ADDRESS

Dr. Gene Theodori

Associate Provost for Academic
and Research Administration

SETZER STUDENT CENTER, LAMAR UNIVERSITY

MONDAY, APRIL 20, 2026 • 9:00 AM–5:30 PM



COLLEGE OF GRADUATE STUDIES
LAMAR UNIVERSITY

GRADUATE RESEARCH CONFERENCE

Setzer Student Center, Lamar University

APRIL 20, 2026 • 9:00 AM–5:30 PM

Welcome to the Lamar University Graduate Research Conference. This event highlights the scholarly work of our graduate students and faculty across disciplines. We invite you to explore the sessions, engage with presenters, and celebrate academic excellence.

The day will begin at **9:00 AM** in the Ballroom with welcome remarks from Dean Jon Gray, followed by the keynote address, “Research with Relevance at Lamar University,” by Dr. Gene Theodori.

A buffet-style lunch will be served from **11:00 AM** to **1:00 PM**.

Conference awards will be announced at **5:00 PM**.

See the Abstracts section for full information on poster, paper, and presenter

POSTER PRESENTATIONS

Poster sessions will run from **9:30 AM** to **11:30 AM**. Poster award winners will be announced at the conclusion of the conference at **5:00 PM**.

LIVE OAK BALLROOM (ROOM 110)

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

Rebecca Jones

Gamification as Structured Instructional Design: An Action Research Study of Achievement Gains and Reduced Score Variability in a Low-Income 6th-Grade Mathematics Classroom

Karla Yon

Current Bimodal Fitting Practices in The United States: A Survey Study

Jovianna Gonzalez

Navigating Access to Advanced Placement Exams

LeKeitha Johnson

Noise Exposure Risk and Perceived Hearing Loss in Online Gamers

Meagan Lafley & Laura Martinez

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

Ariel Wimberly & Mackenzie Crawford

Schedule

LIVE OAK BALLROOM (ROOM 110) (CONT.)

Using XGBoost for server selection on object storage systems

Naman Subedi

From Vacancy to Velocity: Designing Internal Pipelines to Stabilize School Leadership

LaKeisha LeBlanc

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

Laura Martinez

Nonlinear System Identification of Electronic Assemblies under the Motion Excitation

Sima Besharat Ferdosi

Connected and Capable: The Transformative Power of Extracurricular Engagement in Graduate Education

Le'Keisha D. Johnson

KPI overload in enterprise dashboards: When More Metrics Reduce Decision Effectiveness

Dike Onyeanula

Effect of TiO₂ Nanoparticles on the Sterol Biosynthetic Pathway of *Candida parapsilosis*

Chukwudike Eric Enem

Maintaining a High-Performing School Amidst Demographic Shifts

Misty Almasi

A CVSS 4.0 - Informed Cyber-LOPA Framework for Enhancing Resilience of Cyber - Physical Systems in the Chemical Process Industry

Sharath Daida

Development of a Functionalized Chemosensor for Selective Detection of Hg²⁺ and Cu²⁺ Ions with Fluorescent Properties and Cellular Imaging Applications

Kenechukwu Chikezie

Facilitative interactions between *Bacillus subtilis* and *Rhizobium leguminosarum* exposed to alkaline stress in dual culture systems

Maruf Khan, Ahmad H. Kabir*

Supporting Musicians with Cochlear Implants: A Scoping Review of Music Training and Rehabilitation Approaches

Anna Maldonado, Laraib Kausar, and Katie Morris

Differentiating Between Synthetic Fibers: A Forensic Evidence Investigation

Trinity Cross

Schedule

LIVE OAK BALLROOM (ROOM 110) (CONT.)

Development and Characterization of Nitrogen-doped Carbon Nanotube Modified Electrochemical Sensors

Nwaeze Franklyn Ezenwa

The Emerging Role of Auracast™ Broadcast Audio in Hearing Aids: A Scoping Review of Accessibility, Usability, and Clinical Outcomes

Sydney Garza, Hailey Connell, Alyssa Delacruz

Methane Emissions at Tidal Cypress-Tupelo Swamp Upstream and Downstream of a Saltwater Barrier Structure on the Lower Neches River, Southeast Texas.

Alysha Heredia

Design and Development of Fluorescent Probes for Cancer Detection and Inhibition

Mustapha Aminu and Susantha K. Ganegamage

Rhythmic Complexity and Cognitive Performance: Effects on Creativity and Attention in Music-Driven Tasks

Md Jubair Hossain

Design and Development of a Lead Screw-Actuated Robotic Gripper for UAV-Based Fishnet Inspection

Aladin Ahmed

Influence of 3D Printing Process Parameters on the Mechanical Properties of PETG Parts Fabricated by Fused Granular Fabrication (FGF)

Md Sajedul Islam Sakir

Chemoattractant-guided recruitment of *Trichoderma afroharzianum*: in vitro validation and establishment of a dual-compartment microcosm system in planta

Bishrant Pant, Ahmad H. Kabir

Precision Engineering at the Critical Point: The Global Industrial Rise of Supercritical Carbon Dioxide

Najmul Sajal & Ripa Sutar

From Pond to Plate: Total Cryogenic Cold Chain for Premium Seafood, Zero Waste, and Global Food Security

Najmul Sajal

Obstacle Avoidance and Optimal Path Planning for Autonomous Mobile Robots Using Sampling-Based and Graph-Based Algorithms

Md Asifuzzaman

Nanoscale Characterization of Nanomaterial-Based Systems: Mechanisms, Experimental Methods, and Challenges

Md Ashraful Hoque

Schedule

LIVE OAK BALLROOM (ROOM 110) (CONT.)

Examining Parental Involvement Factors that Enhance Student Achievement in Turnaround Schools: A Phenomenological Study

Lizette Castelline

Solar power forecasting using machine learning and deep learning.

Md Rayhan Chowdhury

An Interpretable XGBoost and GPT-Assisted Data Lakehouse Model for Predicting Community-Level Chronic Illness and Long COVID Vulnerability Scores

Ronish Shrestha

Principals' Lived Experiences in Professional Learning Communities: A Phenomenological Study

Jose Lopez

Deep Learning-Based Intelligent Forecasting of Water Quality Variables Using LSTM, GRU, and Hybrid Architectures

Md Abu Taher

Net Load Forecasting under Uncertainty with Statistical and Learning-Based Models

Tasmina Imam

Can Dredge Material Be Used to Remediate Polystyrene Microplastics in Water

Carson McCauley

Enhancing Learning Efficiency and Ergonomic Well-Being: A Comparative Study of Handwritten, AI, AI-Assisted, and Digital Structured Note-Taking

Jannatul Hur

Transformer-Based Design of NIR-Emissive Graphene Quantum Dots with Property-Conditioned Generation

Gaurav Dawadi

Exploring The Perceived Impact Of Dual Credit On College Readiness In First-Year College Students In Southeast Texas

Daniel McLemore

Schedule

STUDENT PAPER PRESENTATIONS

Paper sessions will run from 9:30 AM to 4:55 PM. Paper award winners will be announced at the conclusion of the conference at 5:00 PM.

A projector will be available for students to display content visually. It will use an HDMI cable connected to the laptop. Students could bring a flash drive or connect to the HDMI using a Windows computer. Auditorium Style seating 49.

CYPRESS 1 & 2 (ROOM 125)

- 9:30-9:55** **SIGNAL: A Human-AI Interaction Framework for Real-Time Sign Language Translation**
Nadia Islam Tanha, Md Mehedi Hasan, Jannatul Hur
- 10:00-10:25** **Financial-Based Model for Quantifying Cybersecurity Risk Exposure in Enterprise and Digital Trade Infrastructure**
Ayomipo Alademehin
- 10:30-10:55** **From Fragmentation to Intelligence: A Star Schema-Based Framework for Workforce Engagement Analytics in U.S. Organizations**
Bernice Blay-Miezah
- 11:00-11:25** **Autonomous Interception of Non-Stationary Objects Through Depth-Based Motion Prediction**
Hossein Rahimighazvini
- 11:25-12:25** **LUNCH**
- 12:30-12:55** **AI-content dependent microstructure evolution and mechanical behavior of Al_xCoCrFeNi high-entropy alloys at elevated temperature**
S M Yeasin Habib
- 1:00-1:25** **Bioremediation of Acid Mine Wastewater Using Extremophilic Galdieria sulphuraria**
Shaseevarajan Sivanantharajah
- 1:30 – 1:55** **Erased from the Map: Reclaiming Deaf Histories in Texas**
Kathleen L. Brockway
- 2:00-2:25** **Natural Polymer Composites of Amylose-Pectin as Potential Organic Contaminants Remediators**
Kayode Adeoye
- 2:25-3:00** **JUDGING & REFRESH BREAK**

Schedule

CYPRESS 1 & 2 (ROOM 125) (CONT.)

- 3:00-3:25** **A Multi-Stage Deep Learning and Graph-Informed Gradient Boosting Pipeline for High-Fidelity Leak Identification in Aging Municipal Networks**
Mahbuba Moumita
- 3:30-3:55** **A Simple Simulation Framework for Stress-Testing B2B Logistics Under Weather and Traffic Disruptions**
Sailesh Sitaula & Prashant Thapa
- 4:00-4:25** **Effects of Multitasking on Human Error in LEGO Assembly Tasks**
Rasmia Ishaque, Muhammad Moeez Mughal, Sirja Karanjit
- 4:30-4:55** **Design of an Attention Recovery Mechanism for Students During Cognitive Fatigue**
Jay Kumar Patel, Suman Das, Md Ahsan Habib, & Md Sabiruzzaman

BAYOU SOUTH (ROOM 122)

- 11:00-11:25** **Design And Implementation Of A Cloud-Based Electronic Health Record System For Improving Healthcare Data Management**
Olumide Oluleye
- 11:30-11:55** **Development Of A Stable Phospholipid-Lipid Complex For Controlled Drug Release Applications**
Dipongkar Ray Sobuj
- 12:00-12:25** **An NLP and LLM-Based Framework for Emergency Detection and Prioritization in Natural Disaster Response**
Muna Kandel
- 12:25 -1:25** **LUNCH**
- 1:30-1:55** **Do Nurses Participate in Health Policy and Legislative Advocacy?**
Ana Cordova, Dr. Raouth Kostandy
- 2:00-2:25** **UAV-Based Detection of Stranded Humans in Flood-Affected Environments**
Meet Arvindbhai Monpara
- 2:30-2:55** **A Human-Centered AI Task Management System for Cognitive Load Reduction and Decision Support in Industrial Plant Management**
Md Asfaqur Rahman, Md Masum Billah, Dr. Yueqing Li
- 2:55-3:20** **JUDGING & REFRESH BREAK**

Schedule

BAYOU SOUTH (ROOM 122) (CONT.)

- 3:20-3:45** Investigating the Role of Inc-CMPK2-2 and Inc-TMEM121-26 in Macrophage Response to *Leishmania donovani* Infection Using an ASO-Based Knockdown Strategy
Camren Dionne
- 3:50-4:15** Bridging Gaps In Deaf Epistemology: A Study Of Deaf Balinese Experiences
Cristophorus Subandi Budidharma
- 4:20-4:45** BRIDGING THE COVERAGE GAP: Healthcare Access, Uninsurance, and the Case for Medicaid Expansion in Texas
Akinola Adio

BREAKOUT ROOMS

NECHES (ROOM 120)

- 10 AM** Bridging The Gaps for a Safer, Stronger, More Connected Southeast Texas
Brian Williams, Executive Director, Center for Resiliency
- 11 AM** Maritime Leadership and Innovation: Sea for Yourself
Nathan Sanders, Assistant Director, Port Management
- 12 PM** Readiness for Impact: Doctoral Students' Research Journey
Nina Gjoci, Associate Director, Center for Resiliency
- 1 PM** New Directions in the Midstream Sector at Lamar University
Philip Cole, Director, Center for Midstream Management
- 2 PM** The Lamar University Institute for Environmental Studies
Clayton Jeffryes, Director, Center for Advances in Water and Air Quality
- 3 PM** Data Analytics and Cybersecurity for Energy Resilience
Helen Lou, Director, Center for Data Analytics and Cybersecurity

ABSTRACTS OF POSTERS & PRESENTATIONS

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

Rebecca Jones

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.

Gamification as Structured Instructional Design: An Action Research Study of Achievement Gains and Reduced Score Variability in a Low-Income 6th-Grade Mathematics Classroom

Karla Yon

Middle school mathematics achievement in the United States continues to lag behind international benchmarks, and many educators are exploring ways to increase both engagement and mastery of mathematical concepts. One instructional approach gaining attention is the use of gamification -integrating game-based structures and interactive technologies into classroom learning experiences. While gamification is often associated with increased motivation, questions remain regarding its impact on measurable academic outcomes. This action research study examined the effects of a structured gamified instructional unit on student performance in a 6th-grade mathematics classroom. Participants included twenty students attending a rural, low-income middle school in Texas. The instructional intervention consisted of a 13-day unit focused on data and measurement concepts and incorporated virtual field experiences, collaborative activities, and game-based learning tools designed to reinforce key mathematical skills. Student learning was measured using identical pre- and post-assessments aligned to the unit objectives. Results indicated substantial improvements in student performance following the gamified instructional unit. The class average increased from 45% on the pre-assessment to 86% on the post-assessment. Additionally, 80% of participants demonstrated mastery of the assessed concepts by the end of the unit. Beyond improvements in average scores, the distribution of student performance narrowed considerably, suggesting reduced variability in achievement across the group. Although the study was conducted on a small scale, findings suggest that intentionally structured gamification strategies may support both engagement and measurable learning gains in middle school mathematics classrooms. These results highlight the potential for game-inspired instructional design to contribute to improved mastery and more consistent learning outcomes among diverse student populations. The poster will present the study using a visually structured format inspired by game-interface design. Data comparisons, growth metrics, and instructional components will be displayed through graphical elements that mirror the gamification concepts examined in the research while maintaining clear academic organization.

Current Bimodal Fitting Practices in The United States: A Survey Study

Jovianna Gonzales

Bimodal (hearing aid in one ear and cochlear implant in the other) fitting in the United States remain inconsistent despite increasing evidence of bimodal benefits. Although clinical practice guidelines for bimodal fitting were dated back in 2022, the outcomes remain variable, with some users demonstrating substantial benefit while others either no benefit or interference. It is still unsure whether those guidelines have been adapted into standard care. Hence, this study examines current bimodal fitting practices among audiologists in the U.S. through a literature based questionnaire. Study findings will highlight how well the current bimodal fitting practices aligns with the best practices.

ABSTRACTS OF POSTERS & PRESENTATIONS

Navigating Access to Advanced Placement Exams

LeKeitha Johnson

This qualitative study explores Advanced Placement (AP) teachers' perceptions of the challenges, barriers, and strategies that influence students' decisions to take AP exams after completing AP courses. The study examines the instructional, motivational, and structural factors that teachers identify as shaping exam participation choices. Because AP teachers directly observe students' preparedness, confidence, and the school level conditions affecting exam access, their perspectives offer essential insight into the obstacles that hinder participation and the supports that encourage it. Teachers' observations inform targeted interventions, professional development, and policy decisions aimed at improving equity and access within AP programs. By centering teacher voices, this research seeks to deepen understanding of the complex factors that affect AP exam participation, including perceived preparedness, exam value, financial barriers, and school based supports. The findings provide practical, teacher informed recommendations to strengthen exam taking rates and enhance students' opportunities to benefit from rigorous, college level academic experiences.

Noise Exposure Risk and Perceived Hearing Loss in Online Gamers

Meagan Lafley & Laura Martinez

Chronic online gaming is known to consume the time of enthusiast. 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.

Using XGBoost for server selection on object storage systems

Naman Subedi

Machine Learning and Internet of Things research at Lamar University generates large volumes of heterogeneous data — sensor readings, model outputs, experimental datasets — that do not fit neatly into traditional relational database systems. Object storage has emerged as the natural solution for this class of data, offering version control, metadata referencing, and compatibility with industry-standard interfaces like Amazon S3.

To serve this need, we deployed a MinIO-based object storage system hosted on-site at Lamar University, giving researchers, staff, and students a high-performance, reliable home for their data. The cluster consists of four virtual machines running MinIO in distributed mode, each contributing 150 GB of storage. With erasure coding enabled at EC:2, the system provides 300 GB of usable storage with built-in failover protection. HAProxy sits in front of the cluster as both load balancer and reverse proxy, chosen for its open-source availability and well-documented configuration. Prometheus and Grafana round out the stack, providing real-time metrics collection and visualization.

Out of the box, HAProxy distributes requests using round-robin — a policy that always treats all servers as equally capable. In practice, servers experience uneven load depending on the size and nature of incoming requests. A node already under heavy I/O or CPU pressure receives the same traffic as an idle one, creating latency bottlenecks that a static policy cannot detect or respond to. To address this, we extended HAProxy with a Lua script that intercepts each request and consults a trained XGBoost model before routing occurs. The model considers live system metrics from all four nodes alongside the characteristics of the incoming request itself, predicting which server is best positioned to handle it at that moment.

ABSTRACTS OF POSTERS & PRESENTATIONS

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

Ariel Wimberly & Mackenzie Crawford

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 the 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.

From Vacancy to Velocity: Designing Internal Pipelines to Stabilize School Leadership

LaKeisha LeBlanc

Persistent turnover in school leadership continues to pose significant challenges for districts by disrupting sustained improvement efforts, weakening instructional coherence, and increasing pressure on organizational systems. Although recent patterns show some movement toward greater stability compared with the immediate post-pandemic period, leadership transition rates for principals and superintendents remain higher than those typically seen in earlier years. Such instability can undermine the continuity of school initiatives, hinder the development of a cohesive professional culture, and make it harder to attract and retain effective educators. Overall, these conditions highlight the need for district-driven strategies that intentionally strengthen leadership preparation, expand the pool of qualified candidates, and reduce disruptions caused by recurring vacancies.

The poster project examines an internal leadership pipeline initiative designed to accelerate readiness, strengthen candidate preparation, and improve role stability. The poster will explore program components that support leadership self-efficacy, how participation relates to indicators of organizational stability, and how relationships align with drivers of leadership turnover. The poster will accomplish three goals. First, it will diagnose the problem by illustrating current trends in leadership turnover and their impacts on student achievement and teacher retention. Second, it will present an accessible pipeline model, featuring a flowchart that demonstrates how targeted mentoring, job embedded practice, and structured cohort development work together to build leadership readiness and support sustained role stability. Finally, the poster will deliver actionable insights for districts by summarizing the program elements that exhibit the strongest associations with leadership preparedness and stability metrics.

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

Laura Martinez (presenter) & Lilian Felipe

As the largest minority population in the United States, the Hispanic/Latino population remains significantly underrepresented in healthcare, particularly in the field of 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. Preliminary data collection is currently underway, and the results of this pilot study will be presented at the conference. 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.

ABSTRACTS OF POSTERS & PRESENTATIONS

Nonlinear System Identification of Electronic Assemblies under the Motion Excitation

Sima Besharat Ferdosi

Electronic assemblies are widely used in many engineering applications, and their reliability is critical because failure can lead to high costs and safety risks. These assemblies often operate in harsh vibration environments and, therefore, can be exposed to high levels of acceleration. In both industry and academic research, linear models are commonly used to evaluate their reliability. However, when the excitation level increases, linear theory cannot accurately capture the system response. Therefore, it is necessary to develop nonlinear identification methods that can accurately describe the system behavior at higher excitation levels.

In real applications, the vibration is usually caused by base motion rather than directly applied forces, which makes many traditional force-based nonlinear identification methods difficult to use. For this reason, this paper proposes a nonlinear system identification framework that considers base excitation as the input and is developed for electronic assemblies exhibiting lightly damped, weakly nonlinear behavior, as is typically observed in practical engineering applications.

The proposed approach utilizes the restoring force surface (RFS) method to identify nonlinear stiffness parameters using measured response data, without requiring direct measurement of the input force. Nonlinearity is first detected through resonance frequency shifts observed in step-sine tests and is then characterized and validated using an undamped two-degree-of-freedom mass-spring system with a softening cubic stiffness nonlinearity. Thereafter, the nonlinearity is experimentally identified on a three-dimensional printed circuit board (PCB) under base excitation. For this purpose, the PCB response is measured using accelerometers, and the recorded relative acceleration signals are integrated to obtain velocity and displacement responses. Using these responses, the nonlinear restoring force is reconstructed from the equations of motion and transformed into modal coordinates using measured mode shapes. The restoring force is expressed as a polynomial function of the modal displacement, and linear, quadratic, and cubic stiffness terms are estimated using a least-squares regression. All candidate terms are included in the regression, and their significance is evaluated using statistical metrics such as the coefficient of determination (R^2) and the mean square error (MSE), allowing dominant nonlinear terms to be retained while less significant terms are excluded.

Experimental results show that the PCB exhibits combined quadratic and cubic nonlinearities, mainly due to geometric effects during vibration. The proposed methodology offers a practical and experimentally feasible tool for identifying nonlinear parameters of base-excited electronic assemblies, enabling their direct application in reliability and fatigue modeling.

Connected and Capable: The Transformative Power of Extracurricular Engagement in Graduate Education

Le'Keisha D. Johnson

Resilience is a skill college students gain through extracurricular activities, such as student organization participation. Holdsworth et al. (2018) identified that the collegiate experience allows students to gain knowledge and skills, as well as, develop resilience. Students stated in the Holdsworth et al. (2018) study that resilience is a key ability that is critical to their academic success. Students acknowledged that within the university the development of resilience occurs through an interactive process between the student and the university. Participation in student organizations and communities, amongst other services offered by a university, plays a role in the development of resilience (Holdsworth et al., 2018).

This proposed poster highlights a qualitative study that addressed a gap in the literature and a call for research to explore the impact of extracurricular activities on different types of student populations within different contexts (Buckley & Lee, 2021). Grounded in phenomenological methodology, this study sought to understand the lived experiences of graduate students engaged in student organizations and the student government association as it pertains to connectedness and capacity building. This study was conducted within a dynamic academic health center in south central Texas. Key findings revealed that graduate students experience capacity building through the development of a variety of skills through their involvement within a student organization. When it comes to connectedness for graduate students, participation in student organizations helps graduate students develop relationships with peers and faculty, as well as, their academic environment. This study also created new knowledge through the discovery of a strategy student organizations can implement to align their efforts with graduate student career aspirations.

ABSTRACTS OF POSTERS & PRESENTATIONS

KPI overload in enterprise dashboards: When More Metrics Reduce Decision Effectiveness

Dike Onyeanula

Enterprise dashboards have become central instruments of organizational governance, yet a growing body of evidence suggests that the proliferation of Key Performance Indicators (KPIs) within these systems may undermine the decision-making quality they are designed to support. This paper examines KPI overload, defined as the condition in which the number of metrics presented to decision makers exceeds the cognitive processing capacity required for effective interpretation and action, and explores its association with decision effectiveness outcomes in United States enterprises. Drawing on a mixed-methods design combining a quantitative survey of 760 U.S. based senior executives and managers, 18 semi-structured case study interviews, and a review of 45 empirical and theoretical sources, this study examines how metric density relates to perceived decision quality, time to decision, decision confidence, and strategic alignment. Grounding the analysis in cognitive load theory (Sweller, 1988), bounded rationality (Simon, 1955), and cognitive fit theory (Vessey, 1991), the findings suggest a statistically significant nonlinear relationship between KPI count and decision effectiveness, with relatively stronger performance observed in the approximate range of 8 to 12 primary metrics per dashboard view. This threshold should be interpreted as a context-dependent general indicator rather than a universal prescription, as optimal metric density is likely to vary by role, industry, and decision type. Regression analyses indicate that KPI count, redundancy, and the presence of role-based filtering each contribute meaningfully to variance in decision quality scores, accounting for approximately 65% of explained variance in the full model. Economic costs attributable to KPI overload are estimated using a multi-component model drawing on respondent-reported data and secondary benchmarks; these estimates are illustrative in nature and carry the assumptions inherent to any indirect cost model of this kind. This paper introduces the DICE Framework (Decide, Impact, Currency, Exclusivity) as a proposed diagnostic and governance tool for KPI rationalization, supported by preliminary retrospective and prospective validation. The framework is presented as an emerging contribution warranting further empirical testing rather than a fully validated instrument. Theoretical contributions extend cognitive fit theory and information systems success models to the domain of business intelligence dashboard design. Implications for U.S. corporate governance, public sector performance management, and digital transformation strategy are discussed.

Effect of TiO₂ Nanoparticles on the Sterol Biosynthetic Pathway of *Candida parapsilosis*

Chukwudike Eric Enem

Candida parapsilosis is a member of the Candida family of opportunistic pathogens that under certain circumstances can develop into invasive infections particularly as C. parapsilosis can adhere to medical devices and create biofilms. Antifungal medication alone has not been able to resolve the problem, as the organism develops resistance to treatment. Titanium dioxide (TiO₂) nanoparticles exhibit antifungal activity, possibly through a dual mode of action including the disruption of cell communication pathways. This study evaluates the effect of TiO₂ nanoparticles on Candida parapsilosis by evaluating its effect on the sterol biosynthetic pathway of the cells using gas chromatography. Results suggest an association between cell morphology and relative sterol amounts.

Maintaining a High-Performing School Amidst Demographic Shifts

Misty Almasi

This study focused on teachers' perceptions of their role in maintaining high performance as student demographics shift from a homogeneous population of affluent students, with English as their primary language, to a more racially diverse population, including more students from low socio-economic status and those whose primary language is not English. The goal was to investigate teachers' experiences with changing student populations, their perceptions of how these shifts affect their roles, and the supports they identify as necessary to sustain student success. Grounded in Cultural-Historical Activity Theory (CHAT), the study explores how institutional structures, stakeholder collaboration, leadership practices, and resource availability shape educators' responses to evolving school contexts. The findings aim to inform school leaders and policymakers about strategies for fostering resilience, strengthening professional capacity, and supporting high-performing schools amid demographic change. The poster will include charts on current campus demographics, participant demographics, and a timeline of laws impacting education standards. It will include information on the key thematic findings from the interviews conducted and recommendations for future training and support needed to ensure student success for all students.

ABSTRACTS OF POSTERS & PRESENTATIONS

A CVSS 4.0 - Informed Cyber-LOPA Framework for Enhancing Resilience of Cyber - Physical Systems in the Chemical Process Industry

Sharath Daida

This study/poster presents an integrated Cyber-LOPA framework enhanced with the Common Vulnerability Scoring System (CVSS 4.0) to assess cybersecurity risks in Chemical Process Industry (CPI) environments. Common Vulnerabilities and Exposures (CVEs) were mapped to each level of the enterprise network architecture, and their severity was evaluated using CVSS 4.0. The Cyber Kill Chain model was incorporated to model attacker behavior and intrusion progression. High risk scenarios were further analyzed using Layer of Protection Analysis (LOPA) to assess whether existing cybersecurity safeguards were adequate to meet risk tolerance criteria. To demonstrate the framework's application, a case study involving the remote exploitation of a centrifuge in a high-density polyethylene (HDPE) process revealed critical gaps in protection layers, including VFD setpoint manipulation, unauthorized remote access, and sensor overrides. Mitigation strategies were proposed based on IEC 62443, NIST SP 800-82, and ISA 18.2 standards. By integrating CVSS 4.0 scoring, Cyber-LOPA, and kill chain-based threat modeling, the proposed methodology offers a structured and proactive approach to cybersecurity risk management, enabling informed decision-making for protecting critical CPI infrastructure.

Development of a Functionalized Chemosensor for Selective Detection of Hg²⁺ and Cu²⁺ Ions with Fluorescent Properties and Cellular Imaging Applications

Kenechukwu Chikezie

Toxic heavy metals such as mercury (Hg²⁺) and copper (Cu²⁺) pose serious threats to environmental and public health, highlighting the need for rapid, accessible, and reliable detection methods. This need is particularly important in Southeast Texas, where dredging of industrial waterways can disturb contaminated sediments and increase the risk of metal exposure in nearby communities.

In this study, we report the design, synthesis, and characterization of a novel triphenylamine–Schiff base–thiourea fluorescent chemosensor (L) for the dual selective detection of Hg²⁺ and Cu²⁺. Upon binding either ion, L undergoes rapid, concentration-dependent fluorescence quenching at 488 nm through a chelation-enhanced quenching mechanism. The sensor exhibited a fluorescence quantum yield of 0.45, strong association constants of $1.21 \times 10^6 \text{ M}^{-1}$ for Cu²⁺ and $2.03 \times 10^5 \text{ M}^{-1}$ for Hg²⁺, 1:1 binding stoichiometry, and a detection limit of 1.14 μM in environmental water samples. High selectivity was confirmed in the presence of 18 competing metal ions. Notably, L was able to distinguish Hg²⁺ from Cu²⁺ through their different responses to glutathione. Fluorescence was restored in the Hg²⁺-quenched system but not in the Cu²⁺-quenched system, providing a simple reagent-based method for identification. Density functional theory calculations further supported distinct binding modes and helped explain the observed quenching behavior. In addition, live-cell fluorescence imaging in CL1, A549, and HeLa cells demonstrated good biocompatibility, efficient cellular uptake, and reliable intracellular Cu²⁺ sensing. Overall, this work presents a low-cost and highly selective sensing platform with strong potential for environmental monitoring in dredging-impacted waterways as well as for biomedical studies.

Facilitative interactions between Bacillus subtilis and Rhizobium leguminosarum exposed to alkaline stress in dual culture systems

Maruf Khan*, Ahmad H. Kabir

Soil alkalinity is a major constraint to legume productivity, often limiting nodulation by negatively affecting Rhizobium leguminosarum (RL), a key symbiont required for pea nodule formation. This study examined the effects of alkaline stress (pH 8.0) on the growth dynamics of RL and Bacillus subtilis (BS) under both single and dual culture systems using nutrient agar. Bacterial growth was assessed by measuring colony size over seven days. In a single culture, BS showed minor responses to elevated pH, with slight reductions at early stages but comparable or enhanced growth at later stages. Thus, BS exhibited strong tolerance to alkaline conditions, indicating inherent resistance to elevated pH. In contrast, RL exhibited a modest response to alkaline conditions, with slight growth alterations but no consistent reduction in colony size by Day 7. The limited impact of alkaline stress on RL colony growth may be due to short-term exposure under in vitro conditions, which may not fully capture the sensitivity of RL during host-dependent nodulation. However, in a dual culture system, distinct interaction patterns emerged. BS growth remained largely unaffected by RL across pH conditions. Particularly, RL displayed significantly enhanced growth under alkaline stress in the presence of BS, particularly at later time points, suggesting a potential facilitative interaction. These findings indicate that while alkaline stress can impair RL performance in isolation, microbial interactions may mitigate these effects. This study highlights the importance of microbial interactions in shaping stress resilience and suggests a potential role for BS in supporting RL under alkaline conditions. Future in planta inoculation studies will be essential to determine whether BS can enhance RL-mediated nodulation and nitrogen fixation in pea plants under high pH soils.

ABSTRACTS OF POSTERS & PRESENTATIONS

Supporting Musicians with Cochlear Implants: A Scoping Review of Music Training and Rehabilitation Approaches

Anna Maldonado, Laraib Kausar ,and Katie Morris

Cochlear implants (CIs) restore speech perception for individuals with severe hearing loss, but often fail to convey the fine pitch and timbre cues essential for music appreciation. For musicians, this limitation disrupts auditory artistry and emotional engagement. This scoping review maps current evidence on music-related training and rehabilitation for CI users, including musicians; by examining intervention types, duration and outcomes in music training programs. Emerging approaches such as structured listening, melodic contour training, electro-tactile stimulation show modest gains in pitch accuracy and enjoyment. Findings will guide audiologists in developing evidence-based, music-centered rehabilitation strategies to enhance auditory outcomes and re-engagement after implantation.

Differentiating Between Synthetic Fibers: A Forensic Evidence Investigation

Trinity Cross

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.

Development and Characterization of Nitrogen-doped Carbon Nanotube Modified Electrochemical Sensors

Nwaeze Franklyn Ezenwa

Nitrogen-doped multiwall carbon nanotubes (N-CNT) have drawn much attention recently because of their unique electrochemical activity.

In this study, screen-printed electrodes (SPE) were modified with N-CNT/chitosan polymer suspension and characterized by electrochemical methods. The CV traces collected in K₃[Fe(CN)₆] showed a drastic increase in cathodic peak current from 4.28 μ A (for bare SPE) to 14.3 μ A (for SPE/N-CNT). Electrochemical impedance spectroscopy (EIS) results also showed that the charge transfer resistance decreased significantly from 383.5 Ω to 20.5 Ω when the working electrode was covered with the N-CNT/chitosan suspension.

The results suggested fast electron transfer kinetics at the SPE/N-CNT electrode solution interface and allowed for the development of sensitive and stable electrochemical sensor.

The Emerging Role of Auracast™ Broadcast Audio in Hearing Aids: A Scoping Review of Accessibility, Usability, and Clinical Outcomes

Sydney Garza, Hailey Connell, Alyssa DelaCruz

As Bluetooth technology evolves, Auracast™ represents a major innovation in wireless audio streaming, offering simultaneous transmission to multiple receivers, for hearing aid (HA) users and non-users. Users can benefit from the potential of Auracast™ to transform listening experiences in public and private spaces. This poster explores the influence of Auracast™ technology on user satisfaction in both HA users and non-users, while highlighting challenges in device pairing, venue implementation, and privacy concerns. Attendees will gain insight into how Auracast™ differs from Bluetooth Low Energy (LE) and how its adoption could redefine assistive listening devices.

ABSTRACTS OF POSTERS & PRESENTATIONS

Methane Emissions at Tidal Cypress-Tupelo Swamp Upstream and Downstream of a Saltwater Barrier Structure on the Lower Neches River, Southeast Texas.

Alysha Heredia

Methane is the second most important greenhouse gas contributing to climate change. Primary natural sources are wetlands which contribute approximately 33% of the total global methane emissions. Tidal riparian hardwood wetlands on rivers of the Northern Gulf of Mexico and Southern Atlantic coasts are subjected to increasing saltwater intrusion due to sea level rise, decreasing freshwater discharge, and storm surges. The biogeochemical cycling of carbon can be altered by seawater sulfate supply by increasing sulfate reduction and reducing methanogenesis and methane emissions. This study aims to assess methane emissions in the riparian Cypress-Tupelo wetlands of the tidal Neches River of Southeast Texas. The frequency of saltwater intrusion upriver to a water withdraw station led to the construction of a saltwater barrier (SWB) structure in 2000-2003, which provides an ideal sampling design of only freshwater exposure above and intermittent saltwater exposure below the SWB. Sampling was conducted in spring and summer 2025 for methane emissions by diffusion using static flux chambers and ebullition using funnel traps. Sediment and surface water methane concentrations were also measured, in addition surface water and sediment porewater analyses of biogeochemical relevance (chloride, sulfate, sulfide, ferric and ferrous iron, ammonium, nitrate, and DOC). Sediment microbiomes are also being analyzed to better understand the methanogenic community structure and methanogenesis pathway difference above and below the SWB. Greater methane emissions are expected above the SWB than below it where saltwater sulfate supply can increase methanogen competition with sulfate reducing prokaryotes. The results contribute to greater understanding of the controls of methane emission variability in coastal hardwood wetlands to inform modeling efforts necessary for planning of future sea level rise scenarios.

Design and Development of Fluorescent Probes for Cancer Detection and Inhibition

Mustapha Aminu and Susantha K. Ganegamage

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 over duplex, prompting synthesis and experimental evaluation. Photophysical and biological evaluations were done to determine optically efficiency and biological compatibility. The probe exhibited high molar absorptivity ($\epsilon = 53,300 \text{ M}^{-1} \text{ cm}^{-1}$) and 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.

Rhythmic Complexity and Cognitive Performance: Effects on Creativity and Attention in Music-Driven Tasks

Md Jubair Hossain

This study explores how the complexity of musical rhythms affects brain performance during creative tasks. Music is commonly used in study and work environments, especially in creative fields, but most research has focused on general features such as mood or type of music. Less attention has been given to rhythm, which plays an important role in how the brain processes sound and organizes information. Based on concepts from cognitive neuroscience and predictive coding theory, this study examines how three types of rhythm—simple rhythm, syncopation, and polyrhythm—affect attention, creativity, and mental workload.

A between-subjects experimental design will be used with approximately 20 university students. Each participant will be randomly assigned to one rhythm condition and will complete a creative design task while listening to the assigned rhythm. After the task, participants will complete a reaction time test to measure attention and a NASA-TLX questionnaire to assess mental workload. Creativity will be evaluated by independent raters using clear criteria such as originality, flexibility, and overall quality. The collected data will be analyzed using one-way ANOVA to compare differences between the rhythm conditions.

It is expected that moderate rhythmic complexity, such as syncopation, will improve creativity and engagement by providing an optimal level of mental stimulation. In contrast, highly complex rhythms, such as polyrhythms, may increase mental workload and reduce performance. Simple rhythms are expected to result in lower creativity due to limited stimulation.

As a poster presentation, the findings will be presented using visual elements such as charts and diagrams to clearly communicate the results and relationships between rhythmic complexity and cognitive performance.

ABSTRACTS OF POSTERS & PRESENTATIONS

Design and Development of a Lead Screw-Actuated Robotic Gripper for UAV-Based Fishnet Inspection

Aladin Ahmed

This project deals with the design and development of a compact robotic gripper mechanism for an unmanned aerial vehicle to inspect metallic fishnet structures. This work addresses the need for a reliable and robust gripping mechanism for handling traps, with structurally rigid mesh materials and vertical opening, without damaging or slipping. To develop a mechanically efficient mechanism with high positional accuracy, controlled gripping force, and self-locking properties, a lead screw actuation system is incorporated in the design. The system is modeled parametrically in Computer Aided Design (CAD) software, which enables us to iteratively optimize the jaw geometry, stroke length, and screw pitch. For 3D printing, nylon is selected as the primary fabrication material due to its favorable strength to weight ratio and durability under repeated loading cycles. 3D printing and traditional mechanical parts are employed in the construction of the proposed design. The proposed system is experimentally validated. According to the experimental results, the proposed system effectively grips metallic fishnet in static and dynamic conditions with minimal slipping and without damaging the fishnet material. The mechanical robustness and efficiency of the proposed system are verified by the consistency in results obtained in multiple iterations. The proposed system's potential as a scalable and application specific solution for fishnet gripping is verified by the results obtained.

Influence of 3D Printing Process Parameters on the Mechanical Properties of PETG Parts Fabricated by Fused Granular Fabrication (FGF)

Md Sajedul Islam Sakir

This study investigates the tensile behavior of 3D-printed polyethylene terephthalate glycol (PETG) components manufactured using a pellet-based extrusion system. With the growing adoption of large-scale additive manufacturing, understanding the relationship between process parameters and mechanical performance is critical for producing reliable functional parts. In this work, ASTM D638 tensile specimens were fabricated in both horizontal and vertical build orientations to evaluate the influence of layer deposition direction on mechanical properties. Key process parameters, including printing speed, infill pattern, and infill percentage, were systematically varied to assess their combined effects on material performance. Uniaxial tensile tests were conducted to obtain stress-strain responses, from which key mechanical properties such as Young's modulus, yield strength, ultimate tensile strength (UTS), and elongation at break were determined. Statistical analysis was performed to quantify the significance of observed differences across parameter sets and orientations. The results demonstrate a strong dependence of tensile properties on build orientation, confirming the inherently anisotropic nature of fused granular fabrication processes. Horizontally printed specimens generally exhibited higher strength and stiffness compared to vertically printed counterparts, primarily due to improved interlayer bonding and load distribution. Overall, this study provides valuable insights into the optimization of process parameters for pellet-based 3D printing of PETG. The findings contribute to improving the structural reliability and performance of additively manufactured components, supporting their broader application in engineering and industrial contexts.

Chemoattractant-guided recruitment of *Trichoderma afroharzianum*: in vitro validation and establishment of a dual-compartment microcosm system in planta

Bishrant Pant, Ahmad H. Kabir

*The selective recruitment of beneficial microbes into the rhizosphere is a key strategy for improving plant stress resilience. We developed a dual-compartment microcosm system to investigate chemoattractant-mediated microbial recruitment from bulk soil and its functional implications in plant systems. The system consists of an inner compartment with low-diversity perlite and an outer compartment containing natural soil, allowing microbial migration through a mesh barrier in response to defined chemoattractants. Using *Trichoderma afroharzianum* (TA) as a model beneficial fungus, we first evaluated its growth response to glutamine in nutrient agar media. TA showed significantly increased colony expansion in the presence of glutamine at days 2 and 3, indicating a directed growth response toward glutamine, consistent with its role as a chemoattractant promoting fungal activity. We plan to validate the chemoattractant-driven recruitment framework in planta using tomato and sorghum exposed to high pH and salinity stress. Agar beads infused with chemoattractants are expected to facilitate the selective migration of TA from bulk soil into the rhizosphere, enhancing root colonization and plant performance. This approach mimics natural rhizosphere signaling and enables controlled manipulation of microbiome assembly. Our findings may demonstrate that targeted chemoattractants can directly stimulate beneficial microbes like TA and provide a foundation for designing synthetic microbiome interventions to improve crop productivity under stress conditions.*

ABSTRACTS OF POSTERS & PRESENTATIONS

Precision Engineering at the Critical Point: The Global Industrial Rise of Supercritical Carbon Dioxide

Najmul Sajal & Ripa Sutar

As global manufacturing pivots toward carbon neutrality, Supercritical Carbon Dioxide has emerged as the premier "green" solution, bridging the gap between high-performance chemical engineering and environmental responsibility. This study presents a high-impact, PRISMA-guided synthesis of 163 peer-reviewed articles (2000–2024), uncovering the transformative role of Super Critical CO₂ across six major industrial domains.

Our findings reveal that Super critical CO₂ achieves record-breaking extraction efficiencies of up to 98% for natural bioactive while preserving the integrity of thermolabile compounds. In the pharmaceutical sector, advanced particle engineering techniques—such as RESS and SAS—enable the production of microparticles that significantly enhance drug solubility and bioavailability without toxic residues. Within materials science, Super critical CO₂ facilitates residue-free polymer foaming and impregnation, essential for developing advanced biomedical scaffolds. Furthermore, catalytic hydrogenations in Super critical CO₂ demonstrate turnover frequency increases exceeding 200%, while environmental remediation efforts report over 85% removal of persistent organic pollutants and up to 98% recovery of valuable metals from e-waste.

The maturity of this technology is validated through industrial success stories from global leaders, including Nestlé (97% caffeine removal), Pfizer (micronization), and BASF (polymer coating). While high-pressure equipment design remains a challenge, the integration of CFD modeling and automated safety protocols has streamlined its scalability. By positioning Super critical CO₂ as a mature pillar of the circular economy, this review provides a roadmap for replacing hazardous solvents with a tunable, non-toxic, and economically viable alternative. Explore how tuning the "power of pressure" is redefining the future of sustainable manufacturing.

From Pond to Plate: Total Cryogenic Cold Chain for Premium Seafood, Zero Waste, and Global Food Security

Najmul Sajal

Global food demand is projected to double by 2050, yet 30–40% of post-harvest seafood is lost to spoilage due to broken cold chains. Conventional ammonia-based mechanical freezing is slow, forms large ice crystals, causes 5–10× higher moisture loss, cell rupture, and inferior texture—limiting exporters to low-value markets.

This poster introduces "Total Cold Chain" system—an integrated cryogenic solution that maintains precise, uniform temperature control from farmer's pond to consumer's plate. Immediately after harvest, liquid-nitrogen (LN₂, bp -196 °C / -321 °F) spray delivers instantaneous crust-freeze, dropping surface temperature to -20 °C to -30 °C within seconds and locking freshness, cellular structure, and texture. Products then move in LN₂-operated or CO₂-snow (SNOWCOOL®) refrigerated vans that ensure homogeneous low temperatures, reduce diesel use by 38 %, and cut emissions versus traditional FCFC refrigerants.

At the processing stage, cryogenic IQF freezers rapidly bring the core temperature to -18 °C or below in minutes—producing ultra-fine ice crystals that eliminate cell-wall damage, dehydration, and quality loss. Final Modified Atmosphere Packaging (MAP) with tailored CO₂/N₂/O₂ blends (e.g., ExtendaPak™) doubles shelf life (3–5 days → up to 12 days) by inhibiting microbes such as Pseudomonas.

The system slashes electricity demand by replacing heavy compressors, handles peak-season surges, improves yield, and enables premium export pricing for Southeast Asian producers. It directly supports UN SDGs on food security (SDG 2), responsible consumption (SDG 12), and decarbonization.

This 24 × 36 landscape poster will feature a full-color "Pond-to-Plate" flow diagram, side-by-side cryogenic vs. mechanical freezing comparisons (ice-crystal size, yield, texture), sustainability metrics, and ROI projections—making the engineering innovation and global impact visually compelling and interactive.

ABSTRACTS OF POSTERS & PRESENTATIONS

Obstacle Avoidance and Optimal Path Planning for Autonomous Mobile Robots Using Sampling-Based and Graph-Based Algorithms

Md Asifuzzaman

Autonomous mobile robots require efficient and reliable path planning algorithms to navigate complex environments while avoiding obstacles. Traditional graph-based methods such as A* provide fast and deterministic solutions but often lack optimality in continuous spaces. In contrast, sampling-based algorithms such as RRT* can generate asymptotically optimal paths but suffer from high computational cost and slow convergence. This research proposes a hybrid path planning framework that combines the strengths of A* and RRT*. A* is used to compute a global reference path in a grid-based environment. Based on this path, an adaptive corridor is constructed, which dynamically adjusts its width according to obstacle density. The corridor constrains the sampling space of RRT*, enabling focused exploration near the feasible path while reducing unnecessary random sampling. The proposed approach improves computational efficiency and convergence speed while maintaining high-quality path optimization. Extensive simulations were conducted in various obstacle density environments to evaluate performance in terms of path length, computation time, and success rate. Results demonstrate that the hybrid method outperforms traditional A* and standard RRT* in both efficiency and path quality. For the poster presentation, visual elements will include simulation environments, A* global paths, adaptive corridor construction, RRT* exploration behavior, and final optimized paths. Comparative graphs and performance analysis charts will be presented to clearly illustrate the advantages of the proposed approach.

Nanoscale Characterization of Nanomaterial-Based Systems: Mechanisms, Experimental Methods, and Challenges

Md Ashraf Hoque

Nanomaterial-based systems (NBS) have emerged as transformative elements in advanced surface engineering, offering superior corrosion resistance, mechanical strength, and tribological resilience. However, bridging the gap between these enhanced properties and the metrological tools required to quantify them remains a critical challenge. This review provides a comprehensive examination of the fundamental mechanisms, state-of-the-art experimental techniques, and computational strategies employed to probe NBS behavior.

The analysis elucidates core mechanisms of driving performance, including passive barrier formation, stimuli-responsive active corrosion inhibition, grain boundary strengthening, and the formation of protective tribo-films by 2D nanomaterials. Subsequently, the work evaluates the transition from conventional macroscopic testing to high-resolution in situ characterization, highlighting the capabilities of High-Speed Atomic Force Microscopy (HS-AFM), Liquid Cell Transmission Electron Microscopy (LC-TEM), and nanoindentation in visualizing dynamic defect evolution.

Furthermore, the indispensable role of computational materials science—specifically Molecular Dynamics (MD) and Machine Learning (ML) in predictive modeling and elucidating atomic-scale interactions is discussed. Finally, persistent challenges regarding substrate interference, sample heterogeneity, and instrumentation limits are addressed, concluding with a perspective on future research directions focused on standardization, operando testing, and the development of AI-driven "Digital Twins" for accelerated testing and material optimization.

Examining Parental Involvement Factors that Enhance Student Achievement in Turnaround Schools: A Phenomenological Study

Lizette Castelline

Parental involvement is a well-established predictor of student academic achievement, yet its application in turnaround schools, chronically underperforming schools undergoing comprehensive reform, remains poorly understood from the parents' perspective. Barriers such as historical mistrust, limited communication, and systemic inequities often prevent meaningful family engagement in these contexts, and interventions designed without parent input frequently fail to address the conditions families actually face.

This phenomenological study examines what parents in turnaround elementary schools believe supports their children's academic success. Guided by Epstein's framework of family-school-community partnerships, the study centers on the parent voice to identify effective involvement strategies, perceived barriers, needed institutional supports, and relational shifts experienced during the turnaround process. Phenomenology was selected because it privileges lived experience and is well-suited to surfacing the perspectives of populations whose voices are underrepresented in school improvement research.

The poster will convey findings and key themes from the literature in a visually organized format. A flowchart will illustrate the relationship between parental involvement types, turnaround school conditions, and student outcomes. Five thematic panels with brief summaries will present the major themes from the literature: parental involvement and achievement, turnaround school contexts, parent voice and perspectives, systemic versus individual barriers, and trust as a relational foundation. Pull quotes from parent participants will be displayed prominently to center lived experience alongside the empirical evidence, reinforcing the phenomenological nature of the inquiry.

ABSTRACTS OF POSTERS & PRESENTATIONS

Solar power forecasting using machine learning and deep learning

Md Rayhan Chowdhury

Accurate prediction of solar photovoltaic (PV) power generation is crucial for maintaining grid stability and enhancing the efficiency of renewable energy systems. In this work, we are developing a machine learning (ML)-based framework to forecast solar power output using historical PV generation data and key weather variables, including solar irradiation, temperature, humidity, and wind speed. We are exploring and comparing multiple ML algorithms used for prediction and classification to capture both nonlinear relationships and time-dependent patterns in the data. The workflow involves data cleaning, feature engineering, and time-series processing, with additional features such as time-of-day indicators and rolling statistics introduced to better capture seasonal and temporal variations. Model performance will be evaluated using standard metrics, including Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE), across different time intervals. In addition to forecasting, the proposed framework will generate synthetic load profiles to support improved planning for energy storage and grid operations, as well as analyze deviations between predicted and actual outputs to identify potential anomalies or system faults. Overall, we aim to combine ML models with well-designed features to significantly improve forecasting accuracy, offering a practical and scalable solution for PV operators and energy planners.

An Interpretable XGBoost and GPT-Assisted Data Lakehouse Model for Predicting Community-Level Chronic Illness and Long COVID Vulnerability Scores

Ronish Shrestha

Despite widespread exposure to COVID-19, the combined influence of social, environmental, and behavioral factors on long-term chronic illness vulnerability remains poorly understood. This study introduces a unified, interpretable framework that integrates multi-domain data to generate actionable vulnerability scores at a county level. A weighted approach was utilized to combine variables in a normalized form to obtain a score for vulnerability. Among various models, Random Forest and XGBoost classification models performed well in classifying the level of vulnerability. Among them, XGBoost had a high accuracy of 93.6%. To further analyze the predictions, SHAP was utilized to identify the most important factors contributing to the prediction. From the findings, it is clear that health conditions, environmental exposure, and behavioral factors are crucial in determining vulnerability.

Principals' Lived Experiences in Professional Learning Communities: A Phenomenological Study

Jose Lopez

Principal professional learning communities (PLCs) are increasingly used to support collaboration, leadership development, and instructional improvement; however, limited research captures how principals themselves experience these structures. As school leaders face growing demands and professional isolation, PLCs may serve as critical spaces for shared problem solving, reflection, and emotional support. Yet, little is known about the conditions that make these communities meaningful or the barriers that limit their effectiveness.

This phenomenological study examines the lived experiences of PK-12 principals participating in district-level PLCs in an East Texas public school system. The study centers principals' voices to understand how they perceive the purpose of PLCs, the benefits they gain, the challenges they encounter, and how participation influences their leadership practice and capacity to support teaching and learning. Phenomenology was selected because it prioritizes lived experience and provides insight into how individuals make meaning of collaborative professional structures.

The poster will present key findings through a visually organized format. A conceptual diagram will illustrate the relationship between PLC participation, leadership development, and instructional impact. The display will include five thematic panels with concise summaries of major findings: collaboration and shared problem solving, leadership development, barriers and challenges, instructional leadership and teaching/learning, and trust as a foundational element. Pull quotes from principal participants will be featured prominently to highlight authentic perspectives and emphasize the emotional and relational dimensions of leadership. These quotes will illustrate how PLCs reduce isolation, build confidence, and support decision-making. Additional visual elements will demonstrate how PLC learning translates into improved teacher collaboration, instructional alignment, and campus-level practices.

Overall, the poster will highlight how principal PLCs function as both professional learning spaces and relational support systems, while also identifying structural and contextual factors that influence their effectiveness. The findings offer practical implications for districts seeking to design PLCs that foster trust, relevance, and meaningful leadership growth.

ABSTRACTS OF POSTERS & PRESENTATIONS

Deep Learning-Based Intelligent Forecasting of Water Quality Variables Using LSTM, GRU, and Hybrid Architectures

Md Abu Taher

Accurate forecasting of water quality variables is crucial for sustainable water resource management, environmental protection, and early detection of contamination events. In this work, we are developing an advanced deep learning (DL)-based intelligent framework to predict key water quality parameters using Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU), and a hybrid LSTM-GRU architecture. These models are designed to effectively capture nonlinear relationships and complex temporal dependencies inherent in multivariate water-quality time-series data. The dataset, consisting of physicochemical and biological variables such as pH, turbidity, dissolved oxygen, temperature, conductivity, and chlorophyll *a*, is utilized in this study. Chlorophyll-*a* serve as a critical indicator of algal biomass and eutrophication, while turbidity reflects suspended particles and sediment dynamics. Data preprocessing techniques, including normalization, missing value imputation, and sliding window sequence generation, are planned to enhance data quality and model performance. The models will be evaluated using standard performance metrics, such as Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and coefficient of determination (R^2). The methodology will be designed to effectively capture both short-term fluctuations and long-term trends, including seasonal variations and abrupt changes associated with algal blooms and sediment disturbances. The result of this study demonstrates the potential of hybrid deep learning architectures for real-time water-quality forecasting and for advanced environmental monitoring systems. In addition, we plan to incorporate attention mechanisms and external environmental factors, such as meteorological and hydrological data, to improve prediction accuracy and model robustness.

Net Load Forecasting under Uncertainty with Statistical and Learning-Based Models

Tasmina Imam

The rapid expansion of behind-the-meter (BTM) solar photovoltaics has introduced substantial variability into electric distribution systems, complicating accurate netload forecasting. Because net load arises from the nonlinear interaction between weather-driven solar generation and human consumption behavior, traditional forecasting approaches often lack the precision required for reliable grid operation. This study systematically evaluates statistical, machine-learning, and deep-learning models for day-ahead residential netload forecasting within a unified experimental framework. Four model classes, AutoRegressive Integrated Moving Average with exogenous inputs (ARIMAX), Seasonal ARIMAX (SARIMAX), Gradient Boosting Regressor (GBR), and Temporal Fusion Transformer (TFT), are implemented using identical datasets, preprocessing procedures, and evaluation protocols to ensure a fair comparison. Results show that while model architecture influences performance, feature engineering is a primary driver of predictive accuracy in nonlinear models. The feature-engineered TFT model achieves the best overall performance, attaining an R^2 of 0.923 and the lowest Continuous Ranked Probabilistic Score (CRPS) of 2.990. Sensitivity analysis further indicates that model rankings remain stable across varying training-window lengths, demonstrating the robustness of the comparative results. These findings suggest that deep-learning approaches, when combined with domain-informed feature engineering, provide superior accuracy and more reliable uncertainty quantification. Such capabilities support improved operational planning and more informed decision-making in power systems with high renewable penetration.

Can Dredge Material Be Used to Remediate Polystyrene Microplastics in Water

Carson McCauley

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 to 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 the microplastic contaminants.

ABSTRACTS OF POSTERS & PRESENTATIONS

Enhancing Learning Efficiency and Ergonomic Well-Being: A Comparative Study of Handwritten, AI, AI-Assisted, and Digital Structured Note-Taking

Jannatul Hur

In an intense and demanding academic setting, note-taking is a core part of learning, where students must concentrate for long periods of time. While traditional handwritten notes are usually associated with deeper learning, newer digital and AI-assisted tools are increasingly used to reduce effort and improve efficiency. From a human factor perspective, it is difficult to compare these different note-taking methods when both learning outcomes and workload are considered together. Most existing studies focus on either learning performance or how technology works, making it difficult to understand the trade-offs when we switch between different methods. This study looks at how handwritten, stylus-based digital, and AI-assisted note-taking methods affect learning retention and perceived cognitive workload using a within-subjects pilot study (N=11). Learning performance was measured using immediate and delayed retention quizzes, and workload was evaluated using the NASA Task Load Index (NASA-TLX). The results show no significant differences in immediate recall. Otter.AI, an AI-assisted notetaking tool, has higher learning retention than the stylus-based condition for delayed recall ($F(2, 20) = 4.30, p = 0.028$), while the handwritten method didn't differ significantly from any other. Significant effects were also observed in physical demand ($F(2, 20) = 6.85, p = 0.005$), effort ($F(2, 20) = 7.25, p = 0.004$) and in frustration ($F(2, 20) = 4.44, p = 0.025$). Together, these results show a clear trade-off between learning and workload. The study emphasizes the need to evaluate and ensure the correct usage of technology to help learn deeply, not just the efficiency.

Transformer-Based Design of NIR-Emissive Graphene Quantum Dots with Property-Conditioned Generation

Gaurav Dawadi

Graphene Quantum Dots have gained considerable interest in cancer therapy due to their nanoscale size, luminescence, and chemical traits, which facilitate effective targeted drug delivery and the induction of DNA damage in cancer cells. However, manually designing a large variety of graphene structures is laborious. In this study, we propose two property-conditioned computational solutions to address this challenge. The first approach uses GPT2 - a transformer-based language model coupled with reinforcement learning and reward functions based on design parameters, allowing for the speedy generation of 10,000 intelligent designs approximately in 15 hours. The molecular weights of these structures ranged from 768.8 Da to 1835.3 Da. Subsequent to application of a SA score filter with a cutoff value of ≤ 7.5 , the number of viable structures was reduced to 7,185. The second approach incorporates a physics-informed transformer model, blending both chemical and physical constraints to improve the accuracy and viability of the generated designs. The first method exhibits the capability to generate a large dataset of diverse GQD structures in a short period of time, while the second method is aimed to further enhance the designs for considerable precision and applicability. Supplementarily, we will perform a quantitative comparison between the two approaches using performance indicators such as design accuracy, time complexity, and viability. This work demonstrates a practical computational process for designing GQDs that could notably contribute to cancer diagnosis and therapy.

Exploring The Perceived Impact Of Dual Credit On College Readiness In First-Year College Students In Southeast Texas

Daniel McLemore

Dual credit has expanded rapidly as a college access strategy, yet less is known about how students perceive its role in preparing them for the academic and transitional demands of college, particularly in two-year college contexts. This mixed methods dissertation in practice explored how first-year students at a two-year college in Southeast Texas perceived the impact of their high school dual credit experiences on college readiness. Guided by Conley's College Readiness Framework and Schlossberg's Transition Theory, the qualitative strand used semi-structured interviews with eight first-year students who completed at least one long semester of college. The quantitative strand analyzed institutional records for 1,478 first-year students (86 dual credit; 1,392 non-dual credit), including GPA and demographic indicators. Thematic analysis indicated that students described readiness as (a) calibrating expectations for college-level rigor, (b) developing self-regulation and learner agency, and (c) relying on support ecologies and faculty scaffolding. Students also identified key transition resources as uneven, emphasizing institutional navigation, faculty access and help-seeking norms, and resource awareness. Quantitative results showed dual credit participants earned higher first-year GPAs than nonparticipants ($M = 3.31$ vs. 2.79), with participation patterns differing by first-generation status and socioeconomic status, but not by gender. Findings suggest that dual credit supports academic readiness but does not consistently develop transition knowledge and strategy activation, underscoring the need for proactive, structured pre-matriculation supports. Implications include a proposed transition readiness framework (GO Kit) to identify readiness gaps and trigger targeted outreach prior to enrollment.

ABSTRACTS OF PAPERS

SIGNPAL: A Human-AI Interaction Framework for Real-Time Sign Language Translation

Nadia Islam Tanha, Md Mehedi Hasan, Jannatul Hur

Advances in artificial intelligence and human-computer interaction have enabled significant progress in assistive communication technologies for deaf and hard-of-hearing individuals who rely on American Sign Language (ASL). However, a persistent communication gap remains between ASL users and non-signers in everyday interactions. This study preliminarily evaluates the usability and performance of SIGNPAL, a high-fidelity AI-driven ASL interpretation system designed to provide real-time gesture-to-text translation, text-to-speech output, and customizable accessibility features to support two-way communication. Three participants with basic, moderate, and advanced ASL familiarity completed four usability tasks: real-time sign-to-text translation, accessibility customization, gesture recording and playback, and text-to-speech reply to generation. Objective measures included task completion time, translation errors, and recognition accuracy, while subjective usability was assessed using a 10-item Likert questionnaire and the System Usability Scale (SUS). The results show that SIGNPAL achieved an overall translation accuracy of 83.33%, exceeding the predefined performance threshold, and a 100% task completion rate. Response times remained below two seconds, supporting real-time interaction. Likert-scale ratings indicated high user satisfaction (overall mean = 4.5/5), and the mean SUS score of 90.83 classified the system as having excellent usability. Qualitative feedback highlighted the clarity of the interface and the usefulness of the recording-and-playback feature, with minor recommendations for improving text visibility. These findings demonstrate that integrating human factors principles with AI-driven gesture recognition can produce effective and user-centered assistive communication systems, supporting inclusive real-time interaction between ASL users and non-signers.

A Financial-Based Model for Quantifying Cybersecurity Risk Exposure in Enterprise and Digital Trade Infrastructure

Ayomipo Alademehin

Cybersecurity risk has evolved from a discrete technical concern into a material financial liability with computable, auditable impacts on enterprise valuation, regulatory capital adequacy, and the continuity of digital trade infrastructure. Despite this evolution, dominant risk quantification paradigms, including NIST CSF 2.0, ISO/IEC 27005:2022, COBIT 2019, and the Factor Analysis of Information Risk (FAIR) model, produce qualitative or semi-quantitative outputs that cannot be directly integrated into financial statements, SEC-mandated disclosures, or actuarially grounded insurance pricing. This paper proposes the Financial-Based Cybersecurity Risk Exposure Model (FBCREM), a quantitative framework integrating four analytical components: probabilistic Annualized Loss Expectancy (ALE) derived from Monte Carlo simulation (N=10,000), Sector Exposure Multipliers (SEM) calibrated against CISA critical infrastructure classifications, Digital Trade Disruption Coefficients (DTDC) modelling supply-chain cyber-loss propagation, and a Regulatory Cost Component (RC) derived from 680 enforcement actions across five US regulatory jurisdictions. The combined output is a Cyber Risk Exposure Score (CRES) expressed in USD at specified confidence levels. Validation against 1,247 enterprise breach incidents across three US enterprise archetypes demonstrates a mean absolute error of 8.3%, outperforming FAIR-equivalent benchmarks by 22 percentage points and operational risk Var models by 11 points. The FBCREM framework addresses a documented gap in enterprise risk management, cyber insurance underwriting, regulatory capital allocation under Basel III/DORA, and digital trade policy, providing a replicable methodology grounded in US regulatory and market data.

ABSTRACTS OF PAPERS

From Fragmentation to Intelligence: A Star Schema-Based Framework for Workforce Engagement Analytics in U.S. Organizations

Bernice Blay-Miezah

Mid-sized U.S. organizations routinely collect employee engagement data across multiple disconnected platforms, including digital registration systems, survey tools, recognition programs, and Human Resources Information Systems, yet the structural fragmentation of these sources prevents cross-dimensional analysis. Fundamental questions remain unanswerable without a unifying data architecture: which business units participate at the lowest rates, how does engagement differ by work arrangement, and which activities convert registration intent into actual attendance.

This study designed, implemented, and evaluated a star schema-based workforce engagement analytics framework at a U.S. financial services organization over a ten-week period, following a Design Science Research paradigm. Multiple fragmented engagement data files were unified into a single Power BI dimensional model using conformed dimension keys and a standardized identifier-based join strategy. Nine analytical measures were engineered to deliver cross-dimensional engagement intelligence across three stakeholder-differentiated dashboards.

The framework produced six categories of analytical output previously unavailable to the organization. Conversion rate analysis revealed substantive variation across five engagement initiatives, ranging from 59% to 91%, with two activities differing significantly from the organizational baseline of 68% ($p \leq .05$). Work arrangement analysis, enabled by joining participation records to HRIS designation attributes for the first time, revealed that Permanent Work from Home employees accounted for approximately 17% of total participations compared to 62% for Hybrid employees, a disparity confirmed across both event participation and recognition nomination channels.

The study contributes three propositions to the workforce analytics literature: that a star schema is the appropriate structural mechanism for unifying multi-source engagement data, that registration-to-participation conversion rate is a distinct and statistically testable construct, and that work arrangement designation surfaces systematic engagement disparities that aggregate reporting suppresses. The framework is documented for replication by comparable U.S. organizations using standard Microsoft 365 tooling without enterprise infrastructure.

Autonomous Interception of Non-Stationary Objects Through Depth-Based Motion Prediction

Hossein Rahimghazvini

This paper investigates a vision-guided approach for real-time robotic interaction with non-stationary objects using RGB-D sensing and motion prediction. Building on prior integration of the Azure Kinect sensor and xArm 7 robotic manipulator, this study focuses on detecting, tracking, and intercepting a moving target, such as a tennis ball, within the robot's operational workspace. The Azure Kinect camera continuously captures depth and color data, which are processed by a deep-learning detection model to obtain object position updates in real time. Frame-to-frame changes in object location are used to estimate direction and velocity, establishing a trajectory that enables the robot to anticipate future positions. These predictive measurements are translated into motion commands to initiate a corresponding interception response through the robotic arm. A technical evaluation of this framework is presented, including measurement of detection latency, tracking consistency, trajectory estimation accuracy, and interception reliability under different speeds and movement patterns. The paper also examines system constraints such as sensor field-of-view limitations, accumulated prediction errors during rapid motion, and potential delays introduced by the perception-to-control pipeline. The implementation aims to assess whether a single RGB-D sensing viewpoint can provide motion information sufficient for dynamic interaction within short response windows.

ABSTRACTS OF PAPERS

Al-content dependent microstructure evolution and mechanical behavior of Al_xCoCrFeNi high-entropy alloys at elevated temperature

S M Yeasin Habib

The study investigates how the addition of aluminum influences the high-temperature mechanical properties and phase evolution of the Al_xCoCrFeNi high-entropy alloy (HEA) system. Five as-cast alloys with varying Al molar ratios ($x = 0, 0.21, 0.44, 0.71, \text{ and } 1.0$) were synthesized and characterized using X-ray diffraction (XRD), backscattered electron scanning electron microscopy (BSE-SEM), and energy-dispersive X-ray spectroscopy (EDS). Microstructural characterization demonstrated a phase transition driven by Al content. Alloys with $x < 0.44$ exhibited a single-phase FCC structure, $x = 0.71$ formed a dual-phase FCC + BCC structure, and $x = 1.0$ was predominantly BCC. While elemental distribution remained homogeneous in the FCC alloys, the dual-phase system exhibited Fe/Cr enrichment in the FCC phase, and Al/Ni enrichment in the BCC phase. Nanoindentation testing from room temperature up to 300°C on selected compositions ($x = 0, 0.44, \text{ and } 1.0$) revealed that Al incorporation increases hardness without substantially altering the elastic modulus. Compared to the base CoCrFeNi alloy, the Al_{0.44}CoCrFeNi and equimolar AlCoCrFeNi alloys demonstrated hardness increases of approximately 10% and 80%, respectively. At elevated temperatures, hardness consistently decreased for all alloys. However, the reduced modulus of the FCC alloys declined up to 200°C before partially recovering at 300°C. The temperature-dependence of yield strength was modeled using a Peierls-barrier lattice friction framework, revealing that the BCC phase possesses a narrower dislocation core and a lower thermal softening coefficient than the FCC phase. Solid solution strengthening analysis confirmed Al as the primary strengthening agent due to its substantial atomic size and shear modulus mismatches. The findings establish that tuning the Al concentration effectively tailors the phase composition and the resulting temperature dependent mechanical properties of the Al_xCoCrFeNi HEAs, providing valuable design principles for elevated-temperature structural applications.

Bioremediation of Acid Mine Wastewater Using Extremophilic Galdieria sulphuraria

Shaseevarajan Sivanantharajah

Heavy metal contamination resulting from mining activities poses significant environmental and public health concerns due to the persistence and toxicity of dissolved metals in aquatic systems. Acid mine wastewater is particularly challenging to treat because of its extremely low pH and the presence of high concentrations of multiple metals. Biological treatment using extremophilic microalgae has emerged as a promising and sustainable alternative to conventional physico-chemical treatment methods. The acidophilic red microalga Galdieria sulphuraria has attracted attention for wastewater treatment due to its ability to thrive under highly acidic conditions and tolerate elevated metal concentrations.

In this study, acid mine wastewater obtained from the Berkeley Pit (Butte, Montana (east side)) was evaluated for heavy metal bioremediation using Galdieria sulphuraria CCME 5587.1. Initial characterization of the wastewater revealed high concentrations of several metals, with zinc reaching approximately 590 mg/L, manganese and aluminum around 270 mg/L each, and copper exceeding 50 mg/L, while cadmium, lead, and nickel were present at lower concentrations (<5 mg/L). To assess algal growth in wastewater and evaluate heavy metal removal under different conditions, six experimental media conditions were prepared in batch cultures with an initial optical density (OD₇₅₀) of 0.5 at pH 2.6-2.7: Cyanidium medium (CM) control, raw wastewater (RWW), RWW supplemented with CM medium, and diluted wastewater treatments consisting of 50%, 25%, and 10% RWW with CM medium.

Growth responses varied significantly with wastewater concentration. Algal growth was inhibited in undiluted wastewater but improved markedly in diluted conditions. The highest growth was observed in 50% and 25% wastewater supplemented with growth media, exceeding that of the control, indicating reduced metal toxicity and improved growth conditions. Substantial reductions in heavy metal concentrations were observed after eight days, with removal efficiencies approaching ~50% across multiple treatments. These results demonstrate that Galdieria sulphuraria can tolerate highly acidic, metal-rich environments and effectively remove heavy metals.

ABSTRACTS OF PAPERS

Erased from the Map: Reclaiming Deaf Histories in Texas

Kathleen L. Brockway

This study examines how Deaf individuals and communities have been historically overlooked, marginalized, or omitted from dominant narratives of Texas history. While Deaf people have long contributed to the state's development through education, advocacy, labor, and community-building, their presence often remains invisible within traditional historical records and geographic representations. This project argues that such absence is not accidental, but reflects broader patterns of exclusion shaped by race, segregation, language ideology, and institutional control. Using an intersectional and spatial approach, this research integrates archival sources, census data, and historical narratives with geographic mapping to identify and visualize Deaf historical sites across Texas. Through ArcGIS-based mapping, Deaf schools, community networks, and key figures are re-situated within the broader historical landscape, revealing patterns of migration, segregation, and regional development. Attention is given to border regions and racially segregated educational institutions, where Deaf experiences intersect with issues of race, class, and access. Rather than presenting Deaf history as supplemental, this study reframes Deaf contributions as central to understanding Texas history. The process of mapping serves not only as a methodological tool but also as an act of reclamation making visible to the people, places, and networks that have been historically erased. By foregrounding Deaf-centered perspectives and community knowledge, this research challenges dominant historiography and calls for more inclusive historical practices. Ultimately, it demonstrates that reclaiming Deaf histories is essential not only for representation, but for reshaping how history itself is constructed, taught, and preserved.

Natural Polymer Composites of Amylose-Pectin as Potential Organic Contaminants Remediators

Adeoye, Kayode

The environmental impact of pollutants such as heavy metals, organic dyes, and industrial waste has prompted the development of advanced materials capable of detecting and removing contaminants efficiently. Biopolymer-based composites of polysaccharides have been shown to bind to heavy metals and could offer a sustainable method for the remediation of organic contaminants. In this study we explore the potential of a composite material composed of amylose, a linear polysaccharide derived from starch, and pectin, a heteropolysaccharide found in plant cell walls, for the adsorption of environmental organic contaminants. This study investigated the thermal stability of amylose and pectin polymers, crucial components in plant-based materials, using (DSC).

A Multi-Stage Deep Learning and Graph-Informed Gradient Boosting Pipeline for High-Fidelity Leak Identification in Aging Municipal Networks

Mahbuba Mounita

The integrity of municipal water infrastructure in Southeast Texas (SETX) is a critical concern due to the synergistic effects of aging pipeline materials and high soil subsidence rates. Undetected leaks result in significant non-revenue water (NRW) loss and potential catastrophic structural failures. This research introduces a high-fidelity, multi-stage computational pipeline designed to automate leak identification and enhance systemic resilience. By utilizing data simulated through the Water Network Tool for Resilience (WNTR), the framework transforms raw pressure and acoustic signals into high-dimensional time-frequency scalograms via Continuous Wavelet Transform (CWT). The architecture employs a Convolutional Neural Network (CNN) for automated spatial feature extraction, coupled with a Graph Neural Network (GNN) to capture the topological dependencies of the utility grid. These features serve as the input for a specialized Graph-Informed XGBoost classifier. A central innovation of this study is the implementation of a cost-sensitive learning objective tailored for a "Safety-First" operational threshold. This configuration is specifically tuned to achieve maximal sensitivity (Recall = 1.0), ensuring that no subsurface leak events are omitted, thereby preventing the catastrophic structural failures associated with undetected erosion in noisy municipal environments. Preliminary results indicate a superior Area Under the Curve (AUC) and a significant reduction in false-discovery rates compared to standalone ensemble models. Beyond detection, the pipeline provides an empirical foundation for infrastructure renovation prioritization. By correlating leak probabilities with asset lifecycle data, the model allows Industrial Engineers to optimize capital allocation for pipe replacement, ensuring the long-term economic and operational sustainability of regional utility grids.

ABSTRACTS OF PAPERS

A Simple Simulation Framework for Stress-Testing B2B Logistics Under Weather and Traffic Disruptions

Sailesh Sitaula & Prashant Thapa

In B2B shipping, delays at loading docks and missed deliveries often happen because arrival time (ETA) predictions are inaccurate. While many systems try to smooth out these predictions in real-time, it is more important to test how well a delivery network handles extreme pressure. This paper introduces a simulation tool built to "stress test" logistics operations during major disruptions like storms or traffic jams. The system works through four main parts. First, it creates "worst-case" scenarios where warehouses are completely full and delivery windows are very tight. Second, it adds realistic problems like heavy snow, low visibility, or sudden highway gridlock to see how the routes react. Third, it calculates how long it takes for the system to get back on schedule while accounting for late fees and penalties. Fourth, instead of giving a single arrival time, the system provides a "time window" that shows how much uncertainty there is during a crisis. This tool helps managers find "weak links" in their supply chain places where a small delay can quickly turn into a massive problem. By using these simulations, companies can measure their resilience and create better backup plans before real-world problems occur.

Effects of Multitasking on Human Error in LEGO Assembly Tasks

Rasmia Ishaque, Muhammad Moez Mughal, Sirja Karanjit

This study examines the effects of multitasking on human error, task efficiency, and cognitive workload in manual assembly processes using a LEGO-based experimental model. Manual assembly tasks are still widely used in manufacturing due to their flexibility and adaptability, but they require high levels of attention, coordination, and decision-making. In real-world environments, workers are often required to multitask, such as responding to instructions, monitoring quality, or handling interruptions while performing assembly. These additional demands can exceed human cognitive capacity, leading to increased errors, longer completion times, and reduced overall performance.

The study uses a within-subject experimental design in which participants complete a LEGO assembly task under two conditions: a single-task condition and a multitasking condition. Performance is measured using completion time, number of assembly errors, and perceived mental workload. In multitasking conditions, participants are required to assemble LEGO while performing secondary tasks. In addition to answering simple questions, two additional tasks are introduced to simulate real manufacturing environments and help reduce human error.

The first added task is a visual inspection task, where participants periodically compare their assembly with a reference image. This task improves quality control by helping detect and correct mistakes early, reducing placement and sequencing errors. The second task is a step-by-step checklist task, where participants confirm each completed step during assembly. This structured approach helps reduce cognitive overload, prevents skipped steps, and improves task organization.

It is expected that multitasking without support will negatively impact performance, resulting in higher error rates, increased completion time, and greater mental workload. However, the inclusion of structured support tasks such as visual inspection and checklists is anticipated to reduce these negative effects by guiding attention and improving accuracy.

Overall, this study provides practical insights into human factors engineering by demonstrating how well-designed multitasking strategies can reduce human error, improve efficiency, and enhance performance in manufacturing environments.

ABSTRACTS OF PAPERS

Jay Design of an Attention Recovery Mechanism for Students During Cognitive Fatigue

Kumar Patel, Suman Das, Md Ahsan Habib, & Md Sabiruzzaman

Cognitive fatigue during sustained academic tasks represents a significant and underaddressed challenge for university students, contributing to measurable declines in task accuracy, comprehension, and overall academic performance. Despite the well-documented vigilance decrement — the progressive degradation of sustained attention over time — no systematic comparison of short-duration recovery stimuli has been conducted in a student cognitive performance context. This study proposes a between-subjects experimental design comparing the effectiveness of three 10-second micro-recovery stimuli — a static nature image, a binaural beat audio clip, and an optic flow video — on attention recovery following detected cognitive fatigue during a sustained reading comprehension task.

Fifteen university students will be randomly assigned to one of three recovery conditions (n = 5 per group): Group A receives a static nature image (grounded in Attention Restoration Theory; Kaplan & Kaplan, 1989), Group B receives a binaural beat audio stimulus at 10 Hz Alpha frequency (grounded in Brainwave Entrainment Theory; Reedijk et al., 2013), and Group

C receives a first-person optic flow walking video (grounded in Optic Flow Theory and Default Mode Network suppression; Gibson, 1950; Britten, 2008; Raichle et al., 2001). Recovery stimuli are automatically triggered at fixed 10-minute intervals during a 30-minute reading comprehension task. Dependent variables include primary task accuracy, response time, and subjective mental workload assessed via the NASA Task Load Index (Hart & Staveland, 1988). Data will be analyzed using a one-way ANOVA with post-hoc Tukey comparisons.

It is hypothesized that the optic flow video condition will produce the greatest improvement in sustained attention and lowest workload scores, given its unique capacity to activate the Reticular Activating System and suppress the Default Mode Network through a passive, zero-effort subcortical pathway unavailable to static image or audio stimuli. Findings are expected to inform the design of adaptive recovery tools for educational technology platforms.

Design And Implementation Of A Cloud-Based Electronic Health Record System For Improving Healthcare Data Management

Olumide Oluleye

The transition from paper-based and on-premises electronic health records to cloud-based healthcare information systems represents one of the most consequential infrastructure decisions facing United States healthcare institutions in the current decade. Despite near universal adoption of electronic health records following the HITECH Act of 2009, the fragmentation, interoperability failures, data security vulnerabilities, and access inequities characterising the current EHR landscape impose substantial costs on institutions, clinicians, and patients. This paper presents a comprehensive analysis of the design and implementation of cloud-based electronic health record systems, examining technical architecture, regulatory alignment, clinical performance outcomes, health equity implications, and the emerging role of artificial intelligence in EHR-enabled care delivery.

Drawing on a systematic review of peer-reviewed literature published between 2010 and 2025, regulatory guidance from HHS, ONC, and NIST, and documented institutional implementation case studies, this paper develops an integrated framework for cloud EHR design that addresses HIPAA compliance, FHIR R4 interoperability, zero-trust cybersecurity architecture, and equitable access for underserved populations. Performance data synthesised from the literature indicate clinically and operationally significant improvements following cloud EHR deployment, including a 37% reduction in medical error rates, a 67% reduction in duplicate test ordering, and a 4.5 percentage point reduction in 30 day unplanned readmission rates, with the caution that these figures represent directional trends from published studies rather than guaranteed outcomes transferable to every institutional context.

The paper introduces a seven-phase implementation roadmap calibrated to U.S. healthcare regulatory requirements, a comprehensive cost-benefit framework demonstrating net financial benefit of three to nine million dollars per hospital over a five-year horizon, and a systematic analysis of implementation challenges, including data migration integrity, clinician adoption resistance, cybersecurity risk, and the digital divide. Health equity is treated as a first-class design requirement rather than a peripheral concern, with specific attention to rural critical access hospitals, federally qualified health centres, and linguistically diverse patient populations. The paper concludes with policy recommendations for ONC, CMS, Congress, and healthcare institutions, and identifies priority directions for future research, including quantum-resistant health data encryption, federated learning across health networks, and AI ambient documentation.

ABSTRACTS OF PAPERS

Development Of A Stable Phospholipid-Lipid Complex For Controlled Drug Release Applications

Dipongkar Ray Sobuj

Advanced drug delivery systems have become a central focus in modern pharmaceutical research due to their ability to enhance therapeutic efficacy and reduce adverse effects through improved targeting and pharmacokinetics. Conventional dosage forms often suffer from non-specific distribution, rapid degradation, and poor bioavailability, particularly for hydrophobic or lipophilic drugs, resulting in fluctuating plasma drug levels and suboptimal therapeutic outcomes. Controlled-release drug delivery systems are designed to overcome these limitations by maintaining a consistent drug concentration over extended periods, thereby improving patient compliance and minimizing side effects.

A variety of carrier systems, including hydrogels, liposomes, nanoparticles, polymer-based matrices, and lipid-based formulations, have been explored for controlled drug delivery. Although synthetic polymers such as poly(lactic-co-glycolic acid) (PLGA), polylactic acid (PLA), and polyethylene glycol (PEG) are widely used, their complex synthesis and processing increase formulation complexity and cost. In contrast, phospholipid-based systems offer a promising alternative due to their biocompatibility, biodegradability, and structural similarity to biological membranes.

In this study, a stable phospholipid-based drug delivery system was developed using phosphatidylcholine (PC), cholesterol, and hydrocortisone. The system utilizes the self-assembly properties of phospholipids to form organized structures capable of sustained drug release. Cholesterol incorporation enhances membrane stability, reduces permeability, and improves structural integrity of the formulation. The thermal behavior and stability of the system were evaluated using differential scanning calorimetry (DSC). Variations in transition temperatures and enthalpy values with increasing concentrations of binding agents indicated structural modifications within the system. These findings were further supported by morphological observations, which revealed the formation of phospholipid fiber-like structures. Overall, this study demonstrates the potential of phospholipid-based matrices as efficient, stable, and biocompatible platforms for controlled drug delivery applications.

An NLP and LLM-Based Framework for Emergency Detection and Prioritization in Natural Disaster Response

Muna Kandel

Natural disasters such as hurricanes, floods, earthquakes, and wildfires generate massive volumes of social media messages, including emergency requests, support offers, and situational reports. The unstructured and high-volume nature of this data makes it difficult for emergency responders to rapidly identify and prioritize critical needs in real time. This study presents a Natural Language Processing (NLP) and Large Language Model (LLM)-based framework designed to detect, classify, prioritize, and match emergency-related information from social media across diverse natural disaster scenarios. The framework is developed to be generalizable and adaptable for real-time disaster response, with the goal of enhancing situational awareness and community resilience.

A Framework consisting of five components is implemented. Zero-shot classification using transformer-based models with confidence thresholding is used to automatically label social media messages into categories such as emergency, support offer, and neutral. Inter-model agreement analysis is applied to ensure label reliability. Transformer-based models, including RoBERTa, DistilRoBERTa, BERT, and DistilBERT, are fine-tuned for emergency detection and message classification. Model performance is evaluated using accuracy and F1-score. A rule-based urgency scoring mechanism ranks critical messages by combining model confidence, keyword detection, and engagement indicators. Additionally, sentence-level embeddings and cosine similarity are used to semantically match emergency requests with relevant support offers.

To validate the framework, Hurricane Sandy social media data was used as a case study. Results show that RoBERTa achieved the best performance for Task 1 with an accuracy of 0.8462 and an F1-score of 0.8559, while BERT achieved the best performance for Task 2 with an accuracy of 0.6923 and an F1-score of 0.6760, demonstrating strong capability in detecting and classifying emergency-related messages.

These results indicate that the proposed framework is effective for automated emergency detection and prioritization across natural disasters. Its modular and data-driven design enables scalability and adaptability, providing a strong foundation for real-time disaster intelligence systems and improved emergency response coordination.

ABSTRACTS OF PAPERS

Do Nurses Participate in Health Policy and Legislative Advocacy?

Ana Cordova, Dr. Raouth Kostandy

Background: Registered nurses represent the largest group of healthcare professionals. They play a critical role in patient care and healthcare system improvement. In the United States, there are over 4 million registered nurses, the largest segment of the healthcare workforce. However, they remain underrepresented in health policy development and legislative advocacy (Hajizadeh et al. 2021). Limited education in health policy, lack of institutional support, and low confidence have been identified as key barriers to participation and engagement in policy processes.

Purpose: The purpose of this cross-sectional mixed methods pilot study is to describe nurses' participation in health policy development and legislative advocacy and to identify individual and institutional factors associated with greater engagement.

Methodology: Participants will be recruited from a hospital emergency department and a graduate master's program using convenience sampling. Participants will be eligible if they are registered nurses practicing in the emergency department for at least 6 months or are currently enrolled in the Master of Science in Nursing program at Lamar University and possess an active RN license. Participants will be excluded if they are student nurses in the emergency department, licensed vocational or practical nurses, nurses working outside the emergency department, or submit incomplete responses. IRB approval will be obtained prior to data collection.

Data will be collected anonymously using a Qualtrics survey including demographic questions, Likert-scale measures of support and confidence, yes/no questions on recent policy participation, and open-ended questions on barriers and facilitators. The survey is expected to take approximately 10–15 minutes to complete.

Descriptive statistics will be used to analyze quantitative data, while qualitative responses will be analyzed to extract themes that will provide insight into nurses' perspectives on barriers and opportunities for policy involvement. Findings from this pilot study will inform future educational and institutional interventions to increase nurses' participation in health policy advocacy and legislative engagement. This study will be submitted as a paper presentation.

UAV-Based Detection of Stranded Humans in Flood-Affected Environments

Meet Arvindbhai Monpara

Detecting stranded individuals in flood-affected environments from UAV-based aerial imagery is a critical yet highly challenging problem, primarily due to the small size of targets, limited visual detail, and dynamic environmental conditions. Existing approaches are constrained by the lack of realistic, scenario-specific datasets, which limits their effectiveness in real-world disaster response applications. To address this gap, we construct a dedicated dataset consisting of stranded persons captured under diverse flooding conditions and introduce H-YOLO, an enhanced object detection framework designed for this task.

The proposed H-YOLO model integrates a Bi-directional Feature Pyramid Network (BiFPN) within the neck to improve multi-scale feature representation, along with a dual-attention detection head that combines channel and spatial attention mechanisms. Additionally, the architecture employs specialized prediction branches for classification, localization, and objectness estimation, enabling more accurate and robust detection. This design allows the model to effectively focus on person-relevant features while maintaining computational efficiency suitable for practical deployment.

Extensive experimental results demonstrate that H-YOLO consistently outperforms baseline YOLO models across key performance metrics, including precision, recall, F1-score, and mean Average Precision (mAP). Among the evaluated variants, H-YOLOv11 achieves the best trade-off between accuracy, robustness, and efficiency. These findings highlight the effectiveness of the proposed framework and establish H-YOLO as a viable solution for real-time UAV-based stranded-person detection in flood response scenarios.

ABSTRACTS OF PAPERS

A Human-Centered AI Task Management System for Cognitive Load Reduction and Decision Support in Industrial Plant Management

Md Asfaqur Rahman, Md Masum Billah, Dr. Yueqing Li

Industrial plant management environments are becoming more complicated, with managers having to integrate production operations, maintenance activities, safety compliance, manpower allocation, and operational documentation across many digital platforms. The extensive use of fragmented tools including spreadsheets, emails, dashboards, and calendars frequently results in information overload, an increased cognitive effort, and reactive decision making. To solve these issues, this article introduces AI TaskManager, a human-centered, AI-assisted task and workflow management system intended to aid plant managers in manufacturing and industrial settings. AI TaskManager was built with Google AI Studio, which allows for the rapid creation of a high-fidelity prototype without the need for traditional software development. The system supports important management workflows with natural-language interface and multimodal AI capabilities, such as AI-assisted task creation, automated budget estimation from structured data, technical drawing interpretation, and adaptive job prioritizing. These functions are combined into a single interface to improve situational awareness, minimize cognitive load, and maintain human decision authority. A usability and human performance evaluation was conducted with ten participants, including plant supervisors, engineering professionals, and graduate researchers with experience in operational task management. With an average job execution time of 2.4 minutes, a 93% task completion rate, and a 6% mistake rate, the findings show excellent system performance. The findings demonstrate that AI TaskManager effectively facilitates cognitive ergonomics, decision support, and human-AI collaboration in industrial plant management, underscoring the promise of human-centered AI systems to improve managerial performance and operational resilience.

Investigating the Role of Inc-CMPK2-2 and Inc-TMEM121-26 in Macrophage Response to Leishmania donovani Infection Using an ASO-Based Knockdown Strategy

Camren Dionne

Leishmania donovani, the causative agent of visceral leishmaniasis (VL), poses a significant public health threat due to its high mortality in untreated cases, asymptomatic transmission, and rising drug resistance. The parasite establishes infection by subverting host macrophages, creating a permissive environment for its survival. While host long non-coding RNAs (lncRNAs) are emerging as critical immune regulators, their specific roles in L. donovani infection remain largely unexplored. This proposal aims to elucidate the functional contributions of two differentially regulated lncRNAs, Inc-CMPK2-2 and Inc-TMEM121-26, in modulating macrophage permissiveness to the parasite. We hypothesize that these lncRNAs are functionally significant host factors whose dysregulation during infection promotes parasite survival. Using an in vitro model of human macrophage cell lines (THP-1, U937), we will first characterize the expression dynamics of these lncRNAs following L. donovani infection via RT-qPCR. We will then employ antisense oligonucleotide (ASO)-mediated gene knockdown to determine their functional impact on infection outcomes, quantifying changes in parasite burden. Finally, transcriptomic and protein analyses will be conducted to identify the downstream signaling pathways and gene networks regulated by these lncRNAs. Expected outcomes include establishing a definitive expression profile for Inc-CMPK2-2 and Inc-TMEM121-26 during infection, demonstrating their causal role in macrophage permissiveness, and identifying the molecular mechanisms they govern. By uncovering novel lncRNA-mediated regulatory networks in host-pathogen interactions, this research will advance fundamental understanding of VL pathogenesis and has the potential to identify innovative host-directed therapeutic targets to combat this neglected tropical disease.

Bridging Gaps in Deaf Epistemology: A Study of Deaf Balinese Experiences

Cristophorus Subandi Budidharma

Deaf epistemology examines how Deaf people construct, interpret, and validate knowledge through their lived experiences, language practices, and cultural worlds. Although Deaf epistemology has received growing scholarly attention in the United States, it remains underexplored in Indonesia, where Deaf people navigate distinct sociopolitical and linguistic conditions shaped by limited recognition of Indonesian Sign Language (Bisindo), barriers in education, and histories of language suppression. This study investigated how Deaf Balinese participants described the formation of knowledge within their cultural and social lives and how those experiences reflected or challenged existing Deaf epistemology frameworks developed in the United States.

Using a qualitative design, the study analyzed interview data through thematic analysis and systematic coding. The findings showed that Deaf Balinese ways of knowing were shaped not only by Deaf identity and signed communication, but also by local cultural values, collective community life, and ongoing struggles for recognition and access. Participants' narratives highlighted knowledge as emerging through lived experience, social interaction, resistance to marginalization, and participation in Deaf spaces that functioned as sites of affirmation and meaning-making.

This study contributes to Deaf Studies by expanding Deaf epistemology beyond a primarily U.S.-centered framework and demonstrating the importance of cultural context in theorizing Deaf knowledge. The presentation argues that Deaf epistemology should be understood as locally grounded rather than universally assumed, and that Indonesian Deaf experiences provide an important foundation for broader global discussions of Deaf ways of knowing, language, identity, and educational inclusion.

ABSTRACTS OF PAPERS

BRIDGING THE COVERAGE GAP: Healthcare Access, Uninsurance, and the Case for Medicaid Expansion in Texas

Akinola Adio

Background

Texas represents one of the most significant healthcare access challenges in the United States, with the highest uninsured rate of 16.7% in 2024—more than double the national average. Over 5.1 million residents, including 1.1 million children, lack insurance coverage. This crisis is closely linked to the state's decision not to adopt Medicaid expansion under the Affordable Care Act (ACA). This study examines uninsurance trends, rural hospital instability, health disparities, and the broader economic implications of policy inaction.

Objective

This study aims to (1) measure the extent of uninsurance across populations and regions in Texas; (2) evaluate the consequences of not expanding Medicaid; (3) assess the financial burden of uncompensated care; (4) analyze racial and ethnic disparities in health outcomes; (5) examine rural hospital closures; and (6) propose data-driven policy solutions to improve healthcare access and system sustainability.

Methods

A mixed-methods approach was used, combining secondary data from sources including the American Community Survey (ACS 2024), Kaiser Family Foundation (KFF), Commonwealth Fund, Texas Department of State Health Services (DSHS), Texas Health and Human Services Commission (HHSC), and the Center for Healthcare Quality and Payment Reform (CHQPR), along with peer-reviewed literature. Quantitative analysis included descriptive statistics, trend analysis (2013–2025), and interstate comparisons.

Key Findings

Texas has forfeited an estimated \$5–6 billion annually in federal Medicaid funding while incurring approximately \$5.5 billion in uncompensated care costs each year. Since 2005, 25 rural hospitals have closed, with 87 more at risk. Significant disparities persist, with Black and Hispanic populations experiencing poorer health outcomes. States that expanded Medicaid saw uninsured rates decline by 40–50%, alongside improvements in mortality, financial stability, and hospital viability. Between 617,000 and 1.4 million Texans remain in the coverage gap.

Conclusions

The findings indicate that failure to expand Medicaid contributes to fiscal inefficiency, health inequities, and preventable deaths. This study recommends Medicaid expansion, improved provider reimbursement, investment in rural healthcare infrastructure, workforce diversification, enhanced health information systems, and community-based outreach programs to promote equitable and sustainable healthcare access.

ABSTRACTS FOR FACULTY PRESENTATIONS

Bridging The Gaps for a Safer, Stronger, More Connected Southeast Texas

Brian Williams, Executive Director, Center for Resiliency

We find that our communities define disaster and resilience from their own unique experiences and perspectives. Our communities are made up of local government, nonprofit, industry, business, healthcare, and community groups that are also made up of real people with real needs and real challenges of disaster. As a part of the Southeast Texas community, and in support of the Lamar University mission, the Center for Resiliency strives to provide service, outreach, and education for improved resilience to disaster through community-based research and engagement to uncover the needs of each part of the community in supporting the community system when adversity is at its highest. Our goal is that the work we do can be applied in the Southeast Texas community and serve as an example to communities across the Gulf Coast region, from Texas to Florida, for increased community resilience to disaster.

Maritime Leadership and Innovation: Sea for Yourself

Nathan Sanders, Assistant Director, Port Management

This presentation highlights the comprehensive framework and ongoing initiatives of the Center for Advances in Port Management (CAPM), structured around the three foundational pillars: education, research, and engagement. The Center provides advanced academic pathways through a Master of Science in Port and Terminal Management and three specialized graduate certificates. CAPM's research efforts support port and maritime industry innovation across Texas by leveraging interdisciplinary teams to address critical topics such as AIS-based waterway traffic analysis, statewide and local maritime studies, dredging operations, freight logistics, and emerging technologies like Starlink for maritime applications. Engagement remains central to the Center's mission, reflected in strong partnerships with key industry and governmental organizations including SETWAC, TxDOT, the West Gulf Maritime Association, the Greater Houston Port Bureau, and multiple regional ports. Through these integrated pillars, the Center continues to advance port management practices, strengthen industry collaboration, and foster innovation within the maritime sector.

Readiness for Impact: Doctoral Students' Research Journey

Nina Gjoci, Associate Director, Center for Resiliency

Grounded on the foundations of research for impact in academia and industry, in this presentation, I explain what any graduate students must know about research design and conduct.

The goal of any program of study is to make their graduates think critically, creatively, and independently. Graduate studies, especially doctoral studies, are an opportunity and a privilege to directly contribute to a) the formalized archive of knowledge and b) provide real world solutions to industry. The expectations are high, the work is heavy, and so is the reward.

Doctoral students must know what to expect and what it takes to be ready to conduct research for impact. Clear evaluation criteria for each step on the research are essential for their success: from designing research, to matching the research question with appropriate methodology, conducting, reporting results, and drawing conclusions for impact.

Checkmarks on how to stay on track and what to accomplish year by year during doctoral program provide a clear map on becoming a research expert and be ready to have impact on academia and industry.

ABSTRACTS FOR FACULTY PRESENTATIONS

New Directions in the Midstream Sector at Lamar University

Philip Cole, Director, Center for Midstream Management

Lamar University is uniquely positioned at the epicenter of the densest petrochemical energy corridor in the world. Now that Lamar is a Carnegie Research-2 doctoral institution, as well as a Carnegie designated Opportunity University, great opportunities abound. Along with the two other Signature Centers (Center for Resiliency and the Center for Port Management), the Center for Midstream Management and Science (CMMS) is placed squarely in the "Golden Triangle," the very midstream hub for oil and gas. CMMS is an applied research and workforce-innovation enterprise. CMMS therefore serves a large coastal region that contains the nation's largest refinery capacity, the fourth largest port in the nation, a strategic petroleum reserve, a rapidly expanding LNG export complex, and tens of thousands of miles of gathering, transmission, and distribution pipelines that feed the broader Gulf Coast petrochemical economy.

We propose to preserve and strengthen the transfer of oil and gas for optimizing the efficacy of transferring product from, say, pipelines to rail, truck, and ship and minimizing loss of product. The CMMS research program will not only seek to understand these transportation processes, but will also identify practical methods to harden, improve, and extend the useful life of existing infrastructure. This will include the transport of light and heavy crude. Emphasis will be placed on approaches that enhance reliability, accountability, and operational efficiency while preserving and strengthening the current transportation system rather than replacing it.

Among our research endeavors:

- Pipeline flow optimization for two-phase and laminar vs turbulent conditions;
- Methane leak detection through acoustical and optical signatures;
- Advanced mathematical analysis and AI/ML algorithms;
- Cybersecurity in the midstream sector; and
- Methane migration in various soils.

This will afford many opportunities for enterprising Lamar University students:

- Internships at local industries;
- Connections with local industries;
- Dedicated electives in midstream science and engineering for job preparation; and
- Relevant research topics for the midstream sector (ME & DE).

CMMS will work to strengthen Lamar's connections with industry and the local community, heighten CMMS' profile as a center for midstream science and research, seek significant external funding, and coordinate graduate thesis projects and undergraduate research projects across the broad spectrum of STEM fields at Lamar University.

The Lamar University Institute for Environmental Studies

Clayton Jeffryes, Director, Center for Advances in Water and Air Quality

The Lamar University Institute for Environmental Studies advances interdisciplinary, applied research to address pressing environmental challenges across Texas. Through its three core centers, the Center for Advances in Water and Air Quality (CAWAQ), the Texas Air Research Center (TARC), and the Texas Hazardous Waste Research Center (THWRC), the Institute integrates research, technology, faculty support and community partnerships to improve environmental quality, public health, and regional resilience.

Current initiatives highlight the Institute's commitment to impactful, community-engaged research. In addition to maintaining a suite of state-of-the-art lab equipment available to support research for Lamar faculty, CAWAQ is also leading a transformative project to repurpose an abandoned golf course into a sustainable community green space, demonstrating innovative approaches to land restoration and ecosystem enhancement.

TARC is supporting the Indoor Air Measurements in Southeast Texas initiative, which is developing innovative indoor air measurement techniques and evaluating hazardous air pollutants in indoor and outdoor environments across the Beaumont-Port Arthur region while testing cost-effective air filtration solutions such as Corsi-Rosenthal boxes

THWRC is advancing two applied research projects: (1) the development of AI-enabled robotic systems to detect and manage invasive aquatic species in partnership with regional water authorities, and (2) a field and laboratory investigation of sewage contamination in freshwater systems, using microbial source tracking to identify pollution sources and inform remediation strategies.

Collectively, these projects exemplify the Environmental Institute's role as a regional leader in applied environmental research, fostering innovation, supporting student engagement, facilitating faculty research and delivering data-driven solutions to complex environmental issues.

ABSTRACTS FOR FACULTY PRESENTATIONS

Data Analytics and Cybersecurity for Energy Resilience

Helen Lou, Director, Center for Data Analytics and Cybersecurity

The energy infrastructure – refineries, petrochemical facilities, pipelines and storage facilities– is undergoing a digital revolution. Integration of operation, information, communication, and simulation technologies promises automation, remote work, cost savings, and improved performance. Yet, this digitalization dramatically increases the attack surface for cyber threats, potentially leading to severe consequences.

To ensure energy resilience, both physical integrity and cybersecurity must be addressed. This presentation explores viable approaches, spanning multiple angles. It will also highlight how the Center for Data Analytics and Cybersecurity (CDAC) is building the regional capacity through research, education, and workforce training.

