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O.U.R. 2024 FALL CONFERENCE

November 15, 2024

Location: **Galloway – Business bldg.**

Book of Abstracts

Part I - Oral Presentations

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Locations:

Plenary Session (PL) – 10:00 to 12:00 P.M. – Galloway – Landes 101

Breakout Session (BR) – Galloway rooms (e.g. room 122 is BR_1, etc.)

Glossary:

PL_1_T1 means Plenary Session #1 – Talk #1 (all plenary sessions are in the morning from 10:00 to 12:00pm)

BR_x_T1 means Breakout Session #x –Talk #1 (all breakout sessions are from 2:00 to 3:15pm)

GR means Graduate student.

UG-H means Undergraduate student in HASBSEB area.

UG-S means Undergraduate student in STEM area.

SURF- means Summer Undergraduate Research Fellowship.

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

S – Science, Technology, Engineering, and Mathematics

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

Presenter: **Md Admay Amif** [$]
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BR_6_T1 / GR-S / Advanced Doctoral Project

Quantification of Sub-Surface Wrinkles in Woven Carbon Fiber Reinforced Polymer Laminate Using High-Resolution Ultrasound.

Carbon fiber reinforced polymer (CFRP) composites are highly favored in the aerospace and automotive sectors due to their lightweight, excellent strength, and corrosion resistance. Nevertheless, imperfections like wrinkles or distortions in the composite layers significantly diminish their mechanical properties and structural soundness. This study introduces a manufacturing process to consistently produce out-of-plane wrinkled panels using woven carbon fiber reinforced polymer (CFRP), replicating the wrinkles observed in real-world applications involving thick composite structures. The individual geometries of each lamina were extracted from fabricated samples containing embedded wrinkles, which are captured through ultrasonic waveforms generated by single-element conventional ultrasonic (UT) scans. A methodology is presented for characterizing the wrinkle attributes of each lamina, including the spatial variation in wrinkle height and intensity. Through visual inspection, parts are produced with visually imperceptible wrinkles using a wet layup process and a hot press for curing. Scanning was carried out in a conventional immersion tank scanning system, and the scan data was analyzed to detect and characterize the subsurface wrinkles. Layer extraction was performed by tracking voltage peaks from A-scans in the time domain, followed by spatial Gaussian averaging to smoothen the A-scans, enabling the extraction of surface profiles for each lamina. Wrinkles with wrinkle heights and intensity were presented as a function of layer numbers in a 27 laminae part. The extracted wrinkle surfaces align closely with the anticipated wrinkle geometry.

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BR_6_T3 / GR-S / Advanced Doctoral project

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Effects of Cr Addition on the Corrosion and Mechanical Properties of the AlMoNbTi High Entropy Alloy.

This work evaluates the effects of equimolar Cr addition on the corrosion and mechanical properties of the AlMoNbTi high entropy alloy (HEA) by comparing it with the CrAlMoNbTi HEA. Microstructures of the alloys were characterized using optical microscopy and scanning electron microscopy (SEM). The microstructural analysis revealed elemental segregation of both alloys. Electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization tests were performed in a 3.5 wt.% of NaCl solution at room temperature for the evaluation of corrosion properties of the alloys. The EIS test revealed that by the inclusion of Cr the charge transfer resistance doubled, while the potentiodynamic polarization test indicated the corrosion current decreased by 50%. Because of the heterogeneous microstructures of the alloys, nanoindentation tests were performed to find the localized mechanical properties of different regions. However, there were no significant difference in the hardness and reduced modulus of the alloys. The hardness mapping, microstructures, and X-ray diffraction data indicate that all three specimens have at least two phases in their microstructures. Both specimens' experimental results are compared with conventional carbon steel alloy C1060 for better understanding the performance of these two alloys.

Acknowledgement: Corrosion, HEAs, electrochemical impedance spectroscopy, two phase microstructures.

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BR_6_T5 / GR-S / Advanced Doctoral project

Corrosion Protection Performance of Aromatic Thermosetting Copolyester Coatings on Steel in 3.5 wt.% NaCl Solution.

This study investigates the corrosion protection performance of two advanced polymer coatings sample of Aromatic Thermosetting Copolyester (ATSP), using electrochemical impedance spectroscopy (EIS). Two ATSP samples were labeled as ATSP-Powder (ATSP-P) and ATSP-Solution (ATSP-S) based on the coating application procedure. The results were compared with a commercially available polymer, IMP 444 (IMPREGLON). Carbon steel plates were coated with each of the three polymers in different methods and immersed in a 3.5 wt.% NaCl solution at room temperature. After six months of immersion, the ATSP-P and IMP 444 coatings exhibited no significant signs of corrosion, as evidenced by the high

impedance measured in the EIS tests. Both coatings also demonstrated excellent corrosion resistance during accelerated AC-DC-AC tests from -2V to -9V, with no noticeable drop in impedance. Conversely, while ATSP-S initially showed high impedance, its performance declined significantly after one week of immersion due to polymer breakdown. Substantial corrosion was observed on the ATSP-S-coated steel after 108 days of immersion. The findings indicate that ATSP-P outperforms IMP 444 as a polymer coating, while ATSP-S requires further modification to enhance its corrosion protection capabilities.

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BR_5_T5 / GR-S / Advanced Doctoral project

Changing the Reflectivity of Silica Surfaces Using the Coherent Coupling Between Two cw-Laser Beams.

We report experimental results of coherent interference between two linearly polarized 532 nm laser beams of different brightnesses superimposed on a silica glass surface and assisted by an energy background from a voltage set across the surface. The parallel reflectance of the weak probe for incidence angles near Brewster angle is measured and next, is calibrated and normalized to the total reflectance. Plotting this reflectance versus the angular position of the probe laser beam incident on the silica surface reveals a sinusoidal pattern observed over an angular range of 5° near the Brewster angle. The reason for this finding is because the laser beams create an array of aligned dipoles on the surface that act as a diffraction grating. The experimental angular separation, $\Delta\theta = \lambda/d$, between the first three adjacent maxima is $\Delta\theta = 1.571°$, and the geometric characteristic, d, of the polarized array of silica dipoles is calculated as being 0.0194 μm. The interference structure shows a change in the optical reflectivity of the silica surface with a reduction in the reflectivity at minima and an enhancement of reflectivity at maxima. We find that the index of refraction (and the Brewster angle) shifts from 1.5211 (and 56.678°) at no voltage, to 1.6053 (and 58.079°) at 3.3V. This reduces the angular separation between adjacent maxima of interference from $\Delta\theta = 1.571°$ at no voltage, to 0.649° at 3.3V. We find that higher voltages shrink the interference pattern. Our results show an excellent agreement between the theoretical and experimental results at low voltages.

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BR_5_T4 / GR-S / Advanced Master project

Comprehensive Analysis of Ground Deformation in Beaumont, Texas: Integrating PS-InSAR, and GeoDetector Techniques to Evaluate Impact Factors and Their Interactions.

This research focuses on Beaumont, Texas, situated in Jefferson County along the vulnerable Gulf Coast, an area notably susceptible to subsidence due to its complex geological characteristics. The choice of this locale is driven by its exposure to fluctuating subsidence rates, influenced by a combination of natural and anthropogenic factors such as soil composition, water extraction, and land use changes. Utilizing Interferometric Synthetic Aperture Radar (InSAR) techniques, specifically Persistent Scatterer Interferometric Synthetic Aperture Radar (PS-InSAR), this study capitalizes on the high precision of these methods in monitoring minute ground movements over time. PS-InSAR is particularly effective in urban areas and regions with stable, reflective surfaces, making it ideal for studying subsidence, infrastructure stability, and geological hazards. This methodology's suitability is demonstrated through the analysis of 28 Sentinel-1 SAR satellite images collected in an ascending orbit configuration from January 2023 to December 2023. By applying the PS-InSAR technique, the study captures line-of-sight (LOS) deformation ranging from +20.4 mm to -21.9 mm throughout the year, highlighting significant ground movement. Further investigation reveals that road density (19.9%) and built-up area (16.8%) have a more pronounced impact on ground deformation compared to precipitation (11.73%) and temperature (10.31%). Using the geographical detector (geodetector) tool, this research quantifies the influence of each factor on spatial ground deformation patterns throughout Beaumont and its surrounding areas. Additionally, it explores how weather patterns specifically impact the most subsidence-prone areas, providing insights into the dynamic interplay between urban development and natural environmental changes in shaping the region's ground stability.

Presenter: **Sambeg Dhakal** [$]
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BR_5_T2 / GR-S / In progress
Master project

Social Media Data Analysis for Community Disaster Resilience: Emotion Detection and Prediction Using Neural Network Models.

Community disaster resilience refers to the ability of the community to withstand, adapt, and recover from the adverse impacts of disasters. COVID-19 is a recent pandemic that caused a lot of issues around the world. This paper indulges in determining how people reacted during this pandemic. It involves the analysis of public Tweets from the United States to assess their emotions during that period. Social media platforms have emerged as a powerful tool that facilitates real-time information sharing, so social media has been a popular medium for expressing emotions. Hence, analyzing emotions from these rich sources of data helps us understand the profound impacts that disasters have on community resilience. This paper utilizes advanced machine learning and data science techniques like neural networks to develop an effective and efficient framework/model from scratch to analyze social media data which is further tested against human labeling for better accuracy. The goal of the paper is to leverage the framework in future cases where similar kinds of disasters might occur.

Presenter: **Karen Figueroa** [$]
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BR_X_T# / UG-H / Early phase
Independent research

Letter to Myself.

College is a time of uncertainty, a time to figure out what path in life to take and what kind of person you want to be. Through this photoshoot documentary, we will explore how people developed their gender identity and self-confidence throughout their college experience in Southeast Texas. Participants will work with me to create their dream photo shoot that showcases their identity and expression of themselves, as well as participate in interviews explaining their decisions for the concept and how the college experience affected their journey in becoming the person they are now. Along with exploring that relationship, the goal of this project is to capture people's most confident selves in a creative way, hence the reason for the title of this project. The title "letter to myself." refers to the idea that whenever the participants look back to this moment/project it will serve as a reminder to their future selves to embrace their true identity and serve as a confidence boost. Likewise, it could also be interpreted as a letter to their past self, kind of like a letter of what you would tell kid-you.

Presenter: **Matthew Flores** [$]
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BR_4_T1 / UG-S / In progress
Independent research

An analysis of the lift coefficient of 2D Airfoils at Hypersonic Speed.

This research was done to analyze and compare the lift coefficients of 2D airfoils when subjected to hypersonic conditions. The airfoils used were chosen due to their varying geometry and current use at subsonic and supersonic speeds. They are then simulated at hypersonic speeds using the ANSYS-Fluent Workbench 24.0 program. Once simulated with various angle of attack values, the generated data was analyzed to observe which had a higher aerodynamic lift. The focus on lift is due to much of the drag being generated by the body of an aircraft and thus a practical non-factor when just analyzing an airfoil. Given a high enough lift coefficient, the use of a proper airfoil could decrease in the power required to fly, resulting in a higher efficiency. ANSYS-Fluent Workbench 24.0 was used for its ability to perform Computational Fluid Dynamics (CFD) analysis, which gave us the values of the lift coefficients. The parameters for Hypersonic flight are defined as flight that has a Mach Number greater then 5, or a minimum velocity of 1,715 meters per second. The Mach Number (M) denotes how many times faster than the speed of sound an object is traveling. The data from the simulations thus far show that the shape of the airfoil and the angle of attack play major roles in the values of the lift coefficients. The

airfoils with consistently high lift coefficients will be analyzed further to design future airfoils and to make hypersonic flight more efficient and viable.

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BR_2_T1 / UG-H / In progress
Independent research

Music as Oppression or Hope: Alma Rosé and the Women's Orchestra of Auschwitz.

My research focuses on Alma Rose, the Women's Orchestra of Auschwitz, and how music affected not only their lives but the other prisoners. Alma Rose was the conductor of the orchestra from 1943-1944 and helped save more than twelve girls and women from annihilation in the Holocaust. The orchestra was forced to play "German music" as prisoners entered the camp, when work started, and for the SS guards. Alma was well loved not only by the musicians, but also by prisoners who saw the orchestra as an emblem of hope. Historians have disagreed on the function the orchestra's music served in the Holocaust, some saying that it accentuated the macabre of the Holocaust. I used recorded audio interviews from the survivors of the orchestra to reconstruct its plight inside the Holocaust. With the use of primary sources such as the interviews, personal memoirs, and some secondary sources, this research illustrates how music both consoled and oppressed the musicians and prisoners in Auschwitz-Birkenau. My research proves that music was a dual-edged blade for the musicians that played it and the prisoners that listened. It either supplied them with a sense of security and hope, or further immersed them in the atrocities they witnessed and endured in the camp.

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PL_T1 / UG-S / In progress
OUR sponsored research

Fluorometric Study of Release Rate of Drug-Analog Dye in Two-Photon 3D Stereolithography Printed Microstructures.

Modern drug delivery systems have revolutionized pharmacotherapy by offering significant advantages over traditional methods. One promising approach involves encapsulating drugs within micro containers, which can enhance the bioavailability, enable targeted delivery to specific tissues or cells, and provide precise control over drug release rates for extended periods. This study aims to investigate the optimization of microcube containers for controlled drug delivery. The primary objective of this research is to design and fabricate microcube containers using Two-Photon Stereolithography (TPS) technology,

systematically varying the design to determine the optimal configuration for achieving linear and long-lasting drug analog release. We seek to establish a relationship between container architecture and release profiles, ultimately developing a platform for tailored drug delivery systems. In this study, fluorescein dye is used as a drug analog, we have measured the rate of dye release using spectro-fluorometry. In this early-stage research presentation progress in design of the microcube containers, process development for fluorometry experiments, and initial dye release rate results will be discussed. The insights gained from this study will contribute to the development of next-generation drug delivery systems with enhanced efficacy and improved patient outcomes.

Acknowledgment: This work was supported by an OUR award from Lamar University.

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PI_T3 / UG-H / In progress
McNair project

Exploring Ethnicity and Intimate Partner Violence.

Traditional gender roles often reinforce power dynamics in heterosexual relationships, leading to the normalization of men's abuse of power (McCarry, 2009). This issue is exacerbated in patriarchal cultures, particularly for Latina women (Mookerjee et al., 2015). However, the connection between patriarchal Latin cultures and Latina women's acceptance of male perpetrated abuse remains under-explored. In this study I investigate differences in perceptions of intimate partner violence (IPV) between White women and Latinas, with three hypotheses: White women would identify IPV more frequently than Latinas; participants in an experimental group would recognize IPV more than those in a control group; and ethnicity and group condition would significantly affect IPV perception, hypothesizing that White participants in the experimental group would identify IPV more frequently than Latinas in. The first and third hypotheses were not supported, the second was confirmed. Data from 32 participants, who completed demographic questionnaires, read IPV or non-IPV vignettes, and completed perception questionnaires, were analyzed using a two-way factorial ANOVA. Both groups reported greater discomfort after reading IPV vignettes compared to non-IPV scenarios, which supported the second hypothesis. Participants in the IPV group perceived the male partner's response and scenario as abusive. However, despite recognizing IPV, there was a tendency to assign partial blame to female victims, echoing previous findings that women can identify abuse yet hesitate to fully reprimand male perpetrators and victim-blame. These results highlight the need for further research on how ethnicity influences IPV perception to protect vulnerable populations.

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BR_4_T2 / UG-S / Advanced
SURF project

The Numerical Calculation of the Energies and the Decay Energy Spectra of Quantum Mechanical Resonance.

In quantum mechanics, unstable states (called resonances) decay spontaneously. Such decays are characterized by their energies and spectra. These decay energies were calculated via the Schrödinger's equation, using square well potentials and Gram Schmidt potentials. Using Fortran and Mathematica, we were able to develop a numerical procedure to calculate the energies and the decay spectra of quantum mechanical resonances.

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BR_6_T5 / GR-S / Advanced Doctoral project

Effects of Al Addition on the Corrosion and Mechanical Properties of NbTaTiV High Entropy Alloy.

High-entropy alloys (HEAs) are known for their excellent microstructural stability, mechanical properties, and corrosion resistance owing to the high configurational entropy by multiple principal elements. NbTaTiV, a refractory HEA, is particularly interesting because of its high melting point (2275°C), good ductility with high compressive fracture strain (>40%), high yield strength and wear resistance. Alloying with other elements, such as Al, Cr, and Zr, has the potential to further improve these properties. In this study, we investigated the impact of Al addition at an equimolar ratio on the NbTaTiV HEA system, as it not only has the potential to improve the corrosion resistance and mechanical properties but also reduces the alloy's density and production cost.

The alloys were prepared by casting and homogenization. X-ray diffraction (XRD), backscattered electron scanning electron microscopy (BSE-SEM) and energy dispersive X-ray spectroscopy (EDS) techniques were used for the characterization of the alloys. To evaluate the corrosion resistance, electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization experiments were performed in a 3.5wt% NaCl solution at room temperature. Optical microscopic photographs of the surface were taken before and after the corrosion experiments to detect the presence of pitting or crevice corrosion. The localized mechanical properties of the alloys, such as hardness and modulus, were measured using nanoindentation.

The XRD results revealed that both alloys are BCC solid solutions. The BSE-SEM and EDS images revealed a lower level of elemental segregation in the AlNbTaTiV HEA in contrast to the NbTaTiV HEA. The EIS results indicated that the addition of Al leads to an increase in the charge transfer resistance (~40%), which means higher corrosion resistance. However, the potentiodynamic test revealed that above 1.5V, the AlNbTaTiV HEA's passive film dissolves leading to pitting corrosion, whereas the NbTaTiV HEA formed a second metastable passive film that protected it from pitting. Nanoindentation tests showed that adding Al increases the hardness (~10%) and modulus (~10%) of the matrix. Al addition also increased

the density of titanium precipitation, especially along grain boundaries, which may enhance the alloy's strength, hardness, creep resistance, and wear resistance.

In summary, adding Al to the NbTaTiV HEA can improve both the mechanical properties and corrosion resistance of the alloy, except in scenarios where pitting corrosion might occur. These findings contribute to the ongoing development of HEAs for better performance in various industrial applications.

Acknowledgements: This research was funded by the U.S. National Science Foundation (NSF), Award Number: 2138674.

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BR_1_T2 / UG-H / Early phase Independent research

Navigating Sexual and Emotional Communication in Generation Z University Situationships.

The phenomenon of situationships, a concept evolved from friends with benefits, casual hookups, and flings, reflects Generation Z's (Gen Z) agency and independence as the vocal advocates of the emerging generation (Antopolskaya et al., 2022; Langlais et al., 2024). The conceptual definition of situationships is non-exclusive, undefined romantic relationships that resist clear labels or commitment but often exhibit many features of a traditional relationship, such as physical intimacy, emotional vulnerability, and the appearance of exclusivity (Langlais et al., 2024). Utilizing qualitative interviews with 10-12 anonymous participants, we will investigate how students at Lamar University navigate these dynamics, particularly in a sexually charged environment with a lack of sex education (Stinson, 2010; Tanne, 2005). Key areas of focus will include factors such as boundaries, exclusivity, gender, dating apps, and attachment styles. By examining how partners navigate sexual and emotional communication, we aim to explore how these types of relationships impact communication patterns, boundaries, and expectations among Generation Z university students.

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BR_3_T3 / GR-S / Early-phase Medical research

Repurposing FDA-Approved Drugs to Prevent Preterm Birth: A Computational and Experimental Approach.

Background: Preterm birth (PTB), affecting about 11% of pregnancies, carries significant health risks linked to inflammation-driven fetal injury. However, no drugs have yet been approved to prevent PTB or reduce fetal inflammation, due to safety concerns associated with conducting drug trials during pregnancy. Drug repurposing and repositioning offer a promising approach to identifying existing drugs that could mitigate inflammation and help prevent PTB.

Objective: This study aims to repurpose and reposition FDA-approved drugs to reduce fetal inflammation and prevent PTB, utilizing a computational approach to accelerate drug identification and validation.

Methods: An initial evaluation of 10 FDA-approved drugs was conducted using ADMET-LAB, Protox-II, and AutoDock-Vina to profile absorption, distribution, metabolism, and excretion (ADME), as well as toxicity. Validation used a novel 3D-printed feto-maternal interface model. This approach was then extended to the National Center for Advancing Translational Sciences (NCATS) library of 913 compounds. Drugs were screened based on gastrointestinal absorption, toxicity profiles (neurotoxicity, cardiotoxicity, mutagenicity), and binding affinity to inflammation-related targets such as NF-kB, COX-2, JAK-STAT, and MAP/AKT.

Results: Initial computational screening identified celecoxib as a promising candidate. Screening the NCATS library further highlighted 25 repurposed and 25 repositioned drugs with favorable ADME properties and low toxicity profiles. The top 10 drugs showing strong affinity to inflammatory targets were selected for further testing in micro physiological systems.

Conclusion: This study supports drug repurposing as a viable path for identifying treatments to prevent PTB. The next phase will use Organ-On-Chip technology to evaluate top candidates, ultimately aiming to develop a clinician-friendly app for high-risk pregnancy management.

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BR_6_T2 / GR-S / Advanced Doctoral project

Automated Defect Detection and Quantification in Honeycomb Sandwich Panels Using High-Frequency Ultrasound Testing.

Honeycomb sandwich panels are widely used in industrial applications due to their high bending resistance relative to their weight. Defects between the core and facesheet, however, compromise their integrity by hindering load transfer. While current nondestructive testing methods focus primarily on defect detection, this study introduces a high-frequency ultrasound testing (UT) approach that not only detects but also quantifies defect geometry and type, automating the entire process. Two automated methods were compared: one using signal energy and the other utilizing thickness data. Testing was conducted using two setups: a laboratory-scale immersion tank and a novel portable UT system, both

enabling single-side access. The study included coupons with defects ranging from 5 to 40 mm in diameter, such as missing adhesive, foreign objects, and removed core sections. An algorithm was developed to quantify defect perimeters, achieving successful detection for all coupons, with an average error of 0.6 mm in defect diameter—significantly lower than the typical detectability limits of 15-25 mm. Results highlight the potential of this automated UT approach for effective defect detection and quantification in honeycomb sandwich panels.

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BR_1_T1 / UG-H / Advanced
Independent research

Ethical Evaluation of Nuclear Deterrence on the Example of the Russo-Ukrainian War.

This paper examines the ethical implications of nuclear deterrence, particularly in the context of the Russo-Ukrainian war. It explores two major ethical frameworks: consequentialist (utilitarian) and deontological ethics. The utilitarian perspective supports nuclear deterrence by highlighting its effectiveness in maintaining peace during the Cold War through the principle of Mutually Assured Destruction (MAD). In contrast, the deontological approach, as argued by Noam Chomsky, criticizes nuclear deterrence, pointing to its potential for catastrophic consequences and moral issues, emphasizing disarmament and international cooperation. The paper further discusses the shift in German geopolitics caused by the outbreak of the Russo-Ukrainian war, including increased military spending and debates on nuclear armament, reflecting a broader dilemma between national security and global peace.

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BR_3_T1 / UG-S / Advanced
Welch sponsored research

Effect of Zinc Oxide Nanoparticles on the Biosynthesis of Ergosterol in *Candida tropicalis*.

This study aimed to investigate how lipid manipulation impact cancer cells, which depend on excessive lipids for their metabolism and rapid proliferation. Candida tropicalis was used as a model organism due to its rich sterol content, particularly ergosterol, which resembles the chemical structure of human cholesterol. This similarity allows findings to be transferable to eukaryotic cells with further investigation. To manipulate sterol content, C. tropicalis were exposed to seven concentrations of zinc oxide nanoparticles (ZnO NPs) for 24 hours at 30°C. Optical density (OD) at 600 nm was measured to assess cell count, and 40x light-microscopic images were taken of the cells before and after ZnO exposure to visualize morphological changes. Membrane sterols were extracted using hexane, 10% KOH, methanol, and DMSO solvents. Infrared (IR) spectroscopy was performed before and after lipid extraction, and gas

chromatography (GC) was used for the separation and analysis of lipids after extraction. OD showed that as ZnO concertation increased, cell count decreased, despite similar absorptions across samples. Microscopically, cells retained their blastoconidia bud morphology but lost their hyphae form with higher nanoparticle levels. IR before extraction revealed a decrease in ether link intensity (at 1700-1000 cm-1 wavelength) as ZnO concentration increased, while post-lipid extraction IR indicated a reduction in carbonyl intensity (at 1700-1660 cm-1). GC supported ZnO altered ergosterol, though higher ZnO did not reduce ergosterol levels. These findings suggest zinc oxide can be used as a treatment against cells with abnormal lipid biosynthesis and can be further explored as a potential oncology treatment.

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BR_2_T4 / UG-H / Advanced McNair project

How Southern Gothic Authors Use Genre Tropes to Convey Their Opinions of Racism, Segregation, and Jim Crow Laws.

The Southern Gothic genre discusses the more macabre side of Southern literature, which often depicts the South as idyllic, cozy, and fertile for drama and romance to unfold. It, instead, uses the Southern United States often rural landscape and isolated communities to create a more sinister picture of the South, especially considering the legacy of slavery and segregation in the South. Race and the Southern Gothic are both intertwined in many works and, prior to now, there is and was little scholarship discussing their relationship and just how authors use the genre to speak on racism, segregation, and race in general. This paper aims to discuss how authors of the traditional Southern Gothic (1930-1994) use tropes and their subsequent imagery and evocation of fear to discuss the landscape of Civil Rights in the South, whether it be Jim Crow, segregation, the legacy of slavery, or even the aftermath of segregation in a fully integrated society. Authors often use the grotesque or a similar “freak trope” to either promote integration, display the brutality of racism, or create satire and parodies of bigoted figures. This research provides a fill-in to the gap previously discussed between the genre and racial discussions. Therefore, it allows scholars to further touch on the subject more in depth as a whole and in specific works.

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PL_T4 / UG-S / In-progress SURF research

Does Vaping Nicotine and/or THC Produce Different Levels of Oxidative Stress for Men and Women: An Examination of Markers of Oxidative Stress (8-Isoprostanes) in Expired Respiratory Condensate.

E-cigarettes or vaping cause thermal degradation of liquid bases, producing vapor that is inhaled. There is evidence that diluents, compounds produced because of vaping, and the vaporized substance itself, cause lung damage and oxidative stress. Assaying 8-isoprostanes, which are biomarkers of oxidative stress, is a way to measure the level of oxidative stress and injury in the respiratory system. The current study is comparing the respiratory oxidative stress of individuals aged 18-30. Both nicotine and THC vapers and the results of men and women are compared to determine if sex is a factor in respiratory oxidative stress and/or reduced spirometry results. Participants who vape are asked to identify if they vape only nicotine, only THC, or both as well as how long they have been vaping the substance(s). All participants perform the same non-invasive tests. Participants are asked to breathe normally into a respiratory condensate collection tube (Respiratory Research, Inc) that is covered with a cold sleeve for 10 minutes. The expired respiratory condensate (ERC) from the tube is stored in a –80C freezer until all samples are collected. ERC samples are analyzed using an ELISA assay kit from Oxford Biomedical. Lung function testing is performed by each participant through spirometry. The purpose of this study is to test the 8-isoprostane levels and lung function in men and women (nicotine and/or THC vapers and nonsmokers) to determine if men and women exhibit differing levels of oxidative stress or demonstrate reduced lung function due to vaping nicotine and/or THC.

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BR_5_T3 / GR-S / Advanced Master project

Comprehensive Assessment of Ground Subsidence using InSAR, GIS, and Deep Learning in the Southeast Texas Coastal Region.

The rising global sea level, a consequence of climate change, poses a significant threat to coastal areas. Southeast Texas (SETX) is particularly vulnerable to submersion by seawater, primarily due to heightened flooding compounded by subsidence. Monitoring subsidence in the coastal zone contributes to elevated sea levels, amplifying the frequency and intensity of flooding. Consequently, assessing ground subsidence and its associated geohazards along the SETX coast is crucial for effective engineering risk management and monitoring-use planning. This study aims to identify subsidence-prone areas in SETX and quantify the rate of subsidence in recent years through time series analysis, specifically focusing on its impact on flooding. The study employs the Persistence Scatterer Interferometric Synthetic Aperture Radar (PS-InSAR) method, utilizing Sentinel-1 SAR satellite data collected during ascending observations from 2020 to 2024. Notably suited for urban environments, the PS-InSAR method captures stable signal scattering detected by SAR satellites. The findings will illustrate the spatial and temporal distribution of monitoring subsidence, providing insights into its evolution and its implications for flood risk in coastal regions. Validation of results will be carried out using GPS station data dispersed across the study area. Further analysis of ground subsidence in SETX will involve susceptibility mapping employing Geographic Information System (GIS) and deep learning models. InSAR measurements will be utilized as an inventory map to generate ground subsidence susceptibility maps. Potential factors contributing to ground subsidence will be collected and subjected to analysis, assessing their relationship with subsidence occurrences using frequency ratio method and multicollinearity tests. Deep learning algorithms,

including convolutional neural networks (CNN), will be employed to generate ground subsidence susceptibility results, and comparisons will be made with conventional machine learning algorithms such as logistic regression and random forest. Accuracy assessments will be based on metrics like root mean square error (RMSE) and area under the curve (AUC). This comprehensive study aims to significantly contribute to ground subsidence mitigation, flood warning, and prevention in the SETX area.

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BR_1_T3 / UG-H / Advanced Independent research

Examining Pop Culture Theories in the Movie Some Like It Hot.

The paper "Examining Pop Culture Theories in the Movie "*Some Like It Hot*" delves into the 1959 film's exploration of gender norms, the male gaze, and queerness. The story follows two male musicians, Joe and Jerry, who cross-dress as women to escape gangsters. This disguise allows them to experience life from a woman's perspective, challenging traditional masculinity and expectations around gender.

The paper applies Laura Mulvey's psychoanalytic theory, particularly her concepts of the male gaze and scopophilia, to examine how gender and visual pleasure are presented in the film. As Joe and Jerry navigate life in disguise, they not only view women differently but are themselves viewed through a feminizing lens. Additionally, the text discusses how cross-dressing in the film subverts masculine norms, using Antony Easthope's theories on masculinity as a social construct.

Queer theory is also explored, particularly in Jerry's character; his fluidity shifts between masculine and feminine identities. The paper underscores the film's progressive handling of queer relationships, as seen in the closing scene where Osgood remains undeterred after learning Jerry is a man.

"Some Like It Hot" successfully combines humor with a critical exploration of gender, identity, and queerness, making it a pop culture classic that continues to influence film and television.

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PL_T2 / UG-H / Advanced SURF Project

Asexuals of Color: Experiences of an Invisible Identity.

Asexuality, or the lack of sexual attraction or low sexual interest, is a relatively new and growing orientation within the LGBTQIA+ community. Anthropologists, scientists, and activists study the identity's meaning and related history as the community continues to find acceptance and understanding. As

asexuality became more mainstream in Queer and youth culture, the orientation has continued to expand its representation. However, due to the lack of perception, the orientation has become white-centric and overlooked in minority groups. This study delved into the shared experiences and stories of ten participants who identified as an asexual of color. This project utilized interpretative phenomenological analysis- a qualitative methodology that identifies trends in data to create assumptions about a population or demographic. The study conducted private-personal interviews consisting of eight open-ended questions and found five central trends across the participants' testimonies: (1) Identifying as Asexual, (2) Disclosure of Identity, (3) Sexualization and Fetishization of BIPOC Asexuals, (4) BIPOC Asexuals within Queer and Asexual Communities, (5) Self-Acceptance. This research aims to bring attention to asexuality and the lived experiences and journeys of Asexuals of color.

Keywords: asexuality, racial minorities, aromanticism, Queer community, BIPOC.

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BR_3_T4 / UG-H / Advanced McNair Project

Care Intervention in Aphasia Among Nursing & Speech and Hearing Undergraduates.

This study examined interdisciplinary roles between speech and hearing- and nursing students toward care interventions for aphasia. Previous researchers discovered a significant contrast in competence between nursing and speech-language pathologists when working with patients with aphasia. The objective is to assess a potential need for workplace or educational training for aphasia. Participants were interviewed about their knowledge and experiences with aphasia using a qualitative, structured interpretative phenomenological approach that identified and evaluated shared trends and perspectives on interdisciplinary pre-professional roles among the interviewees. Interviews suggested speech and hearing students (n = 3) possessed limited knowledge of aphasia. Despite the lack of knowledge, the students recognized a nurse's capabilities when aiding aphasia patients. Similarly, nursing students (n = 3) understood speech pathologists' role in care intervention but were more aware of aphasia. When asked about nursing intervention tactics for aphasia, nursing students understood the responsibilities within their field. Their knowledge came from exposure to aphasia in classroom and practicum settings. Overall, participants from both disciplines had various levels of expertise about aphasia, and only nursing students could define care interventions and relate the concept to aphasia. However, both groups recognized the other occupations' role in aphasia. Future directions for this research will be expanding the sample size and academic level of participants and working with those interested in aphasia focusing on care interventions rather than general knowledge of aphasia.

Keywords: aphasia, care intervention, nursing intervention, nursing undergraduates, speech and hearing science undergraduates.

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PL_T8 / GR-S / In-progress Doctoral Project

Cohesive Zone Modeling Strategy to Simulate Progressive Delamination Failure in L-shaped CFRP Laminates with Varying Inter-ply Angle Difference.

Enhancing the damage resistance of curved laminated carbon fiber reinforced polymer (CFRP) composites, e.g., L-shaped components that are widely used in geometrically complex aerospace and automotive structures, can be attained by optimizing the inter-ply relative angle. However, the modeling strategies to estimate the delamination resistance of L-shaped laminates by considering the effect of inter-ply angle differences are not yet established. This work utilizes a modified cohesive element property where the nominal traction in the traction-separation law is replaced with the experimentally obtained interlaminar tensile strength (ILTS) of L-curved laminates with various inter-ply angle differences of 0°,15°,45°, and 90° (unidirectional, helicoidal, quasi-isotropic and cross-ply laminates, respectively). Quasi-static four-point bending tests were conducted to evaluate the ILTS of respective laminates and their associated progressive delamination failure using optical microscopy and X-ray computed tomography. Three-dimensional finite element models incorporating the modified cohesive element properties were built to simulate the delamination progression. Our modeling strategy can accurately predict the onset and progression of delamination in four laminates, validating the use of ILTS instead of nominal traction value in characterizing the failure of L-shaped laminates.

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BR_3_T2 / UG-S / Advanced Independent research

N-Amidothiourea Fluorescence Sensor for Sensitive Detection of Zn^{2+} Ions and Cell Imaging: A Tool for Plasma Membrane Analysis.

We present the development of an innovative "turn-on" fluorescent chemosensor, L1, specifically designed for the selective detection of Zn^{2+} ions in biological settings. L1 exhibited enhanced fluorescence upon the addition of both Zn^{2+} and Cd^{2+} ions, with compositional analysis revealing a 2:1 ligand-to-Zn^{2+} stoichiometry. The chemosensor demonstrated significant selectivity for Zn^{2+}, effectively minimizing interference from other metal ions, particularly heavy metals. Comprehensive characterization techniques, including FT-IR, ^{1}H NMR, mass spectrometry, and Density Functional Theory

(DFT) calculations, confirmed the formation and binding mechanisms of the complex. Notably, fluorescence intensity was optimized at a pH range of 7.0 to 7.5, aligning with physiological conditions. Imaging studies using HEK293 cells validated the chemosensor's capability to visualize Zn^{2+} interactions, primarily at the plasma membrane, highlighting its potential as a valuable tool in cellular signaling research. This study emphasizes the potential of N-amidothiourea-based fluorescent sensors in the exploration of Zn^{2+} dynamics in biological systems.

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BR_2_T2 / GR-H / In progress
Independent research

Empowering Future Teachers with Port Education & Activities.

This study explored the knowledge and awareness of port-related activities and vocabulary among preservice elementary teachers. Using pre-mid-post assessments and exploratory learning activities, the study evaluated their understanding and confidence in these areas. The results indicated that the preservice teachers improved their port related content knowledge and vocabulary. The study also equipped future teachers with the skills to comprehend complex port education parameters and effectively convey this knowledge to their students. Additionally, it enhanced student engagement by incorporating problem-solving skills and real-world applications of port-related activities into lesson plans. Future study will assess if these preservice teachers were successfully integrating these concepts into their classroom activities, such as science experiments.

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BR_5_T1 / GR-S / In progress
Master project

Sentiment Analysis of Weather Disasters: A comprehensive Evaluation from Reddit Data.

LLms models are widely Implemented to gain perspective into the data and comprehend the foundations and emotions of what is going on, as well as what the data can give to the community or any organization in order to assist get things done. Detecting human emotions using simple text and machine learning models is a novel technique to assess and interpret emotional context, improve human-computer interaction, and create individualized user experiences. As of now Two models have been used Transformer Model(Roberta) and Deep Learning Neural Network(LSTM) These two models with different

techniques have been combined to achieve higher and improved the efficient accuracy . The Weather disasters play a vital role in human's life. The model utilizing the LSTM stack achieved 82% accuracy, while the model without the LSTM stack reached 91% accuracy. The people have found a platform to express their experiences through a social media platform. The challenges people go through, the disasters are crucial and effects different household's activities. In this wake of storm events understanding the public sentiments and the collective response of the affected communities has become Important. Social media platform, especially Reddit, have become a vital source of real-time information, people sharing personal experiences, and community support during such natural disasters. Reddit, with its vast and active user base, provides a rich repository of public opinions and that can be analyzed to scale the public sentiment. There has been a lot of Sentiment analysis but in this work, We Compare and contrast various hybrid and individual models to analyze the sentiments of the people using different large language models and different techniques to provide more efficient result. This will help to understand the comprehensive impact.

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PL_T6 / UG-H / Advanced
SURF research

Elementary School Classroom Physical and Social Environment Effect on Students' Affective Performance.

This study examines the impact of the classroom environment on students' affective performance in elementary schools, focusing specifically on second, fourth, and fifth-grade classrooms. Guided by a faculty mentor, the undergraduate researcher investigates four key indicators of a successful classroom environment: physical environment, social climate, accommodations and advocacy for diversity, and classroom expectations and routines. Through a combination of classroom observations and one-on-one teacher interviews, this research aims to explore the nuances of how these environmental factors influence students' emotional and academic engagement. Observational data provided insights into the real-time dynamics of classroom interactions, while interviews offered depth, revealing teachers' perspectives and strategies in shaping these environments. The findings from this study are expected to highlight significant correlations between the classroom environment and student affective performance, offering actionable insights into optimizing educational settings to enhance student outcomes. This comprehensive analysis contributes to the broader discourse on educational best practices, with the potential to inform future policy and classroom management strategies aimed at fostering more effective and supportive learning atmospheres.

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BR_3_T5 / UG-H / Advanced
Independent research

Ethical Implications of Non- Life Saving Hysterectomies in Young Women.

This paper explores the ethical considerations surrounding non-life-saving hysterectomies in young women, specifically focusing on the permanent alteration of fertility in patients of childbearing age. Using the ethical frameworks of utilitarianism and deontology, the analysis assesses whether such procedures can be justified. A case study of a 15-year-old patient, suffering from urogynecological anomalies and considering a hysterectomy, is examined. The paper considers the potential for long-term regret, the impact on gender identity, and the psychological consequences of infertility. Through utilitarianism, the decision's ethical soundness depends on whether it maximizes overall well-being, including that of family members and the patient. In contrast, deontology emphasizes the autonomy of the patient and the moral obligation to reduce suffering, supporting the right to choose the procedure. Research findings reveal that while some women experience grief or regret post-hysterectomy, the majority report improved quality of life and satisfaction with their decision. This study concludes that the ethical implications of such surgeries are highly contextual, with utilitarianism and deontology offering divergent but insightful perspectives.

Keywords: hysterectomy, ethics, utilitarianism, deontology, fertility, gender identity, patient autonomy.

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PL_T7 / UG-H / In progress
SURF research

Slavery, Freedom, and the Law in Antebellum Georgia.

This project examines “Registers of Free Persons of Color” from several counties in antebellum Georgia. In addition to the registries, I also analyze the evolution of Georgia laws surrounding the freeing of slaves and control of Georgia’s free Black population. My research shows that, despite laws designed to assert the inferiority of Black Georgians and to differentiate between Georgia’s enslaved and free Black populations, some Black Georgians were able to play Georgia’s law to their advantage, frustrating the institution of slavery and undercutting the real intent of the law.

Acknowledgement: This study was partially supported by a travel grant offered by The Hawthorn Family. “I want to express my gratitude and appreciation for this donation. I was able to complete exemplary history research in the undergraduate research fellowship program.” (Brandon Stumpf)

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BR_4_T3 / UG-H / In progress
OUR sponsored project

Deaf Interactions within the First Responder World: The Communication Issue.

The knowledge of American Sign Language and various communication technologies used by Deaf and Hard-of-hearing (DHH) rarely exists or does not exist in the first responders' world, particularly among law enforcement officers. Since communication is vital for DHH individuals and law enforcement officers in every incident, challenges in communication can create a barrier. The communication barrier can make it more challenging for the DHH individuals to express themselves, resulting in misunderstandings and delays in dispatching and receiving first responder services from the law enforcement officers who arrive on the scene. The current research has two primary purposes. First, to examine the nature of communication and interaction between law enforcement officers and DHH individuals. Secondly, to know the perceptions of DHH individuals when interacting with a police officer. The current study will adopt a narrative inquiry to address these two goals. The data will involve individual interviews of both police officers and DHH individuals. Content analysis was completed, and emerging themes provided guidelines to better the interactions between the Deaf and Hard-of-Hearing, and law enforcement officers.

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BR_4_T4 / UG-H / In progress
SURF project

Gender Equality Blueprint: Analyzing the Relationship of FML Policies and Cultural Attitudes in OECD Countries.

Despite advancements in gender equality, the gender wage gap remains stagnant in many developed countries. This paradox highlights the relationship progressive family leave policies have with deeply ingrained cultural attitudes that continue to shape career outcomes for women. In this research i investigate the intricate relationship between Family Medical Leave (FML) policies, cultural attitudes, and the gender wage gap in OECD countries. While FML policies are designed to support work-life balance and increase female labor force participation, preliminary findings suggest these policies may inadvertently reinforce traditional gender roles, contributing to the persistence or widening of the gender wage gap. Using a mixed-methods approach, this study analyzes quantitative data from a subset of OECD countries and explores the influence of cultural norms on policy effectiveness. The results highlight the need for a holistic policy framework that balances legislative measures with initiatives aimed at cultural change. This research provides insights for policymakers seeking to close the gender wage gap and promote true gender equality in the workforce.

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PL_T5 / UG-S / In progress
Beck fellowship

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Advancing Protein Downstream Tasks through Pre-trained Large Language Model Representations.

Large language models (LLMs) have demonstrated remarkable success in addressing various natural language processing (NLP) challenges. Recently, LLMs pretrained on protein sequences have led to the development of Protein Language Models (pLMs), which show promise in protein-specific tasks such as structure and function prediction. In this study, we investigate the efficacy of pLMs in tackling two significant bioinformatics problems. The first problem is the prediction of crotonylation sites, a crucial post-translational modification in proteins. We utilize embeddings extracted from the pLM ProtT5-UniRef50-XL, using full protein sequences as input. These embeddings are then input into a Multi-layer Perceptron (MLP) classifier to predict crotonylation sites, resulting in a model we designate as CrotT5-MLP. The second problem involves predicting DNA/RNA binding proteins, approached as a multi-label classification task to simultaneously predict DNA and RNA binding proteins. We generate protein-level representations by applying average pooling to the ProtT5 embeddings and employ an MLP as the classification head to assign DNA/RNA binding labels. We refer to this model as DNA-RNA-T5-MLP. By leveraging pLMs, we obtain high-quality and robust representations directly from protein sequences, thereby automating prediction tasks through machine learning. This approach eliminates the need for handcrafted features, reducing manual effort, and replaces lab-intensive methods that are time-consuming and costly.

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BR_1_T4 / UG-H / In progress
Independent research

A Metis approach to the discourse in Crip Camp.

This essay analyzes the discourse shown in the documentary “Crip Camp”, which chronicles the experiences of disabled teenagers at Camp Jened in the 1970s, emphasizing its role as a foundational space for disability activism. By using Métis methodology, the analysis highlights the importance of embodiment in disability rhetoric, challenging traditional narratives that often exclude disability from rhetorical discussions. Drawing from scholars like Dolmage, the essay argues that Métis, rooted in a rich history of disability representation, reframes disability not as a loss but as a valid and desired human variation. The discussion extends to how disability rhetoric encompasses various identities and experiences, illustrated through the stories of Camp Jened attendees and prominent activists like the late Judy Heumann. Key themes include the role of touch in communication and solidarity, the ongoing struggles for inclusion in education, and the necessity of reframing societal perceptions of disability. Ultimately, the essay proposes that embracing a Métis perspective enriches our understanding of disability discourse, advocating for a more inclusive narrative that acknowledges the diverse realities of disabled individuals.

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BR_2_T3 / UG-H / In-progress
Independent research

The Journey from Black to White in Southwest Louisiana: A Study of Redbones.

Method: This research explores the complex identity trajectory of mixed-race individuals in Southwest Louisiana, tracing their evolution from being recognized as Free People of Color with African ancestry in the early 19th century to increasingly identifying as white in contemporary society. Beginning in the early 1800s after the Louisiana Purchase, the legal and social frameworks established during this period for the people known as Redbones created distinct racial classifications that impacted the lives of these mixed-race people. Historical records indicate that these individuals often navigated a fluid social landscape, utilizing various strategies to assert their identities in response to systemic racism and shifting societal norms.

Data Collection: The study analyzes key historical events, legislation, and cultural shifts that contributed to the transformation of racial identity. By employing a mixed-methods approach, combining interviews, legal records and newspaper accounts with historical analysis, this research highlights narratives that illustrate the challenges and successes faced by mixed-race individuals.

Results: The findings reveal a significant pattern of assimilation over generations, shaped by socio-political factors and a desire for social mobility.

Conclusions/Implications: Ultimately, this research underscores the importance of understanding racial identity as a dynamic and evolving construct, influenced by historical context and personal agency. The journey of mixed-race people in Southwest Louisiana serves as a case study for broader discussions on race, identity, and belonging in America.


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