FALL 2025 UNDERGRADUATE RESEARCH SYMPOSIUM AWARDEES

Most Popular Project

Unequal Heat: Temperature and Vulnerability in Rio's Favelas

Presenter: Gabriel Fernandes Mello Ferreira

Project Subject: Interdisciplinary

Faculty Mentor: Kangning Huang

Rio de Janeiro's slums, more known as Favelas, are disproportionately affected by Urban Heat Islands (UHIs) compared to wealthier areas of the city. Higher temperatures show social and environmental vulnerability in Rio's communities. This research maps and analyzes UHIs in Rio's informal settlements using satellite data to obtain Land surface temperature (LST) and temperature reductions (ΔT) for Green and Cool Roofs obtained from literature. By identifying the hottest neighborhoods and modeling temperature, it evaluates the effectiveness of potential mitigation strategies such as Cool Roofs and Green Roofs. Results are presented in an interactive map, making the analysis accessible to policymakers and communities to guide heat risk reduction.

SOCIAL SCIENCE

Best Research Project

Class Differences in Well-being among Chinese College Students: a Chain Mediation Analysis of College Process

Presenters: Xiaohan Cheng, Zhiteng Yuan

Project Subject: Social Science

Faculty Mentor: Xiaogang Wu

While higher education is often viewed as a “great equalizer,” inequalities may persist and unfold during the college years. Using the first wave of the Beijing College Students Panel Survey, this study examines how family socioeconomic status (SES) influences students’ mental health and the mechanisms behind this relationship. The results show that higher family SES is associated with lower levels of mental distress. This relationship is partly explained by students’ academic efficacy, peer interactions, and participation in leadership and club activities. These dimensions reflect human, social, and cultural capital reproduction. The findings challenge the equalizing view of college and highlight processes of social reproduction in contemporary China.

SOCIAL SCIENCE

Best Presentation

Constructing the Outsider: Anti-Immigrant and Separatist Discourses on X (Twitter) In the U.S. and U.K.

Presenter: Kayla Brackett

Project Subject: Social Science

Faculty Mentor: Zixi Chen

Populist movements in the United States and the United Kingdom increasingly frame immigration as a threat to national identity and social cohesion. Drawing on the work of Franz Fanon, this project applies Epistemic Network Analysis (ENA) to examine how anti-immigrant and separatist narratives circulated on X (formerly Twitter) between 2017 and 2025. A pilot dataset of 100 tweets from verified political and government accounts was manually coded to identify rhetorical frames, including *Security Threat*, *Cultural Incompatibility*, and *Dehumanizing Language*. The analysis reveals that platform dynamics amplify exclusionary rhetoric, showing how elite-driven discourse reproduces colonial hierarchies of belonging in digital spaces.

HUMANITIES

Best Research Project

The Impact of Grading Mechanisms on Student Individual and Collaborative Outcomes

Presenters: Jixuan Zhou, Jinkun Huang

Project Subject: Economics

Faculty Mentor: Peio Zuazo-Garin

This study explores the impact of different grading mechanisms and collaboration expectations on students' effort allocation behavior. The results indicate that compared to the "Equal Grading" mechanism, the "Rank-Based Weighting" mechanism significantly reduced individual task effort and promoted more team collaboration. Additionally, the number of repeated collaborations and the strength of feedback also had a significant impact on students' collaborative behavior. Stronger feedback led to more effort being allocated to individual tasks, suggesting that excessive feedback may hinder cooperative spirit.

HUMANITIES

Best Presentation

Contribution to Open Source Web-based Machine Learning: Enabling Sequential Data Modeling in ml5.js for Educational and Artistic Applications

Presenter: Mathew Ponon

Project Subject: Interdisciplinary

Faculty Mentor: Gottfried Haider

Sequential data modeling remains largely inaccessible to educational and creative coding communities due to implementation complexity. This project addressed this gap by integrating LSTM and CNN architectures into ml5.js, an open-source machine learning library designed for accessibility. The implementation extended ml5.js's existing Neural Network method with additional tasks supporting temporal and spatial data processing. Practical applications were developed to demonstrate functionality, including real-time sign language classification and weather prediction systems. The feature abstracts TensorFlow.js operations into user-friendly APIs consistent with ml5.js design principles. Currently maintained as an experimental branch, the implementation has been adopted by students for course projects, validating its educational utility and demonstrating successful democratization of advanced machine learning techniques for non-technical audiences.

STEM

Best Research Project

Acoustic Embedding for Deepfake Detection and Prevention

Presenter: Ashley Chen

Project Subject: Computer Science/Data Science/Engineering

Faculty Mentor: Hua Shen

Falsified videos, in particular, deepfakes, have become widely popular and fairly easy to produce in the last couple of years. Deepfakes have the power to exploit the platform of highly influential figures by impersonating them, leading to many instances of financial loss and political disruption. We propose a physical signature framework to create and embed dynamic signatures physically in order to secure videos at their digital creation. Specifically, this project focuses on audio, using echo hiding to encode live transcriptions from speeches in audio playback.

STEM

Best Presentation

Neural Dynamics and Representations of Imagined Speech

Presenter: Yolanda Huang

Project Subject: Neural Science

Faculty Mentor: Adeen Flinker

Current speech neuroprostheses rely heavily on the decoding of neural representations in the motor cortex, which may be impaired in severely paralyzed patients. On the other hand, imagined speech activates non-motor areas but remains understudied. We applied machine learning approaches to analyze electrocorticography (ECoG) data, investigating what brain areas and neural features are active during imagined speech. We identified pre-articulatory and articulatory activity in the inferior frontal gyrus (IFG) and precentral gyrus (PrCG). Encoding models revealed acoustic-specific representation in IFG. Our findings highlight the potential of non-motor cortical signals to advance speech neuroprostheses for individuals with severe paralysis.