UNDERGRADUATE RESEARCH & ARTS EXPOSITION

May 26 - May 27, 2021

Northwestern | OFFICE OF UNDERGRADUATE RESEARCH

Dear Members of the Northwestern Community:

Northwestern has demonstrated incredible resilience this year. Faced with unprecedented personal, professional and academic barriers, students and faculty continued to learn and help the world. Nowhere is Northwestern's spirit of perseverance more evident than the Undergraduate Research and Arts Exposition, which takes place remotely for the second year in a row.

I am particularly heartened by how our faculty, dealing with their own individual circumstances, continue to focus on supporting the goals and passions of undergraduate students. We thought we might see a downturn in undergraduate involvement in research this year, but that did not turn out to be the case. In fact, the 2021 Summer Undergraduate Research Grant program recently funded the second-highest number of grants in its 18-year history, and we are excited to see opportunities continue to expand in the humanities and creative arts. In addition to Northwestern's strong support of traditional research environments, the Office of Undergraduate Research (OUR) has committed more than $100,000 to creative arts projects each year for the past four years, a remarkable accomplishment that supports the artistic development of our students.

OUR also earned a grant this year from the Arthur Vining Davis Foundations to continue its support for undergraduate research opportunities in the arts and humanities, and I am particularly pleased with this grant's focus on serving our first-generation and lower-income students, students of color, and students from other underrepresented populations. As part of this work, OUR has recently selected its first cohort into the new Emerging Scholars Program. The program pairs first-year students with faculty as part of a 15-month funded program in which the students start as research assistants and, by next summer, will conduct independent research and creative arts projects in the areas of social justice, diversity, inclusion and equity. Please join me in celebrating the first faculty-student pairs: Professor Sarah Bartolome (Bienen) and Alexi Chavez (Bienen); Professor Joshua Chambers-Letson (SoC) and Olivia Pierce (WCAS); Professor Mesmin Destin (SESP/WCAS) and Krissy McGee (WCAS); Professor Myrna Garcia (WCAS) and Janitza Luna (WCAS); Professor Liz Gerber (MCC/SoC) and Shubhanshi Gaudani (MCC); Professor Jolie Matthews (SESP) and Sasha Benson (SESP); Professor Onnie Rogers (WCAS) and Joelle Moore (WCAS); Professor Shirin Vossoughi (SESP) and Zindeh Scere (SESP); Professor Adriana Weisleder (SoC) and Anika Velasco (WCAS); and Professor Kelly Wisecup (WCAS) and Rivers Leche (WCAS). The Undergraduate Research and Arts Exposition will no doubt be a part of those students' future.

I want to thank Peter Civetta, Director of Undergraduate Research, and the entire OUR staff for their continued outstanding support of undergraduate research at Northwestern. Their annual Expo is designed to celebrate the amazing accomplishments of our students. Through poster presentations, oral presentations and our Creative Arts Festival, the Expo is the largest and most diverse student conference event on campus. We are immensely proud of these students' accomplishments, especially given the complexities of the pandemic this year. Their presentations and performances are a sterling testament to the intelligence, creativity and toughness of our talented student body. I hope that you will enjoy their work as much as I do.

Sincerely,
    Kathleen Hagerty
    Provost and Professor

The 2021 Virtual Undergraduate Research and Arts Exposition

Northwestern University's
nineteenth annual celebration of
undergraduate research and creativity

Wednesday May 26 - Thursday May 27, 2021

Virtually Hosted by Symposium

ഔറെ

৪৩ Contents

Please use the search function to find Northwestern University student presenters by name

✍ **Program of Events**

LINK TO ASYNCHRONOUS POSTER PRESENTATIONS, ORAL PRESENTATIONS, AND CREATIVE ARTS FESTIVAL ENTRIES
symposium.foragerone.com/nuexpo21

Wednesday May 26, 2021

12:00-12:30 PM   **Dr. Onnie Rogers Expo Keynote Address:**
     "Mentorship: Nurturing Relationships and Identities through Research" and Announcement of Fletcher URG and URAP Awards
     https://northwestern.zoom.us/j/95693923194

12:30-1:30 PM   **Oral Presentation Q&A Session One**
     The Experiences/Challenges of Living
     https://northwestern.zoom.us/j/94213503656

4:00-5:00 PM   **Oral Presentation Q&A Session Two**
     The Impact of Health and Education
     https://northwestern.zoom.us/j/97848106457

5:00-6:00 PM   *Forward, A Story About Learning and Growth*
     Film Screening & Discussion with Dr. Haoqi Zhang
     https://northwestern.zoom.us/j/93721153983

Thursday May 27, 2021

12:00-1:00 PM   **Oral Presentation Q&A Session Three**
     Advances in Science and Technology
     https://northwestern.zoom.us/j/91043688452

4:00-5:00 PM   **Oral Presentation Q&A Session Four**
     Understanding Our World
     https://northwestern.zoom.us/j/96499825193

ଔ Office of Undergraduate Research Advisory Council

Lori Barcliff-Baptista, Associate Dean for Undergraduate Programs & Advising, Professor, School of Communication

Neal Blair, Professor, McCormick School of Engineering and Applied Science

Nadege Bizimungu, Student Representative, NU-Q

Candynce Boney, Advisor, Athletics

Ryan Dohoney, Assistant Professor, Bienen School of Music

Renee Engeln, Professor of Instruction, Weinberg College of Arts and Sciences, Chair of the Undergraduate Research Assistant Program committee

Bill Haarlow, Director, Weinberg College – Admission Relations

Mei-Ling Hopgood, Professor, Medill School of Journalism, Chair of the Undergraduate Research Grant committee

Caroline Hsu, Student Representative, Humanities

Jiaxing Huang, Associate Professor, McCormick School of Engineering and Applied Science

Louis Ingram, Student Representative, Social Sciences

Elizabeth Lance, Research Administrator, NU-Q

Kelsey Ann Leslie, Student Representative, Natural Sciences

Daniel MacKenzie, Assistant Director for Student Life, Medill School of Journalism

Patrick Maloney, Program Coordinator, Office of Global Safety and Security

Marina Micari, Associate Director, Undergraduate Programs, Searle Center for Advancing Learning and Teaching

Beth Pardoe, Director, Office of Fellowships

Megan Powell, Program Coordinator, School of Professional Studies

Ken Powers, Advisor, School of Education and Social Policy

Onnie Rogers, Assistant Professor, Weinberg College of Arts and Sciences

Allie Rosenfeld, Student Representative, TedX

Shreya Sriram, Student Representative, Northwestern Undergraduate Research Journal

Miriam Sherin, Associate Provost for Undergraduate Education

Natalie Welber, Student Representative, Arts

ೞ

ഐ   Exposition Planning & Organization

Office of Undergraduate Research

Peter Civetta, Director

Megan Wood, Associate Director

Jennah Vasquez-Thompson Advisor & Student Outreach Coordinator

Tori Saxum, Administration

ೞ

❧ Guide to Undergraduate Research Programs at Northwestern University

Below is a partial listing of current Northwestern programs supporting undergraduate research and creative projects. More are available on the Office of Undergraduate Research web site. You can also search for research opportunities from across the university through the Global Research Opportunities database. Many departments and programs have other opportunities that are not widely advertised. External agencies fund a number of programs, such as the National Science Foundation or the Fulbright IIE government grants. The Office of Fellowships can help students identify these external opportunities.

Office of Undergraduate Research Programs

Academic Year Undergraduate Research Grants:
undergradresearch.northwestern.edu/funding/ayurg/
Summer Undergraduate Research Grants:
undergradresearch.northwestern.edu/funding/surg/
Undergraduate Research Assistant Program (Academic Year and Summer):
undergradresearch.northwestern.edu/funding/urap/
Conference Travel Grants:
undergradresearch.northwestern.edu/funding/ctg/
Undergraduate Language Grants:
undergradresearch.northwestern.edu/funding/language-grants-ulg/
Circumnavigators Travel-Study Grant:
undergradresearch.northwestern.edu/funding/circumnavigator-grant/
Emerging Scholars Program:
undergradresearch.northwestern.edu/funding/emerging-scholars/

Other University-Wide Programs and Resources

Center for Global Engagement: northwestern.edu/abroad/study-abroad/get-started/program-types/gesi.html
Global Research Opportunities: globalresearchopportunities.northwestern.edu/
Global Learning Office: northwestern.edu/abroad/

Institute for Policy Research: ipr.northwestern.edu/who-we-are/students-postdocs/summer-undergraduate-research-assistant-program/
Northwestern Scholars: scholars.northwestern.edu

Weinberg College of Arts and Sciences

African Studies: africanstudies.northwestern.edu/research/funding/index.html
Anthropology: anthropology.northwestern.edu/research/index.html

✆ Guide to Undergraduate Research Programs at Northwestern University, continued

Astrophysics: ciera.northwestern.edu/Education/REU
Biological Sciences: biosci.northwestern.edu/research/
Chemistry: chemistry.northwestern.edu/undergraduate/programs/index.html
Chicago Field Studies Program: wcas.northwestern.edu/cfs
Economics: economics.northwestern.edu/undergraduate/major/research.html
History: Leopold Fellows of the Center for Historical Studies:
historicalstudies.northwestern.edu/fellowships/leopold-fellows/
Mathematics: www.math.northwestern.edu/undergraduate/research-opportunities/index.html
Neurobiology:
neurobiology.northwestern.edu/undergraduate/Research%20Opportunities/index.html
Physics and Astronomy: physics.northwestern.edu/undergraduate/research.html
Political Science: polisci.northwestern.edu/undergraduate/research-opportunities
Psychology: psychology.northwestern.edu/undergraduate/research
WCAS Baker Program in Undergraduate Research: baker.northwestern.edu

School of Communications

EPICS: External Programs, Internships, & Career Services: epics.soc.northwestern.edu

School for Education and Social Policy

Research in SESP: sesp.northwestern.edu/ugrad/opportunities/research.html

McCormick School of Engineering and Applied Science

Biomedical Engineering: mccormick.northwestern.edu/biomedical/undergraduate/research-opportunities/index.html
Chemical & Biological Engineering:
mccormick.northwestern.edu/chemical-biological/academics/undergraduate/research-opportunities.html
Electrical Engineering: mccormick.northwestern.edu/electrical-computer/research/undergraduate-research.html
Computer Science: mccormick.northwestern.edu/computer-science/research/groups-labs.html
International Institute For Nanotechnology:
iinano.org/northwestern-university-nanotechnology-reu
Materials Research Science and Engineering Center: mrsec.northwestern.edu/undergraduate-opportunities
McCormick Opportunities: mccormick.northwestern.edu/students/undergraduate/research-opportunities/

℘ Next Steps for your Research

The most important step in research, and often the most over-looked for undergraduate researchers, is sharing research findings. This final step allows for the vital process of peer review and contributes to the ongoing development of our knowledge about the world. Moreover, research is a cumulative process that grows from one project to another. It is also important to think about how your research can be transformed into new and related projects. Below are some examples of programs that have been developed at both Northwestern and nationally to help undergraduate researchers participate in and learn from the final step in the research process.

Present Your Research

Northwestern's Annual Undergraduate Research and Arts Exposition:
undergradresearch.northwestern.edu/expo

Chicago Area Undergraduate Research Symposium: caurs.com

Academic Conferences:
Consult with your advisor for major conferences in your field and apply for funding through the Conference Travel Grant program: undergradresearch.northwestern.edu/ctg

Council on Undergraduate Research: www.cur.org/engage/undergraduate/presentation/

Publish Your Research

Northwestern Undergraduate Research Journal: thenurj.com

Council on Undergraduate Research: https://www.cur.org/engage/undergraduate/journals/

Directory of Undergraduate Research Journals (UNC Office for Undergraduate Research):
https://our.unc.edu/share/publish/

Transform Your Research

Apply for National & International Research Grants: northwestern.edu/fellowships

Apply for Graduate School. Consult with your advisor for the best programs in your field and apply for funding through the Office of Fellowships:
https://www.northwestern.edu/fellowships/find-fellowships/fellowship-finder/

INAUGURAL EXPO KEYNOTE ADDRESS
WEDNESDAY 12:00-12:30 PM CST
https://northwestern.zoom.us/j/95693923194

Dr. Onnie Rogers

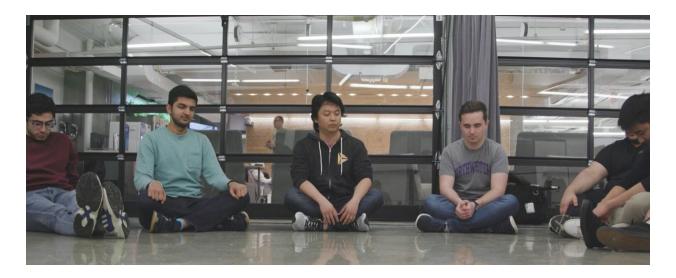### "Mentorship: Nurturing Relationships and Identities through Research"

Dr. Onnie Rogers is an Assistant Professor of Psychology at Northwestern University where she directs the [DICE lab (Development of Identities in Cultural Environments)](#). A developmental psychologist and identity scholar, Rogers is interested in social and educational inequities and the mechanisms through which macro-level disparities are both perpetuated and disrupted at the micro-level of identities and relationships. Her projects focus on how children and adolescents make sense of their racial, ethnic and gender identities; how cultural stereotypes and expectations shape the development and intersectionality of these identities; and the ways in which multiple identities influence adolescents' social-emotional and academic outcomes. Rogers earned her PhD in developmental psychology from New York University and holds a BA in psychology and educational studies from the University of California, Los Angeles (UCLA). She is also on the Northwestern Office of Undergraduate Research Advisory Council.

You can find more information about her and her lab here:

https://sites.northwestern.edu/thedicelab/people/

Forward: A Story About Learning & Growth
FILM SCREENING & DISCUSSION
WEDNESDAY 5:00-6:00 PM CST
https://northwestern.zoom.us/j/93721153983

Abstract: We'll be screening a documentary short film following Northwestern University's Design, Technology, and Research (DTR) program led by associate professor Haoqi Zhang. The film follows graduate and undergraduate students and their faculty mentor in DTR for two quarters, to look at the practices of a community-based research lab. Students self-direct their own research projects in human computer interaction while also learning about their own work process and metacognitive blockers to completing their work. The film focuses on the process by which students work to overcome individual struggles that prevent them from moving forward to make project progress and grow as people. Students work individually but within a community to find ways to seek help from each other, learn from others' experiences, and support one another. By reflecting on their own practices and work processes, students grow personally throughout their time in this community. The ultimate goal of DTR is for students to discover what it's like to pursue work that is meaningful to their own values and goals. *The screening will be followed by a Q&A with the filmmakers, student participants of the class, and discussion with the audience.*

Haoqi Zhang is an associate professor in Computer Science and Design at Northwestern University. He founded and directs the Design, Technology, and Research (DTR) program, which provides an original model for research training.

Sarah Hanson is a director and producer with Furnace FPS. Forward is her second independent documentary project and first in which she held a directorial role.

Sergio Salgado is a director and cinematographer with Furnace FPS which he founded in 2011. He has worked on feature documentaries, such as Forced Perspective (2015) and Grit & Grain (2016).

℘ Faculty Judges of Undergraduate Presenters

Katherine Amato, Anthropology
Casey Ankeny, Biomedical Engineering
Sherif Badawy, Pediatrics
Elspeth Beauchamp, Hematology/Oncology
Veronica Berns, Chemistry
Jeremy Birnholtz, Communication Studies
Sara Broaders, Psychology
John Bullock, Political Science
Stephen Carr, Materials Science & Engineering
Jean Clipperton, Political Science, Sociology
Daniel Cuzzocreo, Mathematics
Chris Davidson, Northwestern Libraries
Lisa Del Torto, Cook Family Writing Program
Sumit Dhar, Communication Sciences & Disorders
Christos Dimoulas, Computer Science
Jaime Dominguez, Political Science
David Dunand, Materials Science & Engineering
Renee Engeln, Psychology
Abigail Foerstner, Journalism
Branden Ghena, Computer Science
Matt Goldrick, Linguistics
Adam Goodman, Center for Leadership
Keith Gordon, Physical Therapy & Human Movement Systems
Benjamin Gorvine, Psychology
Michelle Guittar, University Libraries
Claudia Haase, Human Development & Social Policy
Laurel Harbridge-Yong, Political Science
Kyle Henry, Radio, TV, Film
William Horton, Psychology
Lizabeth Jordan, Psychology, Psychiatry & Behavioral Sciences
Neha Kamat, Biomedical Engineering
Amy Kehoe, Office of Fellowships
Stephanie Knezz, Chemistry
Istvan Kovacs, Physics, and Astronomy
Jason Kruse, University Libraries
Hojoon Lee, Neurobiology
Victor Lefevre, Mechanical Engineering
Elizabeth Lewis Pardoe, Fellowships, History
Hilarie Lieb, Economics
Peter Locke, Global Health Studies
Matty Major, Physical Medicine & Rehabilitation
Luisa Marcelino, Civil & Environmental Engineering
Kimberly Marion Suiseeya, Political Science
Sean McAfee, Mathematics

❧ Faculty Judges of Undergraduate Presenters, continued

Elvia Mendoza, Latina & Latino Studies
Ursula Moffitt, Psychology
Elizabeth Norton, Communication Sciences & Disorders
Alessia Para, Neurobiology
Wendy Pearlman, Political Science
Christine Percheski, Sociology
Sylvia Perry, Psychology
Siobhan Phillips, Preventive Medicine
Andrew Rivers, Physics, Astronomy
Andrew Roberts, Political Science
Jason Roberts, Office of Fellowships
Marianne Santoso, Anthropology
Eric Schulz, Economics
Lilah Shapiro, Human Development & Social Policy
David Smith, Psychology
Karrie Snyder, Sociology
Caitlin Teague, Biomedical Engineering
Regan Thomson, Chemistry
Oya Topcuoglu, Middle East & North African Languages
Debra Weese-Mayer, Pediatrics
LaTanya Williams, Office of Fellowships
Mark Witte, Economics
Anne Zald, University Libraries
Haoqi Zhang, Computer Science & Design

❧❧

❧ Poster Presentation Abstracts

Alphabetical by presenter's last name

Nicholas Abushacra

Faculty Advisor: Jeffrey Lewis

Determinants of Employment Rates by Sex and Education Across U.S. States, 1992-2019

The central aim of my paper is to measure the responsiveness of group-specific employment rates to the overall business cycle. This topic is of great interest to policymakers given current predictions among economists for a potential "K-shaped" recovery from the COVID-19 pandemic. Using pooled, cross-sectional state-level data from 1992-2019, I investigate the determinants of employment rates for ten different demographic groups (sex × education groups). I find that, for males, the effect of an increase in the state unemployment rate on the group-specific employment rate declines steadily as education increases, and large differences are observed between the extremes of the education distribution. While a one-percentage point increase in the unemployment rate is predicted to decrease the employment rate of male high school dropouts by 1.70 points, such a change is predicted to reduce the employment rate of males with advanced degrees by only 0.35 percentage points. I also estimate that the differences in the responsiveness of employment rates to the business cycle across education groups are less pronounced for females than for males.

ℰᴑℛ

Rahma Almajid

Faculty Advisor: Adriana Weisleder

Older Siblings' Influence on Younger Siblings' Language Development in Spanish-English Bilingual Contexts

Children are exposed to language from many different sources. For bilingual children specifically, language input varies even more since different speakers may use each language in varying quantities. The language profiles of children living with multiple speakers, such as siblings or grandparents, may differ from the language profiles of children without these sources. Older siblings are one source of language input likely to be important for young children, but their role in shaping their younger siblings' language development is not well understood. This study explores if older siblings influence the language development of younger siblings from bilingual homes. A sample of parent-child dyads (n=20) from Spanish-English bilingual homes were interviewed using an adapted version of the Language Exposure Assessment Tool (LEAT). Caregivers also filled out the MacArthur-Bates Communicative Development Inventories (MCDI) to report on their child's Spanish and English vocabularies. I will analyze differences in vocabulary between children with and without older siblings and examine how siblings' use of English and Spanish influences their younger siblings' vocabulary. I expect that children with older siblings will have larger vocabularies in English and that children with older siblings will have higher levels of vocabulary than children without older siblings. I predict that higher proportions of either Spanish or English from older siblings result in higher Spanish or English vocabularies in the younger siblings, respectively. The findings can help us develop a broader understanding of the factors influencing bilingual children's language development and have implications for research on bilingual children's language acquisition.

ഇൗരു

Rohil Bahl

Faculty Advisor: Noshir Contractor

The Effect of Leadership Behaviors and Technology Use on the Perception of Team Outcomes During the COVID- 19 Pandemic

The COVID-19 pandemic has had a major impact on numerous aspects of our lives. One of the most significantly affected areas is the workplace. The shift to a virtual workplace could potentially lead to changes in how leaders behave, how employees use technologies in the remote work, ultimately affecting team outcomes. This study aims to examine the effect that the frequency of technology use in teams and engaging in leadership behaviors have on the perception of team viability and performance. The data was collected through a U.S. national survey of 1,186 employed or self-employed individuals working in teams. The survey gathered information about different types of technology used by workers to communicate with their team members - email, audio, video, and messaging. Leadership behaviors, including planning, problem- solving, supporting, and mentoring, were measured in the survey. Furthermore, participants report their perceptions of team viability, meaning the capacity of teams to achieve future success, as well as team performance. Through bivariate correlation analysis, we found a positive correlation between leaders hip behaviors and team viability and performance. Among the use of different technologies, the frequency of making phone calls within teams is significantly positively correlate d with the perception of team performance $(r(1,185) = .10 , p < . 001)$. The results demonstrate that engaging in leaders hip behaviors and the use of specific technologies increase the likelihood of a positive perception of team outcomes. This study provides empirical evidence into the interaction effects between leadership and technology use in teams on outcomes in remote work.

ഇൗരു

Adina Barg

Faculty Advisor: Terri Sabol

Better Understanding Preschool Disciplinary Practices in the 21st Century: Drawing on the Voices of Early Childhood Educators

In this study, I sought to explore preschool disciplinary practices, in terms of both the positive and negative practices utilized by schools. The project aimed to examine the ways in which these disciplinary practices are employed in school settings, as well as how they affect socialization. In order to study these practices, I interviewed participants from four preschools in the Evanston area. Half of the participants were administrators and teachers from preschools considered low socioeconomic status (SES) that receive childcare subsidies, and the other half were from preschools that do not

receive those childcare subsidies. Contrary to expectations, I found that SES ultimately did not have any effect on the disciplinary practices used at the centers. By interviewing both teachers and administrators, I learned the missions of the schools and the extent to which school disciplinary practices were aligned or misaligned with the broader mission of the school, as well as how they are implemented day-to-day. Ultimately, there has been a shift away from harsh discipline, towards a positive reframing of disciplinary/ behavior management practices. This new perspective on discipline is focused on targeting social emotional skills, relationship building, and conflict resolution. These changes have been implemented by creating a more individualized approach based on students' needs, creating strong relationships between the schools and the families, and by utilizing outside resources. However, not all changes have been real and tangible, some have been more language based. In conclusion, after looking through the teacher and administrator reports, it was found that there has been a movement away from harsh discipline and a focus on positive practices.

ഔഽ

Anjelique Bomar and Maya Davis

Faculty Advisor: David Uttal

Child and Parent Communication in Overcoming Challenges During a Robot Coding Activity

Codable robots, small electronic devices programmed with software or apps, have become popular toys for children to play with at home. During play, children learn about coding by programming their robot to move and behave however they choose. But given the novelty of coding, children may face impasses when coding their robot to behave in these desired ways. In these moments, they turn to social partners for assistance - and at home that's often parents. Although parents are critical learning partners, they may have little prior knowledge about coding. Therefore, this study examines how parents help their children overcome coding challenges during codable robot play. We delivered codable robots to families' homes in the Chicago area. Over a Zoom session, we provided parents and children with a brief tutorial and facilitated their participation in a playful computational activity with the robot. During these sessions we took field notes documenting moments when children faced challenges in coding their robot to behave in desired ways. We have conducted qualitative Interaction Analysis on several of these moments. Initial findings suggest that parents support their children in accomplishing their coding goals by demonstrating strategies that involve physically moving their bodies and using objects from the home. These strategies provide an accessible way for parents and children to understand their code and achieve their goals for their robot's behaviors even if both partners have limited prior coding knowledge. Ultimately, these strategies support children's learning, keep their play positive, and motivates children to keep exploring code.

ഔഽ

Sophie Boorstein

Faculty Advisors: Jon Guryan, Reuel Rogers, and Beth Tipton

Black-Owned Small Businesses in Englewood, Chicago: Documenting the Effects of COVID-19 and the Black Lives Matter Movement in 2020

Media accounts report that the COVID-19 pandemic and 2020 Black Lives Matter (BLM) movement disproportionately affected Black communities and businesses, amplifying already-existing racial health and economic disparities. Black-owned small businesses experienced significant indirect and direct economic damages in Chicago, Illinois, and research literature is now striving to provide analyses of Black business owners' experiences in 2020. The present study uses quantitative and qualitative data analyses to discern the impact of 2020 crises on small businesses in Englewood, Chicago. The study examined foot traffic data from cell-phone records to identify business visitation patterns relative to the March 21 Illinois stay-at-home order and the commencement of BLM protests after the murder of George Floyd on May 25. After both March 21 and May 25, there were statistically significant changes in foot traffic in majority-Black neighborhoods as compared to majority-non-Black neighborhoods. The research elucidated the complexity of the mechanisms by which COVID-19 and BLM activities disproportionately influenced Black communities through semi-structured interviews with Black-identifying small business owners (n=8) in Englewood. The study participants detailed their evolving perceptions of policing in Englewood after looting in June, concern for employee well-being in the pandemic, and complex grant application processes throughout 2020. Business owners were motivated to keep their firms open to support their families, promote values benefitting Englewood residents, and refute stereotypes about Englewood itself. This project provides insight into the range of experiences Black entrepreneurs in Englewood have faced in 2020 and suggests ways that policy responses might usefully support their survival and success.

<div align="center">ଛଠଔଋ</div>

Eliana Buckner

Faculty Advisor: Jeffery Lewis

Medical Mergers: Exploring Impact on Quality and Concentration in Medicaid Managed Care Markets

Health insurance plan quality is an under-explored area that has significant consequences for how patients, particularly those who are lower-income, interact with the healthcare system. As healthcare markets become more consolidated through corporate mergers and acquisitions (M&As), research on impacts becomes critical to patients navigating the healthcare system. Do M&As benefit consumers through efficient systems and lower costs, or harm patients through increased prices and reduced quality of care? Using plan-level data on enrollment and quality from 2015-2020, I utilize approved M&As in Medicaid Managed Care insurance markets to estimate causal impacts on concentration and quality. Calculating state-market concentration, measured by the Herfindahl-Hirschman Index, and average plan quality, I directly compare states with mergers to those without.

I also utilize a difference-in-differences framework at the region-level to explore the causal implications of these mergers, since there are considerable differences between states with mergers and states without. I find that for two of the three regions examined, states with mergers experience an increase in concentration greater than 0.02, which is considered harmful by the Department of Justice. This confirms that firms gain market power through consolidation. I find statistically significant evidence that mergers affect plan quality, but the direction of the effect is ambiguous. Further research is needed to understand the implications of rapid consolidation on Medicaid patients' experiences with the health care system.

<div align="center">৪০৫৪</div>

<div align="center">**Rebecca Chen**</div>

<div align="center">*Faculty Advisor: Paul J Reber*</div>

<div align="center">**The Flexibility of Implicit Perceptual Motor Sequence Learning**</div>

Implicit learning, or learning that occurs without conscious awareness, is considered fundamental for skill acquisition. This type of learning has been demonstrated to be largely inflexible, meaning knowledge acquired in one context can only be expressed in the practiced context and is difficult to transfer to new contexts. The extent to which implicitly acquired knowledge can flexibly transfer to untrained contexts is important for understanding the acquisition and flexibility of real-world skill learning. The current studies focused on investigating implicit learning flexibility using a perceptual-motor sequence learning task, the Serial Interception Sequence Learning (SISL) task. Participants learned a 12-item repeating sequence covertly embedded in moving cues under a trained condition and completed tests under untrained perceptual and motor conditions. Learning was measured as the Sequence-Specific Performance Advantage (SSPA) of the repeating sequence compared to non-repeating foil sequences. Knowledge transfer was measured through the percentage of SSPA remaining after participants switched to an untrained condition, indicating the extent of implicit learning flexibility. Full transfer occurred to different cue shapes (Study 1) and novel cue colors (Study 2), indicating flexibility of knowledge relating to perceptual features like shape and color. However, rearranging the trained cue colors at test (Study 2) and disrupting spatial-motor compatibility by changing the stimulus-response mapping (Study 3) both impaired the expression of learning, indicating inflexibility. Collectively, these studies provide evidence that both perceptual and motor components are encoded during implicit sequence learning, and suggest that perceptual manipulations are generally less disruptive to implicit learning than motor manipulations.

<div align="center">৪০৫৪</div>

Ace Chisholm

Faculty Advisor: Francesca Tataranni

Ovid's *Epistulae Ex Ponto* and Writing Nostalgia

In 8 AD, the Roman poet Ovid was relegated to Tomis, where he wrote a series of letters addressed to family, friends, and acquaintances in Rome. Existing research on these letters, the *Epistulae ex Ponto*, consider their creative accomplishments, use as tools of persuasion, and other facets, but little is written which considers the nostalgia that pervades the letters, objects which can return where the author cannot. Ovid displays a clear sense of missing – and missing out on – his modern Rome: describing familiar paths through the city, invoking shared memories, noting events that transpire without him. Studying the *Epistulae ex Ponto*, I investigated how writing and sending letters can be a means of expressing and experiencing nostalgia, and how, as a result, the epistolary genre shapes nostalgia. I read the epistles in translation, annotating and analyzing noteworthy sections, those that conjured images of Rome's landscape, cityscape, population, and culture as well as epistolary language, and examined the Latin of those passages. I observed nostalgia appearing as an expression of identity through an economy of remembrance within the customs of *amicitia*, through Ovid textually reuniting himself with familiar Roman names and locations, through Ovid practicing Latin poetry. I also found a polarization of Rome and Tomis as the good and familiar remained tantalizingly distant and the strange always just off the page. By approaching the letters as mobile, metonymic objects while studying the nostalgia contained in the writing, I hope to further the discussion regarding the interaction between medium and text.

છ૭ભ

Hannah Cohen

Faculty Advisor: Claudia M. Haase

Emotions in Friendship and Mental Health

As adolescents and young adults seek independence from familial ties, friendships become increasingly important for healthy development. These close relationships may play a critical role in mental health, particularly during a developmental period when rates of anxiety and depression rise sharply. Thus, it is important to gain a better understanding of how adolescent s navigate their friendships and to examine the links between emotional functioning in friendships and mental health. In this study, two close friends engage d in two 10- minute naturalistic conversations (i.e., about a conflict in their relationship and about a topic of enjoyment), reported on their negative and positive emotional experiences after each conversation and completed questionnaires to assess symptoms of anxiety and depression. Results from 45 friendship dyads (aged 15- 23 years) revealed that higher levels of negative emotions (e.g., fear, disgust, sadness) after the conflict conversation predicted higher levels of anxiety ($b = .38$, SE [B] $= 1.18$, $p < .001$) and depressive ($b = .36$, SE [B] $= .85$, $p = . 001$) symptoms. Higher levels of negative emotions after the pleasant conversation were also associated with higher levels of depressive symptoms ($b = .366$, SE [B] $= 1.476$, $p = .001$). Lower levels of positive emotions (e.g.,

amusement, compassion, excitement) after the conflict conversation predicted higher levels of depressive symptoms (b = -.22, SE [B] =7, p = .04). Overall, these results suggest that how friends navigate the emotional ups and downs of their relationship could play an important role in their mental health.

<div align="center">ഇൽൽ</div>

<div align="center">

Ella DeBode

Faculty Advisor: David Rapp

</div>

Social Contagion of Knowledge: Do People Reproduce Others' Incorrect Answers?

Research finds people reproduce incorrect information provided by their collaborative partners. These "social contagion" effects largely studied memory for information introduced during experiments (e.g., word lists), rather than preexisting knowledge. This study extends the effects of social contagion of memory to social contagion of *knowledge*: Does what people know to be true change when they hear inaccurate answers from collaborative partners? After reading inaccurate facts (e.g., The capital of France is Marseille), people are more likely to reproduce false answers (e.g., Marseille) when asked related questions (e.g., What is the capital of France). This study examined how exposure to false claims produced by others influences what people report to be true. 47 Northwestern University undergraduates were paired with a confederate partner—research assistant impersonating another participant. Each pair alternated answering 32 total general knowledge questions. Half of these were easy (e.g., What is the capital of France?) and half were hard (e.g., What river runs through Rome?) according to prior norming. The confederate provided 16 incorrect (e.g., answering "Marseille" to "What is the capital of France?) and 16 correct answers. Participants then individually answered the same 32 questions. Results found participants produced more incorrect lures for hard as compared to easy items, producing significantly more incorrect lures after exposure to false as compared to control and true answers. These findings have implications on the malleability of knowledge. As misinformation spreads, it is pertinent to understand how false information influences what others think is true—especially when they should know better.

<div align="center">ഇൽൽ</div>

<div align="center">

Amil Dravid

Faculty Advisor: Aggelos Katsaggelos

</div>

Improved Methods for Image Classification with Auxiliary-Classifier GANs

Deep convolutional neural networks (CNNs) are the current state-of--the--art models for image classification in artificial intelligence, with tasks from object detection, face recognition, to disease diagnosis. During a training phase, CNNs learn which features in images are relevant to classifying what an image is. Their performance is then measured on how accurate they classify on a new set of

similar images which they have never seen. However, CNNs are dependent on large training datasets in order to generalize well on testing data. But obtaining more training data can be costly and time prohibitive, for example in a medical setting. I adapt a class of networks known as Auxiliary-Classifier Generative Adversarial Networks (AC-GANs) to image classification through modifications grounded in mathematical formalisms. I then compare the accuracies of a CNN, an AC-GAN, and the proposed modified AC-GAN framework on multiple datasets. Results show the proposed framework outperforms both the CNN and standard AC-GAN. As such, this framework adds to the existing body of literature of image classification with a new model with greater potential for generalizability. It can be employed for more accurate image classification when data is scarce, with significant implications in more robust diagnostics or autonomous vehicle navigation.

<p style="text-align:center">⅋ⅎ</p>

Harita Duggirala

Faculty Advisor: Alexandria Volkening

Machine Learning to Identify Cells in Zebrafish-Skin Patterns

Zebrafish (*Danio rerio*) are heavily studied because they share a similar genetic structure to humans. The skin patterns of zebrafish are comprised of horizontal stripes of different colored pigment cells. Accurately quantifying the cell size of various pigment cells in relation to their location on the skin is a crucial step towards better understanding cell behavior. The first step to measuring pigment cells is extracting cells from *in vivo* images of fish. In my research, I use machine-learning techniques to extract the size of black pigment cells from images of real zebrafish. Currently, I am focused on identifying the optimal method of extraction to ensure that we accurately determine cell locations in images with varying light intensities and microscope settings. To make image processing more efficient, I am utilizing batch processing to extract the cell locations of multiple images at once. In this presentation, I will highlight how training on different images impacts our measurements of pigment cells and share results on how cell size varies across the skin of zebrafish.

<p style="text-align:center">⅋ⅎ</p>

Georgia Assanuma Dutra

Faculty Advisor: Ana Williams

Symbolic Exchanges in Portuguese

Studies on symbolic exchanges generally analyze the patterns in communication, how the speakers' backgrounds affect their choice of words, and how the native speakers work to make the conversation as smooth as possible for the non-native learners. In this sense, it is pivotal to analyze the flow of topics in a conversation, as a speaker might vary their word choice, tone and role depending on how the topic develops and on the conversational partner, all of which are intrinsically connected

to their background and past experiences. In this study, symbolic exchanges are the identities that are constructed and negotiated during an intercultural conversation. This research builds an analysis on pre-recorded Zoom interactions between Northwestern students taking Portuguese 201 and voluntary native speakers, who live and study in Brazil. It is relevant to note that these interactions took place around April to June of 2020, during the first months of the COVID-19 quarantine worldwide, and that all participants are college students. It was intriguing to see how, during a pandemic, when travelling was fiercely restricted, the prevalent topic in multiple conversations was travel. This topic portrays very well how the identities are negotiated between interacting agents, and how their tone and word choice express multiple intentions in the conversation: to teach, learn, make friends, facilitate the interaction etc. The findings reveal that native speakers change their roles much more often than the learners. Conversely, learners will mostly depend on the native's initiative to better express their identities.

ഇൗൠ

Sarah Eisenman

Faculty Advisors: Leoandra Rogers and Héctor Carrillo

The Gendered and Racialized Experiences of Genderqueer and Non-Binary (GQNB) People: A Master Narrative Approach

Patriarchy and racism create a macrostructure in which different spokes of oppression interact to shape how people of various gender and racial identities are located and understand themselves within social categories. Prior research using the master narrative framework, which emphasizes the role of social stereotypes and expectations, demonstrates that the macrostructure produces specific harm based on one's identities. Genderqueer and non-binary (GQNB) people are those whose gender identities may not align with only one side of the gender binary—a system in which the two gender options, male and female, are opposed and distinct—or may not involve the gender binary at all. Psychological research has explored GQNB identity minimally, focusing solely on gender-related topics. Given the interaction between patriarchy and racism, we must ask questions that combine gendered and racialized experiences to fully capture GQNB identity. I plan to conduct semi-structured interviews with a racially diverse sample of 25-30 GQNB college students. I will ask questions about the gendered and racialized stereotypes and expectations they navigate, such as "Do you ever feel you are expected to act a certain way or do certain things because you are [gender identity + racial identity]?" Using thematic analysis, I will code the transcripts of the interviews to search for broad themes that help identify the specific experiences of GQNB people. This project will help fill in a gap in the psychology literature by highlighting the individual experiences of GQNB people of different racial backgrounds, thereby illuminating the effects of the macrostructure on this understudied population.

ഇൗൠ

Jack Ferry

Faculty Advisor: Jeffrey Lewis

The Impact of Unemployment, Income, and Cash Transfer Payments on Suicide: Evidence from the U.S. and Alaska, 1976-2019

From 2000 to 2018, the U.S. suicide rate rose by 41.7% to 14.8 deaths per 100,000 annually. Could this trend be reversed by providing citizens with a universal basic income? In this paper, I use both state-level data for the entire U.S. and state-level data for Alaska to examine the effects of unemployment, income, and cash transfer payments on suicide over the 1976-2019 period. Using data for the entire U.S., I estimate that a one percentage-point increase in the unemployment rate is predicted to increase the suicide rate by 1.0%. Controlling for unemployment, I find no association between per capita income and suicide. While, using regression analysis of state-level data for Alaska, I find no association between Alaska Permanent Fund dividend (APFD) payments and suicide, I conclude by arguing, with the use of descriptive statistics, that larger APFD payments could potentially improve mental health outcomes for Alaskans with low socioeconomic status.

ଚଚରେ

Adia Fielder

Faculty Advisor: Leoandra Rogers

"'Nasty Names:' Black Adolescent Discussions of Sexuality

Previous studies have shown higher rates of mental illness among Black adolescents and queer adolescents compared to their white and straight counterparts. Yet the experiences of adolescents who are both Black and queer are rarely researched. The little literature that does exist demonstrates equally, if not more, dismal outcomes. This may be due to experiencing identity-based marginalization and oppression on multiple fronts: Black queer adolescents experience racism from nonblack people while also facing anti-LGBT sentiments from both Black and nonblack people. With this research, I explore whether and how Black adolescents discuss sexuality, implicitly or explicitly, when describing their own racial and gender identities. Because all people in the United States navigate oppressive social structures, including but not limited to racism, homophobia, sexism, and any combination thereof, I wanted to know the ways Black adolescents' discussions of sexuality accommodate (uphold and/or reinforce) or resist structures of oppression. Using secondary data, I used thematic analysis to code 28 interviews of Black high schoolers (9th grade), 16 boys and 12 girls. Results indicate that over 85% of all participants did accommodate these harmful social structures. Specifically, while homophobia was present (23.5% for boys and 25.4% for girls), accommodation was mostly linked specifically to a general prioritization or assumption of heterosexuality and endorsement of racialized gender stereotypes. By examining the ideas around sexuality that both straight and queer Black adolescents hold, my research contributes to a growing body of knowledge vital to developing efficacious and culturally conscious psychological treatment for Black queer adolescents.

ଚଚରେ

Abigail Furdak

Faculty Advisor: Eric Schulz

The Impact of Framing on Decision-Making in the Context of COVID-19

People can perceive identical information in different ways depending on the framing, or phrasing and presentation, of that information. Could the framing of public health guidance impact the spread of COVID-19 and possibly save lives? In this study, 503 participants were surveyed about their willingness to go out to dinner during the COVID-19 pandemic given three infection probabilities: 2.75%, 5.50%, and 8.25%. Respondents either received a negative frame survey, which provided the likelihood of becoming infected with COVID-19 at the dinner, a positive frame survey, which outlined the chance of staying safe from the virus upon going out, or a relationship frame survey, which gave the probability of exposing one's household to COVID-19 after the dinner. Participant decisions were compared across frames through regression models, and the regressions controlled for demographic variables such as preexisting medical conditions, age, and political affiliation. Results indicate that receiving the positive frame significantly increased the probability of going out relative to receiving the negative frame for the 5.50% and 8.25% infection risk levels. This risk-seeking behavior under the positive frame contrasts with prior research, which found a reverse effect for higher risk levels. Next, the current study demonstrates that for all three infection risks analyzed, receiving the relationship frame significantly decreased the likelihood of going out compared with receiving the negative frame. Risk-aversion under the relationship frame aligns with illusory superiority. Throughout the remainder of COVID-19 and in future pandemics, public health officials could employ relationship framing to inspire risk-aversion and potentially save lives.

<div align="center">୫୦୯ଽ</div>

Meghna Gaddam

Faculty Advisor: Rebecca Seligman

Homeless Menstruation: A Construction of Embodied Experiences and a Breakdown of Amplified Psychosocial Issues

Homelessness and menstruation are constructs and processes that are plagued with stigma. For decades, academics have researched menstruation and homelessness as separately stigmatized experiences. However, in the process, scholars have overlooked the converging and intersectional nature of the stigma surrounding homeless menstruation. Through library research and records, this paper analyzes in what ways menstrual stigma and homeless stigma have come about, coincide, and are reinforced to exacerbate detrimental psychosocial and structural issues faced by homeless menstruators. The result was the identification of three converging theoretical frameworks that encompass psychosocial and structural issues: phenomenology and embodiment, objectification, and capitalistic and political structures and reinforcement. By comparing, contrasting, and analyzing these overlapping stigmas, this paper will paint a basic picture of the experience and causes of homeless menstruation. Stigma, at its root, is a construct that sets people apart from the status quo and brands

people as disgusting (Goffman, 1990). Therefore, an understanding of the social degradation endured due to the amplified stigma surrounding this vulnerable group would allow communities to start taking the needed steps to alleviate the social alienation of homeless menstruators. In other words, the amplified stigma experienced by homeless menstruators drives their day-to-day life and societal placement; therefore, comprehension of this converging stigma is crucial for enacting systemic social change that improves the lives of homeless menstruators.

ॐ

Joshua Genender

Faculty Advisor: Adilson E. Motter

Stable Dynamics in Continuous Systems with Geometric Asymmetries

Symmetry — the property of an object remaining unaltered after applying an operation on it — is a vital concept in physics. Many scientists assume that symmetric effects (e.g., objects vibrating synchronously) should result from symmetric causes (e.g., symmetric shape). However, recent research has shown that asymmetric causes can produce symmetric effects: a phenomenon called converse symmetry breaking (CSB). Interestingly, CSB appears to contradict common sense, which says things with "nice" behaviors should be "nice" themselves (e.g., expecting a sphere to spin for a longer time than an irregular shape). In this project, we studied an analog of CSB in classical mechanics, where the equilibrium point of an object with geometric asymmetry is more stable than one with higher symmetry. We considered models from three classes of systems: spinning tops (rigid bodies), seesaws (nonlinear oscillators), and floating rafts (floating bodies). For these systems, we used Mathematica and Python to perform numerical integrations of equations of motion. Applying the results, we performed linear or nonlinear stability analyses on the stable equilibrium points with respect to the mass distribution. Our results demonstrate that increasing the geometric asymmetry corresponds to a local increase in the asymptotic stability of our models' equilibria. However, there is a critical point beyond which the stability decreases with increasing geometric asymmetry, suggesting that CSB is a local phenomenon for continuous systems. Furthermore, we demonstrated that CSB is not unique to network systems. The ability to exhibit CSB may have implications for optimizing complex configurations, built from the systems we analyzed.

ॐ

Leah Gentner

Faculty Advisor: Theresa Sukal Moulton

Ankle Movement Indicators for Cerebral Palsy Diagnosis

By assessing infants' movements, our research goal was to determine if particular movement characteristics are indicators for cerebral palsy (CP), a disorder caused by a brain injury to the

fetus/infant that leads to impaired development of movement. Our research may contribute to developing an earlier diagnosis for CP, and therefore earlier intervention. This would benefit children since the early promotion of motor skill development may correlate with better outcomes later in life. My specific focus seeks to identify characteristics of ankle movement to incorporate into early CP screens and diagnoses. This project involved URAP students coding videos of sixteen infants (12-14 weeks corrected age), eight with CP and eight without, for the timing of their active movements at each joint. I specifically examined the frequency and duration of each ankle's movement into plantar flexion, which is a pointed foot position. These measures were compared between the two groups of infants and a t-test was run to determine statistical significance. While infants with CP showed significantly longer average duration compared to typically developing infants (right $p=0.01$, left $p=0.03$), the frequency of plantar flexion between the two groups was nearly but not significant ($p=0.07$). Future studies with greater sample sizes of infants would be warranted to further understand the generalizability and implications of this finding. If further research leads to the conclusion that frequency and/or duration of plantar flexion differ significantly in children with CP, then this movement could be added to the collection of indicators used for early CP diagnosis.

<div align="center">ΞΟΘ</div>

Courtney Goldenberg

Faculty Advisor: Renee Engeln

The Impact of Online Fitness Classes on Women's Mood and Body Image: Examining the Moderating Effects of Body Surveillance and Reasons for Exercise

Objectification Theory focuses on women's experiences living in a society where they are perceived as bodies rather than people. Tests of this theory illustrate that body surveillance (i.e., attending to how one's body looks to other people) is associated with negative mood and body image outcomes, especially among young women. Applying objectification theory to women's fitness may explain how the mood and body image benefits of exercise vary according to individual differences in body surveillance and individual reasons for exercise. I predicted that a 30-minute online fitness class would improve mood and body satisfaction in young women but less so for those who engaged in more body surveillance during the class. Further, women who exercised for appearance reasons would engage in higher levels of body surveillance than those motivated by mood or function. Young women (aged 18-30; $N=177$) completed a pre-test Qualtrics survey, a 30-minute Zoom fitness class, and a post-test survey. Body surveillance was positively related with appearance-related reasons for exercise, and the opposite trend was found for mood and function motivations. A negative correlation between mood improvement and body surveillance during the class indicated that women who thought more about how their bodies looked while exercising experienced a smaller increase in positive mood. Overall, results were consistent with previous evidence demonstrating the positive effects of acute exercise for in-person classes on women's mood and body image. However, consistent with Objectification Theory, women who engaged in less body monitoring during the class experienced greater increases in positive mood.

৪৩০৪৩

Jingxuan Gong

Faculty Advisor: Molly Bright

Comparison of Approaches for Estimating Regional Hemodynamic Timing Differences in BOLD-fMRI data

The mapping of the human brain is one of the most challenging but important topics among the fields of research. The delicate, intertwined networks of neurons obstruct us from taking invasive measures to explore the wonders of the brain. Functional Magnetic Resonance Imaging (fMRI) is a possible non-invasive technique for studying neural activity. When neurons are activated, without an internal reserve of energy, they rely on the increased regional cerebral blood flow for increased oxygen supply which can be detected by the MRI. Therefore, instead of directly measuring neural activity, we use blood-oxygenation-level-dependent (BOLD) signals as a surrogate measure. Resting-state fMRI (rs-fMRI) utilizes the BOLD signals to study the interaction of the brain's functional regions (functional connectivity). Studies on functional connectivity provide rich summaries of the large-scale patterns of synchronized brain activity, in other words, how different brain regions "communicate" to perform certain functions. However, variations in hemodynamic lag obscure true functional connectivity when using BOLD-fMRI. My project focuses on comparing different approaches for estimating regional hemodynamic lag for rs-fMRI scans, with breathing tasks to globally modulate BOLD signals. By comparing the different methods, I will also be able to provide further insight into the analysis of BOLD signals by accounting for the confounding hemodynamic timing differences. The analysis will allow us to have more confidence in the rs-fMRI data with respect to hemodynamic response delays and construct more accurate functional connectivity maps. The project is still ongoing. An abstract of this project was accepted by OHBM 2021 international conference.

৪৩০৪৩

Name: Jill Hsu

Faculty Advisor: Martha Vitaterna

Effects of Activity on Diet-Induced Memory Improvements

Exercise has been shown to improve visual-spatial memory in young adults as well as being beneficial to older populations. In recent years, research has also shown that exercise diminishes AD pathophysiology markers and improves cognitive performance in healthy populations. However, mechanisms linking exercise with cognitive decline in both healthy people and those with AD are still being investigated. Having a robust animal model would allow investigators to better understand the underlying mechanisms. The thesis addressed this question by manipulating the level of spontaneous activity through both genetic strain and diet and assessing its effect on memory. The

chromosome 13 interval-specific congenic strain ("Low-runner" mice), a strain previously found to have lower spontaneous wheel-running activity levels in males will be compared to background strain C57BL/6J wild-type mice to look at decreased activity compared to the control group. On the other hand, mice with modified resistant maltodextrin (MRM) intake, which has shown to increase spontaneous activity in mice, will also be compared to C57BL/6J wild-type mice to observe how enhanced activity compares to control. Results indicate that activity level is negatively correlated with primary latency time in female mice across all groups, suggesting that activity level correlates with improved spatial memory in female mice. Additionally, female mice show a larger improvement in the usage of spatial navigation strategy than male mice after MRM intake. These findings draw insights into the mediating effect of sex on activity and memory and how exercise may better improve memory in females than in males.

෨෬

Angelina Jaglinski

Faculty Advisor: Eric Chang

Visualizing a Fractal Representation of the British Coastline

A famous topic in mathematics involves the theoretically infinite nature of geographic coastlines. If one were to measure the perimeter of Great Britain, for example, the smaller the measuring tool, the larger and more accurate the measured perimeter would be. This phenomenon contains similar properties to the mathematical objects known as fractals: shapes with infinitely many self-similar segments. In our research project, we set out to visualize what a fractal coastline would look like and how it would compare to its real-life counterpart. To do this, we first obtained the coordinates of the British coastline. We then wrote code to insert a fractal segment between each coordinate, thereby creating a new set of fractal coordinates. This code worked on any number of coordinates and allowed us to use several different types of fractals with any number of iterations. Once we had our desired fractal coordinates, we uploaded them to the mapping software ArcGIS to see our results. From far away, the natural coastline and the fractal coastline looked smooth and identical, but zooming in revealed more detail. It was much easier to see the places where the fractal coastline differed slightly from the natural coastline, just like how a larger measuring tool overlooks the smaller crevices of geographic coastlines. Not only did we achieve our goal of visualizing a fractal coastline, but this research provided us with several jumping-off points for future investigation, such as comparing the coastlines' numerical perimeters, areas, and fractal dimensions.

෨෬

Samyak Jain

Faculty Advisor: Jeffery Lewis

Effect of Economic Conditions, Alcohol Consumption, and Vehicle Miles Travelled on Motor Vehicle Fatalities

Several papers have been written about the relationship between economic conditions and mortality. A common subsection of this work examines the relationship between key economic variables and motor vehicle fatalities. This paper examines this relationship and adds to the literature in three ways: First, I take a more comprehensive look at the factors that affect motor vehicle fatalities, such as demographic composition, vehicle miles travelled, and per capita alcohol consumption. Second, I conduct Wald tests to determine whether or not vehicle miles travelled and per capita alcohol consumption are the key channels through which economic conditions affect motor vehicle fatalities. Lastly, I compare results across five key population groups: male, female, aged 15-24, aged 25-64, and aged 65+.

ഐന്ദ്ര

Samuel Jung

Faculty Advisor: Niall Mangan

Complex Timestepping for Numerical Methods

Numerical methods allow us to approximate the solutions to differential equations especially when those equations have no closed-form analytic solutions. In these numerical methods, timesteps are taken in the differential equation to produce these approximations. However, timesteps are traditionally only thought to be real-valued. By considering complex-valued timesteps, one can develop arbitrarily higher order methods while still employing a simple time stepping scheme such as Euler's method where the solution at a new timepoint is found by adding the product of the derivative and the timestep to the solution at a previous timepoint. Specific initial complex time stepping schematics such as the zigzag and box method will be presented to lay the foundation of how complex time stepping can be intuitively thought of and achieved. The performance of these methods on both linear and nonlinear differential equations are then explored. Finally, these schematics can then be generalized and stated in a formal optimization routine to achieve n-th order accuracy by employing an n number of timesteps.

ೞೋಚಿ

Han Lee and Vaynu Kadiyali

Faculty Advisor: Jen Munson

Side-by-Side Coaching: Integrating Three Planes of Teacher Learning

In understanding and designing for primary school mathematics teacher learning, education researchers have often identified disconnects between teachers' contexts, their professional learning experiences, and their practice. In our study, we created a theoretical model to understand these discontinuities, drawing on Barbara Rogoff's 1998 model of observing development in three planes of sociocultural activity. Applied to teacher learning, these three planes are the *apprenticeship* plane, encompassing the contexts and systems which affect learning; the *guided participation* plane, the relationships and interactions between teachers and professional development providers; and the *appropriation* plane, the practices that teachers adopt from their learning. We then applied these three planes to show the effectiveness of side-by-side coaching, a model of teacher learning in which an experienced coach follows and participates in instruction alongside a teacher, while providing direct feedback in real-time. We qualitatively coded videos of side-by-side coaching with three elementary teachers, each taking place over a period of four weeks. These teachers taught at the same school, situated in a largely immigrant neighborhood with a majority bilingual student population. We identified and categorized instances of coaching in these videos based on characteristics such as the presence of students. In our current phase of analysis, we hope to better understand the apprenticeship plane, and how larger educational contexts enter into and influence coaching. For this phase, we are isolating and analyzing references to teacher contexts, which include commentary about the student and community population, professional development opportunities, and the teacher's relationships with other teachers and administrators.

ೞೋಚಿ

Isabelle Kang

Faculty Advisor: Theresa Moulton and Colleen Peyton

Influence of Cerebral Palsy Diagnosis on the Movement of an Infant's Arms and Legs

Cerebral palsy (CP) is a neurological disorder that occurs as a result of brain injury or abnormal brain development and is primarily characterized by impaired muscle movement and coordination. Previous research has shown that movement is one of the most sensitive markers for the health of the nervous system, and thus, can be used to investigate CP. This study seeks to investigate antigravity movements of the arms and legs of infants at high risk of CP through strength analysis. Strength was characterized by an infant's ability to lift a certain limb off the surface. To investigate the effects of CP on body movement, the length and frequency of whether the extremities (right/left upper, right/left lower)

were on or off the surface in 16 infants (8 with CP, 8 without CP) at 12-14 weeks were coded using Datavyu software and analyzed to distinguish observable correlations between movement patterns and CP diagnosis. The rater was blinded to CP diagnosis to prevent bias. The percent time each extremity was on the surface was calculated for each participant and compared between the infants with and without CP. Statistical analysis indicated that there was no significant difference ($p = 0.4\text{-}0.8$) between the percent time a certain extremity was on the surface for infants with CP and those of infants without CP. Further analysis will provide a more specific characterization of the correlation between limb movements with CP diagnosis through strength analysis to improve upon early detection methods.

ഇറബ

Minsoo Kang

Faculty Advisor: Andrew Dillon

How Do Different Household Definitions Affect Survey Data? Results from Global Dataset

The household has long been used as a unit of economic analysis. While numerous multi-topic studies have collected data on household composition and demographic characteristics, there are variations in the way household composition is defined in survey questionnaires. For example, while some surveys identify households as a group of people who share food and eat together, other surveys identify households as a group of people who live in the same dwelling. In this study, we use 57 studies from 21 countries to collect household roster data, resulting in 224,699 households and 1,064,060 individuals. We identify how different household definitions bias the survey respondents' responses to household roster questions on a global scale. The use of global data helps us clarify the relationship between the household definitions in the questionnaire and the resulting household demographics. The study finds that the percentage of males within a household increases when respondents are asked to include people who are not blood related to other household members. Further, for households with female household heads, the income pooling definition (people who share a budget together) decreases the percentage of male significantly more than for households led by male. These findings have potential implications for how roster data should be collected for individual welfare analyses.

ഇറബ

Johanna Kann

Faculty Advisor: Danielle Tullman-Ercek

Rapid and Robust Pipeline for Bacterial Organelle Assembly Analysis

Bacterial microcompartments are protein-based structures that exist within a variety of bacterial species and play an important role in the illness-causing capabilities of these bacteria. Due to these qualities, recent biological research has sought to investigate ways to disrupt the formation of these microcompartments in hopes of finding ways to limit the danger of disease-causing bacteria. In the past, studies have involved individually counting the number of microcompartments in each cell, a

time-consuming and tedious process. The goal of this project was to streamline this counting process into an automated procedure with improved efficiency, comparable accuracy and greater reproducibility compared to the hand-counting procedure. Using Python code and the skimage image processing package, I developed a script to filter the cells from the background of the inputted microscopy image, neglect image noise, and determine a total cell count as well as individual areas of each cell in the photo. If a corresponding microscopy photo is provided which has distinct fluorescent microcompartments, the code uses the pair of photos to count the number of microcompartments per cell and determine which cells were unable to form these organelles. The code is able to successfully distinguish the individual cells from the background with an accuracy rate of 98.6%, and counts the microcompartments per cell with similarly high accuracy. This work has been published in two manuscripts for its use in streamlining the counting of not only microcompartments, but also other relevant chemical particles.

<div align="center">ℬℭ</div>

<div align="center">**Denise Kao**</div>

<div align="center">*Faculty Advisors: Theresa Moulton and Colleen Peyton*</div>

Frequency of Isolated Finger Movement as a Predictor of Cerebral Palsy in Infants 12-14 Weeks (Corrected Age)

Cerebral palsy (CP) is a neuromotor disorder caused by abnormal brain development in utero that can affect movement and muscle tone. CP diagnosis often occurs after the infant's first birthday, but earlier diagnoses can better prepare families to support their children with CP. This study seeks to examine the frequency of isolated finger movement, the ability of a baby to move an individual finger, as a possible predictor of CP in babies ages 12-14 weeks. Parents voluntarily sent 1-2 minute videos of their babies moving spontaneously to a secure app. In total, 16 videos were coded by our URAP team using Datavyu to identify the onset and offset of this movement. 8 infants were later diagnosed with CP, while 8 were not, but coders were blinded to the outcomes. Codes for isolated finger movement were extracted from Datavyu and independent samples t-tests were performed to compare the frequency of isolated finger movements between subjects with and without CP. The average frequency of isolated finger movement in babies without CP was 14.1 instances/minute, compared to 7.7 instances/minutes in the babies with CP (p=0.02). This study is ongoing, but preliminary data suggest that a lower frequency of isolated finger movement in babies may be a possible indicator of CP, and reflect a poorer functioning corticospinal system. We hope that further studies of the relationship between isolated finger movement and CP will lead to greater understanding of the symptoms of CP and earlier interventions for infants with CP.

<div align="center">ℬℭ</div>

Michelle Kee

Faculty Advisors: Colleen Peyton and Theresa Moulton

An Investigation of Infant Neuromotor Development through Proximal and Distal Arm Joint Movements

Much insight into infants' neuromotor development can be gleaned from their spontaneous movements. Specifically, a greater understanding of neuromotor development is valuable for the early diagnosis of cerebral palsy (CP), a neurological disorder resulting from brain injury or atypical development at an early age and is characterized by impaired movement and balance. This study utilized a smartphone application to collect video data of premature infants' movements. Focusing on the upper extremities, this study sought to identify the difference between proximal (shoulder) movements and distal (forearm and wrist) movements in infants. Distal joint movements require more direct neural connections from the cortex and global observations suggest fewer distal joint movement in infants with CP. We hypothesized that infants with CP would have a significant difference in the frequency of proximal and distal joint movements compared to typically developing infants. One-minute videos were coded with the onset and offset times of joint movements in infants' upper extremities. Raters were blinded to the outcome of CP and used Datavyu to code active movements. Results indicated no significant difference ($p = 0.13$-0.78) between the average frequency of proximal and distal movements in typically developing infants versus infants with CP. However, infants with CP showed a significantly higher frequency ($p < 0.01$) of adduction and abduction shoulder movements compared to typically developing infants, a joint that is possibly influenced by neural connections from outside of the cortex. This study's conclusions can contribute to a growing understanding of neuromotor development for infants with CP.

ഓരു

Kayan Khraisheh

The Rise of Eco-Islam: Environmental Organizations and Religious Identity

Experts have recognized the potential for religion to shape environmental attitudes. In recent decades, the world has seen the rise of faith-based organizations in tackling issues of sustainability, particularly those following Islamic ecotheology. Embedded in Islamic scripture is an emphasis on responsibility and accountability towards the Earth; Islamic environmental organizations have capitalized on such teachings to inspire action in Muslim communities. In my research paper, I explored the following question: how are environmental organizations, operating in Western countries with a clear Muslim identity, using religion to encourage environmental sustainability? I chose to focus on Islam as it is the world's second-largest and fastest-growing religion. I selected four of the most successful Islamic environmental organizations in the West: *Green Muslims*, *Faithfully Sustainable*, *Islamic Foundation for Ecology and Environmental Sciences,* and *Khaleafa*. I analyzed each organization based on three factors: target audience, strategy, and use of religion. Similarities included the use of Muslim traditions and

celebrations (i.e. Ramadan and Eid), the use of stewardship to highlight individual responsibility towards the Earth, and the provision of educational resources regarding Islamic environmentalism. The primary differences were their target audiences, the nature of their projects, their use of social media, and their use of religion on their websites and social media platforms. The eco-Islam movement will continue to grow, alongside the rise of faith-based environmental organizations associated with other religions. Learning the most effective way to utilize religion to inspire eco-friendly behavior is becoming increasingly important as we continue to face exigent environmental threats.

ഔറോ

Andrew Kindseth

Faculty Advisor: Venkat Chandrasekhar

The Nonlocal Superconducting Quantum Interference Device

Magnetic measurements are important in a variety of fields, with applications ranging from medical imaging to probing fundamental physics. Superconducting quantum interference devices (SQUIDs) are the basis for some of the most sensitive detectors of magnetic fields. SQUIDs are typically made with 2 parallel superconductor/insulator/superconductor (SIS) Josephson junctions and operated with voltage bias. The bias causes the SQUID to emit microwave radiation, which can affect the sample being measured, due to the ac Josephson effect. Here I describe a SQUID with superconductor/normal-metal/superconductor (SNS) Josephson junctions. SNS SQUIDs can be operated with a voltage bias with expected sensitivity comparable to conventional SIS SQUIDs. However, SNS SQUIDS can be operated in a novel mode due to the long normal metal section in the junction. This new method allows measurement of the magnetic flux without a voltage bias. Avoidance of the finite voltage bias prevents generation of microwave radiation. This gives the nonlocal SQUID higher versatility in usage on microwave sensitive samples. To investigate the design we used simulations based on the quasi-classical theory of superconductivity as well as electronic transport measurements on a mesoscopic device. Estimates of the flux sensitivity in the novel mode show that it should be comparable to conventional SIS SQUIDS. The nonlocal SQUID promises to expand the versatility of SQUID based magnetometers without sacrificing their unparalleled sensitivity.

ഔറോ

Anya Kirsch

Faculty Advisor: David Rapp

Deliberate Evaluation Reduces Reproductions of False Infomation

People frequently encounter inaccurate content in their daily lives. Reading false statements and ideas even once can increase their perceived accuracy, even in cases when people know the information is false (Rapp & Braasch, 2014). This project extends prior work by specifically testing whether deliberate evaluation at exposure reduces people's *reproductions* of false information. 171 English-speaking adults

were randomly assigned to judge 81 true and false statements for how interesting they were or how accurate they were. Half of the statements were well-known or "easy" facts and half of them were unfamiliar or "hard". Afterward, participants answered open-ended questions pertaining to each of the facts. Responses were coded as correct or incorrect. Participants made more errors answering hard ($M = .13$, $SD = .16$) than easy ($M = .06$, $SD = .13$) questions, $b = 1.25$, $z = 4.37$, $p < .001$, and made more errors after judging false statements ($M = .17$ $SD = .18$) as compared to true statements ($M = .02$, $SD = .04$), $b = 2.91$, $z = 18.67$, $p < .001$. Importantly, we also observed a significant statement validity x instruction type interaction, $b = .76$, $z = 2.50$, $p = .02$. Making accuracy versus interest judgments at exposure reduced the amount of incorrect responses following false information. Our results suggest that people may not be routinely considering the accuracy of information they encounter unless explicitly instructed to do so, and encouraging people to deliberately evaluate information can reduce their reproductions of potentially harmful misinformation.

<div align="center">ଈୠ</div>

Andrew Laeuger

Faculty Advisor: Andrew Geraci

Method for Calibration of Micron-Scale Distances Between Conducting Force Carriers

In order to test the strength of forces which decay rapidly with the distance between objects, the distance between the source and recipient of the force in question must be known accurately. Small errors in this distance measurement can lead to significant errors in the experimental determination of other parameters which govern that force. To determine the distance between two conducting surfaces, which will be employed for short-range force measurements, with precision on the order of microns, I developed a method which exploits the electrical capacitance of the two-surface system. I can discretely modify the gap between the surfaces by displacing one surface via a computer-controlled stage, which can shift in sub-micron increments. By placing an oscillating voltage on one surface and monitoring the voltage which passes through the gap (at the voltage oscillation frequency) as I adjust its width, I formulated a mathematical model to correlate voltage with gap width. While this project is still ongoing, I have obtained strong evidence that the specific model that I chose for statistically fitting my voltage data describes the true system with high fidelity. Upon completion of this gap width characterization, the method developed will be applied to a system which will test the strength of Newtonian gravity at micron scales and search for potentially anomalous behavior which may reveal new physics. This method may prove instrumental to other short-distance experiments which are not harmed by local electric fields.

<div align="center">ଈୠ</div>

Shannon Lally

Faculty Advisor: Shalini Shankar

Irish Language Revitalization in the Republic of Ireland and Northern Ireland

The revitalization of endangered languages is both deeply personal and political, as language subjugation is directly linked to intentional efforts by colonizing powers to suppress and eradicate indigenous culture and dismantle local collective identity. Many studies have been conducted on how to promote endangered languages, but few evaluate the effectiveness of the movements and explore the underlying determinants of success, particularly how the relationship between minority language speakers and the colonizing powers may affect these movements. The Irish language revitalization movements in the Republic of Ireland and Northern Ireland serve as a particularly valuable case study of the role of anti-colonial cultural movements especially as they relate to language; the Republic of Ireland is an independent country, while Northern Ireland is still part of the United Kingdom. Despite state-support for Irish language revitalization, census data shows that the Republic of Ireland saw a decrease in the percentage of speakers in all 26 counties from 2001 to 2011. On the other hand, the percentage of Irish speakers during this time in Northern Ireland increased in half of the counties, and decreased at a lower rate in the remaining counties. This research explores how nationalism drives language revitalization movements, and how the stage of decolonization determines its success. I argue that the presence of an identity conflict between colonizer and colonized increases the efficacy of language revitalization movements, as language is a component used to establish a separate identity and assert independence from a colonizer.

ഹༀᏟᎡ

Madeline Lane

Faculty Advisor: Lilah Shapiro

"Zooming Through the College Experience: How Emerging Adults Approach the COVID-19 World"

College students fall within emerging adulthood, a developmental period characterized by high expectations for the future, self-focus, and exploration as well as by significant instability. With pandemic-imposed limits on opportunities and the introduction of COVID-19-related instability, the current experiences and perspectives among college students require consideration. Research conducted during COVID-19 thus far indicates college students experience elevated anxiety and depression, along with changes in sleeping, eating, and concentration. The present study investigates the context surrounding these impacts, particularly examining Northwestern students' experiences of COVID-19, through a Grounded Theory approach paired with a demographic survey. Using semi-structured interviews, this study probed twenty Northwestern students' perspectives on their own and others' behaviors during COVID-19 and on how they navigate academics, activities, relationships, and

responsibilities. Preliminary findings reveal that students have markedly shifted towards pragmatism and have assumed a number of "adult responsibilities," including caretaking and monitoring relatives' behavior. Students also describe disillusionment with America, altered peer relationships – whether influenced by trust, judgment, or a transition to virtual communication – as well as perceiving schoolwork as endless. Further analyses, including demographic analysis, may offer implications for Northwestern and other institutions who wish to support undergraduates in the current moment and in future disasters. This window into students' sources of stress and their reactions can inform psychosocial service applications. Specific interventions may intentionally support students in navigating changes in peer relationships and networks and accentuate boundaries between "work" and "life."

ഇരു

Jay Lawrence

Faculty Advisors: Frederick Northrup and Owen Priest

Effect of Intramolecular Hydrogen Bonding on Solution Conformations of Phenolic Mannich Bases

Drug design often exploits intramolecular hydrogen bonding to encourage a molecule to adopt a specific conformation that is necessary to achieve a desired activity and metabolism. This research examines the effect of intramolecular hydrogen bonding on the solution conformations of a broad scope of tertiary amine phenolic Mannich bases. Variable temperature proton nuclear magnetic resonance (VT ^{1}H NMR) spectroscopy permits inspection of the hydrogen-bonded conformation as a function of temperature. At room temperature, these molecules rotate internally about single bonds and exchange freely between many conformations, uninhibited by the hydrogen bond. At sufficiently low temperatures (e.g., -50 to -100 °C), the internal rotation of the molecules becomes restricted by the intramolecular hydrogen bond, and the molecules adopt more than one stable low temperature conformation. Factors such as steric hindrance and chirality have previously been probed to assess the strength of the hydrogen bond as a function of temperature. Our recent work has investigated the influence of solvent on the hydrogen-bonded conformations: more polar NMR solvents (e.g., acetone-d_6) have a greater dielectric constant, and data suggest that they more effectively disrupt the hydrogen bond, thereby preventing the molecule from existing in the multiple stable conformations until much lower temperatures. Future projects will incorporate solvent dependence into electronic structure calculations in order to accurately visualize these low-energy conformations.

ഇരു

Kate Lawson

Faculty Advisor: David Rapp

Information and Social Media: When and Why People Like and Share Accurate and/or False Claims

In today's day and age, information is quite literally at the tips of our fingers. While accurate information can support how we understand and navigate the world, we also frequently encounter information that is misleading and/or false. And unfortunately, these inaccurate claims and ideas can influence people's judgments and decisions in sometimes life-changing ways. For example, some researchers have attributed monumental world events, like the 2016 U.S. election and the current hesitancy surrounding COVID-19 vaccines, to the spread of misinformation online. Given the increasing extent to which people are informed by claims circulating on online platforms, our project investigates when, how, and why people engage with accurate and inaccurate content on social media. A sample of 40 adult participants viewed social media-like posts that contained either accurate (e.g., essential oils cannot prevent the common cold) or inaccurate (e.g., essential oils can prevent the common cold) assertions about the world. They reported their likelihood of "liking" and "sharing" each post and provided reasons behind their decisions. Through content analysis of participants' open-response answers, we characterize when and why people engage with information on social media, and whether these reasons differ between posts containing accurate versus inaccurate information. This research fills an important gap in existing literature by explicitly capturing the *reasons* people would want to like and share information on these platforms, rather than relying on assumptions made by researchers about the motivations underlying people's behaviors.

ଽଡ଼ଔ

Christopher Lee

Faculty Advisor: Martha Vitaterna

The Role of Circadian Timing of Sugar Consumption and of Exercise in Regulation of Healthy Body Weight

Obesity has been linked to multiple health problems such as cardiovascular diseases and Alzheimer's disease. Attempts to reduce the risk of obesity typically are in the form of reduced caloric intake and increased exercise, however decades of public health measures have not yet solved this problem, so there may be other factors that are being overlooked. One potential area of interest is the timing of both caloric intake and exercise. The timing of consumption of sugar was studied in one experiment herein. In addition to diet, the other method of preventing obesity is through exercise. A dietary supplement to combat obesity is prebiotic soluble fiber. One such prebiotic is modified resistant maltodextrin (MRM), which can improve metabolic homeostasis and is observed to increase activity. Whether this supplement does so by increasing total activity or preferentially increasing activity during

the right time was examined in the second experiment. We set out to test the roles of circadian timing of both eating and exercise. Building on previous findings with high-fat diet, we provide evidence that mice fed a high sugar diet through sugar-sweetened beverages (SSBs) only during the 12 hour light phase (the usual rest period) gained significantly more weight than mice provided SSBs only during the 12 hour dark phase (the usual active period). Additionally, we sought to further define the phenomenon of if MRM better predicts limited weight gain by selectively correcting circadian activity timing. "Low runner" mice genetically predisposed to inactivity and wild-type control mice were monitored for their activity. We observed that MRM may increase overall activity and preferentially increase activity during the 12 dark phase for the nocturnal male mice "low runner" strain. Results for wildtype male mice and female mice of both strains were inconclusive. These two experiments support our hypothesis interventions that correct circadian timing of eating and exercise may help reduce the risk of obesity.

ରେଓ୫

Maxwell Lee

Faculty Advisor: William Klein

Optimizing the Conjugation of ACU-193 Functionalized Nanoparticles and Investigating its Ability to Detect Aβ Oligomers

Alzheimer's disease is an expensive and devastating disease that affects 1 in 9 adults over 65. Magnetic nanostructures functionalized with antibodies (ACU-193) specific to toxic Alzheimer's Disease precursor molecules (Aβ oligomers) may enable MRI imaging of Aβ oligomers or delivery of heat and medication to destroy Aβ oligomers and treat Alzheimer's Disease. The current protocol to functionalize these nanoparticles is inefficient, with only 16% of the antibodies binding to the nanoparticle. This project sought to improve the efficiency of binding antibodies to the magnetic nanostructures (functionalization) without sacrificing the ability to specifically bind Aβ oligomers. In the original protocol, there was a high concentration of antibodies leftover after functionalization, indicating waste and inefficient binding. This project hypothesized that this was not due to poor binding, but rather due to too high of an antibody concentration. In theory, if there was too much antibody in the initial solution, the nanoparticles could be fully saturated with antibody during functionalization and there would be leftover antibody which would present as inefficient binding, despite the nanoparticles themselves being functionalized properly. Thus, this project lowered the initial concentration of antibodies and the binding efficiency improved from 16% to 90%. The new particles demonstrated specific binding in immunofluorescence reminiscent of the particles produced using the original protocol. This verified their maintained efficacy with improved binding efficiency. This improved protocol reduces waste of expensive antibodies and yields nanoparticles that are just as effective, if not potentially more effective, to be used in future diagnostics and therapeutics.

ରେଓ୫

Unsun Lee

Faculty Advisor: Keith Tyo

Computational Modelling of Protein Network for Binary Switch-like Detection of Disease Biomarkers

Rapid point-of-care (POC) diagnostics enable early detection of diseases that is critical for clinical decision making. While many POC devices, such as the paper-based lateral flow assay (e.g., pregnancy test strip), can rapidly detect the presence of specific proteins, they have limited sensitivity, threshold uncertainty, and less reliable quantification of the results in comparison to those that utilize DNA base pairing mechanism for amplification (e.g., polymerase chain reaction test). Thus, there is a pressing need for innovative POC designs that can detect low concentration proteins and small molecules, which lack the DNA base pairing to be used for amplification. To address this limitation, the Tyo research group is developing an *in vitro* detection scheme for proteins and small molecules via self-amplifying enzymatic pathway incorporating split protein system and positive feedback loops that produce readouts in less than a minute. In the preliminary stages of testing this novel protein network, I have optimized an ordinary differential equation-based model in MATLAB to simulate the dynamic protein network behavior using previously reported protein affinity and kinetic parameters. Through running simulations over a range of component protein concentration conditions, I successfully demonstrated switch-like bistable, positive feedback behavior and analyte sensing tunability of the split protein network. Based on model predictions, experiments will be designed with component protein concentrations that should result in ultrasensitive, bistable system behavior to validate platform performance. By using model-based experimental design, the overall experimental burden is decreased, saving resources while validating the novel protein network design as a POC diagnostic.

৺৩৵

Edward Li

Faculty Advisor: Jhumku Kohtz

Identification of Novel lncRNAs Nr2f2 and Ebf3

Much of the vertebrate genome for protein-coding genes has been discovered. However, many lncRNAs (long non-coding RNAs) have yet to be characterized, in part, due to poor conservation and low expression. LncRNAs are noncoding regions of the genome that can have vital roles in gene regulation and cellular processes. Many lncRNAs are involved in embryonic development as revealed by loss-of-function and gain-of-function studies. The Kohtz lab has previously identified Evf2, a nuclear cloud-forming, ultraconserved (>200bp of 98% vertebrate conservation) enhancer (UCE) lncRNA, that regulates Dlx5/6UCE enhancer activity and chromosome topology of genes involved in interneuron differentiation. In a screen for Evf2-like lncRNAs, the Kohtz lab combined bioinformatics, qPCR, and RNA fluorescence in situ hybridization (FISH), identifying 2 nuclear cloud-forming UCE lncRNAs, Nr2f2, and Ebf3. In this work, we show that Nr2f2 and Ebf3 are cloud forming lncRNAs (long non-coding RNAs) similar to Evf2. The clouds formed by Nr2f2 and Ebf3 also colocalize with PP-RNPs such as cohesion (Smc1 and Smc3) and chromatin regulators and

remodelers (Smarcc2) as well as transcription factors (Sox2). The colocalization of the RNA clouds between Nr2f2 and Ebf3 and Evf2 suggests that Nr2f2 and Ebf3 may be increasing association of PP-RNPs to the Dlx5/6 site. The diverse expression profiles and disease phenotypes associated with Nr2f2 and Ebf3 suggest that a wide variety of functions are facilitated by the localization of different factors and proteins in the Nr2f2 and Ebf3 RNA clouds.

<p align="center">☙❧</p>

Julia Lowenthal

Faculty Advisor: Lilah Shapiro and Nick Davis

The Romanticization of Intimate Violence: A Case Study on Gossip Girl

My project analyzes the romanticization of sexual violence, relationship violence, and stalking, referred to as 'intimate violence', in the popular teen TV show *Gossip Girl*. Teen intimate violence is a pervasive issue, and the trauma of experiencing intimate violence is life-long. Many studies have analyzed the effects of violence in media, broadly, on adolescents, but few have focused on intimate violence specifically. I sought to understand how Gossip Girl, as a significant cultural influence, romanticizes intimate violence. To collect my data, I watched through the entirety of Gossip Girl to record each portrayal of and reference to intimate violence, both the acts of violence themselves and all commentary surrounding the topic. To analyze my data, I used open coding in grounded theory to identify themes. My analysis thus far has shown that the primary means by which romanticization occurs is through the minimization of violence, victim-blaming, slut-shaming, the romanticization of perpetrators and their character growth, lack of acknowledgment of violence, and the use of intimate violence to drive the plot. The media is a primary source for many young people to learn about sex and relationships, so the way that these phenomena are portrayed is significant. This project was necessary to understand how popular shows for teens romanticize these incredibly violent acts, and how we might shift away from those portrayals to create a world free of intimate violence.

<p align="center">☙❧</p>

Madison Luce

Faculty Advisor: Tiffany Schmidt

Validating Genetic Tools to Isolate Individual ipRGC Subtypes: An Illumination Across Reporter Lines

Light regulates the mammalian vertebrate visual system to affect a wide array of visual behaviors. Light is detected by the canonical rods and cone photoreceptors, but also by a novel, third class of photoreceptor, termed intrinsically photosensitive retinal ganglion cells (ipRGCs). ipRGCs express the photopigment melanopsin (gene: Opn4) and are a diverse population, consisting of six types (M1-M6), which differ in morphology, electrophysiological properties, central brain projections, and their influences on visual behavior. However, the extent to which these ipRGC subtypes differ in their gene expression and how each individual subtype contributes to visual behavior is unknown. To address

this gap in knowledge, the Schmidt Lab has developed an Opn4^{FlpO} mouse line, which can genetically isolate individual ipRGC subtypes. My project involves validating and characterizing the Opn4^{FlpO} mouse line using both single and double-reporters, while also analyzing retinal cell expression patterns. To validate the line, mammalian vertebrate (mouse) retinas were dissected and immunohistochemistry was performed, allowing for various ipRGCs to be labeled, imaged, and counted. One major conclusion of my preliminary data suggests that the Opn4^{FlpO} line exclusively labels ipRGCs across various reporter lines. Interestingly, not all reporter-labeled cells can be co-labeled with Opn4, however, and a neurofilament staining was employed for elucidation of these results. This work helps contribute to a major goal of visual neuroscience, which is to understand how each of the 40 types of retinal ganglion cells influences visual behavior and determine any commonalities in their gene expression.

<div align="center">ഞരു</div>

<div align="center">**Shayan Malik and Jessica Moonjely**</div>

<div align="center">*Faculty Advisor: Megan Geigner*</div>

<div align="center">**Representations of Middle Eastern, Asian, and Indigenous Communities in Early American Mass Entertainment**</div>

Between 1875-1935, thousands of Americans attended chautauquas: traveling tent shows that featured music, theatre, elocution lessons, lectures, children's activities, and other educational and entertainment programming. This period has been studied using historical, economic, and sociological lenses, among others, but rarely through the lens of performance. In addition, circuit chautauquas were an early form of mass popular culture in the United States and ultimately served to become the principal avenue for introducing Americans to other cultural identities including Middle Eastern, Asian, and Indigenous communities. The purpose of this study is to examine how the chautauquas affected the construction of discourses of race and ethnicity at the end of the nineteenth and beginning of the twentieth centuries, a period of massive migration and immigration. Through the investigation of the chautauqua archives at the University of Iowa, we will be able to identify trends and declarations from which we will examine the impact of these performances on the dialogue used for different minority groups. Furthermore, many of the lectures included offensive rhetoric of "Asiatics," a term they used to divide groups of people from Middle Eastern, South and East Asian, and North African regions from the rest of the world. We argue that circuit chautauquas' representation of Asian peoples, culture, and religion was an early form of mass American culture employed to exoticize Asianness and make Asianness unassimilable with Americanness.

<div align="center">ഞരു</div>

Sydney Matrisciano

Faculty Advisor: Nicolette Bruner

Whitewashed: The Impact of Whiteness in Mississippi Landscapes

This project is a visual exploration of the physical impact of whiteness in the landscapes of Mississippi, with particular focus in rural communities. Additionally, this project expands on the tradition of overpainted photography by utilizing embroidery thread instead of paint. Overpainting is a 19th century technique to add color to black and white photographs. Finally, the project incorporates natural pigment and dye produced from each photographed site in the final pieces. The landscapes were chosen by combining the following criteria: a manmade natural feature, a connection to the artist's experience of whiteness or race, and abundantly available natural pigments. Background information was gathered through oral histories, newspaper records, and title searches. This project shows that homes, livelihoods, and fondest childhood haunts are marred by the wounds of ingrained racism; its impact isn't limited to overtly racist confederate monuments and flags. This project create space for conversation about race in rural communities and highlights the role of Southern whiteness in shaping Mississippi landscapes.

ഔഇ

Ellie McCarthy

Faculty Advisor: David Uttal

Digitization of Mental Rotation and Shape Knowledge Assessments for Zoom

The COVID-19 pandemic prompted the need to digitize various psychological assessments for use in a virtual environment, including those measuring shape knowledge and mental rotation ability in young children. This work focuses on the methodology behind assessment modification for Zoom in children ages 4-6 and investigates the reliability of digital assessment. Modifications were made to address multiple limitations of virtual studies, including the limited attention span of young children and aspects of in-person assessment that wouldn't transfer to Zoom, such as hand gestures and physical materials. Some of the modifications included adding animations to the digitized materials, reducing the number of questions per assessment, and adding various labels to answer choices to replace participants pointing to indicate their response. The data collection is still in the pilot phase, but preliminary results suggest the modified digitized assessments are effective for online studies and have potential benefits that extend far beyond just continuing research amidst a global pandemic. As participants aren't limited by access to Northwestern's campus, much larger, more socioeconomically, and geographically diverse samples can be recruited, potentially reducing sampling biases in in-person psychology research. Future research in this area should explore other potential modifications to assessments, as well as compare the results of digital versus in-person assessment.

ഇൻൽ

Stephanie McCarty and Paige Smyth

Faculty Advisor: David Uttal

Imagining a Role Model: Female Children's Computer Science Self-Efficacy

When asked to imagine a computer scientist, males and females tend to report that they imagine a male. This perception can be detrimental for females' computer science self-efficacy and may contribute to findings that as early as elementary school females are less interested in and less confident in their computing abilities in comparison to their male peers. However, not all females imagine computer scientists to be males. Here we examine the association between females' perceptions of computer scientists' characteristics and their own self-efficacy about coding. Through a larger research study, we measured female children's computer science self-efficacy with a survey on their beliefs about their personal coding ability and the characteristics of other children who code. They were also asked to draw a picture of a computer scientist and report similarities between themselves and the person they drew. We predict that female children who drew female computer scientists will have greater computer science self-efficacy. Initial analyses suggest differences between the responses of girls who drew male computer scientists and those who drew female computer scientists. This work will illuminate how female children conceptualize the identities of professional computer scientists and their own identities as computer scientists in the face of cultural and social norms that tend to place men at the center of STEM fields. It will also provide insight into what specific beliefs or practices, such as participating in a coding activity, might affect female children's development of computer science self-efficacy.

ഇൻൽ

Tommy McGing

Faculty Advisor: Mark Witte

Public Health: The Impact of Superfund Sites on Cancer Rates in Pennsylvania

This paper examines the impact of active Superfund sites on cancer incidence rates and cancer fatality rates at the county and city level in Pennsylvania. Cancer fatality data was drawn from the Centers for Disease Control Wide-ranging OnLine Data for Epidemiologic Research (CDC Wonder), and cancer incidence data was extracted using Enterprise Data Dissemination Informatics Exchange (EDDIE) from the Pennsylvania Department of Health. A multivariate linear regression was run, with health outcome as the left hand side variable and demographic controls, including age group, gender, and race, along with unemployment rate and the number of active Superfund sites, as the right hand side variables. I hypothesized that more active Superfund sites would be a significant predictor of increased cancer rates, due to the toxic and frequently carcinogenic waste often left in the soil that can seep into the groundwater which affects the local community. My analysis results showed that although not statistically significant, the presence of Superfund sites reliably held a positive relationship with cancer rates, whether in the total, male, or female populations, at both the county and city levels. They also

illustrated that, aside from gender and old age often being significantly related to cancer rates, increases in unemployment could predict increases in cancer rates. Health and its relation to unemployment is backed by other literature, which this furthers.

৪৩৫৪

Alka Meresh

Faculty Advisor: Lilah Shapiro

Attributing Blame During the Coronavirus Pandemic

The global coronavirus pandemic has dramatically changed the way people and institutions interact with one another. In the United States, there has been an observable and documented increase in xenophobia and a breakdown of social and institutional trust. Consistent with a US history of scapegoating other populations for major crises, the US government primarily blamed China for the origin and spread of the virus. These actions have been discussed in a variety of forums but have not been examined specifically with respect to people's interpretations and understandings of the pandemic. The current project examines the ways in which individual people attribute and form their concepts of blame about and during the pandemic. I interviewed 12 Northwestern University undergraduate students and asked questions about who they blame and why. The data were subjected to grounded analysis and coded for common themes. The analyses should provide insight into how narratives of blame are developed and disseminated to the public and consumed by the public. This work could have broader societal implications, such as being used to improve health campaigns or support programs designed to rebuild social and institutional trust.

৪৩৫৪

Lauren Miller

Faculty Advisor: Adriana Weisleder

Spanish-English Bilingual Book Sharing in Latino Families

Shared book-reading is one of the most valuable interactions caregivers can engage in to support their child's language development, as book sharing promotes vocabulary growth, abstract language development and literacy. However, despite the fact that Latino children make up 20% of young children in the United States, there is a lack of culturally responsive research on book sharing interactions in Latino families. The current study aims to investigate parent-child booksharing interactions in Latino families, and how the language of the book affects interactions. The study involves video-recording participants as they read two books with their children-one book in English and one bilingual book in Spanish/English. We code these book sharing interactions using an adaptation of the Adult-Child-Interactive Reading Inventory (ACIRI), a scale that measures adult-child book-sharing behaviors. Our coding scheme was adapted to include behaviors representing a wider range of reading styles, including a story-telling style that has been found to be common in Latino families. We also asked participants about their satisfaction and comfort levels while reading

the two books. We predict that Spanish-speaking parents will report higher satisfaction and comfort with the bilingual book and that they will engage in more coded behaviors, including relating the book to their personal lives, teaching words/sounds, and asking questions when reading the bilingual book compared to the English book. Analyzing these interactions will give us insight into the reading behaviors of Latino parents, which will help shape future literacy programs to best fit the needs of Latino families and their children.

ഹⓒൽ

Eric Min

Faculty Advisor: Tiffany Schmidt

The Role of Intrinsically Photosensitive Retinal Ganglion Cells in Threat Anticipation

There is a clear evolutionary survival advantage in detecting the presence of threats in an animal's environment. This is commonly achieved through the visual system, and vision is one of the primary senses used by mammals to detect changes in the immediate surroundings. However, animals must also be able to anticipate the appearance of a future threat. Whether and how the visual system may influence these pathways is not well understood. In this project, we tested the hypothesis that melanopsin-expressing, intrinsically photosensitive retinal ganglion cells (ipRGCs) are critical for this ability. We exposed control and melanopsin knock-out (MKO) mice to a threatening, "looming" stimulus. Two days later, we measured the mice's ability to anticipate the appearance of a second threatening stimulus in the same context. Surprisingly, we found that control and female MKO mice learned to anticipate the threatening stimulus, while male MKO animals lacked this ability. Additionally, c-Fos and Arc analysis suggested that the Perihabenular Region (PHb), the Nucleus Accumbens (NAcc), and the Dentate Gyrus Polymorph Layer (DG-po) were potential brain nuclei that drove threat anticipation. Thus, we sought to determine whether there was an anatomical connection between ipRGCs and these brain nuclei. Using Cre-dependent viruses and CTB, a neural tracer, we observed that ipRGCs project to the PHb, which then sends axons to the NAcc. We then chemogenetically silenced GABAergic neurons in the PHb and found that this reduced male mice's ability to anticipate the threatening stimulus. These results suggest that an ipRGCs-PHb-NAcc circuit drives visual threat anticipation.

ഹⓒൽ

Imani Minor

Faculty Advisor: Leoandra Rogers

"Just because I don't act ladylike doesn't make me any less of a girl": Patriarchal Stifling of Self-Expression in Adolescent Girls

White patriarchal norms in America delineate power dynamics which serve to dictate the roles that girls "should" occupy and how they "should" express themselves. Concepts of femininity and ladylikeness are products of such racist patriarchal norms, which restrict girls from simply *being.* The patriarchal constraints on being may hinder girls from forming genuine and healthy relationships with themselves and others. This project explores how adolescent girls speak about patriarchal constraints in interpersonal contexts. I specifically studied the question: *How do girls talk about self-expression and self-presentation within the context of others' views and expectations of girls?* I analyzed qualitative interview data of 42 Black, 39 Latina, and 42 White girls (N=123; 10-graders). I found that 72% (n = 88 girls) of the sample referenced patriarchal constraints on *being*, via three avenues: **physical/body** (appearance and posture), **voice** (speaking one's thoughts), and **emotional** (how and when to emote). Notably, *physical/body* constraints emerged as the most prevalent category (55%) and the only category that varied systematically by race. Latina and Black girls were more likely to mention *physical/body* constraints than White girls. I discuss implications for how the multiple pathways of patriarchal constraints coexist in the racialized norms of girlhood.

ഇൻൽ

Allison Mo

Faculty Advisor: Rebecca Seligman

Traditional Chinese Medicine in Western Contexts: Translation, Trust, and Efficacy

Ethnomedicines are medical systems that are culturally influenced and defined. With globalization, these medicines are increasingly practiced outside of their context of origin. As ethnomedicines are culturally specific, the transplantation of these medicines into different cultural contexts influences their practices. Drawing from fourteen interviews with practitioners and patients from seven clinics in the Chicagoland area, this study examines the practice of Traditional Chinese Medicine (TCM), an ethnomedicine based on Chinese cultural concepts, in a Western context. This study explores three main topics: the translation and production of ethnomedical knowledge in Western contexts, trust in the patient-practitioner relationship, and efficacy of TCM. Specifically, this study finds that culturally specific concepts in TCM are translated and framed in terms of biomedicine, in order to accommodate dominant, Western cultural understandings. This manipulation of Chinese medical concepts practitioners' medical authority, which, in turn, fosters a trusting patient-practitioner relationship. Trust is an important mechanism for efficacy of medicine: in the case of TCM, trust in the patient-practitioner relationship encourages adherence and continual use. As TCM requires long-time use for results, this continual use is crucial for efficacy. Analysis of data from the interviews demonstrates that ethnomedicines, such as TCM and biomedicine, adjust to the specific cultural context in which they

are being practiced, through manipulation of meaning, in order to foster trust and promote efficacy. Furthermore, this study highlights the importance of patient understanding and trust in the patient-practitioner relationship for increasing efficacy of all medical practices.

This project was funded in part by the Office of Undergraduate Research's Summer Undergraduate Research Grant.

ಹಿಂಜಿ

Lexie Modeas

Faculty Advisor: Joshua Sherman

The Threat of Vaccine Misinformation on Herd Immunity
Factors Influencing Parental Vaccination Decisions

The goal of this paper is to explore the determinants of a child's vaccination status. As the Centers for Disease Control and Prevention (CDC) recommend vaccinations be administered in the early years of a child's life, parents are responsible for most vaccination decisions. These decisions are important as mass vaccination establishes herd immunity and protects against the spread of infectious diseases. Currently, the United States is relying on mass vaccinations to end the COVID-19 pandemic. However, there are already concerns that vaccine hesitancy will prevent the country from achieving necessary vaccination rates. Past data on vaccination rates can help identify which people do not get vaccinated, and why. For the purposes of this study, I used recent survey data from the CDC to test if there is any correlation between parent, child, and household demographics and vaccination statuses in children. My initial results show that breastfeeding duration reduces the probability a child will be vaccinated, as breastfeeding is associated with the "natural" health movement that rejects "manufactured" medical practices. In contrast, receiving benefits from the WIC supplemental nutrition program is positively correlated with being vaccinated, as this program constantly monitors the vaccination statuses of recipients. My results will combine previous literature on antivaccination groups and movements with actual data on which people decide not to get their children vaccinated. Analyzing the root of antivaccination behaviors can help inform the medical community and the U.S. government on how best to ensure widespread vaccination and the end of the COVID-19 pandemic.

ಹಿಂಜಿ

Michael Montoya

Faculty Advisor: Louise Egerton-Warburton

Soil Quality as a Result of Anthropogenic Influences in Cedar Glade Habitats

Soil health and quality play significant roles in the daily processes of an ecosystem and its inhabitants. One such habitat called a cedar glade is a distinguished area in the Middle Tennessee area that shelters many native endangered species. Studying the soil health of a cedar glade can enlighten the general public about why these areas need protection and what efforts ensure their safety for future generations. Soil samples were extracted and analyzed for nitrate, ammonium, and phosphate levels

using spectrophotometric methods, with pH and TDS analyses. In addition, dry weight concentrations of nitrate, ammonium, and phosphate were calculated using the percent moisture of the samples. The cedar glades included the Stones River National Battlefield, Flat Rock Cedar Glade and Barrens Trail, Couchville Cedar Glades, Cedars of Lebanon State Park, and one unprotected site. This study used samples from multiple cedar glades to display soil quality at each site and describe how various anthropogenic factors, including federal or state protection forest management practices, may influence soil health. This study concluded that there was no statistically significant difference between nitrate, ammonium, and phosphate levels in federal/state-protected sites versus the disturbed site. Acquiring more data, incorporating more protected and unprotected locations, and changing the collection season would be required in future soil health studies. Understanding the impact humans have on cedar glades can push for more conservative efforts and improve the education about these and many other endemic habitats.

ᏚᎧᎫ

Madelyn Moy

Faculty Advisor: Katherine Amato

Gut Microbiota and Immune Function Differences During Pregnancy

During pregnancy, mothers undergo a range of physiological changes including shifting hormone levels, modified immune function, and reduced gut motility. These changes are necessary to meet the pregnant mother's increased energy needs and inhibit rejection of the fetus. The gut microbiota (GM) – the community of microorganisms that live in the digestive tract – is theorized to play a role in the production and regulation of the immune system. As a result, the GM is theorized to mediate immune changes during pregnancy. Because the exact nature of this relationship is unknown, my project investigated how the GM and markers of immune function differ during pregnancy by focusing on the fecal samples and blood spots of pregnant and non-pregnant women from Cebu, Philippines. By conducting 16s rRNA bacterial gene sequencing, preliminary data indicates that pregnancy does not have a significant effect on the GM for this dataset, which is contradictory to previous research. Furthermore, infection within a week of sample collection did not significantly affect the GM, suggesting only chronic or long-term inflammation will result in changes to the GM. Since previous research on both immune function and the GM during pregnancy has focused on American and European populations, this project contributes to limited data on how the relationship between these factors may vary across populations. Ultimately, this research can improve our understanding of the factors driving pregnancy outcomes and can inform the development of microbial techniques to treat immune diseases.

ᏚᎧᎫ

Semanti Naiken

Faculty Advisor: Colleen Peyton and Theresa Sukal Moulton

Asymmetrical Hip Flexion and Extension in Infants as a Predictor of Cerebral Palsy

Cerebral palsy is a disease resulting from abnormal brain development or injury during infancy. CP can be difficult to diagnose, as it shares symptoms with other developmental diseases and imaging to detect injury is not always accessible. Consequently, diagnosis often happens relatively late, around 12-24 months. This project analyzes infant movements as potential early indicators of CP to improve the diagnosis timeline. I am investigating if infants with CP show differences in leg movement compared to typically developing infants, as this may indicate abnormal development. I coded the onset and offset of isolated lower extremity movements of 16 infants (8 with CP and 8 without) at 12-14 weeks using one-minute videos. Coders were blinded to infants' CP outcome. The frequency (number of instances) and duration (total time) of hip flexion (moving the leg forward) and extension (moving the leg backwards) were analyzed for significant differences between groups using two-tailed t-tests. Analysis indicated that infants with CP showed significant increases in duration of right hip flexion ($p=0.042$) and total hip extension ($p=0.0093$) compared to the typically developing group, but no significant difference in total frequency of either movement (flexion: $p=0.31$, extension: $p=0.98$). Overall, these results suggest that extended duration of hip movements could indicate CP. Initial findings require replication, but could help develop an early CP diagnostic tool. While it is known that CP affects movement, this project could provide a measurable standard for how hip flexion and extension specifically present in CP.

<div align="center">ॐ</div>

Sam Lien Nguyen

Faculty Advisor: Masaya Yoshida

On Grammatical Sensitivity

Despite the complexity of grammatical structures of sentences, we understand sentences rapidly and accurately. Researchers have suggested that the efficiency of language understanding indicates that native speakers are not sensitive to complex grammatical structures, a phenomenon hereby referred to as "grammatical insensitivity." This study investigates the validity of the grammatical insensitivity assumption, finding evidence against this notion. Using a web-based word-by-word reading experiment (Maze), we presented superficially similar but structurally different sentences, as in:

   (1) a. Which story about   Mary do the stern judges say that she tried to spread before the finals?
         b. How sure of   Mary do the stern judges say that she tried to look before the finals?

Here, if grammatical structures are not ignored, *she* can refer to *Mary* in (1a) but not in (1b). This is because the noun phrases hosting *Mary* in (1a) and (1b) serve different grammatical functions. Our experiment examined the reaction time at critical word regions (such as *Mary* and *she*) of 80 readers

across 96 sentences manipulated in a 2x2 design. This measure indicates how two structurally variant sentences were analyzed by their reader. By comparing the reaction time between the two sentences, we were able to evaluate whether or not the readers were sensitive to the grammatical structures. The results of our investigation confirm that English native speakers are in fact sensitive to grammatical structures of sentences, offering evidence opposing the notion of grammatical insensitivity. We further conclude that the examination of predictive theories underlying language processing, an important aspect of psycholinguistics that remains unclear, must make use of knowledge related to grammatical structures.

გიენ

Hannah Oelschlager

Faculty Advisor: Karl Scheidt

Developing MEK4 Inhibitors for Pancreatic Cancer Therapeutics

Cancer occurs when healthy cells have mutated proteins which allow for uncontrolled cell division and proliferation throughout the body. These cells multiply rapidly due to unregulated cellular signaling pathways. In pancreatic cancer, one of the most lethal cancers, there are high rates of genetic mutation of MEK4, an enzyme in the mitogen-activated protein kinase (MAPK) pathway. The typical function of the MAPK pathway is to communicate a signal from the cell surface to the nucleus to initiate essential cell processes like cell death, but over-activation due to MEK4 mutations allows cancer cells to circumvent this mechanism. The over-activation of MEK4 therefore affects the entire pathway, leading to disease. It has been shown that removing MEK4 sensitizes pancreatic cancer cells to an FDA-approved drug that targets MEK1/2, another protein in the same family. Although permanently removing proteins from cells in a laboratory is possible using genome editing, it is not currently feasible in the context of therapeutics. Therefore, the goal of my research is to synthesize MEK4 protein inhibitors based on an effective compound previously identified by the Scheidt group. I have prepared analogous inhibitors that have two locations with varying functional groups. Since MEK4 usually utilizes ATP to add a phosphate to another protein, I am using an *in vitro* assay with isolated proteins that quantitatively measures the ATP consumption of MEK4 after treatment with an inhibitor. Preliminary findings on these compounds suggest that they are effective inhibitors of MEK4 and show promise for further development within pancreatic cancer therapeutics.

გიენ

Desmond O'Shaughnessy

Faculty Advisor: Chris Udry

Efficacy of Rainfall Index Insurance as an Agricultural Risk Mitigation Tool: Evidence from Northern Ghana

Risk from adverse weather and climate shocks plays a pervasive role in agricultural life, particularly for billions of smallholder farmers in developing countries. Given prohibitively high overhead costs and other structural issues associated with providing traditional crop-loss insurance to smallholders, a less costly form of insurance called index insurance, which indemnifies crop losses based on a correlated index, such as rainfall, rather than observed losses, has seen a surge in promotion throughout the developing world. Though index insurance policies address many of the key issues associated with traditional insurance, they face a major limitation in the form of basis risk, or risk introduced by imperfect correlation between index predicted losses and actual losses. Using four years of longitudinal data from farms targeted for insurance through the DIRTS (Disseminating Innovative Resources and Technologies to Smallholders in Ghana) project, I present a framework for assessing the quality of index insurance in a limited data setting and provide some of the first estimates of farm-level basis risk associated with rainfall index insurance for smallholders. I find that although the policies reduced risk for a portion of the target population, none of the policies reduced risk for the median farmer. In addition, I find that the indices for all products did a poor job in detecting the complexities of the relationship between weather and losses. This research highlights the importance of caution when designing and promoting rainfall index insurance as a risk mitigation tool and emphasizes the necessity of historical farm-level data for effective index construction.

ಶಿಂಧ

Maxwell Paik

Faculty Advisor: Michelle Driscoll

Computer Vision Algorithms for Analyzing Drying Colloidal Suspensions

Drying colloidal suspensions, which consist of particles suspended in a solution, exhibit interesting behavior as they dry. In particular, different patterns of cracks and dimples form depending on the ratio of particle to solution in the colloid. As colloidal suspensions are everywhere from paints to printers, understanding their underlying physics is of great interest. One way to conduct research of these phenomena is to form a dataset of images of drying colloidal droplets across different experimental conditions. In order to speed up eventual analysis of collected data, my research focused on developing an image processing codebase capable of recognizing and describing cracks and dimples that form in these drying suspensions. To develop this software, I made use of computer vision tools included in Python's OpenCV library. In its current state, the codebase is capable of describing the size, position, and angle of dimples and cracks. These different patterns are detected separately. An algorithm searching for blobs of homogenous pixels finds dimples. On the other hand, an algorithm searching for sharp edges is used to locate cracks in the droplet. As more images are captured, this

codebase will be extremely useful in data analysis. Experiments involving imaging drying colloidal suspensions are ongoing within Driscoll Lab. The patterns that emerge from these trials, as analyzed by the image processing tool, will give insight into the mechanisms underlying drying colloidal suspensions.

ഇ∂രു

Akash Palani

Faculty Advisor: Julie Lee Merseth

Long Distance Nationalism: Indian Americans and *Hindutva*

What explains Indian American attitudes toward Hindu nationalism? Following the election of Prime Minister Narendra Modi in 2014, *Hindutva*, or Hindu nationalism, has become a potent, powerful political force in India. In the Indian diaspora, particularly in the United States, the past decade has seen an increase in public activity related to Hindu nationalism. From the World Hindu Congress in Chicago, to President Trump and Prime Minister Modi's massive joint rally in Texas, to demonstrations against Hindu nationalist citizenship laws in India, Indian Americans are more vocal than ever about politics in India. This study employs regression analysis to identify key predictors of Hindu nationalism among Indian Americans. Religious identity and behavior, Islamophobia, and certain benchmarks of assimilation emerge as statistically significant. Little empirical work has been conducted on the subject of Hindu nationalism in the United States, especially after the ascendance of the BJP in 2014. As one of the first surveys of Indian Americans focused on Hindu nationalism, this work evaluates the existing theoretical explanations for the phenomenon and helps set the agenda for future research. Furthermore, this study puts forth a method for quantitatively measuring attitudes towards Hindu nationalism, the index of Hindu nationalist sentiment.

ഇ∂രു

Harlym Pike

Faculty Advisor: Renee Engeln

Who Can Be Body Positive on Instagram?

The body positivity movement began in the 1960s and has found a wider audience throughout the rise of social media. However, the online body positivity movement has been criticized for being dominated by thin, white, cis-gender women and for implicitly and explicitly promoting anti-fat bias and anti-Blackness. The present study is the first to empirically examine claims about the extent to which the body of a person posting an online body positivity message influences how that message is received. Female participants (N = 725) were randomly assigned to evaluate one of eight experimental

faux-Instagram posts, varying by the subject's body size, race, and the message of the caption. Participants rated their overall reaction to the post and provided open-ended responses about their thoughts and interpretation of the post. Quantitatively, participants had more positive reactions to the Black models, with an interaction showing that the fat Black model was most positively received. The open-ended data showed that white thin models received more appearance compliments, but also sparked annoyance more than other models. Overall, these results suggest that while body-positive posts may be more likely to feature thin, white women, many Instagram users may find these posts off-putting. To test the robustness of the initial findings, two replications of the study are being run: one with the original survey and a new sample, and the other with new experimental images and a new sample. These conclusions have the potential to promote conversations about the effectiveness and inclusivity of the body positivity movement.

<div align="center">ℬℭ</div>

<div align="center">

Gabrielle Plotkin

Faculty Advisor: Keith Woodhouse

Renewing and Recycling: The Formation of American Jewish Environmentalism in the 1970s and 1980s

</div>

Environmental historians have just begun to document the varied stories of American environmentalism, yet few authors have focused on how faith-based communities interacted with the postwar environmental movement, and even fewer have considered how American Jews did. Although scholars often characterize American Jews as largely "urban" and separate from nature, I demonstrate how American Jewry's involvement in left-leaning politics and inclination to both assimilate and remain committed to Judaism primed the community for participation in environmentalism. For my undergraduate thesis, I consider how in the 1960s, 1970s, and 1980s American Jews revitalized centuries-old Judaic environmental ethics and agricultural practices in a modern framework. In the United States, different communities prioritized different ecological issues based on their geographic location, identity, and cultural beliefs. In the Jewish community, environmental causes gained traction when political interests and religious tenets aligned. From the conservation of forests in tandem with the destruction of trees during the Vietnam War, to protection of animal rights and religiously motivated vegetarianism, to the development of alternative energies during the Arab Oil Embargo to bolster support for Israel, Jewish environmentalists emphasized issues of particular relevance to their community while also redeveloping liturgies, holidays, and values for American Jews more broadly. While Jewish environmentalists highlighted similar issues as the broader environmental movement, they approached them with a Jewish lens on justice, sustainability, and community. The environmental movement has never held a single set of meanings for all people, and in the late twentieth century American Jews made it their own.

<div align="center">ℬℭ</div>

Lauren Reynolds

Faculty Advisor: Lilah Shapiro

How Northwestern University Students Determine Acceptable Speech

Currently, there is debate over the kind of speech that should be allowed on college campuses, and whether colleges should put restrictions on speech. This debate is important because while college campuses are considered a marketplace of ideas, those ideas may be perceived as racist, bigoted, or hurtful towards other students. College students will contribute to the next generation of cultural thought leaders, so it is imperative to understand what they view as acceptable speech, and how they navigate campus debates about the issue. Disagreements about what speech should be accepted on campus can cause clashes between students, leaving some feeling unprotected and others stifled. Many students consider limits on free speech as decreasing intellectual debate and consideration of differing opinions, while others believe that allowing any form of free speech can harm minoritized students and create a toxic campus culture. This research seeks to establish how undergraduate students at Northwestern University determine what qualifies as (un)acceptable speech and how they make that determination. To examine this, I am using semi-structured interviews with junior and senior Northwestern undergraduates. My approach uses grounded theory to code and analyze themes in their considerations of free speech. The intended analyses should provide insight into how students decide what constitutes allowable speech in the Northwestern community. The findings may provide insight into how students view speech and how administrators and campus decision makers can reflect and act on speech policy to fit the needs of their students and University community.

ℰᴏᴄℛ

Ahan Sahu

Faculty Advisor: Contractor Noshir

Going for Broke: Brokerage Behaviors in Organizations

The efficient interaction of workers is an integral element of productivity at the workplace, especially during a crisis when organizations may need to reconfigure. Therefore, brokers, those who facilitate those interactions, hold an important role because of the strategic value they bring to the organizations. Our study focuses on how engaging in two types of Brokerage Orientations (types of brokers), the Tertius Iungens (TI) Orientation connecting people and the Tertius Gaudens (TG) Orientation mediating between people, affects individual and team outcomes. TI brokers are those who facilitate interactions between people, and TG brokers are those who mediate interactions between people so that they do not have to interact with each other. I used data collected from a U.S. national survey with a sample size of 1566 and performed bivariate correlation analysis between people's two brokerage orientations and team performance and viability. I also correlated people's two

brokerage orientations and the number of team members they reported enjoying working with, going to for advice, and considered as hindrances. Results show TI brokers report their teams have higher performance (r[1565] = .24, p < .001) and higher viability (r[1565] = .26, p < .001). Moreover, TG brokers report more co-workers as hindrances (r[1565] = .14, p < .001), whereas TI brokers enjoy working with their co-workers more (r[1565] = .19, p < .001) and go to more people for advice (r[1565] = .11, p < .001). This work enhances the understanding of distinct brokerage behaviors and how they affect individual and team outcomes in different ways.

ഇറയെ

Lucas Sant'Anna

Faculty Advisor: Neha Kamat

Non-Specific Binding of Ni-NTA and Lipid Domains in Vesicles

Lipid vesicles are synthetic membrane compartments that have been used as a model drug delivery system. By attaching targeting molecules to the surface of the vesicle, we can deliver drugs to specific cells of interest, such as cancer cells. To date, most vesicles have consisted of using only one type of phospholipid, either saturated or unsaturated, and cholesterol as the main composition. Recently, we showed that ternary vesicle compositions with unsaturated and saturated phospholipids with cholesterol can augment vesicle-cell interactions, but can also exhibit off-target, or nonspecific, binding. Our work investigates how ternary compositions, which can control spatial arrangement of proteins on the vesicle surface, might affect binding to cells using a weak binding model molecule, Ni-NTA. Several vesicles were prepared containing different lipid compositions which can control the spatial arrangement of Ni-NTA on the membrane surface. These vesicles were labeled with a fluorescent lipid and incubated with a cancerous lymphocyte cell line, Jurkats. Binding of vesicles to Jurkat cells was characterized using flow cytometry, a method that can measure the fluorescence of individual cells. Preliminary results have shown that lipid composition affects both specific and nonspecific binding to Jurkat cells. Ongoing work includes determining how these parameters might interact, and future steps might involve characterizing the nonspecific binding to other cell types to see if this effect is universal. These future findings may help determine whether new vesicle-based therapies may need to optimize lipid composition and targeting molecules for specific disease states. This project was funded in part by the Office of Undergraduate Research's Summer Undergraduate Research Grant.

ഇറയെ

Nathan Schimpf

Faculty Advisor: Lee Miller

Investigating the Effect of Intracortical Microstimulation (ICMS) in Brodmann's Area 2 Using Topographical Variational Autoencoding (VAE) Models

Proprioception includes the sense of posture and movement and is also critical for motor control; its loss leads to profound movement deficits. One potential technique to restore this loss is intracortical microstimulation (ICMS) which involves applying a small electrical current to activate neurons. ICMS has successfully elicited tactile percepts in primary somatosensory cortex (S1) and primary visual cortex (V1), but similar attempts to evoke proprioceptive sensations have been much less successful. This lack of success may stem from our limited understanding of the topographic organization of area 2 - a subsection of S1 that receives proprioceptive input. To better understand this organization, we trained a self-organizing cortical model based upon the statistics of normal movement. The cortical model arranges a map of area 2 neurons in clusters of similarly encoded neurons in line with previous findings (Weber, et al., 2011). Since we expect proprioceptive sensations to affect limb movement, we modeled the effect of ICMS by selectively activating regions of this cortical map during simulated movement and then decoding hand velocity from the activated neural signals. We found that ICMS caused predictable change in decoded arm movement direction when we activated neurons of similar encoding properties, suggesting that ICMS activation of similarly encoded neurons is necessary to achieve a predictable effect in area 2. We can conclude a potential ICMS protocol that predictably elicits proprioceptive sensations - a necessary phenomenon for restoring proprioceptive loss and bettering neural prosthetics - needs to account for the encoding properties of the neurons surrounding the stimulation location.

<div align="center">৪৩৫</div>

Emily Shteynberg

Faculty Advisor: Maddalena Canna

Soviet Immigrants' Perspective on Mental Health and the Impact of Stigma

The purpose of this research project was to highlight that there are different perspectives on mental health that stem from various experiences. All of these views should be valued and not discriminated against for any reason other than that they are different. As a child of Soviet Immigrants, I quickly observed that my parents and extended family perceived mental health differently than other Americans. I never understood why they did so when I had the opportunity to conduct research in International Mental Health, I thought this was the perfect time to find out why. With this project, I wanted to illuminate that when people have varying outlooks on subjects, there is a reason for that, and it is justifiable. I went about my research with ethnographic interviews, where I interviewed 11 Soviet Union immigrants in depth over Zoom. My questions ranged from how mental health was discussed in the former Soviet Union to how their view on the subject has changed since immigrating to the United States. From these interviews, I quickly learned that candid mental health discussion was

non-existent in the Soviet Union and the topic was highly condemned to the point where citizens feared talking about it in any manner. All my participants recognized how stigmatized mental health was in the Soviet Union and agree that their views have changed since coming to America. However, they still feel that they hold with them a certain tainted outlook on Westernized mental health practices such as therapy and medication because of how intensely they were verboten and punishable in the Soviet Union. Thus, the conclusion I come to in my research is that there is not a one size fits all approach to mental health and other treatments and practices outside Westernized methods should be embraced.

ഇരുജ

Jami Silverman

Faculty Advisor: Benjamin Gorvine

The Just World Hypothesis as a Psychological Defense in Individuals Living Under Acute vs. Chronic Terrorism Threats

The just-world hypothesis claims that individuals are compelled to believe they live in a just world where people get what they deserve, enabling the individual to confront their physical and social environment as though they were stable and orderly. This study examined the extent to which civilians living under two types of terrorism threats—chronic (constant, low-casualty) and acute (rare and high-casualty) use the just-world hypothesis as a means of defense and, as a result, exhibit religiosity. As terrorism becomes increasingly common, it is important to understand how it is rationalized, and how individuals within the affected populations live with the repercussions of terrorist activity. Further, deciphering psycho-social determinants of coping mechanisms can assist policy makers in adapting preparedness plans and promote resilience. It was hypothesized that individuals living under threat of acute terrorism would exploit the just- world hypothesis more often as a means of defense, and as a result, they would exhibit higher levels of religiosity in comparison to individuals living under chronic terrorism threats. To explore this hypothesis, a questionnaire was sent to male and female American and Israeli Jewish adults aged 18 to 22. Questionnaire results revealed a significant positive correlation between individuals 'just-world belief and religiosity, significant differences between American and Israeli religiosity, and significant differences between American and Israeli women's just-world belief. This study's cross-cultural approach attempts to understand the implications of terrorism in order to better promote resilience in targeted populations.

ഇരുജ

Ahmadu Simpson

Faculty Advisor: Dan P. McAdams

Personality Traits and the Narration of Spiritual Experiences

For over a hundred years, psychologists have sought to understand the function of spirituality for the human psyche, and how it might relate to other features like personality. This study considered personal narration of spiritual experience and how it relates to Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Over 400 narrative accounts of spiritual experiences given by mid-life adults were analyzed and coded for themes of Narrator Agency (NA), which tracks how participants describe their own efficacy and responsibility, Spiritual Action/Intent (SA), which tracks how much participants attribute agency to spiritual beings, and Spiritual Proximity (SP), which tracks how much participants view spiritual forces as omnipresent and accessible. Openness was positively associated with themes of NA, and negatively associated with SA. SA also negatively predicted Neuroticism, but positively predicted Agreeableness, Conscientiousness, and Extraversion. Only Extraversion was associated with themes of SP. The relationships between Extraversion, Neuroticism, and descriptions of spiritual forces as active and omnipresent suggest a relationship between certain styles of spiritual belief and stable, upbeat emotional dispositions. Furthermore, themes of NA and SA were inversely related, which has implications for the importance of spiritual paradigms in understanding how participants make sense of their own success and failures in life stories research.

<center>ৡ০৫৶</center>

Shreya Sriram

Faculty Advisor: Jason Tait Sanchez

Spontaneous AMPA-Receptor Mediated Activity in Low Frequency Auditory Neurons

Spontaneous action potential (sAP) activity occurs independent of external stimulation in the nervous systems of all vertebrates. Patterning of sAP activity is important for organizing neural circuits during development, especially in sensory modalities. This is true in the auditory system, where sAP activity helps regulate neuronal topology. In the avian auditory brainstem, we recently identified a sub-population of low-frequency neurons (termed NMc) that exhibit spontaneity due to their *intrinsic* properties that differ from their high-frequency neuronal counterparts, suggesting a role for sAP activity in tonotopic organization (i.e., frequency encoding). However, it is unclear how *synaptic* transmission influences sAP in NMc neurons. Given that high-frequency neurons receive excitatory glutamatergic input from the auditory nerve, we hypothesized that NMc neurons' sAP activity is also dependent on synaptic glutamate transmission. We used whole cell patch clamp electrophysiology and identified glutamate as our neurotransmitter by recording spontaneous excitatory post synaptic currents (sEPSCs) while blocking NMDA (glutamate) and GABA (non-glutamate) receptors. Thus, we predicted that sEPSCs for NMc neurons are mediated by the AMPA-type glutamate receptor. To test this prediction, we used the drug CNQX (antagonist) to block AMPA receptor mediated sEPSCs.

We found that sEPSCs are AMPA receptor dependent in NMc neurons. This was supported by the elimination of sEPSCs with the AMPA receptor blocker and the subsequent return of such spontaneous events upon drug washout. A better understanding of the relationship between spontaneous synaptic and intrinsic activity allows insight into the modulation of spontaneous firing patterns, mechanisms crucial in developing sensory systems.

<div align="center">ℰℭ</div>

<div align="center">**Regan Steigleder**</div>

<div align="center">*Faculty Advisor: Yarrow Axford*</div>

Paleotemperature Reconstruction of the Younger Dryas and the Early Holocene using Sediment Core Proxies from Lake N14, South Greenland

The Younger Dryas, the last glaciation (~12,700 cal yr BP), and the Holocene, the proceeding interglacial, are correlated periods that reveal mysteries regarding paleoclimate in the northern hemisphere. Due to the shutdown of the AMOC from a large influx of freshwater, the temperature around Greenland decreased dramatically, leading to the YD. Today, the AMOC is the weakest it has been in 1,000 years; therefore, understanding the climate throughout the YD and Holocene becomes a crucial topic of study. Current research reveals discrepancies on if South Greenland experienced seasonality (mild summers with cold winters) and how cold temperatures were during the YD and Holocene. Here, using chironomid head capsules preserved in sediments and XRF data from lake N14 in South Greenland, we reconstructed July air temperatures throughout the YD and early Holocene. For most of the last glaciation, summer temperatures were consistently cold, which contradicts Bjorck's study regarding seasonality (2002). However, a warm period occurred around 11,700 cal yr BP (followed by extreme cold conditions) along with a drop in sulfur levels, indicating sea-spray increased due ice sheet melting, supporting Bjorck's hypothesis on the relationship between sea-spray and ice sheet abundance. Around 10,600 cal yr BP, temperatures began increasing during the early interglacial. We plan to analyze more chironomid samples from our sediment cores to estimate when temperatures fluctuated during the YD and the onset of the Holocene. This study will enable us to gather more information on the climate mysteries throughout the YD and help improve future climate projections.

<div align="center">ℰℭ</div>

<div align="center">**Chase Stokes**</div>

<div align="center">*Faculty Advisor: Steven Franconeri*</div>

Dot, Line, and Intensity Plots Can Afford Different Viewer Conclusions

When choosing a chart type for a given data set, some rules are straightforward, like only using a stacked bar chart to display percentages. But the choice of visualization design may also have implications for a viewer's visual affordances, such as what patterns they tend to notice and what conclusions they tend to make. Through two crowdsourced experiments with 120 participants, we

examined the differential visual affordances of plotting data with either dots, lines or intensities (heatmaps). Participants viewed simple charts and communicated the salient patterns they noticed via typed sentences and image annotations. They also matched the patterns that they noticed to a set of common `template' patterns. We developed five qualitative category schemes to categorize the patterns that participants noticed, drawing from both existing data visualization task taxonomies and the perceptual psychology literature. These five category schemes were intended to capture the intuitive tasks that viewers tended to perform, the motivation behind the viewers' segmentation, the low-level task completed by the viewer, whether the viewers employed a local or global processing scope, and how the viewers segmented data overall. We also completed a factor analysis to determine five factors which account for variations in affordance between the chart types: points and values, short trends and changes, shapes, large scale trends and descriptions, and clustering of data points. Across these category schemes and within these factors, we consistently found relatively stronger affordances in line charts for overall trend detection and in intensity plots for clusters and groups of data. Dot plots fell in the middle of the two and had a slight affordance for shape detection. With refinement and tests for generalizability, this mapping between chart design and visual affordance could produce concrete guidelines for choosing and designing charts that most effectively communicate an intended message in data.

ଚଡ଼ଗ

Simon Su

Faculty Advisor: Andrew Papachristos

The Effect of Civilian Oversight on Police Accountability

Does increased civilian oversight improve police accountability? George Floyd's tragic killing at the hands of police officers once again placed police violence and misconduct as well as its disproportionate impacts on Black Americans at the forefront of national attention. Often, these violent incidents are met with calls for increased police accountability, one popular proposal being increased civilian oversight of police activity. Over the last two decades, Chicago has undergone two such changes in the aftermath of egregious misconduct, first forming the Independent Police Review Authority (IPRA) in 2007, which was then replaced by the Civilian Office of Police Accountability (COPA) in 2017. Using ARIMA intervention analysis, I estimate IPRA and COPA's impact on accountability by assessing the number of allegations of police misconduct and likelihood an allegation is sustained. In doing so, this project contributes to examinations on the efficacy or lack thereof of independent civilian investigation of police misconduct as it currently stands in Chicago.

ଚଡ଼ଗ

Selena Suarez

Faculty Advisor: Noshir Contractor

Let's Team Up! Understanding How People Form Teams Using Online Platforms

In a time where work has become increasingly virtual, organizations must adapt to forming teams using online platforms, such as Slack or Microsoft Teams. Forming teams online eliminates the need for proximity and prior relationships; it provides more possibilities for people to engage with others they may not have known in person. Given the elimination of these constraints when forming teams online, I examined if people are in fact more inclined to team up with others outside of their usual networks. Furthermore, I explored what individual attributes affect the likelihood of being invited on a team assembled online. In this study, I analyzed data on 250 individuals who assembled into teams using a team builder platform called MyDreamTeam. Participants of this study send other participants invitations to be on the same team. I analyzed participants' invitations over time to understand how teams were being formed online using social network statistical models. We found that individuals still assembled into groups based on prior relationships and homophily. A participant was more likely to receive an invitation if they had a prior relationship with a person, had the same gender or age, or had high popularity. This study proves that even in online teaming, homophily and the importance of prior social networks still hold true. To increase the likelihood of a group being creative, teams must embrace diversity and inclusion; the design of future online teaming platforms should encourage users to go against their natural tendency to invite others they know and are like themselves.

<div align="center">৪৩৫৩</div>

Charlie Sutcuoglu

Faculty Advisor: Jillana Enteen

Standards of Care and Non-Binary Gender Affirming Surgeries: A Comparison Between Thailand and the US Online

In the forty-two years since its creation, the World Professional Association for Transgender Health (WPATH) has become the dominant source guiding Standards of Care (SoC) for gender-affirming surgeries across the globe, but there has been lag in its willingness to define standards of care so that they are compatible with the desires of non-binary patients. Thailand, at the forefront of the medical tourism industry and a major player in the world of gender-affirming surgery since 1997, has adapted distinct markets for Thais and non-Thai/western patients. Much of this was in response to WPATH's strict SoC enforcing binary gender affirmation, which was posited as a necessary guide for serving western patients. As of 2018, however, WPATH began to expand its SoC to accommodate for non-binary understandings of gender. After my work on professor Enteen's extensive database of English-language websites produced by Thais for surgeries for westerners in Thailand categorizing on the offerings to western clients by Thai surgeons from 1997-present and my examination of existing data regarding surgical techniques on the market in the U.S. (a primary site for gender-affirming surgery), a distinction remains. Thai surgeons opt for a specialized technique or limited set specialized

operations that, presently, are still aligned with a binary understanding of gender that remains predominant in the west. U.S. surgeons more openly advertise non-binary surgery but have only a few standardized procedures completed alongside many non-gender-affirming procedures.

ഇൻൻ

Kaloyan Valchev

Faculty Advisor: Frank Limbrock

Analysis of the Effect of COVID-19 on the Global Economies and Evaluation of Countries' Policy Responses

COVID-19 had significant adverse effects on economic growth, unemployment, and other important economic indicators. In addition, at the time of this abstract, according to the World Health Organization, nearly three million people have lost their lives and almost 140 million have been confirmed to have contracted the disease. COVID-19 affected the lives of many more across the globe and was impactful enough for us to reimagine work, education, and social interactions. As a result, the world entered a recession in 2020, from which many countries are still struggling to recover as the virus takes its toll on both economic indicators and human lives. In my research, I will try to measure the effect of COVID-19 on the global economy and evaluate the effectiveness of different countries' policy implementations in response to the coronavirus. My research focuses on about 60 of the world's largest and most developed economies. The choice of countries to be included mostly depended on the availability of reliable data, but I have succeeded in gathering data on countries from all geographic regions. The countries represented in the study account for vast proportions of the world's population, GDP, and COVID cases. There are multiple data sources that I am using for this research project. In terms of economic indicators, I am using data from the IMF and other international organizations. WHO offers significant amounts of data on COVID-19 cases and other healthcare indicators. Oxford has developed its own database on countries' policy responses. Google provides access to its mobility reports which track how often people in a given region visited or stayed at a particular type of location. I am using each of these sources in my research on the effect of COVID-19 and the corresponding policy responses. I will begin by estimating the effect of the pandemic on economic indicators, mainly focused on GDP growth and unemployment. It turns out that the size of an economy and its level of development are poor predictors of how hard a country would be hit by the coronavirus. Thus, my study will analyze the other data sources listed above in order to explain the differences across countries in terms of their ability to handle the adverse COVID-19 effects. My study will also seek to evaluate the effectiveness of particular policies as well as the overall policy responses for the countries under consideration. In times of misinformation and political polarization observed across the globe, it is important for us to have an unbiased view on the effectiveness of different policies. If we manage to understand the overall effect of COVID-19 and obtain unbiased estimates of policy responses, we will hopefully be better able tackle such global challenges in the future.

ഇൻൻ

Roslyn Valdespino

Faculty Advisor: Chad L. Horne

Neonatal Euthanasia and Morality: What Ought We to Do with the Sick Child?

Scientific breakthroughs have greatly expanded the range in which medical professionals can respond to patients. Although the medical field largely celebrates these advances, some have begun to question the underlying ethics of their implementation. In this paper, I respond to a prominent and ongoing bioethical debate, deconstruct the arguments on both sides, and ultimately demonstrate the moral impermissibility of the discussed practice. Specifically, I assess the ethical considerations at play in a subtype of euthanasia: the voluntary euthanasia of *non-terminal* newborns with life-altering conditions. Such a neonatal euthanasia protocol is typically reserved for newborns who would survive infancy if treated for their conditions, but at the cost of enduring "unbearable", lifelong suffering as a result. Drawing from some of the most influential perspectives in this debate- ranging from persons with disabilities, bioethicists, philosophers, and medical professionals- I discuss the moral inconsistencies in the implementation of this protocol. Additionally, I examine the risk this protocol poses to unintentionally increasing marginalization among adults who are currently affected by the same conditions which motivate this type of euthanasia in newborns. Finally, I consider the problem of subjectivity in suffering. Aside from reiterating that moral assessments ought to keep pace with scientific breakthroughs, this paper concludes that any determination to terminate extrauterine life ought not to be made by anyone other than the affected individual. This conclusion creates room for future assessments regarding the permissibility of euthanasia in infants, the ethics involved in physician-assisted suicide, and the morality of other similar end-of-life cases.

ଓଠଉଓ

Victoria Vizzini

Faculty Advisor: Sandra Waxman

The Effect of an Unfamiliar Non-Native Accent on Preschoolers' Comprehension of Language

Accented speech introduces a source of variability in the language children are likely to hear at some point in their lives. In this present study, we will address whether preschoolers can identify a word spoken by an accented speaker with the presence of a novel image. It also addresses whether semantic context can help children to better understand a word produced by a speaker with a non-native accent. Finally, we consider the relation between literature on mispronunciations and that on accented speech. We developed a task in which participants, ranging from 4 to 5 years of age, will view a 4-item display and be instructed to look to a particular target image. Children are randomly assigned to hear sentence in either their native accent (American English) or in a non-native accent (Turkish). In both conditions, children will hear a target word presented in a sentence, either one that should support

performance *(e.g., you can eat the apple)* or a neutral context *(e.g., you can see the apple)*. For this study, we utilize a 2 x 2 x 2 design to test the effect of accent (between participants: native vs. non-native accent) and sentence context (supportive vs. neutral). Using eye-tracking software, we will test children's accuracy in identifying the target object and the speed with which they do so.

<div align="center">࿇</div>

<div align="center">

Danyi Wang

Faculty Advisor: Bin Jiang

Biphysical Forces on VSMC Phenotype

</div>

Pathological vascular calcification is the hardening of blood vessels into bone-like structures. Vascular smooth muscle cells (VSMCs), which normally constricts or dilates to regulate blood flow and pressure, are capable of transdifferentiating into the osteogenic/bone-like phenotype. Moreover, biophysical forces, or forces applied to induce a physical change, can alter chromatin (complex of DNA) structure within the nucleus and regulate cell fate for several cell lines. The aim of this project is to investigate how biophysical forces can impact VSMC phenotype and the onset of vascular calcification. To that end, biochemically induced biophysical forces are applied to VSMCs via the vasodilator Sodium Nitroprusside ($1\mu M$-$10\mu M$) and the vasoconstrictor Phenylephrine ($1\mu M$-$10\mu M$). No-treatment control groups are included. Immunofluorescence of nuclear DNA was used to confirm that the biochemical treatments generated the nuclear morphological changes expected from the corresponding biophysical forces. Changes in epigenetics and transcriptional activity will be evaluated via Acetyl H3 Staining and immunofluorescence imaging. Lastly, VSMC cell fate will be determined via immunofluorescence imaging for myogenic/contractile versus osteogenic protein markers. Preliminary data collected confirm that SNP-treated cells display the elongated morphological changes expected with cellular dilation. PE validation assays are currently in progress, with histone acetylation immunofluorescence imaging and VSMC protein expression analysis due to follow. There is currently no known treatment for vascular calcification. Therefore, this project will not only increase fundamental knowledge concerning the mechanism of calcification and the role of mechanical forces on VSMC cell fate, but also introduce new therapeutic targets to combat vascular calcification.

<div align="center">࿇</div>

Victor Wang

Faculty Advisor: Stephen Nelson

Tariffs and Partisanship: Evaluating the Link Between Steel and Aluminum Tariffs and the Political Affiliation of American Firms

In March 2018, President Donald Trump acted to impose tariffs on steel and aluminum imports. Not all firms have to pay tariffs though. American companies can receive tariff exclusions by applying for them at the Department of Commerce. In this paper, I study how the political affiliation of American firms may impact their ability to secure tariff exclusions from the Department of Commerce and examine how increasing partisanship in the United States has impacted bureaucratic decision-making with respect to individual American firms. The results of data analysis suggest that the Trump Administration and the Department of Commerce may favor American firms that are not already affiliated with the Republican Party when making decisions to grant or deny tariff exclusion requests. In addition, the Department of Commerce is more likely to approve tariff exclusions for firms that provide supporting documents, have no foreign parents, and import from countries that have a good relationship with the United States, as measured by voting patterns in the United Nations General Assembly.

<div align="center">ഇയരു</div>

Madeleine Ward

Faculty Advisor: Jolie Matthews

The Impact of Online Communities on the Social Idenity of Sneakerheads

Sneakers have become a booming cultural and economic phenomenon, with an intense, passionate group of sneaker fans called "sneakerheads" who enjoy wearing, collecting, trading, and selling sneakers. Before the rise of the internet, sneakerheads primarily bought sneakers in person, made friends waiting in line for new sneaker releases, and met up with other sneaker fans in shoe stores. Now, sneakerheads usually meet others, learn about sneakers, and buy and sell sneakers virtually through different online communities. With technology changing sneaker culture, this study addresses the impact of online sneaker communities on how sneakerheads identify themselves by their membership and interactions within sneaker culture. This study researches sneakerheads in two of the largest online sneaker communities, NikeTalk.com and the SneakerheadsUnite! Subreddit through surveys and interviews regarding the personal journey of individual sneakerheads and the relationships sneakerheads have with other sneakerheads both online and offline. The results so far have shown that before joining online sneaker communities, individuals did not know much about sneakers and had friends in person who were interested in sneakers. After joining online communities, sneakerheads felt they gained more knowledge about sneakers, began to call themselves "sneakerheads," and formed

connections with other sneakerheads, but they did not consider the sneakerheads they connected with to be "friends". This research suggests that online communities allow individuals to gain sneaker knowledge that allows them to feel more comfortable calling themselves "sneakerheads." They are also able to find a sense of community online, but in person sneaker fan relationships are stronger. This project was funded in part by the Office of Undergraduate Research's Academic Year Undergraduate Research Grant.

<p style="text-align:center">₧₧</p>

<p style="text-align:center">**Finn Wintz**</p>

<p style="text-align:center">*Faculty Advisor: Leoandra Rogers*</p>

"[T]hats just how the game is": How Black and White Parents Think about Systemic Racial Structures

Race is a socially constructed category firmly embedded within a system of privilege and oppression that places White people at the top and Black people at the bottom. Though this system has tangible implications in the lives of individuals, much existing literature explores race on an arguably superficial level, without situating the individual's understanding of race within societal structures. As race is embedded within a system, an individual's understanding of occupying a different position in the racial hierarchy can reveal how they engage with and think about systemic forces. The current analysis examines the degree to which Black and White parents engage with themes of systemic privilege and oppression in their discussions of race. Data are drawn from the On Parenting About Race Study (On PAR study) of Black (n=359) and White (n=389) parents of children ages 8-11 years. This analysis examines the question: *How do you think your life would be different if you were Black/White?* (White parents answered about being Black and vice versa). Participants indicated whether their life would be "Better", "The same", or "Worse", followed by an open-ended prompt explaining why. Only respondents answering "The same" were analyzed for the current study. Thematic analysis of open-ended responses was conducted, and patterns were analyzed across each racial group. The question's relational nature provides insight into how individuals perceive their race in relation to another, which reveals how they think about structural forces producing these disparities, thereby reinforcing and/or disrupting the existing racial hierarchy.

<p style="text-align:center">₧₧</p>

<p style="text-align:center">**Tara Wu**</p>

<p style="text-align:center">*Faculty Advisor: Yingying Xie*</p>

Response of Deciduous Forest Senescence Rate in Autumn to Environmental Changes

Phenology, or the timing of biological life cycle events, has drastically shifted in plants across the globe due to climate change. In deciduous trees, senescence is the phenological phase that determines the end of the trees' growing season and affects nutrients allocation for the next year and is characterized by leaf coloration and abscission. This study is one of the first to focus on senescence rate, or how

fast the process progresses, rather than senescence timing. The goal was to examine how senescence rate in deciduous forests of the Northeastern United States have changed over 2000-2018 and how environmental factors affected senescence rate. Based on phenological metrics extracted from satellite remote sensing observations, I calculated the spatial and temporal patterns of senescence rate over the 19-year period in two EPA-defined ecoregions, the Northeastern Highlands and Blue Ridge. I also developed statistical models to identify the most important climatic and environmental stress factors affecting senescence rate. The results showed that on average, senescence rate slowed in both ecoregions, though to a greater extent in the Blue Ridge ecoregion. Within both ecoregions, however, there was spatial variation, with faster rates associated with higher elevations, higher latitudes, lower temperatures, and more drought and heat stress. Understanding the environmental effects on the speed of tree senescence can improve assessment of climate change impacts on ecosystems and associated ecological processes like carbon sequestration and can help with forest management for the fall foliage ecotourism industry.

<div align="center">ഇന്ദ</div>

<div align="center">**Jessica Xia**</div>

<div align="center">*Faculty Advisor: Lisa Beutler*</div>

<div align="center">**Food Cues and Brain-to-Gut Communication**</div>

A food cue predicts food through sight, smell, or sound, preparing the gut to digest food more efficiently. Though it is known that food cues evoke brain-to-gut signals, little is known about the specific brain regions involved. However, we know that brainstem structures, specifically the dorsal motor nucleus of the vagus (DMNV), are required for brain-to-gut communication. My project focuses on which brain regions communicate with the DMNV in response to food cues, which is an understudied aspect of brain-to-gut communication. To answer this question, I first conditioned mice to associate a food cue consisting of sight and smell with imminent food intake. After conditioning, I had a test day where I divided the fasted mice into two groups where one group was presented the cue and the other was a control group. I waited one hour to allow for expression of Fos, a marker for brain activity, before euthanizing the mice. Then, the mouse brains were stained with Fos antibody to see which brain regions were selectively activated by food cues in fasted mice. I found that the brain regions paraventricular thalamus (PVT), supramammillary nucleus (SUMM), and dorsomedial hypothalamus (DM) were activated to a greater extent in cued mice than controls, suggesting that these regions are important for the brain-to-gut pathway. Ultimately, my findings help identify which brain regions facilitate brain-to-gut signaling. Future work will focus on determining which of these brain regions project to the DMNV to elicit gut responses upon presentation of food cues.

This project was funded in part by the Office of Undergraduate Research's Summer Undergraduate Research Grant.

<div align="center">ഇന്ദ</div>

Anna Yang

Faculty Advisor: Peter Locke

Intergenerational Trauma, Gender Ideologies, and Resilience in Post-Apartheid South Africa: Implications for Mental Health During COVID-19

27 years after its dissolution, the psychological, economic, and structural legacies of apartheid violence persist to perpetuate present-day racial and gendered disparities in mental illness and risk to infectious disease. The COVID-19 pandemic has greatly intensified such inequities in South Africa. Despite considerable evidence demonstrating the mental health consequences of past epidemics, there have been few to no studies conducted on the interplay between the enduring remnants of historical intergenerational trauma and the embodied experiences of marginalized communities like Soweto during a global pandemic, nor discourses on how women— in particular— may experience a multiplicity of intersectional vulnerabilities within this context. This study aims to complicate notions of coping, resilience, and trauma by introducing ethnographic data illuminating the lived experiences of women in Johannesburg's largest majority-black township—Soweto—during the COVID-19 pandemic. Through a constructivist and intersectional approach, the primary objective is to shed light on the relational dynamics and gender ideologies that affect Sowetan women's mental health and consequently inform how they attempt to reclaim agency within the structural premise of apartheid legacies. To this end, 17 semi-structured interviews collected between March-July 2020 during Level 5/4 lockdowns were subjected to rigorous qualitative analyses and further informed by demographic data, extended field notes (n=20), and critical theory. The findings revealed that experiences of distress during the pandemic cannot be divorced from the gendered apartheid violence besetting historically oppressed townships, thereby highlighting the urgent importance of radical structural changes to address unique cycles of psychosomatic vulnerabilities for South African women.

ഔരു

Michael Zhou

Faculty Advisor: Jonathan Guryan

Impact of High School Debate and Extracurricular Activity Funding on Future Academic Success

Every year, hundreds of thousands of high school students across the United States compete in debate tournaments. These students are only a fraction of the millions who participate in other extracurricular activities, ranging from Spanish Club to Future Business Leaders of America. While many students take part to explore genuine interests, others do so with the hope that their participation will positively impact future academic success. To explore whether there was such a statistically significant impact on academic achievement, this project explored the amount of funding a randomly selected sample of Illinois high schools each gave to their debate clubs and student activities in general. Outcome variables such as graduation rate and college matriculation rate were included. The regression

outcomes revealed that there was a statistically significant, positive relationship between both debate and general extracurricular activity funding on future academic success, even with control variables such as the schools' percentage of minority and low-income students and class size included. This project also found that debate funding per dollar, on average, created a greater impact on future academic success compared to general activity funding per dollar. This was the first study that explored the relationship between debate and extracurricular funding and future academic success, and its implications could encourage school administrators to provide additional funding to debate and general student activity funding in the future.

✇   Guide to Oral Presentations

❧ Oral Presentation

Question and Answer Session One

The Experiences/Challenges of Living

Wednesday, May 26th 12:30-1:30pm (CST)

https://northwestern.zoom.us/j/94213503656

Farina Amir, Inaara Gangji, and Khadija Islow, "ChangEd Digital Marketing Strategy"

Emily Holtzman, "Objects of Influence: Sacrality and Native American Material Culture Across Five Contexts"

Caroline Hsu, "Strangest Things: Nostalgia vs. Representation in 'Kids on Bikes Media'"

Ginny Ip, "The Impact of Climate Change on Energy Poverty: Evidence from the European Union, 2004-2019"

Diamond Jones, "'Friends With A Girl Like Me:' Girlhood in Japanese Horror Video Games"

Janitza Luna and Joyce Wang, "Modernist Displays of 'Mestizo' Identity in Covarrubias' *Mexican Street Scene*"

Aran Mehta, "The Hindu Rashtra Meets Dar al-Islam: The Impact of Hindu Nationalism on India's Relations with Muslim-Majority Countries"

Sue Um, "A History of Women in Documentary"

Chloe Wong, "Radical Caring: A Qualitative Study on the Role of Frontline Workers in Eradicating Gender Violence in Asian American Communities"

❧ Oral Presentation
Question and Answer Session Two

The Impact of Health and Education

Wednesday, May 26th 4:00-5:00pm (CST)

https://northwestern.zoom.us/j/97848106457

Karina Aguilar, "Examining the Relationship Between Maternal Education and Pediatric Nutritional Health in Guatemala: Questioning the Role of Maternal Health Knowledge and Practices"

Myles Bowen, "Perpetual Violence and Livable Resistance: Historicizing Louisiana's Toxically Fertile 'Cancer Alley'"

Katherine R. Daehler, "Life on the Edge: The Impact of Status, Class, and Stigma on Patterns of Middle-Class Welfare Use"

Annamarie Jedziniak, "A Case Study of Maternal Health Policies Production of a Positive Pregnancy Experience in Australia, New Zealand, and Ireland"

Anika Nerella, "The Role of Demographics as a Determinant of Community Health Concerns"

Rachel Okine, "The Time Is Now: Assessing Fertility Knowledge, Reproductive Concerns and Desire for Fertility Education in Undergraduates"

Leo Sainati, "How Does the Level of Cultural Similarities Between Refugees and Hosts Impact Social Integration?"

Natalie Tomeh, "The Impact of SNAP and P-EBT in the Wake of COVID-19"

Leonardo Trigo, "COVID-19 Vaccine Attitudes Among Native People"

Liam Warner-Shifflett, "Maternal and Paternal Depression Symptoms During the NICU Stay, Transition Home, and First 30 Days"

Catherine Xu, "Dam-Displaced Populations Experience Significantly Higher Household Water Insecuirty, Food Insecurity, Depression, and Domestic Violence due to Construction of the Thwake Multipurpose Dam in Makueni County, Kenya"

❧ Oral Presentation
Question and Answer Session Three

Advances in Science and Technology

Thursday, May 27th 12:00-1:00pm (CST)

https://northwestern.zoom.us/j/91043688452

Henry Abrahamson, "Performance Testing of Accelerated Dynamic Average Consensus"

July Chen, "Heterogeneity of Virulence Gene Expression in Salmonella Typhimurium"

Anna Davis, "Vesicle-Based Sensors for Extracellular Potassium Detection"

Lucy Liu, "The Role of Intrinsically Photosensitive Retinal Ganglion Cells - Perihabenular Region Circuit in Visual Threat Anticipation"

Patricia Lohman-Meza, "Improving Ambient Stability of Nickel-Rich Lithium-Ion Battery Cathode Materials via Polymer and Graphene Coating"

Othman Muhammad, "An Application of Bayasian Autologistic Actor Attribute Models (ALAAM) to Study Social Networks and Their Influence on Human Behavior in Rural Kenya"

Izabela Stankiewicz, "Development and Assessment of a Hydrocephalus Shunt Flow Monitor"

Catherine Walker, "Energy Generation by Saltwater Motion on Metal Nanolayers"

Titobioluwa Williams, "Entering the Black Box: Looking at Pretrial Risk Assessments' Machine Learning Process"

Jade Zhang and Mercedes Sandu, "Constructing Convex Polyhedra by Applying Gaussian Curvature to Pentagons"

❧ Oral Presentation
Question and Answer Session Four

Understanding Our World

Thursday, May 27th 4:00-5:00pm (CST)

https://northwestern.zoom.us/j/96499825193

James Arcieri, "Assessment of New York's Clean Energy Targets: Exploring the Viability of the CLCPA"

Julia Borrelli, "Inter-Peer Social Influence on Post-Graduation Opportunity: Exploring How Peer-to-Peer Social Networks Can Influence the Trend Between the Freshmen on Track, Graduation, and College Enrollment Metrics in the Chicago Public High Schools"

Kendall Gail, "'It's Me. I'm All You Have:' An Examination of Authoritarian Electoral Propaganda Used by Donald Trump and Augusto Pinochet to Target Female Voters"

William He and Emily Mansell, "Mathematical Modeling to Forecast U.S. Elections"

Louis Ingram, "The Effect of Authorship and Typographic Errors on the Evaluation and Trust of Text"

Akie Kadota, "The Effect of Remote Learning on Secondary Ensemble-Based Music Education"

Christina Kim, "Of Horses and Propensity: Exploring Close Counterfactuals"

Christopher Mazurek, "Entering Dreamland: Infusing Signals into a Dream to Produce Awareness of Dreaming"

Olufemi Shakuur Nyabingi, "Does Joint Engagement Relate to Toddlers' Language Abilities Even in Diverse Home Environments?"

Joy Zheng, "Emojis and The Interpretation of Text Messages Between Friends and Between Acquaintances"

❧ Oral Presentation Abstracts

Alphabetical by presenter's last name

Henry Abrahamson

Faculty Advisor: Randy Freeman

Performance Testing of Accelerated Dynamic Average Consensus

Dynamic average consensus algorithms allow a network of agents to compute and track the average of their time-varying reference signals. These algorithms have a wide variety of applications, including swarm formation control and tracking the position of a moving object. However, many algorithms for dynamic average consensus fail to converge to the average quickly. Accelerated algorithms that perform average consensus and promise fast settling times exist, but they make restrictive assumptions on the communication network, namely that all communication in the network is symmetric (i.e., if sensor A communicates with sensor B, sensor B must communicate with sensor A). In practice, symmetric communication may break when an agent has equipment failure or the environment restricts transmission, thereby introducing sparse asymmetries into the communication network. We investigate the effects of asymmetric or one-way edges on the stability and performance of an accelerated algorithm for dynamic average consensus using computational simulations on a wide range of randomly generated communication graphs. We find that the accelerated dynamic average consensus algorithm remains stable (and thus converges to the same value as the unaccelerated algorithm) for nearly all graphs tested when the proportion of asymmetries is low. Moreover, for certain types of graphs, the accelerated algorithm maintains a faster convergence rate when compared to the unaccelerated version, even with a large proportion of asymmetric communication. These results indicate that the structure of a graph affects the robustness of the algorithm, which may have broader implications for studying the robustness of other dynamic average consensus algorithms.

సొంఱ

Laura Karina Aguilar

Faculty Advisor: Julia Behrman

Examining the Relationship Between Maternal Education and Pediatric Nutritional Health in Guatemala: Questioning the Role of Maternal Health Knowledge and Practices

In Guatemala, chronic malnutrition affects nearly 50% of children with gross inequalities by class, ethnicity, and region. Mothers' education is an important determinant of child health outcomes. Some researchers suggest that maternal education can improve child health through mothers' health knowledge and practices (KP). However, others argue that even mothers with the most beneficial health practices may not be able to protect their children from malnutrition in contexts of severe resource inequality and deprivation. What mediates the relationship between maternal education and child health in Guatemala remains unclear; research has not sufficiently interrogated the importance of KP. I hypothesized that KP would not significantly relate to child health outcomes nor would KP explain the relationship between maternal education and child health. With data from the latest Guatemalan Demographic and Health Survey, I created indices of KP and ran regressions for child height-for-age z-score (HAZ), representing chronic pediatric health. I also examined how the

relationship between maternal education and child HAZ could be explained by controlling for KP versus wealth, ethnicity, and regional factors. Results showed that KP do not have a significant positive relationship with child health outcomes. Further, KP explain only a small fraction of the relationship between mothers' education and child health. Wealth, ethnicity, and region explained over half of this relationship. These findings challenge the idea that maternal education in Guatemala influences child health through health knowledge and practices. This calls into question a focus on maternal behavioral characteristics in relevant interventions.

<div align="center">ഐരൂ</div>

Farina Amir, Inaara Gangji, and Khadija Islow

Faculty Advisor: Ilhem Allagui

ChangEd Digital Marketing Strategy

This project aimed to create a well-rounded digital marketing strategy for ChangEd, a student loan repayment application. We were tasked with improving the awareness, engagement, and consideration, areas the application needed to improve on. We created a digital and social media marketing strategy using primary research we conducted with their target audience (graduates, current students, and parents), suggesting ways to improve current paid and earned media, as well as introduce new approaches using our insights and learning in class. Through our research, we found that more than half of U.S. students apply for student loans and are under extreme pressure to find a high-paying job to repay the loan. Student loan repayment applications are not popular among the group and more than half of the respondents did not use any application. In our project, we concluded that student loan applications can help people manage and repay their student loans faster. We based our recommendations and campaign on this. The project includes suggestions for social media as well as their website, search engine optimization, and search engine marketing. We also planned out the cost, and how these would be implemented and evaluated in the campaign period. Applications like ChangEd are useful because graduates struggle with repayment because of other obligations. Student loan applications make this manageable. The parents of these students can also use these applications to contribute to repaying the loan. Our project conveys this information effectively to the target audience using digital and social media.

<div align="center">ഐരൂ</div>

James Arcieri

Faculty Advisor: Yip-Wah Chung

Assessment of New York's Clean Energy Targets: Exploring the Viability of the CLCPA

In passing the Climate Leadership and Community Protection Act, New York State has committed itself to one of the most aggressive climate-focused policies in the U.S. and has lofty goals for the

future of its energy mix. My objective was to evaluate New York's energy grid and project whether or not it can meet its goals for clean energy adoption. After isolating the CLCPA's goals related to electricity generation, I compiled data relevant to New York's current grid capacities, plans to open and decommission plants, and budgets for incentives and solicitations. Drawing on previous research, I made projections of the state's generation capabilities that endeavored to account for factors such as the coronavirus pandemic, the expansion of distributed energy resources, and increased beneficial electrification. I found that three of the five main targets were realistic: 2025 utility-scale solar capacity, 2035 offshore wind capacity, and the bill's key goal of net-zero emissions for electricity generation by 2040. The remaining two targets I found to be less reasonable given time constraints and adoption rates: 2023 utility-scale solar capacity and the 2030 target of 70% electric generation from renewables. Although current renewable development plans will allow the state to meet the majority of its energy mix goals, many factors can still affect their realization if solicitation fulfillment rates change or other unexpected shifts occur within the energy industry. Future research should include a more comprehensive, long-term assessment of COVID-19's effect on the energy sector, specifically in renewable deployment and DER expansion.

ഌരെ

Julia Borrelli

Faculty Advisor: Mindy Douthit

Inter-Peer Social Influence on Post-Graduation Opportunity: Exploring How Peer-to-Peer Social Networks can Influence the Trend Between the Freshmen on Track, Graduation, and College Enrollment Metrics in the Chicago Public High Schools

The Chicago Public Schools District (CPS) has devoted significant attention to the Freshmen on Track metric (FoT); FoT helps understand if a student is "on-track" to graduate high school. An influential trend exists between FoT, and subsequent metrics, Graduation Rate, and College Enrollment, helping to understand the impact FoT policies can have beyond high school graduation. Current literature attributes student success, defined as graduating from high school, to strong social capital and classroom climates, particularly between student and teacher or parent. A gap lies in understanding what specific social structures, or experiences, exist between peers that influence an individual student's success. This study examines the influence of social capital, developed through inter-student relationships, on post-graduation opportunity. How can leveraging learned social capital between students through peer influence, including the factors of classroom climate, engagement and motivation, work habits, and social well-being, increase the correlation between a CPS high school's FoT, graduation, and college enrollment rates? A survey will be sent to 30 northwestern undergraduate students, who are alumni of CPS. Follow-up interviews with some survey participants will further be conducted. Survey responses will be quantified and compared to the respondent's high school's attendance rate, a factor that increases success, to examine the influence peer networks have on high-school graduation rates. Findings aim to provide strategic insight on how high schools can build social networks between students as a best practice supporting individual FoT metrics, ultimately increasing students' successful matriculation into meaningful post-graduation opportunities.

ℰᴑ⅋

Myles Bowen

Faculty Advisor: Melissa Rosenzweig

Perpetual Violence and Livable Resistance: Historicizing Louisiana's Toxically Fertile "Cancer Alley"

Louisiana's industrial corridor, colloquially called "Cancer Alley", stretches from Baton Rouge to Bulbancha, the Choctaw name for the site where New Orleans resides. This region hosts the highest annual incidence of cancer in the state, averaging between 17,000 and 23,000 persons affected. Many of the parishes within Cancer Alley are home to the greatest concentrations of Louisiana's Black citizens. Notably, these Black loci are situated next to many petrochemical facilities which contribute significantly to the estimated 126 million pounds of chemical waste released annually between the years 2003 and 2017. This is a current, ongoing health crisis with adverse effects including respiratory, sinus, and allergy problems which disproportionately exposes Black peoples and their communities to early death. Further, these toxic geographies map onto the very plantations that profited from the subjugation and death of enslaved Black peoples starting in the early 19th century. In my work, I analyze how scholars measure and discuss environmental racism, focusing on how it systemically enacts violence and spurs populations to unique forms of self-making through livable resistance. Using the parishes of St. John the Baptist and St. James in Cancer Alley as case studies, I argue that scholars can broaden their understanding of environmental racism and the legacies of plantation violence by focusing on toxic exposures and environmental constraints in the historical present. My scholarship demonstrates that injuries are experienced momentaneously and through time, yet despite such harm, survivance, livability, and protest constitute the foundation of this region's narrative. By characterizing environmental injustice as anticipated, relived, carried, and survived, my work opens the debate for restorative justice via reconciliation and reparations.

This project was funded in part by the Office of Undergraduate Research's Summer Undergraduate Research Grant.

ℰᴑ⅋

July Chen

Faculty Advisor: Keara Lane

Heterogeneity of Virulence Gene Expression in *Salmonella Typhimurium*

Bacteria interact intimately with humans, from "good" bacteria that live in our bodies to "bad" pathogenic bacteria that cause disease. Pathogenic bacteria express virulence genes, which help bacteria invade and attack their host. The ability to control virulence gene expression would help us treat infection more effectively. Several virulence genes in the bacterium *Salmonella typhimurium* have been observed to be heterogeneously expressed, which means gene expression levels vary among individual bacteria. However, it remains unknown whether this is common to all virulence genes. To look at variation in additional virulence genes, I investigated expression of the genes rpoS and phoP,

which regulate virulence and adaptive responses in *S. typhimurium.* To detect gene expression in real time, I created fluorescent promoter reporters for rpoS, phoP, and their downstream targets katE and pagC. I validated these reporters by exposing cells to the appropriate stimulus and imaging the cells. I observed fluorescent protein expression under the expected conditions, along with heterogeneity in reporter expression. I then infected live macrophages (immune cells that engulf bacteria) with the reporters, and preliminary results suggest that rpoS and katE were primarily activated in a subset of bacteria. I intend to conduct further studies, such as combining the rpoS and phoP reporters in the same cell to examine coregulation of both genes. The findings thus far suggest variation in virulence gene expression in *S. typhimurium.* Further research into the cause behind this variation and its effect on *S. typhimurium* could provide insight into infection by this pathogen.

ഔാര

Katherine Daehler

Faculty Advisor: Beth Redbird

Life on the Edge: The Impact of Status, Class, and Stigma on Patterns of Middle-Class Welfare Use

Status and economic class are often in conflict in economic decision making. Status drives prestige-seeking behavior that comes with an expensive price tag, causing individuals to sacrifice class for status. However, status and class are both innately valuable. This presents an interesting theoretical puzzle: if class and status are both valuable, when does one drive decision making more than the other? I investigate this question in the context of social assistance programs and the 2008 Great Recession, using survival analysis to quantify time to take-up of SNAP, energy assistance, and unemployment insurance. In doing so, I empirically test the balancing act of preserving status by avoiding welfare stigma and getting needed economic support across changing economic backdrops of stability and turmoil. I find that status is more important in times of economic turmoil while class is more salient in times of economic stability, contradicting Weber's original theory. I also briefly explore the unique interaction of the middle class and social assistance programs.

ഔാര

Anna Davis

Faculty Advisor: Neha Kamat

Vesicle-Based Sensors for Extracellular Potassium Detection

Potassium ions (K^+) are one of the most abundant ions in intracellular fluid, affecting a wide variety of cellular processes in living organisms. In humans, irregularities in extracellular K^+ levels contribute to pathologies including cardiovascular disease, immunological diseases, and some cancers. Despite the role of K^+ ions, the detection, quantification, and monitoring of K^+ remains difficult. While

fluorescent indicators exist that can provide a fast, easy readout for K+ concentration, they are often nonspecific, particularly to ions with similar charge states. To address this issue, we developed a vesicle-based sensor that harnesses membrane channels to gate access of K^+ ions to an encapsulated fluorescent indicator. We assembled phospholipid vesicles that incorporated valinomycin, a K^+ specific membrane transporter, and that encapsulated benzofuran isophthalate (PBFI), a K^+ sensitive dye that nonspecifically fluoresces in the presence of sodium and calcium ions. The specificity, kinetics, and reversibility of PBFI fluorescence was monitored and the nanosensors were added to E. coli bacterial culture supernatant to evaluate K^+ levels in media as a function of cell density. We demonstrate that this nanosensor can selectively detect K^+ in the presence of other important biological cations, and can detect changes in extracellular K^+ concentration in bacterial cultures. The approach presented here could be extendable to a range of ions, which can be customized by altering the ion transporter and ion indicator. We expect our methods will enable a new generation of ion sensors that will reveal new information about extracellular ion variations during normal and pathological functions.

<div align="center">ဆပ္ကၠ</div>

Kendall Gail

Faculty Advisor: Tabitha Bonilla

"It's Me. I'm All You Have": An Examination of Authoritarian Electoral Propaganda Used by Augusto Pinochet and Donald Trump to Target Female Voters

This project was designed as an extension of previous research that analyzed how Chilean women were perceived and presented during Chile's 1988 public referendum. This referendum dealt with the potential presidential candidacy of military dictator Augusto Pinochet. After completing this research, I observed similar patterns regarding intentional female targeting in Donald Trump's 2020 re-election campaign materials. In addition, I recognized how both Trump and Pinochet received considerable female support after their years in power had been tainted by controversy. I was then curious to see what these similarities revealed about voter psychology and propaganda. The resulting comparative research question, in what ways and to what extent did America's Donald Trump and Chile's Augusto Pinochet utilize authoritative tactics when appealing to their conservative, female audience was answered by detailed, qualitative primary and secondary source analysis. Public digital archives from Chilean and American news sources, campaign commercials, and social media accounts were analyzed and then coded qualitatively. The results of this analysis highlight a cause-and-effect structure in which the candidates utilize fear tactics in their propaganda to scare their authoritarian followers into looking for a strong leader to protect them from those fears, which the candidate then steps in to fill. As the political world adapts to new forms of media, the comparative perspective of this case study is crucial to understand key themes and arguments made by authoritarian leaders to avoid future violence as well as understand what motivates conservative female voters to support authoritarian leaders.

ഇൗൽ

William He and Emily Mansell

Faculty Advisor: Alexandria Volkening

Mathematical Modeling to Forecast U.S. Elections

Now more than ever, forecasting the outcomes of U.S. elections is an important and challenging task. Traditionally, statistical or political- science methods have been employed to better understand how individuals will vote. Our approach differs in that we use mathematical modeling. Adapting methods commonly used in epidemiology to understand biological disease trans mission, we model the spread of political affiliation (Democratic or Republican) across states using differential equations. We simulate thousands of possible election scenarios, accounting for uncertainty, to make a range of forecasts at the state level. The model's final forecasts for presidential, senatorial, and gubernatorial elections from 2004 through 2016 have had accuracy comparable to popular forecasting sites, such as FiveThirtyEight. A new focus of our research is on how the accuracy of gubernatorial and senatorial forecasts changes over the months leading up to the election day. We will also discuss our forecasts of the 2020 U.S. elections, which we posted in real time last fall on a website that we created (https://modelingelectiondyna mics.gitlab.io/2020- forecasts). Finally, we will share our work on improving the accuracy of the model by weighting the polling data in different ways. Our research highlights how mathematical modeling can be used for data- driven forecasting on a topic of broad interest and suggests additional research in this field.

ഇൗൽ

Emily Holtzman

Faculty Advisor: Erin Waxenbaum

Objects of Influence: Sacrality and Native American Material Culture Across Five Contexts

Much has been written on the politics of (re)presenting Native American objects in American museums and on successes and stumbles associated with the Native American Graves Protection and Repatriation Act of 1990. However, the vast majority of scholarship on Native American material culture focuses on a single context –for example, museum exhibition. Change over time and place is therefore underexplored. The present research addresses this gap by examining Native American religious and cultural objects across both time and space. Particular attention is paid to sacred and ceremonial objects and the histories and current exhibitions of the Field Museum of Natural History and the National Museum of the American Indian. Sacred objects discussed include the Zuni War Gods, the Omaha Venerable Man, and Tlingit clan hats. Taking a biographical approach, this research follows the journeys of Native American material cultural heritage through a framework of five generalized points in the life cycle of such objects: (1) origin, (2) acquisition, (3) exhibition, (4) repatriation, and (5) return. In each stage, objects are acted upon by power, expectation, and cultural

values, whether indigenous or Euro-American. The status of an object as "sacred" also has impact in each stage (e.g., sacred objects may have different needs in museum exhibitions, while the sacrality of the object becomes a topic of debate under a repatriation claim). As objects' meanings are socially constructed and subjective, changes in classification and context dramatically affect how a sacred object is perceived, how it is treated, and what it can be.

☙❧

Caroline Hsu

Faculty Advisor: James Hodge

Strangest Things: Nostalgia vs. Representation in "Kids on Bikes" Media

My project investigates the recent phenomenon of '80s nostalgia media (or half-jokingly, "kids on bikes" movies), a genre staked in the replication of a fantasy of the 1980s inspired by popular films of the era. Many '80s nostalgia texts incorporate "token" characters, who are meant to "update" '80s narratives, which often neglected to take issues like race, gender, and sexuality into serious consideration. I became interested in the ways that '80s nostalgia media attempts to balance the seemingly antithetical impulses towards nostalgia and representation. Nostalgia is the desire to return to the past, and representation is the desire to create a more equitable future. I close-read specific scenes from *Stranger Things* and *It: Chapter Two*, analyzing the ways that each scene sought to balance these impulses, paying attention to sound, cinematography and editing, character archetypes, and narrative structure. My analysis was also informed by texts like Svetlana Boym's *The Future of Nostalgia* and Jacques Ranciére's *The Politics of Aesthetics*. I found that each scene took a unique approach to balancing nostalgia and representation, with varying degrees of success, and with different consequences for the cohesiveness of each text as a whole. Ultimately, I found '80s nostalgia media to be a fascinating case study for the issue of representation in contemporary media. The genre complicates what it means to represent a group in a politically progressive way. Conversely, the clash between nostalgia and representation also raises questions about whether it is possible to feel nostalgic without also inadvertently being politically regressive.

☙❧

Louis T. Ingram

Faculty Advisor: David N. Rapp

The Effect of Authorship and Typographic Errors on the Evaluation and Trust of Text

Why individuals accept novel information as true is an area of great interest. One-way individuals determine if information is trustworthy is based upon source. Past research has indicated that sources viewed as more trustworthy have a higher ability to cause memory contamination, meaning that false information the source provides is more likely to be accepted as true. This project aims to see if the

racial identity of the author influences how trustworthy a source is perceived to be, both by subjective and objective measures. Participants were presented an image of either a White or Black man and told the man was the author of the blog post they were about to read. Participants were presented with a narrative text containing 16 embedded statements, with half being accurate and half being inaccurate lure answers. After reading, participants made six subjective judgements about the author via a Likert scale. The six scores were summed to give an overall subjective rating of the author. Participants failed to demonstrate differences in the overall subjective rating between the White and Black author. Next, they were asked to answer 16 free response trivia questions based upon the statements that were embedded within the text. The proportion of lures reported after viewing false information and true answers after viewing accurate information was taken as an implicit and objective measurement of trust. However, individuals showed a higher amount of trust towards information when it came from the White author instead of the Black author, producing a greater number of true answers after reading accurate information. Additionally, they were more likely to indicate they were unsure of an answer for the Black versus White author, regardless of statement accuracy. This not only indicates the identity of an author can influence the trust of information, but also that people's subjective and objective trust rating may not align, with the subjective trust aligning with societal norms and objective aligning with bias.

ဆာ

Ginny Ip

Faculty Advisors: Mar Reguant and Jeffrey Lewis

The Impact of Climate Change on Energy Poverty: Evidence from the European Union, 2004-2019

Energy poverty can be understood as the inability or difficulty of a household to meet their basic energy needs. While the condition is already widespread across Europe, it will likely worsen in the near future as average temperatures increase due to climate change and there is a greater need for heating and/or cooling. The present study addresses the gap in research in this area by using Eurostat data on energy poverty and changes in heating degree-days (HDD) and cooling degree-days (CDD) across the 28 EU Member States from 2004-2019. A composite indicator of energy poverty that is based on a household's inability to keep warm, pay utility bills on time, and the presence of damp, leakage or rot in the home is created. The results indicate that an increase in the number of days in which air conditioning is needed to be comfortable (CDD) significantly increases the share of energy poor households, but that there is no significant association with HDD. Additionally, a comprehensive analysis of temporal and macroeconomic trends shows that energy poverty is severely unevenly distributed across the Member States, and that both climate change and the ongoing energy transition will likely exacerbate these inequalities. Thus, policy implications include increasing general awareness of the phenomenon and implementing country-specific policies that directly address energy poverty in the context of a changing climate, especially in Southern and Eastern European EU countries.

ဆာ

Annamarie Jedziniak

Faculty Adviser: Rebecca Seligman

A Case Study of Maternal Health Policies Production of a Positive Pregnancy Experience in Australia, New Zealand, and Ireland

In response to critiques about overly focusing on quantitative metrics, the World Health Organization (WHO) published recommendations in 2016 for developing positive pregnancy experiences. This study investigates how the WHO's recommendations might be accomplished in practice. Specifically, this study uses New Zealand, Australia, and Ireland as case studies due to their current maternal health policies' internal focus on women, which may provide viable models of WHO recommendations in practice. Relying on expert interviews, government documents, and academic literature, this research examined how a positive pregnancy experience is understood based upon the WHO guidelines, national policies, and cultural ideas, and compares how different interpretations potentially conflict and may lead to policy successes or failures. Across countries and professionals, this study found no consistent or clear interpretation of a positive pregnancy experience, and each country's policies were successful and failed at creating a positive pregnancy experience. Depending on several factors like population diversity, countries' understanding of positive pregnancy experience changes. This combined with structural issues, cause countries and health professionals' difficulties at creating policies that foster a positive pregnancy experience for all women. Therefore, unless their health system is open, accepting, and capable of changing with women's different choices of maternity plans, and women feel empowered to voice their choices, no country can universally accomplish a positive pregnancy experience for women. Consequently, there is no clear model for countries to follow the WHO positive pregnancy experience recommendations as one country's successful policies can be viewed as a failure in another country's context.

ജ

Diamond Jones

Faculty Advisor: Patrick Noonan

"Friends With A Girl Like Me": Girlhood in Japanese Horror Video Games

In the early 2010s, a group of independently developed, fan-translated Japanese horror games caught the attention of notable YouTube Let's Players. Despite having different developers, each game held curious similarities in the depictions of their protagonists: they were *shōjo* (lit. "small woman"). *Shōjo* is a third-person identifier that refers broadly to the liminal position girls occupy when they are no longer children but not yet adults. Moreover, these adolescent girls face the monstruous in-game entities and bravely create intimate relationships that are not inherently antagonistic. In this manner, these games attempt to provide configurations of young girls in horror who are separate from demonization and infantilization. By closely analyzing and playing through these games and working in tandem with ideas surrounding *shōjo* and the monstrous-feminine, I sought to understand how these games offered up a

new idea of girlhood. How do Japanese archetypes of *shōjo* assist to create agents within the horror genre? Most importantly how does gameplay and horror function recursively to empower both these young girls and the players? Ultimately, I find that these titles present girlhood as sudden, destabilizing, and horrific. Contrasting prior depictions of *shōjo* as lacking autonomy, these video games create autonomy through the dialectic of cuteness and horror.

<div align="center">ℰ✠ℛ</div>

<div align="center">

Akie Kadota

Faculty Advisor: Sarah Bartolome

The Effect of Remote Learning on Secondary Ensemble-Based Music Education

</div>

With the abrupt shift to remote learning due to the COVID-19 pandemic, ensemble-based music teachers have rapidly had to adapt their former classroom structures to be functional online. As group-music making is such an integral part to the music curriculum, remote learning has compromised this previous mean of instruction. However, concerns about the cultural relevancy and educational value of the performance-based curriculum in comparison to the majority of student music experiences outside the classroom have already come into question prior to the pandemic. Through using free music streaming services and participating in informal music opportunities, students have arguably been more engaged in music more than ever beyond the music curriculum. This collective case study seeks to provide insight into how this mass curricular reformation due to a pandemic can potentially incite new perspectives of what should be taught in the music classroom. For this study, I have interviewed 12 choral and instrumental secondary music teachers from public schools across the Chicagoland area to uncover what they have currently done in the classroom as well as how teaching in a pandemic may have shifted their educational values. This thesis may offer suggestions on how to engage more closely with student music experiences as a result of accommodating student, teacher, and community needs in a pandemic.

<div align="center">ℰ✠ℛ</div>

<div align="center">

Christina Kim

Faculty Advisor: Lance Rips

Of Horses and Propensity: Exploring Close Counterfactuals

</div>

In this study, I strive to determine when people will agree that an event almost happened—for example, that a horse almost won a race. Kahneman and Varey's seminal work on these "close counterfactuals" proposes a framework for them, but it is still unclear what role the components of this framework play. With this research, I focus on one component, "propensity," which is the

likelihood of an event reaching culmination after the event has begun. According to the framework, the more propensity increases just before the event fails, the more likely people will believe the event almost happened. I propose instead that close counterfactuals are not necessarily dependent on an increase in propensity. To study close counterfactuals, I presented 12 adults (7 female) with a description of a horse race, in which the favored horse faces a sudden obstacle, leading to its loss in the race. Participants were then asked to indicate whether this horse *almost* won. Participants were divided into three propensity conditions: constant, increasing, and decreasing propensity during the race. All participants in the constant and increasing propensity conditions, but not the decreasing condition, agreed that the favored horse almost won. Hence, rather than high propensity being necessary for close counterfactuals, it may be safer to conclude that negative propensity deters them. Understanding the role of propensity will allow us to narrow the criteria for events that people perceive as close counterfactuals.

<div align="center">ᘓᘛᘀ</div>

<div align="center">**Lucy Liu**</div>

<div align="center">*Faculty Advisor: Tiffany M. Schmidt*</div>

The Role of Intrinsically Photosensitive Retinal Ganglion Cells - Perihabenular Region Circuit in Visual Threat Anticipation

The visual system is one of the primary senses used by mammals to respond to and detect changes in the environment. The ability to anticipate a potential threat in the environment provides a clear evolutionary advantage. However, whether and how the visual system may influence these pathways is not fully understood. In the present work, we analyzed the retina to brain circuits involved in this behavior. First, we exposed control and melanopsin knock-out (MKO) mice to a threatening visual "looming" stimulus to determine the role of the melanopsin-expressing, intrinsically photosensitive retinal ganglion cells in this behavior. After two days, we studied the ability of the mice to anticipate the appearance of a second threatening looming stimulus in the same context. Surprisingly, we found that male MKO animals were not able to anticipate the threatening stimulus, while control and female MKO mice learned the threat anticipation. c-Fos and Arc analysis suggested that the Perihabenular Region (PHb), the Nucleus Accumbens (NAcc), and the Dentate Gyrus Polymorph Layer (DG-po) were potential brain nuclei candidates that drive visual threat anticipation. To identify which of these regions receive retinal input from ipRGCs to drive this behavior, we chemogenetically excited PHb-projecting ipRGCs in MKO mice. We found that excitation of these PHb-projecting ipRGCs partially rescued the deficits we observed in threat anticipation. We next characterized the ipRGC subtypes projecting to the PHb. To do this, we labeled PHb-projecting ipRGCs by injecting a retrograde AAV into the PHb. We found that the ipRGCs projecting to PHb are more concentrated in dorso-nasal retina, and in a preliminary description, a small proportion are M4 ipRGC subtype. Overall, our data suggests that the ipRGC-PHb circuit plays a role in visual threat anticipation behavior in male mice. This project was funded in part by the Office of Undergraduate Research's Summer Undergraduate Research Grant and an Academic Year Undergraduate Research Grant.

<div align="center">ᘓᘛᘀ</div>

Patricia Lohman-Meza

Faculty Advisor: Mark Hersam

Improving Ambient Stability of Nickel-Rich Lithium-Ion Battery Cathode Materials via Polymer and Graphene Coating

One of the most pressing challenges for society is to develop high-performance energy storage solutions for electric vehicles and grid storage as part of a renewable energy infrastructure. Due to their high energy density and lithium-ion batteries (LIBs) have been the most successful technology to meet the increasing demand for energy storage. Ni-rich, layered materials, such as $LiNi_{0.8}Co_{0.15}Al_{0.05}O_2$ (NCA), are among the most promising cathode material candidates for electric vehicles due to their high storage capacity. However, NCA is known to react with atmospheric moisture and CO_2, producing lithium impurities such as $LiOH$, and Li_2CO_3 that subsequently coat the cathode surface. After cathode production, it is commonplace to handle and store cathode powders in ambient conditions leading to production of lithium impurities. This exposure degrades the cathode surface, impedes cathode fabrication, and decreases high-rate performance. In this work, an ethyl-cellulose stabilized conformal graphene coating (GrEC) is employed to protect the cathode surface from prolonged (24hr) ambient exposure. The resulting NCA is hydrophobic and highly electrically conductive, facilitating rapid lithium-ion transport kinetics. X-ray photoelectron spectroscopy, chemical titration, and characteristic first cycle test techniques were used to study lithium impurity levels, and all found GrEC-coated-NCA exposed to humid CO_2 has significantly reduced lithium impurity levels. Additionally, coated GrEC-coated-NCA exposed to humid CO_2 showed superior capacity retention over 200 cycles than uncoated cathodes. This coating scheme effectively protects the cathode surface from lithium impurities and improves the performance of NCA exposed to humid CO_2 producing better LIBs for renewable energy.

‽

Janitza Luna and Joyce Wang

Faculty Advisor: Kathleen Berzock

Modernist Displays of 'Mestizo' Identity in Covarrubias' *Mexican Street Scene*

Mexican Street Scene by Miguel Covarrubias, a print in The Block's collection, lacks essential research about the complexities of the print itself, the artist's intentions, and its possible audiences. Our work attempt s to understand what Covarrubias was trying to convey in the artwork, considering his expertise in anthropology and his influential role in modernist circles moving between the U.S. and Mexico. Our research methodology included observing the lithograph directly, reading the artist's own writings, and researching secondary sources to contextualize the historical and social implications of the print. Covarrubias' artistic style reflects his global experiences and interdisciplinary interests. "Mexican Street Scene" depicts a general image of two traditionally dressed people in an ambiguous setting. This artwork, alongside other modernist work from the period, attempt s to visualize a national Mexican identity for international audiences that were often far removed from the subjects of the art. In post- revolutionary Mexico, the upper and middle classes borrowed the aesthetics of rural and

Indigenous culture as a way to differentiate themselves from the Europe an aesthetics of previous regimes and to give an impression of a unified racial group. While mixed European and Indigenous culture, known as mestizaje, played a vital role in creating a national image, representations of rural subjects could often be reduced to stereotypes and generalizations in artworks. Understanding Covarrubias' work contribute s to our understanding of other works in The Block's print collection, many of which include stories of revolution, identity, and labor in different contexts.

ॐ

Christopher Mazurek

Faculty Advisor: Ken A. Paller

Entering Dreamland: Infusing Signals into a Dream to Produce Awareness of Dreaming

Dreams have played an important role in human social life, spiritualism, and creativity, but scientific study of dreams remains challenging for many reasons. One limitation of most dream studies is that dreams must be recalled retroactively upon waking up, and this recall is subject to forgetting. We sought new perspectives on dreaming by showing that real-time communication between an experimenter and a sleeping person during lucid dreaming is possible. In a lucid dream, dreamers knows that they are dreaming while still asleep. We confirmed that participants were lucid dreaming with polysomnographic methods. Applications of dream communication are many, but research on this topic has been limited because it is difficult to reliably induce lucid dreams. Our research focuses on the use of Targeted Memory Reactivation (TMR) to induce lucid dreams in participants remotely using a smartphone application. In TMR, participants learn to associate a cue with a piece of information, in this case, a lucid state of mind. That cue is then played during sleep to facilitate reactivation of the information, a method that induced lucid dreams with 50% efficacy in lab. To test the hypothesis that TMR increases lucid dreaming frequency remotely, over 150 participants across two experiments used the lucid dreaming app for one week. Data were collected via dream reports. Although data analyses are not yet complete, early results indicate the TMR technique is effective at increasing lucid dreaming frequency compared to a control condition without TMR.

ॐ

Aran Mehta

Faculty Advisor: Elizabeth Shakman Hurd

The Hindu Rashtra Meets Dar al-Islam: The Impact of Hindu Nationalism on India's Relations with Muslim-Majority Countries

Since 2019, tensions between Hindu nationalists and Muslims in India have received greater attention in mainstream political discourse. This thesis evaluates the impact of Hindu nationalism on India's relations with Iran, Turkey, and Malaysia during Narendra Modi's premiership. While Modi's increasingly Hindu nationalist agenda has provoked rhetorical condemnations from these three countries, the direct impact of Hindu nationalism on bilateral relations is negligible. Although this trio's criticisms of India are partly out of solidarity with Muslims, they are largely symptoms of their desire to challenge Saudi and Emirati hegemony in the Muslim world. Through detailed analysis of current scholarship, newspaper articles, government publications, and interviews with experts, I demonstrate that Hindu nationalism plays a superficial role in India's relations with these three countries, and is ultimately outweighed by pragmatic considerations. This research draws attention to an understudied area of India's foreign relations and the intersections between religion and foreign policy, painting a clearer picture of India's great power trajectory.

ဆဝဟ

Othman F. Muhammad

Faculty Advisor: Noshir Contractor

An Application of Bayesian Autologistic Actor Attribute Model s (ALAAM) to Study Social Networks and Their Influence on Human Behavior in Rural Kenya

Overpopulation in developing nations strains a country's resources and contributes to the economic challenges which limit a nation's development. Currently, policy programs in developing countries struggle with promoting modern- day contraceptives to residents due to their perceived health risks and opposition within residents' social networks. To improve policy programs to support the study of cultural dynamics, Northwestern University's Science of Networks in Communities (SONIC) research group conducted a sociocentric network data collection in a hard to reach community in Kenya. The scope of the project is to identify the main factors that influence individuals' use of modern contraceptives. To study the community's cultural dynamics, the research team modeled the social influence using a novel social network approach: Bayesian Autologistic actor attribute models (ALAAM). Preliminary results show that individuals are more likely to use modern contraceptives if they spend their free time with other individuals who use modern contraceptives. Moreover, results show that rather than seeking information about health advice from health practitioners, individuals are more likely to seek health advice from the community's chiefs and elders. With insights into how cultural dynamics influence modern- day contraceptive use, policy programs can strengthen their current policy tools to create interventions that address the country's low modern contraceptive prevalence rate.

ဆဝဟ

Anika Nerella

Faculty Advisor: Rebecca Johnson

The Role of Demographics as a Determinant of Community Health Concerns

Demographics serve as a major influence on shaping perceptions on primary community health issues and improving health standards. Understanding the contextual role of demographics is critical in creating effective health policies and community-based programs. The original study examines the influence of demographic differences in community populations on the identification of pertinent health issues and health needs. The hypothesis was that demographic variations would manifest differently with respect to the major health concerns and health needs identified by a given population. Between 2016-2018, IRB-certified community representatives called Research Ministry Ambassadors (RMAs) collected community health survey data from participants in Chicago, Illinois and Little Rock, Arkansas. Survey respondents chose health issues most prevalent in their communities and health-related factors they deemed crucial to improving health standards. Results show that health concerns differed significantly across subpopulations stratified by location, age, year, and gender. Principal Component Analysis was used to investigate more complex relationships among responses involving commonly-selected health issues—including alcohol and drug addiction, cancer, diabetes, and high blood pressure—and allowed for identification of how the responses of different subpopulations differed from those of respondents-at-large. Data visualization techniques displayed results in an interpretable manner for discussions among participants. Visualization displays are an effective method to educate faith-based community members and to assist in prioritizing community health issues. These results contribute to a growing body of evidence demonstrating that health policy needs to be well-tailored to specific communities in order achieve maximum benefit in promoting community health.

<div align="center">෨ൠ</div>

Olufemi Shakuur Nyabingi

Faculty Advisor: Elizabeth Norton

Does Joint Engagement Relate to Toddlers' Language Abilities Even in Diverse Home Environments?

Language learning is a process that is critically rooted in a child's early years. Joint engagement, a style of interaction where a parent and a child share their attention between each other and a third object, is known to be a type of interaction that aids the language learning process. However, less is known about how other environmental factors that also play a role in language development, might impact the role of joint engagement. Thus, this investigation explores whether joint engagement is associated with language ability once accounting for the environmental factors of socio-economic status (SES) and a child's sibling status. This investigation takes recordings of mother and toddler (24-30mo.) pairs (n=60) while they are playing in naturalistic settings and evaluates how much of that play time is spent in moments of joint engagement. Planned analysis will examine relations between time spent jointly engaged and collected measures of child vocabulary, controlling for the environmental factors of SES and sibling status. Having a deeper understanding of the impact of joint engagement with the inclusion of environmentally relevant considerations could lend insight on how best to support young learners, allowing for the implementation of more fine-tuned and effective language interventions for families and households of all types.

ᛉᚱ

Rachel Okine

Faculty Advisor: Lia A. Bernardi

Assessing Fertility Knowledge in Undergraduate Students

Examining fertility knowledge and identifying knowledge gaps in those who may need to delay childbearing is essential, especially for individuals who may be pursuing higher education. Educating these individuals is also critical as prior research has confirmed that fertility awareness may modify future reproductive choices and outcomes. The primary goals of this project are to ascertain baseline fertility knowledge in well-educated undergraduate students and to determine best educational methods to improve fertility knowledge. An electronic REDCap survey that included 43 fertility-related questions was distributed to undergraduate students enrolled at Northwestern University. Answers were collected and analysis of the descriptive statistics was performed. In this cohort of undergraduate students, knowledge about the age-related decline in fertility was limited. The majority of students plan to delay childbearing, but a substantial proportion has anxiety about their future fertility due to career goals. Further, this study confirms students are interested in learning about fertility and provides better insight into the preferred educational methods amongst undergraduates. The majority of the cohort was composed of females and a large percentage were planning to pursue a career in medicine. As the incidence of infertility is markedly higher in female physicians, it is imperative that all individuals, but particularly those females pursuing medicine, receive tailored early education regarding the age-related decline in fertility. Early education can help empower undergraduates, prepare them to make informed decisions that will lead to successful reproductive outcomes, and decrease the incidence of infertility in those who delay childbearing.

This project was funded in part by the Office of Undergraduate Research's Academic Year Undergraduate Research Assistant Program.

ᛉᚱ

Leo Sainati

Faculty Advisor: Wendy Pearlman

How Does the Level of Cultural Similarities Between Refugees and Hosts Impact Social Integration?

Refugee integration is often framed as a process of two-way accommodation; two different cultures learning to co-exist through compromise and empathy. As such, scholars name cultural differences as focal points for where this accommodation happens. If cultural differences are an obstacle to integration, settling into a host country with the same language should demand less accommodation, compromise, and therefore integration. This assumption, however, often fails to explain contemporary cases of refugee integration. Syrian refugees, for example, have settled into a wide variety of recipient nations, integrating into cultures that are both very similar to and very different from their own. In

Jordan, a country with strong cultural ties to Syria, many refugees live in poverty, without work or shelter. Many Syrians in Germany, however, feel welcome and have numerous paths to employment, despite the lack of strong cultural similarities. What explains these counterintuitive outcomes? Under what conditions does cultural overlap – cultural similarities among refugee and host populations – facilitate integration or instead have relatively little influence in narrowing the degree of two-way accommodation? By comparing the formation of social connections among refugees and hosts in Jordan and Germany, I propose that there is a key intervening variable mediating the effect of cultural overlap on integration outcomes: the role of the state in setting a refugee policy response, which I label as host country governance. Host country governance as a predominant variable in affecting refugee integration outcomes gives hosts states considerable agency in the integration process – regardless of refugee demographics.

<div align="center">80CR</div>

<div align="center">

Izabela Stankiewicz

Faculty Advisor: John A. Rogers

Development and Assessment of a Hydrocephalus Shunt Flow Monitor

</div>

Hydrocephalus is a common, neurologically devastating condition characterized by the accumulation of cerebral spinal fluid (CSF) within the cavities of the brain. By far the most common treatment for the condition is the surgical implantation of a tube, also known as a "shunt," which diverts excess fluid in the brain to another area of the body. What at first seems like an extraordinarily simple solution is greatly complicated by the technology's high failure rates due to obstruction. Absence of CSF flow through the shunt puts a patient at risk of brain damage, but symptoms may be as inconspicuous as a headache. A novel device capable of sensing shunt flow would eliminate the need for radiation-based brain scans or invasive surgeries to detect shunt obstruction. In my research, I constructed and validated the efficacy of a flexible, wearable circuit for the continuous monitoring of CSF flow. I quantified the effects of several variables on sensor accuracy and sensitivity using a skin model. This optimization allowed for exploration of difficulties associated with device encasement and material selection before clinical assessments. After obtaining promising results for the device's sensing capabilities and thermal response, I am currently investigating nuances in CSF flow's response to positionality and pulsatility. The foundational design elements of the shunt flow monitor are anticipated to have significant diagnostic applications related to flow in other areas of the body, especially for individuals at risk of diabetic neuropathy and end-stage renal disease.

<div align="center">80CR</div>

<div align="center">

Natalie Tomeh

Faculty Advisor: Diane Whitmore Schanzenbach

The Impact of SNAP and P- EBT in the Wake of COVID- 19

</div>

Food insecurity tripled in 2020 as people lost their jobs due to COVID-19 induced shutdowns. In response, Congress passed the CARES Act which expanded the Supplemental Nutrition Assistance Program (SNAP), commonly known as food stamps, and the Families First Coronavirus Response Act which created the Pandemic-EBT program for families with children receiving free and reduced lunch. Prior research has demonstrated that SNAP and P-EBT have been effective in reducing food insecurity and hunger. However, limited research is yet available on the impact of these programs and the timing of their benefits 'release during the COVID-19 crisis. Moreover, little research has been done to address the programs 'impacts on food confidence: a measure of households 'confidence in their ability to afford food in the next month. Using the results of the Census Bureau's Household Pulse Survey, as well as state level data on SNAP and P-EBT participation, I have been able to use ordinary least squares regressions and a differences in differences model to determine the impact of the food assistance programs on hunger, food insecurity, and food confidence in the year 2020. Preliminary results suggest that an increase in SNAP participation rates reduces all three outcomes - hunger, food insecurity, and food non-confidence - up to one month later. This research can be added to the body of literature on food insecurity and hunger reduction, and thus can support efforts to increase expenditures on these programs and provide benefits quickly.

<div align="center">ൟ</div>

<div align="center">

Leonardo Trigo

Faculty Advisor: Stephen Hersh

COVID-19 Vaccine Attitudes Among Native People

</div>

This research project seeks to examine Native people's sentiment towards COVID-19 vaccines, with the goal of supporting Native American organizations in designing effective public health campaigns. Most current nationwide surveys on COVID-19 vaccines have not been designed to reach Native people nor to address the issues most important to them. As such, data on Native peoples' attitudes is insufficient and, more importantly, fail to address culturally specific factors such as consumption of Native American media, access to group-specific healthcare institutions, and adherence to traditional medicine. With these issues in mind, we created a survey designed to gather data exclusively from Native people, and distributed it through partnerships with Native news agencies, most notably Native News Online, as well as multiple Native health organizations. Structurally, the survey aims to identify socioeconomic, political, cultural and psychological correlates with vaccine hesitancy. To that end, questions span multiple facets of one's personal information ecosystem, including media consumption and community engagement, past experiences with healthcare, current beliefs regarding vaccines, practical barriers to obtaining medical support, and demographic variables. Additionally, the survey provides a variety of marketing messages in favor of COVID-19 vaccines. Methodologically, the crux of our results will be the identification of links between one's profile and the promotional messages that are most persuasive in reducing vaccine hesitancy. It is our hope that our survey will showcase how personal ecosystems varies between those for and against the vaccine, and what are the most effective ways to address the latter's reservations through public health campaigns.

<div align="center">ൟ</div>

Sue Um

Faculty Advisor: Danielle Beverly

A History of Women in Documentary

As a medium, documentary filmmaking has the power to enact tangible social change foster connection by telling stories of the human experience. Women documentary filmmakers are often behind not only the canon's most prominent and influential films, but also the most technically innovative and thematically groundbreaking works. This online interactive timeline features the films and lives of fifteen American women documentarians from 1920 to 2021, and it contribute s to the growing knowledge of who can be a documentary filmmaker. It features original writing, research, and embedded links to images and videos. Research for the timeline was sourced from scholarly texts written about the filmmakers, but also film journal articles, reviews, and social media posts to broaden commonly held conceptions of legitimate sources. By creating this timeline, I hope to highlight that institutional access to academic resources does not make one filmmaker more legitimate than another and to cultivate a more multifaceted and intersectional notion of women documentarians. This timeline is a living document, and it is subject to change over time. By covering a general and incomplete history of documentary filmmakers, this research spans across the social, political, cultural, and personal, and it shows how these films and the filmmakers themselves are in conversation with one another and broader society.

This project was funded in part by the Office of Undergraduate Research's Academic Year Undergraduate Research Assistant Program.

<div align="center">ഭാഗ</div>

Catherine Walker

Faculty Advisor: Franz M. Geiger

Energy Generation by Saltwater Motion on Metal Nanolayers

With global energy demands rising and climate change intensifying, humanity's need for renewable energy is growing. One potential source is nanoscale semi-conducting structures, which can transform the kinetic energy of moving ionic fluids like saltwater into electricity. Such devices could harvest electricity from ocean waves, wastewater, raindrops, and more. These nanostructures can approach efficiencies of 30%, but scalability remains an obstacle to implementation of many of them. The Geiger lab has developed metal nanolayers (~ 10 nm) fabricated in a single step from Earth-abundant elements such as iron and nickel. The metal nanolayers produce current densities of several microA cm^{-2} under modest velocities of ionic fluids mimicking ocean water. While these qualities suggest high scalability, information about the nanolayers' mechanism of energy transduction, stability, and affinities for different substrates is needed for implementation. Electrical data I obtained for an array of metals support a mechanism that is dependent on saltwater motion and intra-electron transfer between metals of different oxidation states in the metal oxide overlayer, which forms spontaneously and terminates the metal nanolayers. Saltwater degrades the metal nanolayers quickly, mitigating electrical activity, but by depositing organic and inorganic protecting layers atop the metal nanolayers,

I have prevented degradation while retaining electrical activity. Finally, I have successfully fabricated metal nanolayers on a variety of chemically diverse substrates with high scalable potential, the most prominent of which is polyethylene terephthalate, a cheap and flexible plastic. These results have furthered the lab's understanding of the metal nanolayers, increasing their potential for implementation.

છાલ્ક

Liam Warner-Shifflett

Faculty Advisor: Craig Garfield

Maternal and Paternal Depression Symptoms During the NICU Stay, Transition Home, and First 30 days

Parents of infants admitted to the neonatal intensive care unit (NICU) have a heightened risk of mood disorders and poor emotional functioning. Such mental health outcomes are associated with adverse child development and parenting practices. While depression is one of the most common complications of childbirth, little is known about its severity across significant NICU transition periods. Thus, the goal of this prospective longitudinal cohort study was to examine the trajectory and risks factors of parental depression symptoms through the NICU to home transition. In this prospective cohort analysis, mothers (n = 230) and fathers (n = 201) completed the Edinburgh Postpartum Depression Scale (EPDS) at four timepoints: NICU admissions, discharge, 14-days post-discharge, and 30-days post-discharge. Parent demographic and infant clinical data was also collected. From admissions to 30-days post discharge, the EPDS score change was 1.9 points different between mothers and fathers [CI: (1.3,2.6); $p<0.0001$)]. Mothers' scores decreased 10.96 times [CI: (2.99,38.20); $p=0.0003$]; fathers' scores did not decrease [0.99 times (CI: (0.26,3.79), ($p=0.9854$)]. Further, the ability of demographic-only models to predict positive depression screenings (EPDS $\geq$ 10) 30-days post discharge was significantly improved upon the addition of in-NICU depression screenings (AUC 0.66 baseline demographics only vs 0.84+admissions ($p<0.0001$), and vs 0.80+discharge screening ($p<0.001$)). These results indicate that mothers and fathers experience different trajectories of depression symptoms through the NICU to home transition, and focused attention on fathers is warranted. The significance of in-NICU depression screenings underscores clinicians' needs to provide improved post-discharge mental health care.

છાલ્ક

Titobi Williams

Faculty Advisor: Sarah Van Wart

Entering the Black Box: Looking at Pretrial Risk Assessments' Machine Learning Process

From the recommendation algorithms that guide audiences towards more cat videos, to the GPS that steers drivers away avoiding traffic, to recidivism risk assessments – privately developed criminal justice technology – that guide judges to determine their sentencing for pretrial defendants. Existing scholarship focuses on the methods used within the algorithm and excludes raw data that is analyzed to predict recidivism outcomes. This study asserts that the data manipulated is as crucial as the algorithmic model used to render predictions. I test the limits of transparency surrounding risk assessment systems - (1) Correctional Management Offender Management Profiling for Alternative Sanctions (COMPAS) and (2) Public Safety Assessment (PSA) – using open records processes, I focused on local and state governments responses to inquiry of COMPAS and PSA. The aim was to understand the viability of open records as a tool for transparency of algorithms that dictate citizens lives with little public oversight. Secondly, I aimed to understand how different tools would understand the same defendant. Using ProPublica's COMPAS dataset, recidivism scores using both COMPAS and PSA were calculated for a set of 10 randomly selected defendants and the variance in scores was measured to determine if risk assessments are consistent. I concluded open records processes are insufficient as tools to discover the fairness of risk assessments and that COMPAS and PSA do vary in their predictions of recidivism for the same defendant. These findings contribute to existing literature by investigating the legality of recidivism risk software and advocates for the importance of algorithmic accountability.

<div align="center">৪৩৫</div>

<div align="center">

Chloe Wong

Faculty Advisor: Shalini Shankar

</div>

Radical Caring: A Qualitative Study on the Role of Frontline Workers in Eradicating Gender Violence in Asian American Communities

Gender-based violence (GBV) is a prevalent issue on a global scale, but the effects of such violence upon Asian American communities in the United States is compounded by their immigrant, refugee, and/or other historically marginalized identities. While current literature recognizes GBV as a public health issue of equity and social justice, anthropology closely examines the asymmetry of power by informing a holistic view of local contexts. The research examines the perspectives of Asian-identifying frontline workers within domestic violence agencies and civic organizations in Chicagoland. Frontline workers, such as social workers and legal advocates, play a pivotal role in serving survivors and offering intimate local-level knowledge. Feminist ethnography grounded in Asian American Critical Race Theory (AsianCrit) guided data collection and analysis. Ethnographic fieldwork at a local domestic violence agency for six weeks was conducted and 14 key informant interviews with frontline workers from 5 non-profits across Chicagoland took place. The analysis demonstrates that their labor as influenced by personal life histories, or "radical caring," provides agency to survivors on the individual, relationship, community, and societal levels, aligning with the WHO Socio-Ecological Framework for Violence Prevention. The positionality of frontline workers is crucial in eradicating gender-based violence and resisting the structural violence affecting all female and non-binary people of color. Highlighting the advocacy of frontline workers broadens interdisciplinary understandings of gender-based violence in anthropology, public health, critical race studies, and other social science disciplines.

ഏൽ

Catherine Xu

Faculty Advisor: Sera Louise Young

Dam-Displaced Populations Experience Significantly Higher Household Water Insecuirty, Food Insecurity, Depression, and Domestic Violence due to Construction of the Thwake Multipurpose Dam in Makueni County, Kenya

Household water insecurity (HHWI) is a burgeoning global health crisis affecting over 700 million people. Kenya has been disproportionately affected as a result of droughts, floods, and poor water supply. In response, its government has proposed the construction of the Thwake Multipurpose Dam in Makueni County. Although dams positively impact flood management and water generation, they also decrease water quality and displace local populations. Given that knowledge of the psychosocial consequences in displaced populations and the burden upon women at a household level is lacking, this study aims to determine whether dam-displaced households experience poorer psychosocial and nutritional well-being in women, including HHWI, household food insecurity (HHFI), depression, and domestic violence. This quantitative study employed the following scales as measures of the variables of interest: the Household Water Insecurity Experiences (HWISE) scale, the Household Food Insecurity Access Scale (HFIAS), and the Center for Epidemiological Studies Depression (CES-D) scale. Domestic violence was operationalized by experiences with physical, sexual, and emotional abuse in the past 6 months. Equal variance independent t-tests, Fischer's exact tests, and linear/logistic regressions were conducted with STATA which showed that displaced households had significantly higher scores across all measures and a significantly higher percentage reporting experiences with domestic violence. Based on these findings, we conclude that women in dam-displaced households exhibit significantly poorer psychosocial and nutritional health measures highlighting the potential detrimental effects of dam construction. Therefore, we recommend that future large-scale water infrastructure projects incorporate psychosocial/mental health mitigation measures for displaced households and women in particular.

ഏൽ

Jade Zhang and Mercedes Sandu

Faculty Advisor: Shuyi Weng

Constructing Convex Polyhedra by Applying Gaussian Curvature to Pentagons

Gauss' Theorema Egregium states that the Gaussian curvature of a surface is invariant under local isometry; that is, if one takes any smooth surface and twists or bends it without stretching, the Gaussian curvature at any point on the surface does not change. In this project, we aim to extend Gauss' Theorema Egregium to the case of polyhedral surfaces, which are not smooth, but instead have flat polygons as faces. We show that, given a polygon with five vertices, we can perform a series of calculations to find its "companion shape," which is another pentagon with the same side lengths. When this "companion shape" is folded such that each side is glued to the corresponding side of the

original polygon, it forms a convex polyhedron where all cone angles are equal. We examine the criteria for which five-sided polygons actually form a closed "companion shape" (and resulting convex polyhedron) with the aim of constructing a fundamental domain which relates all the different pentagons that fold up to the same polyhedra. Our methods include using complex coordinates and programs in graphing software (Mathematica) to construct test cases, verifying the validity of such test cases with geometric computations, writing proofs to formally establish observed patterns, and making paper models for demonstration. Using the known fundamental domains for three- and four-sided polygons, the geometric computations we perform rely on trigonometry and the Gauss-Bonnet Theorem, extending the applications of Gaussian curvature.

ഹോര

Joy Zheng

Faculty Advisor: William Horton

Emojis and The Interpretation of Text Messages Between Friends and Between Acquaintances

Currently, a great deal of information is conveyed through written online communication. However, this leads to a lack of important pragmatic, or contextual, cues that are present in face-to-face interaction such as body language, tone of voice, or facial expressions. One method to potentially reduce this issue is emoji usage. In this project, we studied face emojis and how they affect the interpretation of ambiguous text messages between people with different social relationships and hope to gain an understanding of how emojis act as a pragmatic clue. We recruited 64 college-aged English speakers online as participants. They were presented with short text message conversations and asked to select one out of four possible interpretations for an ambiguous message that was sent from either an imagined friend or acquaintance. Some messages had an emoji present and others did not. Participants were additionally asked to rate how appropriate the message was. Results suggest that emojis do guide the reader and influence the option selected. Generally, more interpretations congruent with the meaning of the message was chosen when emoji was present than absent. Interestingly, despite sharing less social context, acquaintances were more likely to select congruent, perhaps desiring to follow more closely to the safer meaning of the emoji whereas friends have more coded and stylized forms of communication. Therefore, emojis may lessen miscommunication by providing pragmatic information. This contributes to our understanding of the nature of effective communication of written online discourse, though there may be a difference depending on social context.

ഹോര

ॐ   Creative Arts Festival

℘   Creative Arts Festival

Lalla-Aicha Adouim – *Dinnertime* **(Short Story)**

Julia Borrelli - *Washed Away: Come Towards* **for String Quartet (Composed Music)**

Ace Chisholm – *Ovid, to Rome from Afar* **(Graphic Novel)**

Juyoung Choi and Saad Ejaz – *Home to Home: How a Yemeni Refugee Found Love in South Korea* **(Documentary Film)**

Princess Collado and Mohammed Al-Khulaifi – *Of Things That Shouldn't Be* **(Cinematic Poetry)**

Kayan Khraisheh – *Work in Progress* **(Short Story)**

Sydney Matrisciano – *Whitewashed: The Impact of Whiteness in Mississippi Landscapes* **(Threadpainted Landscape)**

Xinyuan (Joyce) Pu – *A Flower Explodes* **(Staged Reading)**

Peach (Ganpicha) Sahasakul – *My Mother Fled to the Submerged Palace* **(Animated Short Film)**

Emmet Smith, Ruchir Khazanchi, and Michael-Ellen Walden – *A Bridge to the Moon* **(Musical Theater Film)**

Hank Yang – *The Generic Fish* **(Drawing)**

Erin Zhang – *These Days* **(Animated Short Film)**

℘ℂ℞
Professional Jury

Tara Mallen, Rivendell Theatre

AJ Links, Pascal-Rudnicke Casting

Charles Murphy, Chicago Musician

Mickie Pascal, Pascal-Rudnicke Casting

℘ℂ℞

ಇಾಡಿ

Lalla-Aicha Adouim

Dinnertime **(Short Story)**

Description and Artist Statement

One afternoon, Pauline Butler is running around the kitchen trying to prepare a last-minute dinner for her husband and his boss, while also looking after her child Ethel. Ethel runs around the kitchen in her childish chaos, causing Paulin to continuously kick her out, putting her in front of the television and eventually out in the backyard. Oblivious to what Ethel is doing, Pauline takes a phone call from her friend Margaret, discussing her home life and husband who has been having an affair. As Pauline tries to maintain her image of a picture-perfect housewife, Ethel ends up on the roof of the house, her mother more concerned with the burning chicken.

Dinnertime was inspired by the housewives of the 1950's, and their obsession with appearing perfectly domestic while also being appealing to their husbands. I wanted to explore how desperate they are to be a good wife, and how some saw an ideal wife in being a servant to their husbands. I also wanted to explore the effect this has on the children, how they are neglected by their parents as their mothers cook and leave them to be raised by the television. Most of the time, this neglect is merely emotional, but I wanted to explore the darker side of that, of what can happen when you turn away from your child for too long, even if the intentions were not malicious. I intended for this piece to force the reader to reflect on not only the suffocating gender roles of the time, but also on how easily disaster can strike when children are neglected, how they are still growing and need constant attention. To some extent it's a norm to neglect your children and simply hand them an iPad to play games or shove them into another room, but it leaves children to be all alone, never having someone to always be there to catch them when they fall.

ഇൻൻ

Julia Borrelli

Faculty Advisor: Hans Thomalla

Washed Away: Come Towards **for String Quartet**

Description

The internal battle in all things of being both content and able to free the mind into relaxation- even just for a second- washes away and comes towards itself as life circles around. This tension and release to be in such state of the mind, content and relaxed, is explored through this piece. Written during the 2020 COVID-19 pandemic, this piece navigates an era of frustration and a yearning to find new light and space in the world to separate from the tensions we exist within.

The string quartet is quite homogenous sonically, consisting of instruments from the same family and sharing many of the same open strings and fundamental tones. The homogeneity serves as a conduit for me to release the tension I experience. The lacing of melodic lines, use of harmonics and trills, the contrasting sounds of a light and heavy bow, and seamless transitions between playing from one area of the finger board to another collectively build the sense that the music is washing away and coming towards the listener at both the micro and macro levels of the piece.

The Bienen School of Music's Institute for New Music provided the opportunity for me to collaborate with the Spektral Quartet to compose and record this piece. This experience helped me refine my composition process, heavily developing my ability to link sounds together in a seamless way.

Artist Statement

I currently am a fourth year student studying music composition at the Bienen School of Music, and learning and organizational change at the School of Education and Social Policy. I am interested in merging my interests of musical composition and organizational design to enhance my work in both fields. My music is greatly influenced by social structure, societal practices, and the differences between generations, although, my music does not explicitly require the audience to perceive the performance experience in such light. My writing process is influenced by experiencing, listening, and discussing arts forms, including but not limited to composition, and always includes a drawing or sketch of some format to guide my project's narrative and development. My hope is that my music inspires others to critically think about their life's experiences, and in particular to this piece, how to find release in a time of tension. Thank you to Northwestern University's Institute for New Music, and the Spektral Quartet, for providing the opportunity to write and beautifully record my piece, *Washed Away:Come Towards* for string quartet.

Ace Chisholm

Faculty Advisor: Francesca Tataranni

Ovid, to Rome from Afar (Graphic Novel)

Description and Artist Statement

When relegated to Tomis in 8 AD, the poet Ovid wrote a series of letters, the *Epistulae ex Ponto*, to various connections back in his beloved Rome. Funded by a summer research grant, I studied these letters, objects that could return where Ovid was unable, as a means for him to express and experience nostalgia. "Ovid, to Rome from Afar" is the first of a seven-chapter graphic novel collection of my observations. It follows Ovid who visits – as a letter – four Roman connections: "Cotta Maximus," "Tuticanus," his wife, and "Ingratus." The characters "Cotta Maximus" and "Tuticanus" are compilations of actual addressees, divided by theme. Ovid's interactions with "Cotta Maximus," based on letters to Cotta Maximus, Graecinus, Brutus, Macer, and Sextus Pompeius, examine the anxiety to be remembered, the struggle to maintain continuity, and the hope of return. "Tuticanus," a combined Tuticanus, Atticus, Severus, Rufinus, and Carus, features the joy of Latin poetry and kindred spirits. The personality of "Tuticanus" is built on the collection of fellow poets and literature enthusiasts, and his immediate warmth toward Ovid acts as a foil to "Cotta's" more reserved attitude. Letters to his wife walk a delicate line between performative role-casting for their public image and sincere affection and frustration. "Ingratus" is a failure of Ovid's hope to be remembered and cared for by friends, named for the single epistle addressed *ad ingratum*. Dialogue between the characters combines paraphrases of epistle passages, fiction, and explicit research conclusion. This graphic novel is intended to make accessible and interesting to readers of any background but one facet of the *Epistulae ex Ponto* and add to the limited body of Classics-based comics that do not feature militaristic imagery.

ഔരു

Juyoung Choi and Saad Ejaz

Faculty Advisor: Professor Abraham N Abusharif

Home to Home: How a Yemeni Refugee Found Love in South Korea (Documentary Film)

Description

In late 2014, a civil war broke out in Yemen. Since then, 3 million Yemenis have been forced to leave their homeland in search for food, shelter and security. Two years ago, over 550 of them made their way to Jeju Island in South Korea, sparking nationwide protests. While the outrage at their arrival had been well reported, the world had paid very little attention to what had brought them there and how they navigated a society so different from their own. To remedy this, we spent 14 days in Jeju City, South Korea and interviewed Yemeni refugees, humanitarian workers, government officials and Jeju residents. Our documentary in particular focuses on the relationship between Muhammad Amin, 31, and Ha Min-kyeong, 36 who had married each other shortly before our arrival there. Together, they had invested in a cozy eatery called Wardah restaurant, that served traditional Arabic food and was a hotspot for the Muslim community in the Christian nation. Despite their love and plans to have children soon, Amin's legal status in the country was constantly under threat. Our documentary thus explores the lengths Amin and Min-kyeong have gone to find security and build a relationship that might ultimately be taken away soon. Throughout our work, we show the ways in which Amin integrates himself into Min-kyeong's family. We follow them as he helps them prepare for Jesa, a ceremony to honor the dead. During the cooking and cleaning for guests, we discuss the barriers to their future and the hurdles of making a relationship like their works in South Korea.

Artist Statement

To capture on film a brief moment in someone's life is an art form like no other. Choosing a particular lens, moving a light, adding the right music elevates the people in our stories, and their ideas and emotions. Seeing and hearing, aided by the cinematography and editing, conveys the raw and visceral truth of human experience. Much of the coverage of this story had focused on the novelty factor of Yemenis in South Korea. From the very start, we were opposed to this kind of reporting. Instead, we wanted to humanize the numbers that had been thrown around in the press so recklessly. That is why we chose to take a more intimate approach to our documentary making process. To do so, we spent hours at a time with both Amin and Min-kyeong. We would visit their restaurant and discuss their lives as they prepared for the day ahead. As they closed up their shop, we'd help them clean the tables and put away the chairs. The trust and connection we built with them is the reason we were able to access Jesa, a very private ceremony reserved exclusively for close family. Soon, they forgot that the cameras and lights were even there. Doing so helped us tell their story in a way that truly captures who they are for one another. Sitting in their home, watching Amin and Wardah joke and flirt with one another, puts a face and a story behind a group that is treated homogenously. After watching our film, we want our audience to feel hopeful that despite the never ending news cycle, the people of this world can truly coexist.

ഗ്രര

Princess Collado and Mohammed Al-Khulaifi

Faculty Advisors: Sami Hermez and Torsten Menge

Of Things That Shouldn't Be (Cinematic Poetry)

Description and Artist Statement

Of Things That Shouldn't Be is a cinematic poetry piece that attempts to explore the nature of Paulo Freire's banking education system and our desires to break free from the system where we are held to absorb knowledge without resistance. When choosing which concept we wanted to focus on, our main priority was focusing on something that everyone feels strongly about, and would be able to comprehend their best ideas into it. We eventually decided to focus on Paulo Freire's banking education system, noting that everyone has undergone similar experiences on it. We posed the question about the nature of this system and if it operates in a way that is beneficial to the learner even to a miniscule extent. Planning out the film during pre-production was one of the biggest challenges we faced. We found great difficulty in trying to visualise the concept in a way that sticks to its own values. Eventually, we came up with a poem that tells a story as abstract as the visuals. *Of Things That Shouldn't Be* was something we like to think of as the exemplification of going beyond what we see on text. Even as the poem speaks for itself, it is accompanied by visuals that could be interpreted in many ways. This encourages everyone to interact with the film in any way they could without having to settle with just one explanation.

ഇൗരു

Kayan Khraisheh

Work in Progress **(Short Story)**

Description and Artist Statement

This short story was written for my Short Fiction class; using symbolism and nature imagery, I aimed to depict the unsteady and conflicting emotions of a young girl who has never lived in her home country Palestine, and struggles with feeling like she belongs anywhere. The character is flawed and becomes consumed with trying to become something she is not. These feelings lead her to make nearly deadly mistakes, but she comes out of it with a better understanding of her identity. This story can be understood at a deeper level by any third culture kid, or otherwise, who has struggled to put together the pieces of their identity and understand who they are at their core.

<div align="center">

 howcr

Sydney Matrisciano

Faculty Advisor: Nicolette Bruner

</div>

Whitewashed: The Impact of Whiteness in Mississippi Landscapes (Threadpainted Landscape)

Description and Artist Statement

My work is influenced by my desire to correct perceptions of place. I am from Mississippi, a state misunderstood by both its proponents and its detractors. To represent the complexities of Mississippi in its entirety is beyond the capacities of any one individual. However, by combining diverse techniques and collective knowledge, my work attempts to convey a more perfect reality of the places that I call home.

Whitewashed is an ongoing exploration of the history of Southern land use through seven locations relevant to my experiences as a young, white woman in rural Mississippi. Though the scenes seem innocuous, the natural features depicted within are manmade. The artificial waterfronts, agricultural expanses, and recreational centers were created by and for white Mississippians. The scenes are photographed, printed, then altered to highlight the impact of whiteness on the landscape. By delving into the histories of these synthetic scenes, *Whitewashed* examines the impact of whiteness on the environment. White economics, white recreation, and white history created these tableaus to the exclusion of other historical narratives.

I choose to embroider the photographs to pay tribute to the long line of women who taught me and to acknowledge the ways in which gender affects one's perceptions of race and power. I use embroidery to highlight the manmade elements of the scene. I aim to amplify the colors of the spaces depicted to represent the image more realistically, or rather, more akin to my experience of the site. To convey a sense of warmth, optimism, and hope, I might enhance the purple tones of a shadow or the rich yellows cast by the sun. Additionally, stitching is a slow and methodical process. The consideration of each stitch creates space for the viewer to pause, inviting them to reflect on their own impact and connections to race and environment.

Finally, I incorporate natural pigment, collected from the scene, as dyed thread or paint to question the materiality of the scene depicted. Pigments are derived from clays, soils, plant matter, iron waste, and found objects such as cigarette butts and other consumer waste products. My pigment practice is exploratory in nature, guided by a commitment to slow consumption. The pigments cement the connection between the image and its physicality, closing the gap between the viewer and the location depicted. In this, I challenge the viewer not to distance themselves from issues of race in our society. This project was funded in part by the Office of Undergraduate Research's Academic Year Undergraduate Research Grant.

ഓരു

Xinyuan (Joyce) Pu

Faculty Advisor: David Catlin

A Flower Explodes (Staged Reading)

Description and Artist Statement

Set in a longtang neighborhood in Shanghai, this play follows the lives of three generations of Chinese women from 1957 to 1966, the beginning of the Cultural Revolution. Coming from different regions and backgrounds, these women meet each other in the longtang and form a community of their own. The play tells their bittersweet struggles during the socially and politically turbulent years in twentieth-century China. It's about individual ambitions and their push and pulls with the community. It's about mother and daughter. It's about crushed dreams. It's about how the women choose and move forward in choiceless situations. Currently, the play is still a work in progress. It is written in Chinese and translated into English by myself. This version of staged reading will be presented in Mandarin and several Shanghai and other regional dialects. Thank you to Northwestern Office of Undergraduate Research for their support of this project; David, for trusting me and the story and mentoring me all along; Peter, for inspiring my interest in research; and finally, my stage manager Wenke (Coco) Huang and actors Ella Rouwen Chen, Yishan Hao, Eli Huang, Ruoyin (Jonyca) Jiao, Olivia Xixuan Xing, and Zhong Guan, for bringing this story to life.

I have always wanted to write a play about Chinese women. I am proud to be one, and I was raised by resilient, hard-working, and loving women who have inspired me. With my feminist awakening and more involvement in social justice in recent years, time after time I was frustrated by not seeing a compelling female character with agency on stage at home. Therefore, I embarked on the journey to write my own play that would amplify marginalized female voices in China. Through my year-long research, my focus has expanded from writing a female-centered narrative to exploring themes including migration, activism, forgotten history, industrialization, and collectivism. As feminism has been heatedly discussed on Chinese social media and growing challenges arise for feminists in China, increasingly I feel the urgency to write this story and invite people to think critically about history and women's situation in modern China.

ೞಲ

Peach (Ganpicha) Sahasakul

Faculty Advisor: Eric Patrick

My Mother Fled to the Submerged Palace

Description

I set out to update a beloved Thai folktale. Most existing Thai animated films are based on epics, classics, and folklore, which is all fine and good except they imply that 'Thainess' is forever embedded in a distant past. I chose to adapt the tale of *The Golden Goby Fish* such that it would affirm that Thainess is alive and well in the present day, and to make the story more accessible to a non-Thai audience. To make this film, I first studied a version of the folktale in the original Thai and drew artistic inspiration from contemporary Thai art and culture. It was important to me that Thainess could be conveyed through pattern and motif without appearing overly anachronistic. I wrote an original script that set the tale in modern-day Bangkok, and challenged myself to tell a story without dialogue. This condensed version of *The Golden Goby Fish* is intended to get to something more universal about grief and acceptance. I designed and animated my characters before adding backgrounds. Lastly, I worked with sound students to add music and sound. The film represents an alternative approach to adapting folktales for animation. My writing and designs were guided by animal symbolism from the original tale, where the daughter-protagonist is associated with a parakeet and her mother is associated with a golden fish. The resulting story has very little in common with the folktale that inspired it while still staying true to the fairy tale logic.

Artist Statement

I'm a 2D computer animator passionate about using the power of story to bridge cultures. I've been fascinated with the tale of *The Golden Goby Fish* for a very long time. It's a totally unique, fantastical, convoluted Southeast Asian Cinderella folktale. When writing and designing my version, I focused on maintaining the surreal tone of the original. As a perpetual international student, I'm always looking to explore themes of moving away from people and places, and of departure and return. Once I had a script, I sketched out different scenes and created a spreadsheet of what needed to be animated in each shot. I prioritized looping character animation before unique character animation, backgrounds and effects. Animation was done in Adobe Animate using a combination of puppet and frame by frame animation. Seeing as the second half of the short mirrors the first, similar shots were animated together then later rearranged. I chose a range of bright and dark colors to visualize how the narrative moved from dark to bright, and from blues to warmer shades of red and pink. I worked with sound students through many iterations of sound design and music before settling on the final version of the film. The film was untitled through most of this process, but ultimately, I decided to name it after a line spoken by the girl's father in the original tale (this character does not appear in this adaptation), which roughly translates to, "Your mother has fled to the submerged palace."

ळ०ର

Emmet Smith, Ruchir Khazanchi, and Michael-Ellen Walden

Faculty Advisor: David H. Bell

A Bridge to the Moon (Musical Theater Film)

Description and Artist Statement

Dreams, loss, climbing toward the stars on string lights. In the face of an environmental crisis, three grieving siblings are tasked with holding their island and family together. When Lil decides to take drastic action in hopes of finding their mother or at the very least, some answers, the limits of their world are tested. Written in collaboration with the American Music Theatre Project as a Capstone for the Creating the Musical Module, *A Bridge to the Moon* celebrates the power of a child's dreams and the risks we will take to care for our community.

This iteration of our heartfelt musical is a filmed theatre piece: 70 minutes of Michael-Ellen Walden, Ruchir Khazanchi, and Emmet Smith making music, making believe, and making absolute fools of ourselves in a living room-turned mythical island of Marama. This winter, the three of us were able to safely get in a room together to create this original folk-tale, write the music, rehearse, design a set, and film the piece, directed by Autumn Thelander. We hope our play can take you on a fantastical adventure to another world while reckoning with the grief and complexities of this one.

When we imagined this piece for the American Music Theatre Project's senior capstone festival, we wanted to create something that was safe for our artists in the room while simultaneously allowing our audience to escape beyond the current restrictions of our COVID-19 riddled world. For the time leading up to the inception of "Bridge to the Moon" as a foundational image for the story of our show, we had to find ways to meet outside, rain or shine, online, and distanced while still focusing on the development of our material. We were met with several challenges of collaborating on a musical that stretched beyond the platform of "zoom theatre" as many readings of new plays have opted for. Using this story and the setting of an off campus apartment combines to create a detailed image of a child's struggle to overcome their loss felt like our way of coping with the past year of mourning while also imagining a way out of the grief of the past year. People want to leave their houses. They want to feel something new, try something. We came to our Bridge because there was something fantastic about it but also so truthful about it.

Hank Yang

The Generic Fish **(Drawing)**

Description and Artist Statement

This is a generic fish with dull, dead eyes that should have depth but fails to do so. It was drawn on 8.5 x 11 inch paper with a black pen. When I doodle, I usually like to do it without any thoughts in my head. I draw and draw and shade and crosshatch and something forms as a result. But for this piece, I drew knowing I wanted to draw a fish. I typed "fish" in Google and used one of the first images that popped up as a reference to be as generic as possible. Look it up right now; you'll find my reference image. I suppose I could have put scales and made it a normal fish, but I created different textures because I hate repeatedly drawing the same thing over and over again. The fish frame was generic enough; I wouldn't have enjoyed it if I was merely drawing reality. It's nice to get a measure of creative liberty. It's like quarantine: you're free to do whatever in your room but you can't go out. I can't make it not look like a fish, so I follow the form of a fish. Is that how life should be lived? Being creative to a certain point, but not beyond a set of guidelines that must not be crossed? Maybe I should do something that's more productive than drawing on a piece of paper which will eventually be lost or crumpled or thrown out and cause me to worry about nonsense like this.

<div align="center">

ഔ‌‌ർ

Erin Zhang

Faculty Advisor: Eric Patrick

These Days **(Animated Short Film)**

</div>

Description and Artist Statement

These Days is a 2D-animated short film I illustrated, animated, and wrote for Professor Eric Patrick's RTVF 2D Animation course. This film was my first trial with computer animation software and is one of the larger visual art pieces I've released. During the time I was taking his course, I experienced a period of intense depression and anxiety, triggered by pandemic-related stagnancy. Each day blended into the same, and I could not remember much except my cut-and-dry daily routine. I tangibly represented these thoughts into a visual medium, something that was both therapeutic and challenging. My approach towards *These Days* was amateur but stylistic, as I blended my digital art experience with the technical foundation of computer animation from the course. After the completion and release of the piece on Vimeo, I am currently in the process of final editing, distribution, and film festival submission. Generally speaking, this piece can certainly be clumped within the pandemic art movement; however, the piece never mentions the pandemic and remains vaguely about routine. Ultimately, I wished for *These Days* to be a broad statement about the beauty and sadness that is simultaneously present in mundanity.