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Conference Schedule

3:30 - 3:45 PM	Doors Open and Presenter Check-in
3:45 – 4:15 PM	Welcome & Outstanding Mentor Awards
4:15 – 5:10 PM	Session One
5:10 – 5:25 PM	Break
5:25 – 6:20 PM	Session Two
6:20 – 6:35 PM	Break
6:35 – 7:30 PM	Session Three
7:30 – 7:35 PM	Thank You and Closing Remarks

Outstanding Mentors



Dr. Amy Bintliff

Amy Vatne Bintliff is an Associate Teaching Professor at UC San Diego and director of the Partners at Learning (PAL) program, one of the largest service learning programs on campus, in the Department of Education Studies. She holds a Master's Degree in Education from Hamline University and a PhD in Educational Psychology-Human Development from the University of Wisconsin, Madison. Amy researches positive youth development, out-of-school programming, critical service learning, and adolescent and teacher well-being. In addition, she advocates for equity, justice, and compassion in educational settings, including the prevention of gender-based violence and the inclusion of trauma-informed teaching practices. She has developed an out-of-school arts-based and restorative practices program, *The Wellbeing Club*, which supports vulnerable youth in the U.S. and Uganda. A former public school teacher, Amy loves teaching and mentoring undergraduate and graduate students on community based participatory research and arts-based research methods.



Dr. Libby Butler

Dr. Libby Butler is a UCSD, Muir College, alumna, who also served as a full-time faculty member in Education Studies several years ago. Dr. Butler holds a doctoral degree in Education, with research that focuses on equity and inclusion in racially diverse environments. After a long career in secondary mathematics education, she returned to UCSD as an adjunct faculty member in the Black Diaspora and African American Studies Program (BDAAS), where she has an opportunity to teach 5-6 courses per year, building relationships with undergraduate students and members of the faculty who teach affiliate courses within the BDAAS and Black Studies Programs (BSP). When Dr. Butler is on campus, you can usually find her hanging out in the "Family Room" at the Black Resource Center, where she enjoys engaging further with students, faculty, and staff in the less formal setting.



Dr. Giordano Lippi

I am an Associate Professor in the Department of Molecular and Cellular Neuroscience at The Scripps Research Institute. I received my PhD from the University of Modena and Reggio Emilia (Unimore), working in the labs of Dr. Michele Zoli (Unimore) and Dr. Pierluigi Nicotera at the MRC Toxicology Unit in Leicester, UK. For my postdoctoral training, I joined the lab of Dr. Darwin Berg at the University of California, San Diego. I received several awards during my career, including an EMBO Fellowship, an MRC Career Development Fellowship, a Whitehall Foundation Award, a Brain Initiative Award, and I recently became a Chan Zuckerberg Initiative investigator.

Dr. Parinaz Naghizadeh



Parinaz Naghizadeh is an Assistant Professor in

the Electrical and Computer Engineering Department and The Design Lab at the University of California, San Diego. She received her Ph.D. in electrical engineering and M.Sc. degrees in mathematics and electrical engineering from the University of Michigan, and her B.Sc. in electrical engineering from Sharif University of Technology, Iran. She leads the Multi-agent Intelligence and Decision Systems (MINDS) lab, an interdisciplinary group of researchers working towards incorporating analytical models of human decision making in the design of socio-technical networks and AI, with a focus on balancing economic goals (performance,

robustness) and ethical considerations (fairness, explainability, and safety). Parinaz is a recipient of the NSF CAREER award in 2022, a Rising Stars in EECS in 2017, and a Barbour Scholarship in 2014.

Abstracts

luna

Cognitive Science (Design & Interaction), Psychology ppl, Sixth

Mentored By Deepak Kumar

Automod Audit

Reddit's Automoderator tool executes millions of automated moderation actions daily, yet very little is studied about how its configuration evolves to match community needs. Our study conducts a longitudinal analysis of the automoderator tool on several Reddit communities in order to understand how community behavior and moderation responses evolve. We are recruiting volunteer communities on Reddit (10k-10M members) to add a research account as a moderator. Using that access, we are extracting the histories of the automoderator configuration for these communities from 2015-2025. We will then analyze these results with numerous metrics, such as bursts of activity, major revisions, or when the minimum posting requirements were changed. We expect to identify novel patterns which will improve the understanding of community moderation online surrounding the usage of automation and provide a useful framework for moderators and platforms alike to improve transparency and efficiency in automated moderation actions.

Natalie Abel

Cog Sci- specialization in design & interaction, Sixth

Mentored By Yeshaya Koblick

LLMs in Fashion and Personal Styling

My academic internship entails understanding challenges in the fashion industry and with the current ability of LLMs, from cold starts, long tails, temporal evolution (seasonal trends), and complex visual semantics. This research, through Dr. Julian McAuley, has been disclosed to UCSD OIC and patent application has been filed. Yeshaya Koblick is supporting the project as UCSD - Entrepreneur in Residence. We are seeking to commercialize the project to build a visually aware LLM recommender system into what remains unknown what this shopping experience will be, and how it can advance future search and social media. For this project, I am designing a storyboard for the conversational recommender based-on de novo AI capabilities, and what-if scenarios of research progress. My role will be to incorporate my field of cognitive science to understand how UCSD students (as potential users) would respond to new recommenderenabled online shopping experiences for fashion. I will also expand my abilities into the business side of things, and, with guidance, I will build a sales and marketing plan for fashion companies, influencers, and related communities with the objective of developing an ecosystem. I will participate in customer discovery by meeting with boutique clothing stores and fashion companies in requesting letters of intent. While working through this process, I will iterate on the technical implementation and building the foundation for the proposed UI/UX. The project will conclude with an investor pitch to present with the Basement, and discussion of AI, user interaction, and beyond fashion for the cognitive science department.

Maya Adenihun

World Literature and Culture, Muir

Mentored By Gabriel Bamgbose

Afrosurrealist Aesthetic in ihsan bracy's "Ibo Landing"

This essay will argue that ihsan bracy's "Ibo Landing" demonstrates that Afrosurrealism can be used as a lens of postcolonial critique as a literary aesthetic in African American speculative fiction. I explore ihsan bracy's "Ibo Landing" aesthetics of mysticism and grotesque and references to folktales using D. Scot Miller's Afrosurreal Manifesto and James Scott's theory of hidden transcript to demonstrate how Afrosurrealism can act as a challenge to colonial logic. Studying this is important because African American aesthetics provides a new analysis and valuation to black identity and culture by the terms of the people who create it. Afrosurrealism is not just a movement, but a philosophy of art that [upends] traditional narrative structure and value.

Jesse Alejo

Cognitive Behavioral and Neuroscience, Revelle

Mentored By Mary Boyle

The Role of Grayscale on Smartphone Use by Exploring the Behavior and Motivation in College Students

This study aims to examine the role of grayscale smartphone displays in influencing the behavior and motivation behind smartphone use among college students. With increasing concerns about excessive screen time and its negative impact on productivity and wellbeing, this research explores whether altering phone display settings can lead to measurable changes in user behavior. To distinguish this, there is active and passive phone use, and it examines how different motivational drivers, such as escapism, boredom, or functional need, moderate the effects of grayscale. A four-week-long field experiment will be conducted with a sample of students at the University of California, San Diego, comparing grayscale and standard color displays. Data will be gathered through device analytics, self-reports, and validated psychological scales, with statistical analysis using SPSS (Statistical Package for the Social Sciences). The study seeks to fill a gap in existing literature by not only addressing screen time reduction but also unpacking the psychological and behavioral mechanisms behind smartphone use. This could allow for new ways to change people's philosophies on phone use and ultimately decrease the problem.

Gizem Altinok

Molecular and Cell Biology, School of Biological Sciences, Revelle

Mentored By Cory Root

Disappearing Pineal Mass

The spontaneous regression of malignant tumors in the absence of definitive treatment or adequate therapy is very rare. Previous cases of spontaneous regression of pineal masses have been reported in association with ventriculoperitoneal shunt placement, extensive diagnostic imaging, apoplexy, and granulomas. The patient discussed presented with the clinical, laboratory, and imaging findings consistent with a pineal germinoma. After several diagnostic CT scans and placement of a ventriculoperitoneal shunt, the mass spontaneously regressed immediately prior to planned surgical biopsy. We will discuss the potential causes of this spontaneous regression, including the characteristic radiosensitivity of germinomas, ischemic or hemorrhagic apoplexy due to a terminal blood supply, consequences of ventriculoperitoneal shunt placement, and immune system reactions. We believe that the spontaneous regression in the case at hand was the result of a combination of influences from all of these possible causes.

Ethan Alviar

Pharmacological Chemistry, Marshall

Mentored By Justin Seltzer

Evaluating Urine Heavy Metal Testing Practices at a Major Academic Health System

Urine heavy metal screening is a diagnostic tool used to assess exposure to toxic elements such as lead, mercury, cadmium, and arsenic. These tests are often ordered in patients with nonspecific symptoms or suspected environmental or occupational exposure. However, the clinical value of urine heavy metal screening remains uncertain. Concerns have been raised regarding low diagnostic yield, high variability, and potential overuse of these costly tests.

We aim to conduct a retrospective review of urine heavy metal screening practices across an academic health system over a 10-year period. The study will include patients aged 18 and older who received care at UC San Diego Health and had a documented urine heavy metal test performed for any clinical indication. Demographic data, test indications, and downstream clinical actions will be collected to evaluate how these tests are used and whether results influenced patient care.

By identifying utilization patterns and potential gaps in clinical efficiency, this project seeks to clarify the contexts in which urine heavy metal screening provides the most value, and to inform more evidence-based testing practices.

Knara Arutiunian

Department of Psychology, Warren

Mentored By Michael McCullough

Recidivism and Reform: Understanding the Psychological Barriers to Reintegration

The United States has one of the highest incarceration rates in the world, and many formerly incarcerated individuals face significant challenges upon release. Prior to reentry, many adapt to prison culture as a means of survival, internalizing norms and values that are often incompatible with life outside prison walls. Upon release, they encounter numerous barriers, including limited employment opportunities, loss of social support, negative stigma, and reduced access to economic resources such as public assistance or benefits. These obstacles significantly contribute to high recidivism rates. While structural and policy factors are important, public attitudes toward formerly incarcerated individuals also play a critical role in shaping outcomes. This research explores the complex relationship between empathy, moral reasoning, prosocial behavior, and societal attitudes, all of which ultimately impact recidivism. Psychological research suggests that public attitudes and underlying social values play a crucial role in shaping the reintegration process of many individuals. People with both mental illness and substance use issues are the most likely to return to prison, showing why mental health support is important for successful rehabilitation. Addressing recidivism requires moving beyond the traditional view that incarceration alone rehabilitates individuals. Promoting empathy, changing the way we talk about crime, and breaking down the stigma that dehumanizes incarcerated individuals can help shift public attitudes to better support rehabilitation. It is crucial to understand the psychological dimensions of justice in order to achieve meaningful, long-term reform.

Shae Atkins

Neurobiology, Revelle

Mentored By Masaki Hiramoto

Investigating the therapeutic potential of non-canonical neurotransmitter receptors in an animal model of myasthenia gravis

Myasthenia gravis (MG) is an autoimmune disorder resulting in loss of nicotinic acetylcholine receptors (nAChR's), or lipoprotein-related protein 4 (LRP4), which are both essential proteins for neuromuscular junction (NMJ) formation. In Xenopus laevis larvae, knockdown of LRP4 leads to loss of presynaptic acetylcholine (ACh). Simultaneous induction of GABA receptor expression in muscle cells stabilizes expression of presynaptic GABA. Here, we report the effects of these synaptic modifications on larval swimming behavior. Xenopus eggs were fertilized in vitro. At the 4 and 8 cell stage, each ventral blastomere was injected with either LRP4 morpholino (LRP4MO) only (to knock down LRP4 resulting in loss of presynaptic ACh) or were coinjected with LRP4MO and GABA receptor mRNA (to induce GABA receptor expression in the muscle cells). After 3 days, the swimming behavior of the larvae was assessed using a manual "poke" and video recording. Manual analysis and an unsupervised algorithm (B-SOiD) were used to identify differences in swimming behavior. The larvae were fixed, immunostained and imaged using confocal microscopy to assess the expression of LRP4 MO and GABA receptors in muscle cells. Both manual and B-SOiD analysis revealed deficits in swimming behavior in LRP4MO larvae when compared to control larvae. We found that overexpression of GABA receptors in the LRP4MO larvae rescued some of the deficits. Our data suggest the therapeutic potential of expressing non-canonical GABA receptors in muscle cells to restore NMJ function and behavior in MG.

Allison Bang

Bioengineering: Biosystems / Bioengineering, Muir

Mentored By Richard Childers

Socioeconomic Impact on Antibiotic Prescription in Urgent Care Patients with Acute Respiratory Infections (ARIs): A Randomized Trial

Antibiotic overuse for acute respiratory infections (ARIs) is a common low acuity issue in the urgent care (UC) setting. Unnecessary antibiotic prescription is commonly seen in the UC setting due to patient misunderstanding of antibiotic purpose, patient demands, and providers aiming to achieve patient satisfaction by "providing a solution." However, antibiotics have been shown to provide minimal benefits against ARIs and are not efficacious against common viral infections including COVID, influenza, and respiratory syncytial virus (RSV). In a previous iteration of this study, patients presenting to the urgent care with ARI were given a handout describing antibiotic risks and benefits. An intervention group additionally included cost information. It was shown that antibiotic cost, around \$15, did not make a significant difference in the rate of antibiotic prescription. This study aims to determine whether socioeconomic factors including age, sex, income, and chief complaint predict antibiotic prescription after receiving an informational pamphlet on antibiotic risk, benefits, and cost in a randomized trial of patients presenting with cough, sore throat, or sinus congestion in an academic emergency department-affiliated UC. Uncovering common factors in antibiotic overprescription can help predict alternative ways to promote public health to ultimately reduce antibiotic overuse, antibiotic resistance, and unnecessary healthcare spending.

Michelle Barriga

Education Sciences & Political Science, ERC

Mentored By Sherice Clarke

San Diego County's Continuation School Outcomes: A Quantitative Analysis

A continuation high school is an alternative school for students who are at risk of not graduating and who are still required to attend school due to compulsory laws; though a response to gaps in student outcomes, continuation schools are often a continuation of inadequacies in our education system. Continuation high schools in California have disproportionate rates of Brown and Black youth, foster youth, and students from lower socioeconomic backgrounds. Stated outcomes of continuing education programs, from the CA Department of Education include: preventing "dropout", recovery of youth that are out-of-school, increased student retention, increased graduation rates, learning gains, increased services and support for foster youth, diversion from the criminal justice system, support for pregnant/parenting students, and specialized additional services. There is mixed evidence on the success of individual continuation high schools in providing educational opportunities and fostering a positive school environment where students can graduate as intended. Outcomes vary given differences in implementation; the stated goals of continuation high schools are often in contradiction to their common outcomes. This research project seeks to address the gap in quantitative data of continuation high schools in San Diego County by compiling the data of student outcomes from School Accountability Report Cards in order to compare outcomes to the intended goals of continuation high schools. I will compile the data as a form of transparency and accountability. Using the social justice framework of Critical Policy Analysis, I will systematically research student outcomes to examine the relationship between intended goals and student outcomes at continuation high schools. In order to support and empower our youth in continuation high schools and ensure the success of continuation high schools in helping students graduate, we need to assess and address policy and implementation failures. I am driven by the students of color, foster youth, low-income students, student-parents, and system-impacted youth that attend continuation high schools in San Diego who deserve schools worthy of them and their potential.

Jenicca Bastien

Clinical Psychology, Marshall

Mentored By Katia Harlé

A Neurocomputational Approach to Reward Learning in Anhedonic Patients that Experience Anxious Arousal

Anhedonia, i.e., diminished sensitivity to rewards, is commonly experienced by those with anxiety. Heightened arousal, a transdiagnostic signature of anxiety, has been shown to alter adaptative learning in uncertain environments, which could impair reward exploration. To test this hypothesis, we utilized a neurocomputational paradigm designed to enhance reward-seeking behavior to elucidate the impact of anxious arousal on reward learning mechanisms.

Individuals (N = 50; 54% Female; 18-65 yo) with anhedonia and diagnostic levels of depression and/or anxiety completed a reward learning task, i.e., a multi-arm bandit (MAB). Participants were randomly assigned to a high reward MAB task with either low variance (LV) or high variance (HV) in reward rates. HV is expected to boost reward exploration and maximization. A Bayesian reinforcement learning model was fit to participants' decisions in the MAB to extract individual markers of reward learning.

Anxious arousal modulated the effect of reward variance on individuals' prior mean of reward rates, a parameter associated with initial expectations of reward at the beginning of exploration (F(3, 37)=1.836, p=0.029). Specifically, those with higher anxious arousal had higher initial reward expectation in the HV (rs(48)=0.456, p=0.029) but not the LV (rs(48)=-0.246, p=0.326). In the HV condition, participants with lower initial reward expectation also earned higher reward in the task (rs(48)=-0.408, p=0.043).

Anxious arousal may bias initial reward expectations, potentially impairing rewardseeking behavior. These findings may provide insights into how anxiety affects reward processing, which could help in identifying treatment targets for improving reward learning and hedonic tone in individuals with anxiety. Luca Boccalato Rodriguez

Psychology, Seventh

Mentored By Caren Walker

US and Mexico Differences

Research in psychology has revealed consistent cross-cultural differences between Western independent cultures and East Asian interdependent cultures across domains such as cognition, language, perception, and reasoning. However, Latinx cultures despite often being characterized as interdependent—remain significantly underrepresented in this literature. To address this gap, we are conducting a large-scale study comparing adults from the United States and Mexico across 12 psychological tasks previously shown to elicit cultural differences between Western and East Asian populations. While data collection is still underway, we predict a heterogeneous pattern of results: some tasks will replicate previously observed cultural differences, others may show null effects, and some may reveal culturally specific patterns unique to the Mexican context. We also anticipate that, consistent with prior research, these task-based differences will not strongly correlate with explicit measures of cultural identity or behavior.

Alexie Bulmer

Marine biology/ SIO, Sixth

Mentored By Moira Decima

Pteropod Community Composition and Abundance in the Southern California Current

Thecosome pteropods are common free-swimming marine gastropods. Their shells are made of aragonite, a polymorph of calcium carbonate that is particularly sensitive to dissolution under low pH conditions. Because of this, pteropods are expected to be the first organisms within the plankton assemblage to be negatively impacted by ocean acidification (OA), and shell surface dissolution is considered to be a promising bioindicator of the impact of OA. However, little is known about how environmental factors influence thecosome pteropod community structure. Using whole zooplankton samples collected by the California Cooperative Oceanic Fisheries Investigations (CalCOFI) program, we investigated how environmental variables such as pH, depth of aragonite saturation, chlorophyll, temperature, and salinity affect thecosome pteropod abundance and community composition. Our samples were taken from southern and central California over a 20-year span at 5-year intervals in the springtime. These findings will contribute to the growing data on pteropod ecology and provide valuable data for future monitoring and ocean acidification studies.

Julia Cervantez

International Studies - Political Science, Eighth

Mentored By James Crawford

Methods of Including Unhoused People in the State Legislative Process

In my project, I research current mechanisms of citizen involvement (both in law and in practice) and create a plan to improve these practices to be more accessible and inclusive. Through conducting interviews with the team members in my office to see how they have been approaching this concept, analyzing past legislation, and using public policy theories and frameworks, I propose a prototype to include involvement of unhoused people in the State legislative process.

Samantha Chan

Public Health/BSPH, Marshall

Mentored By Leslie Lewis

Assessing the Efficacy of TritonFresh: A CalFresh Gap Program Supporting Marginalized Student Populations

Food insecurity presents growing concerns of public health inequities on college campuses, with an inadequate access to food having the potential to impact student mental health, physical wellbeing, and academic success. Recent surveys at the University of California, San Diego, have shown that almost half of the student body experiences food insecurity with a disproportionate increase for underserved and underrepresented minority undergraduates. Undocumented and international students are particularly vulnerable, often excluded from federal nutrition assistance programs such as CalFresh due to immigration or visa status. To address this systemic gap, TritonFresh was launched as a campus-based pilot program aimed at addressing food insecurity by providing monthly gift cards for grocery purchases. This study aims to evaluate the anticipated effectiveness of TritonFresh in improving food security outcomes among students ineligible for CalFresh at a large public university. Using a mixed-methods approach, the study will collect data through pre- and post-program surveys, qualitative interviews, and administrative records to explore the role of institutional support programs. Key measures will include food security levels, program utilization, and student-reported outcomes. It is expected that the program will reduce food insecurity and strengthen support services for undocumented and international students. Findings from this study will inform future pilot program development, contributing to a growing body of research on the food security initiatives in higher education. In collaboration with universities across the UC system, TritonFresh has the potential to serve as a scalable model for addressing food insecurity where university, state, and federal support falls short.

Lucy Chandler

Cognitive and Behavioral Neuroscience, Marshall

Mentored By Katia Harlé

The Role of Alexithymia in Predicting Guilt Outcomes and Treatment Responsiveness Among Trauma-Exposed Veterans

Trauma-exposed individuals often endorse symptoms of alexithymia, i.e., difficulty identifying and expressing emotions. Individuals with alexithymia may rely on external signals (physical sensations) rather than emotional cues, which may interfere with processing guilt and other trauma-related emotions. Trauma-Informed Guilt Reduction Therapy (TrIGR) is a cognitive-behavioral treatment designed to assist trauma-exposed individuals develop more adaptive ways to process guilt and related emotions. However, the predictive role of alexithymia for individuals undergoing trauma-focused treatment remains unclear. In this study, trauma-exposed Veterans (N=69, 91% Male; 18-65 yo) were randomly assigned to a 6-session protocol of either TrIGR or Supportive Care Therapy (SCT). Subjective alexithymia and trauma-related guilt were assessed before and after treatment using the Toronto Alexithymia Scale (TAS-20) and the Trauma-Related Guilt Inventory (TRGI), respectively. Baseline alexithymia predicted treatment-related change in guilt. Specifically, in the TrIGR relative to the SCT group, lower baseline alexithymia was associated with greater reductions in global guilt (B=0.029, 95% CI=[0.004,0.053]; t=2.26, p=.027), and hindsight bias (B=0.060, 95% CI=[0.022,0.097; t=3.03, p=.004), i.e., the tendency to perceive past events as more predictable than they were. Higher alexithymia may hinder responsiveness to cognitive-behavioral interventions targeting trauma-related guilt and hindsight bias reduction. Understanding alexithymia's impact on trauma-related guilt may help improve treatment efficacy and guide future trauma-focused interventions.

Cindy Chen

Poli Sci, ERC

Mentored By Kwai Ng

Fair or Familiar? Exploring Perceptions of AI and Human Judges in China's Smart Courts

I'm so sorry, I completely forgot the deadline to submit this was by today and totally understand if I won't be able to present. I'll have an abstract finished by tomorrow (Wednesday) and email it to you.

Alvin Cheng

Anthropology, Sixth

Mentored By Bonnie Kaiser

The Language of Illness at the End of Life: A Qualitative Study of "Living while Dying"

Patients near the end of life face large symptom burden and subsequently undergo multiple treatments. Despite advances in improving quality of life, many patients receive no palliative care or receive services only in the last stage of their illness for various reasons, ranging from clinician's limited training in "breaking bad news" to cultural and societal beliefs of what palliative options entails. In addition, characteristics like masculinity, military identity and military culture may play a large role in veteran care. In our study, we examine the meaning-making frameworks of veteran patients receiving palliative care and the way they articulate their illness narrative. We plan to enroll 15 patients with various serious late-stage diseases for a semi-structured interview at the Jennifer Moreno VA Medical Center. Using Braun and Clarke's thematic analysis, we will identify themes in veterans' use of language and stories when discussing their serious illness. This study aims to improve understanding of how veterans' unique cultural and service experiences influence their communication, perception and understanding about end-of-life care, potentially revealing important considerations for culturally-sensitive healthcare delivery in this population.

Elizabeth Choi

Ethnic Studies, Political Science, Seventh

Mentored By Sam Museus

The Racialization of Black-Married Korean Military Brides: A Concealed Narrative Within the Western Racial Binary

During the United States' occupation of Korea throughout and after the Korean War (1950-1953), American GI soldiers engaged in sexual and romantic relationships with Korean women, oftentimes through militarized prostitution. Many of these women became military brides, eventually joining their GI husbands to the United States. Crosscultural systemic gender and racial constructs—including negative Korean cultural pressures surrounding prostitution as well as the sexualization of Asian women by American society—have affected the lives of Korean military brides, circumstances which governmental and media coverage have historically overlooked. Existing literature focuses primarily on military brides married to White GI soldiers, but there is a lack of coverage on the specific socialization of their Black-married counterparts. Notably, military brides married to Black GIs have often faced greater ostracization by not only the general Korean and American societies, but also within the military bride community. I intend on exploring the socialization of Korean military brides married to Black GIs through the lens of the racial triangulation, exploring constructed and interconnected ideas of Asianness, Blackness, and Whiteness in conjunction with existing military bride literature. This study can advance scholarship specific to military brides by deepening research on nuanced positionality within interracial marriages. Encouraging future focus on individual and collective means of assimilation and resistance within Korean military brides can lend to a more comprehensive understanding of socialization on a personal level, examining how war disproportionately marginalizes certain populations.

Edward Correa

Ecology, Behavior, and Evolution: Biological Sciences, Sixth Mentored By David Holway

The Impact of Ornamental Tree Composition on Argentine Ant Activity

The Argentine ant (Linepithema humile) is a consistent contender for being the world's most successful invasive ant. Originally native to central South America, these ants have invaded every continent except for Antarctica. Argentine ants disrupt ecosystems by outcompeting native ants and by protecting honeydew producing insects, inflicting damage to ornamental and agricultural plants. They are known to forage in tree canopies, but little is known about what specifically they are foraging for, especially in urban ornamental trees. We aim to uncover how the composition of urban ornamental trees impacts the activity of the Argentine ant, and we hypothesize that certain tree species will attract the ant more than others. This goal will be accomplished by mapping the trees in and around the UC San Diego campus and recording the ant activity on tree trunks. In addition, ants will be collected and inspected if they are spotted with prey in their mandibles to link tree species and prey species together. We hope the results of this research will influence decision making in urban planning and integrated pest management.

Ida Danesh

Human Biology / Biological Sciences, Sixth

Mentored By Kevin Tharp

Exploring the Role of Integrin β *3 in Nutrient Stress Adaptation in Lung and Breast Cancer*

In hepatocellular carcinoma (HCC), tumor-initiating cells are able to adapt to nutrient deprivation through metabolic adaptation, which allows for their survival in stressed conditions. The molecular pathways that allow for this mechanism remain under-studied, although recent studies in lung cancer have discovered that integrin $\alpha\nu\beta3$, mainly the $\beta3$ subunit, may play a role in promoting metabolic plasticity in nutrient deprived conditions. Integrin $\beta3$ is not well understood, as its function, regulation, and possible localization-dependent activity must be studied further.

This study aims to determine whether there is a specific nutrient stress that allows for upregulation of the expression of integrin $\beta 3$ in HCC cells. Additionally, we will determine whether the localization of the $\beta 3$ integrin to the plasma membrane is required for signaling a stress response. Lastly, we will study whether the role of integrin $\beta 3$ in metabolic adaptation is conserved across cancer types, including breast cancer. To address this, HCC cell lines expressing integrin $\beta 3$ -GFP proteins will be utilized and monitored to determine their expression levels, as well as to determine whether localization to the plasma membrane is required in stressed microenvironments.

We expect nutrient deprivation to promote the upregulation of integrin β 3, as well as its localization to the plasma membrane in order to initiate a signaling cascade that would trigger metabolic adaptation, such as the Src/AMPK/PGC1 α pathway observed in lung cancer. These results would point towards a conserved, integrin mediated pathway that allows for metabolic changes within carcinomas and potentially other cancers.

Okalani Dawkins

Political Science, Marshall

Mentored By Christopher T. Stout

Post-Imperial Legacies of the CNMI Status Referenda (1961-1975)

Contemporary studies of the Northern Mariana Islands (CNMI) often relegate discourse to U.S. imperialism in the Pacific during World War II. The current canon of CNMI literature, broadly, generalizes Chamorro attitudes toward reintegration with Guam and the U.S., thus presenting a gap between such attitudes and its eventual status. Interrogating current CNMI political scholarship, I examine distinct measures of public opinion—namely three status referenda held in the CNMI from 1961-1975. Predicated upon the question of, "What were the main arguments made by both proponents and opposition of the CNMI Status referenda?", I aim to identify potential causes of an evident plateau since 1975, and the impact by recent calls for reevaluation of the CNMI's political status. I conduct a comparative analysis of archival newspaper coverage sourced from Guam and Saipan-based institutions. Such analysis will be performed through (1) categorization of eligible voters, using a "host state/secessionist region model" to identify where proponents lie in the canon of theoretical literature about independence referenda; and (2) using the arguments of such proponents and opposition to capture the complexities of public opinion with regard to the referendums' respective outcomes. I expect the circumstances predating the occurrences of the referenda to have been organized by the UN by way of an agenda juxtaposing that of the CNMI Legislature. I strive to create a pathway by which scholars can delve into the origins of the CNMI's political status, utilizing this knowledge to formulate broader predictions about what its future holds.

Dora Deng

Psychology and Human Biology, Revelle

Mentored By Sharon Nichols

The Moderating Role of Cannabis Use on the Relationship Between Sleep and Mental Health in Young Adults

Sleep and mental health share a bidirectional relationship, with sleep playing a crucial role in cognitive and emotional development and mental health influencing sleep patterns, particularly during adolescence and young adulthood. Many young adults report using cannabis to manage sleep problems, yet research on its effectiveness remains mixed. Studies suggest that the therapeutic effects of cannabis on sleep may depend on factors such as mental health status and frequency of use. This study explores the association between sleep and mental health, and whether cannabis use moderates this relationship, with a focus on young adults aged 18-24 with varying HIV status and substance use history. I hypothesize that (1) poor sleep quality is associated with higher internalizing symptoms (depression and anxiety), and (2) cannabis use moderates this relationship such that low or heavy use is associated with worse sleep outcomes, while moderate use is associated with better sleep only among individuals with clinically significant internalizing symptoms. Measures include the Insomnia Severity Index (ISI) for sleep, ASEBA Internalizing and DSM-Oriented subscales for mental health, and the Customary Drinking and Drug Use Record (CDDR) for cannabis use. This study aims to clarify the nuanced role of cannabis in sleep and mental health and aims to contribute behavioral targets for harm-reduction and intervention strategies for young adults, particularly those with comorbid mental health and sleep challenges.

Juri Dojun

Cellular and Molecular Biology/School of Biological Sciences, Revelle Mentored By Ryan Hibbs

Mechanosensation in the Gut- The Critical Role of Piezo1 and Piezo2 Channels

Mechanosensation is a critical physiological process in the gastrointestinal (GI) tract, enabling the detection and transduction of mechanical forces into electrochemical signals that regulate motility, secretion, and sensory perception. Central to this process are the mechanically activated ion channels Piezo1 and Piezo2, which have emerged as key players in gut mechanotransduction. This poster synthesizes current insights into the molecular architecture, activation mechanisms, and functional distinctions of Piezo1 and Piezo2 channels within the GI system. Piezo1 is widely expressed in smooth muscle cells, epithelial cells, and enteroendocrine cells, contributing to intestinal motility, epithelial integrity, and fluid homeostasis. Piezo2, predominantly localized in sensory neurons and enterochromaffin cells, governs mechanosensory signaling that mediates gut reflexes and visceral sensation. The dysregulation of these channels is implicated in gastrointestinal disorders such as irritable bowel syndrome (IBS), inflammatory conditions, and colorectal cancer, where aberrant mechanotransduction disrupts normal physiology. The poster also highlights emerging research on Piezo channels as therapeutic targets and calls for deeper exploration of mechanosensitive pathways using advanced imaging and molecular profiling techniques. Understanding the nuanced roles of Piezo1 and Piezo2 will be pivotal in advancing diagnostic and treatment strategies for GI pathologies driven by mechanical stress.

Mark Dyachuk

Clinical Psychology, ERC

Mentored By Sonya Norman

Comparing Trauma-Informed Guilt Reduction Therapy to Cognitive Processing Therapy in Veterans with PTSD: A Non-inferior Study Design

The prevalence of post-traumatic stress disorder (PTSD) among veterans is high, with trauma-related guilt emerging as a significant contributor to symptom severity. Additionally, traumatic guilt is positively associated with PTSD symptoms. Cognitive Processing Therapy (CPT) is an evidence-based treatment for PTSD, yet high attrition rates suggest that its intensity and duration are too exhaustive. Trauma-Informed Guilt Reduction Therapy (TrIGR) is a brief intervention designed to target trauma-related guilt, a major component of moral injury. An initial study of TrIGR therapy is associated with reductions in trauma-related guilt and distress, with no reported attrition. This randomized clinical trial aims to evaluate whether TrIGR is non-inferior to CPT in reducing PTSD symptoms among veterans who meet criteria for trauma-related guilt. The study will conduct a non-inferior design with primary outcomes focusing on PTSD symptom reduction, measured by the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5). Secondary aims consider a comparison of outcomes for depression severity, as measured by the Patient Health Questionnaire-9 (PHQ-9). With TrIGR therapy's ability to hone in on trauma-related guilt and previous success of implementation, we hypothesize TrIGR will prove to be non-inferior to CPT when treating PTSD and depression symptoms. If the hypothesis proves to be correct, this new implementation would provide better access to care for individuals with PTSD, specifically those who meet criteria for trauma-related guilt. Moreover, the specialized yet brief sessions would provide better patient consistency and lower drop-out rates, effectively treating more of the population.

Arman Farahani

General Biology, Seventh

Mentored By Rahul Nene

How Emergency Department Use for Patients with Opioid Use Disorder Over the Past 6 Years

Opioids have dopaminergic properties that induce feelings of pleasure and drowsiness, encouraging addictive tendencies among users. Awareness of their adverse effects were highlighted in the 1990s, during a surge of presence as prescribed painkillers in the United States, now marking the beginning of an ongoing opioid epidemic. The prominence of opioids transitioning from prescription to street drugs in recent years describes the struggle in reducing the detrimental effects they have on the American population. This study takes a look at the relationship hospitals across California have with individuals who come seeking help from opioid use disorder (OUD), observing patient demographics and visits to the Emergency Department (ED) from 2018-2025. Assessed were comorbidities and other diagnoses along with first opiate-related visits and a 7-day ED return within the last visit.

Layla Farhan

Psychology, Marshall

Mentored By Charles Taylor

Resonate and Respond: Engaging in Positive and Negative Valence Systems To Increase Opportunities of Partner Responsiveness and Positivity Resonance in a Dyad

Anxiety and depressive disorders are debilitating mental health conditions that often lead to feelings of social disconnection and lower quality of social life (Olatunji, 2007). While standard treatments such as Cognitive Behavioral Therapy (CBT) improve psychological symptoms, they often fall short in targeting social implications of these disorders (Hofmann et al., 2014). This project investigates how engaging positive and negative valence systems– neurocognitive mechanisms related to approach/avoidance goals and behaviors– may affect dyadic processes implicated in social connectedness. Specifically, we examine how these systems influence Positivity Resonance (PR), one key process in bond-building (Hove & Risen, 2009).

This secondary analysis utilizes data from a clinical trial involving 110 adults seeking treatment for anxiety or depression. This sample completed a Social Affiliation Task– a structured conversation with a same-sex confederate designed to replicate the affiliative processes involved in bond-building (Hoffman et al., 2021). Measures included positive and negative affect scales (PANAS), affiliative behaviors, a proxy measure for PR, and perceived social connectedness.

Correlational analyses seek to answer the following hypotheses: (1) Engaging with positive valence systems will enhance PR, thereby increasing perceived social connection, while engaging with negative valence systems will hinder these outcomes. (2) participants of minoritized gender and ethnocultural identities will report lower levels of perceived social connectedness from lack of PR by virtue of less engagement with positive valence systems.

While limitations related to robustness of demographic measures and generalizability exist, results may offer insight into the dyadic mechanisms implicated in social connectedness and may inform interventions dedicated to improving social connectedness for these populations.

Adam Ferguson

Microbiology, Marshall

Mentored By James Wilhelm

Germline-targeting vaccine design to elicit HIV broadly neutralizing antibody PGZL1

To date, there is no effective HIV vaccine, and in 2023, there were 1.3 million new cases of HIV and 630,000 AIDS-related deaths. Most likely, a preventative vaccine must elicit HIV broadly neutralizing antibodies (bnAbs). HIV bnAbs target the envelope glycoprotein spike (Env), a trimer of gp120 and gp41 heterodimers. Germline precursors of HIV bnAbs appear to be rare in the human Ig repertoire, hence, a Germline-Targeting (GT) approach has been described whereby immunogens are developed to potently bind and activate rare bnAb precursor B cell lineages. PGZL1 is a HIV bnAb that belongs to the 4E10 class of Abs that bind to gp41's C-terminal membrane proximal external region (C-MPER) alpha helix that is a target of multiple bnAbs and bnAb classes. We found that an inferred germline revertant of PGZL1 (iGL PGZL1) bound in an ELISA to a previously described C-MPER protein scaffold that we designated, PGZL1.GT1. We used GT1-decorated liposomes to immunize iGL PGZL1 gH+ knock-in (KI) mice and strong serum Ab titers to the MPER were elicited. We further discovered that a scaffold mutant, GT1.1, bound with 45-times higher affinity to iGL.PGZL1 Fab by biolayer interferometry (BLI). Our findings inform GT vaccine design involving the 4E10 class of HIV bnAbs and the MPER more generally.

Lillian Frank

Chemistry, Muir

Mentored By Nathan Romero

photo-oligomerization of EDOT

Poly(3,4-Ethylenedioxythiophene) (PEDOT) is a lightweight and flexible conjugated polymer with optoelectronic properties that can serve as an advanced organic electronic material. However, PEDOT's solubility issues pose challenges when creating PEDOTbased devices. The goal of this research is to develop a method for synthesizing PEDOT through photopolymerization of 3,4-Ethylenedioxythiophene (EDOT). We have found that EDOT can undergo photo-oligomerization with thianthrene salts that act as photoinitiators. Various parameters such as irradiation time, time between irradiation and analysis using 1H-NMR, anion identity, monomer to initiator ratios, and irradiation containers were tested to optimize the photopo-oligomerization process. The parameter that yielded the highest overall monomer conversion for various monomer to initiator ratio was 100:1 with 75% conversion, samples that were immediately analyzed by 1H-NMR have the lowest monomer conversion with 43% while the samples that sat for two days and another for a week have conversion of 74 and 75% respectively. The photooligomerization process converts the monomer to dimer and trimer and the thianthrene salts are converted to thianthrene and an acid which is used in an acid catalyzed reaction. Optimizing the photopolymerization process of EDOT will allow for photolithographic production of high yielding, flexible, conductive, and lightweight polymer production.

DJ Frick

ICAM Music, Sixth

Mentored By Shlomo Dubnov

Co-Creative Dynamics: A Study of Real-Time AI MIDI Improvisation: Focuses on the interplay between human and AI.

Real-time musical improvisation between humans and artificial intelligence holds significant potential for novel creative expression. Existing systems like PyOracle or Somax that can work online and in real time are limited in terms of the size of the corpus it can use for learning and the amount of musical knowledge that the model uses in order to interact with a human musician. One of the motivations in this project is to bring the capabilities of existing generative AI methods into live interaction and improvisation. However, achieving fluid, musically meaningful interaction in real-time remains challenging due to size of the model, system latency and the complexities of modeling co-creative dynamics.

This project, "Co-Creative Dynamics: A Study of Real-Time AI MIDI Improvisation," investigates how to optimize this interaction with foundation genAI music models. We are developing a system where an AI agent generates responsive MIDI data in real-time, integrating with standard Digital Audio Workstations to facilitate bidirectional musical communication with a human musician.

To address the critical need for low latency in live performance, the system's generative core utilizes a Performer model. This efficient transformer architecture, applied here as a music transformer (or musical LLM) trained on large amounts of musical data, features linear complexity. Our central research question examines how interactive parameters, such as system latency and the AI's generative musical characteristics (e.g., balance of imitation vs. novelty), alongside deployment environment factors (e.g., CUDA vs. MPS performance), can be optimized to foster a more musically meaningful co-creative dynamic.

Evaluation will involve technical performance metrics (latency, stability) and qualitative assessments from musicians interacting with the system, focusing on perceived interaction quality and co-creative engagement. This research aims to provide insights into future research for optimizing AI systems as responsive musical partners, contributing to the advancement of human-AI co-creativity in music.
Thomas Frisch

Chemistry & Biochemistry, Muir

Mentored By Michael Burkart

Rethinking polyurethane dogmas for fully renewable and biodegradable foams

The development and adoption of sustainable alternatives to the major classes of plastics is an urgent global need. Accounting for 10% of new plastics, polyurethanes (PUs) can be renewably sourced, and a scalable route to 100% renewable PUs incorporates aliphatic diisocyanates that can be derived from plant or algae oil has been demonstrated. Historically, most PUs have been formulated with aromatic diisocyanates, which currently have no biological sourcing, and traditional dogma assigns PU hard segments to these aromatic components. We recently showed that the renewable aromatic monomer furandicarboxylic acid (FDCA) can be incorporated into polyols as a way to replace these hard segments when utilizing aliphatic diisocyanates. Here we report a systematic study to understand the molecular role of both aromatic and aliphatic components in high performance PU foam formulations using FDCA polyols. We show that these foams display robust mechanical properties rivaling commercial materials and show excellent biodegradability. This work suggests that many commercial materials could be reengineered for both renewability and biodegradability to address the sustainability gap.

Jewel Fulmore

Literature and Writing/Literature, Marshall

Mentored By Libby Butler

Challenging Linguistic Discrimination: Anti-Racist Writing Pedagogy in First-Year College Courses

Linguistic discrimination in higher education disproportionately affects Black students who speak African American Vernacular English (AAVE) and Black Language (BL). Standard Language Ideology (SLI) reinforces the belief that Standard English (SE) is the only legitimate academic language, embedding racial biases in grading and assessment. Traditional grading systems penalize students for linguistic diversity, positioning AAVE as "improper" and "unacademic" rather than recognizing it as a legitimate linguistic system (Baker-Bell, 2019; Horton, 2000). Scholars (Inoue, 2015; Baker-Bell, 2019) advocate for anti-racist assessment models.

Using surveys of UCSD freshman writing instructors/faculty and students who are enrolled in or recently completed at least one freshman writing course, this project investigates the types of assessment models used and students' perceptions of their impact on academic success. Understanding how grading practices influence student success is critical in addressing systemic linguistic racism in higher education. By reshaping assessment practices, universities can foster learning environments that recognize linguistic diversity as an asset rather than a deficit, ultimately contributing to more equitable and inclusive academic spaces.

Moumen Gabir

Neurobiology and Cognitive Science (spec. Machine Learning and Neural Computation), Marshall

Mentored By Kay Tye

Investigating Anhedonia in Chronic and Acute Stress Models Reveals Distinct Behavioral Patterns in Depression-like Responses

Anhedonia, the inability to experience pleasure, is a key symptom in psychiatric disorders like Major Depressive Disorder (MDD) and Schizophrenia remain difficult to treat with current antidepressants. To understand how different stressors induce anhedonia and depressive-like behaviors, we utilized a commonly used preclinical model, Chronic Mild Stress (CMS) to model these depressive-like behaviors. CMS models chronic unpredictable stress, while LH represents acute, severe stress. This study aimed to determine whether these paradigms produce distinct behavioral phenotypes and stress susceptibility patterns.

Mice in the CMS paradigm were classified as resilient or susceptible using k-means clustering, based on Sucrose Preference Test (SPT) performance for reward-seeking behavior in CMS. Anhedonia and depressive phenotypes were assessed using SPT, the Tail Suspension Test (TST) for behavioral despair, 3-Chamber Sociability Test for social deficits, Lick probability under a Pavlovian Discrimination Task to test for reward seeking behaviors, and facial microexpression analysis to assess affective state. To examine stress effects on antidepressant response, ketamine was administered post-stress, and its impact on behavioral patterns.

CMS-exposed mice exhibited increased TST mobility following ketamine treatment, regardless of anhedonic classification, suggesting a broad antidepressant response. Susceptible mice displayed blunted facial microexpressions and increased lick probability following stress. These findings reveal key insights into the mechanisms that are affected by anhedonia and modern day antidepressants like ketamine. These distinctions underscore how stress alters anhedonic resilience and susceptibility, shaping depressive phenotypes and treatment responses.

Shrey Gandhi

Biology w spec in Bioinformatics, Seventh

Mentored By Michelle St Romaine

Unequal Access: How Age and Demographics Influence Post-Assault Emergency Contraception in Southern California EDs

Emergency Contraception is a very important component of post-sexual assault care but the access that many people get is still very uneven in states such as California. This study investigates how different demographic characteristics such as age, race/ethnicity, and insurance status can affect the likelihood of receiving Emergency Contraception in emergency departments across Southern California. This research will be done by focusing on specific age groups and stratifying by key that may disadvantage certain populations. Additionally, this study will also consider how institutional factors may come into play and how location can intersect with patient demographics to influence care outcomes. Preliminary observations indicate that adolescents and young adults, especially those from minority backgrounds or with public insurance, encounter distinct barriers to EC access.

Carlos Garrido

Structural Engineering, Warren

Mentored By Petr Krysl

Benchmark Catalogue for the Finite Element Analysis of Composite Plates and Shells

Finite Element Analysis (FEA) is widely used in engineering to simulate how structures respond to loads and boundary conditions. But like any simulation tool, its accuracy depends on testing it against problems where the correct answer is already known, what we call benchmarks. For traditional materials like steel or aluminum, these benchmark problems are well established. However, for composite materials, which are now common in aerospace and structural applications, there's no standard set of problems researchers agree on. This lack of consistency makes it hard to compare results across studies or confirm whether a simulation is truly reliable.

This project focuses on addressing that gap by developing benchmark problems specifically for laminated composite plates subjected to linear vibration. The benchmarks are based on closed-form solutions published by Phan and Reddy in 1985, which use First Order Shear Deformation Theory (FSDT) to better capture transverse shear effects. These problems were recreated in SW Simulation, where mesh refinement studies using 10×10 , 20×20 , and 40×40 element grids were performed. Richardson extrapolation was applied to estimate the true solution and evaluate the rate of convergence across meshes.

The validated results are intended to serve as part of a growing library of benchmark problems for composite plate analysis. Although the final database is still under development, this research establishes a structured method for testing and comparing FEA models of composite structures. By contributing toward a standard set of reference problems, this work supports more consistent, accurate, and trustworthy simulation practices in composite structural engineering.

Stella Ghevondyan

Public Health, ERC

Mentored By Tala Al-Rousan

Evaluating Domestic Violence Support Services in Armenia: Perspectives from Service Providers

Issues: Domestic violence (DV) is a critical global public health issue, with profound physical, psychological, and socioeconomic consequences for survivors and their families. Consistent with global prevalence, nearly one in four women in Armenia experience DV, yet support services have not been formally evaluated. The recent Nagorno-Karabakh conflict has exacerbated DV and increased pressure on service systems, making it urgent to evaluate DV support services.

Description: This qualitative study aims to assess Armenia's DV support services from the perspectives of service providers. In-depth interviews with up to 20 social workers, psychologists, legal counselors, and shelter staff will explore insights on service accessibility, quality, and systemic barriers. Interviews will be conducted virtually in Armenian, transcribed, and translated to English for thematic analysis.

Lessons Learned: Preliminary findings indicate that DV support providers face significant challenges due to deeply rooted cultural stigma, which discourages women from reporting abuse. Inadequate police responses such as reluctance to intervene, victim-blaming, and, in some cases, even returning women to their abusers along with gaps in DV policies, further endanger survivors. Addressing these issues requires comprehensive strategies to shift societal attitudes and strengthen institutional support for survivors.

Recommendations: Service providers, policymakers, and police must collaborate more effectively to strengthen the response to DV and address systemic gaps. Survivor-centered intervention protocols should be established to prioritize safety and prevent harmful practices. Police must receive mandatory trauma-informed training from DV support centers to address victim-blaming and improve intervention practices. Finally, targeted public awareness campaigns are essential to challenging cultural stigma.

Luna Glenn Reyes

global health, Marshall

Mentored By Lindsey Burnett

Investigating if Social Determinants of Health Impact What Stage of Pelvic Floor Prolapse Patients Seek Care in the San Diego Borderlands

The goal of my research project is to determine if social determinants of health affect which stage of pelvic organ prolapse people seek access to care and treatment. In order to do this, demographic data was obtained from UCSD Health, including race, age, gender identity, sexual orientation, BMI, blood pressure, zip code, parity, income, education level, insurance type. Data on pelvic floor prolapse and stage diagnosis and stage of severity was also collected, identifying them with the corresponding ICD-10 codes and POP Q scores. The social determinants of health variables were analyzed independently as well as a group to determine if any individual variable or poor diet overall have a correlation to POP Q scores and stage of pelvic floor prolapse diagnosed when seeking treatment. Clinical data analysis conducted using SPSS software tools and performing statistical ANOVA tests. This study looks into the factors that affect the quality of life of patients and determines the role these factors play in complications from childbirth and postpartum. The research is focused in the San Diego borderlands community, our unique demographic makeup will give us insight into the broader international community present here and across the border. The research will touch on subjects relating to access to healthcare, in relation to our most vulnerable populations, including refugees, asylum seekers, and immigrants. This research will give us more insight into pelvic floor prolapse in the San Diego community so we can focus our efforts to reach the most vulnerable populations.

Iidah Golly

Black Diaspora and African American Studies, Marshall

Mentored By Lagina Gause

How Black Identity Combats Political Control in the Workplace

Racial capitalism describes the intimate and codependent relationship in which race becomes a mechanism through which the capitalist system perpetuates and justifies the exploitation of Black communities. Understanding political control in the workplace as a byproduct of racial capitalism makes the role of Black identity evident. Political control refers to the methods institutions use to prevent resistance and ensure widespread compliance. This can occur in the workplace through surveillance or the rewarding of apolitical behavior. This research focuses on analyzing political control in the workplace and the role of Black identity in inspiring workers' political activity. Using a racial capitalist framework to understand the importance of the workplace in facilitating a broader analysis of Black people's political activity, I aim to show the connection between Black identity and worker resistance through semi-structured interviews with Black workers from San Diego County. I hypothesize that Black identity undermines political control by providing Black workers with a group consciousness that facilitates critique and inspires individual and collective action. Especially in marginalized spaces, Black workers seeing the economic impacts of their discrimination shows blatant contradictions in the racial capitalist system, which fuels conversations and analyses that lead to noncompliance. My findings will help scholars, workers, and organizers better understand the conditions necessary for producing collective action.

Kavya Gurunath

Biology with a Specialization in Bioinformatics, Sixth Mentored By James Wilhelm

Learning from All of Us: Is it Time to Stop Changing the Time?

Daylight Saving Time has become a recent topic of conversation, with many states considering abolishing it to either stay permanently in standard time or Daylight Saving Time. The spring forward shift in March has been known to be associated with a decrease in sleep duration and efficiency and an increase in hospitalization for heart-related conditions, such as atrial fibrillation and stroke. Our study aims to determine the physiological effects on sleep and heart rate after the spring Daylight Saving Time shift using wearable device data for sleep and heart rate. We conducted a retrospective cohort study using the All of Us database, comparing those exposed to Daylight Saving Time (48 states) to those not (residents of Arizona). We examined the impact of the spring forward time change during March of 2022 in the following outcomes: 1) sleep duration, 2) sleep efficiency, and 3) heart rate variability. Findings from this study could change the way we look at Daylight Saving time and prove that the shift in time has a physiological effect on our health. We hope this study's findings contribute to the discourse around Daylight Saving Time and are factored into decisions about its abolishment.

Veronica Hernandez

Clinical Psychology, Department of Psychology | Cognitive & Behavioral Neuroscience, Department of Cognitive Science, Muir

Mentored By Dr. Lisa Eyler

Longitudinal Changes in Cognition and Mood Instability in Bipolar Disorder

Cognitive dysfunction and mood instability are hallmark features of Bipolar Disorder (BD), yet over time, the long-term trajectories of these factors are not well-understood. While previous studies have primarily focused on cross-sectional assessments, few have explored the longitudinal changes in cognitive performance and mood within individuals with BD, particularly in comparison to non-psychiatric controls (NC). The current study aims to address this gap by examining the stability of cognitive function and mood/impulsivity over a multi-year period, using the MATRICS Consensus Cognitive Battery (MATRICS) and the 5-choice Continuous Performance Task (5C-CPT). We hypothesize that individuals with BD will show greater cognitive decline over time, particularly in executive functioning, compared to NCs. Additionally, we anticipate that mood fluctuations, which are assessed through daily phone-based affect ratings, will significantly impact cognitive performance. Specifically, we expect that depressive states will correlate with poorer cognitive outcomes. Using linear mixed models, we will examine how these variables change over the course of two to four years, with a focus on whether changes in mood predict subsequent cognitive performance and vice versa. Our study will contribute to a more nuanced understanding of the relationship between mood instability and cognitive dysfunction in BD, offering insights into the long-term trajectory of these symptoms and informing future interventions.

Ani Hovhannisian

Neurobiology/Biology Department, ERC

Mentored By Li Ye

Exploring Introspection of Adipose Tissue

Adipose tissue is in constant discussion with the central nervous system in order to maintain whole-body energy homeostasis. My research is centered around analyzing brain regions that respond to peripheral metabolic activity in adipose tissues, especially inguinal white adipose tissue (iWAT), which is highly dynamic and tightly innervated by the nervous system. This research can expand current knowledge on the central regulation of whole-body metabolism regulation. The current literature only examines metabolic processes of brain, sensory neurons, and adipose tissues; while the connection between all three of them are less understood. My main aim is to find multiple candidate brain regions that potentially play critical role in the central regulation of metabolic homeostasis.

Jack Howard

Data Analytics (B.S.) - Political Science, Muir

Mentored By Christopher Stout

"Universities as Communities of Interest: Exploring Electoral Influence and Political Representation in Campus-Adjacent Districts"

Universities play a critical yet underexamined role in shaping electoral dynamics and local political representation. As economic anchors and civic hubs, college campuses influence employment, housing markets, and voter turnout—particularly among young voters. Despite this significance, university communities are often split across legislative boundaries, weakening their collective political voice. This project investigates whether recognizing universities and their surrounding neighborhoods as "Communities of Interest" (COIs) in the redistricting process could enhance their representation and policy influence.

Through a mixed-methods approach, I analyze voting patterns, redistricting maps, and civic engagement trends in university-adjacent districts across California. I pair this quantitative work with interviews from student leaders, policymakers, and redistricting advocates to understand how universities are perceived as political entities and whether formal recognition as COIs would improve representation. I also examine case studies of successful student-led electoral efforts to identify strategies that increase the political power of campus-based communities.

This research aims to produce data-driven insights and policy recommendations on how redistricting and electoral outreach can better reflect the economic and civic realities of university communities. By highlighting the intersection of education, local economies, and democratic participation, this project contributes to broader discussions on fair representation, youth engagement, and education equity. Ultimately, it proposes a new framework for understanding universities not just as educational institutions, but as vibrant and cohesive political constituencies deserving of intentional inclusion in electoral decision-making.

Grace Hung

Cognitive Science, Marshall

Mentored By Tzyy-Ping Jung

Real-Time Emotional Analysis and Stress Regulation Using Multi-modal Biosensors and AI Agents

Emotions play a central role in human cognition, behavior, and well-being, yet their multidimensional nature—encompassing physiological, behavioral, and cognitive components—makes real-time assessment and regulation challenging. This research proposes a novel system that integrates multimodal biosensors and AI-driven adaptive feedback to enable real-time emotional analysis and stress regulation. By combining biochemical (e.g., cortisol levels), neurological (e.g., EEG), physiological (e.g., HRV, skin conductance), and behavioral data (e.g., gaze tracking, body movement), the system creates a robust dataset for emotion classification. Leveraging Large Language Models (LLMs) and deep learning, the project aims to transform subjective emotional experiences into structured data, enhancing classification accuracy and intervention precision. Furthermore, the system incorporates an AR-based biofeedback platform, where an AI agent delivers personalized, adaptive interventions through visual, auditory, and haptic feedback. This research bridges critical gaps in affective computing and has far-reaching applications in mental health, cognitive enhancement, and human-computer interaction.

Chloe Hunter

Communication, Muir

Mentored By Amy Lerner

USAID"s Closure: International Realities and Emerging Opportunities for Sustainable Development

This research presentation will explore how international development and prospective career paths in international sustainable development like climate adaptation will be impacted by the closure of USAID. A close examination of how the ecosystem of sustainable development financing will adapt to the erasure of USAID and what sorts of potential new funding sources are likely to fill the void left behind will also be explored. The United State's dismissal of USAID creates a vacuum in which potential world powers may take lead concerning Americans and international agencies alike. As opportunities within USAID disappear, potential employees and agencies are forced to reassess the quickly changing landscape of financing. Financing for sustainable development is based on many different institutions, including the United States government, and a full understanding of the consequences of USAID's closure are still being played out in real time. This presentation will analyze real time reflections and changes captured through policy analysis and interviews with industry experts. These real time changes will be articulated through qualitative and quantitative findings sourced from a variety of data from think tank reports, white papers, and structured interviews with developmental agencies and industry professionals providing an insider looking glass for prospective employees and a world without USAID.

Brandon Hunter

Psychology, Muir

Mentored By Nadia Brashier

Extending beyond the headline: Does suggestive news support false memories?

Many people are misinformed on important topics. As examples, some people believe that human-driven climate change is a hoax, that COVID-19 was a bioweapon engineered by China, and that vaccines cause autism. But blatant falsehoods only compromise a small portion of Americans' news diets. This seeming paradox likely reflects the prevalence of headlines from mainstream sources that merely imply falsehoods, and thus are not flagged by fact-checkers. This sensational content exploits the tendency of our memory system to form pragmatic inferences - reasonable but not explicitly stated conclusions. In this experiment, we will investigate whether misleading headlines support false memories through pragmatic inferences. Participants will first be exposed to true (e.g., Canada to cut immigration levels in major reversal, Trudeau says), false (e.g., Canada to end immigration levels in major reversal, Trudeau says), and misleading (e.g., Canada to freeze immigration levels in major reversal, Trudeau says) news headlines. Participants will then complete a cued-recall test (e.g., Canada immigration levels in major reversal, Trudeau says), either immediately or after a short delay. We hypothesize that participants will make memory errors that extend beyond what was stated in the misleading headlines, particularly after a delay. The results of this work will inform theories of the relationship between memory and belief, as well as suggest journalistic best practices to reduce the spread of misinformation.

Julian Jackson

Astronomy and Astrophysics, Sixth

Mentored By Adam Burgasser/Dr.Nicole Lloyd Ronning (Los Alamos National Laboratory)

The Ultimate Glow Up: Gamma Rays

Stars are the fireflies of the known universe. These amazing combinations of hydrogen, helium and a few other gasses are truly a marvel, even in death. When a star "dies" or collapses in on itself, it has the potential to turn into a black hole. In that process, a Gamma-ray Burst (GRB) jet can be launched. GRBs are the brightest phenomena in our universe. While we have observed thousands of these events, the progenitor of these brilliant events is still an open question. In this project, we investigate the electromagnetic radiation produced from a relativistic jet launched from a black hole-accretion disk central engine. Through the use of afterglowpy we calculate GRB light curves and spectra and compare this to the existing data, to better pinpoint what it takes to produce these most luminous explosions in our universe

Shravi Jain

Computer Science/Computer Science and Engineering, Revelle

Mentored By Parinaz Naghizadeh

Data Analysis and Machine Learning to Understand Educational Outcomes

It has been argued that college-going rates are positively correlated with life satisfaction and income levels. The California Department of Education defines college-going rate as the percentage of students completing high school in a given year, making high school graduation a first step towards gaining these benefits. However, California has lower high school graduation rates than many other US states. My research project's foundation lies in exploring how data-driven analysis and the use of machine learning tools can help understand the root causes of these low graduation rates. This foundation leads to my central research questions about how socio-economic and demographic factors can affect high school graduation rates, i.e. academic success, and whether the insights gained from this analysis can improve educational outcomes. Using machine learning models like linear regression and gradient boosting machines, the project analyzes educational datasets from California, as well as other states, to identify patterns and predictors of graduation rates, such as chronic absenteeism and the number of students enrolled in the free or reduced-price meal programs. By identifying key indicators like attendance that reflect the broader school environment, the data analysis can be useful for making datainformed decisions while developing targeted strategies to improve student engagement and retention. A key hypothesis is that traditional predictive models may underperform for economically disadvantaged schools, thereby masking critical underlying factors. Ultimately, the goal is to leverage modern analytical tools to support a student's chance to graduate irrespective of background and have an opportunity to pursue higher education.

EJ Jappi

Political Science: International Relations, Marshall

Mentored By Jesse Driscoll

Internal State Conflicts: Investigating the Factors that Cause Civil Wars and Internal Conflict in Ethiopia

In 2020, Ethiopia's civil war in the Northern Tigray region ended with the death of at least 600,000 civilians, with millions more internally displaced. Prior to the Tigray War, the country had experienced numerous internal conflicts and other major civil wars with a similar death toll of over 500,000 - 1 million civilians. This pattern of recurring, large-scale violence raises a critical question: What makes Ethiopia so prone to civil wars and deadly internal conflicts? My research suggests three related factors. First is the corrupt politicization of security institutions, especially the police and military forces. This causes public distrust of these institutions, resulting in the transition of non-combatant rebels to armed rebellion. Consequently, deadly violence occurs whenever insurgency (i.e., armed rebellion) erupts. The second factor is the role of ethnic politics that are caused by the mixed understanding of the country's political history. These conflicting perspectives motivate political actors and local leaders to use hardline extremist bargaining positions. Lastly, Ethiopia has never enjoyed a sustained period of well-ordered liberal democracy, regardless of whether it was under imperial rule, a communist military junta, or an ethnofederal system. In a winner-take-all dictatorship or semi-democratic government, with no expectation that power will really rotate fairly in the future, different factions come to see all politics as a zero-sum game.

Harshita Jinaga

Undeclared, ERC

Mentored By Jason Handwerker

How can advanced preprocessing, 3D convolutional architectures, and ensemble learning be integrated to optimize the accuracy and efficiency of AI-based detection of astrocytomas and glioblastomas in T1 MRI scans?

The timely and accurate detection of intracranial tumors, such as astrocytomas and glioblastomas, has become a crucial challenge in neuro-oncology. With knowledge of the aggressive nature of these tumors, early detection significantly improves the treatment efficiency and patient outcomes. Today, our diagnostic system mostly relies on manual interpretations of MRI images, which can be subjective and implicit to radiologists' human error. Artificial intelligence (AI) offers a promising approach to enhancing diagnostic accuracy and consistency, specifically in complex cases. To resolve this issue, I created an AI detection tool to identify intracranial tumors like astrocytomas and glioblastomas through the use of various AI imaging methods and utilizing a dataset of 4715 native T1 MRI images from 152 patients. I developed this detection tool through my skills in Python coding and my knowledge of brain tumor segmentation and analysis. I have refined and enhanced this model to improve its efficacy and accuracy by exploring other AI imaging methods and leveraging my skills in Python-based optimizations to create a more robust diagnostic tool. The model by incorporates three impactful aspects: transition to 3D convolutional neural networks (3D CNNs), advanced preprocessing techniques (intensity normalization and bias field correction), along with ensemble learning (combining different CNN models). Implementing these three techniques into my existing model will has had a significant impact on its overall effectiveness in detecting intracranial tumors.

Rick Jones

Physics with Astrophysics Specialization, Marshall

Mentored By Samantha Trumbo

Analysis of HST/STIS Spectra in Search of Irradiated NaCl on Ganymede

Ganymede, the largest moon in the Solar System, is a compelling target for planetary science due to its internal magnetic field, varied geologic terrain, and potential subsurface ocean. While previous studies have hinted at hydrated salts on Ganymede's surface in the infrared, these data lack clear diagnostic features of specific salts. Irradiated sodium chloride (NaCl) forms distinct absorption features, most notably near 230 nm and 450 nm, when exposed to high-energy particles. These features have been previously identified on Europa in regions of recent geologic activity and may similarly indicate endogenic resurfacing on Ganymede. We use data from twelve Hubble Space Telescope (HST) visits employing G230L, G430L, and G750L gratings to construct a complete reflectance map. Spectral features are identified by solar-corrected reflectance and characterized by depth and areal coverage.

This study presents the first spatially resolved global mapping of Ganymede's surface in the 200–1000 nm range using HST STIS data, focusing on the spectral signatures of irradiated NaCl. Detecting irradiated NaCl could provide strong evidence of past exchange between Ganymede's subsurface ocean and its surface, offering clues about geologic activity and potential habitability. Even a non-detection would inform the role of magnetospheric irradiation on Ganymede's surface composition and help constrain the distribution of salts across Jupiter's satellites. This research will not only fill critical gaps in our compositional understanding of Ganymede but also contribute to the comparative study of the Galilean moons in the broader context of icy world evolution.

Hannah Jun

Human Biology/Biological Sciences, Marshall

Mentored By Alfredo Molinolo

Optimizing PBMC Processing Protocols for Long-Term Cryopreservation: Assessing Post-Thaw Cell Viability and Immune Profiling Integrity

Peripheral blood mononuclear cells (PBMCs) are an essential resource in immunological and translational research- nevertheless, their long-term survival is significantly influenced by the isolation and preservation procedures used. To determine the optimal approach for fractionating and cryopreserving PBMCs, three isolation techniques were evaluated: density gradient standard method (LymphoPrep), physical barrier + density gradient tubes (SepMateTM), and positive selection using magnetic cell separation (EasySepTM), under two cryopreservation conditions: Serum-free media (CryoStor) and FBS-based medium. In addition, to evaluate the effect of red blood cell contamination in long term cryopreservation, a red blood cell lysis group was tested against a no lysis group.

The MOXI GO-II system was used to evaluate cell count and viability immediately postisolation, revealing that EasySep provided the greatest overall viability and recovery, followed by SepMate and finally LymphoPrep. Initial studies indicate that the RBC lysis buffer in the LymphoPrep condition may be indiscriminately compromising cell viability, leading to the loss of both red blood cells and valuable immune cell populations.

Samples will undergo reassessment at the six-month interval to determine post-thaw viability under all test variables. To further characterize the immune cell populations, immunostaining using multiplexing techniques by Akoya Phenocycler is being performed using common lymphocyte markers (CD-3,CD-11b, CD-11c,CD-45,CD-68) followed by multiplex imaging. Image analysis will be performed using PhenoChart and QuPath software for detailed visualization and quantification of these specific markers within the preserved PBMC samples.

Brian Keller

Environmental Chemistry/SIO, Seventh

Mentored By Clifford Kubiak

Structural Modifications to Enhance Electrochemical Reduction of CO2 by Cobalt (II) Phthalocyanine

Electrochemical reduction of CO2 is one of the most advanced methods to produce carbon neutral fuels. Almost all existing CO2 reduction catalysts convert CO2 to CO or formate by a two-electron reduction, and these products must be further processed to produce combustible liquid fuels. Cobalt (II) phthalocyanine (CoPc) is nearly unique in its ability to generate methanol in situ by a six-electron process without the need for further processing. While the mechanism of this catalyst is still being studied, it is known that the process takes place in two stages: CO2 is reduced to CO, followed by the fourelectron, four-proton, transformation of CO to methanol. Recent evidence from our lab demonstrates that the formation of a highly reactive, triply reduced state of CoPc is necessary for the reduction of CO. However, [CoPc]3- must be protonated at the phthalocyanine ring to do productive catalysis. Otherwise, complexation of CO leads to decomposition of the complex. The present work investigates substitution of the apositions of phthalocyanine with hydrogen bond accepting and donating groups and studies the consequences of these functionalities on the protonation of exocyclic N to make catalysis more favorable. Synthetic control over the catalyst framework will evaluate the effects of regioisomers, steric interactions, and degree of substitution on catalytic ability. Electrokinetic analysis, bulk electrolysis with coupled product detection, infrared spectroelectrochemistry, and isolation of chemically reduced intermediates will be employed to observe the involvement of these groups in catalysis. This work will contribute to the understanding of structural characteristics that enhance catalysis.

Nehme Lahoud

Human Biology/Biological Sciences, Revelle

Mentored By Justin Meyer

Evolving Phage Antibiotic Synergisms

Bacteriophage therapy—the use of bacterial viruses to suppress bacteria in multi-drugresistant infections—has emerged as a promising experimental strategy to combat the growing problem of antibiotic resistance in the clinic. However, the phages' capacity to clear bacterial infections is often limited because bacteria evolve resistance to phage. Coevolutionary bacteriophage training, which encourages an arms race between bacteriophages and their hosts, offers a potential solution by developing more suppressive "trained" phages with a suite of counter-defenses against bacteria, limiting the bacteria's ability to evolve resistance. Previous experiments have shown trained phages are more effective at suppressing bacteria, partly because the resistance mutations required to defend against the trained phages are costlier and interfere with bacteria's growth. Here, we show that a second consequence is that the bacteria become more vulnerable to antibiotics. These findings suggest that some antibiotics can synergize specifically with trained phages. This research highlights the potential of the development of phage therapies tailored to patients undergoing antibiotic treatment.

Daniel Landaverde

Clinical Psychology, Revelle

Mentored By Katherine Bangen

Cognitive Intraindividual Variability (IIV) and its Association with Arterial Compliance

Dispersion, a measure of intraindividual cognitive variability across multiple neuropsychological measures administered during a single testing session, has the capacity to function as a sensitive marker for cognitive decline and/or dementia. Related to the development of dementia is that of arterial stiffening, which is recognized as a contributor to its onset. The aim of the current analysis is to characterize the crosssectional relationship between cognitive IIV and arterial compliance, as only a few studies have examined the relationship between IIV and arterial stiffness. For the current project, the lab's local data will be utilized for the statistical analysis. Participants will have completed a neuropsychological battery, and the measures from the battery will produce an IIV index. Further, participants will have completed MRI scans, which includes scanning their carotid arteries. Measuring carotid pulse wave velocity (cPWV) will be conducted to assess for cerebral arterial compliance. It is hypothesized that higher IIV (more cognitive variability within an individual) will relate to lower arterial compliance (greater arterial stiffness). Increased dispersion may be a marker that reflects sensitivity in relation to cognitive impairment, compared to conventional cognitive scores. Furthermore, based on recent literature, it is understood that dispersion relates well to cognitive decline and progression to dementia, but the underlying mechanisms are still unknown. Thus, the current study seeks to understand these underlying mechanisms of increased dispersion, and to observe whether certain subgroups of individuals for whom dispersion may be more predictive for, such as those with elevated vascular risk.

Jasmine Le

Bioengineering, Warren

Mentored By Shaochen Chen

Digital Light Processing Printed Core-Shell Architectures for Sustained Antimicrobial and Biocontrol Applications

Antibiotic resistance poses a serious and growing threat to global health, urging the development of alternative antimicrobial strategies. While probiotics have shown great promise, being able to effectively harness their biocontrol capabilities remains a challenge in practical applications. In this study, we propose using digital light processing (DLP) bioprinting to fabricate a core-shell architecture designed to address this issue. The architecture is composed of a polyethylene glycol diacrylate (PEGDA) shell structure with tunable nanoscale porosity that encapsulates a core structure containing germinable spores of Bacillus subtilis. The nanoporous PEGDA shell confines spores within the core while permitting inward nutrient diffusion to support controlled germination, and simultaneously entraps target pathogens to enhance local biocontrol efficacy. This configuration facilitates both the long-term viability of the probiotic and the sustained release of bioactive compounds with antimicrobial properties. This approach demonstrates the feasibility of embedding probiotic spores within engineered scaffolds for extended antimicrobial functionality. Additionally, the inherent versatility and scalability of DLP bioprinting offer significant potential for tailored designs and highthroughput manufacturing, with prospective applications in biomedical packaging, environmental sanitation, and engineering living materials.

Stephanie Lee

Business Economics/Rady, Revelle

Mentored By William Molloie

Effective strategies to maximize knowledge retention and long-term benefits of financial literacy programs

Financial literacy programs are educational initiatives designed to enhance financial knowledge and ultimately reduce financial stress. They are also believed to have long-term impact on individuals' financial behaviors and outcomes [4]. However, wide variations in program structure raise questions about the validity of this assumption. For example, factors such as whether the participation was voluntary or mandatory, the stage of life at which participants were exposed to the program, and the inclusion of interactive simulations can significantly influence the effectiveness of financial literacy programs.

Previous studies on the effectiveness of financial literacy programs yield mixed results: Some studies propose significant long-term impact on participants' financial decisionmaking [2], while others indicate little to no financial impact [1]. A possible explanation for these inconsistencies is that these studies often fail to adequately measure and account for the critical variables which can determine program efficacy. To address this shortcoming, this study will examine how key factors beyond the program itself affect financial knowledge retention and behavioral change.

This study aims to identify the optimal strategies and environments with which financial literacy programs can be most effectively delivered. For this objective, the study will contextualize findings from past experiments and use a mixed-methods approach which combines surveys, interviews, and experiments. College students who enrolled in finance elective courses will be surveyed and assessed in terms of their financial decision-making. In addition, program designers and educators will be interviewed for their insights into program structures and intentions. To complement these findings, a simple comparative experiment will be conducted in high school and college settings to evaluate the differences in knowledge retention and application between the two age groups.

Justin Lee

Human Biology, ERC

Mentored By Haiwang Yong

*Comparison of Ultrafast X-ray and Electron Diffraction for Imaging CH*₄/*CD*₄ *Ionization Dynamics*

Ultrafast diffraction techniques provide unprecedented insights into molecular dynamics. This computational study employs MATLAB to compare X-ray and electron diffraction signals during the ionization dynamics of methane (CH₄) and its deuterated analogue (CD₄). Using numerical simulations and advanced signal processing techniques, we develop a computational framework to analyze and visualize the differential scattering characteristics of these isotopologues. Our MATLAB-based approach quantifies the nuclear and electronic rearrangement during the excitation process of these molecules, revealing the complementary nature of electron and X-ray diffraction techniques.

Peter Leonido

Education Studies, Sixth

Mentored By Amy Bintliff

Critical Service-Learning: Advancing Understandings in Meeting Community Partner and University Goals for Improving Educational Equity

This study explores the transformational aspects of critical, community-engaged servicelearning in higher education, within the context of San Diego schools and P-12 serving, nonprofit organizations in partnership with UC San Diego. This research uses a critical framework of service learning (Mitchel, 2008; Santiago-Ortiz, 2019). According to critics, traditional service-learning employs a charity-based approach to working for communities whereas critical service-learning takes a social justice turn, analyzing the root causes that necessitate service. It questions the distribution of power, uncovers and centers political notions inherent in service-learning, and focuses on community– university relationships.

Much of the service-learning literature focuses on college students' outcomes. This study uncovers the mechanisms by which such outcomes for college students are achieved, but also how participating P-12 schools, community organizations, and involved communities are affected by the Partners at Learning (PAL) program's critical approach to service-learning. University service-learning programs such as the PAL Program, are understudied in terms of the benefits to program partners regarding diversity, equity, and inclusion goals and anti-bias/anti-racist and educational community goals (such as literacy advancement) for Students of Color in underresourced settings.

This study invites community partners, instructors, and service-learning students to speak to this issue through traditional focus groups, as well as through participatory methods (i.e. 2-hour workshops) using visual arts, writing, and discussion.

Rihui Ling

Math & Data Science, Marshall

Mentored By Gao Sicun

Scalable Reinforcement Learning for Portfolio Management

Portfolio management has long relied on classical mean-variance optimization to balance expected return against risk, but these methods often perform worse when faced with large, high-dimensional asset universes. Recent advances in reinforcement learning (RL) offer a data-driven alternative, yet RL agents trained on small asset pools suffer from scalability challenges-exponential growth in state and action spaces, slower convergence, and heightened sensitivity to market noise. In this work, we propose a unified, hierarchical RL framework to restore performance in large-scale portfolio selection. Our method partitions the large pool into several smaller sub-pools based on industry, volatility, or some data-driven clustering. We assign an RL agent, pre-trained on small asset pools, to each sub-pool. A top-level allocator model, trained via its own RL updates, dynamically distributes capital among these agents based on their respective performance and risk metrics from trading in the sub-pools. We assess performance via cumulative return and Sharpe ratio, against the benchmark set by a baseline RL agent trained on the full pool without subdivision. By integrating existing RL methodologies into this hierarchical structure, this research aims to deliver a scalable, automated tool for real-world asset allocation across arbitrarily large stock universes.

Zex Liu

Joint math-icon, Warren

Mentored By Steve Wu

Quantitative Tightening and Financial Markets: Evidence from Shadow Rate

This study investigates the impact of Quantitative Tightening (QT) on U.S. financial markets through the lens of the shadow federal funds rate. While much empirical work has focused on the expansionary effects of Quantitative Easing (QE), the contractionary implications of QT—particularly in terms of asset pricing and financial conditions—remain less well understood. To fill this gap, this research estimates the shadow federal funds rate using the Gaussian Affine Term Structure Model (ATSM), leveraging U.S. Treasury yield and Overnight Indexed Swap data.

The shadow rate serves as a comprehensive measure incorporating nominal rate hikes, portfolio balance effects, and forward guidance. I decompose the estimated effect of QT into announcement and implementation components. The residual component will be tested for correlations with risk and liquidity premia using regression analysis and principal component analysis on indicators like the VIX, Baa corporate spreads, and SOFR.

The hypothesis is that QT's effect on asset prices is fully captured by announcement and implementation effects. A significant residual term would challenge this assumption, suggesting that QT affects financial markets through additional channels, such as risk or liquidity premia. Such findings could reshape the understanding of balance sheet normalization and its implications for monetary policy transmission in non-zero lower bound environments. This research contributes to ongoing debates over the effectiveness of QT, with broader implications for central bank communication and financial stability.

Artemis Lopez

Cognitive Science Specializing in Design & Interaction, Seventh Mentored By Seth Hill

AI on the Prize: Protecting Medical Data in the Digital Age

As artificial intelligence (AI) becomes increasingly integrated into healthcare systems, its ability to process vast amounts of medical data quicker than any insurance agent or doctor presents new opportunities and unexpected challenges. This project investigates the ethical, legal, and social implications of AI's role in healthcare, focusing on patient privacy and data protection. Prompted by high-profile cases such as UnitedHealthcare's use of an AI algorithm to deny Medicare coverage, this research examines how existing legislation—including the California Consumer Privacy Act (CCPA), the California Privacy Rights Act (CPRA), and the Health Insurance Portability and Accountability Act (HIPAA)—addresses the collection and use of sensitive health data.

Through legal analysis and case study evaluation, this project highlights gaps in current protections, particularly around nontraditional healthcare providers like health apps, while raising concerns about the "black box" nature of AI systems. These systems often lack transparency, making it difficult for patients and regulators to understand the decision-making process. This ambiguity, paired with the increasing digitization of personal medical records, places patients at risk for data misuse and algorithmic bias.

Ultimately, this research argues for reforms that ensure stronger oversight, enhanced transparency, and human accountability in AI-assisted medical decision-making. Legislative proposals must prioritize privacy and fairness, ensuring that AI is more of a help than a hindrance when providing human-centered care. With the continued digitization of healthcare, these questions will become increasingly urgent in shaping the future of equitable and secure patient treatment.

Elizabeth Lopez

Political Science/ History, Warren

Mentored By Sarah Kozameh

N/A

The project I would like to conduct is focused on gathering and preserving the stories of Guatemalans who fled their home country and migrated to the United States, particularly during the 1980s. As a first-generation American with Mexican-Guatemalan roots, I've been profoundly impacted by the historical silencing of my Guatemalan heritage—especially the erasure of the struggles faced by Guatemala's indigenous population. This silencing, which occurred during a period of intense political violence from the 1960s to the 1980s, resonates deeply with my family's personal journey to the United States. My father arrived in the U.S. in 1982, and until recently, he refused to speak about his childhood in Guatemala. This historical gap, both in my family's narrative and the broader historical context, has inspired my passion for social justice and advocacy. It has fueled my desire to uncover and share the stories of those who, like my ancestors, were silenced and displaced by political unrest.

Linda Lou

Cognitive Science, ERC

Mentored By Christina Gremel

Stress-Induced Neuronal Activation in the Dorsal Lateral Septum and Dorsal Peduncular Cortex: A TRAP2-Ai9 Study in Mice

Stress exposure significantly influences neurobiological processes, shaping behaviors that contribute to the development of mental health disorders such as depression, anxiety, and addiction, including alcohol use disorder (AUD). Chronic stress alters brain function by affecting key neural circuits involved in emotional regulation, decision-making, and reward processing. Understanding how these circuits respond to stress at the cellular level is essential for identifying potential mechanisms underlying stress-related disorders.

The project at Zorrilla lab focused on image and data analysis to examine stress-induced neuronal activation in the dorsal lateral septum (LSD) and dorsal peduncular cortex (DP), two brain regions implicated in stress processing and emotional regulation. Using the TRAP2-Ai9 reporter system, the project analyzed neuronal ensemble activity following acute and repeated psychosocial stress exposure in mice subjected to predator odor stress. By quantifying Fos-positive and TRAP-labeled neurons, we investigated differences in activation patterns across stress conditions, assessing how repeated stress exposure alters neural recruitment compared to acute stress.

The goal of this research was to better understand the neural circuits and ensemble dynamics underlying the brain's response to stress. By identifying patterns of neuronal activation in LSD and DP, this study provides insight into how stress influences key brain regions involved in emotional and behavioral responses. These findings contribute to a broader understanding of how stress exposure may drive vulnerability to conditions such as depression, anxiety, and AUD, helping to inform future research on stress-related neurobiological adaptations.

Iliana Maiz

Ethnic Studies/UCSD Department of Ethnic Studies, Warren

Mentored By Roy Perez

Falling in Love with Ephemera: A Guide to Centering Joy in Our Social Movements

Falling in Love with Ephemera: A Guide to Centering Joy in Our Social Movements looks at the embodiment of ephemera and will heavily lean into the work of José Muñoz and his essay "Ephemera as Evidence". In my inquiries, I interrogate what ephemera is and how we can not only feel it and move through it, but at a certain point we begin to embody it. This is an important insight when thinking about mobilization within communities with a focus on social and transformative justice as burnout begins to wear communities down and cause rifts within our organizations. Ephemera focuses on the fleeting nature of joy and resilience within our communities. Rather than applying a colonial lens to liberation that demands that we must only have joy to make our politics attractive or only talk about community deficits to give our movements meaning; using ephemera as a tool to hold the multiplicities of our liberation creates a new framework for building sustainable social movements. There is no way to only feel happiness in a movement and it is equally impossible to only feel sorrow, the embodiment of ephemera serves as a linguistic tool to define our humanism. Through this expansion of ephemera, I hope to work closely with communities of color in San Diego and employ this praxis in an effort to see how we can humanize each other better in our movements. This means that we will create structures of transformative justice, critical hope, and communal joy in an effort to ground our efforts for social change in critical theory. My hope is that through this project, we can create a module for a college course that focuses on the humanization of people in our social movements. That way we apply theory in the development of healthier communities that have a greater capacity of holding each other's humanness which ultimately creates communities of social change that are future-oriented.

Sebastien Mallari

NanoEngineering, Eighth

Mentored By Darren Lipomi

A Simple Method for Photopatterning Commercial PDMS Using an Off-the-Shelf Photodeactivated Hydrosilylation Inhibitor

We present a novel photodeactivated hydrosilylation inhibitor for platinum-cured silicones that enables high-resolution microstructure patterning with only brief exposure to 365 nm ultraviolet light. Our method uses a UV-sensitive emulsion of ferric chloride (FeCl₃) and a polyethylene oxide-co-polydimethylsiloxane (PEO-co-PDMS) copolymer. This emulsion acts as a light-activated inhibitor of the silicone's curing reaction (hydrosilylation). Exposure to UV light through a photomask deactivates the inhibitor in targeted regions, allowing the silicone to solidify there while unexposed areas remain uncrosslinked. This approach allows us to create intricate microscale patterns without compromising the base silicone's mechanical tunability, biocompatibility, or optical transparency. We demonstrated the versatility of this photopatterning approach by fabricating high-resolution microfluidic devices and cardiac microphysiological systems with integrated strain gauges. The process achieves feature sizes down to 20 µm and is fully compatible with standard photolithography equipment. This combination of fine resolution and simplicity makes our approach easy to adopt in existing microfabrication workflows and promising for rapid prototyping of silicone-based microdevices.

Jasmine Mehalko

Human Biology, Seventh

Mentored By Kevin Tharp

Exploring the Role of Integrin B3 in Nutrient Stress Adaption in Lung and Breast Cancer

In hepatocellular carcinoma (HCC), tumor-initiating cells are able to adapt to nutrient deprivation through metabolic adaptation, which allows for their survival in stressed conditions. The molecular pathways that allow for this mechanism remain understudied, although recent studies in lung cancer have discovered that integrin avB3, mainly the B3 subunit, may play a role in promoting metabolic plasticity in nutrient deprived conditions. Integrin B3 is not well understood, as its function, regulation, and possible localization-dependent activity must be studied further.

This study aims to determine whether there is a specific nutrient stress that allows for upregulation of the expression of integrin B3 in HCC cells. Additionally, we will determine whether the localization of the B3 integrin to the plasma membrane is required for signaling a stress response. Lastly, we will study whether the role of integrin B3 in metabolic adaptation is conserved across cancer types, including breast cancer. To address this, HCC cell lines expressing integrin B3-GFP proteins will be utilized and monitored to determine their expression levels, as well as to determine whether localization to the plasma membrane is required in stressed microenvironments.

We expect nutrient deprivation to promote the upregulation of integrin B3, as well as its localization to the plasma membrane in order to initiate a signaling cascade that would trigger metabolic adaptation, such as the Src/AMPK/PGC1a pathway observed in lung cancer. These results would point towards a conserved, integrin mediated pathway that allows for metabolic changes within carcinomas and potentially other cancers.
Andrea Melendez

Cognitive Science, Marshall

Mentored By Nicola J. Allen

Astrocyte GLT-1 and GLAST in Rett Syndrome

Astrocytes are glial cells that are critical for neurodevelopment, in part, through the secretion of proteins that support synapse formation and function. In neurodevelopmental disorders, such as Rett Syndrome (RTT), astrocyte protein secretion is altered and a specific astrocyte-secreted protein is increased. Since this specific astrocyte-secreted protein is increased in RTT we hypothesize that it contributes to RTT phenotypes. We are testing this by reducing a specific astrocyte-secreted protein. In RTT, expression of the astrocyte glutamate transporters GLAST and GLT-1 may be altered. GLAST and GLT-1 are responsible for removing excess glutamate, which prevents the accumulation of glutamate that can lead to excitotoxicity. The Allen lab has found that reducing a specific astrocyte-secreted protein improves astrocyte GLAST expression in a mouse model of RTT. Using the same approach, for this project, I am testing to see if GLT-1 is also altered in RTT. If so, I will also test if reducing this specific astrocyte-secreted protein normalizes GLT-1 expression. Our primary methods include cryosectioning, fluorescent in situ hybridization, fluorescence microscopy, and image analysis using IMARIS. Investigating GLT-1 and GLAST, can give us more insight into the mechanisms that underlie RTT and potentially yield novel therapeutic interventions.

Yukari Mendoza

Human Biology, Revelle

Mentored By Cory Root

Understanding Healthcare Disparities Through Clinical Experience in an Underserved Community

As a Human Biology major and aspiring Pediatrician, I applied for an internship at South Bay Neurosurgery in Chula Vista to gain hands-on clinical experience while contributing to a meaningful cause. The clinic primarily serves individuals from an underserved, lowincome community. Many of these individuals come from Hispanic backgrounds and are Spanish-speaking, which strongly resonates with my background as a Mexican-American from a similar community.

This project aims to explore how my involvement in a clinic and interactions with patients deepens my understanding of healthcare disparities and the importance of cultural competency in medicine. Through patient interaction and administrative support, I am enhancing my skills in communication, teamwork, and cultural awareness. My bilingual communication skills also allow me to engage more meaningfully with Spanishspeaking patients, helping bridge gaps in care.

As I move forward in my internship, this experience has slowly revealed the challenges faced by marginalized populations in accessing specialized healthcare and has highlighted the value of compassionate, culturally aware providers. It reinforces my commitment to pursue a career in medicine focused on equitable care.

Rahul Mistry

Mathematics, Warren

Mentored By Christian Klevdal

Embedding Lattice-Based Encryption into QR Codes utilizing Steganographic Techniques

Security and privacy are now of utmost importance due to the exponential growth in digital information sharing. Due to its resilience to quantum computing, lattice-based cryptography—particularly the Learning with Errors (LWE) problem—has become more popular than traditional cryptographic techniques like RSA, which are susceptible to quantum attacks. Widely used for a variety of purposes, from data exchange to payment gateways, QR codes usually hold data in an unencrypted or partially encrypted format. This study looks into employing steganographic techniques to implant lattice-based encrypted data—more especially, LWE ciphertexts—into QR codes. How might using steganographic techniques to incorporate LWE-encrypted data into QR codes improve security without sacrificing functionality? This is the main research question that is addressed.

Naseem Moussa

Neurobiology, Marshall

Mentored By Kay Tye

Analyzing the Effects of Social Relocation on Rodent Behavior and Medial Prefrontal Cortex (mPFC) Dynamics

Social instability has been shown to induce behavioral alterations that may contribute to psychiatric disorders. Recent studies have indicated a higher rate of depression in those who moved once or more as a child. In mice, the medial prefrontal cortex (mPFC) has been implicated in processing social information, such as rank and isolation. I utilized a novel relocation paradigm in which group-housed mice were relocated into cages with established social Hierarchies, and used in-vivo epifluorescent calcium imaging to assess the effects of relocation on the mPFC. In relocated mice, I found an anxiogenic effect with no changes in social rank compared to control. Additionally, future cohorts will elucidate the effects of relocation on mPFC responsiveness during hierarchy-based social interaction. These results demonstrate a novel method of social instability that induced anxiogenic effects in mice, as well as opening the door for further research into the mPFC's response to social instability.

Arlene Grace Nagtalon

Molecular & Cell Biology and Community Research, Education, and Well-Being (Individual Studies Major), Revelle

Mentored By Edward Castillo

Exploring Racial Disparities in Respiratory Illness Incidence Among Asian and Asian-American Patients in the Emergency Department

Asian and Asian-American communities are among the most diverse and fastest-growing populations in the United States, yet remain underrepresented in healthcare research in the context of Emergency Department (ED) utilization. National databases often collapse Asian individuals into broad racial categories, masking key differences in healthcare access, vaccination uptake, and health outcomes among distinct ethnic subgroups. While aggregate data suggest similar vaccination rates between Asian and white populations, barriers to healthcare access, insurance coverage, and targeted vaccine information persist, particularly in the context of upper respiratory infections (URIs) such as influenza and COVID-19. These disparities are especially concerning given the ED's critical role in managing URI-related morbidity among uninsured or underserved populations.

To investigate these issues, this study utilizes data reported by UCSD to the REgistry of suspected COVID-19 in EmeRgency care (RECOVER) network, which includes clinical records from 18,850 patients across 116 U.S. hospitals in 25 states. By examining differences in ED utilization and URI-related outcomes among disaggregated Asian ethnic groups, this study aims to uncover patterns obscured by traditional racial classification and identify barriers to care in this rapidly growing yet understudied population.

Nam Nguyen

Human Biology, Warren

Mentored By Christopher Coyne

Managing Cancer Pain in the Emergency Department

Introduction

Patients with cancer frequently present to the emergency department (ED) with acute pain, often due to disease progression, treatment-related side effects, or comorbid conditions. Despite its prevalence, pain management for this population remains inconsistent, with documented delays in assessment, under-treatment of symptoms, and variability in prescribing practices. Emergency departments, typically designed for rapid triage and stabilization, may lack standardized protocols tailored to the complex needs of oncology patients. Factors such as ED overcrowding, limited access to oncology history, and stigma around opioid prescribing further complicate timely and adequate pain relief. This study seeks to examine the quality of cancer pain care in the ED.

Methodology

This study employed a narrative literature review to assess current practices and gaps in emergency department care for cancer-related pain. Peer-reviewed articles published between 2015 and 2025 were retrieved using databases such as PubMed and CINAHL, with search terms including "cancer pain," "emergency department," "pain management," and "oncologic emergencies." Studies were screened for relevance based on inclusion criteria that prioritized adult populations presenting to the ED for pain related to cancer. Data were extracted and synthesized to identify common themes regarding pain assessment tools, pharmacologic interventions, treatment delays, and disparities based on patient demographics or cancer type. The findings inform recommendations for improving pain protocols and interdisciplinary communication in emergency care settings.

Helen O'Neal

Neurobiology, ERC

Mentored By Douglas Nitz

Exploring Subicular Connectivity Through Adeno-Associated Virus Tracing

The subiculum receives major inputs from the anterior thalamus and the CA1 subfield of the hippocampus. However, the connectivity and properties between these regions are yet to be fully understood. In this project, adeno-associated virus (AAV) tracing was performed to determine the specific origins of the subiculum inputs. The AAV was injected into the subiculum of Sprague-Dawley rats with existing recording electrodes for single-unit recordings, allowing for the study of both the structure and function properties of projections unique to the implicated subicular circuitry. The subjects' brains were sliced and observed using fluorescent microscopy. We expect that the virus will travel from the subiculum back to the specific input locations within the anterior thalamus and CA1 region, thereby tracing the origins to visualize pathways. By anatomically identifying input regions into the subiculum, we can assess whether connectivity strength aligns with the multi-modal neural representations and whether physical connectivity itself may explain the spatial and directional contributions of these input regions. These advances may guide multimodal neural network models and applications in clinical studies of episodic memory. This project is a precursor for future projects involving optogenetic manipulations of subiculum inputs. In the future, the lab would be able to use my research to design the placement of viral vectors to optogenetically manipulate parts of the Anterior Thalamus or CA1.

Tess Oswalt

Clinical Psychology, Marshall

Mentored By Charles Taylor

Suicidal Ideation as a Predictor of Treatment Response in Participants Experiencing Anxiety and Depression

The complexity of suicide research highlights the importance of examining suicidality as a predictor of treatment response. Social disconnection, in particular, plays a critical role in shaping outcomes for individuals experiencing suicidal ideation (SI). Building on this and Abbott et al.'s findings that adolescents with varying baseline SI levels respond differently to treatment, this study explored whether the presence of SI predicts treatment response and whether individuals endorsing SI respond differently from those who do not. Data was analyzed from a completed trial comparing treatments focused on amplifying positivity versus reducing stress in help-seeking individuals with anxiety/depression. SI status was determined using the PHQ-9, and treatment response was assessed via Ecological Momentary Assessment, operationalized as social connectedness. I hypothesized individuals endorsing SI would show a more negative response than those not endorsing SI, regardless of treatment type. I further hypothesized among individuals endorsing SI, those receiving Amplifying Positivity would show a more positive response than those receiving Stress Management Training. Results did not support hypothesized interactions between Time and SI status, nor between Time, SI status, and Treatment Type. However, there was a significant main effect of Time, indicating participants across groups reported increased connectedness at post-treatment. Although findings did not support primary hypotheses, they suggest engagement in treatment may foster social connectedness. These results underscore the potential benefits of accessible interventions for individuals with diverse mental health needs. Future research should examine changes in SI status over the course of treatment, particularly reductions from pre- to post-treatment.

Dahlia Page

Cognitive Science, ERC

Mentored By Rick Grush

The Philosophy of Humor

This study would aim to interrogate the role that humor serves in facilitating social interaction through a philosophy of mind lens borrowing influence from cognitive science and psychology in doing so. As this project has its roots in philosophy, I intend to take a nonstandard approach in analyzing this information- meaning that the structure of my final product is likely to take the shape of a meditative literature review as opposed to a proper experimental study. For gathering information on something as universal to our lives as humor, the swathe of candidates I have access to for interview and study purposes is lacking greatly in both number and variety. Indeed, the research conducted here is likely to be warped through my own personal lens, although I would argue that in and of itself is valuable information so long as it is acknowledged properly.

As for the actual literature being reviewed, my intent is to draw from courses I have taken relating to the field, synthesizing individual takeaways into a singular conclusion. Specifically, I will be analyzing materials from a neuroscience of humor course, one on philosophy of mind, and one on metaphysics, among other assorted sources that I will gather myself. Specifically, I would like to study notions of humor such as relief theory or superiority theory while holding them up to philosophical frameworks of mind to see what's consistent and what's contradictory.

Dahlia Page

Cognitive Science, ERC

Mentored By Rick Grush

Philosophical Implications of Humor in Social Settings

Humor is particularly interesting in this case because of its position as a primarily social phenomenon that interacts with the body in a very physical way. What implications does this have for the existence of mental states if such a thing occurs? Such a question begs multiple levels of analysis in the realms of scientific and philosophical understanding. We start from laughter, then. It is a fundamental form of expression that is observable even in infants born deaf and mute, and even in many non-human animals. We then move on to its implementation in social settings. There are many theories that attempt to explain humor as a tension relief mechanism, as an indicator of membership in certain in-groups or hierarchies, or as a response to detected incongruities. Some of these mesh nicely with mentally focused theories of mind, and others with physically focused ones. We take these numerous, non-falsifiable theories and frameworks, pit them up against each other, and see what sticks in order to find the most consistent and coherent set of theoretical frameworks. From the conclusions I draw here, I intend to prove that the existence of humor as a primarily social phenomenon requires an understanding of mind that allows for the existence of mental states and nonphysical concepts.

Pooja Parthasarathy

Biology: Bioinformatics, ERC

Mentored By Gene Yeo

Measuring translational efficiency across diverse mRNA coding sequences using Ribo-STAMP

The central dogma of molecular biology describes the flow of genetic information from DNA to RNA through transcription and from RNA to proteins through translation. During translation, messenger RNA is decoded by the ribosome, a cellular organelle essential for protein synthesis. Transfer RNA facilitates this process by delivering specific amino acids, the fundamental building blocks of protein, to the ribosome, which then assembles them into functional proteins.

To assess translational efficiency, the extent to which mRNA is effectively translated into proteins, I utilize a tool called RiboSTAMP. RiboSTAMP employs an RNA-binding protein RPS23 fused to an RNA editing enzyme APOBEC. This enzyme selectively edits cytosine bases to uracil in actively translated RNAs, providing a direct means of measuring translation activity.

This study focuses on seven coding sequences: Citrine, Yescarta, ABE, EPO, MKO2, CRE, FLUC, and EGFP, which were selected based on their therapeutic relevance and potential impact on translation efficiency. By detecting and quantifying C to U RNA edits within these sequences using RiboSTAMP, this research aims to provide an empirical measure of translational efficiency.

A comparative analysis of RiboSTAMP data with protein expression levels quantified using techniques such as Western blotting enables a comprehensive evaluation of how variations in coding sequences influence translation. This research advances our understanding of the fundamental mechanisms governing mRNA translation and lays the foundation for engineering mRNA based therapeutics potentially leading to treatments for diseases reliant on precise protein expression.

Beatriz Pereira dos Guimaraes Peixoto

Biochemistry, ERC

Mentored By Hiromi Wettersten

Integrating Multimodal In-Vivo Imaging Techniques in Preclinical Disease Models

In-vivo imaging is a critical component of translational biomedical research, enabling real-time, non-invasive monitoring of disease progression and therapeutic response in preclinical models. During my internship with the Diseases of Aging and Regenerative Medicine group at Novartis, I gained expertise in high-resolution functional MRI and CT imaging, applying contrast-enhanced protocols to evaluate vascular changes in murine models of salivary gland regeneration and neurodegeneration. This foundation translated directly into my work at the Wettersten Lab, where I am developing an Osimertinibresistant EGFR-mutant non-small cell lung cancer (NSCLC) in-vivo model. Tumor progression is quantified via IVIS bioluminescence imaging using luciferase-tagged cells, with ROI values reflecting tumor burden; however, issues such as signal saturation at high cell densities necessitate complementary modalities. Spectrum CT allows volumetric lung analysis based on air content differentials, offering rapid imaging without the need for transgenic reporters, while MRI provides high-resolution whole-body imaging essential for detecting brain metastases and characterizing therapeutic resistance. These integrated imaging strategies—analyzed using platforms like 3D Slicer—enhance spatial resolution, reduce biological variability, and improve experimental reproducibility. My work underscores the indispensable role of multimodal in-vivo imaging in modeling tumor biology, optimizing therapeutic interventions, and advancing precision medicine in oncology.

Hrithik Prakash Lavanya

Mechanical Engineering/ MAE, Eighth

Mentored By Tzer Han Tan

Beyond Engineered Control: Exploring Natural Synchronization in MASBot Swarms Through Fluid and Magnetic Coupling

How collective behaviors arise in active systems remains a central question in physics and robotics. Unlike engineered swarms that rely on predefined control algorithms, active matter offers a self-organized alternative, where coordination emerges from intrinsic interactions. Here, we investigate emergent behavior in chiral active matter using MASBot—a robotic platform that mimics spinning active particles. Each MASBot continuously rotates, generating hydrodynamic attraction and magnetic repulsion, enabling tunable solid-to-fluid transitions.

Beyond phase transitions, we hypothesize that MASBots exhibit emergent synchronization, akin to coupled oscillators. Unlike conventional robotic swarms, this system operates without centralized control, relying purely on physical interactions to achieve collective phase locking. If verified, this would challenge the necessity of engineered coordination in multi-agent systems.

To test this, we analyze rotational phase dynamics using MATLAB-based segmentation and develop a modified Kuramoto model incorporating hydrodynamic and magnetic coupling. Experimental validation will determine whether synchronization emerges spontaneously and assess its robustness under perturbations.

This work advances the understanding of self-organized swarm dynamics, demonstrating that coordination can arise purely from physical forces. By offering a decentralized, scalable alternative to algorithmic control, our findings could inspire novel approaches in swarm robotics, soft matter physics, and collective intelligence.

Drishti Regmi

Computer Science, CSE, Marshall

Mentored By Edwin Solares

Evolutionary Analysis of Breast Cancer Genes: Insights from Primate and Early Human Genomes

Investigating the evolutionary conservation of genomic elements associated with breast cancer susceptibility provides critical insights into the genetic architecture underlying this disease. This research project examines the conservation of various genomic features correlated with breast cancer—including single nucleotide polymorphisms (SNPs), copy number variations (CNVs), somatic mutations, epigenetic modifications, and non-coding RNAs—across humans and their ancestral primates. By integrating sequencing data from the NCBI database encompassing early human populations (Neanderthals, Denisovans) and non-human primates Neanderthals, Denisovans, bonobos, chimpanzees, gorillas, and orangutans, and utilizing PanGenome Graph Builder (pggb) methodology to generate pangenomic graphs, we will examine variant patterns within breast cancer-associated genes across these species. This comparative genomic approach will identify highly conserved genetic factors that are correlated with breast cancer, and potentially provide insights into how these diseases may evolve in the future.

Anna Rosenbaum

Marine Biology, Integrative Oceanography, Seventh

Mentored By Moira Décima

Pterotracheoidea Atlantidae Species Distribution in the Southern California Bight during Spring 2021

Heteropods are common pelagic gastropods that play an important role in marine pelagic food webs. This study investigates the species abundance and distribution of heteropods in the Southern California Current, in relationship to the physical environment. Using zooplankton samples collected as part of the California Cooperative Oceanic Fisheries Investigations (CALCOFI) program, we present the first analysis of species abundance patterns across the CALCOFI grid and explore how these patterns correlate with environmental variables such as temperature, salinity, and chlorophyll, to name a few. Based on previous studies, there are 18 atlantidae heteropod species expected in the California Current. Our preliminary results suggest that Atlanta californiensis and Atlanta gaudichaudi are the main – if not only – members of the atlantidae heteropod assemblage in the Southern California Region during spring of 2021. We also find that larger animals are found in cooler, fresher waters of the California Current, as opposed to the warmer saltier waters of the California Undercurrent, suggesting they are more associated with temperate conditions and northerly source waters. Interestingly, higher heteropod abundances were found to be more concentrated in lower chlorophyll regions. These findings provide the first descriptions of species abundance, distribution and ecology of Atlantidae heteropods in the Southern California Current.

Kate Ruiz

Neurobiology, Warren

Mentored By Diane Jacobs

Diagnosing dementia in Spanish-Speaking U.S. Latinos: Potential implications of using self-reported education vs. grade-equivalent reading level for normative referencing of cognitive tests

Background: Normative references for neuropsychological tests commonly adjust for years of education; however, this may not adequately capture full educational achievement. Grade-equivalency scores from reading tests provide additional information about learning experience. Therefore, we explored the impact of adjusting cognitive test results for years of education vs. estimated grade equivalency in Spanish-speaking U.S. Latinos.

Method: 140 Spanish-speaking Latinos with subjective cognitive decline were referred by a community-based neurologist for objective cognitive testing. Participants were aged 47-88 (M=70.6, SD=8.0) with an average of 9.1 self-reported years of education (SD=4.5, range=0-20). Participants completed a battery of standardized neuropsychological tests. The Woodcock-Muñoz Letter-Word Identification Test was used to estimate grade-equivalency. Standardized scores (Z-scores) that adjusted for age, sex, language of testing, and either self-reported years of education or Woodcock-Muñoz grade-equivalency were obtained for each cognitive test. The two sets of Z-scores were compared using paired samples t-tests.

Results: Grade equivalency estimated by the Woodcock-Muñoz (M=13.5, SD=4.6; range=1.7-18) was significantly higher than self-reported years of education (M=9.1, SD=4.5; t [139]=10.9, p < .001). For all neuropsychological tests, adjusted Z-scores derived using grade equivalency were significantly lower than those derived using self-reported years of education.

Conclusions: Education-adjusted norms appeared to underestimate level of impairment in Spanish-speaking U.S. Latinos who presented to a neurologist with cognitive complaints. Self-reported years of education may not adequately reflect the educational experiences of this diverse group. Although additional validation is needed, these results indicate caution is warranted when interpreting education-adjusted test scores for Spanish-speaking U.S. Latinos.

Matthew Segovia

Physics, Marshall

Mentored By Aobo Li

On the Search for Neutrinoless Double Beta Decay Using Machine Learning

Neutrinos being indistinguishable from their own antiparticles is the hypothesis proposed by Ettore Majorana in 1937, still yet to be proven or disproven. A subtle tell that this would be the case comes from neutrinoless double beta decay ($0\nu\beta\beta$). There are detector experiments that aim to record this decay, but to sift through all the data by hand is inefficient. In this study, we explore different machine learning models tasked with classifying $0\nu\beta\beta$ signal candidates and reconstructing event energies, which we expect to be more efficient.

Sriram Selvakumaran

Neurobiology, Revelle

Mentored By Paula Desplats

Effects of a Circadian-Modulating Intervention in a Parkinson's Disease Mouse Model

Lewy Body Diseases (LBD) are marked by prominent non-motor symptoms that significantly impact patient well-being but are often under-recognized and undertreated. Cognitive decline is a core feature of Alzheimer's disease-related dementias (ADRDs), including Parkinson's disease (PD) dementia and Dementia with Lewy Bodies (DLB), both of which are characterized by alpha-synuclein (aSyn) accumulation. Among the most pervasive non-motor symptoms in LBD are circadian and sleep disruptions. PD patients, for instance, exhibit reduced activity amplitude, greater intraday variability, and fragmented rest-activity rhythms. Sleep disturbances such as insomnia and excessive daytime sleepiness are also common in LBD.

Importantly, non-motor features often appear years before motor symptoms, suggesting that circadian dysfunction may play an early role in LBD progression. Our previous studies in aSyn-overexpressing (ASO) mice show an age-dependent decline in circadian regulation, including altered total activity, fragmentation, timing precision, and sleep patterns. Using spatial transcriptomics, we also found that aging wild-type mice exhibit changes in clock-regulated gene expression in brain regions implicated in LBD pathology. These findings suggest that circadian disruptions may increase vulnerability to synuclein-related neurodegeneration.

Moreover, we have shown that circadian-based interventions can reduce pathological protein accumulation and improve behavioral outcomes in neurodegenerative models. Despite this, the potential of circadian modulation as a therapeutic strategy for LBD has not been fully explored. This proposal seeks to evaluate whether targeting the circadian system can modify disease trajectory and rescue behavioral and pathological phenotypes in LBD, offering a promising avenue for early intervention.

Roshni Sen

Molecular and Cell Biology/ Biological Sciences, Muir

Mentored By Alfredo Molinolo

Optimizing PBMC Processing Protocols for Long-Term Cryopreservation: Assessing Post-Thaw Cell Viability and Immune Profiling Integrity

Peripheral blood mononuclear cells (PBMCs) are an essential resource in immunological and translational research- nevertheless, their long-term survival is significantly influenced by the isolation and preservation procedures used. To determine the optimal approach for fractionating and cryopreserving PBMCs, three isolation techniques were evaluated: density gradient standard method (LymphoPrep), physical barrier and density gradient tubes (SepMateTM), and positive selection using magnetic cell separation (EasySepTM), under two cryopreservation conditions: Serum-free media (CryoStor) and FBS-based medium. In addition, to evaluate the effect of red blood cell contamination in long term cryopreservation, a red blood cell lysis group was tested against a no lysis group.

The MOXI GO-II system was used to evaluate cell count and viability immediately postisolation, revealing that EasySep provided the greatest overall viability and recovery, followed by SepMate and finally LymphoPrep. Initial studies indicate that the RBC lysis buffer in the LymphoPrep condition may be indiscriminately compromising cell viability, leading to the loss of both red blood cells and valuable immune cell populations.

Samples will undergo reassessment at the six-month interval to determine post-thaw viability under all test variables. To further characterize the immune cell populations, immunostaining using multiplexing techniques by Akoya Phenocycler is being performed using common lymphocyte markers (CD-3, CD-11b, CD-11c, CD-45, CD-68) followed by multiplex imaging. Image analysis will be performed using PhenoChart and QuPath software for detailed visualization and quantification of these specific markers within the preserved PBMC samples.

Cina Sepasi Ahoei

Human Biology, Sixth

Mentored By Andrew Lowy

Identifying synergistic combination in pancreatic ductal adenocarcinoma organoids

My project is based on finding potential synergies between different drugs in the most common form of pancreatic cancer, PDAC. Through finding synergies the goal is to perform better in killing PDAC tumors. This is done so through gathering cancer tumors and splitting the tumors into what we call organoids. Organoids are used to show a 3D environment of cells which helps us understand how tumors work in humans better. If the cancer cells were on slides it would be a 2D environment which would After gathering the organoids different doses of drugs are given to look at whether or not the cell is thriving. This is done through measuring ATP, a basic form of energy, so certain drugs like metabolic drugs cannot be used. Metabolic drugs might have a potential effect on the production of ATP which could result in cells showing up as dead when in reality the metabolic drug is simply slowing the production of ATP. Another big factor is trying to find synergy between the two drugs without them both being in a higher dosage. A higher dosage of drugs could be potentially harmful to an individual's body outside of the cancerous tumor. Currently organoids have been already split and a couple of drugs have been tested. Different drugs will also be tested on these organoids up until the research presentation to try and find synergy. Finally the cell plates will be checked about once or twice a week to check up on growth.

Bhaavyaa Shah

Cognitive Science, Seventh

Mentored By Susan F. Tapert

Title: The Impact of Childhood Physical & Emotional Trauma on Adolescent Drinking Behavior Authors: Bhaavyaa Shah, Sonja Eberson, Herry Patel, Susan F. Tapert

Background: Youth exposed to physical or emotional childhood trauma are particularly vulnerable to using alcohol, increasing their risk of developing risky drinking. This study prospectively examines whether emotional and physical childhood trauma can indicate the likelihood of alcohol use in adolescents.

Methods: Data were drawn from a subset of adolescents (N=601) in the National Consortium on Alcohol & Neurodevelopment in Adolescence (NCANDA), a longitudinal study of youth alcohol use . The Childhood Trauma Questionnaire measured childhood emotional and physical trauma and neglect. Alcohol use was measured with the Customary Drinking and Drug Use Record. Participants were categorized using youthadjusted Cahalan scores (0 - 1 = control | 2 - 3 = moderate | 4 = heavy | 5 = heavy with binging). We use data from Baseline (BL) and the first four annual follow-ups, and hypothesized that greater exposure to emotional and physical childhood trauma would be associated with greater subsequent alcohol consumption.

Results: In a linear mixed model, emotional trauma and physical trauma scores were modeled as fixed factors to predict youth-adjusted Cahalan scores, with time of assessment (BL, Y1, Y2, Y3, Y4) as a random factor and age and sex as covariates. Childhood physical trauma was linked to heavier alcohol use in adolescents (p = 0.023). Emotional trauma did not significantly influence drinking (p > 0.05).

Conclusion: Findings support previous research suggesting a link between childhood physical trauma and future risky drinking. This study underscores the importance of addressing physical trauma in interventions aimed at preventing risky drinking behaviors in adolescents.

Jiangnan Shou

Neurobiology, Warren

Mentored By Nicola Allen

Effect of Astrocyte Secreted Protein in AD Pathogenesis

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by memory loss and cognitive decline, primarily affecting the elderly. Astrocytes, essential for maintaining neuronal homeostasis and responding to injury, have emerging roles in neurodegenerative diseases, but their contributions to AD remain poorly defined. Insulinlike Growth Factor Binding Protein 2 (IGFBP2), expressed by neurons and astrocytes, modulates cell growth, survival, and repair by binding and inhibiting insulin-like growth factors (IGFs). While IGFBP2 is implicated in several neurological functions, its involvement in AD pathogenesis is unclear. Studies of cerebrospinal fluid from AD patients have reported conflicting IGFBP2 levels, with some showing increases and others decreases, underscoring the need for further investigation. This study aims to elucidate the role of IGFBP2 in AD by studying its overexpression and knockdown in AD mouse models and examining effects of IGFBP2 in human induced pluripotent stem cell (iPSC)-derived cultures. Plasmid constructs will be used to manipulate IGFBP2 levels, followed by assessment of synaptic protein expression as a readout of neuronal health. We hypothesize that elevated IGFBP2 expression exacerbates AD pathology by negatively regulating synaptic protein levels. These findings have the potential to enhance our understanding of astrocyte-mediated mechanisms in AD and clarify IGFBP2's functional role in disease progression.

Pallavi Singamsetty

Neurobiology, Marshall

Mentored By Giordano Lippi

MicroRNA Regulation of Retinogeniculate Tract Development via Activity-Dependent and Microglial Mechanisms

The differentiation of motor neurons (MNs) from neural progenitors is a highly orchestrated process requiring precise regulation at both the transcriptional and posttranscriptional levels. While the role of transcription factors has been well established, the contribution of noncoding RNAs to MN specification has remained largely unexplored. Here, we define the MN2 locus as a critical post-transcriptional regulator of MN development. This locus gives rise to a cytoplasmic long noncoding RNA, lncMN2-203, as well as two embedded microRNAs, miR-325-3p and miR-384-5p. Through CRISPR/Cas9-mediated gene editing and single-cell RNA sequencing during in vitro differentiation of mouse embryonic stem cells, we demonstrate that lncMN2-203 facilitates motor neuron differentiation by sequestering miR-466i-5p, leading to the upregulation of neuronal differentiation genes. In parallel, miR-325-3p and miR-384-5p act to repress proliferation-associated pathways, promoting timely cell cycle exit. Deletion of the MN2 locus or disruption of the miR-466i-5p interaction site significantly reduces the generation of mature MNs, indicating that the combined actions of these long and short noncoding RNAs are essential for proper lineage progression. Our findings reveal a novel multifunctional regulatory hub that integrates competing endogenous RNA mechanisms and microRNA-mediated repression to control motor neuron fate, providing new insight into the layered complexity of neural development.

Pranav Singh

Data Science, ERC

Mentored By Andrea Chiba

Can AI help predict stress in children's voices?

Audio predictive analysis using machine learning has advanced significantly over the past decade, driven by improvements in signal processing techniques and the growth of audio datasets. Recent models such as OpenAI's Whisper have substantially outperformed previous approaches across multiple benchmarks, including word error rate and multilingual comprehension. Despite these advances, many state-of-the-art models are optimized specifically for Automatic Speech Recognition (ASR) rather than broader acoustic analysis. Our research investigates the encoder component of OpenAI's Whisper model to determine whether its tensor outputs effectively represent fundamental acoustic features such as formants and harmonic-to-noise ratio. We compare these representations against both traditional signal processing techniques and alternative models like Google's Phonetisaurus. By examining the Whisper encoder's vector outputs through targeted classification tasks, we aim to uncover correlations between specific outputs and the acoustic properties of their corresponding audio samples. This approach enables us to gain insights into the interpretability of this typically black-box model component while evaluating its potential for specialized audio analysis applications. The broader outcomes of this research are to assess the Whisper encoder's capability for acoustic feature representation and to evaluate its applicability to specialized audio analysis tasks, including stress detection and phonetic analysis for identifying speech delays in children. Our findings may reveal how encoder architectures can generate acoustic features with richer contextual information than traditional signal processing methods alone.

Shriya Singh

Neurobiology, Seventh

Mentored By Dr. Eric Zorrilla

Genetic sequence and knockout studies implicate a role for RGS7BP/Rgs7bp in obesity.

Obesity is a chronic disease that affects 108 million American adults. The current treatment options need to be used consistently, possess side effects hence warranting the demand for new biological targets. Here, we correlate the gene encoding regulator of G protein signaling 7 binding protein (RGS7BP) and obesity. Previous GWAS have found that RGS7BP variants have been linked to body mass index, body weight, smoking and sleep-wake patterns. In order to determine a causal relationship between Rgs7bp and obesity, we study the body weight composition and chow intake in Rgs7bp knockout mice (KO; n=15) and wildtype mice (WT; n=15) at weekly intervals from P21. By 5 weeks age (P35) KO mice have demonstrated being fattier than WT. At 8 weeks, the mice are single-housed and provided ad libitum 5TUM chow (TestDiet; 3.30 kcal/g; 10.4% fat) for 2 weeks, using FED3 devcies, then randomly assigned t one of 3 conditions: 1) continuous 5TUM, 2) continuous sweet-fat diet (more preferred, 35% fat, 31% sucrose [kcal]; 4.18 kcal/g; Bio-Serv), or 3) intermittent sweet-fat (24h, 3d/wk) with 5TUM on non-access days. Across these genotypes and diets, body weight compositions, meal patterns and chronotype will be compared. We hypothesize that KO mice will maintain their fattier compositions as they continue to consume more, gain weight and demonstrate a heightened early-dark-cycle-onset feeding, which will be most pronounced in continuous and intermittent sweet-fat diet conditions.

Natalie Tran

Molecular and Cell Biology, Marshall

Mentored By Tala Al-Rousan

Hypertension Management Among Former Vietnamese Refugees and Immigrants

Hypertension is a leading preventable risk factor for cardiovascular disease, yet little is known about self-management behaviors in the Vietnamese American refugee and immigrant community displaced to the United States after the Vietnam War. This study explores how social, cultural, and displacement-related factors shape hypertension knowledge and self-management among older Vietnamese American refugees and immigrants. Participants (n = 6) were recruited from San Diego and Orange County, California via snowball sampling and completed semi-structured interviews. Rapid qualitative analysis examined associations between displacement-related factors and hypertension management, while thematic analysis explored the role of language, education, acculturation, and healthcare access.Participants identified key facilitators of hypertension management, including strong medication adherence, access to Vietnamesespeaking providers, and lifestyle practices such as diet, exercise, and religious coping. However, language barriers, especially in hospital settings, remained a significant challenge, particularly when interacting with non-Vietnamese providers. While participants were comfortable identifying as refugees, they did not directly attribute their hypertension management difficulties to refugee experiences or trauma. Health literacy and healthcare navigation were more influenced by education and acculturation levels than by displacement itself. Preliminary findings suggest that Vietnamese Americans displaced to the U.S. after the 1970s have generally acculturated and maintained access to culturally and linguistically appropriate care. This study highlights the value of culturally tailored healthcare, education, and community support in promoting effective hypertension management, while acknowledging persistent language and acculturation barriers. Compared to earlier research, findings point to notable improvements in care and outcomes for this population.

Emiri Tsubouchi

Biochemistry (Department of Chemistry & Biochemistry), Chemical engineering (Aiiso Yufeng Li Family Department of Chemical and Nano Engineering), Seventh

Mentored By Michael D. Burkart

Synthesis of Tight-binding Probes: Binding Enoyl Reductase and Acyl Carrier Protein in Fatty Acid Biosynthesis

Enoyl Reductase (ER) have been identified as a critical factor for bacterial cell survival, and understanding their protein-protein interactions with Acyl-Carrier Protein (ACP) in fatty acid biosynthesis can provide valuable insights. The project aims to understand the protein-protein interactions between Enoyl Reductase and Acyl-Carrier Protein in fatty acid biosynthesis.

To achieve this, the research follows three key steps: establish a tight binding probe panel to crosslink the proteins, explore the efficiency of the tight binding probes, and understand and characterize the ACP-ER complex.

Currently, the project is focused on the first step: the synthesis of probes with varying chain lengths. By creating and testing probes of different lengths, the structure that best facilitates strong interactions will be determined. The creation of the probe involves a multi-step synthesis requiring careful execution and analysis at each step. Specifically, the process includes setting up reactions by adding chemicals, monitoring the progress, removing byproducts after the reaction is completed, analyzing the structure after each step, and proceeding to the next reaction. These steps are repeated systematically until the final product, the probe, is successfully formed.

Through these synthetic techniques, a set of new probes to study the interactions of the proteins(ER and ACP) will be created.

Chloe Twu

Anthropology, Archaeology Concentration, Seventh

Mentored By Paul Goldstein

Exploring Viru (ca. 200 B.C.E - 600 C.E.) Foodways at Puerto Malabrigo in the Chicama Valley, Peru: Household Economy, Cuisine, and Gender Roles Exploring Viru (ca. 200 B.C.E - 600 C.E.) Foodways at Puerto Malabrigo in the Chicama Valley, Peru: Household

This project investigates the subsistence practices and foodways of the Viru people (ca. 200 BCE - 600 CE) through household archaeology and archaeobotany at the archaeological site of Puerto Malabrigo in the Chicama Valley of Peru's north coast. In northern Peru, research has largely focused on centers of power. These studies, focusing on temples, royal tombs, and other elite spaces, have often overlooked households that can provide greater understanding of daily life and domestic social dynamics. Since societies and occupations in the Chicama Valley fluctuated, households are critical areas of interest, providing a record of larger social transformations as residents actively respond and adapt to these changes (Billman 2021; Hendon 1996). This study examines subsistence at the household level to gain insight into broader social change. In the household, people prepare, cook, eat, store, and throw away food, reinforcing group identities, forming memories, or making new dietary choices with social meaning (Hastorf 2017). Foodways encompass the processes of food consumption, production, and storage, as well as the ways in which diets and cuisines are formed (Bardolph, 2017, p. 19). In 2023, Proyecto de Investigación Arqueológica de Puerto Malabrigo (PIAPM) excavated Viru households and systematically sampled sediment samples from fill, floors, and features to recover organic remains from 4.0, 2.0, 1.0, and 0.5-mm screens. By comparing the archaeobotanical data from floors and features within those floors (e.g., burning spaces), we can discern how different areas of the home were used and how Viru foodways changed throughout time.

Adomas Vaitkus

Mathematics, Seventh

Mentored By Gil Goffer

Triangle Puzzle

Consider the n-puzzle for any n number of triangles on one of its sides. The bottom rightmost two slots are empty and the puzzle will only exist for any $n \ge 2$. Separate the slots and pieces as those that are oriented such that a vertex is at the top and those that a vertex is at the bottom. The only possible moves are those for which a piece can slide through the two blank spaces into one that is of the same orientation and also empty. The ones oriented with a vertex at the top will be numbered, with the cells enumerated the same way. The ones with a vertex at the bottom will be lettered with capital letters A, B, C, etc. and the slots will be enumerated with lowercase letters a, b, c, etc. The goal of this paper is to show all possible combinations are possible.

Izabella Vasquez

Neurobiology/Biological Sciences, ERC

Mentored By Amy Bintliff

Learning Experiences in Uganda: How Hands-on Learning Affects Student Confidence and Interest in Biology

This research project focuses on providing hands-on biology education kits for children in Kampala, Uganda, with a goal of increasing interest in the field of biological sciences. Uganda has a high percentage of students who are missing basic educational skills, with students in East Africa underperforming in biology. I conducted a curricular review of the Uganda Ministry of Education and Sports science curriculum and identified the following findings: 1) Biology material was based on the memorization of material; 2) there was a lack of hands-on learning which left little room for conceptual understanding or imagination; 3) the curriculum did not include resources for teachers to implement the lessons. Implementing some hands-on activities for students to visualize biology concepts, practice making connections, and engage with their classmates would allow students to use their curiosity and learn in ways that are engaging to them. My goal is to build three biology kits, including lessons and materials, to use by our international partner, Africa Education and Leadership Initiative. The expected results are that students will express more interest in biology and improve their biology understanding. Using hands-on activities going beyond the classroom setting will nurture critical thinking in their everyday life experiences through the lens of biology with the goal to build interest in the biology field.

Jenny Vo

Chemistry and Biochemistry, Sixth

Mentored By Tala Al-Rousan

Hypertension Management Among Former Vietnamese Refugees and Immigrants

Hypertension is a leading preventable risk factor for cardiovascular disease, yet little is known about self-management behaviors in the Vietnamese American refugee and immigrant community displaced to the United States after the Vietnam War. This study explores how social, cultural, and displacement-related factors shape hypertension knowledge and self-management among older Vietnamese American refugees and immigrants. Participants (n = 6) were recruited from San Diego and Orange County, California via snowball sampling and completed semi-structured interviews. Rapid qualitative analysis examined associations between displacement-related factors and hypertension management, while thematic analysis explored the role of language, education, acculturation, and healthcare access. Participants identified key facilitators of hypertension management, including strong medication adherence, access to Vietnamesespeaking providers, and lifestyle practices such as diet, exercise, and religious coping. However, language barriers, especially in hospital settings, remained a significant challenge, particularly when interacting with non-Vietnamese providers. While participants were comfortable identifying as refugees, they did not directly attribute their hypertension management difficulties to refugee experiences or trauma. Health literacy and healthcare navigation were more influenced by education and acculturation levels than by displacement itself. Preliminary findings suggest that Vietnamese Americans displaced to the U.S. after the 1970s have generally acculturated and maintained access to culturally and linguistically appropriate care. This study highlights the value of culturally tailored healthcare, education, and community support in promoting effective hypertension management, while acknowledging persistent language and acculturation barriers. Compared to earlier research, findings point to notable improvements in care and outcomes for this population.

Hanqi Wang

Chemistry and Biochemistry, Revelle

Mentored By Xi Fang

The Role of AGK in the Heart and Cardiomyopathy

Sengers syndrome is an autosomal recessive mitochondrial disease that causes death from heart failure and/or cardiac arrest. Over 85% of Sengers syndrome patients are diagnosed with Congenital Heart Disease (CHD) with symptoms including hypertrophic cardiomyopathy (HCM) (the most common form), dilated cardiomyopathy (DCM), left ventricular non-compaction (LVNC), and electrocardiographic (ECG) abnormalities at infant stages, and die by three years of age. Mutations resulting in complete or partial loss of function in the acylglycerol kinase (AGK) gene cause Sengers syndrome. Thus far, there is no curative therapy for CHD in Sengers syndrome and its molecular pathology remains largely unknown.

To address these concerns, we have successfully generated Agk global knockout (gKO) mice and Agk kinase-inactive (KI) mutants. Our preliminary data revealed that Agk gKO mice displayed sudden death beginning at postnatal day (P) 45, with no gKO mice surviving beyond P63. In contrast, Agk KI mutants survive to at least 2 months of age. Interestingly, in the cardiomyocyte-specific knockout (cKO) we generated, we observed a sex difference in the phenotype of mice beyond P45. I will investigate the detailed molecular mechanism in which kinase-independent and kinase-dependent roles of AGK and impaired aspects of AGK function lead to cardiac defects. Additionally, I will perform histological and physiological analysis of the heart to study the pathology of this disease. These studies would provide insight into potential therapeutic practices.

Warren Warren

Computer Engineering, Sixth

Mentored By Marcelo Caetano

Creating Evolving Structures in Granular Synthesis

Some works in electronic music use the sound synthesis method known as granular synthesis, where milliseconds-long waveforms called "grains" are used to build larger sound events, known as "clouds", which are masses of grains. Grains can be mathematically generated waveforms or samples of existing sounds, and multiple grains can overlap in time within a cloud. The sound of a cloud varies according to different granular synthesis techniques, grain waveforms, and specified characteristics, such as grain density or frequency ranges. The focus within existing granular synthesis techniques has not been on time variation, but adding temporal evolution within clouds may lead to musically interesting structures. In my work, I will explore the potential of time-varying methods for sample-based granular synthesis by analyzing the samples, developing a vector space from their timbral descriptors, and resynthesizing the samples into time-varying clouds by following trajectories within the descriptor space. The contribution of this research is the creation of generative techniques specifically tailored for granular synthesis that musicians can apply in their own works, and continue the exploration of methods for creating evolving clouds.

Courtney Wheeler

Psychology, ERC

Mentored By Caren Walker

Associations Between Language Development and Biases in Relational Reasoning: Examining Differences in Typically and Non-Typically Developing Preschool Aged Children

Introduction

Relational reasoning is a cognitive ability in which patterns in our environment are extended to other sets of stimuli. It follows a U-shaped developmental trajectory in young children: one in which toddlers and school-aged children succeed, but preschoolers fail. Previous work suggests that this temporary decline is related to the rapid noun learning that takes place during early language development. We aim to test this theory among preschoolers with typical and atypical language ability by examining whether associations between relational reasoning and noun learning biases (e.g. shape bias) are modulated by the presence of autistic traits. Additionally, exploratory analyses will assess relationships between the shape bias and general language abilities.

Method

68 children between 46 and 72 months of age will complete a novel object categorization task to measure the strength of the shape bias and at least one relational reasoning task to measure accuracy in identifying and extending abstract relations. Two subtests from the Differential Ability Scales-Early Years, Second Edition (DAS-II) will be administered to assess expressive and receptive language abilities. The quantity of autistic traits for each participant will be measured using the total score from a caregiver questionnaire (AQ-Child).

Results

Preliminary results suggest that children with higher quantities of autistic traits show a weaker shape bias, relative to children with lower AQ-Child scores. We hypothesize that (1) scores on the DAS-II will be positively correlated with the strength of the shape bias and (2) a stronger shape bias will predict lower accuracy in relational reasoning tasks.

Nylah Williams

Human Biology, ERC

Mentored By Eddie Castillo

Anxiety-Related ED Utilization Among California Patients Under 25 Years of Age

Background: Rates of anxiety-related emergency department (ED) visits among youth have risen in recent years, particularly during and after the COVID-19 pandemic. This study aimed to analyze trends in anxiety-related ED visits among patients under 25 years of age across California, with a focus on regional and age-based differences.

Methods: We conducted a retrospective analysis using publicly available California ED discharge data from January 1, 2018, to December 31, 2021. We extracted counts and rates of anxiety-related ED visits (defined by ICD-10 codes) per 100,000 ED visits. Stratified analyses were performed by region and age group (10–14, 15–17, 18–20, and 21–24 years). A heatmap visualized regional patterns, and a line chart illustrated trends by age group.

Results: Anxiety-related ED visit rates increased significantly among all age groups under 25 from 2018 to 2021, with the most notable rise occurring in 2020. The 10–14 and 15–17 age groups saw the largest increases, with visit rates climbing from 2,250.6 and 4,977.3 in 2018 to 3,601.3 and 6,431.9 in 2021, respectively. Regional variation was evident, with the North Coast and San Diego–Imperial regions experiencing higher rates overall. (See Figures 1 and 2.)

Implications: This study highlights a marked increase in anxiety-related ED visits among California youth during the COVID-19 pandemic. These trends may reflect broader psychosocial stressors, including increased digital media use. Findings emphasize the need for targeted public health interventions addressing youth mental health.

Ivan Wong

Political Science, Sixth

Mentored By Philip Roeder

Liberate Hong Kong: Nationalist Secession and the Localist Movement in Hong Kong

I investigate the rise of the localist movement in Hong Kong, particularly its evolution from a cultural issue to a political movement. I find the development of Hong Kong's local identity began during its period of rapid economic development in the 1970s with the goal of promoting Chinese culture in the British colony. However, as a result of the Tiananmen massacre in Beijing and subsequent concerns over the looming transfer of sovereignty, the city's residents began to take pride in the qualities that distinguished themselves from the mainland. After the handover in 1997, campaigns emerged to preserve heritage sites, bolstering local culture protection. As modified visa policies allowed mainlanders to tour and move to the territory, protestors argued mainlanders were taking advantage of Hong Kong to the detriment of its original residents. Increasing rejection of the "Chinese" label in favor of "Hongkonger" followed. As a result of the 2014 Occupy Central movement's failure, a rising belief that traditional methods would never achieve genuine democratic reform led student activists to use localism to form a new political movement aimed at making Hong Kong more autonomous, with some even pushing for Hong Kong's independence. While this originally caused conflict with the legacy pro-democracy camp, both groups ultimately learned to cooperate and present themselves as a unified opposition. I find that several theories demonstrating how the unifying nature of ethnicity and economic leverage cause nationalist secession movements to arise help explain the developments that led Hongkonger identity to become a major political force.
Ellen Wu

Molecular and Cell Biology / Electrical and Computer Engineering , Revelle Mentored By Ramesh Rao

Institutional Strategies for Combating Food Insecurity at UC San Diego

Food insecurity is a pressing issue on college campuses, with nearly half of UC San Diego undergraduates reporting inconsistent access to meals. This project explores how university governance can play a proactive role in addressing food insecurity by analyzing institutional data, evaluating the effectiveness of campus food assistance programs, and identifying policy gaps.

Through literature reviews, campus-level data analysis, and stakeholder interviews, this research investigates how UCSD can adopt sustainable strategies that embed food access into long-term planning. A particular focus is placed on how surplus food from dining halls, student feedback systems, and basic needs programming can be better coordinated through governance structures.

This project aims to generate policy recommendations that will support more equitable and efficient distribution of food resources, reduce waste, and improve student academic outcomes. The long-term goal is to design a framework for addressing food insecurity that is scalable across UC campuses.

Travis Wu

Data Science, Seventh

Mentored By Sicun Gao

Scalable Reinforcement Learning for Portfolio Management

Portfolio management has long relied on classical mean-variance optimization to balance expected return against risk, but these methods often perform worse when faced with large, high-dimensional asset universes. Recent advances in reinforcement learning (RL) offer a data-driven alternative, yet RL agents trained on small asset pools suffer from scalability challenges-exponential growth in state and action spaces, slower convergence, and heightened sensitivity to market noise. In this work, we propose a unified, hierarchical RL framework to restore performance in large-scale portfolio selection. Our method partitions the large pool into several smaller sub-pools based on industry, volatility, or some data-driven clustering. We assign an RL agent, pre-trained on small asset pools, to each sub-pool. A top-level allocator model, trained via its own RL updates, dynamically distributes capital among these agents based on their respective performance and risk metrics from trading in the sub-pools. We assess performance via cumulative return and Sharpe ratio, against the benchmark set by a baseline RL agent trained on the full pool without subdivision. By integrating existing RL methodologies into this hierarchical structure, this research aims to deliver a scalable, automated tool for real-world asset allocation across arbitrarily large stock universes.

Monique Wynn

EDS, Marshall

Mentored By Sherice Clarke

Fostering Black Belonging in Education: How to Combat Gendered and Racialized Oppression

Black students in the public school system are facing challenges like racism, misogyny, toxic masculinity, and dehumanization. This research project aims to examine and compare narratives given by Black high school students on the impacts of administrative and classroom experiences on their sense of belonging in education as a whole. Keeping in mind the long-standing racist and misogynistic oppression that Black students have experienced in public schools, this research hopes to adequately address the similar but different experiences of Black students based on their gender expression and skin color. Qualitative narrative interviews will be conducted on site at an alternative high school to give Black students a place to share their stories and to conduct analysis that looks into how their sense of belonging in school is interacting with their identity as Black students. Investigating this question is one small step towards a future of securing school practices aligned with the purpose of prioritizing the humanity, culture, and life experiences of Black students.

Sophia Xie

General Biology/Biological Science, Muir

Mentored By Jing Yang

The Role of TPM2 in Matrix Stiffness-Driven EMT and Metastasis

Breast tumors are often detected by their hardness, resulting from increased extracellular matrix (ECM) deposition and remodeling, creating a fibrotic microenvironment. This stiffness is associated with poor prognosis, metastasis, and reduced survival. Tropomyosins (TPMs), particularly TPM2, are actin filament-binding proteins expressed in breast epithelial cells and linked to transformation. This research aims to elucidate how TPM2 senses ECM rigidity and influences invasion and metastasis in breast cancer. To investigate TPM2's role in breast cancer, a 3D culture system mimicking the breast tissue microenvironment will be used. Breast cancer cells with varied TPM2 expression will be cultured on hydrogels with different stiffness levels. In vivo studies will involve orthotopic injections of GFP labeled MCF10DCIS cells into immunodeficient NSG mice to observe tumor growth and metastasis. Preliminary results indicate that TPMpm2 knockdown significantly increases matrix stiffness-driven EMT and invasion in 3D culture. The in vivo results also show that TPM2 knockdown promotes tumor growth and metastasis. The results suggest that TPM2 plays a crucial role in breast cancer metastasis through sensing matrix stiffness. Understanding this mechanism can lead to targeted interventions and the development of anti-metastasis treatments, improving survival rates in cancer patients. Future research will focus on validating these findings and exploring therapeutic applications.

Zihan Xu

Molecular and Cell Biology, Sixth

Mentored By Judith Varner

Investigating the Interaction Between Syk and PI3Ky in Macrophages

The connection between cancer and inflammation is well established, with immunosuppressive macrophages—particularly the M2 phenotype—playing a key role in promoting tumor progression. In the tumor microenvironment, M2-like tumor-associated macrophages (TAMs) are the most abundant immune cells and contribute to angiogenesis, metastasis, and chronic inflammation. Clinically, high infiltration of M2like TAMs correlates with poor prognosis in multiple cancers, including breast, lung, and pancreatic cancers. A hallmark of M2 macrophages is the predominant expression of phosphoinositide 3-kinase gamma (PI3K γ), a critical regulator of myeloid cell recruitment into tumors. PI3K γ is activated downstream of G-protein coupled receptors (GPCRs), receptor tyrosine kinases (RTKs), and Toll-like/Interleukin-1 receptors (TLRs/IL-1Rs), and facilitates integrin activation through phosphorylation of MLCK210 and Rap1 signaling. While Spleen tyrosine kinase (Syk) is a well-known mediator of inflammatory responses downstream of TLR4, its potential upstream role in modulating PI3K γ signaling remains unexplored. In this project, we aim to investigate whether Syk regulates PI3K γ activation in macrophages.

Lucas Yan

Maths-Computer Science/Math, Muir

Mentored By Shlomo Dubnov

Piano Reduction using Deep Neural Networks

This research explores a novel approach to the musical problem of translating music into different instrumental arrangements, specifically between piano and orchestra, also known as piano reduction by using SOTA deep neural networks, such as Transformer GANs that integrate strong representation learning with adversarial training, aiming to improve the realism and musical coherence of the generated piano scores. Piano reduction represents a complex computational challenge that requires sophisticated modeling of relationships between orchestral textures and pianistic constraints. Our project could also look into if each specialized attention head in the transformer network attends to identifiable, meaningful, and distinct musical elements.

In this framework, the transformer functions as a generator that produces piano reductions from orchestral input, while the discriminator evaluates these reductions against expert-created examples, guiding the transformer toward more musically coherent and pianistically viable outputs.

The adversarial component provides distinct advantages over traditional supervised learning by capturing nuanced qualitative aspects of piano reduction that are difficult to express through conventional loss functions. This integrated approach enhances the model's ability to preserve essential musical characteristics while respecting the physical and technical limitations of piano performance. This research aims to contribute to computational musicology and music information retrieval by advancing automated methods for translating between instrumental domains while maintaining musical integrity.

To address dataset limitations, we implement controlled data augmentation through key transposition of existing orchestral-piano pairs, significantly expanding the available training material while preserving structural relationships.

Sylvia Zuniga

Psychology (Cognitive Specialization), Muir

Mentored By Tal Waltzer

Yes, but Also No: Ambivalence Towards ChatGPT During Its Initial Release

The public release of ChatGPT in late 2022 prompted urgent questions about the role of generative artificial intelligence (AI) in society and a great need to understand what people think about this new tool and how they use it. We conducted two naturalistic studies during the months immediately following ChatGPT's release, offering an ideal case to explore people's emerging attitudes through everyday conversations. Study 1 (January-March 2023) involved naturalistic observations of everyday interactions surrounding ChatGPT. 239 reports were collected and out of those reports, 74 reports contained 106 events in total with ChatGPT related content. These events contained predominantly positive interactions (47%), such as praise, recommendations, and satisfaction with the tool. However, 24% of the content was unclear. Study 2 (April-June 2023) examined people's attitudes more directly: 234 students (Study 2a) and 211 nonstudents (Study 2b) were interviewed about their experiences with ChatGPT. The vast majority of participants indicated they were aware of ChatGPT. Participants stated that they heard mostly positive and ambivalent attitudes from their social circles. The vast majority of participants, however, held ambivalent attitudes towards ChatGPT, weighing in both the benefits and risks the tool brings. Additionally, participants, unprompted, admitted to using or seeing ChatGPT use for cheating (69%). The widespread ambivalence suggests a complex and evolving relationship between users and emerging AI technologies. While many recognize its utility, uncertainty about its broader implications persists. Our research contributes to understanding generative AI's impact on societal norms, with implications for AI adoption and policy.

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