

Senior Projects

2023–2024



BASIS AHWATUKEE



SENIOR PROJECTS

At this point in their senior year, BASIS Charter School students have completed a set of four BASIS Capstone classes to earn their BASIS Honors Diploma. In addition, many students are in the process of completing the College Board's AP Capstone Diploma™, a challenging, two-year sequence of AP Seminar™ and AP Research™, plus four other AP® Exams—all of which require extensive research, writing, and oral defense. The BASIS Diploma Senior Project marks the culmination of this hard work and perseverance.

Completed in the third trimester of a student's senior year, the Senior Project is unique, self-designed, and reflective of each student's varied academic interests and passions. Regardless of the discipline—business, art, humanities, science, engineering, social work, medicine, or law—each senior must develop and explore a research question. Creating an abstract that sets the tone of the research, participating seniors must submit a project proposal, and later, orally defend their methodologies.

Under the guidance of an external advisor who is a professional in their field, as well as a faculty advisor from their school, students dedicate 10–15 hours per week to the completion of their Senior Project. To document their journey, students post weekly blog entries about their experiences, successes, and challenges as they explore their guiding question. This journaling provides a unique viewpoint on the students' activities and adds a reflective layer to their research process.

Throughout the development of the Senior Project, BASIS Charter Schools support their seniors every step of the way. The project summaries in this publication clearly illustrate each senior's ability to apply the knowledge and intellectual curiosity they have acquired in the classroom to professional research methods. At the successful conclusion of this project, students are eligible for a BASIS Diploma with High Honors, the most distinguished accolade offered by BASIS Charter Schools.

Each member of the BASIS Charter Schools network commends our seniors for their dedication and motivation—not only for completing this Senior Project, but for their commitment to the BASIS Charter School Curriculum. Congratulations to them on this powerful achievement, and our best wishes as they move forward on their educational journey.



Carolyn McGarvey
Chief Executive Officer
BASIS Ed AZ, DC, LA



David Hubalik
Chief Executive Officer
BASIS Ed Texas



Ahwatukee SENIOR PROJECTS

ADAM B.



MOLECULES OF THE THERMOSPHERE: CALCULATING NITRIC OXIDE PROFILES IN THE UPPER ATMOSPHERE

SUMMARY: The thermosphere is the largest portion of Earth's atmosphere, and because it ranges at such high altitudes, 120-3000 km, the gaseous activity and molecular number densities, amount of molecules per unit cube, become hard to measure and observe when compared to the lower layers of the atmosphere. To remedy this, we can consult basic chemical kinetics in an attempt to calculate a steady state model of these profiles for different molecules. The reactions and interactions of gaseous particles in the thermosphere all make up one system, so the construction of a simple model will help us further our research and understanding of what occurs in the upper atmosphere, using reactions we already know and possibly uncovering certain gaseous behaviors that we do not know. In my project, we are specifically looking to construct a steady state model of the number density profiles of nitric oxide, due to its involvement in many photochemical reactions that result in both its formation and deformation. There are other factors that also need to be consulted outside of the kinetics, such as diffusive mixing in the atmosphere, but these factors can be consulted using software constructed for atmospheric systems known as VULCAN. I am working with Dr. James Lyons to calculate this model and develop my conceptual understanding of Earth's upper atmosphere, and serve this model as a reference of comparison for past or future measurements of nitric oxide concentrations in the thermosphere.

• **BASIS ADVISOR:** James Lyons • **ON-SITE MENTOR:** Dr. James Lyons • **LOCATION:** Independent Project

RAYMOND C.



FORGET ME NOT: ANALYZING THE EFFECTS OF A GENE-REGULATING PROTEIN ON THE PROGRESSION OF ALZHEIMER'S

SUMMARY: Alzheimer's disease affects 1 in 9 people aged 65 years or older, and since its discovery in 1906, there has been no cure for the disease. Within the past few decades, various possible causes of Alzheimer's have been identified, but there has not been a conclusive understanding of the onset of the disease and its specific mechanisms. With the number of people afflicted with Alzheimer's projected to more than double by 2050, it is paramount that Alzheimer's disease be better understood so that researchers can create highly promising treatments and devise prevention measures for those vulnerable to the affliction. At the ASU-Banner Neurodegenerative Disease Research Center, I will be analyzing the protective effects of a protein called RBBP7 against Alzheimer's through studying mice. At the end of the project, I wish to understand the extent to which the presence of RBBP7 affects Alzheimer's disease progression and hopefully find promising results for further research.

• **BASIS ADVISOR:** Doug Eubanks • **ON-SITE MENTOR:** Dr. Ramon Velazquez
• **LOCATION:** ASU-Banner Neurodegenerative Disease Research Center

TREVON C.



STAY INSIDE! IT'S BURNING OUT THERE!: EXPLORING THE LOCALITY AND DANGEROUS IMPLICATIONS OF HIGH TEMPERATURES

SUMMARY: With a world dominated by an increasing global population, the process of urbanization continues to influence the development of many cities. Countries such as France, Japan, and the United States are highly industrialized with large urban centers allowing for improved global production levels. While such urban sprawl can improve a city's economic prosperity and infrastructure, consequences can easily arise from such a development pattern, one of them being climate change. Especially in the larger, denser urban areas, the surface and air temperatures are much greater compared to that of outlying rural areas, a phenomenon known as the urban heat island effect. However, the intense heat does not affect everybody equally, rather certain demographic and socioeconomic factors such as income, race, and age can affect the susceptibility to heat-related symptoms. This greater risk of vulnerability for certain populations is actively being discussed through government and public policy around the world, most recently being the COP28 Climate Summit. During my project, I collected temperature readings from weather stations across Phoenix that allow me to spatially map heat fluctuations across a given area. With this information, I compared temperature levels with demographic and socioeconomic factors in a specific neighborhood to analyze any trends or correlations that are present. Working at ASU with my on-site mentor Dr. Sailor, I not only better understood the inner workings of the heat island effect on communities in Phoenix, but also created a possible solution based on my findings to effectively mitigate the health risks of high temperatures.

• **BASIS ADVISOR:** Matthew Winter • **ON-SITE MENTOR:** Dr. David Sailor • **LOCATION:** Arizona State University

DELANO D.



"REVOLT" LUTIONIZING THE LECTURE: ELECTRIFYING EDUCATION WITH MULTIMEDIA PRESENTATIONS AND AI NARRATION

SUMMARY: Since its inception, the academic lecture has languished unchanged despite the myriad technological and pedagogical innovations that have occurred since. On top of being costly and labor-intensive, the overwhelming majority remain dull and uninspired. Instead of needlessly spending billions of dollars annually on outdated relics, it's time we reinvent them. With the advent of the internet, multimedia presentations emerge as the most efficient and cost-effective solution, for they require neither the effort it takes to produce a high quality documentary nor the reliance on unengaging yet prominent PowerPoint presentations. However, creating quality multimedia presentations demands a specific skill set and copious amounts of time, the sort of skills and time professors scarcely have. That's why Professor Rick Trebino at the School of Physics at Georgia Tech hopes to mass produce quality, pre-recorded multimedia presentations that can be used and re-used by students and teachers worldwide. The problem is that voicing over the lecture proves the most difficult part of the process, for humans are prone to sickness, drowsiness, caffeine intake, stutters, and various other inconsistencies that would hinder narration. Thanks to the rapid development of artificial intelligence, though, we can use artificial voices to do the work for us. For my project, I'm aiding Professor Trebino's work by using an AI software to narrate over his modern physics lectures. This software can be used on any device, so I'll be completing my project from home. I hope my small but significant contributions can make lasting impacts on both Professor Trebino's research and education at large.

• **BASIS ADVISOR:** Michael Lemons • **ON-SITE MENTOR:** Dr. Rick Trebino
• **LOCATION:** Georgia Institute of Technology

VERONICA E.



WHO LET THE DOGS OUT?: A STUDY OF SERVICE DOG TRAINING AND BEHAVIOR

SUMMARY: My project is about service dog training and the dogs' behavior surrounding their training. There are many kinds of dogs, and each breed has different behavioral patterns that can make or break a service dog. Service dogs have a massive impact on the lives of their handlers. Often having a service dog gives the handler independence whereas without their dogs they would need another person to go everywhere with them. The training of these dogs is incredibly important. They need to be able to ignore all other distractions around them and focus solely on their handler. For dogs, this is quite a difficult task. They also need to be able to perform complicated tasks related to their handler's condition. For example, guide dogs learn deliberate disobedience, which is when their visually impaired handler wants to do something that would put them in danger and the dog refuses to perform the task to keep their handler safe. My site placement is at Canine Companions. Canine Companions is a company that raises and trains service dogs. Because my project focuses on training the dogs and how the dogs learn, this placement is a perfect fit. I am addressing my topic by observing how different dogs learn different tasks. Although the training protocol is similar, not all dogs learn the same way. Some dogs learn more quickly than others. Older dogs learn more complicated tasks, while younger dogs learn simpler tasks. I hope to find an understanding of what goes into training a service dog and what makes a good service dog.

• **BASIS ADVISOR:** Paige Receveur • **ON-SITE MENTOR:** Pat Lawson • **LOCATION:** Canine Companions

AKSHITH G.



MARIO KART 8 LUIGI DEATH STARE: A STUDY IN IMAGE CLASSIFICATION OF CARS ASSISTED BY ARTIFICIAL INTELLIGENCE

SUMMARY: In 2022, 38.6 of the 52.2 million cars sold (73.9%) were used. With online dealerships growing in prominence and being cheaper than verified, in-person dealerships, they come with a risk of being overpriced or scammed. To the layperson, differentiating between a wildly overpriced car or scam, and a legitimate good deal would be difficult. Research and development of applications in this niche will help better identify the legitimacy of the listings. My project will be tackling this niche. My site placement is Arizona State University, and I feel that this is a good fit for this project because I can work with a professor who is extremely knowledgeable about AI and can aid me if need be. This also allows me to develop my skills as I get to program independently. The code will be mine, but I will use outside libraries and resources to supplement my lack of knowledge on the subject. I will program the different algorithms in the same language, mostly the same libraries. I will then train and test the algorithms and record the accuracy of the algorithms in predicting the make, model, and year. I will plot the accuracy and training time of one of the algorithms on a graph. I hope to find any trends within the graph, as well as to understand how the algorithm works under the hood.

• **BASIS ADVISOR:** Don Whiteside • **ON-SITE MENTOR:** Dr. Ajay Bansal
• **LOCATION:** Arizona State University Polytechnic Campus

KAMALESH G.



ONE SICK PUPPY: A LOOK INTO THE HEALTHCARE PRACTICES IN ANIMAL SHELTERS AND THEIR EFFECTIVENESS

SUMMARY: In the past few years, animal shelters have increasingly played a crucial role in our society, from housing lost or abandoned puppies to helping them find a forever home. These shelters are not just temporary holding facilities: they are places of dedication, where staff and volunteers provide food, shelter, medical care, and love to the animals. Out of all these procedures, healthcare is by far the most influential practice. I am currently working with Home Fur Good, an animal shelter organization, to accurately study the mechanics of these healthcare practices. I have looked into healthcare guidelines and evaluated the effectiveness of preventing and controlling infectious diseases in Home Fur Good. By examining the procedures implemented at Home Fur Good, I gained insights into the factors influencing the health outcomes of the shelter animals, including vaccination protocols, disease surveillance, and daily intake of medication. My work in Home Fur Good gives me exposure to the medical environment in an animal shelter and their healthcare practices. Through diligent review, I assessed the efficacy of the shelter's disease-preventative measures and treatment strategies. I hope that, in this project, I will be able to observe how healthcare is integrated into animal shelters by their specific disease prevention protocols.

• **BASIS ADVISOR:** Michael Lemons • **ON-SITE MENTOR:** Jaynn Turan • **LOCATION:** Home Fur Good

TUSHAR G.



AMERICAN NIGHTMARE: WORK AND FAMILY-BASED MIGRATION AND THEIR DISCRIMINATORY WAIT TIMES

SUMMARY: Foreign-born individuals compose nearly 14% of the population, making immigrants and immigration a vital part of American society. Over the past 50 years, the U.S. immigration system has seen a massive overhaul of its structure, making it a completely different institution than it was 100–150 years ago. The current immigration system faced massive criticism in terms of its policies and lack of efficiency. At the forefront of this issue is illegal and asylum-seeking immigration. Often overlooked parts of U.S. immigration are work and family migrants. Those who enter the U.S. seeking new job opportunities or trying to reunite with families often endure long processing times and even spend decades getting approved. When looking deeper into the processing times, the U.S. immigration system practices a discriminatory system where aliens from certain nationalities have a systemic disadvantage when they try to convert to permanent residents. This project focuses on why the system is the way it is, how it can be changed, and what the ramifications of the change could mean for the future of U.S. immigration.

• **BASIS ADVISOR:** Caroline McCloskey • **ON-SITE MENTOR:** Dr. Brock Ruggles
• **LOCATION:** Arizona State University

OLIVER I.



TRADING WITH A GRAIN OF BITS: THE APPLICATION OF ARTIFICIAL INTELLIGENCE INTO TRADING STOCKS

SUMMARY: Trading and investing are key to building wealth and becoming more financially free. According to Gallup, a global research company, 94% of households with an annual income greater than \$100,000 own stocks. I am implementing artificial intelligence to help lower the barrier of entry so people with less stock market and financial knowledge can take less risk when trading. The implementation of AI shows stocks that have a higher chance of performing well. The AI can look at past performance, indicators of future performance, news articles, and more to predict the likeliness of a stock to perform positively. My site placement is with an organization that handles and focuses on AI and machine learning. This allows me to have access to people with experience in this field and fine-tune my project. I am creating a trading bot that will analyze a stock that a person chooses, attempt to give a report, and help with the due diligence process. It gives an insight into what the general news relating to that stock is, looks at past performance, and combined gives its opinion on the stock and whether it believes that the stock will perform positively. I hope to have my trading bot accurately predict the trend of 50% of the stocks given.

• **BASIS ADVISOR:** Jennifer Murillo • **ON-SITE MENTOR:** David Wrench • **LOCATION:** Datajoi

MARC K.



SLEEP IT OFF: INSPECTING THE RELATIONSHIP BETWEEN TARGETED SLEEP INTERVENTION AND CHRONIC PAIN

SUMMARY: Targeted sleep interventions, such as cognitive-behavioral therapy for insomnia (CBT-I) and mindfulness techniques like yoga, have shown promise in improving sleep quality. However, their impact on pain management outcomes remains understudied. There is an unquestionable link between sleep and pain, but emerging evidence suggests that the effect of sleep on pain may be even stronger than the effect of pain on sleep. Researchers have found that short sleep times, fragmented sleep, and poor sleep quality often causes heightened sensitivity to pain. Encouragingly, many studies have also found that in the long term, quality sleep may improve chronic pain (Pacheco). This research aims to investigate the potential benefits of incorporating specific sleep interventions into pain management protocols. At Foothills Physical Therapy, I observed how Dr. Ted Carter incorporates sleep strategies in the recovery process for his chronic pain patients. I am working in the physical therapy clinic a couple of times a week, assisting technicians and getting to know specific patient cases. I am working with Dr. Carter to observe the progress of patients with chronic pain to reach my final goal of ascertaining if targeted sleep interventions should have a significant role in chronic pain management.

• **BASIS ADVISOR:** Melissa Calderon • **ON-SITE MENTOR:** Dr. Ted Carter
• **LOCATION:** Foothills Sports Medicine Physical Therapy

ANAGH M.



NO PAIN, JUST GAIN: THE EFFECT OF EXERCISE IN NEUROPATHIC PAIN RECOVERY

SUMMARY: One of the most important fields in medicine is pain medicine; and a major sector of this field is managing pain that stems from the nervous system. Whether it is a swollen nerve in the ankle or a deviated disc in a patient's spine, controlling pain through the nerve allows patients to continue with their lives and keep themselves active. One predominant method of relief used by pain management experts is exercising. Multiple physicians use exercise in order to relieve pain today, but measuring its efficacy is not that easy, especially when it's neuropathic. Not only are its effects variable from different kinds of pain, but other factors such as frequency of exercise, lifestyle, and other characteristics also play into it. Through this project, I am analyzing the importance of exercise in recovery used by patients with neuropathic pain and its effectiveness in healing or preventing further pain by working with Foothills Sports Medicine with Dr. Ted Carter, a physical therapist with a specialty in neuropathic pain. My project focuses on 3 things. First, does exercise help with pain reduction? Second, how much exercise is the most effective? And third, what kind of exercise is the most efficient?

- **BASIS ADVISOR:** Doug Eubanks • **ON-SITE MENTOR:** Dr. Ted Carter
- **LOCATION:** Foothills Sports Medicine Physical Therapy

NAFISA M.



CORTISOL CATASTROPHE: THE NEUROSCIENCE OF STRESS

SUMMARY: Stress is a frequent factor in the lives of many people, still there are multiple uncertainties that individuals may not be aware of with regards to the true role stress plays in one's life. The impact of stress is a reaction that expands further than one's mental state, it is a biological response to various factors in one's life. Due to the misconceptions about stress and its effects, many individuals fail to recognize how their own bodies function when put in different situations. Through my research, I aim to understand how stress impacts both a person's mental state and brain, examining the reactions triggered and determining the regularity with which individuals deal with stress throughout their daily lives. I am currently working with Dr. Katherine Brazaitis, a psychiatrist located in Tucson, who is experienced working with adults in areas concerning anxiety, PTSD, and depression. Through her guidance I intend to observe how stress forms and progresses in one's daily life noting how it affects one's quality of life and what occurs when stress is left unregulated. Despite stress being a very nuanced topic including many intricacies and being a topic still heavily researched, I plan to gain a better understanding of stress and intend to ascertain and share different techniques that are uncommon yet useful regarding stress.

- **BASIS ADVISOR:** April Klundt • **ON-SITE MENTOR:** Dr. Katherine Brazaitis
- **LOCATION:** Mountain View Mental Health, LLC

RAHMA M.



EMDR-U-OK?: A HOLISTIC OVERVIEW OF EYE MOVEMENT DESENSITIZATION AND REPROCESSING THERAPY

SUMMARY: Eye Movement Desensitization and Reprocessing (EMDR) is a form of psychotherapy that was devised by Francine Shapiro in 1987 and intended to mitigate the suffering caused by PTSD and traumatic memories (Rosen). Patients focus on the trauma memory while experiencing “bilateral stimulation,” or stimulation (visual, auditory, or tactile) occurring in a left-right pattern. This process lessens the severity of traumatic memories and positively alters the patient’s perception of them. Though it has been overshadowed by other forms of therapy, EMDR has recently been gaining popularity for its array of benefits. Despite this, EMDR and its features remain largely unknown to the public, and most sources pertaining to EMDR are inaccessible to laypeople. This project is meant to clear some of the mystery shrouding EMDR. I am working with Dr. Carlie Rouse at Aligned Counseling & Consulting to formulate and make instructional materials for an EMDR therapy curriculum. While doing so, I am taking a closer look at EMDR’s 8 phases: history taking and treatment planning, preparation, assessment, desensitization, installation, body scan, closure, and reevaluation. In addition, I am expanding my understanding of the Adaptive Information Processing model, or the theory underlying EMDR’s functionality. Furthermore, I am covering the intricacies of Bilateral Stimulation. Overall, my project assesses EMDR’s development, attributes, process, and overall efficacy. Ultimately, my goal is for this project to serve as a comprehensive repository for EMDR-related information and an easily digestible guide to EMDR.

• **BASIS ADVISOR:** Cristina O’Neill • **ON-SITE MENTOR:** Dr. Carlie Rouse • **LOCATION:** Aligned Counseling

RAJIV M.



“THERE IS ALWAYS ROOM FOR IMPROVEMENT!”: A LOOK INTO THE IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE INTO OPTIMIZATION PROCESSES

SUMMARY: In the last few years, there has been exponential growth in the use of artificial intelligence (AI) across the board. It has been used in countless work fields, whether organization, design or the focus of this project, optimization. This implementation of AI is interesting as it will undoubtedly be the future of many industries. The different ways it can be used and the countless ways you can customize it allow it to be a good fit for any task. In the project, I will be conducting my research in Freshkub, a company that allows for different refrigeration units to be used in the transportation of crops. This allows farmers and other agricultural businesses to transport multiple different crops at the same time, all being at their optimal refrigerator temperature. They are able to achieve this by having a collection of sensors and machine learning to support the humidity and temperature for said crops. This research will mainly be achieved through observation of data and overall improvement of the system to allow for the rest of the job to be taken care of by AI. I hope that in this project I will be able to observe the ways AI can be implemented into the optimization of processes and be able to point out the shift in the industry to allow for the use of AI.

• **BASIS ADVISOR:** Cynthia Stevens • **ON-SITE MENTOR:** Rene Villalobos • **LOCATION:** Freshkub

BRIDGET N.



PIXELS AND PORTRAITS: NAVIGATING THE ART OF WEBCOMICS

SUMMARY: With the innovations of the past twenty years allowing quick communication and the ability to make a living online, webcomic, comic, and film adaptations have burst into popularity relatively recently. Webcomics and comics tell a story in a different medium from a text story, and adapting a story to a different medium requires changing it to match. A well-written story can change the perspective of someone's life, and a well-produced adaptation can build on the impact of a story. My site placement is with Paige Receveur, where I would be working on creating webcomic and comic adaptations of myths told in their published latin books. It is the perfect place to discover how an adaptation can change an interpretation of a story, along with the experience of creating a comic. I will attempt to discover the ins and outs of an adaptation by using my own comic adaptations compared to the original stories and pre-existing adaptations. By the end of my project, I will understand the technique and style needed in order to create an adaptation of a story that retains and amplifies the original intention of the work.

• **BASIS ADVISOR:** Paige Receveur • **ON-SITE MENTOR:** Paige Receveur • **LOCATION:** Independent Project

AURORA P.



TREATMENT NOT TRAUMA: THE RISE OF COMMUNITY-CENTERED SAFETY BEYOND POLICING

SUMMARY: America has witnessed over and over again incidents of the police using excessive force and killing those they are supposed to protect and serve. Discourse has ensued and Americans are arguing over the best solution to deter police brutality and reform the institution of law enforcement. While this nationwide discussion occurs, innocent people continue to have fatal interactions with police officers. My project explores not only the extent to which the police harm various communities but also the realistic implementation of police abolition. I focus specifically on the Phoenix Police Department (PPD) and its relationship with Phoenix residents; I argue that the PPD leads the country in police violence and urgently needs a solution. I am working with Poder in Action, an abolitionist organization that works to dismantle oppressive systems and strengthen communities of people of color in Phoenix. My work with Poder in Action gives me the opportunity for hands-on work with my community as well as a look into purposeful advocacy for public policy and social change. My focus in this work is to reduce dependency on the PPD and contribute to the organization's effort to provide alternate solutions for personal safety. Wholistically my project educates people on police abolition, what a world without police would look like, and ways we must empower communities to redefine their protection and well-being.

• **BASIS ADVISOR:** Holly Sow • **ON-SITE MENTOR:** Isabel García • **LOCATION:** Poder in Action

PRAKRUTI P.



I'M POSITIVE!: A LOOK INTO THE WORLD OF PREGNANCY

SUMMARY: Marveling at the ability to bring new life into the world, pregnancy is a transformative and life-changing experience that many women encounter. The array of pregnancy symptoms and side effects is extremely diverse; trying to compile them into a list would span longer than the one included in a prescription for birth control, which is exactly what I set out to do. What should women anticipate, understanding the potential risks involved as they approach the subject of pregnancy? My research and statistics seek to allow for a more informed approach from the woman's end if they do choose to conceive a child. I am learning and researching under Dr. Rabi Narayan Satapathy, an awarded OBGYN who runs his clinic in Bhubaneswar, Odisha, about case studies and the more common experiences regarding the different side effects and symptoms experienced by women during pregnancy over an online mentorship. In addition, I am volunteering at the Aid to Women Center a couple of times a week, noting down symptoms felt by patients and getting to know their cases in the specifics. Going into this research I hope to be able to compile a list of as many possible side effects and symptoms that may come alongside pregnancy and create a slate of statistics that determine the relative frequency of each side effect.

• **BASIS ADVISOR:** Mikaela Hatfield • **ON-SITE MENTOR:** Dr. Rabi Narayan Satapathy • **LOCATION:** Ashu Skin Care

NAEHA R.



YOU CAN'T HANDLE THE TRUTH!: AN INVESTIGATION INTO ETHICAL DILEMMAS IN THE LEGAL FIELD

SUMMARY: "In 2018 (the most recent year with available data) 872 lawyers were publicly disciplined for misconduct in 45 states and the District of Columbia" (Drive and Cary). No matter their age, experience, or focus of law, attorneys will undergo an ethical dilemma at some point in their career. The definition of an ethical bias is "faulty beliefs, attitudes, or behavioral tendencies that constrain cognition and thereby inhibit an individual's ability to make ethical decisions" (Hofmann). This will affect their personal and professional lives and limits the extent to which an attorney can properly present themselves and clients during a trial. My project focuses on how much an attorney's ethical values influence their decisions and actions. I am researching how lawyers face ethical dissonance and what resources are provided to lawyers who are undergoing an ethical dilemma. I am interning at a non-profit organization that gives legal aid to the community. I am shadowing the attorneys to get an understanding of the day to day lives of attorneys. Then I am reaching out to attorneys from different sectors of law and interviewing them about their experiences with ethical dissonance. My goal is to gather different solutions and tips for future young attorneys and law school students so they can have some guidance when facing their own endeavors in the legal field.

• **BASIS ADVISOR:** Dyson Ellis • **ON-SITE MENTOR:** Pamela Bridge and Joshua Einsenstein
• **LOCATION:** Community Legal Services

ABHINAV S.



PUT A SM-A.I.-LE ON YOUR FACE: EXPLORING THE EMPLOYMENT OF GENERATIVE ADVERSARIAL NETWORKS FOR MENTAL HEALTH COUNSELING

SUMMARY: Artificial Intelligence has been increasingly utilized to produce text, images, audio, and video. Its use has been expanded to a variety of pathways of human interaction. There is a current lack of psychologists and therapists needed to combat the population's lowering mental health. My project focuses on the use of image-generating Artificial Intelligence in augmented therapy. Generative AI uses competing neural networks known as GANs to improve the realism of the produced images. Currently, many counseling offices are unable to provide long-term personalized care even for conditions that require it. By using Artificial Intelligence to supplement the current iteration of counseling, patients can receive longer-lasting treatment for their well-being. I am working on the development of a GAN at the Grand Canyon University's Computational Science Exploratorium to create images for use in a counseling video wall. Alongside Dr. Isac Artzi's team, I am focusing on resolving the style and method of generation based on a patient's emotionally analyzed journal entry. Through my research, I hope to understand how to target mental conditions of depression, addiction, and anxiety through technology in the advancement of therapy. I am analyzing the potential that Artificial Intelligence can have in the health field while being wary of the drawbacks and care that must be taken with patient conditions and personal information. At the end of my project, I want to contribute to the production of augmented counseling for the future of mental healthcare.

• **BASIS ADVISOR:** Don Whiteside • **ON-SITE MENTOR:** Dr. Isac Artzi • **LOCATION:** Grand Canyon University

KALYN S.



CUTTING CORNERS: CREATING A SUSTAINABLE FUTURE ONE BOX AT A TIME

SUMMARY: Every piece of plastic created is still on our planet. Containers and packaging are a key contributor of municipal solid waste. The increasing use of plastics in the packaging industry is alarming. A switch back to paper packaging will help retain the un-replenishable natural resources used to make plastic as well as prevent the overuse of our landfills. I researched and examined this problem with my internship at Intel Corporation. Intel ships millions of boxes every year that contain plastic corner protectors and air pillows to protect product quality during the shipping process. With paper and cardboard being the most recycled material globally, creating a more identifiable as recyclable corner protector (made from paper) would lessen the global impact of plastic waste. While Intel aims to achieve a 97% (by weight) recyclable or reusable packaging goal by 2025, due to plastic's low weight and inability to fully decompose, it is challenging to address the environmental impact of plastic corner protectors. I am working in the TMME ISTA lab (Transport Media and Materials Engineering International Safe Transit Association lab) at Intel to design, test, and implement new paper and cardboard prototypes of plastic packaging cushions. During my internship, I tested these new product prototypes to potentially decrease Intel's plastic footprint as well as maintain product quality creating a company with more sustainable practices.

• **BASIS ADVISOR:** Josie Taylor • **ON-SITE MENTOR:** Kyle Kippes • **LOCATION:** Intel Corp

SARHANA S.

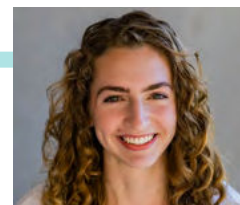


BEYOND HER SMILE: EMPOWERING WOMEN THROUGH DENTAL HEALTH

SUMMARY: In a world where micro-aggressions against women persist, the seemingly polite command to "smile" holds deeper implications, symbolizing the societal pressure for women to conform to a prescribed image. As a woman myself, I am deeply attuned to these nuances and am committed to addressing them head-on. My senior project focuses on exploring the unique dental challenges faced by women, shedding light on an often-overlooked aspect of women's health. At Shine Dental Arts, under the guidance of Dr. Vanessa and Anthony Quihuis, I delve into the realm of women's oral health from a gendered perspective. While my primary goal is to observe and understand the prevalent yet ignored dental issues that women encounter, I also leverage my interests in data analysis and business strategy to view dentistry through a multifaceted lens. My experience at Shine Dental Arts not only deepens my understanding of women-specific dental issues but also provides invaluable insights into the business side of dentistry. As someone interested in studying bioinformatics, the data-driven approach I employ at Shine Dental Arts prepares me for future endeavors in both healthcare and business analytics. This comprehensive immersion equips me with the knowledge and skills to develop a foolproof business plan tailored to the unique needs of Shine Dental Arts. Should I choose to pursue dentistry in the future, I can utilize this experience to ensure that my practice aligns with my commitment to women's empowerment. Through my site placement, I aim to immerse myself in patient care while researching women-specific dental issues. From hormonal influences to societal expectations, I seek to dissect the various factors contributing to dental disparities among women. My endeavor is not merely about addressing dental issues; it's about empowering women with knowledge and fostering a proactive approach to oral care. Through research, education, and advocacy, I aspire to empower women with the tools they need to achieve and maintain a state of dental harmony, fostering a community where a woman's smile reflects her true strength and resilience.

• **BASIS ADVISOR:** Jada Genter • **ON-SITE MENTOR:** Dr. Vanessa and Anthony Quihuis • **LOCATION:** Shine Dental Arts

SAFIYA T.



ONE THOUSAND AND ONE DIALECTS: ANALYZING NATIVE SPEAKERS' USE OF COLLOQUIAL ARABIC AND IMPLICATIONS FOR LEARNERS

SUMMARY: Arabic is a perfect choice for people seeking to learn a foreign language: it is the language of around 422 million people worldwide and of Islam, valued by governments, businesses, the military, and countless other fields. But learners face a daunting decision: which Arabic to learn. Arabic has roughly thirty regional dialects, many of which are mutually unintelligible. Most Arabic programs teach Modern Standard Arabic (MSA), which is not spoken in daily conversation, rendering many learners unable to communicate with native speakers. This diglossic situation also discourages many people from learning Arabic in the first place. Very little literature exists on Arabic dialectology, and even fewer resources are available to aid Arabic learners in their decision. In my project, I will survey native Arabic speakers to extract patterns about how many dialects speakers understand, how they acquire them, and how useful they perceive each to be. I will work with Dr. Hamed Ghazali of the Houston Qur'an Academy to develop effective survey questions and recruit native speakers from diverse linguistic backgrounds. I plan to synthesize the results I obtain with existing research to develop a learning model for Arabic learners in high school, college, and beyond. I hope that my findings might be useful for prospective Arabic learners, teachers, and curriculum coordinators and increase the appeal of learning this beautiful, critical global language.

• **BASIS ADVISOR:** Lucy Kang'ethe-Wilcox • **ON-SITE MENTOR:** Dr. Hamed Ghazali • **LOCATION:** Independent Project

SARAH U.



MAKEUP OF OUR COSMIC BACKYARD: A LOOK INTO THE ISOTOPIC COMPOSITION OF THE MAGNETOSPHERE

SUMMARY: Many impressive galactic phenomena that we can observe from Earth, from auroras to the Van Allen radiation belt, are the result of smaller processes that occur in our outer ionosphere. The Earth, moon, and solar wind are all interconnected through chemical processes in the magnetosphere, which fuels the very fibers of Earth's existence in the solar system by protecting it from cosmic particle radiation and atmospheric erosion by the solar wind. The magnetosphere is a critical aspect of much of what we know about magnetic field theory today, and research in the area is very much still in its early stages. The attributes of the magnetosphere have been thus far limited to its orientation, density, structure based on magnetic field attraction and solar wind pressure, and its interactions with plasma. To accurately study the mechanics of the processes in the magnetosphere, for my research project, I will estimate a chemical composition that bases its calculations on previously published data. My analysis and findings will be independently modeling the effects of escape from the ionosphere to understand the chemical composition of the magnetosphere. I will use previously published work on ionic escape fluxes to guide my calculations with the help of my faculty advisor.

• **BASIS ADVISOR:** James Lyons • **ON-SITE MENTOR:** Dr. James Lyons • **LOCATION:** Independent Project

NADIA V.



DID WE LEARN NOTHING FROM THE RAINBOW FISH?: DISCRIMINATION IN THE FIELD OF MARINE BIOLOGY AND OCEANOGRAPHY

SUMMARY: In recent years, it is clear that there has been more of an effort to include women and other marginalized groups more in the workforce, and an attempt to decrease rates of discrimination. This is something that is especially a problem in the field of STEM, as seen in studies that show issues with retention for black, indigenous, and people of color (BIPOC) individuals in the workforce (Graham et al. 2022) and transgender and nonconforming (TGNC) undergraduates in STEM (Maloy et al. 2022). With a world that is currently facing a climate crisis, it is crucial to include different peoples with different perspectives, as shunning any marginalized group will only lead to harm in the long run. The ocean is crucial to the Earth's environment, and the study of marine biology and oceanography can not only offer humanity a better understanding of the world we live in, but can also help mitigate this current crisis. Over the course of my project, I will be working with an organization called Minorities in Shark Sciences, MISS, to help address the issue of discrimination within marine biology and oceanography. MISS is an organization that aims to help any gender minority of color, giving them extensive firsthand experience with the issues we have today. My mentor, Jasmin Graham, has not only conducted a similar project in terms of observing discrimination through the lens of BIPOC people, but is also an African American woman herself, and has faced feelings of isolation and hostility within the field. I will be working with MISS and will be collecting data and firsthand accounts of discrimination in regard to one's gender identity. With these results, I will try to understand the experience of people who have faced discrimination in regard to their gender identity, including data such as how frequent their negative experiences are, and their emotions regarding the incident afterwards. I hope that my project will be able to help the people who have the intelligence and drive to work in marine biology to be able to work in the field without fear of discrimination, and if possible, even apply what I learned to other fields.

• **BASIS ADVISOR:** Heather Weiler • **ON-SITE MENTOR:** Jasmin Graham • **LOCATION:** Minorities in Shark Sciences

ALEXANDER Y.



MONARCH BUTTERFLY PREFERENCES AND GROWTH: UNRAVELING THE IMPACT OF MILKWEED VARIANCE

SUMMARY: It is no big secret that climate change is causing a profound change in ecosystems globally. Any given environment is affected negatively by the changes in temperature. For example, heat increases disrupt the migratory cues of animals reliant on changes in temperature to migrate. Similarly affected is the monarch butterfly (*Danaus plexippus*) whose population has declined by 85 percent in the last two decades due to climate change, urban development, and pesticides (Center for Biological Diversity). Different conservation organizations have made many efforts to restore the monarch population with varied success. These initiatives can reach a broad range of organizations, communities, and individuals to create a collective change. Without the resources of an international or nationwide organization, I will do what I can and focus my efforts on local endeavors. I am working with the Desert Botanical Garden to boost monarch butterflies' survival by finding the ideal milkweed species for monarch caterpillars to feed on. The Desert Botanical Garden has the resources to support monarch butterfly research given that they feed on any milkweed species which the Garden nurtures. By researching how different species of milkweed plants affect the monarch caterpillars' growth, we can plant milkweeds that will be optimal for monarch butterfly survival and guarantee that more monarchs make it to adulthood to gradually restore their population. This research could also include applying this newfound knowledge to collaborators of the Botanical Garden so that they can plant milkweeds that are more beneficial to monarch butterflies. I expect to learn more about monarch butterflies as a whole while gathering research data on their caterpillars. I hope that the data I collect can be used in future efforts to restore the monarch butterflies.

• **BASIS ADVISOR:** Jason Crosby • **ON-SITE MENTOR:** Natalie Melkonoff • **LOCATION:** Desert Botanical Gardens



The teachers, administrators, staff, and executive leadership of the BASIS Charter Schools network **commend all of our seniors for their perseverance** in their research, and for their hard work throughout their BASIS Charter School journey. We give **our most heartfelt congratulations** to them for their achievements thus far, and these projects are only the beginning!



Ahwatukee

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