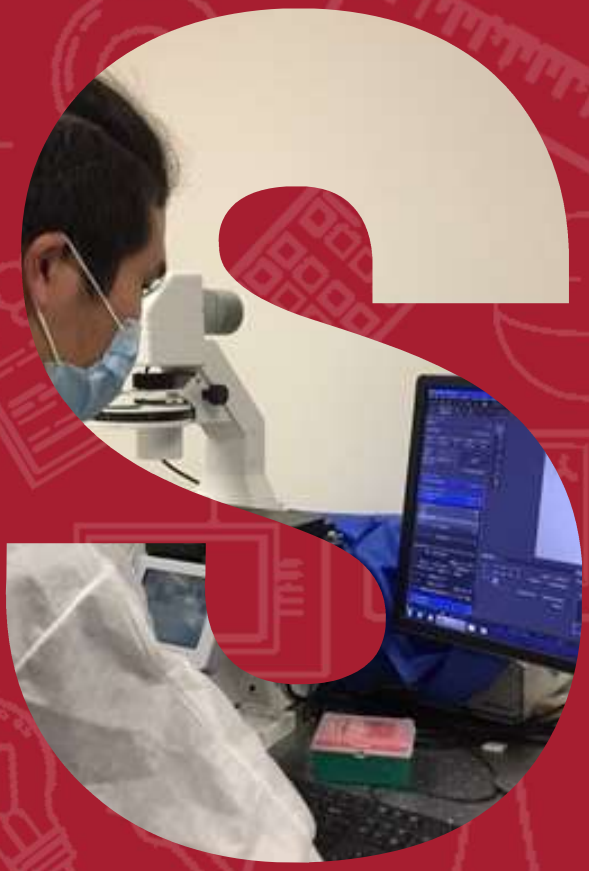

SLI STEM Internships

Volume 1, Number 1, 2022

Winter 2022 Micro-Internships

Editors:
Sophia Kim, SLI Director
Marissa Yáñez, STEM Workforce Specialist
Ram Subramaniam, STEM Division Dean

FOOTHILL COLLEGE
SCIENCE LEARNING INSTITUTE

About the Internships

The Science Learning Institute's mission is to advance equity and diversity in STEM at Foothill College by supporting students from underrepresented groups in their academic and career pathways in STEM. As a way to achieve this mission, SLI provides internship opportunities for students at Foothill, including the Winter 2022 Microinternships.

Foothill students participating in the Winter 2022 cohort were paired with mentors from local higher education institutions to work on research projects. These projects, ranging from self-driving cars to hyena behaviors, enabled students to gain insight into the research process and to work closely with mentors to advance academic and professional goals.

FOOTHILL COLLEGE
SCIENCE LEARNING INSTITUTE

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Biology

Research Intern

Amanda Antonelli dos Santos

Winter 2022

ABOUT YOU:

- Hometown: São Paulo, Brazil
- Major/certificate: Biology
- Transfer institution: San Jose State University
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/ institution: Stanford University
Website: https://dirzolab.stanford.edu/
Supervisor: Chinmay Sonawane

OBJECTIVE:

My objective during the internship was to code the behavioral responses of hyenas from videos taken by my mentor. With this data, I was to run statistical tests to find which responses were significant, giving my mentor preliminary results.

METHODS:

The first thing I did was read related research. One related paper's methods section described the coding rules they used for their experiment. Chinmay and I used this paper as a guide to form the coding rules I would be using. After this, I spent a few weeks coding the videos, and then I ran statistical tests on the coding data. To run these statistical tests, I used the RStudio program, which I also used to make violin plots to visualize the data.

RESULTS & DISCUSSION:

Our results found that the hyenas do respond significantly to the audios played. However, they responded to both the leopard audios and the jackal audios, which were meant to serve as a control. My results contribute to the overall project as they support that the audio stimulus has a statistically significant impact on hyena behavior, but they do not specify the hyena's response. For example, we know that the hyena behavior was impacted by the audio playing, but we are not sure in what shape it has been impacted. By running more statiscal tests, we could find out whether the hyenas were attracted to the noise and approached the source of the audio, or if they were afraid of the noise and they avoided the audio source.

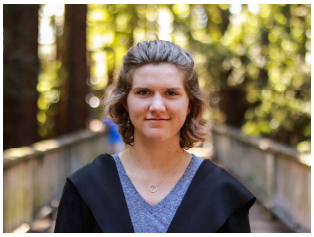
ACKNOWLEDGEMENTS:

- Chinmay Sonawane: My mentor & Ph.D student at Dirzo Lab
- Rodolfo Dirzo: Head of Dirzo Lab
- Jennifer Serrano Rojas: Ph.D student at Dirzo Lab
- Sophia Kim: SLI Director
- Marissa Yañez: SLI STEM Workforce Specialist

Genetic Elements and Toxin Antitoxin Systems of E. Coli

Lydia Calkum - Winter Quarter 2022

ABOUT YOU:



- Hometown: Sebastopol, CA
- Major/ certificate: Biology Major- Premed
- Year of graduation from Foothill College: Fall 2023

PLACEMENT:

Name of Institution: University of California Santa Cruz

Website: www.ucsc.edu

Supervisor: Amanda Carbajal

OBJECTIVE:

The goal of the internship was to gain more understanding in cutting-edge research of the genetic mutations in the bacteria, E.coli, that are causing a rise in antibiotic resistance.

METHODS:

We educated ourselves by reading peer-reviewed scientific papers that were chosen by our mentor related to our project subject. We met weekly to discuss questions and gain more insight to the work being done in her lab. In reading scientific papers, I learned to read papers by first reading the summary and introduction, the conclusion, and lastly, read the methods and results.

RESULTS & DISCUSSION:

In our results we were able to understand how the antibiotic class, Fluoroquinolones, binds to Gyrase A and Topoisomerase 4 which are important to the cell replication process. When antibiotics bind to them, it stops the cell from dividing and leads to cell death. We learned that the overuse of Fluoroquinolone is a factor in antibiotic resistance. Through studying the evolutionary resistance of Fluoroquinolones we can better assess what would be better used to treat mutated E. coli strains that are highly resistant. Through further research, there is potential to convince pharmaceutical companies to put more resources into updating antibiotics.

ACKNOWLEDGEMENTS:

Stacy Tran- Other Foothill student mentee in this project

Genetic Elements and Toxin Anti-Toxin Systems of E. Coli

Stacy Tran

Winter 2022

ABOUT YOU:

- Hometown: San Jose, California
- Major/ certificate: biological sciences major
- Transfer institution: University of California Irvine
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/ institution: University of California Santa Cruz
Website: https://www.ucsc.edu/
Mission (if a company):
Supervisor: Amanda Carbajal

OBJECTIVE:

The objective of this internship was to perform an in-depth literature search to understand the mechanism behind E.coli and its reason for inefficiency in our bodies.

METHODS:

I performed multiple literature searches by reading 2-3 peer-reviewed scientific papers referred to me by my mentor. After doing so, I constructed an informative powerpoint in which I shared my findings with my colleagues.

RESULTS & DISCUSSION:

The results of my project showed that the reason behind E coli resistance was due to a mutation within an enzyme for our body, which was topoisomerase 4 and gyrase. These 2 enzymes are responsible for stopping DNA replication, which in turn stops the spread of E.coli in our bodies. Since the medicine for E.coli (Fluoroquinolone) cannot bind to these enzymes, E.coli continues to persist within the body, making it harder to treat with the medicine that is in wide use today.

ACKNOWLEDGEMENTS:

I want to thank the SLI Internship program, Amanda Carbajal (my mentor), Sophia Kim, and Marissa Elena Yanez for this opportunity in helping me gain more confidence in the academia field.

Chemistry

Machine Organic Chemistry

Daniel Chavez

Winter 2022

ABOUT YOU:

- Hometown: Novato, CA
- Major/ certificate: Chemistry
- Transfer institution: UC
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/ institution: Stanford University
Website: https://mtzweb.stanford.edu/
Supervisor: Dr. Cody Aldaz

OBJECTIVE:

Our main objective was to train a computer to do Organic Chemistry. My role in our research project was to develop a dictionary of elementary step reaction templates and template generators in order to map-out reaction pathways (Mechanisms).

METHODS:

With a team, I coded chemical reaction templates using Python. We collaborated on a shared repository in Jupyter Lab, and individually pushed our edits and contributions to our project using Git. To coordinate tasks and document our progress, we used Asana, and to take group notes, we used Obsidian.

RESULTS & DISCUSSION:

The result of our work coding reaction templates and developing template generators was a database of elementary steps that were used to create reaction mechanisms. Our individual Elementary Steps enabled us to map out a network of viable pathways from our reactants (purchasable molecules) to our desired products. With reinforcement learning, we can develop this program to recognize the most promising organic synthesis route for retrosynthesis. Furthermore, we can evaluate the reaction mechanisms with quantum mechanics to predict the concentration and yield of our products!

ACKNOWLEDGEMENTS:

- Sophia Kim, SLI Director
- Marissa Yañez, STEM Workforce Specialist
- Dr. Cody Aldaz, Research Mentor & Post Doc Researcher at Stanford University
- Dr. Gandhi, Internship Advisor
- Samuel Pavelites, Alessio Valentini, Jan Estrada, & Todd Martinez (Martinez Group)

wFoothill SLI Winter Micro-Internship

Nhu Dao

Winter 2022

ABOUT YOU:

- Hometown: Saigon, Vietnam
- Major/ certificate: Chemistry
- Year of graduation from Foothill College: 2023

PLACEMENT:

Name of company/ institution: Stanford University
Supervisor: Kimberly Carter-Fenk

OBJECTIVE:

In my micro-internship, my mentor and I worked on a 10-week long investigative research project titled "Elucidating Intermolecular Interactions of Deep Eutectic Solvents with Quantum Chemistry". Our goals were to quantify the intermolecular interactions that give deep eutectic solvents their unique properties and create a generalized model for predicting and modeling DESs, specifically its intermolecular interactions.

METHODS:

Using a theory called SAPT (Symmetry Adapted Perturbation Theory), we were able to quantify the intermolecular interactions of deep eutectic solvent components and determined the dimer with the highest magnitude in total interaction energy. The molecules we used were tetramethylammonium ion, ethylene glycol, and chloride ion.

RESULTS & DISCUSSION:

The tetramethylammonium chloride dimer had the highest magnitude in total interaction energy and we determined that the deep eutectic solvents involving ions will have the highest magnitude in total interaction energy.

ACKNOWLEDGEMENTS:

I would like to thank Kim for being my mentor and giving me this opportunity to explore research. I would also like to thank Sophia and Marissa for supporting this micro-internship and Foothill SLI, Stanford University, and Stanford Research Computing Center for providing computational resources and support that contributed to these research results.

Teaching Computers Organic Chemistry

Junyue Lin

Winter 2022

ABOUT YOU:

- Hometown: Jiangmen, China
- Major/certificate: Biochemistry
- Transfer institution: N/A
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/institution: Stanford University
Website: https://www.stanford.edu/
Supervisor: Cody Aldaz

OBJECTIVE:

The objective of the research project was to develop a database that can speed up the reaction outcome prediction by teaching computers organic chemistry.

METHODS:

We broke down the mechanism into elementary steps and encode each reaction into Jupyter notebook in Python 3. Working in a team, we used Git to synchronize the files between our local computers and the remote repository. We also utilized Asana to manage the workflow of the team.

RESULTS & DISCUSSION:

Together with two other fellow interns, we contributed to a library of reaction temples (512 at the end of the internship) that can be used to form unique reaction mechanisms. We managed to successfully stimulate five reaction mechanisms in total. In the big picture, our project can help speed up the process of reaction outcome prediction and synthesis planning by using the templates we coded to automate all the possible pathways for a reaction mechanism.

ACKNOWLEDGEMENTS:

Cody Aldaz – Supervisor/Mentor
Sophia Kim, Marissa Yanez – SLI Director
Vivian Truong, Daniel Chavez – Fellow Intern

Teaching Machines Organic Chemistry

Vivian Truong

Winter 2022

ABOUT YOU:

- Hometown: Sunnyvale
- Major/ certificate: Biological Science
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/ institution: Stanford University
Supervisor: Cody Aldaz

OBJECTIVE:

To train a computer to do organic chemistry

METHODS:

We used Asana to organize our tasks and Git to access and upload our work to the repository and work as a team. We used Obsidian as our smart notebook and Jupyter Lab for coding with Python. We had weekly office hours with our mentor and weekly buddy meetings as a team.

RESULTS & DISCUSSION:

We were coding elementary steps and templates in Jupyter Lab and used those templates to create reaction mechanisms. Our role was to work on this template library so we could use it and feed the computer and it will be able to predict the products of the reaction. Eventually, we will get it to predict the yield and concentration of the products, but that is still a work in progress.

ACKNOWLEDGEMENTS:

Cody Aldaz, Stanford University
Sophia Kim, Foothill College
Marissa Yanez, Foothill College
Samuel Pavelites, Cornell University
Alessio Valentini, Stanford University
Jan Estrada Pablon, Stanford University
Todd Martinez, The Martinez Group

Engineering

Sensor for Wearable Electronics

Tosif Aliyev

Winter, 2022

ABOUT YOU:

- Hometown: San Jose, Ca
- Major/ certificate: Engineering
- Transfer institution: San Jose State University
- Year of graduation from Foothill College: Fall, 2022

PLACEMENT:

Name of company/ institution: Stanford University
Website: https://www.stanford.edu/
Mission (if a company):
Supervisor: Kaiwen Hsiao

OBJECTIVE:

Design capacitive sensors for wearable electronics with high sensitivity.

METHODS:

I come up with a design idea that can change the sensitivity of the sensor. I first did a very rough sketch on paper then used Computer-aided design software such as Fusion 360 and Ansys to draw the geometrical shape. I then performed strain-stress, force-strain, and force-deformation tests. I collected data and graphed it. Based on my results, I did the necessary modifications to my designs and repeated the simulations tests.

RESULTS & DISCUSSION:

I found the sensitivity of the sensor depends on material elasticity, the dielectric constant of the material, and architecture. As I increased the void volume of my design, strain vs force curve flattened which means it required less force to deform the middle part of the sensor, and hence it becomes more sensitive.

ACKNOWLEDGEMENTS:

Mentor: Kaiwen Hsiao, a postdoctoral researcher at Stanford
Frank Cascarano, Physics Professor at Foothill College
Sophia Kim, SLI Director
Marissa Yañez, STEM Workforce Specialist
Miloni Gandhi, Internship for Credit and Global Studies Instructor

Reverse engineering from kinematics to impacts: deduce the impact direction and velocity based on wearable sensor measurement

Daisy Fragoso
Winter 2022

ABOUT YOU:

- Hometown: San Jose
- Major: Computer Science
- Year of graduation from Foothill College: 2023

PLACEMENT:
Name of company/ institution: Stanford University Bioengineering
Supervisor: Xianghao Zhan

OBJECTIVE:
Extract features from the sensor signals, create a linear regression model, find the best model with Elastic Net(alpha), then report the results on train/val/test.

METHODS:
To report the results on train/val/test. I first had to read the MATLAB file in python. I tried using scipy.io to load the MATLAB file. Ran into some complications because the MATLAB files version were not supported. Then did a little bit of researched in google and found that importing mat73 and using .loadmat would work perfectly. Then I had to access the data and extract features from the sensor signals, in this case the sensor signals were angular acceleration, angular displacement, angular velocity, linear acceleration, linear displacement, linear velocity and find the integral, max, to peak.

RESULTS & DISCUSSION:
The research project goal is to use kinematics data measured by the mouthguard to predict the force on the helmet for the detection of dangerous impacts. One of my final works was to use linear regression model, to report the results on train/val/test. Then I used ElasticNet and modified the hyperparameter, alpha, to again report the train/val/test.

ACKNOWLEDGEMENTS:
Xianghao Zhan, Sophia Kim, Marissa Yanez

Building a 3D Simulator for Auxetic Surfaces

Samantha Izaguirre

Winter Quarter 2022

ABOUT YOU:

- Hometown: Guatemala City
- Major/certificate: Computer Science
- Year of graduation from Foothill College: 2023

PLACEMENT:

Name of company/ institution: SLI Micro-Internship
Website: https://foothill.edu/sli/
Supervisor: Ahad Rauf

OBJECTIVE:

The goal is to visualize these auxetic skin patterns as they deform in a 3D display, so we can see how the auxetic surfaces change when they are being stretched over a period of time. And, I was looking to accomplish transitioning the 2D visualization code to 3D.

METHODS:

We used the Python programming language to write out the code while using the packages; Numpy for numerical calculations and Matplotlib for 3D visualization. There were 3 papers I had to read, my mentor's final project on the mathematical explanation of the 2D calculations and two more research papers on Buckling-induced kirigami. At the beginning of the internship, I got familiarized with previous 2D research and python packages. Then I applied the concepts I learned in the middle of the internship. And, in the end, I focused on creating Unit Tests.

RESULTS & DISCUSSION:

The unit tests are what we'd expect the output of your code to look like for a few simple inputs. And there were mathematical calculations such as the 3D rotation matrices I had to use for the unit tests. The Unit Tests help future programming to continue converting the 2D visualization code to 3D. My mentor pointed out how one of the common issues when programming is that someone might implement a function without having a clear idea of what they're trying to achieve or what the expected output should look like at the end. So, creating unit tests beforehand can help a programmer focus their time and effort into making sure that their code produces the output they expect. It's the reason why my mentor chose simple unit tests on purpose since it's easy to think through all the math on paper before checking the code is doing the right thing to produce the output.

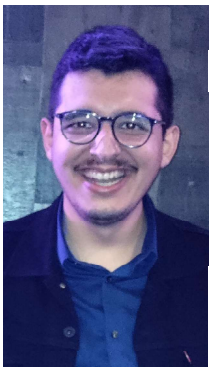
ACKNOWLEDGEMENTS:

Ahad Rauf, Marissa Yanez, Sophia Kim, Miloni Gandhi, Funding sources of research project (EPA, DARPA, NIH, NSF) & Foothill College & SLI for scholarship funding

Random Walk in Applied Physics

Erik Mercado

Winter 2022



ABOUT YOU:

- Hometown: Hayward, CA
- Major/ certificate: Electrical & Computer Engineering
- Transfer institution: UC Santa Cruz
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/ institution: University of California Merced
Website: https://engineering.ucmerced.edu/academics/graduate-programs
Supervisor: Anupam Mishra

OBJECTIVE:

To learn and compare passive and active brownian particles. Also, to learn MATLAB and create a simulation of a particle undergoing brownian motion in one and two dimensions.

METHODS:

To begin, I had to read several articles explaining Brownian motion. While that was occurring I was also learning MATLAB. I then moved on to other researcher papers explaining the mathematical equations that express random movement. I then applied all the information I had gathered and coded a program that will simulate the completely random movement of a particle.

RESULTS & DISCUSSION:

I found that particles are one hundred percent random. No two particles will share the same path. With this information we found that we can design and create a form of a blockade in air filters and surgical masks. The block aids can be adjusted by thickness, distance between blackheads, and at the angle in which they open. Each of these parameters had their advantages and disadvantages.

ACKNOWLEDGEMENTS:

Anupam Mishra - Mentor
Sophia Kim & Marissa E. Yáñez - SLI Coordinators
Jeff Anderson - MATLAB Support

Enhance Sensor Compatibility for a Custom Arduino-Based Datalogger

Jasmin Ramos

Winter 2022

ABOUT ME:

- Hometown: Mountain View
- Major/Certificate: Mechanical Engineer
- Transfer Institution: UC Davis
- Year of Graduation from Foothill College: 2024

PLACEMENT:

Name of company/institution: Wind Engineering Lab, Stanford University
Website: www.stanford.edu
Supervisor: Jack Hochschild

OBJECTIVE:

The first goal for this project was to implement Arduino with code for CO2 sensors in order to collect data from the sensors. The second goal for this project was to test the quality and accuracy of the measurements from the sensors through different experiments.

METHODS:

I first began with familiarizing myself with Arduino and the sensors. Next I used the Arduino software to add code from the sensors to enable the Arduino to read and collect data from the sensors. Code was also added to allow wifi to send the data to a server where I would be able to analyze the data. A Python IDE was used to view the collected data. The second goal included experimenting under different types of environments, conditions and time spans.

RESULTS AND DISCUSSIONS:

Through the graphs developed from the Python IDE, we found that the VOC sensor didn't work well and the CO2 sensor was the better option despite being more expensive. Next, it's likely that the code gets adjusted to collect data from only the CO2 sensor. Currently, the Arduino still includes the VOC sensor code. After, the CO2 sensor could be incorporated into a detector for air quality.

ACKNOWLEDGEMENTS:

- Jack Hochschild, Mentor
- Sophia Kim, SLI Director
- Marissa Yanez, SLI STEM Workforce Specialist

Fundamental Studies of Non-Covalently Bonded Soft Materials

Elias Vlastos

Winter 2022

ABOUT YOU:

- Hometown: Casper, WY
- Major/ certificate: Engineering
- Year of graduation from Foothill College: 2023

PLACEMENT:

Name of company/ institution: Bao Research Group, Stanford University
Website: https://baogroup.stanford.edu/
Supervisor: Will Henderson

OBJECTIVE:

Our research concerned the design and synthesis of organic compounds for use in non-covalently bonded soft materials. My focus was the design, synthesis and characterization of the compound CODT and its derivatives for use in supramolecular polymers.

METHODS:

Reactions at room temperature and at reflux were used to synthesize target compounds which were then purified using a variety of techniques including rotary evaporation and column chromatography. Compounds were characterized using thin layer chromatography, proton NMR, IR spectroscopy and X-ray crystallography. PerkinElmer's ChemDraw software was used to draw compounds and reactions.

RESULTS & DISCUSSION:

Over the course of ten weeks my mentor and I successfully synthesized a variety CODT derivatives and were ultimately able to verify that we had controlled the conformation of our final target compound thereby achieving the desired "boat" (or contracted) conformation. These results pave the way for further functionalizations of CODT and ultimately the creation of supramolecular polymers.

ACKNOWLEDGEMENTS:

- Will Henderson, Postdoctoral Scholar, Stanford University
- Marissa Yáñez, SLI STEM Workforce Specialist
- Sophia Kim, SLI Director

Medicine

SLI STEM Microinternship

Hyeon Seok Choi

Winter 2022

ABOUT YOU:

- Hometown: Gimpo, South Korea
- Major/ certificate: Biology
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/ institution: Canary Center at Stanford for Cancer Early Detection
Website: https://canarycenter.stanford.edu/
Supervisor: Jie Wang

OBJECTIVE:

- Engineering self-propelled micromotor for drug delivery
- Engineering microalgae for cancer therapy
- Perform comprehensive literature review to understand mechanism behind how micromotor and microalgae improve cancer therapy efficiency.
- Learn how to track and analyze image data for microalgae and micromotor using ImageJ
- Fabricate microfluidic device using laser cutter

METHODS:

First, I performed a comprehensive literature review to understand the mentor's project. I started from the terms that I didn't know, and the mechanism involved in propulsion, targeting cancer tissue, and chemical reaction. Thereafter, I understand the experiments used to prove that micromotors and microalgae are improving cancer therapy efficiency in previous papers Then, I analyzed the microscopy data from the mentor's experiment using ImageJ plugins. I quantitatively calculate the RGB value of pixels to measure the intensity of fluorescence from normal and confocal fluorescence microscopy data. I designed a microfluidic device using the laser cutter and assembled the parts.

RESULTS & DISCUSSION:

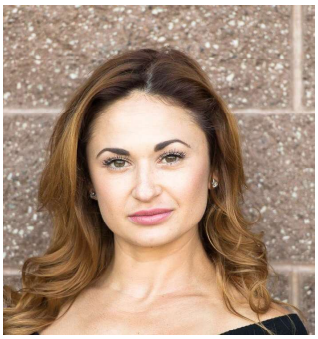
The major results from the internship period are image analysis and microfluidic devices. Through the image analysis, I converted qualitative experimental data from the mentor's experiment to quantitative data, which can be used to graph, conclude and comprehend the visual results. The image that I used includes the videos image of the propulsion of micromotor and fluorescence image of cancer cells by different treatments. It is important because we can draw objective and obvious conclusions from microscopic image data. I made the laser 3D cutting microfluidic device. With the microfluidic device that I made during the internship, we could culture cells in different situations, such as the flow rate of the culture medium and drug candidates for testing. These various arrays of conditions in culturing cancer cells allow the cells to fit the model environments mimicking the human body tissue. All my work from my internship contributes to the research on improving cancer therapy and reducing the side effects of cancer therapy.

ACKNOWLEDGEMENTS:

Sophia Kim, Foothill College / Marrisa Yanez, Foothill College

Copper depletion for the treatment of cancer

Natalia Franchuk
Winter 2022



ABOUT YOU:
Hometown: *Mountain View, CA*
Major/ certificate: *Biology for transfer*
Transfer institution: *University of Tennessee, Knoxville or California State University, Northridge*
Year of graduation from Foothill College: *2022*

PLACEMENT:
Name of company/ institution: *Stanford University*
Website: https://med.stanford.edu/ Supervisor: Liyang Cui, Ph.D.

OBJECTIVE:
The research goals:
- Explore a new chelator and new formulation for copper deleting nanoparticles (CDN) to see if we can further improve the efficacy of the Copper depleting treatment for breast cancer.
- Create a protocol that can be standardized to achieve a chelator-containing formulation that is stable.
- Develop a series of assays to characterize this nanoparticles property.

METHODS:
I used several tools to complete my project:
- Nanoparticle (CDN) Formulation
  - Sonicator (Branson, W-150)
  - Centrifuge
- Characterization of the copper-depleting nanoparticle
  - Measured Absorption spectra using UV-Vis spectroscopy.
  - Analyzing data in Excel
  - Measured Size, charge, and morphology with Dynamic light scattering (DLS) Zetasizer
- Breast Cancer cells culturing
- Cell viability MTS assay
  - Microplate reader
  - Prism data analysis

RESULTS & DISCUSSION:
Dr. Liyang Cui and colleagues developed a copper-depleting nanoparticle (CDN) and demonstrated its safety and efficacy against triple-negative breast cancer in mice. In this project, we were interested in exploring a new chelator (CPC2) and a new formulation for CDN to see if we can further improve the efficacy of the coper-depleting treatment for breast cancer. Currently, there are not many chelators available that are highly specific to Cu 1 or Cu 2 but do not affect other metals in the body. We hypothesize that the CPC2 chelator has better binding abilities to Cu1 in mitochondria. In the initial stage of our research, we successfully designed, formulated, and characterized a new copper-depleting nanoparticle.

ACKNOWLEDGEMENTS:
Mentor: Liyang Cui, PhD. Jianghong Rao Lab team Sophia Kim, SLI Director
Marissa Elena Yáñez, STEM Workforce Specialist

SLI STEM Micro-Internship

Momo Hlaing

Winter 2022

ABOUT YOU:

- Hometown: Cupertino, CA
- Major/ certificate: Biological Sciences
- Transfer institution: Undecided
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/ institution: Stanford University, Radiology School of Medicine
Website: https://thakorlab.stanford.edu/
Supervisor: Shashank Chetty

OBJECTIVE:

To understand and analyze the metabolic profile of stem cells under normal condition.

METHODS:

I cultured stem cells using standard protocols (frozen to cell culture), then analyzed the metabolic profile of stem cells in two ways. I first investigated the NADH dehydrogenase activity (an important protein in OXPHOS that eventually leads to ATP production) using CCK-8 Assay at 488 nm with a spectrophotometer which uses the conversion of a salt into a dye through NADH dehydrogenase activity to quantify the number of living cells. This was used with Rotenone, a drug that damages the mitochondria to see at which point the metabolic health gets inhibited. Then I visualized stem cells using a Leica Confocal Microscope using different dyes for the cytoskeleton, nucleus, and mitochondria to determine the mitochondrial distribution and cell proliferation.

RESULTS & DISCUSSION:

We learned that higher Rotenone concentration results in lower NADH dehydrogenase activity which correlates to lower metabolic health and what is very interesting about our data is that metabolic health only dropped at 20nM of Rotenone while at 10nM, it had not dropped yet. This indicates that metabolic health only starts dropping after 10nM of Rotenone. From this experiment, we learned that it is possible to determine the metabolic health of MSCs by analyzing NADH dehydrogenase activity. In addition, we were also able to visualize mitochondrial distribution and cell proliferation through confocal imaging. As for next steps, we would like to test the mitochondrial health in different conditions, namely inflammation (immune system response) and hypoxia (tumor/ cancer environment).

ACKNOWLEDGEMENTS:

Shashank Chetty – Mentor; Postdoctoral researcher at Stanford University
Sophia Kim – SLI Director
Marissa Yañez – STEM Workforce Specialist

COVID-19 Impact in Jails:
Science Communication & Policy Brief

Corinne Ladinez
Winter Quarter 2022

ABOUT YOU:

- Hometown: Millbrae, CA
- Major/ certificate: Psychology
  - Interest in studying Biology after Transfer
- Year of graduation from Foothill College: Fall 2023

PLACEMENT:
Name of company/ institution: Stanford University
• Department of Epidemiology & Population Health
Website: https://med.stanford.edu/
Supervisor: Yiran Liu

OBJECTIVE:
Overall Research Project: There is a lack of information on the effectiveness of COVID-19 policies and transparency of infection and death rates in jails, Stanford researcher's goal is to understand the COVID-19 policies in jails and indirect impacts on incarcerated individuals and jail staff
My research project focus: Develop my key findings from scientific papers & create a policy brief to be sent out to local policy makers

METHODS:
Stanford researchers partnered with local correctional officials to study the impact of COVID-19 policies in jails and developed their scientific papers, and my role was to analyze their findings and develop policy recommendations. To find my key takeaways of the scientific paper, I had to take notes, ask questions, and read journals to better understand the larger issues relating to my research goal. In addition, I also examined the tables and figures to find results of the research, and created templates and brochures to develop a format to communicate my policy recommendations.

RESULTS & DISCUSSION:
After an extensive analysis on the scientific paper I was studying, I detected significant key findings and established policy recommendations. One significant key finding is that there is flawed implementation of the COVID-19 policies and a lack of infection response from jail staff and correctional health officials. For example, there was inadequate mask distribution to jail residents which resulted in 2/3 of incarcerated individuals to receive a new mask less often than once a month. Moreover, 1 in 5 jail residents who reported symptoms said no action was taken. In addition, the impact of the harsh COVID-19 policies led to underreporting of symptoms due to the fear of isolation, in fact, 4 in 10 residents did not report their COVID-19 related symptoms due to the fear of isolation. These significant findings entails that the COVID-19 policies in jails are insufficient towards preventing COVID-19 infection and outbreaks among jail residents and staff. In fact, the lack of practice of infection response can lead to increased risk of infection, worsened mental health, and expressions of neglect.
One policy recommendation that I've developed is to implement and monitor systematic procedures for supplying face masks and cleaning supplies provided by jail staff frequently, followed with consistent infection response from jail staff and correctional health officials to establish better preventive measures for jail residents and their safety.

ACKNOWLEDGEMENTS:
Yiran Liu, Stanford University of Medicine - Mentor
Marissa Yañez, Foothill College - SLI STEM Micro-internship Supervisor
Sophia Kim, Foothill College - SLI STEM Micro-Internship Supervisor
Dr. Gillian Schultz, Foothill College - Human Biology Instructor
Miloni Gandhi, Foothill College - SLI STEM Micro-internship ITRN class Instructor
SLI Internship & Foothill College - Internship Funding

Targeting Myeloid-derived Suppressor Cells for Cancer Immunotherapy

Hailie My-Hien Le
Winter 2022

ABOUT YOU:

- Hometown: My Tho City, Vietnam
- Major/certificate: Biology
- Transfer institution: Not yet known
- Year of graduation from Foothill College: 2022

PLACEMENT:
Name of company/institution: Stanford University
Website: https://med.stanford.edu/
Supervisor: Allison Banuelos

OBJECTIVE:
To find an alternative treatment option for ovarian cancer by targeting tumor-specific cells and incorporate this method into cancer immunotherapy.

METHODS:
To try to understand why macrophage depletion aggravates tumors, we used an inducible CSF1R (colony-stimulating factor 1 receptor) knockout mouse. CSF1R is a gene and a receptor that initiates the production of macrophages. We crossed CSF1R floxed mice with Mx-1 Cre mice. After genotyping these mice, we injected them with Poly IC, a drug that knocks out CSF1R in the presence of Cre and therefore ceases the production of macrophages. One week later, we harvested and analyzed the cells using FACS and Flow Cytometry and confirmed our hypothesis. Then, we injected thioglycolate, an infection to stimulate the immune responses toward an inflammation or cancer, into 2 groups of mice that had been treated with Poly IC previously, in which one group had gene Cre and the other did not, to evaluate the results in connection with MDSC (myeloid-derived suppressor cells) that populates and promotes growth at the cancer site. Molecule SB225002 was tested to observe its effects on the activation of MDSC from neutrophils.

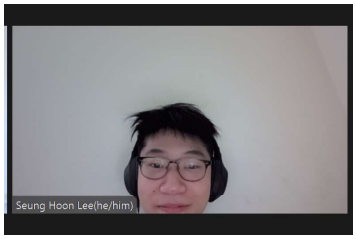
RESULTS & DISCUSSION:
The non-Cre mice after having been injected with Poly IC and thioglycolate produces macrophages to battle the infection. On the other hand, the Cre mice did not produce macrophages to fight the infection. In this situation, chemokines released from the inflammatory site would bind onto the neutrophil's surface protein, CXCR2, activating immunosuppressive activities. However, SB225002 provided promising results by attaching to CXCR2, preventing the initiation of immunosuppressive behavior from neutrophil, thus stopping the MDSC development, a contributing factor to ovarian cancer.

ACKNOWLEDGEMENTS:
Allison Banuelos, 4th-year Ph.D. Student at Stanford University
Sophia Kim and Marissa Yanez at Foothill Science Learning Institute

A Qualitative, Facebook Group Analysis of Key Symptomatic Concerns of Patients with Epidermolysis Bullosa

Seung Hoon Lee

Winter 2022



ABOUT YOU:

- Hometown: Seoul, South Korea
- Major/ certificate: Biological Sciences
- Year of graduation: 2025

PLACEMENT:

Name of company/ institution: Stanford University
Website: https://www.stanford.edu/
Supervisor: Shivali Fulchand

OBJECTIVE:

The goal of this internship was to find key concerns for Epidermolysis Bullosa patients that may not be currently known to physicians through the close qualitative analysis of Facebook Groups.

METHODS:

I chose a range of comments to closely analyze over a two-week period between January 1st to January 15th of 2022, which I transferred to a premade table. We started to analyze and code for various themes that were present as well as various patient demographics such as age, EB subtype, as well as geographic location. Some restrictions that we placed on our data selection method were that we did not include non-English posts and those with no text.

RESULTS & DISCUSSION:

Throughout the course of the internship, my key findings included the fact that the comments mostly related to the management of one's condition, whether that be in proposing new treatments or questioning the effectiveness of already well-known treatment methods. We also compared our findings with previous quantitative text mining studies in which we were able to pick up on more key patient concerns that were deemed to be less mentioned in the previous study. For example, hair loss was not displayed to be one of the more prominent symptoms of Epidermolysis Bullosa but after an analysis of the Facebook Group, we were able to come to the conclusion that hair loss was a key concern for some patients. As a result, we realized that these quantitative studies have limitations in the regard that they are usually unable to fully pick up on patient concerns.

ACKNOWLEDGEMENTS:

Thank you to Shivali Fulchand for being a wonderful mentor throughout the course of this internship. I thank the Science Learning Institute at Foothill and Stanford for making this opportunity possible as well as Sophia and Marissa for their support throughout the course of this internship.

Research Intern at Stanford

Xuanwei Liang

Winter 2022

ABOUT YOU:

- Hometown: Jiangmen, China
- Major: Physics
- Year of Graduation from Foothill College: June 2022

PLACEMENT:

Name of Institution: Stanford University
Website: https://med.stanford.edu/pratxlab.html
Supervisor: Dr. Hieu Nguyen

OBJECTIVE:

Develop a user-friendly program to automate the process of exponential fit for the phosphorescence decays and obtain the associated lifetimes that aims at verifying oxygen depletion upon FLASH radiation.

METHODS:

Developed working algorithm in Jupyter Notebook by using existing data. The analysis of data contains a series of procedures such as curve isolation, background removal, exponential fit, and CSV file generation. The algorithm was then integrated into Pycharm for a prompt automation process and important data exportation in a user-friendly IDE.

RESULTS & DISCUSSION:

The dissolved oxygen calibration curve produced by my program demonstrated a consistent trend and values as the results reported previously. In addition, it matches the Stern-Volmer relationship with a R^2 value of 0.988. Therefore, the program is able to extract the phosphorescence lifetime accurately, and replicate the outcomes reported previously; highlighting the program's potential for future data analysis, and thus, contributing to the understanding of FLASH's mechanism.

ACKNOWLEDGEMENTS:

Dr. Hieu Nguyen - Mentor; Postdoctoral Researcher at Stanford
Dr. Guillem Pratx - Principal Investigator; Associate Professor at Stanford
Sophia Kim - SLI Director
Marissa Elena Yanez - SLI STEM Workforce Specialist
Miloni Gandhi - Internship Course Instructor

Physics and Astronomy

Autonomous Vehicle Radar Tracking and Algorithm

Gerardo R Padilla Jr

Winter 2022

ABOUT YOU:

- Hometown: Santa Clara, CA
- Major/ certificate: Computer Science B.S.
- Transfer institution: San Jose State University
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/ institution: Stanford University
Website:
Supervisor: Adyasha Mohanty

OBJECTIVE:

Our research is focused on Autonomous Vehicle Tracking, especially with Radars, and the implementation of the Kalman Filter, to create more accurate readings for positions and velocities.

METHODS:

The first and most important step was the familiarization with the Kalman Filter; its function, mathematics and physics behind it. Then, we had to research and understand the Methods of Vehicle Tracking, such as radars, cameras, Lidars, and Sonars.
After this, I had to understand the Python Programming Language, and Matlab, for the purpose of modeling this project. The final step was the creation of the Code and implementation; Using Python and Matlab, we created a filtering algorithm to make our radar measurements accurate

RESULTS & DISCUSSION:

As a result of this internship, I gained a deeper understanding of the Python Programming Language, Matlab, differential Equations, physics, and general Vehicle Tracking.
The Kalman Filter Algorithm would prove useful to determine how useful and accurate a radar measurement is to us.
The Algorithm will be used to Track positions and distances with respect to other vehicles in situations where less control is available, such as in drifting.

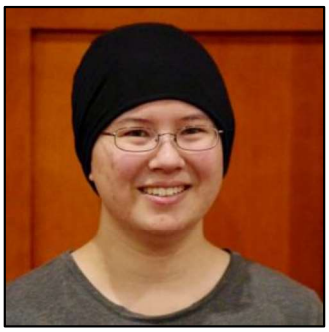
ACKNOWLEDGEMENTS:

Adyasha Mohanty (Mentor, Aerospace Eng. Ph.D Student at Stanford University)
Sophia Kim (Director, Science Learning Institute at Foothill College)
Marissa Elena Yáñez, Ph.D (Foothill College Faculty, SLI institute)
Sarah Parikh (Professor @ Foothill, Mechanical Engineering Ph.D)

Modeling Blazar Spectra

Sarah Youngquist

Winter 2022



ABOUT YOU:

- Hometown: Palo Alto
- Major/ certificate: Computer Science
- Year of graduation from Foothill College: 2022

PLACEMENT:

Name of company/ institution: UC Santa Cruz
Website: https://www.physics.ucsc.edu/
Supervisor: Dr. Olivier Hervet

OBJECTIVE:

Model the spectral energy distributions of blazars using a Markov chain Monte Carlo (MCMC) method in Python. Create clear code that can be made public to the scientific community.

METHODS:

A spectral energy distribution can be created from certain parameters. The goal of the algorithm was to find the best parameters given the real data. Markov chain Monte Carlo does this by randomly selecting parameter sets and iteratively converging on the best solution. I implemented the MCMC in Python using the `emcee` package, and I wrote functions for plotting and data analysis. I also modified C++ code written by my mentor to allow the Python program to run faster. I created the code based upon code previously written by a PhD student for her thesis.

RESULTS & DISCUSSION:

I wrote fully functional code that can run the Markov chain Monte Carlo program from a parameter file or be imported and used within Python. We tested the MCMC method on a specific blazar that has been modeled by scientists using a completely different method in order to validate the MCMC; we found similar results as we hoped. The code is well-documented and understandable so that it can eventually be released to the public for use by the scientific community. It is several times faster than the code it is based upon due to implementing parallel processing, it is more flexible because code is moved into functions with optional parameters, and the code has more features.

ACKNOWLEDGEMENTS:

Dr. Olivier Hervet—Mentor, UC Santa Cruz
Sophia Kim and Marissa Yañez—SLI Micro-Internship program organizers

Student Testimonials

The Winter 2022 SLI Microinterns researched an incredible range of topics from cancer treatments to blazars in distant galaxies. A lot of the interns had some final words about their experience, which we share below.

"I'm thankful to have had the opportunity to participate in this internship. I got to learn the significance of how computer science is making an impact in the world. I was able to feel more confident with programming."

- Computer Science student

"This internship gave me great hands on experience on industry standard software. Gave me a boost in confidence in my skillset. I now know capable of doing whatever I set my mind to."

- Biology student

"This internship opened up a whole new door into the world of research that I didn't know about as well as created very important connections that I can now fall back on in terms of opportunities. Although I was initially hesitant about stepping foot into the world of academia because I felt that I did not have enough knowledge, this internship experience allowed me to feel much more confident about doing research and allowed me to see myself doing this at a 4-year institution."

- PreMed Student

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