FOOTHILL COLLEGE
SCIENCE LEARNING INSTITUTE

SLI STEM Micro-Internships Winter 2022: Project and Mentor Catalog

NOTE: This document was updated on 11/9/21 to create more understandable Topic Names for each project. If you saw previous version of this catalog, just know that the order of all the projects remains the same.

The following are the possible research projects you will be working on this winter if selected. In your application, you will be asked to mark all that you are interested in.

Read through each description carefully to see if

1) You have the skills that the mentor is asking for.
2) You have an interest in the topic.
3) The modality works for you – several of these are in-person, either fully or partially. You will need to provide your own transportation to the institution and some have parking fees. We will provide some financial assistance if you have demonstrated need (through the FAFSA or CA Dream Act) or some other means of proving your financial need.
4) Use this as a guide as you fill out the application. READ IN FULL DETAIL!

If you have any questions, please reach out to the SLI Director, Sophia Kim at kimsophia@fhda.edu. We are happy to provide support with the application process.

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*See here a **summary** of the research projects.*
Click on the link of the projects you're interested in to read in more detail.

BE SURE TO REVIEW THE FULL DESCRIPTION BELOW THIS TABLE OF CONTENTS!

Biology

Topic	Required Skills	Modality	CODE NAME (for application)
Cell Communication	Interest in biochemistry required! Introductory molecular biology coursework preferred but not required. Other biology, chemistry, biochemistry coursework a plus.	Hybrid - with more emphasis on in-person, if possible	**Bruguera – Wnt signal**
How Bacteria Develop Resistance to Antibiotics	Good communication, interest, drive, and some basic knowledge of biology and microbiology. If the student has the time, interest and work ethic, the rest will work out just fine.	Can be fully remote, but in-person opportunities are available if desired	**Carbajal – Genetic Toxin E.Coli**
Hyena Behaviors	A background in basic ecology is useful, but enthusiasm to learn more about ecology and evolutionary biology is all that is necessary.	Online, in-person, or hybrid – student's choice	**Sonawane - Hyenas**

Chemistry

Topic	Required Skills	Modality	CODE NAME (for application)
Teaching Machines Organic Chemistry	General Chemistry, Organic Chemistry (preferred)	Can be fully remote, but in-person opportunities are available if desired	Aldaz – Machine OChem
A Study of Intermolecular Interactions in a New Class of Chemicals	The mentee will be expected to have taken at least one semester/quarter of General Chemistry. Computing/programming experience is not required, but a willingness to try and learn new things will be helpful! The computer does most of the math, so an extensive math background is also not required!	Fully remote/ online	Carter-Fenk – Quantum Chemistry
3D Printed Materials for Grid Storage and Solar Batteries	Interests in materials science, electrochemistry and batteries. Basic knowledge of general chemistry and physical chemistry. Ability of searching information (scientific literature) on the internet. Skillful use of Microsoft Word, Excel and PowerPoint.	Fully remote/ online	Lin – 3D printing Zinc
Synthesizing Polymers for Drug Delivery and Bioengineering Applications	Ideally, a student would have some familiarity with organic chemistry (understanding chemical structures, for example), but I understand if that's not possible. I don't expect my mentee to have any experience with lab techniques. Overall, I expect this to be a learning experience, and the most important skill for my mentee is a willingness to ask questions!	Mostly in-person with the possibility of some remote work (1-2 hrs/wk).	Williams - Hydrogels

Engineering

Topic	Required Skills	Modality	CODE NAME (for application)
Developing Stretchable Materials for Wearable Electronics	The only knowledge a student may need would be a background and interest in general chemistry. An interest in organic chemistry, materials science, or chemical engineering would be beneficial.	Fully in-person	Henderson – Wearable Electronics
Writing Arduino Codes and Designing Circuits for Environmental Applications	Basic experience with coding (at least 1 quarter of introductory computer science or equivalent necessary)	Could be either fully in-person or hybrid, but not fully remote	Hochschild – Arduino Datalogger

CAD Design and Structural Modeling for Wearable Electronic Sensors	Some exposure or background to engineering concepts would be great. At least one quarter of physics is preferred. Coding skills such as Python are also helpful as opportunities to pursue coding may arise as the project progresses.	Fully remote/ online, with some opportunities for in-person if the student desires	Hsiao - CAD
Random Walk with Matlab	A curious mind, having taken at least 1 quarter (or equivalent) of Computer programming and at least 1 quarter of Calculus (Math 1A) is required. Some experience with Matlab is desired or at least have an interest in learning Matlab.	Fully remote/ online	Mishra – Random Walk
Building a 3-D Simulator for Auxetic Surfaces	General programming experience is expected (Python is preferred, although C or Julia is good as well), and prior coursework or experience in optimization would be nice. A background in solid mechanics or computer graphics would also be helpful, but not required. A positive mental attitude is always welcome :).	Hybrid - remote/ online with some in-person opportunities	Rauf – Auxetic Simulator
Traumatic Brain Injury and Sensor Measurement	Experience or knowledge of Python required, knowledge of numpy, machine learning and deep learning is preferred	Can be entirely remote/ online, but some in-person opportunities are possible if the student desires	Zhan - Kinematics and Brain Injury

Medicine

Topic	Required Skills	Modality	CODE NAME (for application)
Understanding Immune Cells to Fight Cancer	Having taken a biology course or two might be helpful (but not necessary)	1 – 2 short days a week in-person, rest of time online	Banuelos – Cancer and Suppressor Cells
Copper Depletion for Cancer Treatment	I expect the mentee to have basic knowledge of cell biology. It would be a huge plus if they have lab (course) experience and understand lab safety.	Fully in-person	Cui – Copper and Cancer
Stem Cells in Different Conditions	Basic laboratory work practice (have taken at least 1 course with a lab required), knowledge in cell culture is preferred but not required, skills in doing a standard protocol defined assays preferred, analyzing data using MS excel etc. preferred	Fully in-person	Chetty – Stem Cells
Using Facebook to	We will try to teach them the skills required but mainly an interest in medical	Mostly remote/ online with some	Fulchand –

Understand Patient Concerns	studies and qualitative analysis	in-person opportunities	Facebook and Disease Concerns
Characterizing Oxygen Depletion in a New Radiation Therapy	Programming (MATLAB, or other languages). Interest in learning curve fitting, phosphorescence lifetime, and exponential decay.	Fully remote/ online	Nguyen – Radiation Oncology
Impacts of COVID-19 in Jails	We are looking for students passionate about health equity, justice, and community-engaged research! Otherwise, some experience reading and interpreting scientific papers and communicating science to a general audience will help. Students who have been directly or indirectly impacted by the carceral system are particularly encouraged to apply.	Can be fully remote/online, however some in-person opportunities are available if the student desires.	Liu – COVID in Jails
Developing Micro-motor for Drug Delivery	At least one quarter of Biology with a hands-on lab, a background/interest in cell culture and oncology is helpful but necessary	Fully in-person	Wang – Micromotor and Cancer

Physics and Astronomy

Topic	Required Skills	Modality	CODE NAME (for application)
Developing Code to Fit Emissions Data from Galactic Nuclei	The student needs to have competency and experience in Python. The additional ability to understand C and bash is preferable.	Can be fully remote/online; a few in-person opportunities (especially initially) are available/preferable but not required.	Hervet – Spectra of Blazars
Autonomous Driving Technology	Github, Programming, either in Python or in Matlab, Some exposure to multi-variable calculus required; familiarity and/or significant interest in sensors such as cameras, LiDARs and radars is preferred. Exposure to linear algebra and differential equations is helpful.	Fully remote/ online	Mohanty – RADAR tracking

KEEP READING BELOW FOR DETAILED DESCRIPTIONS OF THE ABOVE OPPORTUNITIES.

Make sure you read the details as you make your selections of what project you'd be interested in!

BIOLOGY

Topic	Cell Communication
Project	**Wnt signal initiation through LRP6 receptor**
Discipline	Molecular and Cellular Physiology, Structural Biology
Name of Research Mentor	Elise Bruguera (she/ her)
Institution and Affiliation	Doctoral candidate at Stanford University
Project Description	Cells must send, receive, and respond to molecular signals to coordinate during organismal growth and development. One such signal, the secreted protein Wnt, binds to cell surface receptor proteins Frizzled and LRP6 to initiate a cascade of intracellular protein interactions, which result in the transcription of target genes directing cell proliferation and migration. How do these receptors communicate the binding of Wnt across the membrane to the inside of the cell? This project will investigate a conserved region of LRP6 which we hypothesize to be important for this signaling cascade. We propose to (1) search for other proteins that may share this region's amino acid sequence for clues into its function; (2) mutate this region of LRP6; and (3) test the ability of this mutated LRP6 to respond to Wnt in a cell-based assay. If these mutations indeed impair signaling, the next step will be to (4) identify candidate proteins that might physically interact with this region.
Required Skills	Interest in biochemistry required! Introductory molecular biology coursework preferred but not required. Other biology, chemistry, biochemistry coursework a plus.
Modality of Project	Hybrid - with more emphasis on in-person, if possible
Short Bio	I am a 6th-year PhD student studying biochemistry. I am a cis woman of mixed race, and I was born in San Francisco and grew up in Palo Alto, spending some time in North Carolina before returning to the Bay Area for graduate school. In my free time I hang out with my dog (a tiny yorkie-mix), backpack, and play ultimate frisbee.
Selection Process	Will be selected by Foothill SLI team based on application
CODE NAME	Bruguera – Wnt signal

Topic	How Bacteria Develop Resistance to Antibiotics
Project	**Genetic Elements and Toxin Anti-Toxin Systems of E.Coli**
Discipline	Molecular, Cell, and Developmental Biology/ Microbiology and Environmental Toxicology (MCDC/ METX)
Name of Research Mentor	Amanda Carbajal (she/ her)
Institution and Affiliation	PhD candidate at UC Santa Cruz
Project Description	My project aims to learn more about how bacteria, specifically E. coli harbor genetic elements to adapt and evolve in ways that cause them to be antibiotic resistant. Additionally I seek to understand the mechanisms of a poorly understood

	system called a toxin-anti toxin system and its role in evolution and conferring resistance as well as other beneficial outcomes for bacteria.
Required Skills	Good communication, interest, drive, and some basic knowledge of biology and microbiology. If the student has the time, interest and work ethic, the rest will work out just fine.
Modality of Project	Can be fully remote, but in-person opportunities are available if desired
Short Bio	I started out at the community college level and have made my way through undergrad, a master of science degree at UCSF, working at NASA, working at Genentech to here and now, a 4th year PhD student. I am a Latinx student, of low socioeconomic background who had to figure out this journey mostly alone and I wish to give back. I am interested in discovering more about the biological work in a context that can help people especially those living in developing nations. My project has many interdisciplinary applications in the clinical sense, in the infectious disease field, public health, novel drug design, antibiotic resistance and epidemiology.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Carbajal – Genetic Toxin E.Coli**

Topic	Hyena Behaviors
Project	**Behavioral responses of spotted hyenas to interspecific competition**
Discipline	Biology
Name of Research Mentor	Chinmay Sonawane (he/ him)
Institution and Affiliation	PhD student at Stanford University
Project Description	How do hyenas react to different species of animals, and why do they behave in such a way? Previous studies have found that hyenas do not always avoid interspecific competition (i.e. hyenas are not always avoiding interactions with species such as lions) — in fact, some hyenas are attracted to other carnivores as it provides an opportunity for hyenas to steal and scavenge food. In this project, we will systematically analyze videos of hyenas responding to leopard and jackal vocalisations, and determine how hyenas in Ethiopia view the presence of leopards and jackals. Through this research, the student may engage in the following activities (though no background knowledge in the following is required!): reading scientific literature, statistics, GIS, data visualisation and writing scientific papers. The aim of this project is to understand how hyenas in Ethiopia interact with other species (ecology), and the selective pressures driving these interactions (evolution). This internship can be remote, in-person or hybrid, depending on the preferences of the student. Please feel free to contact me at sonawane@stanford.edu with any questions.
Required Skills	A background in basic ecology is useful, but enthusiasm to learn more about ecology and evolutionary biology is all that is necessary.
Modality of Project	Online, in-person, or hybrid – student's choice
Short Bio	International student from Australia/India, big fan of soccer, outdoors, engaging

	students and communities from underrepresented backgrounds in science.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Sonawane - Hyenas**

CHEMISTRY

Topic	Teaching Machines Organic Chemistry
Project	**Teaching Machines Organic Chemistry**
Discipline	Chemistry
Name of Research Mentor	Cody Aldaz (he/ him)
Institution and Affiliation	Stanford Science Fellow at Stanford University (postdoctoral research)
Project Description	The goal of this project is to train a computer how to do organic chemistry. In this project we will encode chemical reactions into machine interpretable formats and generate simulated chemical reaction data. The chemical reaction data will be used to train a computer how to do tasks such as predicting how a molecule will react and how to synthesize new chemicals from scratch.
Required Skills	General Chemistry, Organic Chemistry (preferred),
Modality of Project	Can be fully remote, but in-person opportunities are available if desired
Short Bio	I am a first generation college student from the small town of Pueblo, Colorado. I received a B.S. in Chemistry from the University of New Mexico, where I was a MARC scholar, and a PhD in Chemistry from the University of Michigan, where I was a DOE graduate science fellow. I am currently a Stanford Science Fellow in the theoretical chemistry department at Stanford. Despite my current position, my upbringing was so far removed from academia I didn't even know what a PhD or research was until I was already at University. I remember when I first learned about research I was so interested in doing it and I was eventually fortunate to pursue this as a career. I am incredibly happy and proud to be able to share this opportunity with a student because I knew how much it meant to me when I was in their position. When I am not thinking about research my hobbies include skateboarding, although I prefer riding my electric longboard nowadays, and I also enjoy 3D printing.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Aldaz – Machine OChem**

Topic	A Study of Intermolecular Interactions in a New Class of Chemicals
Project	**Elucidating Intermolecular Interactions in Deep Eutectic Solvents with Quantum Chemistry**
Discipline	Chemistry
Name of Research Mentor	Kimberly Carter-Fenk (she/ her)

Institution and Affiliation	Postdoctoral researcher at Stanford University
Project Description	Within the past two decades, chemists have discovered a suite of molecules that, when mixed together at a particular ratio, form a liquid that melts at a much lower temperature than its individual component molecules. These liquids, known as deep eutectic solvents, have potentially useful applications in carbon dioxide capture, battery electrolytes, biomass recycling, pharmaceuticals and medical research, and materials synthesis. However, the fundamental principles underlying the chemical and physical properties of these mixtures are not fully understood. To use deep eutectic solvents most efficiently, scientists must be able to predict which mixtures can produce desired properties. Thus, detailed studies of the intermolecular interactions between components of deep eutectic solvents are needed to eventually create generalized and predictive models. In this Micro-Internship, the student will use quantum chemistry and computational chemistry methods to calculate the interaction energies and configurations of deep eutectic solvent components. The Sherlock High Performance Computing Cluster at Stanford University will be used to perform these calculations. Additionally, the student will have opportunities to learn about experimental measurements conducted in this area of research through participation in laboratory group meetings and through guided exploration of the scientific literature.
Required Skills	The mentee will be expected to have taken at least one semester/quarter of General Chemistry. Computing/programming experience is not required, but a willingness to try and learn new things will be helpful! The computer does most of the math, so an extensive math background is also not required!
Modality of Project	Fully remote/ online
Short Bio	I am a Postdoctoral Scholar in the Fayer Lab at Stanford University in the Department of Chemistry. I received my PhD in Physical Chemistry from The Ohio State University and my Bachelor's degree in Chemistry from the College of Wooster. I am a first-generation college student, and I was a commuter student for the entirety of my college career. In my free time, I like to watch documentaries, play the piano, and spoil my cat, Penelope! I am also a member of the Stanford Disability Staff Forum, and I am a mentor in the Disabled in STEM Mentoring Program.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	Carter-Fenk – Quantum Chemistry

Topic	**3D Printed Materials for Grid Storage and Solar Batteries**
Project	**3D printed substrates for high-loading Zn anodes in high-rate flow cells**
Discipline	Chemistry and Biochemistry
Name of Research Mentor	Dun Lin (he/ his)
Institution and Affiliation	Doctoral candidate at UC Santa Cruz
Project Description	This project uses 3D printing technique to prepare conductive substrates for Zn

	anodes in flow cells, which are expected to show high capacity and power density for grid storage. Since you will work remotely, your main task would be making literature reviews of relevant fields to clarify the value and competitiveness of our project. You will also assist in data processing and analysis using basic Office skills and chemistry knowledge.
Required Skills	Interests in materials science, electrochemistry and batteries. Basic knowledge of general chemistry and physical chemistry. Ability to search information (scientific literature) on the internet. Skillful use of Microsoft Word, Excel and PowerPoint.
Modality of Project	Fully remote/ online
Short Bio	I am Dun Lin, a 4th-year PhD student in physical chemistry in UCSC. My research focuses on nanomaterials, electrochemistry, batteries and 3D printing, trying to create some useful devices for grid storage. I have full experience in mentoring grad students and community college students, so I will make sure you learn things and have fun. Also, I like basketball (LAL & GSW) and electronic dance music (Trance & Techno). Hope to be a good mentor and friend!
Selection Process	Will be selected by Foothill SLI team based on application
CODE NAME	Lin – 3D printing Zinc

Topic	**Synthesizing Polymers for Drug Delivery and Bioengineering Applications**
Project	**Development of an optimal PEG-PLA polymer for injectable hydrogels**
Discipline	Chemistry/Materials Science
Name of Research Mentor	Shoshana Williams (she/ her)
Institution and Affiliation	PhD student at Stanford University
Project Description	Polymers consisting of polyethylene glycol (PEG) and polylactic acid (PLA) blocks form an integral component in some hydrogel systems that show great utility for drug delivery and immunoengineering applications (to see more about the use of these gels in vaccines, cancer treatments, and diabetes treatments, check out the publications on supramolecularbiomaterials.com). Although the Appel lab often takes advantage of PEG-PLA polymers, little research has been done to investigate the optimal composition of these molecules. I propose a project in which a student will synthesize polymers containing varying PEG/PLA ratios. They will then use these polymers to form hydrogels and explore their material properties such as stiffness and injectability. The student will gain experience in polymer synthesis techniques as well as characterization of chemical and material properties.
Required Skills	Ideally, a student would have some familiarity with organic chemistry (understanding chemical structures, for example), but I understand if that's not possible. I don't expect my mentee to have any experience with lab techniques. Overall, I expect this to be a learning experience, and the most important skill for my mentee is a willingness to ask questions!
Modality of Project	Mostly in-person with the possibility of some remote work (1-2 hrs/wk). I understand that transportation is difficult, but my experience is in hands-on

	chemistry experimentation, and that has to happen in a lab. (Two short days in a row in person is ideal, but there is flexibility here as long students can be in-person at least one day a week)
Short Bio	I am originally from St. Louis, MO, where I grew up with two sisters and many dogs. As an undergraduate, I minored in religion while majoring in chemistry. I am passionate about making the world a better place, both through scientific discovery and civic engagement. In my free time, I enjoy reading mystery novels and going on hikes around the Bay Area.
Selection Process	Will be selected by Foothill SLI team based on application
CODE NAME	**Williams - Hydrogels**

ENGINEERING

Topic	Developing Stretchable Materials for Wearable Electronics
Project	**Design and synthesis of stretchable dielectric actuators**
Discipline	Chemical Engineering
Name of Research Mentor	Will Henderson (he/ him)
Institution and Affiliation	Postdoctoral researcher at Stanford University
Project Description	I propose that a student would work with me to develop new stretchable materials for self-healing and recyclable electronic devices for potential use as wearable electronics.
Required Skills	The only knowledge a student may need would be a background and interest in general chemistry. An interest in organic chemistry, materials science, or chemical engineering would be beneficial.
Modality of Project	Fully in-person
Short Bio	I'm originally from Florida, and moved to the bay area 3 months ago. My hobbies include surfing, skateboarding, and playing guitar. I did my PhD at the University of Florida in organic chemistry and mentored an undergraduate student for 3 years and 3 graduate students. My interests are fundamental organic chemistry and polymer chemistry. I am very easy-going and enthusiastic and like to keep a positive attitude .
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Henderson – Wearable Electronics**

Topic	Writing Arduino Codes and Designing Circuits for Environmental Applications
Project	**Enhanced Sensor Compatibility for a Custom Arduino-Based Datalogger**
Discipline	Civil & Environmental Engineering
Name of Research Mentor	Jack Hochschild (he/ him)

Institution and Affiliation	PhD student at Stanford University
Project Description	Stanford's Wind Engineering Lab seeks to make buildings more resilient to extreme-wind events like hurricanes, reduce the energy use of buildings by harnessing natural ventilation, and investigate opportunities for wind energy. Our lab has many environmental sensors that we have used in the past to measure wind and other weather conditions in the field. Historically, we used commercial dataloggers to collect data from these sensors. Since these dataloggers were very expensive (and frankly not very good), I designed our own custom datalogger that is powered by an Arduino connected to the cellular network. During an internship with us, you would be writing Arduino codes in C++ and designing electronic circuits so that we can use more sensors with our custom datalogger. There will also be opportunities to use CAD software to design parts for the system and use our 3D printer to build these parts.
Required Skills	Basic experience with coding (at least 1 quarter of introductory computer science or equivalent necessary)
Modality of Project	Could be either fully in-person or hybrid, but not fully remote
Short Bio	I got my B.S. in Aerospace Engineering at USC before coming to the bay area for graduate school, which was also in Aerospace Engineering. Although the application of my current research is in Civil & Environmental Engineering, I see myself working in Aerospace after graduating. I've been doing academic research now for 5 years, and love having the opportunity to investigate something new or unknown. Another perk is that you get to do a lot of different things: on a typical day I spend some time writing, coding, soldering, and tinkering. This is in contrast to a lot of industry jobs, where you often specialize in something and spend most of your time doing that one thing. Outside of work/school, my hobbies are hiking, exploring San Francisco and the bay, and SCUBA diving.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Hochschild – Arduino Datalogger**

Topic	**CAD Design and Structural Modeling for Wearable Electronic Sensors**
Project	**CAD design and structural modeling for 3D printing lattice structures**
Discipline	Chemical Engineering
Name of Research Mentor	Kaiwen Hsiao (she/ her)
Institution and Affiliation	Postdoctoral researcher at Stanford University
Project Description	We are designing sensors for wearable electronics. Currently we are designing and testing sensors with high-sensitivity that is achieved through lattice structures. A student can help me design CAD designs for 3D printing of the sensors projects and conduct simple structural mechanics simulations with Abaqus software to test the mechanical response of the sensors.

Required Skills	Some exposure or background to engineering concepts would be great. At least one quarter of physics is preferred. Coding skills such as Python are also helpful as opportunities to pursue coding may arise as the project progresses.
Modality of Project	Fully remote/ online, with some opportunities for in-person if the student desires
Short Bio	My name is Kaiwen and I'm a postdoc here at Stanford Chemical Engineering department. I'm interested in working on high-resolution 3D printing, develop experimental setup and simulation model for the system. Outside of lab, my interest range from biking, swimming, running to hiking. Before I joined Stanford, I have 3 years of industrial experiences where I worked at Apple and Intel on optics hardware and resolution enhancement technology for photolithography.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	Hsiao - CAD

Topic	**Random Walk with Matlab**
Project	**Random Walk in Applied Physics**
Discipline	Engineering
Name of Research Mentor	Anupam Mishra (he/ his)
Institution and Affiliation	Doctoral candidate at UC Merced
Project Description	Imagine a drunk person in a bar who wants to go to his home. The city is infinitely large and divided into square grids of sidewalk. The drunk person chooses a random direction(left/right/straight) at every intersection. Would the drunk person ever get home? What about if it's a drunk bird, would it ever find its nest? If two drunk people leave from the bar, would they ever meet again? Well, "A drunk man will find his way home, but a drunk bird may get lost forever." In this project, you will explore the magic of random walks and their applications in biological domains. You will computational methods(Matlab etc.) to model these systems.
Required Skills	A curious mind, having taken at least 1 quarter (or equivalent) of Computer programming and at least 1 quarter of Calculus (Math 1A) is required. Some experience with Matlab is desired or at least have an interest in learning Matlab.
Modality of Project	Fully remote/ online
Short Bio	I am a PhD. candidate at UC Merced, I love talking and learning things from others and hope to give them a thing or two to think. I love talking about Philosophy. I like outdoors(hiking, running, backpacking etc.).
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	Mishra – Random Walk

Topic	**Building a 3-D Simulator for Auxetic Surfaces**
Project	**Building a 3D Simulator for Auxetic Surfaces**
Discipline	Mechanical Engineering
Name of Research Mentor	Ahad Rauf (he / him)

Institution and Affiliation	PhD student at Stanford University
Project Description	This project aims to create a robust 3D simulator for thin auxetic sheets. Auxetics are structures or materials that have a negative Poisson's ratio, i.e. when stretched, they become thicker perpendicular to the applied force. The research challenge of creating such a simulator is analyzing how thin auxetic sheets deform (often plastically) under internal and external loads. I have a starting code base for 2D simulations, and I'd like some help extending the analysis to 3D. Throughout the project, you'll be able to see how your simulation model matches with the real device, and if we establish a good fit there'll also be opportunities for lab experience as we explore and test new auxetic designs.
Required Skills	General programming experience is expected (Python is preferred, although C or Julia is good as well), and prior coursework or experience in optimization would be nice. A background in solid mechanics or computer graphics would also be helpful, but not required. A positive mental attitude is always welcome :).
Modality of Project	Hybrid - remote/ online with some in-person opportunities
Short Bio	I'm a second-year Mechanical Engineering PhD student fascinated by the potential of human-robot interaction and dynamically reconfigurable interfaces. My hobbies include anime and manga, hiking, biking, video games, and reading. Nice to meet you!
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Rauf – Auxetic Simulator**

Topic	Traumatic Brain Injury and Sensor Measurement
Project	**Reverse engineering from kinematics to impacts: deduce the impact direction and velocity based on wearable sensor measurement**
Discipline	Bioengineering
Name of Research Mentor	Xianghao Zhan (he/ him)
Institution and Affiliation	PhD candidate at Stanford University
Project Description	Traumatic brain injury are frequently caused by head impacts in traffic accidents, contact sports, accidental falls and even domestic abuse. There are generally four stages to cause TBI: 1) head impact, 2) kinematics (head rotation and translation), 3) brain deformation and 4) injury. To estimate the TBI risks (brain deformation), we have developed sensors (accelerometers and gyroscopes in the instrumented mouthguard) to measure the kinematics, and we have developed machine learning models to quickly calculate brain deformation caused by the head impacts. However, the kinematics measurement usually requires manual video validation to determine the real impacts. This project aims to predict the impact locations and impact speeds based on the measure kinematics, based on the simulation data, which will aid in more accurate detection of real-head impacts and bridge the impact information with the brain deformation. The mapping from kinematics to impact information also enables potential camera-based sensors for head

	kinematics measurement.
Required Skills	Experience or knowledge of Python required, knowledge of numpy, machine learning and deep learning is preferred
Modality of Project	Can be entirely remote/ online, but some in-person opportunities are possible if the student desires
Short Bio	Xianghao Zhan is a Ph.D. student in the Department of Bioengineering. He obtained his M. S. in Bioengineering at Stanford University. He obtained his B. Eng. in control science and engineering and his B. Art in English language and literature with Summa Cum Laude at Chu Kochen Honors College, Zhejiang University, China, in 2019. Under the guidance from Prof. Gevaert and Prof. David B. Camarillo, he mainly focuses on the optimization of computational modeling of traumatic brain injury with machine learning based on biomechanical and radiological data. His research interests and projects also involve the data mining of free-text clinical notes with natural language processing and biomedical data fusion for COVID-19 patient outcome prediction.
Selection Process	Will be selected by Foothill SLI team based on application
CODE NAME	**Zhan – Kinematics and Brain Injury**

MEDICINE

Topic	Understanding Immune Cells to Fight Cancer
Project	**Targeting myeloid-derived suppressor cells for cancer immunotherapy**
Discipline	Stem cell biology and regenerative medicine
Name of Research Mentor	Allison Banuelos (she/ her)
Institution and Affiliation	PhD student at Stanford University
Project Description	The innate immune system, which includes neutrophils and macrophages, plays a dynamic and critical role in fighting cancer. However, a subset of immune cells, called myeloid-derived suppressor cells, have been found to promote tumor growth and are associated with poor patient outcomes. In this project, we will be targeting myeloid-derived suppressor cells in models of cancer to better understand their role and how eliminating them can be exploited as a form of treatment.
Required Skills	Having taken a biology course or two might be helpful (but not necessary)
Modality of Project	1 – 2 short days a week in-person, rest of time online
Short Bio	I'm a 3rd year PhD student at Stanford in Dr. Irv Weissman's lab. My research is mostly focused on understanding the role of the innate immune system in cancer. I'm originally from Los Angeles and went to Cal State Fullerton for my undergraduate degree. When I'm not in lab, I enjoy road cycling and hanging out with my dog.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Banuelos – Cancer and Suppressor Cells**

Topic	Copper Depletion for Cancer Treatment
Project	**Copper depletion for the treatment of cancer**
Discipline	Radiology
Name of Research Mentor	Liyang Cui (she/ her)
Institution and Affiliation	Postdoctoral researcher at Stanford University
Project Description	Many types of cancer have a thirst for copper for proliferation and progression. We previously demonstrated that deplete copper in the mitochondria of breast cancer cells effectively inhibit the cancer growth and metastasis. In this project, the student mentee will develop a biocompatible copper depleting nanoparticle and test its efficacy against a panel of human cancer cell lines. He/She can also dive into the cellular mechanism under guidance of the mentor to see which cellular functions are altered by deprivation of copper. The mentee will have access to material formulation and characterization laboratory. He/She will also be trained for a variety of biological assay and techniques including but not limited to cell culturing, fluorescence microscopic imaging, western blotting, RNA extraction, ELISA etc.
Required Skills	I expect the mentee to have basic knowledge of cell biology. It would be a huge plus if they have lab (course) experience and understand lab safety.
Modality of Project	Fully in-person
Short Bio	I am a senior postdoc scholar in the Department of Radiology. My academic background is material science and cancer biology. I have mentored undergraduate students from different cultural backgrounds (and still in contact will some of them as a friend!). I speak English and Mandarin. I am easy-going and supportive. I love cooking and gardening. I also enjoy reading books (now reading Dune) when I am not thinking about research.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Cui – Copper and Cancer**

Topic	Stem Cells in Different Conditions
Project	**Analysis of metabolic health of stem cells in different conditions.**
Discipline	Radiology
Name of Research Mentor	Shashank Chetty (he/ him)
Institution and Affiliation	Postdoctoral researcher at Stanford University
Project Description	The project will aim to understand the metabolic profile of stem cells under different conditions namely normal, pro-inflammatory and mechanical stimulation.
Required Skills	Basic laboratory work practice (have taken at least 1 course with a lab required), knowledge in cell culture is preferred but not required, skills in doing a standard protocol defined assays preferred, analyzing data using MS excel etc. preferred
Modality of Project	Fully in-person

Short Bio	I am very much cool and excited about science. It is so wonderful to know what happens within in the world where everyone is admiring outside. The proposed work will focus on understanding the single cell and understanding the dynamics within single cell in different conditions.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Chetty – Stem Cells**

Topic	Using Facebook to Understand Patient Concerns
Project	**A qualitative, facebook group analysis of key symptomatic concerns of patients with Epidermolysis Bullosa**
Discipline	School of Medicine
Name of Research Mentor	Shivali Fulchand (she/ her)
Institution and Affiliation	Postdoctoral researcher at Stanford University
Project Description	Two open facebook groups of two rare diseases will be coded for key themes and comments to assess if there are patient concerns that are not addressed by clinicians. This is an interesting area because patients may have open conversations with other patients, but may not necessarily discuss this with their clinician.
Required Skills	We will try to teach them the skills required but mainly an interest in medical studies and qualitative analysis
Modality of Project	Mostly remote/ online with some in-person opportunities
Short Bio	I am Shivali (she/her/hers) and I am a Post-Doctoral Research Fellow in the department of dermatology and am conducting clinical trials and studies of a life-limiting genetic disease called Epidermolysis Bullosa. I graduated as an MD in 2017 in the UK and worked for two years as a Internal Medicine Physcian and for one year as a Medical Editor at The BMJ (a UK medical journal). I founded a medical journal at medical school and have a passion for involving students in the publishing process as this is the key way we share our ideas with the scientific community. I enjoy running, playing soccer, and nerding out at book and film festivals. I am also passionate about global and public health and improving health inequalities.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Fulchand – Facebook and Disease Concerns**

Topic	Characterizing Oxygen Depletion in a New Radiation Therapy
Project	**Characterize lifetime of phosphorescence decays with automation**
Discipline	Radiation Oncology and Medical Physics
Name of Research Mentor	Hieu Nguyen (she/her)
Institution and Affiliation	Postdoctoral researcher at Stanford University
Project Description	We are at an end phase of a project where we need to analyze the previously collected data. Briefly, we have measured phosphorescence decay and need to fit

	these decay curves to find the lifetimes. These lifetimes provide a crucial understanding of the oxygen depletion in a new radiation therapy (called FLASH).
Required Skills	Programming (MATLAB, or other languages). Interest in learning curve fitting, phosphorescence lifetime, and exponential decay.
Modality of Project	Fully remote/ online
Short Bio	I was born in Vietnam and moved to Singapore for college. I completed the Biomedical Engineering Ph.D. program at UT Austin before coming to Stanford for postdoctoral training. I love exercising, outdoor activities, and having weekly badminton with my friends during the weekends. I enjoy watching sport, particularly the Premier League, and a fan of Manchester United.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	Nguyen – Radiation Oncology

Topic	**Impacts of COVID-19 in Jails**
Project	**COVID-19 in Bay Area Jails: Community-Engaged Research and Science Communication**
Discipline	Epidemiology, Medicine – Infectious Diseases
Name of Research Mentor	Yiran Liu (she/her)
Institution and Affiliation	Doctoral candidate at Stanford University
Project Description	Prisons and jails have been dangerous settings for COVID-19 transmission. Not only have people living in these facilities during the pandemic been at increased risk for infection and death, they have also experienced other impacts to their health and well-being as a result of policies implemented to mitigate COVID-19 spread. For instance, visitation and many in-person programs were suspended, and people who were exposed to the virus were held in medical quarantine for 14 days or more, which in a carceral setting can feel like solitary confinement. To better understand these impacts locally, the Andrews lab at Stanford surveyed people living in four Bay Area county jails about their experiences and perceptions surrounding COVID-19. Throughout the study, we engaged a community advisory board consisting of incarcerated people, their loved ones and advocates, and correctional health representatives, to ensure that the study was sensitive for and relevant to stakeholder populations. We are seeking a motivated student enthusiastic about science communication and community-engaged research to develop materials sharing the major findings of this work in an accessible way. The target audience includes policymakers, incarcerated individuals and their loved ones and advocates, and the general public. Materials may include research briefs, videos, op-eds, and more.
Required Skills	We are looking for students passionate about health equity, justice, and community-engaged research! Otherwise, some experience reading and interpreting scientific papers and communicating science to a general audience will help. Students who have been directly or indirectly impacted by the carceral system are particularly encouraged to apply.

Modality of Project	Can be fully remote/online, however some in-person opportunities are available if the student desires.
Short Bio	I was born in China, grew up mostly in Michigan, and moved to the Bay Area for grad school! I'm passionate about science by and for the people. I love live jazz, hiking and camping, plants, spicy food, and deep conversations!
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Liu – COVID in Jails**

Topic	Developing Micro-motor for Drug Delivery
Project	**Engineering self-propelled micromotor for drug delivery**
Discipline	Radiology
Name of Research Mentor	Jie Wang (she/ her)
Institution and Affiliation	Postdoctoral researcher at Stanford University
Project Description	My project is exploring biocompatible micromotor that can self-propelled in body and engineering this micromotor as drug delivery carrier to delivery drug to specific tumor site for therapy
Required Skills	At least one quarter of Biology with a hands-on lab, a background/interest in cell culture and oncology is helpful but necessary
Modality of Project	Fully in-person
Short Bio	I worked as postdoc for three years at Stanford University School of Medicine, with a research focus in developing micro/nanomaterials technologies. Before this, I got my Phd degree from huazhong university of science and technology in China, with major in biomedical engineering. I have expertise in microfabrication, chemistry, material science with a focus on biomedical engineering applications. I've been focused on developing micromotor fabrication and engineering technology to isolate and detect biotargets from whole blood, as well as engineered the biocompatible micromotors as a drug delivery carrier for tumor diagnostic and therapy. In my spare time, I like go hiking and reading.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Wang – Micromotor and Cancer**

ASTRONOMY AND PHYSICS

Topic	Developing Code to Fit Emissions Data from Galactic Nuclei
Project	**Implementing a Markov chain Monte Carlo (mcmc) method to fit broadband spectra of blazars**
Discipline	Physics
Name of Research Mentor	Olivier Hervet (he/ him)

Institution and Affiliation	Postdoctoral researcher at UC Santa Cruz
Project Description	The emission processes of active galactic nuclei, and their subclass of blazars, are still holding many unknowns to the astrophysics community. One of the current challenges we are facing is to accurately define the physical parameters of each observed source from their multiwavelength emission, such as the magnetic field strength, particle distribution, Doppler factor of the jet,... We now have sophisticated emission models that provide good results but still are challenging to be fitted to dataset with standard chi-square minimization algorithms. The student will extend a work started by a PhD at UCSC on adapting a Markov chain Monte Carlo (mcmc) method to fit observed spectral data of blazars. The goal is to produce a user-friendly and optimized code that can perform this task. Given the short duration of the internship, it is critical for this project that the student has already basic knowledge and experience of the computing languages python, C, and bash.
Required Skills	The student needs to have competency and experience in Python. The additional ability to understand C and bash is preferable.
Modality of Project	Can be fully remote/online; a few in-person opportunities (especially initially) are available/preferable but not required.
Short Bio	I am passionate about astronomy and astrophysics since my childhood in the French countryside. After obtaining a PhD in France, at the Paris Observatory, I moved to Santa Cruz to pursue a postdoc in the field of high-energy astrophysics. I would say my hobby eventually became my job. I like the fact that Astrophysicist is a job that still possesses a part of romanticism, as I felt when I was out of the grid in Namibia to observe the sky with one of the largest worldwide telescopes. I like to share my interest with the new generation and see them develop a rigorous scientific method and critical spirit.
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	**Hervet – Spectra of Blazars**

Topic	**Autonomous Driving Technology**
Project	**Exploring radar for two-car target tracking**
Discipline	Aeronautics and Astronautics
Name of Research Mentor	Adyasha Mohanty (she/ her)
Institution and Affiliation	Doctoral candidate at Stanford University
Project Description	The project shall involve designing algorithms for target tracking using a RADAR sensor for a two-car setup within a filtering framework. The first few weeks will involve replicating existing filtering algorithms that use RADAR for collision avoidance or target tracking. In the second half of the project, the student will conceptualize and code a new algorithm. This algorithm will be used by the follower car to track the leader car and always maintain a safe distance from it, without

	risking collision at any timestep.
Required Skills	Github, Programming, either in Python or in Matlab, Some exposure to multi-variable calculus required; familiarity and/or significant interest in sensors such as cameras, LiDARs and radars is preferred. Exposure to linear algebra and differential equations is helpful.
Modality of Project	Fully remote/ online
Short Bio	I am a third-year PhD student in AeroAstro at Stanford. My research revolves around designing algorithms for safe perception of autonomous cars. I also get excited by opportunities to mentor students, DEI initiatives and startups that are working on cutting-edge autonomy. I am involved in multiple leadership positions on campus and I love having an impact in anyway possible. My hobbies include dancing/zumba, traveling around the world and just meeting different people and having engaging conversations!
Selection Process	Research mentor will review 3 - 5 applications and select 1 or 2 to make offers to
CODE NAME	Mohanty – RADAR tracking