

Summer Research Internships (SURI) 2022

Faculty Name	Program/Expertise Area	Campus	In-person, Online, or Either	U.S. Citizens, International Students or Both
A. M. Kannan	Li-Ion Batteries	Polytechnic	In person	Both

Project Description: Thermal management for faster charge/discharge for EV application; **Students will:** Conduct experiments, collect data, and analyze/report results; **Prerequisite skills/knowledge:** Basic knowledge in science and engineering.

A. M. Kannan	PEM Fuel Cells	Polytechnic	In person	Both
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Brief Description: Designing durable catalysts for high power fuel cells for EV application; **Students will:** Conduct experiments, collect data, and analyze/report results; **Prerequisite skills/knowledge:** Basic knowledge in science and engineering.

A. M. Kannan	Green H2 Generation	Polytechnic	In person	Both
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Brief Description: Develop oxide catalysts for efficient water splitting by solar photoelectrochemical method; **Students will:** Conduct experiments, collect data, and analyze/report results; **Prerequisite skills/knowledge:** Basic knowledge in science and engineering.

Aditi Chattopadhyay	Investigation of Multifunctional Smart Materials	Tempe	In person	U.S. Citizens
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Brief Description: Multiple projects on utilizing design of experiments to develop novel nanofiller-enhanced multifunctional materials with improved mechanical, electrical, and thermal properties; **Students will:** Prepare material standardized samples and assist in performing microscopy and physical testing; **Prerequisite skills/knowledge:** Students from mechanical or aerospace engineering; some background in mechanics of materials is a plus.

Aditi Chattopadhyay	Impact Study of Space Meteorites	Tempe	In person	U.S. Citizens
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Brief Description: The objective is to understand the physical scale-dependent mechanical & dynamic properties of meteoritic materials and gain insight into their fracture & impact dynamics; **Students will:** Students will assist in conducting ballistic impact tests on space meteorites and performing microscopy on the fragments from impact; **Prerequisite skills/knowledge:** Students from mechanical or aerospace engineering; some experience in hands-on experiments is a plus.

Adolfo Escobedo	Crowdsourcing, Wisdom of the Crowds	Tempe	Either	Both
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Brief Description: Multiple projects related to the development of online crowdsourcing activities from which to test and enhance the concept of the wisdom of the crowd; these include crowdsourced prediction, computation, and opinion tasks; **Students will:** Collaborate towards the development and implementation of new crowdsourcing activities; the work that can be performed by students ranges from the conceptual design of activities to their implementation in a crowdsourcing platform, and analysis of the results; **Prerequisite skills/knowledge:** Talented students from many fields can contribute; students should have some experience in 1) web programming, 2) mathematical modeling, or 3) sociology/psychology (to develop interesting activities).

Adolfo Escobedo	Operations Research, Infrastructure Design and Planning	Tempe	Either	Both
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Brief Description: Multiple projects related to the development of decision-making models for the design and operation of infrastructure systems; these may include logistics and power system applications; **Students will:** Collaborate towards the construction and implementation of the decision-making models; the work that can be performed ranges from the collection of real-world data and learning of trends to the analysis of outputs from the decision-making models; **Prerequisite skills/knowledge:** Junior and senior undergraduate students and graduate students from Industrial Engineering, Electrical Engineering, and Mathematics fields can contribute.

Arindam Sanyal	Analog Integrated Circuits (Analog-to-Digital Converter)	Tempe	Either	U.S. Citizens
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Brief Description: The goal of this project is to design high-performance (16-bit resolution) and high-bandwidth (> 50MHz) analog-to-digital converter; **Students will:** Develop Matlab/Simulink based behavioral model and perform transistor level circuit simulation. **Prerequisite skills/knowledge:** Knowledge of data converters and mixed-signal circuits, Matlab model design; prior experience working on mixed-signal system and Cadence is a plus.

Faculty Name	Program/Expertise Area	Campus	In-person, Online, or Either	U.S. Citizens, International Students or Both
Arindam Sanyal	Analog Integrated Circuits (Embedded Machine Learning)	Tempe	In person	Both

Brief Description: The goal of this project is to investigate the robustness of embedded machine learning models against power-domain side-channel attack; **Students will:** Design and fabricate printed circuit board level systems, perform laboratory experiments, collect data and analyze; **Prerequisite skills/knowledge:** Prior experience with PCB design and Matlab.

Ashif Iqbal	Generative Models, Cheminformatics	Tempe	Either	Both
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Brief Description: Inverse design of self-healing materials using generative models and dynamic combinatorial library; **Students will:** This research will involve two tasks—the first task will involve literature review and data collection. Here, we will identify the primary mechanisms (covalent and non-covalent bonds) through which intrinsic self-healing occurs and the corresponding functional groups needed to achieve the desired self-healing. In the second task, we will build generative models to discover new materials from the dynamic combinatorial chemistry that exhibit self-healing. We will also develop predictive models in this task to determine the stability and properties of the newly discovered materials; **Prerequisite skills/knowledge:** Students should have knowledge of undergraduate chemistry, especially covalent and non-covalent bonds. Prior exposure to machine learning/data science is preferred but not required.

Ayan Mallik	Power Electronics/Control systems	Polytechnic	In person	Both
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Brief Description: Develop an interface between MATLAB/Simulink and single/dual-core digital signal processor (DSP) for real-time coding-based controller implementation for power converters; **Students will:** Be responsible for simulating an AC-DC power converter in MATLAB/Simulink, and then implementing the sensing/controller code in real-time DSP block as part of Simulink, and establish an embedded connection with a hardware power converter for closed loop testing; the student will report with both simulation and hardware results; **Prerequisite skills/knowledge:** Control systems, power electronics.

Chao Wang	Circuit Design/Biosensing	Tempe	In person	Both
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Brief Description: Very recently, my lab has established a new method to rapidly detect viral antigens for Ebola and SARS-Cov-2. Here the biological sample signals are analyzed by simple electronic circuitry. This prototype has the potential to greatly reduce human intervention in readout, data compiling and reporting, and facilitate fast and accessible diagnostics; **Students will:** Work with graduate and undergraduate students in Wang lab to build an integrated detecting system; **Prerequisite skills/knowledge:** Circuit design.

Chao Wang	Machine Learning/Biosensing	Tempe	Either	Both
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Brief Description: Our lab has established a sapphire-supported nanopore sensing system for low-noise detection of biological molecular signals. The signal pulses are stochastic and need algorithms for automated analysis; **Students will:** Work with graduate and undergraduate students in Wang lab for data analysis and machine learning algorithms; **Prerequisite skills/knowledge:** Machine learning.

David Nielsen	Metabolic Engineering, Synthetic Biology, Bioprocess Engineering	Tempe	In person	Both
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Brief Description: This project will involve the engineering of bacteria to produce specialty chemicals, as well as the development of suitable bioprocesses for enhancing their performance. Our group works on photosynthetic as well as fermentative microbes and is currently exploring multiple products of interest; **Prerequisite skills/knowledge:** Experience with microbiology and/or molecular biology is helpful but not required.

Gautam Dasarathy	Machine Learning, Data Science, AI	Tempe	Either	Both
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Brief Description: Design and study novel algorithms for interactive machine learning by leveraging structure; **Students will:** Understand the challenges of applying data science and machine learning to various modern applications in science and engineering. They will then design and study novel algorithms that interactively and adaptively acquire data by leveraging structure present in the problem. This project has the potential to make fundamental contributions to the fields of machine learning, data science and artificial intelligence; **Prerequisite skills/knowledge:** Knowledge of undergraduate probability, some mathematical maturity and knowledge of a programming language (such as MATLAB or Python). It is preferable if the student has a strong inclination for math (calculus, probability, statistics, linear algebra) and algorithms.

Faculty Name	Program/Expertise Area	Campus	In-person, Online, or Either	U.S. Citizens, International Students or Both
Jeffrey Wishart	Automated Vehicles (CARLA Simulation)	Polytechnic	Either	Both

Brief Description: In order to understand how safe automated vehicles are, operational safety assessment (OSA) metrics have been developed by the Institute of Automated Mobility (IAM), a private-public research organization run by AZ state. These metrics must be validated, and part of this validation is being performed through simulated scenario-based testing. To perform this testing, traffic scenarios need to be developed in the CARLA simulation software for subsequent OSA metrics analysis; **Students will:** Program in Python and CARLA; **Prerequisite skills/knowledge:** Python programming.

Jeffrey Wishart	Automated Vehicles (Infrastructure-based Cameras, LIDAR)	Polytechnic	Either	Both
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Brief Description: In order to understand how safe automated vehicles are, operational safety assessment (OSA) metrics have been developed by the Institute of Automated Mobility (IAM), a private-public research organization run by AZ state. These metrics must be validated, and part of this validation is being performed through analysis of real-world traffic. The data come from infrastructure-based cameras or LIDAR, and computer vision techniques are applied in order to measure the OSA metrics. It is imperative to understand the measurement uncertainty associated with the OSA metrics measurements so that the safety of the AV can be appropriately assessed; **Students will:** Measure uncertainty analysis of real-world traffic data from cameras and LIDAR; **Prerequisite skills/knowledge:** Testing, measurement uncertainty, cameras, LIDAR, computer vision.

Jeffrey Wishart	Automated Vehicles (AI Techniques)	Polytechnic	Either	
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Brief Description: In order to understand how safe automated vehicles are, operational safety assessment (OSA) metrics have been developed by the Institute of Automated Mobility (IAM), a private-public research organization run by AZ state. Certain aspects of the OSA metrics, notably thresholds and parameters, must be determined. AI techniques will be used with real-world naturalistic driving data for human-driven vehicles to determine the thresholds and parameters. This work will improve the OSA metrics so that the safety of the AV can be appropriately assessed. **Students will:** Conduct AI-based analysis of real-world traffic data to determine parameters and thresholds for AV metrics; **Prerequisite skills/knowledge:** Artificial neural networks, computer vision, cameras, Python programming.

Jeffrey Wishart	Automated Vehicles (Comparing LevelX and AVs)	Polytechnic	Either	
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Brief Description: In order to understand how safe automated vehicles are, operational safety assessment (OSA) metrics have been developed by the Institute of Automated Mobility (IAM), a private-public research organization run by AZ state. Certain aspects of the OSA metrics, notably thresholds and parameters, must be determined. Real-world naturalistic driving dataset for human-driven vehicles (from LevelX) as well as AVs (from various AV developers) will be compared to understand what the naturalistic driving of both types is with respect to the OSA metrics. This work will improve the OSA metrics so that the safety of the AV can be appropriately assessed; **Students will:** Conduct dataset analysis comparison between human-driver vehicles and AVs; **Prerequisite skills/knowledge:** Dataset analysis comparison between human-driver vehicles and AVs.

Jit Muthuswamy	Neural Interfaces, Neuromodulation, In Vitro Diagnostics	Tempe	In person	U.S. Citizens
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Brief Description: The overall goal of the project is to develop neural interfaces and neuromodulation approaches for 2 distinct clinical applications, namely chronic migraine and deep brain stimulation (DBS) for Parkinson's disease; **Students will:** Participate in in vivo and in vitro experiments, assist in data collection, perform data analysis and interpretation, write reports and make presentations; **Prerequisite skills/knowledge:** Bio-instrumentation, signals and systems, physiology.

Jit Muthuswamy	In Vitro Diagnostics	Tempe	In person	U.S. Citizens
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Brief Description: Develop in vitro clinical diagnostics for a variety of disease pathologies; **Students will:** Perform in vitro experiments, collect, analyze and interpret data, write reports and make presentations; **Prerequisite skills/knowledge:** Bioinstrumentation, signals and systems.

Jordan Yaron	Drug Delivery	Tempe	In person	Both
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Brief Description: This project will focus on the characterization of loading and release kinetics of immunomodulating drugs from biomaterial scaffolds for use in applications of tissue repair; **Students will:** Learn how to generate biomaterial scaffolds, load them with immunomodulating drugs, and measure the release kinetics of those drugs; **Prerequisite skills/knowledge:** Theoretical familiarity with the concepts of drug loading and release will be helpful, but not required. All other aspects of this project will be learned in the lab.

Faculty Name	Program/Expertise Area	Campus	In-person, Online, or Either	U.S. Citizens, International Students or Both
Jordan Yaron	Drug Screening	Tempe	In person	Both

Brief Description: This project will focus on the use of an *in vitro* macrophage reporter system to evaluate the biocompatibility and inflammatory capacity of putative drug release biomaterials for ultimate use in applications of tissue repair; **Students will:** Learn how to culture macrophage cells, treat them with drugs and biomaterial constituents, and measure the cellular responses to evaluate inflammation, injury, and general biocompatibility; **Prerequisite skills/knowledge:** Theoretical familiarity with macrophages and biocompatibility responses will be helpful, but not required. All other aspects of this project will be learned in the lab.

Kenan Song	3D Printing (Plastics Recycling of XLPE)	Polytechnic	In person	Both
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Brief Description: Plastics recycling of XLPE; **Students will:** Manufacturing platform assembly; **Prerequisite skills/knowledge:** Engineering in manufacturing or mechanical.

Kenan Song	3D printing (3D Printing of Batteries)	Polytechnic	In person	Both
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Brief Description: 3D printing of batteries; **Students will:** 3D printing of batteries; **Prerequisite skills/knowledge:** Engineering in manufacturing or mechanical.

Kerry Hamilton	Risk Assessment, Environmental Microbiology	Tempe	Either	Both
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Brief Description: Multiple projects focusing on measuring pathogenic microorganisms in the environment and assessing risks through modeling; **Students will:** Research focus on collecting and environmental samples and/or developing models in R or Python related to managing infection risks; **Prerequisite skills/knowledge:** Experience working with a programming language such as R or Python preferred. Attention to detail for conducting literature review and meta-analysis.

Lalitha Sankar	Machine Learning—Theory and Practice to Electric Power Systems	Tempe	Either	Both
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Brief Description: Research on applying advanced data science and machine learning techniques including sparse and structured learning to emerging real-time data integration and processing challenges in electric power systems; **Students will:** Research on applying advanced data science and machine learning techniques including sparse and structured learning to emerging real-time data integration and processing challenges in electric power systems; **Prerequisite skills/knowledge:** An ideal student will have some background in power systems and sound background in control systems and data science methods.

Lalitha Sankar	Bayesian Methods for Hyperparameter Tuning in Machine Learning	Tempe	In person	Both
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Brief Description: While ML techniques for tuning hyperparameters have emerged, there is a screaming need for techniques with guarantees. This project will explore Bayesian methods to do so and develop theorems on the convergence of the learned posterior to the true; **Students will:** Focus on learning Bayesian methods to prove convergence theorems and verify using data and methods including Gibbs sampling and Slice sampling methods; **Prerequisite skills/knowledge:** An ideal student will have some background in Bayesian methods and sound background in proving theorems.

Lalitha Sankar	Evaluating Performance of GANs with Tunable Loss Functions	Tempe	Either	Both
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Brief Description: GANs are notorious for facing issues of mode collapse, vanishing gradients etc. This project focuses on designing GANs using tunable loss functions that promise to avoid these pitfalls; **Students will:** Student will work with postdoc and senior graduate students on designing and testing generative adversarial network models to evaluate their performance against state-of-the-art methods; **Prerequisite skills/knowledge:** Knowledge of tunable loss functions for learning is desirable. Knowledge of tuning deep learning models and GANs is desirable too. A solid background in math is also of need.

Leila Ladani	Additive Manufacturing of Metals	Tempe	In person	Both
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Brief Description: Modeling and experiments related to powder bed additive manufacturing including laser and electron beam powder bed processes; **Students will:** Additively manufacture metallic parts using a concept laser additive manufacturing machine, post process procedures such as evaluation of mechanical integrity and microstructure, model the process using software such as ANSYS or COMSOL; **Prerequisite skills/knowledge:** Background in mechanical engineering, experience with mechanical testing and materials characterization.

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Leila Ladani	Characterization of Soft Tissues Using High Frequency Ultrasound Device	Tempe	In person	Both

Brief Description: Developing a handheld device for characterization of soft tissues, specifically used for cancer margin detection during surgery; **Students will:** Work on design and development of this device. The tasks may include processing ultrasound signals and determining the characteristics that are used for this characterization; **Prerequisite skills/knowledge:** Familiarity with MATLAB, wave propagation in materials, ultrasound concepts, instrumentation and sensors, signal processing.

Margaret Garcia	Hydrology, Water Resources Engineering	Tempe	Either	Both
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Brief Description: Assessing flood and drought risk and the effectiveness of both reservoir operations and local responses to manage these hazards. The project focuses on two case studies—one in Northern California and one in the Patagonia region of Argentina; **Students will:** Research focused on data analysis, modeling, and communicating results to a broad audience through visualizations and writing; **Prerequisite skills/knowledge:** Experience working with a programming language such as R or Matlab is preferred. Interest in a career in hydrology, water resources management or water resources engineering is also a plus.

Mark Easley/Texas Instruments	Embedded Machine Learning	Tempe	Either	U.S. Citizens
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Brief Description: The project will focus on machine learning applications for embedded systems using TinyML techniques and tools; **Students will:** Program the microcontroller hardware and collect machine learning data; **Prerequisite skills/knowledge:** This project is for electrical or computer engineering students. Some knowledge of embedded systems and microcontroller programming will be helpful.

Mark Easley/Texas Instruments	Robotics/Mechatronics	Tempe	Either	U.S. Citizens
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Brief Description: Project will focus on robotics applications using microcontrollers and sensor integration; **Students will:** Program the microcontroller hardware and interface new sensors to the robot platform; **Prerequisite skills/knowledge:** This project is for electrical or computer engineering students. Some knowledge of embedded systems and microcontroller programming will be helpful.

Mark Easley/Texas Instruments	Connectivity	Tempe	Either	U.S. Citizens
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Brief Description: The project will focus on wireless internet of things application area; **Students will:** Program the microcontroller hardware and connect the hardware to a wireless network and eventually the cloud; **Prerequisite skills/knowledge:** This project is for electrical or computer engineering students. Some knowledge of embedded systems and microcontroller programming will be helpful.

Mark Easley/Texas Instruments	Analog Circuit Simulation	Tempe	Either	U.S. Citizens
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Brief Description: The project will focus on using PSPICE or simulation tools and working with portable measurements tools like Analog Discovery to make measurements of the selected circuits; **Students will:** Ramp up on simulation software, select several circuits to simulate and compare against the real-world results using portable test equipment. **Prerequisite skills/knowledge:** This project is for electrical or computer engineering students. Some knowledge of analog circuits, simulation will be helpful.

Meng Tao	Solar Energy Systems	Tempe	In person	U.S. Citizens
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Brief Description: This project develops a new solar system for hydrogen production and electric vehicle charging; **Students will:** Work with graduate students and develop either the hardware or software for the system; **Prerequisite skills/knowledge:** Electrical engineering major with a specialization in energy systems and power electronics.

Mohammadreza F. Imani	Electromagnetics and Antennas	Tempe	In person	Both
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Brief Description: Optimization of a smart on-chip wireless environment; **Student will:** Simulate an on-chip multi-core communication system in Ansys HFSS and use reconfigurable metamaterial elements to optimize communication between transmitter(s) and receiver(s). As part of this project, the student needs to streamline the simulation process by running HFSS projects through MATLAB; **Prerequisite skills/knowledge:** Basic knowledge of MATLAB, Ansys HFSS, and electromagnetics (have at least passed EEE341).

Faculty Name	Program/Expertise Area	Campus	In-person, Online, or Either	U.S. Citizens, International Students or Both
Nick Rolston	Thin Film Renewable Energy Materials and Devices (Thin-film Structures)	Tempe/ Research Park	In person	Both

Brief Description: The intent of this project is to study the mechanical properties and reliability of advanced thin-film structures that have applications in next-generation photovoltaic technologies. The goal of the work is to develop a fundamental understanding of how mechanical properties are related to their structure, processing, and stability. The student will gain familiarity and experience with a number of experimental techniques, including thin-film sample preparation and the use of X-ray diffraction, X-ray photoelectron spectroscopy, and scanning electron microscopy for analyzing diffusion, deformation, and reaction processes in perovskite materials and devices; **Students will:** Be responsible for characterizing thermomechanical reliability of thin film perovskite photovoltaic materials using accelerated degradation tests such as in-situ film stress measurements, debond kinetics, fracture tests, and device stability measurements; **Prerequisite skills/knowledge:** Knowledge of electronic devices, materials science, and mechanical properties is a plus.

Nick Rolston	Thin film Renewable Energy Materials and Devices (Chemomechanical Degradation)	Tempe/ Research Park	In person	Both
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Brief Description: The intent of this project is to better understand the chemomechanical degradation effects in both lithium-ion batteries and solid-state batteries. The project will be experimental in focus and will leverage structures that are commercially available along with in-house produced layers with a range of chemistries and architectures. Fracture testing will be a key aspect of the project to determine failure points in battery devices along with film stress measurements to determine possible sources of accelerated degradation. The student will gain familiarity and experience with a number of experimental techniques, including thin-film sample preparation and the use of atomic force microscopy (AFM), X-ray photoelectron spectroscopy (XPS), and scanning electron microscopy (SEM) for analyzing fracture surface composition and morphology; **Students will:** Be responsible for conducting mechanical testing on Li-ion and solid-state battery materials and devices to determine the effect of film stress from cycling and resistance to fracture on cyclability. The goal will be to better understand degradation mechanisms and to engineer improvements for various battery architectures and structures; **Prerequisite skills/knowledge:** Knowledge of electrochemistry, materials science, and mechanical properties is a plus.

Pat Phelan	Thermal Engineering, Sustainable Energy	Tempe	Either	Both
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Brief Description: We want to develop analytical tools to predict energy efficiency opportunities in buildings and factories; **Students will:** Conduct exploratory data analysis for building electricity consumption; **Prerequisite skills/knowledge:** Background in energy efficiency concepts, background in statistical data analysis desired.

Rebecca Muenich	Environmental and Watershed Modeling	Tempe	Either	Both
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Brief Description: Multiple projects focused on developing inputs for and models of environmental and watershed systems, specifically for nutrient cycling; **Students will:** Research focus on creating, collecting, analyzing, and applying data to problems related to nutrient pollution; **Prerequisite skills/knowledge:** Experience working with a programming language such as Matlab, R, python preferred, as well as experience with a GIS program such as ArcGIS or QGIS.

Rong Pan	Digital Twins	Tempe	In person	Both
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Brief Description: The aim of this project is to explore and design simulation tools as digital twins of physical manufacturing systems and to actualize simulation-based production control; **Students will:** Design and execute discrete event simulation experiments; **Prerequisite skills/knowledge:** Knowledge of basic probability and statistics, Monte Carlo simulation, and production system modeling.

Rong Pan	Predictive Analytics for Digital Manufacturing	Tempe	Either	Both
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Brief Description: The aim of this project is to model and analyze manufacturing data from 3D printing processes and to improve product quality; **Students will:** Analyze data and develop predictive models; **Prerequisite skills/knowledge:** Knowledge of regression models, R or Python programming.

Shenghan Guo	Data Analysis, Machine Learning	Polytechnic		
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Brief Description: Spatial-temporal feature extraction from video data of extreme weather; **Students will:** This research will focus on image processing and feature extraction from video data of extreme weather. The data consists of subsets of data, which were collected by different sensors for the same weather events. The objective will be extracting features from the data that reflect the spatial correlation among pixels as well as the temporal changes of the weather; **Prerequisite skills/knowledge:** Fundamental knowledge about statistics and proficiency in Python.

Faculty Name	Program/Expertise Area	Campus	In-person, Online, or Either	U.S. Citizens, International Students or Both
Shuguang Deng	Carbon Capture	Tempe		

Brief Description: This project aims at evaluating different adsorbents for direct carbon capture from ambient air and assessing the technical and economic feasibility of direct air capture technology.

Shuguang Deng	Chemical Upcycling of Plastics	Tempe		
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Brief Description: This project aims at understanding the reaction mechanisms of the depolymerization of polyethylene and polypropylene and valorizing depolymerization products of discarded plastics.

Sydney Schaefer	Non-invasive Brain Stimulation, Motor Learning	Tempe	In person	Both
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Brief Description: This project uses transcranial direct current stimulation to deliver electrical signals to motor regions of the cerebral cortex to augment motor skill acquisition; **Students will:** Assist in data collection and data entry; **Prerequisite skills/knowledge:** Experience in human subjects research is preferred.

Tianfang Xu	Machine Learning Applications in Hydrology (Karst Watersheds)	Tempe	Either	Both
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Brief Description: Snow dominated mountainous karst watersheds are a primary water supply in many parts of the world. The project aims to quantify dynamics of these watersheds and their response to climate change, using hybrid physically based and deep learning models; **Students will:** We are looking for two SURJ students to take on (1) preparing data and running an energy balance snow model for multiple watersheds, and (2) exploring variants of a deep learning model we have developed and assess their performance and physical consistency; **Prerequisite skills/knowledge:** For focus (1), interest in numerical simulation and high performance computing is a plus. For focus (2), demonstrated programming experience with Python. Experience with machine learning/deep learning is a plus.

Tianfang Xu	Machine Learning Applications in Hydrology (Agricultural Water Use Dataset)	Tempe	Either	Both
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Brief Description: We are developing an agricultural water use dataset by integrating in situ and remote sensing data using machine learning; **Students will:** Exploratory data analysis to support feature engineering of machine learning; **Prerequisite skills/knowledge:** Background in working with time series and/or spatial datasets.

Wenlong Zhang	Wearable Robotics, Soft Robotics, Human-robot Interaction, Unmanned Aerial Vehicles (Novel Soft Actuator for Exosuits and Manipulators)	Polytechnic	In person	Both
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Brief Description: Experimental demonstrations on control of connected and automated vehicles/robots; **Students will:** Help and assist experimental tests in the field, both indoor and outdoor; **Prerequisite skills/knowledge:** Students in mechanical engineering or material science majors. Prior background in soft robots and wearable robots is a plus.

Wenlong Zhang	Wearable Robotics, Soft Robotics, Human-Robot Interaction, Unmanned Aerial Vehicles (Human-Robot Collaboration)	Polytechnic	In person	Both
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Brief Description: The objective of this project is to conduct human experiments and analyze the data to evaluate new robot learning algorithms for human-robot collaboration; **Students will:** Participate in designing human experiments, conducting human experiments with PhD students, and analyzing the collected data; **Prerequisite skills/knowledge:** Student from human systems engineering, ergonomics, psychology, computer science. Prior experience in human experiments is preferred.

Yan Chen	Dynamics and Control of Connected and Automated Vehicles and Robots	Polytechnic	In person	Both
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Brief Description: Experimental demonstrations on control of connected and automated vehicles/robots; **Students will:** Help and assist experimental tests in the field, both indoor and outdoor; **Prerequisite skills/knowledge:** Background on hardware related to vehicles, robots, such as ultrasonic sensors, Raspberry Pi.

Faculty Name	Program/Expertise Area	Campus	In-person, Online, or Either	U.S. Citizens, International Students or Both
Zachary Holman	Solar Cells and Modules—Thin Films (Aluminum Foil Modules)	Tempe/ Research Park	In person	U.S. Citizens

Brief Description: Our lab has developed a new technology to connect the solar cells in a solar module that replaces (expensive) silver and copper with aluminum foil that is 10-100x cheaper. This project will investigate the reliability of these modules by characterizing their performance as a function of exposure to thermocycling (temperature swings) and damp-heat environments; **Students will:** Be responsible for solar module characterization (current-voltage, electroluminescence, adhesion tests, etc.), accelerated degradant testing, failure characterization (e.g., scanning electron microscopy), and becoming familiar with the current literature and state of the art of silicon solar modules; **Prerequisite skills/knowledge:** Familiarity with electronic devices, materials science, mechanical properties, or statistical analysis is a plus.

Zachary Holman	Solar Cells and Modules—Thin Films (Solar Cell Efficiency Potential)	Tempe/ Research Park	In person	Both
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Brief Description: Our lab has developed a new method to measure the efficiency potential of a solar cell before the fabrication of that solar cell is complete. The method uses quantitative photoluminescence: the emission of light by a semiconductor when it is illuminated. This project will analyze the efficiency potential of perovskite, CdTe, and silicon solar cells using this technique; **Students will:** Take quantitative photoluminescence measurements, analyze the resulting data, and compare the predicted efficiency potential of solar cells to their actual measured efficiency after they've been completed. The student will work closely with graduate students to define experiments that vary the composition and structure of the solar cell samples to be analyzed (to understand the effects of such variations and predicted cell performance) and will become familiar with the current literature and state of the art in perovskite and other solar cells; **Prerequisite skills/knowledge:** Classes or research experiments in solid state or semiconductor physics is important; any previous experience with optical equipment (lasers, lenses, detectors, etc.) or solar cells is a plus.