

2023 SURP Project Descriptions

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2023 SURP Project Descriptions - Albany Campus

Professor Andre Melendez

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College of Nanoscale Science and Engineering

Professor

Project Title: Identifying aging factors in coral. Cellular senescence has evolved to prevent uncontrolled cellular proliferation and to limit tumorigenesis but when left unchecked gives rise to many age associated disease. In collaboration with capital coral we will explore factors that are produced by distinct corals block cellular senescence. The student will learn cell culture, microscopy and many molecular techniques are used to monitor senescence in cell culture.

Student Skills / Requirements: Marine Biology or Equivalent.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Albany Campus

Professor Greg Denbeaux

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College of Nanoscale Science and Engineering

Associate Professor

Project Title: Measurements of fundamentals of photoresists. You will be studying fundamental processes of the photoresist coatings for semiconductor lithography. Specifically, we are studying how the different components of the photoresist segregate during the coating and baking processes.

Student Skills / Requirements: Matlab is useful, willingness for hands on research is essential.

Location: Albany Campus Utica Campus

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Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Albany Campus

Professor Michael Fasullo

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College of Nanoscale Science and Engineering

Associate Professor

Project Title: Identifying mammalian genes that function to detoxify P450-activated carcinogens. Many carcinogens require activation by cytochrome P450 enzymes to become active genotoxins. These activated genotoxins can be deactivated by a myriad of other gene products, including glutathione transferases and epoxide hydrolases. The purpose of this project is express mammalian glutathione transferases in humanized yeast strains expressing the mammalian gene CYP1A2. We will then determine whether expression of mammalian glutathione transferase can reduce the genotoxicity of activated mycotoxins and heterocyclic aromatic amines.

Student Skills / Requirements: 2nd or 3rd year student.

Location: Albany Campus Utica Campus

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Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Albany Campus

Professor Nathaniel Cady

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College of Nanoscale Science and Engineering

Professor

Project Title: Nanoelectronics for AI and Neural Network Applications. The Cady Lab is developing new low-power, high-efficiency electronics for neural network and artificial intelligence applications. In this project, students will work with a team of graduate students and staff to fabricate and test nanoelectronic devices and circuits. This work is currently being applied to robotics applications and unique in-memory computing approaches.

Student Skills / Requirements: Electrical testing, electrical engineering, simulation, data analysis, physics, engineering, robotics, computer programming.

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Albany Campus

Professor Serge Oktyabrsky

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College of Nanoscale Science and Engineering

Professor

Project Title: Molecular Beam Epitaxy System Automation and Upgrade. The summer internship will include upgrade for the group III-V molecular beam epitaxy (MBE) control system. That would involve writing code in C++ and Python for PC and possibly for microcontroller for shutters and ion gauges communication and deploy growth recipe solutions on our MBE tool. Some prior experience with C++ and/or Python would be great. This will give the student an insight of how automation works in complex semiconductor tools, and experience for future industrial automation job.

Student Skills / Requirements: Python, C++, ultrahigh vacuum equipment - preferable but not necessary.

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Albany Campus

Professor Spyros Galis

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College of Nanoscale Science and Engineering

Associate Professor

Project Title: Near-Infrared Single-Photon Emission Microscopy. The overarching objective of this project is to provide valuable team-driven research experiences for an undergraduate student through participation in our current National Science Foundation (NSF) research project “QuIC-TAQS: Multifunctional integrated quantum photonic processor for quantum connectivity.” Our project aims to advance fundamental understanding in developing and characterizing solid-state quantum emitters capable of operation at the technologically important low attenuation telecom band.

Student Skills / Requirements: Senior Physics/ Engineering student

Location: Albany Campus Utica Campus

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Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Albany Campus

Professor Robert Brainard

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College of Nanoscale Science and Engineering

Full Professor

Project Title: (1) Bio Roll-Up. The goal of this project is to develop the methodology for controlling timing of self-assembly of bilayer stacks upon which cells are growing. The ultimate goal of this project is to determine how shape changes influence the biology of cells. Students will synthesize polymers and formulate polymers into photoresists, that will be coated onto silicon wafers into multiple stacks of hydrogel films. Students will study the kinetics of self-assembly of these multi-layer stacks under conditions suitable for cell growth. Students may participate in growing cells onto these stacks.

Student Skills / Requirements: No experience necessary, but strong background in chemistry and biology required.

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Albany Campus

Professor Robert Brainard

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College of Nanoscale Science and Engineering

Full Professor

Project Title: (2) Molecular Organometallic Resists for EUV (MORE). The goal of this project is to develop organometallic compounds that can be used as high resolution photoresists in the microelectronics industry to fabricate future integrated circuits. Students will synthesize and/or characterize compounds containing main-group metals. These compounds are designed to undergo chemical reactions when irradiated with 13.5 nm extreme ultraviolet light resulting in a change in solubility.

Student Skills / Requirements: No experience necessary, but strong background in chemistry, particularly organic chemistry.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Albany Campus

Professor Robert Brainard

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College of Nanoscale Science and Engineering

Full Professor

Project Title: (3) Statistics and Reaction Rates of Free Radical Polymerization. The manufacture of integrated circuits requires a high degree of uniformity in the performance of all parts of the process. One of the most important materials is the photoresist which is typically composed of organic polymers. The goal of this project is to explore various polymerization techniques and to determine the degree of uniformity of incorporation of two or more monomers into these polymers so that all of the individual polymer chains are the same.

Student Skills / Requirements: No experience necessary, but strong background in chemistry, particularly organic chemistry.

Location: Albany Campus Utica Campus

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Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Albany Campus

Professor Robert Brainard

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College of Nanoscale Science and Engineering

Full Professor

Project Title: (4) Reactivity and Identification of the Products of Development of Organometallic Photoresists. One of the hottest areas of material research today is the development of Organometallic resists (similar to our MORE program described in Project 2). This project will focus the development of a completely new development chamber to dissolve these resists and the analysis of the dissolved reaction products.

Student Skills / Requirements: No experience necessary, but strong background in chemistry, particularly organic chemistry. Additionally good hands-on mechanical skills will be valuable.

Location: Albany Campus Utica Campus

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Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Jagannath “Jay” Upadhyay

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College of Engineering

Assistant Professor

Project Title: Relating Porosity to Mechanical Behavior of SS 316L Manufactured by DLMS

Method. This summer work aims to collect preliminary data to support state/federal research grant applications. The work performed under this program aims at conducting experiment work to test research hypotheses concerning porosity and mechanical behavior of SS 316L samples manufactured using Direct laser Metal Sintering (DLMS) techniques. Thus, knowledge gained from this preliminary study will support PI to understand the effects of porosity on mechanical behavior for better optimization and development of the new manufacturing process. These data will also provide a basis for multiscale numerical simulation for AM to predict the mechanical behavior of the material as well. This list is the objective of the research plan:

1. Using state-of-art X-ray Computerized Tomography (CT) Scan technique, porosity and surface roughness of the sample manufactured using DLMS will be obtained.
2. Perform a series of mechanical testing experiments using Instron, torsional, rotating fatigue, and hardness tools to understand the relationship between porosity and mechanical behavior of 3D printed SS 316L samples.

Student Skills / Requirements: Willingness to operate Tensile, Fatigue, Hardness and Torsional testing tools, Excel, Basic Engineering Skills

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Iulian Gherasoiu

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College of Engineering

Associate Professor

Project Title: (1) Fabrication and Characterization of Silicon Solar Cells – A Laboratory Activity for Undergraduate Students. Addressing the climate change requires the fast replacement of the fossil fuels with clean sources of renewable energy such as the photovoltaic energy. Learning about the fabrication steps and the operation of the solar cells (SC) is greatly enhanced when the students have the opportunity to participate and experience the fabrication and characterization process. Despite its importance, the adoption of this teaching approach presents safety challenges, as the typical fabrication of silicon solar cells is technologically complex and requires the handling of hazardous chemicals (P, B, HF). This project aims to establish an alternative process flow that is based on chemicals that are usual in the undergraduate chemistry labs. The goal of the process is to fabricate functional silicon SCs using only aluminum (Al) as dopant and to avoid the use of HF for the etch of the silicon oxide layers. Besides silicon processing, the student will receive training in evaluating the results of the characterization techniques, such as SEM, x-ray energy dispersive spectroscopy and AFM. The electrical performance of the SCs will be determined using a solar simulator under AM 1.5 illumination conditions.

Student Skills / Requirements: Electrical Engineering, Physics, Chemistry

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Iulian Gherasoiu

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College of Engineering

Associate Professor

Project Title: (2) Current Leakage Passivation for InGaN Semiconductor Alloy Bipolar Devices. InGaN semiconductor alloys are suitable for the fabrication of full spectrum solar cells. However, the material suffers from the formation of extended defects during the growth that drastically diminish their efficiency. Ex-situ defect passivation could provide a method to suppress the current leakage along these defects and improve the solar cell efficiency. Students will use sputtering deposition and annealing methods to deposit, diffuse and oxidize Al at different temperatures on InGaN films. Defect etching, and passivation with Nitrogen plasma will be also tested. The results of the passivation process will be structurally and electrically evaluated using Scanning Electron Microscopy (SEM), Conductive Atomic Force Microscopy (C-AFM), and current-voltage (I-V) measurements under dark and AM1.5 illumination conditions.

Student Skills / Requirements: Electrical Engineering, Physics, Chemistry

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Yu Zhou
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College of Engineering
Associate Professor

Project Title: Control of Robot Manipulator for Composite Prepreg Layup Process. Robotic composite prepreg layup processes use robot manipulators to pick and place prepreg plies (fabrics pre-impregnated with resins) to produce composite laminates. One major challenge is to control the robot manipulator to follow the planned path accurately and apply the layup force uniformly during the continuous layup process for each ply and each laminate and throughout the process of mass production, in order to attain consistent product quality. This summer project will explore control approaches for layup trajectory and force control during a robotic prepreg layup process using a Baxter robot. The tasks mainly include programming and running the robot to implement control algorithms, setting up and performing experiments to assess control algorithms, and documenting the research process and results.

Student Skills / Requirements: Python programming, Ubuntu OS, and basic understanding of how robot manipulators work

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Daniel Jones
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Engineering Technology
Associate Professor



Project Title: Analysis of Electroencephalography (EEG) Data. We have collected EEG data from 80-100 student participants in a modern EEG laboratory. Signals are measured with 256 sensors at 1,000 Hz while participants provide emotional response to photographs. This project aims to analyze the data to understand neural activity of the brain in response to the images.

Student Skills / Requirements: General computer skills for analyzing data, preferably Matlab or Excel (or a desire to learn), motivation to work independently.

Location: Albany Campus Utica Campus

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- Yes No Track 2: Faculty-Grant Funded SURP
- Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Aarthi Sekaran

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Mechanical Engineering

Assistant Professor

Project Title: Simulation of photoresist removal from high aspect ratio trench structures in semiconductor wafers. This project aims at exposing undergraduate students with semiconductor industry challenges that require a fundamental understanding of the mechanisms governing the fabrication of semiconductor chips. The proposed project will be investigated from both theoretical and experimental frameworks by selecting technical problems relevant to bleeding-edge semiconductor industry with emphasis on advanced-node transistor fabrication. The specific goal of this project is understanding the thermodynamics of photoresist removal in trench structures used for semiconductor interconnects. Sequence includes patterning, photoresist (PR) fill and plasma strip of the PR film. Computational fluid dynamics (CFD) will be used to simulate the relevant processes and compare to theoretical and experimental data. This project is in collaboration with the IBM research center (Albany, NY).

Student Skills / Requirements: The student should be a mechanical engineer (2nd and 3rd year) with a basic understanding of engineering physics and some experience with coding. Student should be comfortable with standard tools such as Microsoft Word and Excel and be open to using new software.

Location: Albany Campus Utica Campus

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Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Zhanjie Li
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College of Engineering
Associate Professor

Project Title: Computational simulation of cold-formed steel column members.

Computational modeling has been greatly advanced in recent years. High-fidelity computational modeling that has been validated has a great advantage in providing reliable prediction of structural behaviors and yet saves a lot of costs compared to full-scale experimental tests. Particularly for cold-formed steel (CFS) member analysis, sophisticated shell models have been greatly validated in the past with tests for nonlinear collapse analyses. However, there are lots of modeling parameters involved in the analysis: • Geometric imperfections modeling for CFS members • Residual stress/strain for CFS members • Material modeling for CFS steel • Boundary conditions – particularly warping • Solution schemes • Element choices • Mesh sensitivity All of these require a guidance and provisions to efficiently yet reliably conduct computational modeling for CFS members. In particular, how the analysis should be conducted as a replacement of test-based design procedures, i.e., analysis-based test approach, could be potentially implemented into American Iron and Steel Institute (AISI) standards. As a commencing effort for possible codification of testing by analysis in the AISI standards, the objective, by starting from the member level, is to provide the needed background work for stub column by analysis, provide a guidance for conducting computational modeling of CFS members through a series of numerical examples, and then summarize the recommended provisions related to all the modeling parameters above. ABAQUS package will be chosen as the beginning computational model tool based on extensive experiences in our past research.

Student Skills / Requirements: Student should be familiar with modeling, MATLAB coding, fundamental mechanics.

Location: Albany Campus Utica Campus

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- Yes No Track 1: SURP-Funded
- Yes No Track 2: Faculty-Grant Funded SURP
- Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Hisham Kholidy

kholidh@sunypoly.edu

College of Engineering

Assistant Professor

Project Title: (1) Open 5G network Security: A Blockchain based Federated Learning Framework for 5G Networks. 5G is introducing a world of opportunities for the consumer market with much speed and bandwidth. This project specifically contributes toward the development and validation of a proactive cyberdefense framework to self-protect a multitenant large-scale 5G networks against cyberattacks in a timely, dynamic, and accurate way. To this end, this project uses the federated learning and Blockchain models to protect the exchanged parameters between open 5G architecture domains.

Student Skills / Requirements: Programming using Python, C, and/or Java. Some experience about Blockchain.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Hisham Kholidy

kholidh@sunypoly.edu

College of Engineering

Assistant Professor

Project Title: (2) Protecting the Unmanned Aerial Vehicles (UAV) Communication: UAV based 5G and beyond networks security. Unmanned aerial vehicles (UAVs) are anticipated to significantly contribute to the development of new wireless networks that could handle high-speed transmissions and enable wireless broadcasts. This project studies the security of the UAV communication with regard to 5G and beyond networks. We harness the machine learning, blockchain, and federated learning techniques to protect the UAV communication.

Student Skills / Requirements: Programming using Python, C, and/or Java. Some experience about Blockchain.

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Ana Jofre

jofrea@sunypoly.edu

Communications and Humanities / College of Arts and Sciences

Assistant Professor

Project Title: Timeline 1923-2014. I have been developing a project that explores an archive of over 3000 Time magazines from 1923 to 2014. See project here: <https://magazineproject.org/sandbox/> For this particular summer project, I will need help with preparing the content for the "Travel Through Time" page. This page will allow users to explore key events that were covered by Time magazine between 1923 and 2014. I need help collecting and working through the data for this page. The ideal student will have taken at least one history course, and will know how to use the library databases.

Student Skills / Requirements: Humanities research skills.

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Arjun Singh

singha8@sunypoly.edu

Electrical and Computer Engineering / Engineering

Assistant Professor

Project Title: Development of a 5G Test-bed for wireless communications - Measurements and Channel Profiles. Funded through the Wilcox gift, the department of Engineering is investing in multiple spheres of ECE, wireless communications being one of them. The development of a 5G testbed at SUNY Polytechnic is currently underway, within which students can work with software defined radios operating at mmWave frequencies. Under the supervision of the professor, the student(s) will help to characterize the RF equipment to make the testbed operation. This will include learning about an understanding the domain of signal processing equipment, recording measurements in multi-path settings, post processing the recorded data offline through MATLAB, and implementing improvements in the signal processing back end. The envisioned work plan is as follows: Week 1: Intensive training for familiarity on the testbed equipment. MATLAB refresher course, and basics of communication systems including convolution and Fourier transforms. Week 2: Refresher course and explanation of single carrier (SC) physical layer and frame structures for 5G NR. Characterization of the equipment including power profile, noise floor, and beam steering capability of the transceiver ends. Week 3: Review and interpretation of characterization measurements (repeat if incongruities detected). Advancement into multi-carrier (MC) physical layer structure, including OFDM. Week 4: Continuation of multi-carrier physical layer design lecture and discussion. Recording measurements with SC and MC profiles on the testbed. The initial basic measurements will be directed in favorable settings with clear line of path channels, to avoid complex multi path. Variable bandwidths, different power profiles, and dual Tx / Rx beamforming will be explored. Week 5: Continuation of the measurements from the previous week. Post processing guidance and steps, advice and guidance on how to record and keep data (for later publications), and review and interpretation of the deciphered results. Week 6: Multi-path channel, unfavorable N-LOS setups, and effect of basic mobility to be recorded and reviewed. Week 7 - 10: Finishing the previous tasks, helping the student prepare a publication for IEEE sponsored Journals or high-impact factor conference workshop with the student as first author. The work will include the characterization results, measurement insights, and development of the back-ends for improved performance of the testbed.

Student Skills / Requirements: Second or Third year ECE student, with prior experience in MATLAB desirable but not completely necessary. Basic familiarity with electrical equipment required. Some experience with SPI would also be great.

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Bongmook Lee

leeb1@sunypoly.edu

Electrical Engineering Technology / Engineering

Associate Professor

Project Title: Development of air quality monitoring system. In this project, we aim to build a new generation of low-powered, portable, multiplexed gas and particle sensors for indoor air quality exposure monitoring. The proposed system has multiplexed gas sensors for monitoring volatile organic compounds as well as particulate for indoor exposure monitoring. This portable system measures the emissions in real-time and sends measured data to aggregators. It is implemented entirely with commercial off-the-shelf (COTS) components and custom printed circuit board (PCB) design.

Student Skills / Requirements: Engineering student / Arduino Programming / basic knowledge of hardware / Python / C

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Carolyn Rodak

rodakc@sunypoly.edu

Civil Engineering / Engineering

Associate Professor

Project Title: Development and application of infrastructure performance metrics for wastewater systems in Upstate NY. This project looks to develop resilience and performance metrics for wastewater infrastructure in Upstate NY. The project focuses on the analysis of the New York State Sewage Pollution Right to Know database which houses publicly available data on the occurrence of sewage releases in New York State. The analysis will include general statistics, correlations (climate, water quality, spatial-temporal datasets), and measures of performance from the perspective of frequency, duration, and severity of release events. The end goal for this work is a publicly accessible general summary / white paper which succinctly communicates information related to wastewater infrastructure performance or the Utica, NY area. Although the main portion of this work is computational, the student will also have the opportunity to participate in several water quality sampling trips to the Mohawk river and local tributaries.

Student Skills / Requirements: Excel

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Indika Udagedara

udagedi@sunypoly.edu

Department of Mathematics & Physics, College of Arts and Sciences

Lecturer

Project Title: Offline signature verification using a data-driven approach. A signature is a legally accepted key for document authentication and personal verification. Offline signatures are the most widely used authentication technique in financial institutions and security systems. In the literature, several signature verification methods have been used to verify the genuineness of the offline signature. Our previous work focused on offline signature verification using a graph-theory-based algorithm and a reduced order modeling approach based on proper orthogonal decomposition. In this project, we will develop a probabilistic approach based on Bayesian statistics to capture the features of the training data phase.

Student Skills / Requirements: Matlab (or Python), Applied Mathematics student (3rd year/fourth year)

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Juan Felipe Henao Piza

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Management Department / College of Business

Associate Professor

Project Title: How is the New York State power system preparing for climate change? The project seeks to understand the basic configuration and functioning of New York State's power system, particularly its transmission network and primary energy sources (2 weeks). In addition, it aims to understand how climate change may impact NY State, affect its power infrastructure and alter local weather patterns (2 weeks). Also, it will seek to investigate what adaptation strategies have been considered to make the power system resilient to climate change (2 weeks). Finally, the most recent literature in power capacity expansion modeling will be reviewed to see what has been published regarding the NY State and how climate change has been considered in those models (4 weeks).

Student Skills / Requirements: 3rd-year or above student from any Engineering or Business major.

Location: Albany Campus Utica Campus

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Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Margarita Orlova

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Dept. of Biology and Chemistry, College of Arts and Sciences

Assistant Professor

Project Title: (1) Role of learning and experience in queen-worker communication in social insects. This project seeks to examine whether learning and memory play a part in the perception of queen pheromones in social insects and how role of learning differs across species with different social structure. We will examine the effects of developmental conditions and neuropharmacological intervention on perception of queen signals by workers and uncover the molecular pathways responsible for this process. I plan to achieve these goals by rearing bees in manipulated environments with controlled exposure to different chemical and behavioral components, pharmacologically manipulating neural pathways responsible for learning and memory and observing the results of such manipulation on queen-worker interactions, and worker brain gene expression.

Student Skills / Requirements: No fear of insects, absolutely no allergies to insect stings or other outdoor materials, such as pollen. Willingness to work in the field and in the lab.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Margarita Orlova

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Dept. of Biology and Chemistry, College of Arts and Sciences

Assistant Professor

Project Title: (2) Effect of stressors on chemical communication in the honeybee. The project is focused on identifying the effects of stressors, such as pesticides, pathogens and nutritional deficiency, on the cuticular hydrocarbon (CHC) profiles of honeybee workers and queens. The project aims to identify CHC signatures that could serve as diagnostic criteria for colony stress levels and for queen quality. The data for the project will be collected in the lab as well as in the field.

Student Skills / Requirements: No fear of insects, absolutely no allergies to insect stings or pollen, willingness to work in the field and perform physical tasks (e.g., carrying parts of hives).

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Shing Chi Leung

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Mathematics and Physics, College of Arts and Sciences

Assistant Professor

Project Title: (1) Machine-Learning Approach in Supernova Light Curve Classification.

Modern supernova transient surveys, such as Zwicky Transient Factory (ZTF) and Large Synoptic Space Telescope (LSST), observe tens of thousands supernovae per year. Identification and classification of these optical signals can reveal the statistical distribution of stars and the explosion mechanisms, which are not fully understood. Classification based on experience will become inefficient in view of the samples available and machine-learning approach is one of the ways to accelerate the process. In this project, the participating students will use Python to develop a theoretical catalogue of supernova light curves. The students will explore and build a machine-learning pipeline to classify the light curve and extract the internal physics based on the light curve morphology, and calibrate its accuracy. This project will serve as a pilot project for real supernova identification and the exploration of supernova explosion physics in the dawn of data astronomy.

Student Skills / Requirements: Python, numerical programming, knowledge in physics.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Shing Chi Leung

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Mathematics and Physics, College of Arts and Sciences

Assistant Professor

Project Title: (2) Modelling the Origin of Silicon-group Elements in Metal Poor Stars. X-ray spectroscopy is a powerful technique in precisely measuring the chemical element abundance in stellar objects. In Isobe et al (Astrophysical Journal, 2022) some metal-poor (low metallicity) stars are observed with unusual abundance for Si-group elements. These ratios can act as constraints on the massive star progenitors and how they explode as supernovae, which are not fully understood. In this project, the participating students will explore the mechanism that lead to the observed chemical abundance. They will use Fortran to develop extension subroutines of the current supernova explosion code, simulate the explosion and calculate the associated chemical production. This project will serve as the pilot project for interpreting new data from future telescope mission (e.g. XRISM in 2023) for robust identification of stellar and supernova progenitors.

Student Skills / Requirements: Fortran (or C-like language), numerical programming, basic knowledge in physics.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Tarannum Shaila Zaman

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College of Engineering

Assistant Professor

Project Title: Developing Mobile Applications to Read/Hear the Review of Scientific Research Papers! Researchers always need to read research papers to build deep and wide perspectives on a specific topic. They also need to know about the recent works of their peers, so that they can always contribute something novel and can also appreciate the work of peers. Writing a systematic review of a scientific research paper takes a lot of human effort and hours. Moreover, as the quality of human writing can be different, we cannot ensure a good quality review all the time. In this project, we propose to develop an automated tool to write down good-quality scientific research paper reviews. Our goal is to develop mobile apps where a user can read/hear those reviews.

Student Skills / Requirements: Familiarized with mobile platform Application Programming Interfaces (API) such as Apple iOS, Android and Windows Mobile, programming languages like C# and Java, Experience in Mobile App development.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Zahid Akhtar
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College of Engineering
Assistant Professor

Project Title: (1) DeepFake and Fake News Detection. Deep learning-based methods are being used to generate digitally manipulated facial samples, known as 'DeepFakes'. Such digitally manipulated face videos or images not only deceive the humans but also automated face recognition-based biometric systems. One of the main defenses against face manipulations is DeepFakes detection.

Student Skills / Requirements: Python, Matlab, Computer Vision, Machine Learning.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor Zahid Akhtar
akhtarz@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (2) Adversarial Examples Detection. Despite their major breakthroughs in solving complex tasks, it has been observed that Deep Learning (DL) and Artificial Intelligence (AI) techniques are highly vulnerable to adversarial examples/attacks. Adversarial examples (AE) are carefully crafted variations of genuine samples intentionally modified so as to confuse or fool undefended DL/AI models.

Student Skills / Requirements: Python, Matlab, Computer Science, Machine Learning.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)

2023 SURP Project Descriptions - Utica Campus

Professor William Thistleton

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Mathematics, College of Arts and Sciences

Associate Professor

Project Title: Decentralized AI Applications. Many platforms now exist for generating images and text, see for example <https://openai.com/dall-e-2/> for images and <https://deepai.org/machine-learning-model/text-generator> for text. Our research group has successfully partnered with SingularityNET (<https://singularitynet.io/>) as a funding source to develop machine intelligence approaches for data generation with applications in weather and in financial models. Students working on this project will gain experience hosting machine intelligence applications online through the SingularityNET platform. Participating students will work with faculty mentors from SUNY Poly (Thistleton) and Photrek (Nelson) to use the existing onboarding instructional suite to host a simple generative application. They will also work to develop a more detailed and user-friendly set of instructional videos and text for onboarding applications.

Student Skills / Requirements: Some Python programming ability, maturity, ability to learn in an unstructured environment.

Location: Albany Campus Utica Campus

I am willing to accept students from the following tracks:

Yes No Track 1: SURP-Funded

Yes No Track 2: Faculty-Grant Funded SURP

Yes No Track 3: Research for Credit (for non-matriculated students)