CSUN

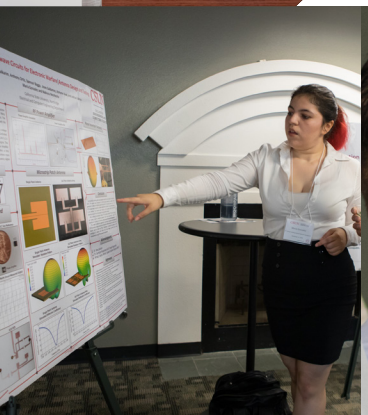
COLLEGE OF
ENGINEERING AND
COMPUTER SCIENCE

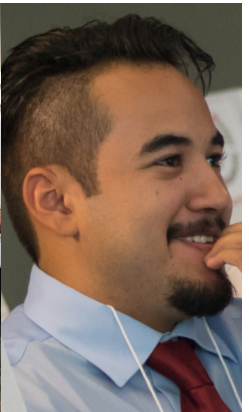
aims²

attract, inspire, mentor, support students

student research symposium

Sept. 11, 2019
3 p.m.
USU Grand Salon





Attract Inspire Mentor Support Students
AIMS²

HSI STEM Grant Program

AIMS² 2.0

ATTRACT, INSPIRE, MENTOR, AND SUPPORT STUDENTS

This collaborative project is led by the College of Engineering and Computer Science (CECS) at California State University, Northridge (CSUN), in partnership with four community colleges: Glendale Community College (GCC), College of the Canyons (COC), Pierce College, and Moorpark College. It builds on the highly successful and nationally recognized AIMS² program that has served approximately 800 students during the past eight years, supported by the U.S. Department of Education and led by Dr. S. K. Ramesh, faculty and staff from the partner institutions. The program has been named an Examples of Excelencia finalist in the baccalaureate program category for two years in a row (2019 and 2018) and was one of ten programs worldwide shortlisted for the 2018 Airbus Global Engineering Deans Council Diversity award. It was previously recognized by Excelencia in Education (2014), and as a Bright Spot in Hispanic Education (2015) by the White House Initiative for Educational Excellence for Hispanics for its success in retention and improved graduation of Latino/a students and underrepresented minorities

2019 AIMS² Graduating Class

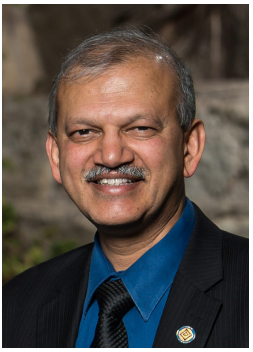
in engineering and computer science. Students in the AIMS^2 cohorts have access to special mentoring and advisement by faculty, tutoring and peer mentoring, social activities, field trips and opportunities to take part in undergraduate research projects. They are expected to carry a full academic load (a minimum of 24 semester units/year). Results from our work indicate that student contact with faculty mentors on research projects, coupled with participation in cohort group meetings, and informal interaction leads to their academic, social, and career development. The program continues to make a difference with an increase in the number of students served to over 800, effectively bridging the achievement gaps, improving transfer success, and increasing overall graduation rates for all Hispanic and low-income students in the College of Engineering and Computer Science.

¡EX! RECOGNIZED EXAMPLE of EXCELENCIA

Disclaimer: The contents of this brochure were developed under a grant from the U.S. Department of Education. However, those contents do not necessarily represent the policy of the U.S. Department of Education, and you should not assume endorsement by the Federal Government.


CSUN
Attract Inspire Mentor
AIMS2
Support Students
HSI STEM Grant Program
http://www.ecs.csun.edu/aims2/

AIMS² Director Message



Welcome to the fifth annual AIMS² Student Research Symposium at CSUN supported through our sequel 2016 HSI-STEM collaborative grant from the U.S. Department of Education. This has been an incredibly busy year as we served 150 students in three cohorts at CSUN including first time freshmen and transfers; and with our community college partners we are serving over 500 students across all sites. It has also been a sobering year underscoring the fragility of life as we unexpectedly lost two key members of our program: Mr. Bill James from our External Advisory Committee, and Mr. Jesse Bermudez (2019 AIMS² graduate and peer mentor). We will always remember them! Their lives and contributions inspire us daily as we serve future cohorts of students.

At its core, the AIMS² program is a testament to the power of collaboration and the cohort model. When students in the cohort are connected and engaged actively with their peers, and work on hands-on research projects with faculty and staff mentors, it builds enormous self-confidence and empowers every single member of the cohort, with a sense of belonging and community. The cohort becomes their extended family and as all families do, they sustain and support them academically and socially. More importantly, they are inspired to share, emulate, learn and support one another as they complete their education in engineering and computer science and prepare for their lives and careers ahead. They graduate from the program prepared and ready to serve their communities and inspire the next generation of students to follow their example.

I hope you will take advantage of this opportunity to join us on September 11 to see and hear firsthand from our outstanding AIMS² students and their innovative research projects. Do not miss it!

AIMS² Project Director and
Lead Principal Investigator

CSUN | COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

18111 Nordhoff Street • Northridge • California 91330-8295

www.csun.edu/ecs

Advisory Committee

SUNAND BHATTACHARYA, IDSA
Associate Vice Provost for
Design and Innovation Strategies
Boston College

VAUGHN CABLE
Spacecraft Antenna Research Group
Caltech-JPL
College Industry Advisory Board (Chair)
CSUN Electrical & Computer
Engineering Industry Liaison Council

LUIS CARBAJO
ECE Program Alumnus
Director, Los Angeles Promise
Neighborhood, Promise Zone
Youth Policy Institute

RUPA DACHERE
Member of Technical Staff, VMware
Executive Director & Founder,
CodeChix.org
Advisory Board, Department of
Computer Science
University of Colorado, Boulder

LINDA FRIEDMAN
Director, Software & Systems Engineering
Northrop Grumman Corporation
Navigation Systems
CSUN Computer Science Industry
Liaison Council

MIGUEL MACIAS
Emeritus Faculty, CSUN Civil
Engineering & Applied Mechanics

TONY MAGEE
Senior Metallurgist
Aerojet Rocketdyne
CSUN Manufacturing Systems
Engineering & Management
Liaison Council

MICHAEL MEDINA
Director, Civic CM
CMT Program Alumnus
Analyst
Consulting and Claims Services
San Diego

ROSLYN SOTO
Higher Education Group
Education Office
NASA Jet Propulsion Laboratory

Faculty Mentors

ANWAR ALROOMI
Civil Engineering & Construction Management

BEHZAD BAVARIAN
Manufacturing Systems Engineering & Management

KYLE DEWEY
Computer Science

JIMMY GANDHI
Manufacturing Systems Engineering & Management

TZONG-YING HAO
Civil Engineering & Construction Management

RUTING JIA
Electrical & Computer Engineering

BINGBING LI
Manufacturing Systems Engineering & Management

BRUNO OSORNO
Electrical & Computer Engineering

LISA REINER
Manufacturing Systems Engineering & Management

Project Staff

CINDY CRUZ
AIMS^2 Student Support
Graduation and Retention
Specialist

JOSEFINA GUDINO
AIMS^2 Student Support

EMIL HENRY
AIMS^2 Tech Support Lead
CECS Technical Services Manager

DEAZELL JOHNSON
AIMS^2 Student Support
CECS Academic Advisor &
Student Outreach Coordinator

KATHLEEN POHL
AIMS^2 Administrative Assistant
CECS Dean's Assistant

ROBERT RYAN
AIMS^2 Co-PI
CECS Special Assistant
to the Dean

AIMS² STUDENT RESEARCH SYMPOSIUM

September 11, 2019
3:00 - 8:00 p.m.
University Student Union (USU), Grand Salon

CIVIL ENGINEERING & CONSTRUCTION MANAGEMENT

- A Mobile Construction Management Risk Assessment Model
- Virtual Labs – Learning Engineering Mechanics and Dynamics with Virtual Hands-on Experiments
- Geotechnical and Earthquake Engineering Research: Active Earth Pressure on Retaining Walls & Soil-Structure Interactions on Building Structures
- Earthquake Engineering Research: 3D Modeling & Simulation of Passive Water Dampers

COMPUTER SCIENCE

- Automated Testing for Introductory Computer Science Assignments
- Validating Machine Learning

ELECTRICAL & COMPUTER ENGINEERING

- An Evolutionary Approach to DoS Defense
- A Particle Swarm Optimization Approach for Route Planning
- Energy Storage and Environmental Impact of Electric Vehicles
- Electric Transportation and PWM (Pulse with Modulation) Speed Drives

MANUFACTURING SYSTEMS ENGINEERING & MANAGEMENT

- Corrosion Inhibition Using Bio-friendly Packaging Materials
- High Strength Aluminum Alloys in Aerospace and Automotive Applications
- Reverse Engineering and Topology Optimization of Cam Support Plate for Harley Davidson Milwaukee 8 Engine in Metal Additive Manufacturing
- Wireless Keyboard Powered by Piezoelectric Effect
- Educated Future
- Hydrosól - a Solar Powered, Portable Charging Hydroflask Cap

FACULTY MENTOR

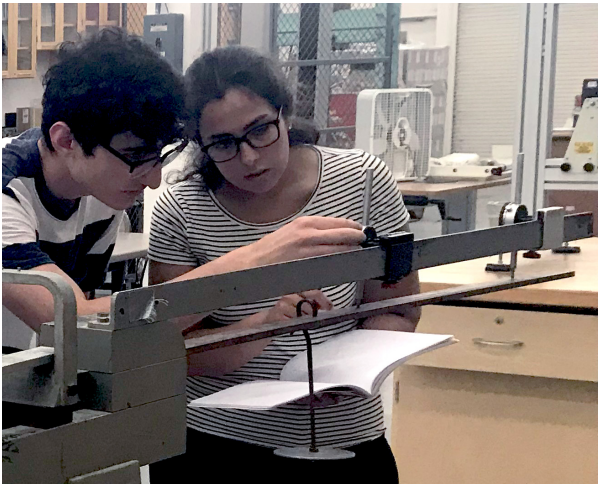
Dr. Anwar Alroomi

RESEARCH ASSISTANTS

Marc Chanko
Yasaman Forouzesh

A Mobile Construction Management Risk Assessment Model

Project Description: Construction projects are considered very critical in terms of the different types of risks associated with them. Risks can be classified as known risks, unknown risks, and dynamic risks. In this study, a mobile application using virtual labs will be developed. Risks can be assessed and evaluated based on their severity as low risks, moderate risks, and high (extreme) risks. Using virtual lab an interactive mobile model can be developed. The application will help in determining the risk level instantly, decisions can be made efficiently, and all development efforts can be prioritized effectively.



FACULTY MENTOR

Dr. Anwar Alroomi

RESEARCH ASSISTANTS

Caroline Padilla-Ramerez
Alexis Sierra

Virtual Labs – Learning Engineering Mechanics and Dynamics with Virtual Hands-on Experiments

Project Description: As hands-on experiments strengthen theories learned in engineering mechanics and dynamics, and mobile learning becomes very popular, virtual labs are on the rise. The goal of this project is to create, test and assess virtual-lab modules, and ultimately implement those modules in existing courses.

Student research assistants will explore open web-resources, learn and use qdex (qdex is an eLearning mobile platform for STEM education). With faculty mentors' instruction, they will create and test the virtual-lab modules.

FACULTY MENTOR

Dr. Tzong-Ying Hao

RESEARCH ASSISTANTS

Musfiqur Ali
Elizabeth Esquivel
Aaron Palacios-Romero
Alexander Rivera

Geotechnical and Earthquake Engineering Research: Active Earth Pressure on Retaining Walls & Soil-Structure Interactions on Building Structures

Project Description: Retaining walls are common structures used to retain earth materials while maintaining a grade change between the front and rear of the wall. The retaining walls are designed to resist earth pressures acting on the rear face of the wall that are caused by the weight of the soil and seismic loads. Generalized Limit Equilibrium (GLE) method is used to analyze the seismic active earth pressures for various earthquake ground accelerations. In seismic design of building structures, the fundamental period of vibration is one of the governing factors from which other design parameters are derived. The fundamental periods of the vibration of building structures are investigated with soil-structure interaction models imposing boundary conditions necessary to impart the earthquake motion.

Photo taken at the CSUN Earthquake Garden

FACULTY MENTOR

Dr. Tzong-Ying Hao

RESEARCH ASSISTANTS

Jennifer De Avila
Azmain Hossain
Gerardo Reyes
Andy Sanchez

Earthquake Engineering Research: 3D Modeling & Simulation of Passive Water Dampers

Project Description: The use of sloshing water damper as a passive means of reducing the vibrations has already been implemented in civil engineering community. Although these dampers have been researched extensively the accuracy of the models and simulations is still a question. This project focuses on the application of computer software, ANSYS, for 3D water tank models. The investigation includes the comparison of modeling techniques, the validation of the models, and the adequacy of the software.

Photo taken at the CSUN Earthquake Garden

FACULTY MENTOR

Dr. Kyle Dewey

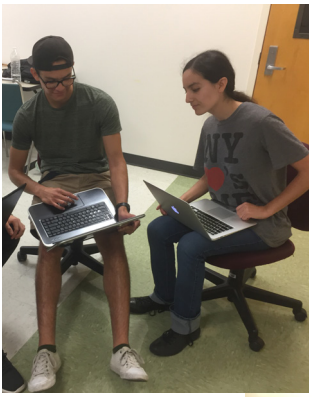
RESEARCH ASSISTANTS

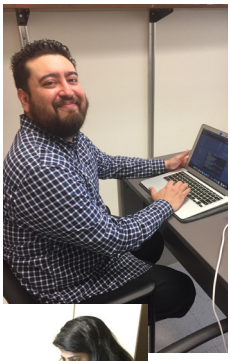
Mario Garcia
Kavya Manohar
Victor Pineda
Alexis Siguenza

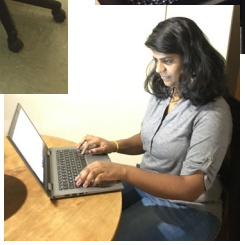
Automated Testing for Introductory Computer Science Assignments

Project Description: Introductory Computer Science assignments require students to write potentially significant amounts of code which must be evaluated by an instructor. Instructors commonly employ handwritten test suites to help in the evaluation process. While handwritten test suites are popular for evaluation purposes, they can be time-consuming to write, and are prone to missing key behaviors in student code.

Although test suites are traditionally written by hand, various techniques exist which can automatically generate test suites. These techniques range from simplistic to complex, and claim to offer different, potentially conflicting, benefits. The purpose of this project is to experiment with a variety of automated test suite generation techniques in the context of introductory Computer Science assignments, and to qualitatively evaluate the benefits and limitations of each technique in this context.







FACULTY MENTOR

Dr. Kyle Dewey

RESEARCH ASSISTANTS

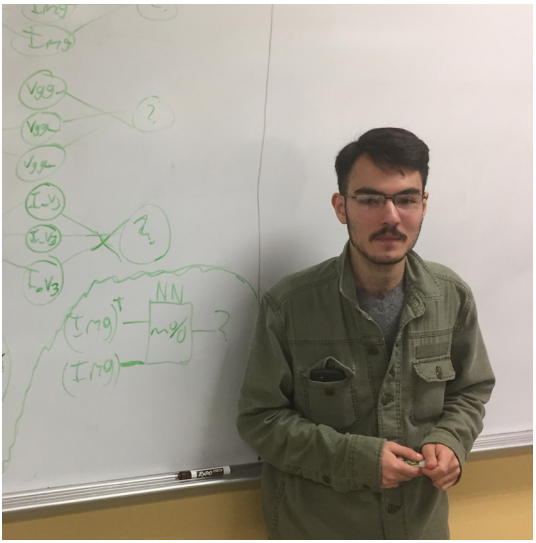
Meyer Millman

Validating Machine Learning

Project Description: Machine learning (ML) has rapidly grown in popularity over the past several years, and has contributed to major improvements in voice and facial recognition, search algorithms (including those of Google and YouTube), self-driving cars, drone flight control software, among many others. However, just like traditional software systems, ML-based systems are prone to flaws. Biometrics can fail or be tricked. Search algorithms can deliver imprecise results and amplify misinformation. Self-driving cars can crash. Drones can collide.

Despite the critical nature of these systems, there are no formal ways to ensure they work correctly, and methodology for finding problems in ML-based systems is lacking.

This project seeks to improve this state of affairs, and develop ways to test and validate ML-based systems.



FACULTY MENTOR

Dr. Ruting Jia

RESEARCH ASSISTANTS

Elvis Chino-Islas
Christopher Cuellar
Giovanni Martinez

An Evolutionary Approach to DoS Defense

Project Description: Large reliance on internet networks have exposed vulnerabilities in certain servers that can have catastrophic consequences. In 2000, MAFIABOY launched a Denial of Service (DoS) attacks on Amazon, CNN, and eBay that caused roughly 1.2 billion dollars in damages. It sends requests that never complete the connection, creating an overflow and backlog of requests. By applying a modified version of a computational method called Particle Swarm Optimization (PSO), we are able to protect internet servers against DoS attacks. This method continuously monitors the internet server and optimizes two variables. Results show that the method recognizes when a server is under attack and goes on to protect the system's performance by minimizing the attacker's ability to overflow the server with fraudulent requests.

FACULTY MENTOR

Dr. Ruting Jia

RESEARCH ASSISTANTS

Jozsef Feher
Jose Flores
Simran Gill

A Particle Swarm Optimization Approach for Route Planning

Project Description: The project is focused on finding the optimized route using particle swarm optimization algorithm. It takes two main aspects into account, distance and flow of traffic. In the simulated map there are regular locations as well as hub nodes. The map is displayed in two modes--shortest path & shortest time. To represent the real world scenario, two extra functions have been implemented. The accident and the flow function. Last but not least, a GUI is made to formalize the program into a standalone solution that will allow the end user to be able to run the program by itself. The layout is streamlining the performance while outputting the path and giving a numerical result. It also gives the user the option to add more stops to the path in addition to the starting and ending points. The user is warned if the inputs are incorrect.

FACULTY MENTOR

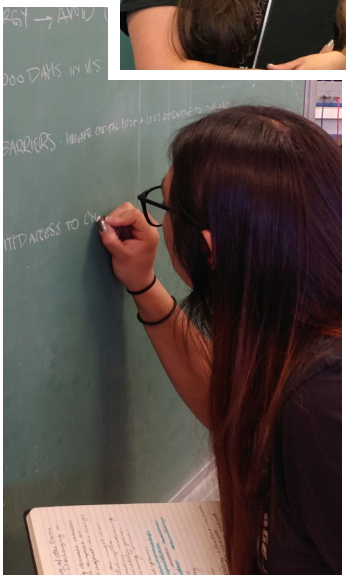
Prof. Bruno Osorno

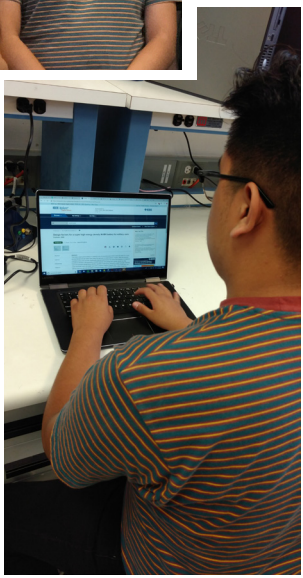
RESEARCH ASSISTANTS

Chelsea Mendez
Gerardo Sanchez

Energy Storage and Environmental Impact of Electric Vehicles

Project Description: Electric vehicle technology targets the "zero emission" goal. The poster shows different technologies utilized in powering these vehicles. In addition, the poster presents different battery and alternative green fuel technologies and their environmental impact. It also includes the simulation of a lithium-ion battery using Simulink. This poster represents the research of the students mentioned above for the summer of 2019.





FACULTY MENTOR

Prof. Bruno Osorno

RESEARCH ASSISTANTS

Froilan Campos
Samuel Ochoa

Electric Transportation and PWM (Pulse with Modulation) Speed Drives

Project Description: Electric transportation utilizes a technology called PWM to invert DC energy into AC energy. Most electric transportation uses AC induction machines as part of the electric speed drive. The poster presents a typical speed drive, simulation of an induction motor using matlab/Simulink. The speed control of a DC motor and a stepper motor using MyRio (data acquisition system) and Laview programing software are also included.

FACULTY MENTORS

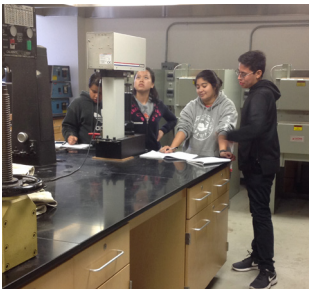
Dr. Behzad Bavarian
Prof. Lisa Reiner

RESEARCH ASSISTANTS

Kathleen Molina
Kimberly Ortiz
Ismael Pablo
Sherlyn Villasis

Corrosion Inhibition Using Bio-friendly Packaging Materials

Project Description: Students evaluated packaging materials for corrosion protection of metals. These environmentally friendly, biodegradable papers were coated with corrosion inhibitors and provide a simple process to minimize corrosion without toxic by-products. VCI coated wrapping paper method is easy to use and is critical during production, shipping and storage of electronic parts, machinery, automotive parts and tools. The vapor phase corrosion inhibitors (VCI) migrate off the paper onto the metal surface. The absorbed VCI film on the metal surface causes a repulsion of water molecules away from the surface. The paper also acts as a barrier between the metal and the elements, further shielding parts from salt, moisture, air, gases and contaminants. Test samples were prepared for electrochemical testing and standardized military tests including exhaustion and vapor inhibiting ability (VIA) to investigate the effectiveness of the VCI coated packaging papers. Metallographic analyses were done on the metal samples at the end of testing to determine the extent of any corrosion damage.



FACULTY MENTORS

Dr. Behzad Bavarian
Prof. Lisa Reiner

RESEARCH ASSISTANTS

Emilio Aguilar
Armando Briseno
Anthony De Leon
Christopher Villalpando

High Strength Aluminum Alloys in Aerospace and Automotive Applications

Project Description: Students investigated the effects of different heat treatment processes on the aluminum 7050 alloy followed by preparation of C-ring samples to observe stress corrosion cracking behavior. This aluminum-copper-zinc alloy is preferred in aircraft and automotive applications due to its high strength, light weight and improved corrosion resistance. Multiple Al-7050 samples were compared for mechanical properties (hardness and tensile) and measured for conductivity before and after heat treatments. Metallographic and SEM analysis were conducted to visually observe the heat treatment effects on grain structure. Over aging was done for some samples, which reduced the tensile strength compared to untreated samples, but was to improve ductility and increase fracture toughness. The stress corrosion samples were subjected to stress levels ranging from 50%-80% of yield strength in a cyclic corrosion testing (CCT) machine for three weeks. The chamber was set to cycle through eight hours of salt spray, eight hours of dry heat, then eight hours at room temperature. Samples were removed weekly for metallographic observation. Stress cracks were seen after one week of exposure.

FACULTY MENTOR

Dr. Bingbing Li

RESEARCH ASSISTANTS

Osmar Estrada
Angela Calderon
Andrew Langwald
Kerstern Malama
Christian Mariscal
Abraham Meiszner

Reverse Engineering and Topology Optimization of Cam Support Plate for Harley Davidson Milwaukee 8 Engine in Metal Additive Manufacturing

Project Description: The Cam Support Plate is critical to the success of this engine design. A failed cam support plate results in catastrophic engine failure. The Cam Support Plate supports one side of the flywheel, allowing the pinion shaft to turn the oil pump, a chain drive, and the camshaft. The Cam Support Plate directs the flow of oil from the oil pump throughout the engine. Working in conjunction with the oil pump, it is considered to be the heart of the engine. This project details the process of reverse engineering a Cam Support Plate used in the Harley Davidson Milwaukee 8 Engine. During this project, we have reverse engineered the Cam Support Plate by attempting a variety of processes including: white light and laser scanning, physical measuring, virtual recreation, redesign its oil channels, investigate surface finish and reduce the weight of the Cam support plate by using software tools such as SolidWorks, Autodesk Inventor, and Solidthinking Inspire. The focus of this project is to redesign the internal oil channels by removing the edges and making a curvy channel in order to make the oil flow smoother, look into the surface finish, change the topology, and eventually reduce the weight of the plate. Redesigned Cam Support Plate will be printed with Aluminum by an emerging metal 3D printer: Renishaw AM400, laser powder bed fusion system.

FACULTY MENTOR

Dr. Jimmy Gandhi

RESEARCH ASSISTANT

Waheedah Akberzie
Demi Avilla
Kamran Mapar
Evelyn Mendieta

Wireless Keyboard Powered by Piezoelectric Effect

Project Description: As part of this research project, the team of students has worked on developing a Piezoelectric Keyboard. The innovative aspect of this new product is that there is no power source needed like most other keyboards currently on the market, which include solar keyboards that need an external source of light as a power source. For this product, the power is generated by the typing action of the user. The team has engaged in a thorough feasibility study for the project, which includes an economic analysis as well as a technical analysis of the technology being incorporated into the product to see if commercialization of this project is viable.

FACULTY MENTOR

Dr. Jimmy Gandhi

RESEARCH ASSISTANT

Teny Shahjahanian

Educated Future

Project Description: The student working on this project has been involved in the development of an app named "Educated Future." The aim of this app is to help students (both high school and college level) to be more educated when it comes to selecting a class for their major. Students are matched with other students who have taken classes in the major and at the school they are enrolled, and can thus obtain input about which classes to select, particularly for courses that have multiple sections being offered. The part of the title includes the word "Educated" as the value proposition includes students being able to make a more educated selection of the classes they pick as they are spending their time and tuition for the classes they select, so the chosen class can best serve their needs.

FACULTY MENTOR

Dr. Jimmy Gandhi

RESEARCH ASSISTANT

Kareem Asal
Jacob Delson

Hydrosól - a Solar Powered, Portable Charging Hydroflask Cap

Project Description: The team working on this project has been involved with developing a product that gives an innovative yet useful twist to the replacement caps currently on the market for hydro flasks. This product is a solar powered, portable charging hydro flask cap. This product enables users of the product to be able to charge their mobile devices from the cap of their flasks that they are carrying, thus giving them portability and the convenience of not having to rely on an external power bank while they are on the move. The team has worked on the economic as well as technical feasibility of the project to understand the process of commercialization of this product.

http://www.ecs.csun.edu/aims2/

Funded by the United States Department of Education FY 2016 Title III, Part F, Hispanic-Serving Institutions (HSI) STEM and Articulation Program five-year grant, Award Number P031C160053, CFDA Number 84.031C