CSUN | COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

6TH ANNUAL STUDENT RESEARCH SYMPOSIUM

aims²

attract. inspire. mentor. support students

April 7 & 8, 2021
@3:30 p.m.
Posters and
Oral Presentations
[Online]

Attract Inspire Mentor Support Students
AIMS²
HSI STEM Grant Program

AIMS^2 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 AIMS^2 program that has served approximately 1500 students during the past decade, supported by the U.S. Department of Education and led by Dr. S. K. Ramesh, faculty and staff from the partner institutions. The program was named a 2019 Example of Excelencia in the baccalaureate program category, and was a finalist the year prior in 2018. It was one of ten programs worldwide shortlisted for the 2018 Airbus Global Engineering Deans Council Diversity award. It was also previously recognized by Excelencia in Education with an Honorable Mention award (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 Latinx students and underrepresented minorities

2019 AIMS^2 Symposium

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 effectively bridging the achievement gaps, improving transfer success, and increasing overall graduation rates for all Latinx 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
S. K. Ramesh
Director
AIMS² Program
CALIFORNIA STATE UNIVERSITY, NORTHRIDGE
1958

AIMS² Director Message

Welcome to the sixth annual AIMS² research symposium at CSUN supported through our sequel 2016 HSI-STEM collaborative grant from the U.S. Department of Education. It is hard to imagine how much the world has changed since our last symposium in September 2019. Our students were busy working on their research projects and looking forward to the symposium in fall 2020 when the pandemic emerged in March 2020. In the space of a week, the world as we knew it transitioned to online virtual modalities to protect lives and halt the spread of the virus. To say that this was challenging would be an understatement. The toll on humanity has been devastating and has affected all of us in deeply personal ways. Yet, here we are today, a year later, with the unprecedented development and deployment of vaccines to combat the virus, and the promise to return to face-to-face modalities in the not too distant future. We are rediscovering our values as we build trust, respect, and collaboration and the things that are truly important in life.

Our faculty, and staff, across AIMS² worked hard to adapt to the new technology enabled realities and found innovative ways to engage and support our students. It is that spirit that led to our 100% online virtual research program which began with a summer 2020 pilot with 4 projects and 10 students, blossoming to 7 projects and 24 students in fall 2020. Our students have adapted very well, demonstrating tremendous resilience in the face of adversity. In this year's symposium, you have the opportunity to view student research posters on an exciting new virtual platform where you can interact live with the students, followed by oral presentations on their projects.

The National Academy of Engineering noted, "No profession unleashes the power of innovation like Engineering" in its signature 2008 publication "Changing the Conversation". Our students, faculty, and staff are a living testament to the power of innovation. "Engineering the Future" with AIMS²! See you online in April!

AIMS² Project Director and
Lead Principal Investigator

CSUN | COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

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Advisory Committee

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Associate Vice Provost for Design and Innovation Strategies
Boston College

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Spacecraft Antenna Research Group, Caltech-JPL
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Consulting and Claims Services, San Diego

JENNY TIEU
Education Project Office
NASA Jet Propulsion Laboratory

Faculty Mentors

BEHZAD BAVARIAN
Manufacturing Systems Engineering & Management

KYLE DEWEY
Computer Science

TZONG-YING HAO
Civil Engineering & Construction Management

BINGBING LI
Manufacturing Systems Engineering & Management

BRUNO OSORNO
Electrical & Computer Engineering

LISA REINER
Manufacturing Systems Engineering & Management

JOHN VALDOVINOS
Electrical & Computer Engineering

Project Staff

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AIMS^2 Tech Support
CECS Information Systems

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AIMS^2 Student Support

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

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


Heat Treatment

AIMS² SIXTH ANNUAL STUDENT RESEARCH SYMPOSIUM

• POSTER SESSION [ON SPATIAL CHAT]:
Wednesday, April 7, 2021 • 3:30 – 5:30 PM PST

• ORAL PRESENTATIONS [ON ZOOM]:
Thursday, April 8, 2021
Session A: 3:30 – 4:30 PM PST
Session B: 5:00 – 6:15 PM PST

Click here for a complete schedule.

Research Projects

CIVIL ENGINEERING & CONSTRUCTION MANAGEMENT

- Analysis of Ground Motions and its Application to Earthquake Early-Warning Systems [Session A]
  Students: Luke Barrella, Alex Leong, Jessica Perez
  Faculty Mentor: Dr. Tzong-Ying (Kay) Hao

COMPUTER SCIENCE

- Towards the Sentiment Analysis of Tweets [Session B]
  Students: Joshua Alvarado, Nuelbella Sandoval, Fernando Vargas
  Faculty Mentor: Dr. Kyle Dewey
- Building on the Proteus Programming Language [Session B]
  Students: Simran Gill, Eileen Quiroz, Frank Serdenia
  Faculty Mentor: Dr. Kyle Dewey

ELECTRICAL & COMPUTER ENGINEERING

- Modeling and Simulation of Electric Vehicles, Energy-Battery Systems and Environmental Impact [Session A]
  Students: John Dizon, Lucia Castillo, Farouk Mostafa
  Faculty Mentor: Prof. Bruno Osorno
- Two-Dimensional Biomagnetic Model of Cardiac Tissue [Session B]
  Students: Suzanne Fisher, Jessica Frederich, Ashley Kuhnley, Robert Salone
  Faculty Mentor: Dr. John Valdovinos

MANUFACTURING SYSTEMS ENGINEERING & MANAGEMENT

- Corrosion and Corrosion Protection of Aluminum Alloys for Automotive Applications [Session A]
  Students: Beatriz Acuna, Emily Rossiter, Christopher Villalpando
  Faculty Mentors: Dr. Behzad Bavarian and Prof. Lisa Reiner
- Generative Design of Cam Plate Optimization for Metal Additive Manufacturing [Session B]
  Students: Jason Kim, Andrew Langwald, Christian Mariscal, Abraham Meiszner
  Faculty Mentor: Dr. Bingbing Li

FACULTY MENTOR

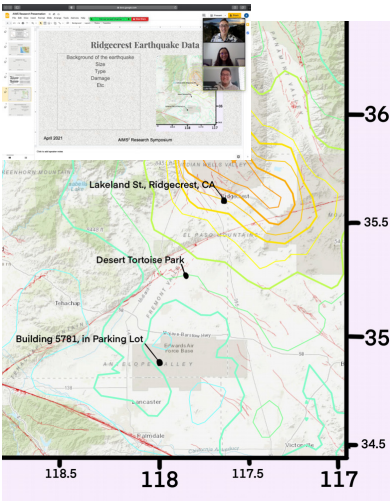
Dr. Tzong-Ying Hao

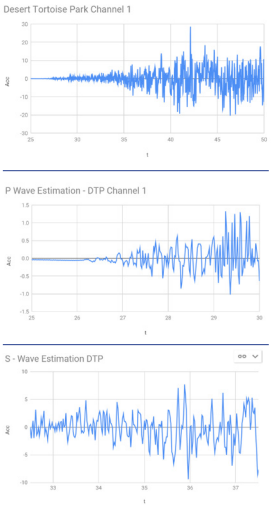
RESEARCH ASSISTANTS

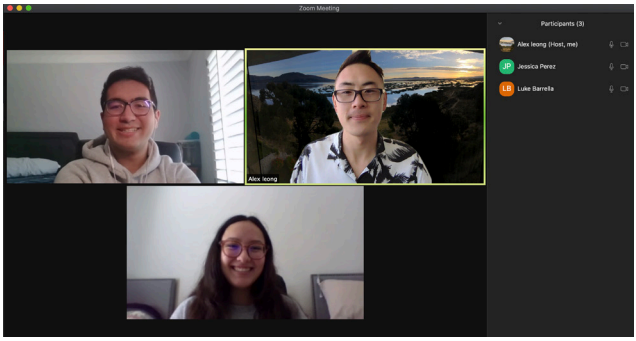
Luke Barrella
Alez Leong
Jessica Perez

Analysis of Strong Ground Motions and its Application to Earthquake Early-Warning Systems

Project Description: The real-time earthquake early warning system uses earthquake science and technology to detect significant earthquakes quickly so that alerts can reach many people before shaking arrives. With warning times of up to tens of seconds it is possible to mitigate the damage, but only if the seismic source parameters are determined rapidly and accurately. In this project we investigate recorded strong-motion accelerograms in California to demonstrate conventional methods of time-series analyses and calculate the wave arrival time.







FACULTY MENTOR

Dr. Kyle Dewey

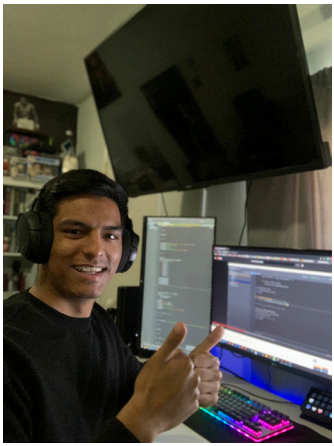
RESEARCH ASSISTANTS

Joshua Alvarado
Nuelbella Sandoval
Fernando Vargas

Towards the Sentiment Analysis of Tweets

Project Description:
In online social networking, there is often a need to perform moderation, be it by blocking particular posts, or potentially whole users. Due to the sheer quantity of posts and users, performing this moderation fully manually is often not feasible. To this end, we need automated tools which can assist human moderators. Towards assisting with this moderation, sentiment analysis is of great value. Sentiment analysis is used to automatically determine if a particular post displays a positive, negative, or neutral attitude.

The goal of this project is to build a sentiment analysis system for Twitter tweets. This system will utilize machine learning for this purpose.



FACULTY MENTOR

Dr. Kyle Dewey

RESEARCH ASSISTANTS

Simran Gill
Eileen Quiroz
Frank Serdenia

Building On the Proteus Programming Language

Project Description:

In space applications, software correctness is of paramount importance. Humans are rarely physically available to reset malfunctioning software, and software bugs can (and have) lead to mission failure. For these reasons, the Jet Propulsion Lab (JPL) is particularly interested in the development and use of specialized programming languages (PLs) which can provide correctness guarantees about written software. To this end, we have been designing and implementing a new PL named Proteus for writing software with correctness guarantees. Proteus compiles to C++. Proteus is currently in an early state and is missing many common PL features.

The goal of this project is to add a number of essential common PL features to Proteus. A non-exhaustive list of possible features includes user-defined data structures, references, and function pointers. For each feature, we would discuss the impact on Proteus' syntax and semantics, including how we could ensure the user uses the feature correctly (with types), and how we could compile the feature to C++. Once we understand the impact, we would incrementally add the feature to Proteus, which will likely require working with the entire Proteus compiler.



FACULTY MENTOR

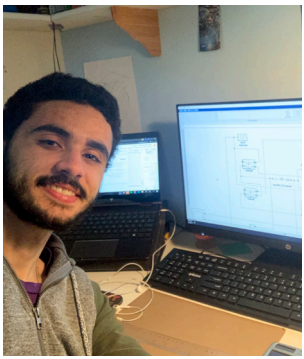
Prof. Bruno Osorno

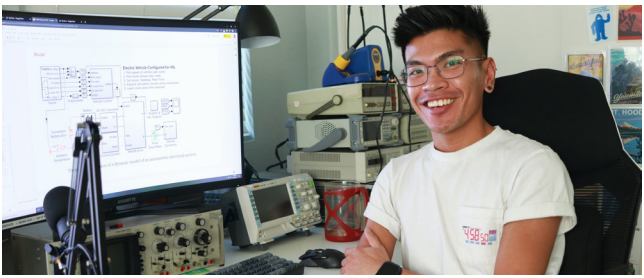
RESEARCH ASSISTANTS

Lucia Castillo
John Dizon
Farouk Mostafa

Modeling and Simulation of Electric Vehicles, Energy-Battery Systems and Environmental Impact

Project Description: Just recently a new state of the art vehicle called Lucid air was tested by the Federal government. The manufacturer claims that a range of approximately 500 miles per battery charge is possible. Looking into some details of the technology used, the voltage claims to have a 900VDC powertrain and smaller motors. The efficiency of the powertrain in an electric vehicle (EV) defines the efficiency of the electrical system. In this research, we propose to simulate and analyze the combined efficiency of the powertrain, and battery. We intend to focus in on three separate research topics: First, the powertrain, second, the DC-DC converter, and third, battery storage. Simulink/ MATLAB will be used to perform this research project.





FACULTY MENTOR

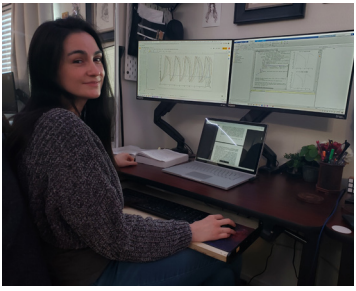
Dr. John Valdovinos

RESEARCH ASSISTANTS

Alan Cruz (Fall)
Suzanne Fisher
Jessica Frederich
Samuel Garza (Fall)
Ashley Kuhnley
Robert Salone

Two-Dimensional Biomagnetic Model of Cardiac Tissue

Project Description: Magnetocardiograms (MCG) are biomagnetic signals that are an alternative measurement to electrocardiograms measured in a clinical setting. MCGs represent an improved and safer method to measure cardiac electrical activity in clinical scenarios where electrode placement is not possible. These biomagnetic signals are difficult to measure due to the need for specialized and highly sensitive magnetometers. Magnetoelectric laminate devices can operate as room-temperature magnetic field sensors if designed correctly. In this research project, we have developed a numerical model that simulates the electrical activity and the magnetic field distribution emanating from a piece of excitable cardiac tissue. The model will aid in the design of a room-temperature magnetoelectric laminate sensor to measure MCGs. The model uses a reaction-diffusion formulation and the Fitz-Hugh Nagumo model for cardiac cells.



FACULTY MENTORS

Dr. Behzad Bavarian
Prof. Lisa Reiner

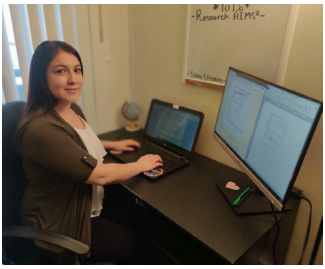
RESEARCH ASSISTANTS

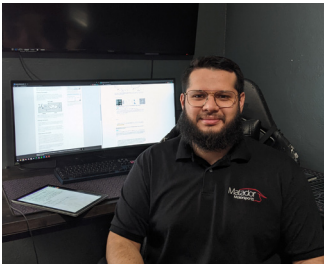
Beatriz Acuna
Emily Rossiter
Christopher Villalpando

Corrosion and Corrosion Protection of Aluminum Alloys for Automotive Applications

Project Description: Lighter weight vehicles result in lower fuel consumption. As a result, automotive industries are considering the use of high strength lightweight aluminum alloys in the heat exchanging system, the body of the automobile, and the wheels. However, due to aggressive environmental exposure, corrosion is one of major concerns for these alloys. Corrosion inhibitors and coatings are the two main options to improve corrosion protection of aluminum alloys.

In this project, fellow researchers will conduct a literature survey and internet search of corrosion mechanisms of aluminum alloys in different environments, and will evaluate the existing corrosion protection techniques. The main objective of this project is to develop new green inhibitors to combat these corrosion problems.





FACULTY MENTOR

Dr. Bingbing Li

RESEARCH ASSISTANTS

Jason Kim
Andrew Langwald
Christian Mariscal
Abraham Meiszner

Digital Design and Topology Optimization of Harley Davidson Engine CAM Support for 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.

Attract Inspire Mentor Suppo

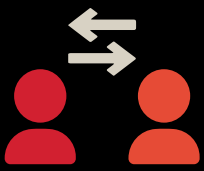
California State Univ

Total project participants across five project sites: CSU North
College of the Canyons, Glendale Community College,
Moorpark College, and Los Angeles Pierce College

255	366	388	44
Year 1	Year 2	Year 3	Yea

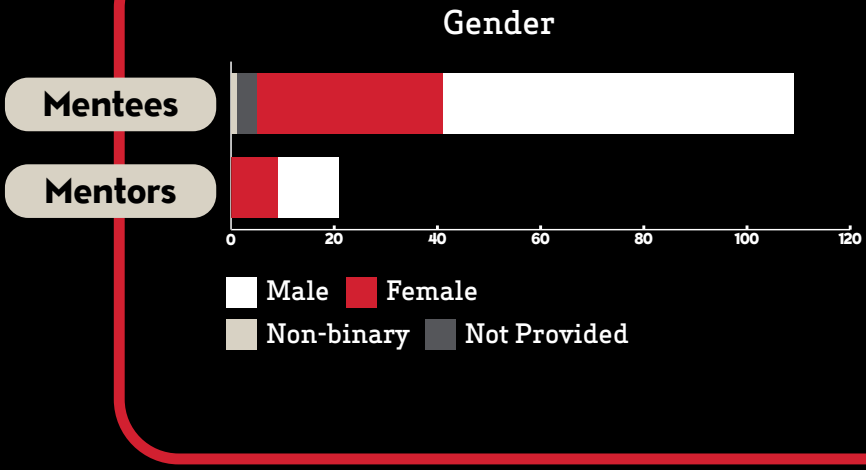
Key Program Components

Faculty Mentoring



Peer Mentoring

Peer Tut



rt Students (AIMS²) Program

versity Northridge

nridge,

44

r 4

CSU Northridge Participants

111
Mentees matched

21
Mentors volunteered

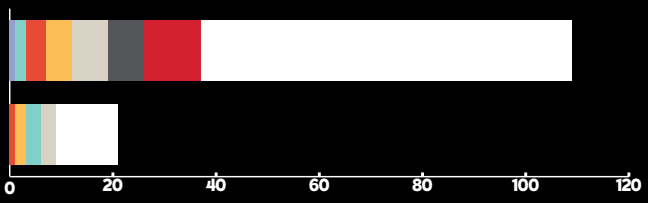
oring

Student Research with Faculty

Pre-professional and Career-related Activities

CSUN Mentee-Mentor Demographics

Race



Hispanic-Latino
African American
Not Provided
White-Non Hispanic
Multi-racial
Other
Asian American
Hawaiian-Pacific Islander

Performance Measure Data f

259 out of 297
CSUN project participants who successfully completed gateway courses

84

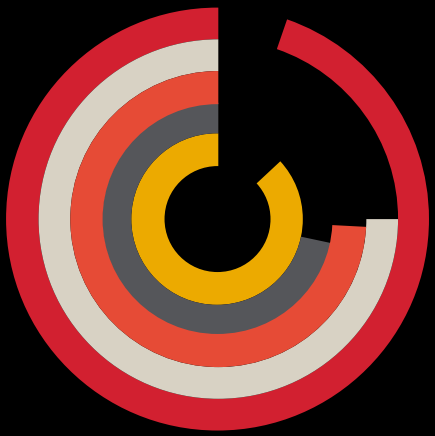
97%

130 out of 134
CSUN project participants in good academic standing

71%

10 out of 14
3-year graduation rate from CSUN for the first two transfer cohorts of project participants

Gains Reported on the Undergraduate Resear



94.9%

75.2%

74.4%

71.8%

87.2%

Contact Us

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or CSUN Project Participants

111 out of 127

Female CSUN project participants who successfully completed gateway courses

50 out of 50

Female CSUN project participants in good academic standing

100%

4 out of 6

3-year graduation rate from CSUN for the first two transfer cohorts of **female** project participants

67%

ch Student Self-Assessment

strongly agreed or agreed that doing research confirmed their interest in their field of study (*n*=111).

reported great or good gains in confidence in their ability to do research (*n*=88).

reported great or good gains in understanding what everyday research work is like (*n*=87).

strongly agreed or agreed that their research experience has prepared them for graduate school (*n*=84).

strongly agreed or agreed that their research experience has prepared them for a job (*n*=102).

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

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