



**Symposium** **AIMS<sup>2</sup>**  
STUDENT  
RESEARCH  
SYMPOSIUM

September 14, 2016  
3:30 – 6:30 p.m.  
USU Northridge Center



## ATTRACT, INSPIRE, MENTOR, AND SUPPORT STUDENTS

The AIMS<sup>2</sup> program is a collaborative grant between the College of Engineering and Computer Science at CSUN, Glendale Community College, and the College of the Canyons and is supported through a five year, \$5.5 million grant under the HSI-STEM Initiative from the US Department of Education. The program led by Dean Ramesh and faculty and staff from the partner institutions has made huge strides to address the academic needs of over 200 students, that includes proactive academic advisement and tracking, organized tutoring, peer and faculty mentoring, hands on research opportunities and project based learning, career advising and eventual transition to the workforce or advanced studies. Students in the cohort are supported with stipends to motivate and inspire them to succeed. The program has been nationally 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 under-represented minorities in engineering and computer science.



## Dean's Message >

*I am delighted to invite you to the second annual AIMS<sup>2</sup> Student Research Symposium at CSUN supported through a collaborative grant under the HSI-STEM Initiative from the US Department of Education. Hard to believe how far we have come in the past five years! Fittingly our program was recognized as a Bright Spot in Hispanic Education by the White House Initiative for Educational Excellence for Hispanics in 2015- and it was one of the 230 programs nationwide that was recognized! Students in the AIMS<sup>2</sup> cohorts are supported and mentored by our outstanding faculty through numerous “hands-on” learning experiences. Our data clearly reveals that participation in undergraduate research projects connects students to their disciplines and builds career capital and practical skills marketable in their future careers. One of our students said it best: “Research has made me look differently at myself, what I can do and where I can go with what I am learning.” The unmistakable pride, commitment, and dedication of the faculty, staff and students in the AIMS<sup>2</sup> program are a testament to the program’s continued success.*

*Don't miss this opportunity to see and hear firsthand from our outstanding AIMS<sup>2</sup> students. I am sure you will be impressed with the diversity and quality of their work and look forward to seeing you on September 14th!*

  
Dean

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COMPUTER SCIENCE

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# Faculty Mentors >



**ANWAR ALROOMI**  
Civil Engineering & Construction Management



**BEHZAD BAVARIAN**  
Manufacturing Systems Engineering & Management



**DAVID BOYAJIAN**  
Civil Engineering & Construction Management



**VIBHAV DURGESH**  
Mechanical Engineering



**JIMMY GANDHI**  
Manufacturing Systems Engineering & Management



**RUTING JIA**  
Electrical & Computer Engineering



**SAMI MAALOUF**  
Civil Engineering & Construction Management



**VIDYA NANDIKOLLA**  
Mechanical Engineering

Project Staff >



**BRUNO OSORNO**  
Electrical & Computer Engineering



**VAHAB POURNAGHSHBAND**  
Computer Science



**LISA REINER**  
Manufacturing Systems Engineering & Management



**TADEH ZIRAKIAN**  
Civil Engineering & Construction Management



**EMIL HENRY**  
AIMS<sup>2</sup> Technical Support Lead  
CECS Manager of Technical Services



**KATHLEEN POHL**  
Assistant to the Dean



**LISA REINER**  
AIMS<sup>2</sup> Research Staff  
Faculty, Manufacturing Systems Engineering & Management



**STACEY SCHAAF**  
Office Manager, CECS Student Services Center

# Principal Investigators >

## PI CSUN



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Dean  
College of Engineering & Computer Science

## Co-PIs, CSUN



**ROBERT G. RYAN**

Associate Dean  
College of Engineering & Computer Science



**ALI AMINI**

Professor, Department of  
Electrical & Computer Engineering



**NAZARET DERMENDJIAN**

Professor & Chair, Department of  
Civil Engineering & Construction Management



**HAMID JOHARI**

Chair, Department of  
Mechanical Engineering



**BEHZAD BAVARIAN**

Professor, Department of Manufacturing  
Systems Engineering & Management



**GLORIA MELARA**

Professor, Department of  
Computer Science



**NATHAN DURDELLA**

Associate Professor, Department of  
Educational Leadership & Policy Studies

## Co-PIs, GCC



**SCOTT RUBKE**  
Glendale Community College



**JAN SWINTON**  
Dean of Workforce Development  
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**RICHARD CORTES**  
Articulation Officer/Transfer & STEM Counselor  
Glendale Community College

## Co-PIs, COC



**DAVID MARTINEZ**  
Professor & Chair, Department of  
Engineering & Physics  
College of the Canyons



**ERIC LARA**  
Program Director for MESA  
College of the Canyons

## Emeriti Co-PIs



**NAGWA BEKIR**  
Associate Dean  
College of Engineering & Computer Science



**KRISTIN BRUNO**  
Dean of Instructional Services  
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**SUSAN CROWTHER**  
Founding Program Director - MESA  
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Spacecraft Antenna  
Research Group  
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College Industry Advisory Board (Chair)  
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Membership Development Chair  
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Vice Chair, IEEE Los Angeles Council  
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CSUN College of Engineering  
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**ROSLYN SOTO**

Higher Education Group  
Education Office  
NASA Jet Propulsion Laboratory



## AIMS<sup>2</sup> STUDENT RESEARCH SYMPOSIUM

September 14, 2016

3:30 - 6:30 p.m.

University Student Union, Northridge Center

### CIVIL ENGINEERING & CONSTRUCTION MANAGEMENT

- Developing a Structural Engineering Encounter (SEE) Active-Learning Laboratory Environment

### COMPUTER SCIENCE

- Detecting Network Compression and Strict Priority Queueing on the Internet

### ELECTRICAL & COMPUTER ENGINEERING

- Solving Real World Problems by Using Intelligent Control Techniques
- Electric Speed Drives Technology in Transportation (ESD TT)

### MANUFACTURING SYSTEMS ENGINEERING & MANAGEMENT

- Aluminum Alloys for Aircraft Applications
- Creation of an Entrepreneurial Mindset among Undergraduate Students

### MECHANICAL ENGINEERING

- Experimental Study of Airfoils Performance at Low Reynolds Numbers
- Application of MATLAB for Separation Detection in Hydrogen Bubble Flow Visualization
- STEM Integrated Robotics: Drone
- Robotics for Elementary School

## FACULTY MENTORS

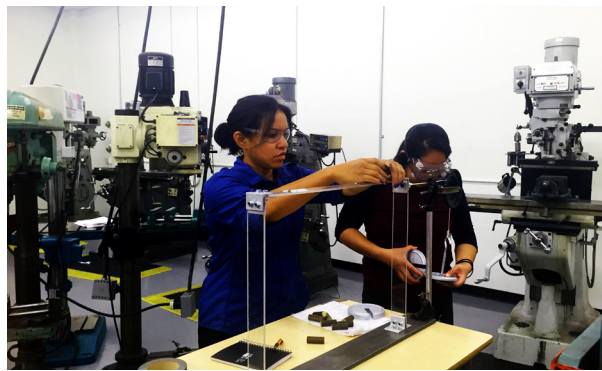
Dr. David Boyajian  
Dr. Tadeh Zirakian

## RESEARCH ASSISTANTS

Jessica Opinion  
Veronica Rico

## Developing a Structural Engineering Encounter (SEE) Active-Learning Laboratory Environment

**Project Description:** Considering the present status of disrepair of the AM 317 Mechanics Lab at CSUN in which many of the machines and measuring tools are either obsolete or not working properly, this research undertaking proposes to work closely with the students of the cohorts (GCC or COC) to revamp this all important lab-based course during the summer of 2016. To this end, under the faculty advisor's supervision, the students will be equipped with the necessary materials (e.g. plexiglass, aluminum, steel, etc.) as well as the measuring tools (e.g. strain gages, displacement transducers and deflectometers, etc.) in order to construct various structural modules and detailed testing instructions for future classes of engineering students to gain an enhanced and complete active-learning environment associated in their field of study. It is believed that the results and products of this project will greatly heighten the mastery of basic mechanics concepts in structural engineering for students at CSUN as well as potentially being used as an effective recruitment device for college and high school aged students in introducing them to the world of engineering.



## FACULTY MENTOR

Dr. Vahab  
Pournaghshband

## RESEARCH ASSISTANTS

Richard Dojillo  
Omri Gabay

## Detecting Network Compression and Strict Priority Queueing on the Internet

**Project Description:** Currently, every packet sent on the Internet goes through numerous routers and intermediaries until it gets to the intended receiver. While routing the traffic, these intermediaries (referred to as middleboxes) are potentially capable of making significant changes to what happens to a traffic stream on the network. During the past decade, a wide variety of middleboxes have been proposed, implemented and deployed. Examples include traffic shapers, proxies, firewalls, and WAN optimizers. These middleboxes are becoming a common element of various types of networks, making their detection by end-hosts beneficial and in some cases crucial. In this project, we will investigate if these middleboxes are detectable through implementing network tools. The project involves implementation using OOP network simulation, scripting, automation, and configuration of network switches. The goal of this project is to emphasize on object-oriented programming paradigm, critical thinking, software development, hands-on experience with network equipment, innovation, and small group collaborations.



## FACULTY MENTOR

Dr. Ruting Jia

## RESEARCH ASSISTANTS

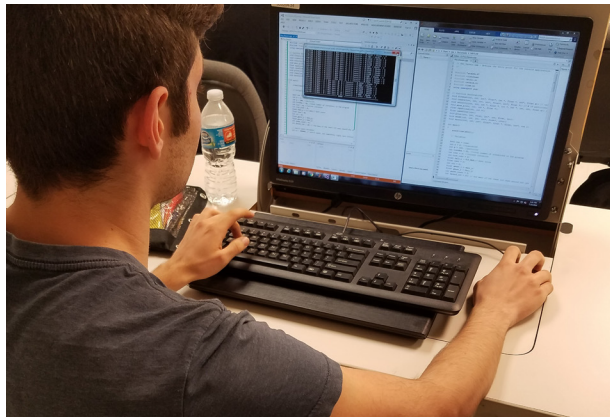
Eric Boghozian

## Solving Real World Problems by Using Intelligent Control Techniques

**Project Description:** In this summer experience, students are introduced to a class of intelligent control techniques that use various artificial intelligence computing approaches like neural networks, fuzzy logic, evolutionary computation and genetic algorithms.

Students learn different intelligent control techniques and the fundamentals of several software packages. Students choose a real world problem such as flight status control of an Airship and apply the intelligent control technique learned through the summer project. Several software packages are utilized, such as: Matlab (Toolboxes that apply), Simulink computer simulations, C++ and Python.

The advanced goal is to implement the complete system model as well as the designed intelligent controller in Simulink and conduct system performance analysis. Students document the experience, understanding the challenges on supporting technology and designing, implementing and testing a solution for a real world problem.



## FACULTY MENTOR

Prof. Bruno Osorno

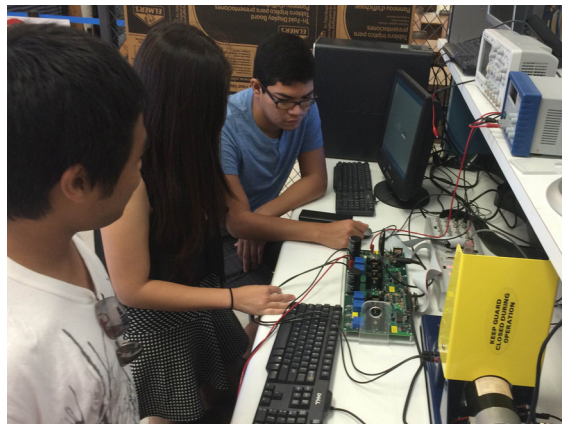
## RESEARCH ASSISTANTS

Francis Cuevas  
Cristian Mendoza  
Suthasinee Virnig  
Ninsina Yadkar

## Electric Speed Drives Technology in Transportation (ESDTT)

**Project Description:** Electric car sales increased by 50% during 2015, which surpassed the car market sales by ten times. Hybrid electric cars is still a large business. The components industry is booming very fast with components such as batteries, supercapacitors, in wheel-systems, transmission and electric motors, and power electronics. There is a tendency to use electric speed drives with capacities from 5 to 15 KW for specific vehicles, such as golf carts, cargo vehicles, lifting vehicles and small shuttle buses. Permanent magnet synchronous motors (PMSM) and Induction Motors (IM) are the motors of choice for drives. To put it in perspective of education, job market and state of the art technology, in year 2013, 63 billion dollars were spent in electric motors alone and it is projected to spend 302 billion dollars by the year 2023. This is very important in terms of CO<sub>2</sub> pollution and the environment as a whole.

This project introduces students to the speed-drive technologies being utilized for electric transportation with a look into the CO<sub>2</sub> consequences.



# MANUFACTURING SYSTEMS ENGINEERING & MANAGEMENT

## FACULTY MENTORS

Dr. Behzad Bavarian  
Prof. Lisa Reiner

## RESEARCH ASSISTANTS

Brian Arbiv  
Aviv Brafman  
C. J. Nesheiwat  
Blanca Villafuerte  
Julio Zamora

## Aluminum Alloys for Aircraft Applications

**Project Description:** Mechanical and corrosion behavior of high strength aluminum alloys used in the aircraft industry was investigated. Fellow researchers were trained to prepare samples, use universal test equipment, microscope and do metallographic analysis. Students explored the effects of different heat treatment conditions on alloy performance. Material characterization was conducted using SEM/EDAX analysis.



## FACULTY MENTOR

Dr. Jimmy Gandhi

## RESEARCH ASSISTANT

Anna Chilingarian

## Creation of an Entrepreneurial Mindset among Undergraduate Students

**Project Description:** An entrepreneurial mindset involves creating a competitive advantage for yourself in an increasingly competitive and changing business environment. The expectations for an engineering graduate of 2020 has changed considerably. Creativity will become one of the top three skills workers will need.

As part of this research project, the AIMS<sup>2</sup> students will be doing research to understand what an entrepreneurial mindset is in an industry of their choice and how to go about creating that mindset. This will include working on the creation of solutions for everyday problems we face through research, critical thinking and creativity. It will also include decision making that will put the students in real life scenarios that would better prepare them to go into the dynamic workplace. Engineering students also get an understanding of the relevance of supply chain management.



**FACULTY MENTOR**  
Dr. Vibhav Durgesh

**RESEARCH ASSISTANTS**

Elifalet Garcia  
Nebiyou Meshesha  
Fernando Iniguez

## Experimental Study of Airfoils Performance at Low Reynolds Numbers

**Project Description:** The objective of this investigation is to experimentally study the force and moment characteristics of thin and thick airfoils at low Reynolds numbers, as well as to correlate the steady and unsteady flow structures over airfoils with instantaneous load characteristics. To accomplish this, simultaneous force measurements and flow visualization experiments are performed for Reynolds numbers of 20,000, 30,000, and 40,000, and angles of attack between  $2^\circ$  to  $12^\circ$ . All the measurements for this investigation are performed in the low speed flow visualization water tunnel facility at California State University Northridge. Two-component Laser Doppler Velocimetry system is used to quantify inflow parameters prior to each experiment. A 6-axis force/torque transducer is used for performing force and moment measurements, and hydrogen bubble technique is used for flow visualization on the suction side of airfoil. A detailed discussion of aerodynamic load characteristics of the thin and thick airfoils at low Reynolds numbers, and flow visualization results, is presented.





## FACULTY MENTOR

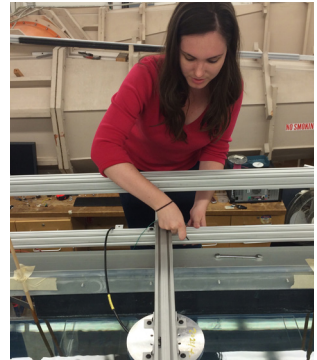
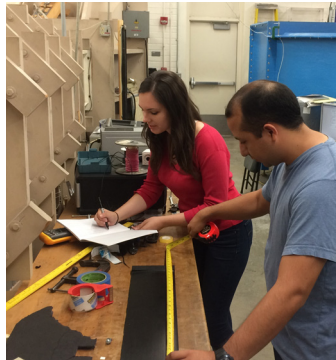
Dr. Vibhav Durgesh

## RESEARCH ASSISTANTS

Elifalet Garcia  
Charlotte B. Meola

## Application of MATLAB for Separation Detection in Hydrogen Bubble Flow Visualization

**Project Description:** Flow visualization is an essential tool in experimental fluid mechanics research as it allows for characterization of complex fluid dynamics phenomena and developing a deeper understanding of the physics of flow. For this study, hydrogen bubble flow visualization was performed on a NACA0009 airfoil at Reynolds numbers from 20,000 to 50,000. A 2MP CCD camera (Basler ace-gm2000), and an in house hydrogen bubble system was used for the flow visualization setup. The flow visualization images were used to identify the point of flow separation on the airfoil. A separation point is defined as a location on the airfoil when the fluid flow becomes detached from the surface. To automate the separation point detection, a MATLAB program with Graphical User Interface (GUI) was developed. The GUI acts as an interactive layer over the main kernel and enables the user to effectively calculate critical information like the airfoil angle of attack and identify the region of interest over the airfoil. After user input is validated, the program continues to analyze a series of flow visualization image data to identify the separation location in each image. A successful GUI code was designed during AIMS<sup>2</sup> summer research internship and was tested to ensure overall robustness and accuracy.



## FACULTY MENTOR

Dr. Vidya Nandikolla

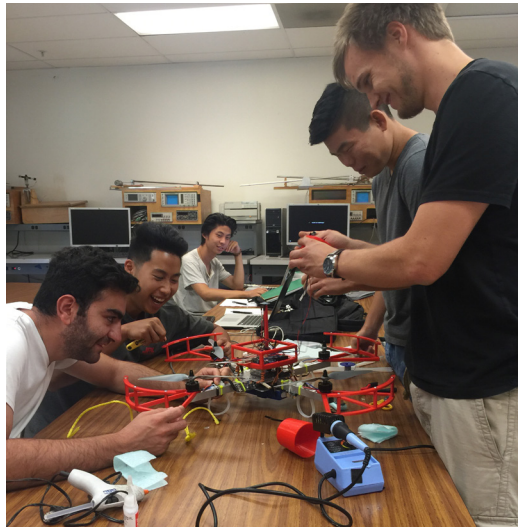
## RESEARCH ASSISTANTS

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Robin Bochen  
Andrew Fechtner  
Changhyun Kim  
Jesus Melendez  
Seyediman  
Moosavicheheltanan  
Kenneth Oyama  
Brian Park

## STEM Integrated Robotics: Drone

**Project Description:** The overall focus of this proposal is to seamlessly integrate the interdependent disciplines of Science, Technology, Engineering and Math (STEM) into a focused and real-world robotics project. The goal is to emphasize on engineering (mechanical, electrical, & software), design, innovation, communication, small group collaboration, and critical thinking skills for students to be successful in college, career and community.

A robot can be a mechanical agent using an electronically operated mechanical machine guided by a computer program or electronic circuitry. They can be autonomous, semi-autonomous or remotely controlled. The proposed drone project will introduce the concepts and navigation control. The drone will be programmed to navigate to a particular location and send the specific data to the user.



## FACULTY MENTOR

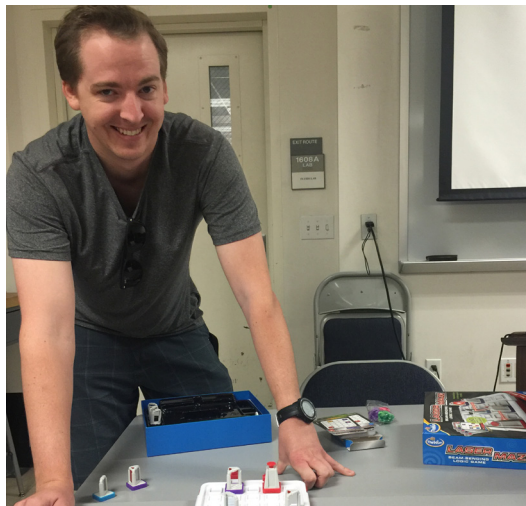
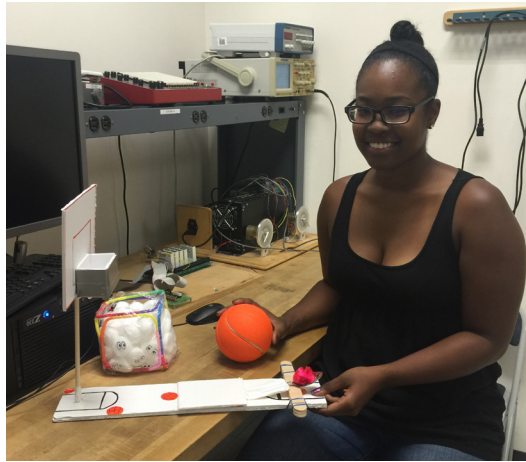
Dr. Vidya Nandikolla

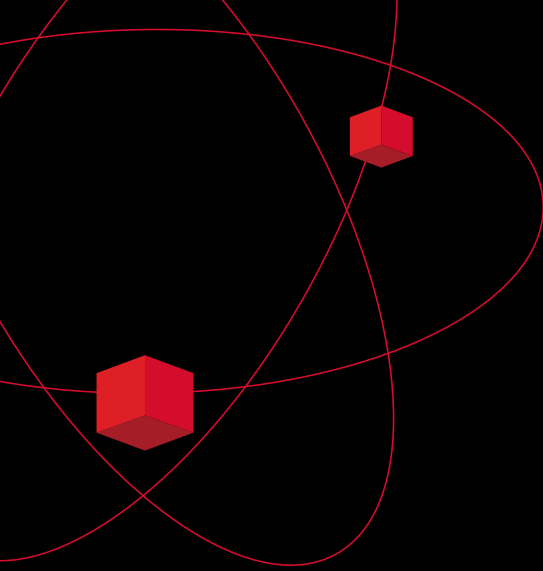
## RESEARCH ASSISTANTS

Michael Diaz  
Tiffany Joyel  
Christina Seeholzer  
Michael White  
Irfan Zaman

## Robotics for Elementary School

**Project Description:** STEM focus in elementary school is critical. This project will develop elementary level STEM concepts and hands-on activity to demonstrate the fundamentals to elementary school students. We will demonstrate our activities in elementary school and train the teachers for their summer camp.





HSI STEM Grant Program

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

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