AIMS²

STUDENT RESEARCH SYMPOSIUM

¡EX! RECOGNIZED EXAMPLE of EXCELENCIA

SEP 11TH 2018

3:00 TO 7:00 P.M.

USU GRAND SALON

CSUN

COLLEGE OF ENGINEERING AND COMPUTER SCIENCE


JACARANDA HALL

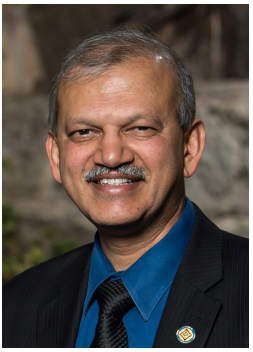
AIMS^2 2.0

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 240 students during the past seven years, supported by the US Department of Education and led by Dr. S. K. Ramesh, faculty and staff from the partner institutions. The program was recently named as an Examples of Excelencia finalist in the baccalaureate program category for 2018. It has been 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 in engineering and computer science. Students enrolled in the AIMS^2 cohorts continue to 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 previous five year grant 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 new grant has already made a difference with an increase the numbers of students served to over 500, 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.


CSUN
Analysis Results
Conclusions & Recommendations
Work Cited

AIMS² Director Message



I am delighted to invite you to the fourth 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 92 students in two cohorts at CSUN including first time freshmen and transfers; and with our community college partners we are serving over 350 students across all sites.

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 in their footsteps. The results speak for themselves with an overall cohort retention rate of 95% and a three year transfer graduation rate of 70%. As this goes to press, the AIMS² program has been named as a 2018 Examples of Excelencia finalist in the baccalaureate category.

The present grant includes several new activities that enhance student success such as peer mentoring, week long summer skills workshops, and of course the opportunity for "hands-on" learning by working closely with faculty as paid research assistants. I hope you will take advantage of this opportunity to join us on September 11th to see and hear firsthand from our outstanding AIMS² students and their innovative research projects. Don't miss it!

AIMS² Project Director and
Lead Principal Investigator

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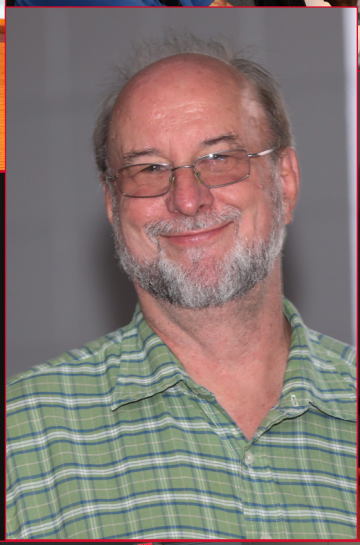
A look at past AIMS² Symposia
[2016 and 2017]





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CSUN
S. K. Ramesh
President


CSUN

Faculty Mentors

ANWAR ALROOMI
Civil Engineering & Construction Management

BEHZAD BAVARIAN
Manufacturing Systems Engineering & Management

DAVID BOYAJIAN
Civil Engineering & Construction Management

ROBERT CONNER
Manufacturing Systems Engineering & Management

KYLE DEWEY
Computer Science

JIMMY GANDHI
Manufacturing Systems Engineering & Management

TZONG-YING HAO
Civil Engineering & Construction Management

BRAD JACKSON
Electrical & Computer Engineering

RUTING JIA
Electrical & Computer Engineering

ARAM KHACHATOURIANS
Mechanical Engineering

BINGBING LI
Manufacturing Systems Engineering & Management

BRUNO OSORNO
Electrical & Computer Engineering

RONALD POGORZELSKI
Electrical & Computer Engineering

VAHAB POURNAGHSHBAND
Computer Science

LISA REINER
Manufacturing Systems Engineering & Management

SEMBIAM RENGARAJAN
Electrical & Computer Engineering

JOHN VALDOVINOS
Electrical & Computer Engineering

TADEH ZIRAKIAN
Civil Engineering & Construction Management

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Lecturer, Franklin Olin College of Engineering

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

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ECE Program Alumnus
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CMT Program Alumnus
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Consulting and Claims Services
San Diego

ROSLYN SOTO
Higher Education Group
Education Office
NASA Jet Propulsion Laboratory


Experiment Setup a
- Temperature controlled piston dispensing
- Lid screw Syringe-based assembly
- Printer Settings include: Extrusion and pr
speeds, infill pattern density, first layer thic

AIMS² STUDENT RESEARCH SYMPOSIUM

September 11, 2018
3:00 - 7:00 p.m.
University Student Union (USU), Grand Salon

CIVIL ENGINEERING & CONSTRUCTION MANAGEMENT

- Study of Building Vibration Responses with Liquid Dampers – Shake Table Experiments and Computer Simulation

COMPUTER SCIENCE

- Evaluating Test Suite Generation Techniques for Introductory Computer Science Assignments
- Analyzing and Verifying Live Network Measurements

ELECTRICAL & COMPUTER ENGINEERING

- Antennas and RF/Microwave Circuits for Electronic Warfare
- Antenna Design and Testing
- Solving Real World Problems by using Intelligent Control Techniques
- Electric Speed Drives and Environment
- Magnetoelectric Effect Wireless Power Links

MANUFACTURING SYSTEMS ENGINEERING & MANAGEMENT

- Corrosion Protection of Steel Pipes/Reinforced Concrete Structures Using Corrosion Inhibitors
- Additive Manufacturing for Lightweight Metal Matrix Nanocomposite
- Closing the Bulk Metallic Glass Data Gap in the Supercooled Liquid Region
- Automated Security Information and Event Management Business Model Canvas
- M^3—More Melted Metal
- Hunny: The Virtual Cosmetician
- Commercialization of the Next Generation Airbag for the 21st Century Automobile
- Understanding the Economics of Developing an Affordable 3D Printer for Educational and Recreational Purposes
- Plastic Bag Alternatives


Experiment
Water tunnel
• Uniform inflow
LabView
• Control AOA o
• Acquire lift and
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FACULTY MENTOR

Dr. Tzong-Ying Hao

RESEARCH ASSISTANTS

Sophia Ha
Andrew Langwald
Nancy Corrales
Alan Quiles

Study of Building Vibration Responses with Liquid Dampers – Shake Table Experiments and Computer Simulation

Project Description: This summer project is based on last summer's project. The findings suggested that the passive tuned liquid damper (TLD) reduces the vibration response of buildings with restrictions. This project focuses on the liquid (water) damper's dynamic behavior by obtaining analytical analysis, conducting shake-table experiments and producing the computer simulation. The shake table experiments include the harmonic motions and the results are compared with the analytical solutions. The simulated seismic motions (such as 1997 Northridge earthquake) are used in the computer simulation. The effectiveness of the passive TLD for buildings are evaluated. This project does not require students to have strong background in engineering majors, nor programming skills. However, they are willing to learn while learning and think deeply about this project.

FACULTY MENTOR

Dr. Kyle Dewey

RESEARCH ASSISTANTS

Hekmat Barbar
Kavya Manohar
Evelyn Mendieta
Victor Pineda

Evaluating Test Suite Generation Techniques 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. Vahab Pournaghshband

RESEARCH ASSISTANTS

Aren Boghozian
Mario Garcia

Analyzing and Verifying Live Network Measurements

Project Description: In 2016, we collected large amount of data from our experiments at CSUN. In this project, we will analyze the data collected, sanitize and identify outliers through automation scripts. Using simulations, we then verify the collected data by comparing to the model of the data created in the simulated, hence controlled, environment. The project involves extensive implementations using network simulations, scripting, and automation.

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. The required skills are programming in C++, Python, Latex and advanced Data Structure.

FACULTY MENTOR

Dr. Bradley Jackson

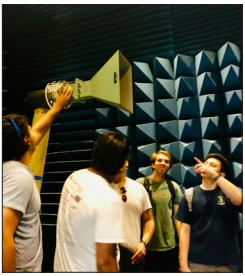
RESEARCH ASSISTANTS

Hareth Abdalkarim
Azmyne Asad
Spencer Bagga
Joses Galdamez
Joshua Galeno
Anthony Ortiz

Antennas and RF/Microwave Circuits for Electronic Warfare

Project Description: In this AIMS^2 research project, students had the opportunity to learn about antennas and radio frequency (RF)/microwave circuits, as well as be introduced to electronic warfare. Antennas and RF/microwave circuits are critical components of every wireless communications device. Work on this project began by learning about the basics of wireless communications systems and was followed by an introduction to antennas and RF/microwave circuits.

Once the basic concepts were introduced, the focus of this project was on the design and simulation of antennas and circuits that could be used for communications electronic warfare systems (specifically for jamming). There were opportunities for students to work on either antennas or RF/microwave circuits based on their background and interests. In addition to learning the basics of antennas and RF/microwave circuits, students were also introduced to software design tools commonly used in industry such as ADS and FEKO. Students had the opportunity to build prototypes of their designs and learn how to make measurements using RF/microwave lab equipment.



Antenna Design and Testing

FACULTY MENTORS

Dr. Sembiam Rengarajan
Prof. Ronald Pogorzelski

RESEARCH ASSISTANTS

Nebiyou Meshesha
Maria Gonzalez

Project Description: Antennas provide connectivity to everyday devices such as the cell phones, laptops, tablets, robots, drones, and many medical devices and thereby allow them to communicate. Antennas come in different sizes, shapes and complexity depending on their applications. It is proposed to design, build and test simple antennas and understand their properties.

Students will be exposed to basics of antennas and their properties. Using simple empirical formulas and computer software available in the antenna laboratory they will study and design antennas such as dipoles, loops, helixes, microstrip patch and dielectric resonator antennas. Using the machine shop facilities available in the college of engineering, they will build some of these antennas. They will test them for the input match and the radiation pattern and gain in the CSUN antenna laboratory.

Students will learn important skills such as studying scientific papers, performing designs based on simple models and computer software. They will build the antennas using the facilities available in the CSUN machine shop. They will be taught basics of antenna measurements and will be able to test the antennas built by them. They will present their project at the AIMS^2 symposium. These skills will help them to motivate and do well in their later courses at CSUN and will help them in the job market once they graduate.

FACULTY MENTOR

Dr. Ruting Jia

RESEARCH ASSISTANTS

Jesse Bermudez
Anthony Ortiz

Solving Real World Problems by Using Intelligent Control Techniques

Project Description: Throughout the project, students will be 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.

It is intended to have students learn different intelligent control techniques, learn the fundamentals of several software packages. Students will choose a real world problem such as cruise control of car, or formation control of airships and apply the intelligent control technique learned throughout the project. Several software packages will be utilized, such as: Matlab (Toolboxes that apply), Simulink computer simulations if time allows).

The goal is to implement the complete system model as well as the designed intelligent controller in Simulink and conduct system performance analysis.

Electric Speed Drives and Environment

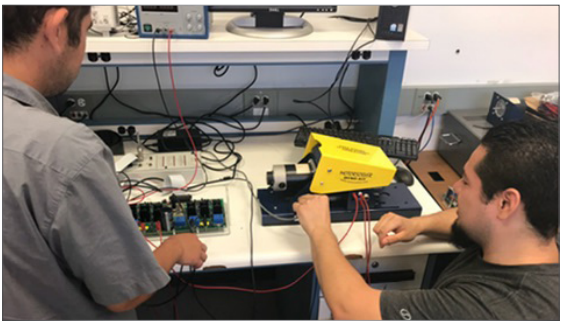
FACULTY MENTOR

Prof. Bruno Osorno

RESEARCH ASSISTANTS

Joshi Kiran
Samuel Ochoa
Jose David Torres
Andy Vo

Project Description: Electric Speed Drives (ESD) or Variable Speed Drives (VSD) are at the forefront of electric transportation. Companies such as Tesla, Nikola, GM, among others are developing and improving their electric vehicles and targeting heavy transportation such as semi-trucks and commercial buses. There is a considerable impact of such technologies on the environment. The cost of these technologies is in the billions of dollars and they create thousands of jobs. For example, Anheuser-Bush will buy from Nikola 800 semi-trucks, hydrogen fuel powered with a 320 KWH battery system. Nikola will build 28 hydrogen fuel stations. We also know that the City of LA bought 100 BMW electric vehicles. This project will focus on understanding VSD and their impact on the environment.



FACULTY MENTOR

Dr. John Valdovinos

RESEARCH ASSISTANTS

Ashley Bermudez
Ivan Garcia
Meilee Stern
Omar Vargas

Magnetoelectric Effect Wireless Power Links

Project Description: The development of implantable medical devices, like pacemakers and cochlear implants, has had a tremendous impact for patients who suffer from chronic disease. While these medical implants have been successfully miniaturized for low-risk surgical implantation, the batteries that power these devices still occupy a large percentage of the device volume. In addition, battery longevity increases the need for additional surgery for replacement. Thus, methods to wirelessly recharge medical implants is needed for this patient population. Wireless inductive coupling between two coils (one external and one implanted coil) has offered a solution to this challenge. However, the use of an implantable receiver coil may not be the most effective solution to power these devices as the mutual inductance between these two structures provides an additional reflected impedance to the transmitting circuitry. The primary objective of this proposed research is to demonstrate the feasibility of utilizing magnetoelectric (ME) effect devices as wireless power receivers for low-power implants in the near-field regime. Students under this project will learn how to design and fabricate ME effect devices, test for their ME coefficients, design and build a transmitting amplifier and magnetic link, rectify small oscillating voltages, and carry out wireless powering experiments on artificial skin.

FACULTY MENTORS

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Prof. Lisa Reiner

RESEARCH ASSISTANTS

Aline Avanessian
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Jayshawna Jones
Victor Magallanes
Ivan Plascencia
Dariel Tapia
Fernando Trinidad

Corrosion Protection of Steel Pipes/ Reinforced Concrete Structures Using Corrosion Inhibitors

Project Description: AIMS^2 students used different corrosion inhibitors to protect steel and aluminum alloys in highly corrosive environments. They performed literature research, had to evaluate appropriate materials and corrosion inhibitors using multiple electrochemical tests (potentiostatic, potentiodynamic and EIS impedance) for monitoring corrosion behavior. Students were trained to use numerous types of equipment, do analysis, prepare test samples and work in a cohesive group.

FACULTY MENTOR

Dr. Bingbing Li

RESEARCH ASSISTANTS

Kerstern Malama
Sergio Amaro
Christian Mariscal

Additive Manufacturing for Lightweight Metal Matrix Nanocomposite

Project Description: Lightweight materials, such as aluminum (Al) and its alloys, have been extensively used in today's society for energy savings and environmental sustainability because of their high specific stiffness, high specific strength, corrosion resistance, and good ductility. Laser additive manufacturing (LAM), with its intrinsic layered rapid melting and solidification at a cooling rate about 103 to 107 K/s, has been applied to directly produce functional materials/components that can potentially meet the demanding requirements from aerospace, defense, automotive and biomedical industries. The fabrication of near net shape Metal Matrix Nanocomposite (MMNC) printed via selective laser melting (SLM) technology will allow researchers to find new methods of developing 3D printed lightweight metal parts. The Renishaw AM400 with the resolution of 20 microns demonstrates the possibility of using SLM technology. By using metallographic observation, surface coatings and surface finish processes, it is capable to produce mechanical properties and surface finish specifications that adhere or surpass to current aerospace standards."

FACULTY MENTOR
Dr. Robert Conner

RESEARCH ASSISTANTS

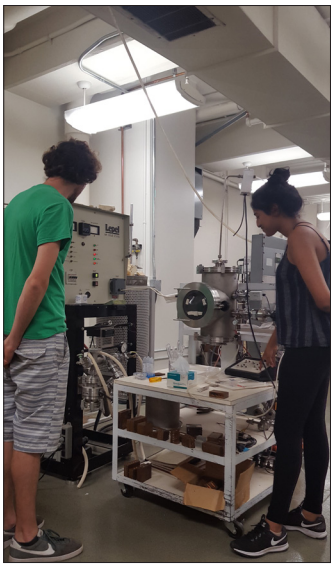
Bryan Gutierrez
Simmarjot Kahlon
Christian Mariscal
Ria Regi

Closing the Bulk Metallic Glass Data Gap in the Supercooled Liquid Region

Project Description: The purpose of the project is to measure the viscosity and shear modulus of bulk metallic glasses (BMG) in a previously inaccessible temperature range. This data is key to understanding the fundamental physics behind glass rheology as well as advancing fabrication methodologies.

Students made BMG samples from scratch, processed the BMG to make test samples, and tested the samples to extract shear wave velocities and viscosity as a function of temperature. Students learned about processing equipment and methods, including weighing, melting, forming techniques; X-ray and thermal characterization, ultrasonic shear-wave measurement, and measure viscosity using rapid discharge forming.

The experiments were conducted at the California Institute of Technology.



FACULTY MENTOR
Dr. Jimmy Gandhi

RESEARCH ASSISTANT

Henry Reed

Automated Security Information and Event Management Business Model Canvas

Project Description: Automated advanced persistent threats are forms of computer attacks created by malicious entities, group or individual. Security Information and Event Management (SIEM) software is meant to protect against these attacks. However, for a small business owner the costs of managing a SIEM, including the salaries of the cyber security specialists, are far too great. Hence a product was developed that would meet this unmet need. The proposed business model canvas is for an automated SIEM that will require minimal installation and replace a security specialist. The product will be marketed towards small business owners. During its initial launch, the target area will be Los Angeles, where an approximate 25,000 potential customers exist, after which the product would expand to other regions of the U.S. with high small business density. The business model canvas also explores other aspects of the business such as the value proposition of the product for the customer, channels used, partners needed as well as the cost structure and revenue streams needed to make this business successful.

M^3—More Melted Metal

FACULTY MENTOR
Dr. Jimmy Gandhi

RESEARCH ASSISTANT

Teny Shahjahanian

Project Description: More Melted Metal (M^3) is a company which strives to reduce waste metal from getting into our landfills, for which some of the major causes are car manufacturing companies, space exploration companies and other companies which use large amounts of metal for realizing their products. This company uses scrap metal parts that aren't being used after being trimmed and cut to be melted in small batches separated by the type of metal to prevent contamination. Having these metal founders built either on or near each company provides fast deposit and a faster production and delivery of the final product.

This company will also bring a helping hand to companies such as NASA and other companies that require metal, to reduce their cost structure, due to the fact that the metal they buy can be significantly cheaper when purchased as waste metal that has been recycled.

This project talks about the company's business model canvas and strives to show the value proposition by reducing waste metals and thus reducing metal that ultimately ends up in our own water and food supply. Since this is a labor intensive process, the implementation of this business plan will create more jobs as well as reduce pollution that comes with decaying and rusting of metals on our planet.

Hunny: The Virtual Cosmetician

FACULTY MENTOR
Dr. Jimmy Gandhi

RESEARCH ASSISTANT

Camrynn Robles-Dilley

Project Description: The billion dollar makeup/beauty industry captivates millennials through social media and is only growing. It is perhaps the largest, most diverse and community based industry today. With the growing diversity of people, a demographic for the makeup industry really is anyone and everyone that enjoys wearing makeup, which makes the industry just that much more competitive. With the up rise of successful, independent beauty brands and the growing community of beauty and makeup fanatics on social media, it is certain that the makeup industry is ready for that extra step forward.

Over 67% of beauty products purchased are done so by teens via social media and apps such as ModiFace and MakeupPlus encourage the trend further. There are a variety of makeup related apps that allow users to virtually try on makeup looks and make purchases but none of these apps quite understand how to teach consumers the makeup application process. As an app that will potentially revolutionize the learning process of applying makeup, "Hunny" could potentially be the one thing the makeup/beauty industry has been waiting for.

The ever evolving smartphone hardware and software allows for building a more precise augmented reality (AR) experience. Using AR, Hunny would be able to accurately apply virtual guides on the user's face allowing the user to have a better understanding of where to apply makeup for best results. This will benefit users and beauty gurus/influencers alike. Hunny would allow beauty gurus to curate their own set of guides based off of the makeup looks they showcase on their social media accounts. This allows beauty gurus to have a better connection to their audiences and could even be a way of showcases their sponsored products. In this project, the value proposition as well as other aspects of the business model canvas associated with Hunny have been discussed.

FACULTY MENTOR
Dr. Jimmy Gandhi

RESEARCH ASSISTANT

Uriel Castillo

Commercialization of the Next Generation Airbag for the 21st Century Automobile

Project Description: When it comes to the purchase of a car, one of the main concerns that people have is to focus on the safety systems installed in the cars and how well they would protect them in case of an accident. Today's airbag is extremely useful and most importantly, has saved the lives of thousands of Americans each year. Though the airbag has proved to be of huge benefit to the driver, there are still numerous instances in which drivers and passengers are injured due to airbags malfunctioning or not being deployed the right way. Therefore, an improvement to the airbag would definitely help with the safety of the driver. In order to realize this innovation, an entrepreneurial mindset was necessary that helped envision the value proposition as well as customer segment associated with the newly developed airbag. This research project also looked at building relationships with potential customers like BMW, Toyota, Nissan, or Audi. All these automobile companies would be targeted for the purchase of this new safety system, so that the company to license this product would be able to then differentiate themselves from the other competition. In order for this project to be economically sustainable, the entrepreneur has to keep in mind the cost structure, revenue streams and many other important key factors such as key partners and the channels used to reach potential customers.

FACULTY MENTOR

Dr. Jimmy Gandhi

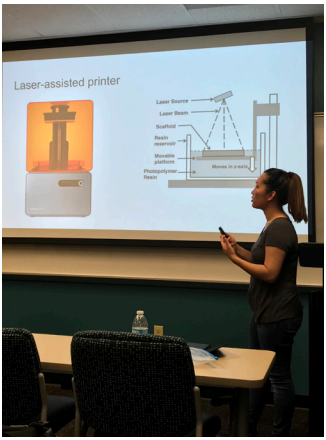
RESEARCH ASSISTANTS

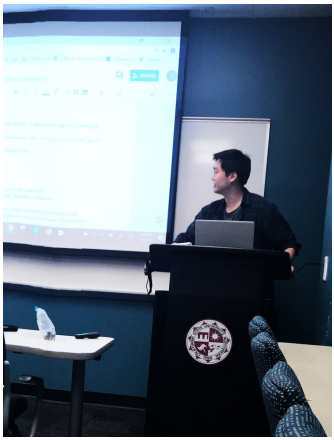
Joowhan Lee
Nathalie Pham

Understanding the Economics of Developing an Affordable 3D Printer for Educational and Recreational Purposes

Project Description: Three-dimensional (3D) printing, also known as additive manufacturing, is the process that creates a three-dimensional object by applying layer by layer of the material. It has become a prevalent technological breakthrough that enables various scientific advances such as in medicine, automobile industry, and architecture. Due to the high demand and economic growth of the 3D printing technology, there is an opportunity to help grow the industry and generate profit.

To understand the concept of the entrepreneurial mindset, the AIMS^2 students working on this project have developed a business model canvas for a newly designed multi head 3D printer to fulfill the growing demand of additive manufacturing. As part of the research project, the components analyzed include the Opportunity Identification, Product and Process Improvement, Developing Customer Awareness, Determining Market Risks and obtaining funding for Engineering Projects to start and operate with the aid of the six thinking hats model. These components are crucial to the success of any business and helped the students understand what an entrepreneurial mindset is and apply it towards the development of this new 3D printer.





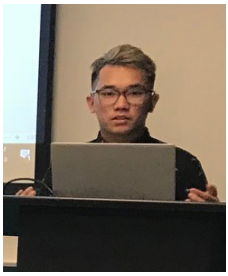
FACULTY MENTOR

Dr. Jimmy Gandhi

RESEARCH ASSISTANT

Vu Ly

Plastic Bag Alternatives



Project Description: It has been estimated that since plastic was introduced in the 1950s there has been around 9.1 billion US tons of plastic produced. Ninety-one percent of this plastic is not recycled, and winds up either in landfills or in the ocean. Depending on the structure of the plastic, some may take 450 years and some may take up to 1000 years to decompose. These plastics decompose through a process called photodegradation, in which the UV light will breakdown bonds holding long molecular chains together. For this reason these plastics will breakdown to micro plastics which will be consumed by marine animals when they wind up in the ocean. Consequently, this will impose serious health issues to consumers when they consume these marine animals as part of their seafood diet.

In this project, the goal is to introduce to the market a grocery bag that is made from a different material called nanocellulose, which can be found in the cell wall of green plants. This material is made up tightly packed array needles, is light, non toxic, biodegradable and eight times stronger than stainless steel. The characteristics of this material can be used to replace plastic bags, food packaging, etc. Even if the users do not recycle the bag after, the material will be able to decompose quickly on its own and not wind up in the ocean.

As part of this project, the business model canvas associated with the development of nanocellulose bags has been discussed, including the value proposition for customers, the costs associated with it as well as other aspects of economic sustainability of implementing this alternative to plastic bags at grocery stores in the United States.

HSI STEM Grant Program

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

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