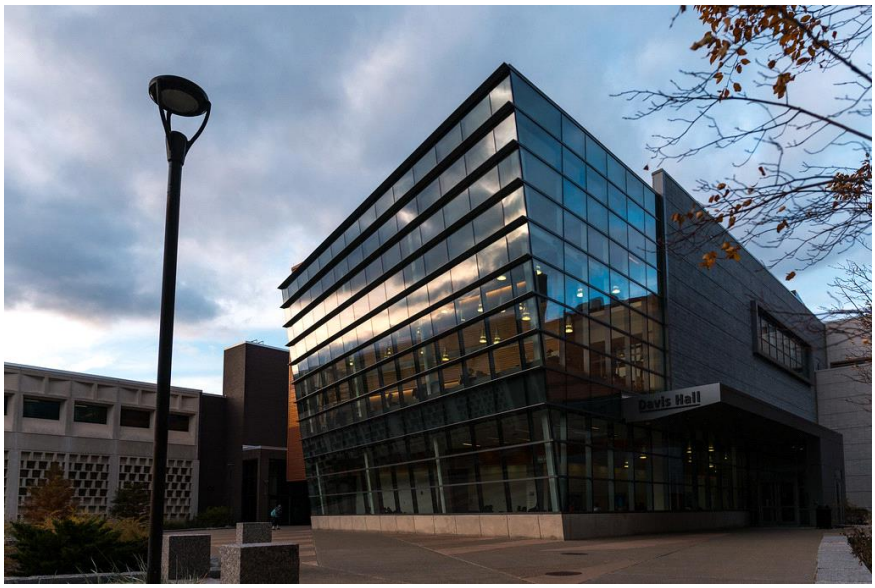
University at Buffalo
STEM Diversity Programs
School of Engineering and Applied Sciences



LSAMP RESEARCH SYMPOSIUM

July 29-30, 2020 | Online

ABOUT LSMP

The University at Buffalo Louis Stokes Alliance for Minority Participation (UB-LSAMP) is funded by the National Science Foundation (NSF) and seeks to increase the number of underrepresented students pursuing degrees in science, technology, engineering and mathematics (STEM) disciplines.

Welcome

The Office of STEM Diversity Programs in the University at Buffalo (UB) School of Engineering and Applied Sciences (SEAS) is pleased to highlight the research projects of our 2020 Louis Stokes Alliance for Minority Participation (LSAMP) Summer Research Internship Program.

LSAMP is funded by the National Science Foundation (NSF) and seeks to increase the number of underrepresented students pursuing degrees in science, technology, engineering and mathematics (STEM) disciplines. The program funded 8 undergraduates, who participated in research internships during a COVID shortened eight-week summer program.

The summer proved challenging as soon as we realized we would be unable to hold an in-person program. The staff felt strongly that we should move forward with a virtual program and that it was important for students to have an opportunity to gain this research experience. We thank our talented and patient UB faculty mentors for stepping up to mentor our students, even as they had to grapple with disruptions to their own research lab operations.

Students worked on virtual projects under the direction of their faculty member and we held a few "essential skills" workshops, including Lab Safety, Dress for Success, Business Etiquette and DISC Training. The students also enjoyed a virtual tour of MOOG Incorporated.

LSAMP students researched a wide variety of topics, including: bio-inspired design, voice recognition software, gust generation for drone testing, MRI contrasting agents, microplastics, microgrids and access to healthy food through design. During these short eight weeks, students had to be self-disciplined and self-paced, to perform "virtual" science, without lab access. They also managed to acquire some essential skills and learn to support one another in an impersonal Zoom environment. The summer of 2020 was inarguably unlike any other, but the students persevered and maintained a good attitude along the way.

Take a moment to view our summer interns' research projects, and thank you as always for your support of our students.

Letitia Thomas
Project Director, UB LSAMP

Agenda

Wednesday, July 29, 2020

11:00 – 11:50……Poster Session A (All Students)

12:00 – 12:50……Poster Session B (All Students)

Thursday, July 30, 2020

Oral Presentations

10:30 – 10:50…… Rosanna Valencia

10:55 – 11:15…… Dylan Tua

11:20 – 11:40…… Jelani Lewin

11:45 – 12:05…… Raul Babilonia

Intermission

12:25 – 12:45…… Alec Pitter

12:50 – 1:10…… Michael Cueter

1:15 – 1:35…….. Dekayla Dubose

1:40 – 2:00…… Robert Cordova

Abstracts

Raul Babilonia

Mechanical and Aerospace Engineering
Hometown: Kerhonkson, NY
Faculty Mentor: Javid Bayandor, PhD
Research Project: ***The effects of caudal fin designs and a bio-inspired boat***

Biomimicry -design inspired by nature -is gaining in popularity as a research process. Understanding the dynamics of marine life, more specifically fish and their swimming patterns, helps to create a biomimetic design and is an advancement toward developing technology based on nature. This project examines various design aspects such as underwater propulsion and caudal fin dynamics, as the basis for the creation of an efficient bioinspired boat. In particular, a fish caudal fin was used to create several models using a variety of design methods. Changes were made to the number of actuators on the tail design in order to create an efficient bio-inspired boat. For future study, a comparison of the efficiency of each fin design will analyzed. This data will be used improve advanced boat design and determine most efficient and effective mechanisms to use.

Robert Cordova

Mechanical and Aerospace Engineering
Hometown: Port Chester, NY
Faculty Mentor: Frank Lagor, PhD
Research Project: ***Gust Generator Design for Indoor Aerial Drone Testing***

What if standard package delivery times could be reduced to under an hour? Companies such as Amazon are turning to autonomous (self-flying) aerial drones to deliver packages directly to consumers in 30 minutes. However, a significant concern for drone deliveries is the loss of stability when hit by wind gusts. Avoiding crashes and power loss depends on early gust recognition by the drone's onboard system and immediate wing adjustments. Programming these preventive measures requires further data from gust encounters to improve drone stability. Outside experiments do not allow for repeatable, controlled conditions due to complex wind patterns. This project addresses the need to build a controllable, artificial gust generator for indoor simulation. Analytical theory and computational data from previous work on the flow development of air jets will be used to construct velocity profiles of the artificial wind gust. 3D CAD models of a proof of concept design will then be constructed. The proposed gust generator will be powered by adjustable fans and will generate gusts with speeds 25% higher than the drone's travel speed. The generator will facilitate experiments with full knowledge of the gust properties resulting in reliable data on how gusts affect critical components of the drone. Ultimately this will allow us to program drones to recognize and efficiently react to gusts, allowing successful delivery of packages to the consumer

Abstracts

Michael Cueter

Chemical and Biological Engineering
Hometown: Mineola, NY
Faculty Mentor: Marina Tsianou, PhD
Research Project: ***Aged vs. Pristine Microplastics***

Plastic is one of the most abundant materials used in virtually everything today, but at the cost of it being littered all over our oceans with one study estimating greater than five trillion pieces of plastic to be in our oceans today. Furthermore, about 92.4% of these pieces are estimated to be microplastics which can be as small as .1 micrometers, depending on who you ask, or up to 5 millimeters. The problem with these microplastics is that they have not just invaded our oceans, they are in our lakes, soil, air, animals, and even our drinking water with one study claiming our water can have microplastics ranging from several particle up to 10^6. Not a lot is known about microplastics since we currently do not have a reliable way to extract and analyze microplastics say from a glass a water. Microplastics have different chemical and physical properties that can affect the way they behave, interact, and distribute across the globe. Properties like particle size, density, crystallinity, and surface morphological all influence how microplastics behave in their environment whether its adsorbing organic pollutants or moving across a river these properties can change how they do so. Furthermore, by understanding how these properties affect microplastics we can further explore what effects degradation has on microplastics.

Dekayla Dubose

Computer Science and Engineering
Hometown: Buffalo, NY
Faculty Mentor: Wenyao Xu, PhD
Research Project: ***The effects of speaker origin on the utility of voice recognition software***

Almost every piece of modern technology has some voice-to-search feature. Apple products have Siri and Microsoft products utilize Cortana. Voice recognition technology even plays a part in job hiring as well as immigration. This technology will continue to play a greater role in people's lives so it is important that it is able to understand any kind of speaker, regardless of their accent. There is an understanding that this technology is flawed when it comes to understanding speakers of different ethnic backgrounds. Studies have shown that this technology has a higher error rate when listening to minority speakers. This study investigates the relationship between an English speaker's region of origin and a voice recognition software's ability to understand the speaker. The origins of the speakers used in this study include Australia, United Kingdom, and different regions in the United States. In order to investigate this relationship, this study utilizes software to record different speaker's voices and compare the error rate. YouTube captions technology was also used to study the error rate between people of different origins. The findings of this study are that region of origin does have an effect on the ability of voice recognition software to understand a speaker. The software's artificial intelligence itself does not discriminate against people from different regions; rather, the voices used to train its artificial intelligence do not cover a wide range of English dialects. This study speaks to biases intrinsic to the way we develop our machine learning technologies. In order to solve this problem, there needs to be greater diversity in the voice samples used during the machine learning process.

Abstracts

Jelani Lewin

Mechanical and Aerospace Engineering
Hometown: Brooklyn, NY
Faculty Mentor: Javid Bayandor, PhD
Research Project: ***Analysis of Fish Swimming Efficiency for Bio-inspired Boat***

As the world turns further towards an ecofriendly future we often hear of improvements to the automotive as well as energy production industries. Sometimes overlooked is the maritime industry, with cruise and commercial ships leaving increasing carbon footprints as their demand raises. This study aims to analyze the swimming efficiency of differently configured fish models for design cues in building a more efficient boat design. The results will be used in the creation of a boat designed to decrease the carbon footprint of existing boat designs.

Alec Pitter

Chemistry
Hometown: Bronx, NY
Faculty Mentor: Janet Morrow, PhD
Research Project: ***On the spin density and rotational correlation times being determinants of enhanced relaxivity in the high spin Fe^{III} macrocyclic complex FeTACO***

Contrast-enhanced magnetic resonance imaging also known as MRI is an essential diagnostic tool in the medical field. The power of the MRI is rooted in the incorporation of contrasting agents. Gd^{III} complexes have been used extensively in these machines but health related concerns in connection to this complex have arisen in recent years. High-spin macrocyclic Fe^{III} complexes show promise in being a new class of contrasting agents as this complex produces a far more intense contrast in the kidneys and livers of mice than Gd^{III}. The efficiency of a contrasting agent resides in its proton relaxivity. There are many mechanisms that affect the relaxivity of a contrasting agent but we have accentuated the optimization of correlation times and the calculation of spin densities to show the enhancement of said relaxivities in Fe^{III} complexes.

Abstracts

Dylan Tua

Electrical Engineering
Hometown: Richmond Hill, NY
Faculty Mentor: Xiu Yao, PhD
Research Project: ***Simulation Study of Arc Fault Response in a DC Microgrid***

DC microgrids have shown promising advances in power systems design, especially with renewable energy sources. In many cases, they can overcome or eliminate some of the prominent flaws in AC microgrid design. With DC microgrids gaining popularity in research, so is DC fault protection for these systems. One of the most prominent faults being studied is the arc fault. This occurs when connections between nodes become loose. In low-voltage environments, these faults are self-extinguishable and low risk; in high-voltage applications, they can sustain themselves for extended periods of time and are extremely dangerous. Most studies regarding arc faults focus on devising algorithms to detect and locate the occurrence of these faults. However, only a few studies analyze how the system reacts to these faults (i.e., the fault response). This study attempts to analyze the fault response of a DC microgrid simulation. A model of a simple microgrid system is designed through MATLAB/Simulink, and arc faults are simulated as additional resistances added to the system over time. For each location where the fault is placed, the voltage, current, and power near the sources, by the constant power loads (CPLs), and along the bus lines are measured. Through data analysis and case comparison, conclusions will be made based on general trends observed by each case. Results from this study are theorized to offer insight into metrics to focus on for future studies in arc fault detection and protection measures.

Rosanna Valencia

Architecture and Planning
Hometown: Bronx, NY
Faculty Mentor: Samina Raja, PhD,
Research Project: ***Designing for Food Access for the East Side of Buffalo***

The Healthy Corner Store Initiative (HCSI) is a collaborative partnership to incentivize and educate store owners and their customers, and expand access to healthy foods in communities with histories of food insecurity and poor health conditions. The target areas are commonly established in cities with a low income and a high African-American population. Through incentives, participating stores in the program receive funding for new stock, infrastructure, and display improvements. In addition to analyzing health conditions from a nutritional perspective as it is common in food research, it is important to consider the meaning of the stores for residents (Jones 2019). From its various uses throughout the day as a quick place to shop for foods, the corner store is also a meeting place and a way to create social networks between neighbors and store owners. The characteristics of corner stores to allow African-American populations to use space and reinvent them, are driven by residents' cultural backgrounds. This research will investigate the patterns exemplified by corner stores of the East side of Buffalo, New York. The project will explore how design can aid in addressing the multitude of uses of a corner store, and how it can be utilized to improve food access.