Book of Abstracts

The CUNY Research Scholars Program

Fall 2019

Supported by

New York City College of Technology,

CUNY Research Office

			Acid) Samples as Model Biomaterials	
Fahameda Hassan, and Mary Lee	Prof. Zoya Vinokur	Radiology Technology & Imaging Production	Correlation of Open Lab X and Student' Final Grades	8
Aneeza Hussain, and Ibeth Erazo	Prof. Daniel Alter	Dental Hygiene	Comparative Analysis between Natural and Ceramic Teeth	9
Shaylin Venitelli, and Raadiya James	Prof. Navid Allahverdi-Pur	Civil Engineering and Construction Management	Non-Destructive Testing of Concrete	9
Joan Beatrice Ladaban	Prof. Farrukh Zia	Computer Information System	Machine Learning Application in Physical Computing	10
Steven Li	Prof. Benito Mendoza	Computer Engineering Technology	Augmented Reality Gaming: Harnessing Real and Virtual Environments with Game Interactions	10
Saminur Miah	Prof. Marcos Pinto	Computer Information System	Image Classification– MNIST	10
Justin Kyungmin Park, and Anthony Rivera	Prof. Daeho Kang	Environmental Control Technology	Implication of Local Weather on Heat Transfer Rates by Infiltration in Summer	11
Yani Acham Yaou Zakari	Prof. Xinzhou Wei	Telecommunication Engineering Technology	MQTT Protocol for Application of Internet of Things (IOT)	12

The Ethical Implications of Genetic Engineering and the Lack of Mainstream Media Coverage

Aliff Abad
Prof. Katherine Gregory

How do the media interpret reproductive interventions that involve genetic testing? When a scientist performed the first known genetic editing on twins, Lulu and Nana, he ignored ethical considerations of CRISPR use. This project provides a content analysis based on a review of popular science and newspaper articles. Our interpretation of these articles suggests that there is a lack of critical interpretation of this unethical procedure and a similar attitude towards future genetic developments. While the public is curious about the repercussions of genetic editing, not enough focus is applied to the ethics of conducting such a procedure.

A Self-Driving Toy Car Using Deep Learning Student

Fahim Ahmed, Mubtasem Ali, Suleyman Turac

Prof. Benito Mendoza

Self-driving cars technology is one of the hottest areas of research and business. In the last few years, we have seen an enormous evolution in the area with cars from Uber, Tesla, Waymo; what seemed like a science-fiction, some years before, now seems more like something which is soon to become part and parcel of life. Different technological advancements, in both hardware (LIDAR sensors, cameras, GPS, ultrasonic sensors) and software (advanced algorithms for fusion and analysis of data in real time, making the autopilot functionality) are making Self-driving cars are now a reality. For the later, Artificial Intelligence, and in particular two its subfields Machine Learning and Deep Learning have contributed to developing the latest generation of algorithms for the five essential steps to form the self-driving pipeline Localization, Perception, Prediction, Planning, and Control. Although this technology sounds relatively sophisticated, it is not far out of reach for the general public. Recently, platforms such as Amazon Deep Racer or DonkeyCar.com are available to the public. These platforms allow to build and train scale model cars 1/10th or 1/18th. These small, toy-like cars have a mounted camera and an onboard computer module. The computer module runs self-driving pilot algorithms, neural network, trained by the user, which can drive itself along a track. These platforms provide developers with the opportunity to go hands-on with advanced techniques used on training real self-driving cars, such as reinforcement learning. However, the cost of the hardware goes from $300 to $400, depending on how much assembly is required. The goal of this project is to explore current developments of Open Source hardware and software to build a low-cost platform for autonomous driving scale model cars (car chassis/framework and software). This platform should allow, for example, other students with low budget enter into the world of Deep Learning, during self-driving cars, and self-driving car racing competitions.

Roboqueen 3D

Jensy Maldonado and Anny Baez Silfa

Prof. Farrukh Zia

RoboQueen is an ongoing research project in the Computer Engineering Technology Department. Its goal is to create a semi-autonomous internet-connected remote-controlled robotic mannequin to conduct research in several areas such as social robotics, interactive storefront fashion display model and to teach computer hardware, software, networking and mathematics concepts in various courses. The current phase of the research project has two major objectives. To improve its arms and head movements by using 3-Dimensional control implemented with the help of linear algebra-based algorithms and program code. The second part includes updating some of its current components with the help of 3D printed electronics and embedded circuits and sensors. These custom 3D printed devices and circuits will be used to add more functionality and features to the RoboQueen project.

3D Printed Computer Circuits

Sultana Begum

Prof. Ohbong Kwon

3D printing technology has rapidly become a mature technology due to the availability of low-cost 3D printers based on open source designs and components. A wide variety of 3D print materials are now available with many different physical and electrical properties. This research project has explored novel and innovative ways to use 3D printing technology to create electronic computer circuits, sub-systems and devices by using a combination of conducting and non-conducting materials and components. The 3D printed computer circuits will have a range of applications in creating systems such as IoT (Internet of Things) devices, toys, bio-sensors such as the motion sensors, wearable tech garments such as Light Emitting Diodes (LED) and jewelry such as wrist bands, rings embedded with LEDs.

Talk and Roll Bot-Mind Control

BingFang Chen (Cornelia), Yipenca Tang Liang

Profs. Farrukh Zia and Ohbong Kwon

Talk and Roll Bot is a mobile robot project which combines computer hardware, computer software, mechanical, electrical, data communication and networking subsystems to create a working prototype of a computer-controlled robot system. In the current phase of the research

project, background research is done to learn to use the Electroencephalogram (EEG) measurements of brain waves to control the robot. A modified Mindflex game controller is connected to Arduino and brain activity data is passed on to Processing code running on a PC in order to track and record brain wave patterns. The electrical activity of the brain will be used to control the DC motors in Talk and Roll Bot.

Degradation Rate Calculations of Polydimethylsiloxane (PDMS)

Ibrahim Chouman, Matthew Sanchez
Prof. Ozlem Yasar

PDMS is a biodegradable and biocompatible material that is commonly used in the Tissue Engineering field. In this research, the degradation rate of PDMS is investigated by dissolving the PDMS within the water and ethyl alcohol. Outcomes are compared to decide the degradation speed of engineered scaffolds. Our preliminary results indicate that PDMS can be dissolved within ethyl alcohol faster.

Analyzing Exotic Function in Calculus under a Microscope

Showmik Chowdhury
Prof. Satyanand Singh

In studying Calculus, we learn about exotic functions which can be seen everywhere, and we can differentiate them. By differentiating a function, we can visualize and understand the rule of its nature. People frequently wonder if such functions have real life applications. It turns out that movies such as “The Dark Knight” used exotic functions to create special sound effects. In our case, we closely studied the behavior of the Weierstrass function and sequences of functions that approximate to it from both a visual and theoretical perspective.

Know your Body: Health Data Analysis Across Gender and Ethnic Populations

Maria DeLeon
Prof. Niloufar Haque

Why knowing your body is important? It’s important for your health. Our diet, sleep pattern, pulse rate, lung capacity are key indicators of our risk for major illness. The human body consists of organized yet complicated organs and systems, making it work-day in and out. It can be affected by a person’s life-style. Quality of an individual life depends largely on a person's mental and physical health. One’s life-style plays a key role, however, one’s genetic predisposition also is an

important factor to be taken into consideration. Family history is a good index to identify disease traits early on. We hypothesize that life-style and genetic predisposition may be the key factors in triggering various chronic diseases. In this study we collected patient information from 20 females and 7 males. Our results show that there is a significant difference between male and female calorie intake and slept hours. Our results confirm that physiologically male and female body functions differently. Understanding sex differences as between calories intake, slept hours, lung capacity and pulse rate will allow a better diagnosis, treatment, and eventually prevention of diseases in men and women. Additional details will be discussed one the project is completed.

Physico-Chemical Modeling, Optical Microscopy and Near-Infrared Spectroscopic Characterization of Model Biomaterials

Amina Shahbaz, Aldona Gjoni

Profs. Zoya Vinokur, Subhendra Sarkar, and Chen Xu

Physics and Chemistry of tissue/biopolymer interaction is ill-understood. Biopolymers are being developed with embedded nanostructures for in vivo drug delivery to treat various diseases including cancers. In the current project two biopolymers were designed and fabricated under a separate project: poly di-methoxy siloxane (PDMS) with 0-4 vol% of SiC nano whisker(fillers) that were non-destructively characterized and modeled by the authors. Characterization included optical surface microscopy (5-100X) and 2DX-ray imaging at low kV and low MAS to ensure proper loading and uniform distribution of SiC content in PDMS matrix distinguishable within 1 vol% of SiC. In addition, near infra-red spectroscopy (NIRS) was performed to obtain basic filler-PDMS bonding behavior with increasing nano-filler load. Preliminary results suggest SiC anchored at the PDMS backbone even at 1 vol% causing the observed enhancement of mechanical properties with filler loading. CT and MRI characterizations are under way with iodinated and gadolinium-based contrast agents to understand hydrophobicity and bulk behavior of pores and defects in PDMS composites as predictors of in-vivo compatibility

Biotechnology and Reconstructing the Self through Genetic Health Markers and Elevated Health Risks

Nadia Gordon
Prof. Katherine Gregory

New commercial technologies promise personalized genetic information upon request. As these technologies become more popular, it is meaningful to understand how consumers interpret their results. Applications like 23andme, AncestryDNA, and Promethease grant consumer access to their individual genome and interpret data for health markers. Using these applications,

participants have gained genetic knowledge that shifts self-concepts of ethnic/racial ancestry, health risks, and the potential meaning of genetic identity. This study began as an autoethnographic account and then expanded to in-depth interviews with users of these kits. This study aims to understand how consumers use the applications and tools to interpret results, and how those results are understood as a determinant of wellness and health knowledge. Based on interview findings, consumers are concerned about privacy issues, discrimination, and data hacking.

Fabrication and Imaging Characterization of Poly (Dimethyl Siloxane)/SiC Nano-fillers and Electrospun Poly (Lactic Acid) Samples as Model Biomaterials

Viorica Gutu, Tetiana Soloviova

Profs. Zoya Vinokur, Subhendra Sarkar, Akm Rahman

Biopolymers are being developed with embedded nanostructures for in vivo drug delivery to treat various diseases including cancers. In the current project we developed fabrication steps to prepare two biopolymers, polydimethylsiloxane (PDMS)with 0 0.9 vol% of SiC nano whisker (fillers) followed by non-destructive characterization. Optical reflection microscopy (5-100X) was performed to ensure loading and distribution of increasing SiC content. Optical microscopy showed progressively higher SiC distribution as filler loading was increased from 0-0.9 vol%. X-ray imaging at low kV(kilovoltage) and low mAs (milli amperage per second) were optimized to allow distinction between filled PDMS with SiC concentration that differed as low as by 0.2%. In addition, MRI characterizations are under investigation to obtain basic inter-molecular relaxation information with and without nano fillers. Preliminary results suggest SiC attached at the PDMS back bone even at 0.2 vol% explaining observed enhanced mechanical properties with filer loading.

Correlation of Open Lab X and Student' Final Grades

Fahameda Hassan, Mary Lee

Prof. Zoya Vinokur

Open ended laboratory or open lab as it is known to the Radiological Technology students is an invaluable tool that the Radiological Technology and Medical Imaging Department provides to help the students become better radiographers. One way to ensure students use this resource is to make it a weekly requirement for some classes, other classes have no weekly requirements or may have a set total hour requirement per semester. We hope to study how utilizing this department resource impacts the student's final grades over a multi-year study. Does making it mandatory help

the students succeed in improving their skills and knowledge base or does it harm students if they are unable to complete requirements. In surveying the Radiological students, we will investigate whether other factors impact how both first- and second-year students use this resource, such as personal commitments outside school, academic requirements that make it difficult to use this resource and whether or not the times designated as open lab are sufficient for all the students in the department. Over the course of the school year, we will see how first- and second-year students utilize open lab and how does it impact their grades, and does it improve performance, communication skills and build skill confidence.

Comparative Analysis between Natural and Ceramic Teeth

Aneeza Hussain, Ibeth Erazo
Prof. Daniel Alter

Ceramics play a fundamental role in Dentistry and are used widely, due to their ability to mimic the optical characteristics of enamel and dentine, as well as for their biocompatibility and strength. Initially, dental ceramics were materials that formed part of systems, designed with the purpose of producing dental prosthetics that in turn were used to replace missing or damaged dental structures. However, due to the increased demand for esthetics, its development has gone beyond in such a way that it has led to the development of all ceramic restorations. So that, in the last few decades, there have been great advances in the mechanical properties and methods of fabrication of dental ceramic materials. While porcelain-based materials are still an important component of the market, the use of all ceramic systems is growing exponentially. The new generation of ceramic materials present interesting options, both in terms of material selection and in terms of fabrication techniques. A closer understanding of the dynamics of the materials with respect to design of the restoration and the intended use, is necessary to enable these restorations to perform productively. The aim of this study is to attain a general understanding regarding the development in the composition and indications of ceramics in dental applications by the analysis of the evolution that this material has had during the last century in order to obtain esthetic and functional dental prosthesis that replace natural teeth when they are missing.

Key words: dental materials, dental ceramics, ceramic restorations.

Non-Destructive Testing of Concrete

Shaylin Venitelli, Raadiya James

Prof. Navid Allahverdi-Pur

The use of concrete in the world's infrastructure dates back centuries. Builders in Ancient Rome used limestone and volcanic rock to create structures more durable than many of those erected

today. In order to assess the strength of existing structures the construction industry utilizes Non-Destructive Testing. Non-destructive testing applies to a diverse array of techniques used in science and technological fields in order to evaluate the properties of a material, component or system without causing damage. Non-destructive testing is applicable to many fields and circumstances in which properties are unknown or have changed due to time. It allows analysts to determine how strong structures are without destroying their integrity and preserving their form. With the use of devices such as the Schmidt Hammer, the elastic properties, or strength of concrete, are determined through the rebound resistance that the tested material exerts on the device. The accuracy of non-destructive testing results will be assessed through comparison with results obtained from destructive techniques. With comparative data describing the benefits of non-destructive, the industry can focus on efficiency and productivity.

Machine Learning Application in Physical Computing

Joan Beatrice Ladaban

Prof. Farrukh Zia

Machine learning and physical computing are important areas of research. This project involves the use of machine learning and physical computing to control an autonomous robot. Machine Learning refers to writing code that learns from data and improves its performance and is a topic related to Software Engineering. Physical computing refers to writing code to interact with the physical environment by using sensors and physical devices. This is a topic related to Hardware Engineering and where one can use open source hardware such as Arduino and Raspberry Pi. This research project combines the Software and Hardware aspects into one working system.

Augmented Reality Gaming: Harnessing Real and Virtual Environments with Game Interactions

Steven Li

Prof. Benito Mendoza

Augmented Reality (AR) technologies enhance the version of the physical environment with computer-generated sensory input such as sound, video, or graphics overlaid on top of the real-world view. AR can also be used to improve the user experience while interacting with the world. Today, some examples of AR games consist of Pokémon Go and Zombies Run!. These games display virtual characters in the real-world using smartphones, capturing the surrounding environment, and embedding the virtual characters as if they were real ones. In these games, players are also able to interact and play against each other. AR has other uses beyond gaming, for example, it can be used to display an interactive MTA map just by scanning a small barcode. In

this project, we focus on making virtual characters interact with the real-world environment and explore more possibilities on how AR can be used to communicate between the people and virtual objects. Many AR applications bring virtual objects to the real-world environment but are unable to make them interact with real objects around them because both objects are in two different worlds. Our goal is to make AR interact with real-world objects like they actually coexist in a cyber-physical world.

Image Classification–MNIST

Saminur Miah
Prof. Marcos Pinto

One of the problems that arises when dealing with extremely large amounts of data, big data, is image classification and among the type of image data we have to deal with is handwritten text that must be 'read' by an automate system, for example a computer. And there comes machine learning again which is a method that relies on the fact that one can build systems that can learn from data, identify patterns and make decisions with minimal human intervention. The project uses a popular dataset called MNIST (Modified National Institute of Standards and Technology that contains handwritten digits that is commonly used for training various image processing systems. The dataset contains 70,000 28x28 pixel images (usually 60,000 are used for training the system and 10,000 for testing the system). An application that uses a convolutional neural network (CNN) is created to classify any given handwritten digit to a great accuracy (over 95%).

Implication of Local Weather on Heat Transfer Rates by Infiltration in Summer

Anthony Rivera, Justin Kyungmin Park

Prof. Daeho Kang

The first law of thermodynamics, also known as "Law of Conservation of Energy", states that energy can neither be created nor destroyed; energy can only be transferred or changed from one form to another. The natural transfer of heat flows from a warmer environment to a colder environment. Infiltration through a building entrance door has major impacts on the indoor thermal environment, indoor air quality and energy performance. In our research, we measured differential pressure and air velocity across entrance doors. We also monitored the indoor and outdoor environments in the Environmental Building by collecting data using specialized instruments and sensors. After analyzing the measured data, we were able to calculate the heat transfer of the infiltration through the entrance doors. Finally, we were able to compare the heat transfer rates calculated from local weather and standard weather.

MQTT Protocol for Application of Internet of Things (IOT)

Yani Acham Yaou Zakari
Prof. Xinzhou Wei

The Internet of Things (IoT) refers to a vast number of “things” that are connected to the internet so they can share data with other things. Things Board is an open-source IoT platform that enables rapid development, management and scaling of IoT projects. With Thingsboard, we can collect and visualize data from devices and assets. We also can analyze incoming telemetry and trigger alarms in our system. MQTT is a publish-subscribe-based messaging protocol used in the internet of Things. It works on top of the TCP/IP protocol, and is designed for connections with remote locations where a "small code footprint" is required or the network bandwidth is limited. The goal is to provide a protocol, which is bandwidth-efficient and uses little battery power. So, it’s the perfect solution for Internet of Things applications. In our research project, we adopt the MQTT protocol with an open source platform, Thingsboard, to collect real time data and display them in real time with user design dashboard.