Book of Abstracts

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Assessing Participants' Feedback and Hygiene Care Provided by New York City College of Technology's Dental Hygiene Students

Alona Abdullaieva, Wen Wen Dong, Yujing Mei.

Profs. Susan Davide and Audra Haynes

This study is a continuum of the initial dental screenings provided at the CUNY Graduate Center's Wellness Fair in spring 2018. A new cohort of dental hygiene students provided this second annual dental screenings in April 2019. Following the comprehensive dental screening those participants who made an appointment received complimentary care at NYCCT's Department of Dental Hygiene Clinic. Upon completion of treatment care, participants completed a post-treatment survey to determine overall satisfaction of services provided. This study will further continue to allow Dental Hygiene faculty and students to improve accessibility and strategies to increase public awareness of services, access to care and patient recruitment opportunities.

Lasso Regression

Afsana Mimi, Fabliha Afia, Dung Mai, Shubha Shrestha

Prof. Nan Li

This Project is conducted to understand how Lasso Regression is used to analyze *Communities and Crime Unnormalized Data Set***.** In today's world, regression analysis is one of the most commonly used methods in many scientific fields as the statistical method for predictive modeling. Our research aims to explain and discuss the use of the LASSO method and reasons why LASSO is used instead of Simple Linear Regression. Throughout the project, there will be data computations to show how this method will give us a better understanding of crime records based on specific areas, age limits, different races and so on. Since big data modeling and prediction requires more accurate methods, we will try to conclude that Lasso Regression will give a better understanding of our results. All the required calculations and graphical displays will be performed using the R software for statistical computing.

High Performance Facade Metrics, Closed Cavity Systems and Incentives in Context of Net-Zero Building

Laurin Moseley, Tasfia Amir, Rafia Amin & Taylor Hernandez

Prof. John Neary

Curtain Wall facades, modular enclosures of aluminum framing and with vision glass and opaque spandrel infill, have come under attack recently as inefficient in terms of insulating performance and as a principal contributor to the problem of greenhouse gas emissions related to buildings. But they are ubiquitous and the reasons for that are not changing overnight. We need to understand

how the curtain wall performs and how it can improve to make buildings, especially tall urban buildings, more sustainable in the future.

We investigated the strengths and weaknesses of the curtain wall, especially recent emerging technology of Closed Cavity Facades with integral automated shades and photovoltaic screening. These technologies control heat gain (which is the principal environmental problem with the glass building) while reducing the need for artificial lighting, and generating electricity.

In our research, we compared the U values and Solar Heat Gain Coefficient of the conventional high-performance curtain wall enclosure with the Closed Cavity curtain wall. We have also documented code performance requirements for façade insulation and Solar Heat Gain, as well as targets set forth in incentive programs such as New York's Zone Green FAR Bonus program and the recently announced Climate Mobilization Act (Local Law 97). Next, we evaluated the impact of the façade, specifically the Closed Cavity Façade, on the metrics of the Net-Zero energy consumption commercial building. This puts the relative importance of the façade system performance in context for evaluating the life-cycle cost and benefit of the premium represented by the high-performance curtain wall.

From our research, we have concluded that the closed cavity façade can achieve the higher performance which the new incentives and regulations demand. The CCF can result in a 25% energy savings in annual energy use. This significant energy reduction proves that improving facade performance contributes to lowering a building's carbon emission and helps to reach Net-Zero. Achieving Net-Zero should mean compliance with new energy laws of NYC, as well as creating more sustainable buildings are beneficial for the world we live in.

Redefining Gender Culture: A New Perspective on Dress and Identity

Arsha Attique and Chayange J. Davis-Levy
Prof. Alyssa Dana Adomaitis

In recent times, paradigm shifts have propelled cultural change, and our society is continually attempting to integrate these into a new consensus. These changes have not only influenced what is considered allowable in conversation but also in many other forms of behavior. One current shift relates to gender identity and expression: what is gender? Many individuals no longer identify with binary definitions such as "he" or "she," or "male" or "female."

As culture evolves, every industry must determine how best to adapt to these changes. Fashion, in particular, may serve as a great signifier of these gender identities, but how it does so is an area that is not yet well researched. How do people accurately express their gender identity to others to enable appropriate identification and subsequent respectful verbal communication? Which types of presentation result in appropriate reactions from those who in contact with the individual. When gender was a simple binary distinction, one method used to signify gender was dress and appearance cues (Barnes & Eicher, 1997). The purpose of this proposed research is to investigate

how individuals representing a range of gender identities express their gender and the extent to which dress and appearance cues play a role in that expression and communication. Dress is also important to establishing and maintaining gender identity. Stone's highly influential 1962 "Appearance and the Self" which first printed in Human Behavior and the Social Processes: An Interactionist Approach outlined a process that explains the role of dress in forming identities. Qualitative methodologies will be used to conduct this research.

Long-Term Effect of Very High Fat Diet to Study the Synergism In Hormonal And Cellular Changes in Male Mice

Ilhom Bakiyev, Bushra Miah, and Brian Holliday
Prof. Sanjoy Chakraborty

Long term intake of very high fat diet (VHFD) leads to the hormonal changes causing simultaneous changes in the islets of Langerhans and adipocyte cell size. The role of a High Fat Diet (HFD) and its direct correlation with regards to health has become one of the most important subjects of our time. The aim of this study is to analyze the effect of high fat induced obesity in the male mice model by feeding some of them a normal chow diet (ND, n=15) and the others with a VHFD (n=30) for 2, 12, and 24 weeks. Body weight, food intake, caloric intake [fat (saturated and unsaturated), protein, and carbohydrate], hormone levels (leptin and insulin), and islet of Langerhans/adipocyte size were quantitatively recorded. In VHFD-fed animals, body weight (as well as leptin and insulin levels, along with grow thin islet and adipocyte size) significantly increased within the first 12 weeks and then plateaued with time. VHFD-fed animals consumed significantly less food than ND-fed animals at all time periods indicating that it was the quality of food, and not the quantity, which caused the increase in body weight. The increases in islet and adipocyte size in VHFD-fed animals were like the analogous increases in hormonal levels (at 2 vs 12 vs 24 weeks). These results, therefore, suggest that in diet-induced obesity changes, shifts in hormonal levels works hand in hand with metabolic adjustments at the cellular level to combat the effect of fat. Thus, mechanisms like hormonal resistance, changes in adiposity, islet size and caloric intake with prolonged exposure to high fat are probably defensive mechanisms employed to protect against diabetes. In order to understand these complicated and nuanced effects of high fat and to comprehend the underlying mechanism associated with it, it is important to focus on long-term studies that emphasize the synergy between cellular and hormonal changes in addition to an analysis of individual components.

Energy and Carbon Neutral NYC

Elena Zimareva, Evan Banks and Elena Malysheva
Prof. Navid Allahverdi

In 2016, the world's leading countries signed the Paris Agreement that focused on reducing climate impacts on the planet. In May 2019, NYS and NYC signed up for ambitious goals to decarbonize the city and bring the state to be 100% on renewable energy. Specifically, Local Law 97 was signed by the office of mayor that requires all buildings over 25,000 sq ft to reduce the CO2 footprint by 40% by 2030 and by 80% by 2050 at the same time increasing the efficiency of the buildings based on Energy Star energy rating system. While the goal is very ambitious and is leading the city towards the right direction, there are a few concerns on whether the system of energy rating is comprehensive or not, how carbon dioxide emissions are calculated and what are the means and methods that building owners will have to take to comply with the law. The law will become official in 2024 and there is not much time to think, there is a need for action.

Hybrid Green Technology Systems for New York City Roof Tops: Green Roofs and Solar Energy

Ilana Berger
Prof. Ivan Guzman

Climate change is a reality which we can no longer ignore. As a response New York City has set some of the most stringent energy code regulations in the nation. In 2019 the Mayor's office of Sustainability released an initiative to reduce carbon emissions by 80% by 2050. In order to meet this goal, the new building codes stipulate that all new buildings must include green technology. The issue however is how can we maximize the limited space we have available within the urban environment and how can designers and builders develop feasible solutions for developers and owners. I intend to explore the possibilities of maximizing rooftop space by creating hybrid green technology solutions for New York City rooftops. Green roofs and solar energy are both proven to be efficient and sustainable solutions. The issue however is that both technologies occupy the same space and therefore in conventional practice, are mutually exclusive. The challenge is how to make these and other technologies work in unison within the same roof real estate. With the development of new fully translucent solar cell technology, components of natural light that are not used for the generation of electricity can now be harvested for other purposes. By installing these types of solar panels on a canopy system which are mounted above a roof's surface, the roof can then be used perhaps for a green roof. An added benefit is that clear solar panels block UV and ultraviolet rays which can be harmful to some plant species. With the combination of solar electric onsite generation and the thermal insulating benefits of green roofs, homes, buildings, and factories can significantly reduce their energy consumption and therefore decrease their dependency on fossil fuels. With the successful combination of solar energy and green roof

technology, buildings can now move closer to meeting the new energy code requirements while also reducing their carbon footprint.

The Psychology of Hurricane Warnings: Why are they Sometimes Ignored?

Christina Bhawanidin and Jeevanie Liliah
Profs. Howard Sisco and Ngana Mundeke

Why do some people heed evacuation orders given before an impending major disaster such as a hurricane while others do not? Failure to comply with departure instructions puts the individual at personal peril as well as the first responders responsible for rescuing them during those dangerous times. For example, during Hurricane Sandy in New Jersey, 72% of people refused to evacuate whereas with Hurricane Rita 53% disobeyed orders to evacuate. The purpose of this research is to begin the process of investigating the psychological factors that contribute to individual differences in not obeying evacuation orders. A hurricane preparedness questionnaire will be developed using rational methods. When completed, the survey will be administered in person to future hurricane victims at disaster response centers.

Overview of Student Needs & Readiness in Working with Persons with Substance Abuse Issues at Professional Internship Sites

Joya Biswas and Nashrin Akter

Prof. Charisse Marshall

A quantitative survey study of a cohort of 12 Human Service (HUS) Department Interns is proposed to assess the readiness and needs of HUS students during their internship semester. The data yielded from this study will help the HUS Department-specifically students and instructors from the HUS 1203 Human Seminar Course- understand what skills and abilities are needed to prepare HUS Students for professional internships dealing with persons coping with substance abuse and addiction.

The Logical Minimalism Algorithm Applied to First-order Logic Axiom Sets

Aurkaw Biswas
Prof. Brad Isaacson

This study assumes an acquaintance with some basic knowledge of first-order logic. I describe a recursive process, called the Logical Minimalism Algorithm, on finite axiom sets. This algorithm finds all the minimal subsets of axioms from a given finite set of axioms. A minimal subset of axioms, called a minimal core, is one that has no redundant axioms, where an axiom is redundant

if it can be derived from the remaining axioms. Every finite axiom set has at least one minimal core. There is a rooted tree corresponding to the Logical Minimalism Algorithm applied to any finite axiom set. I apply this algorithm to an axiomatization of Boolean Algebras.

A Study on Building Occupancy Detection with Sensor Data Analysis

Brian Borerro and Daniel Sampong

Prof. Li Geng

Thermal comfort is a considered factor for building design and innovation. Efficient regulation of thermal comfort can be achieved through incorporation and use of occupancy sensors. However, there are often difficulties in accurate detection of occupants therefore affecting proper auto regulation of occupants' spaces. The sensors often employed are used to gather information regarding possible occupancy. In related work, researchers and investigators employed the use of pre-existing environmental sensors such as CO_2, humidity, and temperature sensors. The data collected with those sensors in the tested environment were charted with various software and verified with other instruments such as cameras and logs. This was for the purpose of verifying true occupancy and false ones. For our research, we investigated some of these existing works and endeavored to build our own sensor system to collect temperature and humidity values and then send them to the cloud to be visualized and analyzed remotely. We investigate the feasibility of using these data for occupancy detection. To fulfill this idea, we analyze the time-series data sets, perform the statistical tests and find the significant difference between data sets with and without occupancy. In addition, we are unable to observe the change in data sets in efficiency in using different types of sensors. Due to our limited time and budget, we were unable to create many devices to collect data, but through trial and error, we gained an understanding of the functions of occupancy detection and looked forward to what will come next. Our future work includes building more devices that consist of different sensors in collecting environmental data, using Received Signal Strength of WiFi, and predicting occupancy using machine learning models.

Static Analysis of Structural Members

Amani Calderon; Alexis Villalona
Prof. Farhad Alinaghizadeh

This research is devoted to statics analysis of structural members under mechanical loads. Static analysis of beams under uniform transverse mechanical loads is presented. The beams are supported by simply supported boundary condition at both sides. The equilibrium equation of the beams is obtained and solved using analytical method and numerical method. The numerical method employed in this work is generalized differential quadrature (GDQ) method. The type of

differential quadrature method used for numerical solution is the polynomial-based GDQ method. The differential equation is discretized into algebraic equations based on the GDQ technique. The algebraic equations are then solved to obtain the deflections of the beam. The results of GDQ method are compared with the analytical solutions. It is found that the result of GDQ method are in good agreement with those of analytical solution which shows high accuracy of the GDQ method. Effects of material properties, geometrical property (cross section of beam), and mechanical loads on deflection of the beams is investigated.

Characterizing one of *Tetrahymena Thermophila* Calpain Family Member, TTHERM_00471200

Collette Cameron
Prof. Ralph Alcendor

This research project is to provide information on one of *Tetrahymena thermophila* calpain family member, TTHERM_00471200. Calpains are proteins belonging to the family of calcium-dependent, non-lysosomal cysteine protease. These proteins are expressed in mammals as well as many other organisms. These genes are well conserved from bacteria to mammals and they function in many important cellular processes such as cell cylcle control and cell death. *Tetrahymena thermophilia* are unicellular eukaryotes that are larger than several mammalian cells. They live in fresh water such as ponds and streams all over the world. They are known to be valuable to eukaryotic research. They have two types of nuclei, macronucleus and micronucleus, each with distinct functions. The macronucleus has been sequenced but not all the genes have been fully expressed. The goal of this project was to use Bioinformatics tools to gain information on TTHERM_00471200. Initial BLAST results indicated the coding sequence of TTHER_00471200 is very similar to human calpain 15. However, additional computational tools such as T-COFFEE, MUSCLE, MAFFT and MEGA, showed TTHERM_00471200 may share similar function and structure with human calpain 15 and calpain 7.

Electric Vehicle Mobility

Andois Carrasco
Prof. Yu-Wen Chen

With the increase popularity of Electric Vehicles, user face a question, where should I charge my EV? User face many options that are overpriced, confusing and don't offer any benefits. The demand for a better business model for the EV Users and Station Owner will help both reduce costs and maximize the benefits owning an EV on both ends. There has been an increase of charging stations all over the United States. EV User face different mobile applications, charging

availability, traffic congestion, charge time and different pricing models. The aim is to provide a Electric Vehicle Mobility Business Model that will use an algorithm to focus on the issues the EV User would face when picking a charging station. The algorithm will take different variables into account, such as the users walking ability, congestion, charging requirements and time. The introduction of the algorithm will help reduce the cost for the EV user and helping reduce the cost and introduce more benefits of owning an Electric Vehicle.

Ball Catching with Omni-directional Wheeled Robot Utilizing Computer Vision and Neural Network

Mason Chen and Eric Martinez
Prof. Ali Harb

The purpose of this experiment is to test the hypothetical efficiency and implementation of a computer-vision driven robotic system in order to recognize color coded object and autonomously catch them. This system will feature a PIXY2 camera, a derivative of the CMUCAM5 camera, which will detect objects of fairy uniform color distribution and shape. Utilizing an algorithm which will map out the Cartesian coordinates of the object in relation to the "center" of the camera, the robot will drive to the object. The algorithm was first developed on paper then programmed into Arduino IDE. The chassis for the robot was designed in Autodesk Inventor and 3D printed. Further research is required to develop the neural network with MATLAB. We also have plans to switch the PIXY2 camera with a standard webcam and utilize a Raspberry Pi to develop an algorithm that can detect a true ball rather than a round object.

Burnside-Pólya Counting Methods Student

Dahiana Jimenez, Gabrielle Langston and Matthew Edelmann
Prof. Satyanand Singh

We will consider tic-tac-toe, permutation groups, Burnside Lemma, fixed points and stabilizers to perform computations on various sized tic-tac-toe board grids, as well as polygons. Our computations involve rotations, reflections, matrix visualizations, cycle indices and congruence classes. We will ultimately demonstrate that it is preferable to utilize the Burnside Pólya enumeration theory rather than ad hoc methods because the theory reduces one's chance of error and is applicable for computations that involve large cardinalities, making ad hoc counting impractical.

Comparative Analysis between Natural and Ceramic Teeth

Aneeza Hussain, and Ibeth Erazo

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.

Voice Controlled Augmented Reality: A Comparison of Speech-Recognition Tools for AR Applications

Juan Estrella
Prof. Benito Mendoza

Augmented Reality (AR) refers to the technologies that enhance the version of the physical environment with computer-generated sensory input such as sound and graphics overlaid on top of the user's view of the real world. Artificial Intelligence (AI) studies how to make computer programs and machines "smart" and take decisions. Our research project focuses on exploring the Integration of AI in AR applications. Specifically, on using Speech Recognition or Natural Language Processing for controlling virtual AR objects and enhancing the human-computer interaction. It is obvious that integration of AI and AR is of great value. However, for developers, it is difficult to find the right tools to start building applications. We present an empirical study that compares currently available alternatives for creating voice-controlled systems. We compare several Speech Recognition services in terms of openness, usability, cost. We developed two applications to test these services, one that uses simple keyword-based voice commands and the

second that uses more advances sentences. We present our experience while integrating these libraries/services with the game engine used to develop AR applications, and the services pros and cons.

Mechanical Characterization of Nano-material Doped Polydimethylsiloxane (PDMS)

Deldrys Gomez Reynoso
Prof. Ozlem Yasar

In this project, dog-bone shaped PDMS testers are fabricated at the Research Laboratory SET in the Department of Mechanical Engineering Technology. Tensile tests are performed to investigate the mechanical properties of the PDMS. Similar procedure are also repeated for the nanomaterial doped PDMS to investigate the effects of nanomaterials on the mechanical properties of PDMS. Our preliminary results indicate that engineered scaffolds' mechanical properties can be improved with nanomaterials.

Entertainment Connection

Conny Gordon
Prof. Tamrah Cunnignam

We have developed Entertainment Connection as a website to gather and consolidate information related to the entertainment industry. Entertainment Connection consists of the development of a contributory web application to display and gather information on the Entertainment Industry, as well as to vet users for students. The goal of the website is to create the foundation for a web-based directory of existing jobs within the field. We have designed Entertainment Connection because existing options lack necessary infrastructure. The directory is meant to advise students and career seekers on jobs that are available, and the steps required to achieve those jobs. This is important because there are countless opportunities awaiting those who are in search for their next journey. A directory of what exists, what's to come, and how to accomplish what's needed will help to digitally keep a record of all of those who take the time to create. Also, as part of its purpose, the website seeks to engage the general public, including interested professionals and scholars, by incorporating a roster. The "Stay Connected" page will consist of verified workers in case users who come across our website need to be further assisted with questions pertaining to a certain job. As a secondary purpose, the web application was developed to be replicable by others who might choose to take and adapt to Entertainment Connection for their own career-related purposes.

Creation in Art Architecture and Geometry Wrapped in Orgami

Oliver Hadi
Profs. Anne Leonhardt and Satyanand Singh

Origami has been around for centuries known as the art of paper folding. In the 20th century, this ancient art form found its way to applications in the fields of engineering, medicine, and other sciences. We will take a closer look at how origami can be integrated and used as a problem-solving tool in the field of architecture. Our focus will explore the potentials of origami through tessellations of parallelograms. The target of application will be an interchangeable ceiling that folds like a "Herringbone Tessellation" and alters both the aesthetics and acoustics of the space that it is applied to. We will make explorations through digital and physical modeling as well as following mathematical principles to identify the limitations and explain the movements of the proposed design.

Doctor-patient Communication and Patient Continuity of Care: A Mixed Methods Study of Primary Care Services in NYC

Kavita Hariprashad
Prof. Noemi Rodriguez

Continuity of care is a vital component of patient health status. Doctor-patient communication is basic to the continuity of care. Data is sparse regarding up-to-date surveys done in New York. This study looked at the outcome of patient continuity of care through the survey of patients treated in primary care settings by primary care physicians in New York City. A mixed-methods survey was carried out using validated Likert scales to assess the correlation between doctor-patient communications and dimensions of continuity of care. Surveys were distributed via Google Forms to 20 adult participants whom resided in New York City. Participants were predominantly Non-Hispanic with the majority being 25-44 years of age. Correlational analysis showed a significant negative correlation between the Doctor-Patient Communication variable and Dimensions of Continuity of Care. Importance of the link between family medicine and patient care in the delivery of primary care services is stressed as a means for productivity within the healthcare system spectrum.

Software Implementation of an Assistive Technology Mobile Robot

Jannat Hoque
Prof. Farrukh Zia

HeathKit Educational Robot (HERO-1) was used in many colleges and universities for 15 years since 1980 to teach students about Computer and Robotics Technology. HERO is being revived to give new features with modern computer hardware and software technology, such as mobile robot obstacle detection and navigation and speech synthesis and recognition. This will enhance the implementation of Assistive Technology to enable her to help people with disabilities. The two most common modern devices that are used for mobile robot obstacle detection and navigation are ultrasonic sensor using sound waves and infrared sensor using light waves. By learning and comparing the advantages and disadvantages with testing and technical specifications of the two devices, we implement them on a mobile robot to test their effectiveness in real world situations.

Examination of Schiff Base Condensation of Aromatic Amines with Cyclohexanone and Related Carbonyl Compounds

Taline Ingram, Wesley Lu, Jonathan Samuel
Prof. Peter Spellane

The Schiff Base (named after Chemist Hugo Schiff) is characterized as a ketone or aldehyde compound whose carbonyl group gets replaced by an imine group. To produce this substance, each student utilized a different method to conduct the synthesis. Since the first several sessions produced fruitless results, we resigned ourselves to expanding literary references to approaching schiff base condensation. Approach A which is a green approach by performing the reaction under solvent-less condition where lemon juice is used as a natural acid to perform a simpler, cleaner, and eco-friendly method that results in high product yield. Approach B suggest synthesis of (E)-4-methyl-N-(3,4,5-trimethoxybenzylidene) benzenamine and the way it is synthesized. As a result, the simple way to synthesize this Schiff base is microwave irradiation. Approach C suggests a 1:1 ratio of a ketone and a primary imine in a solvent of methylene chloride overnight at room temperature with catalyst drying agents to prevent unfavorable results.

Spectroscopic Study of the Interaction of Multi-target Compounds with DNA

Baljit Kaur
Prof. Alberto Martinez

As the basic genetic material of life, and because of its key role in cell replication, DNA plays a fundamental role in cell replication. In addition, the activity and potential toxicity of drugs might be related to the mode and the intensity with which those external compounds interact with the biomolecule. For these reasons, medicinal chemists have been traditionally interested in gaining insights on drug-DNA interaction to understand the mechanism of action, as well as toxicity, of compounds of therapeutic value. Our group is currently working on the design, synthesis and primary testing of multi-target polyphenols as potential anti-Alzheimer's disease agents. As part of our ongoing biological investigation on these compounds, we have determined the binding mode as well as binding affinity of a multi-target polyphenol by using fluorescence and UV-visible titrations, and we have compared the results to clioquinol used as control. The results show that both compounds form permanent adducts with DNA with binding affinities in the range of 104 – 106 M-1 and one binding site. In conclusion, we have gained insights into the pharmacological profile of a compound with promising potential in the anti-AD therapeutic scheme.

A Preliminary Health Study across Student Population; Comparison between Sexes and Ethnic Groups

Dianna Khass

Prof. Niloufar Haque

The human body is comprised of trillions of cells. Each cell group has a unique structure and function that differentiates them from one another. The combination of cells results in the formation of tissues, organs and organ systems. The human body is made up of different organ systems that have the ability to carry out a specific function. Our age and lifestyle affect our physiological functions. Our health, nutrition and lifestyle are a major contributor of how our body responds in health and disease conditions. It is necessary to maintain our health such as our weight, body mass index, food consumption, the number of hours slept, our pulse and lung capacity, which can all in all help us promote a healthy mind and body. The objective of the present study was to evaluate if there was any significant difference in our student population. In order to compare we looked at parameters such as our weight, body mass index, food calorie quantitative and qualitative consumption, the number of hours slept, our cardiovascular system pulse and lung capacity, within a time frame of a week. Then we compared the data across sexes and ethnic groups. Our results show that there is a significant difference between male and female sleep patterns. The most

significant variation in pulse was within the Asian and African American communities. Additional details will be discussed once the project is completed.

Static Analysis of Circular Plates under Mechanical Loads

Harpreet Lalia
Prof. Farhad Alinaghizadeh

In this research statics analysis of circular plates is performed using SolidWorks. Circular plates with different material properties, thickness to radius ratios, and boundary conditions under mechanical loads are modeled and analyzed in SolidWorks. The results are obtained for deflections of circular plates under uniform and point loads. A three-dimensional (3D) model of circular plates is first created in SolidWorks. Then the material properties, mechanical loads and boundary conditions are defined for the plate. It is found deflection of plates is depended on magnitude of mechanical loads, geometrical parameters, boundary conditions and material properties. Responses of SolidWorks for deflections of plates versus loads are obtained and shown in figures. The effects of boundary conditions, geometrical parameters, material properties and mechanical loads on deflection of plates is investigated. Furthermore, equilibrium equation of circular plates under load is obtained by writing equilibrium condition for an element of circular plate under mechanical loads.

Circulate Laser Engraver

Kevin Rojas, Mandy Li, and Ericka Saldana
Prof. Angran Xiao

Most people who are not in a field or career path that requires the use of a laser engraver, as we were, would never encounter such a device in their lives. Our team of nine students decided to embark on this journey of understanding how to create our own laser engraver in order to sell this product for an affordable cost compared to conventional lasers. Our focus is on an educational and small business setting. However, we also wanted to do something else besides a basic laser engraver. Our project's purpose was to create a feasible and cheap DIY laser engraver that encompasses a rotational feature that almost all DIY laser engravers do not have, while also making it lightweight and portable.

The main things we needed to figure out was the design of the chassis or frame that would house the engraver, to find a software that would control the engraver or make our own, and to buy hardware that would be compatible with the software and fit into our design. We also had to keep in mind things like engraving speed, battery capacity, laser strength, laser safety standards, the material of the frame, ease of use, and other issues, while making this product. The team went

through numerous product design methodologies of deciding what would work and what would not. We also asked our mentor, other professors that had coding knowledge, and a few CNC technicians in our mechanical engineering department.

Through our online research, we found a free source software called, K40 Whisperer, that had our desired rotational component that we had sought after. We finalized a CAD design on Solidworks that would allow for enough space to exist for the rotational engraving effect, while also keeping it big enough to engrave objects of lengths of about less than 2ft, but small enough that it would be travel-friendly. We used aluminum metal bar extrusions to make the frame. We also designed mounts and holders and 3D printed them so that everything could be snuggly put into place.

We had a semester to complete this project and we finished before our deadline. Assembly time for our product came out to under an hour and anyone would easily be able to start engraving a cylindrical bar or hydro flask bottle after assembling our product in less than minutes using the provided software on their computer. We want to continue our research and work into making it autonomous from using the computer and having an interface on the engraver for more ease of use. This project showcased how to work in a large group of people while also furthering our understanding of how to finalize a product.

SuperHERO Assistive Technology Mobile Robot - Hardware Implementation

Joycephine Li
Prof. Farrukh Zia

SuperHERO is an on-going research project in Computer Engineering Technology department which involves upgrading Heathkit Education Robot (HERO) hardware circuits and features by using modern hardware devices and sensors. The current phase of the project will focus on upgrading the motor drive system hardware as well as implementation and testing of features such as mobile robot obstacle detection and other assistive technologies to help people with disabilities. This involves the reattachment of the robot arm after repairing and updating with 3D printing and using modern hardware and software technology. We observed that the robotic arm has rotary and translation movements after testing with a sample code. Also, the arm gripper has a rotary movement with an open and close function. This part of the experiment will help people with limited arm movements, so the robot arm can help to reach and grab objects.

Software Implementation of Assistive Technology Mobile Robot

Jannatul Mahdi
Prof. Farrukh Zia

HeathKit Educational Robot (HERO-1) went into hibernation after helping colleges and universities for 15 years since 1980 across the country to teach students about Computer and Robotics Technology. Currently, the members of City Tech Women Engineers Club revive HERO to give new features with modern computer hardware and software technology, such as mobile robot obstacle detection and navigation and speech synthesis and recognition. This will enhance the implementation of Assistive Technology to enable her to help people with disabilities.

Determinism of Stochastic Processes through the Relationship between the Heat Equation and Random Walks

Gurmehar Singh Makker
Prof. Lin Zhou

We study the deterministic characteristics of stochastic processes through investigation of random walks and the heat equation. The relationship is confirmed by discretizing the heat equation in time and space and determining the probability distribution function for random walks in dimension d = 1, 2. The existence of the relationship is presented both through theoretical analysis and numerical computation.

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.

Students' Perceptions of the Impact of Peer-led Workshops on their Team-Working and Problem-Solving Skills

David Mastalerz
Prof. Melanie Villatoro

The Department of Construction Management and Civil Engineering Technology (CMCE) has incorporated Peer Led team Learning (PLTL) in the CMCE 1115 Statics course since 2015. The implementation of PLTL has contributed to increased pass rates and decreased withdrawal dates in this critical course. Statics is the first course in the four-course design sequence required for all Associate and Bachelor Degree students. The study will explore students' perceptions of the benefits of PLTL workshops on their team working and problem-solving skills. The workshops are facilitated by Peer Leaders and are designed to promote team-working and problem-solving skills. This study seeks to measure students' perceptions of their improvement of these skills. The participants in the study are the students attending the weekly one-hour peer-led workshop over the course of one semester. Data will be collected through surveys, and organized, analyzed, and presented in a poster.

Latency Measure of Multiple Servo Network

Gene Nadela
Prof. Xiaohai Li

Robotics has seen greater widespread use and implementation in recent decades. Automating complex tasks in industry will require a proportionally complex robotics system. In our heteromorphism robotic system, multiple servos are needed for the robot to fulfill a variety of tasks to demonstrate its humanoid locomotion as well as its wheeled locomotion. It becomes necessary to examine the effect of a large network of servos on the time delay between command and action, as this may affect the stability and performance of the entire robotic system.

To accomplish this, we developed an experimental apparatus which will determine the time delay between the system controller and the servo action. Using an oscilloscope, we carefully measure the time between the end of a command packet and the response of the servo. We then compare the effect of a single servo to three servos, then six, then nine servos. Across hundreds of trials, we determined that there is little difference in the time delay when increasing the number of servo motors in a network.

International Space Object Orbit Tracker

Nicole Navarro
Prof. Farrukh Zia

In recent years, many people believe that space agencies are underfunded because people don't pay attention in Space. One way to find it out is by using an Orbit Tracker. International Space Station Orbit goal is to program to track directly at any astronomical object. Tracker pointer is powered by a STMicroelectronics nucleon F401 development which performs the orbital propagation and coordinate system transformations using a ported version of the SGP4 model and drives an Adafruit motor shield. This board has an 84-megahertz clock and 512 Kbytes of memory programmed written in C++ programming language. This project will work on both the stepper motor which controls azimuth and the servo which controls elevation. The goal of this project is to realize technology advancement; how the world is filled with incredible things.

Injection Molding using 3D Printed Molds

Abel Tapia and Dany Nolasco
Prof. Angran Xiao

In this project, the professor and students in Department of Mechanical Engineering Technology will set up a Morgan Press injection molding machine and experiment injection molding using 3D printed molds. The main task in this semester is to design an injection mold using the measurements of the table pan. Most of the work so far are focused on creating a computerized model of the mold, which lays the foundation for the following activities including 3D printing and CNC machining of the mold.

Characterizing one of *Tetrahymena Thermophila* Calpain Family Member

Titilope Odumuwagun,
Ralph Alcendor

In recent years more attention has been giving to identifying, naming and characterizing the structural and functional role of non-lysosomal, intracellular proteinase. One family of these proteinases, calpains, is well conserved from bacteria to mammals. These proteins are calcium dependent and have many important roles in the cell. They have been implicated in multiple diseases including cancer, multiple sclerosis, diabetes, Alzheimer's disease and cataracts. This project aimed at characterizing one of many *Tetrahymena thermophila* calpains using computational tools such as BLAST (Basic local alignment search tool), MUSCLE (MUltiple

Sequence Comparison by Log- Expectation), T-Coffee (Tree-based Consistency Objective Function for Alignment Evaluation), and MAFFT (multiple alignment using fast Fourier transform). Other tools such as Phylogenic Fr, and MEGA (Molecular Evolutionary Genetics Analysis) were used to analyze phylogeny relationship. Swiss Model and Phrye2 were used to compare protein structure predictions. Preliminary results suggest the compared calpain from *Tetrahymena thermophila* is more closely related to human Calpain 15.

Characterization TTHERM_00190820, a *Tetrahymena Thermophila* Calpain Family Member

Ebunoluwa Okunade
Prof. Ralph Alcendor

Calpains are proteins found in many different organisms, including human beings. They are proteins belonging to the family of calcium-dependent, non-lysosomal cysteine proteases. *Tetrahymena thermophila,* is a group of ciliated eukaryotes with many similarities to other eukaryotic cells, including our cells. Although *T. thermophila* has about 27 different calpains, very little is known about their function. The overall goal of this project was to begin characterizing one of *T. thermophila* calpains, TTHERM_00190820, using computation tools. Basic Alignment Search Tool (BLAST) software was used to search for human calpains with similarity to TTHERM_00190820. Multiple alignment tools like, Multiple Alignment using Fast Fourier Transform, (MAFFT), Tree based Consistency Objective Function For alignment Evaluation (T-Coffee), and Multiple Sequence Comparison by Log- Expectation (MUSCLE), were used for sequence alignment. Molecular evolutionary genetics analysis (MEGA) and Phylogeny.fr were used for constructing phylogenetic tree. Preliminary results from these tools showed that TTHERM_00190820 is closely related to human calpain 15 and 7.

Discovering Blockchain Technology

Tajamul Rabbani

Prof. Marcos Pinto

A blockchain is a decentralized peer-to-peer network consisting of blocks also known as records. Each record is unique and contains a unique history which is added to the chain after it is verified by several computers, known as nodes. Every block that is added contains a hash of the previous block linking them to each other, hence blockchain. The data added to blockchain is not immutable. By allowing digital information to be distributed but not copied, blockchain technology created the backbone of a new type of internet. It is this difference that makes blockchain technology so useful — representing an innovation in registering and distributing information, that eliminates the need for a trusted party to facilitate those relationships. The objective of this research is to

implement a simple blockchain using .NET Core Blazor and illustrate how blockchain technology behaves.

Light-matter Interactions in Emerging Two-dimensional Materials

Shaina Raklyar
Prof. German V. Kolmakov

Two-dimensional transition-metal dichalcogenide (TMD) atomically thin layers are characterized by record strong light-matter interactions and provide a platform for optoelectronic applications at room temperatures. By considering the coupled dynamics of cavity photons and TMD excitons, we numerically studied exciton-polariton formation and propagation in an optical microcavity with an embedded TMD layer. Specifically, we studied the case where the TMD excitons are affected by a short-scale (10-100 nm) random potential due to the interactions with the environment inside the cavity. To characterize the stability of the polaritonic states in the system, we numerically calculated the energy of eigen modes in a cavity as a function of the wave number, $E(k)$. In our poster, we present our findings and, in particular, we discuss the crossover from the polaritonic modes formed at weak disorder to strongly broadened photonic and excitonic modes at strong disorder. We also discuss the polariton formation and propagation in a cavity where the TMD layer is non-uniform and consists of a set of separate, topologically disconnected microflakes.

Synthesis of TiO_2 –$H_3PW_{12}O_{40}$ Composite Material, Characterization, and Photocatalytic Studies

Farah Rammal
Prof. Ivana R. Jovanovic

Due to an increase in industrialization and pollution, it is necessary to investigate the remediation of polluted sites to eliminate contaminants. This study will focus on how TiO_2 based materials can be used as photocatalysts and if the photocatalytic efficiency of TiO_2 can be improved using polyoxometalates such as phosphotungstic acid ($H_3PW_{12}O_{40}$ or PTA). TiO_2-PTA bounded molecules will be used for the degradation of the methylene blue dye, a pollutant found in water and for the reduction of silver metal cations from silver nitrate ($AgNO_3$). This approach will allow researchers in determining how advanced photocatalytic materials can provide a significant solution for environmental cleanup as they allow for the complete oxidation of the pollutants and reduction of metals.

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

Anthony Rivera
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.

Low-cost Near Infrared Diffuse Optical Imaging System

Mohammed Shakil
Prof. Chen Xu

Diffuse Optical Tomography (DOT) and Optical Spectroscopy using near-infrared (NIR) diffused light has demonstrated great potential for the initial diagnosis of tumors and in the assessment of tumor vasculature response to neoadjuvant chemotherapy. The NIR technique utilizes intrinsic hemoglobin contrast, which is directly related to tumor angiogenesis development, a key process required for tumor growth and metastasis. The NIR diffuse tomography holds great promise in distinguishing early-stage invasive breast cancers from benign lesions. This technique also provides insight into tumor metabolism and tumor hypoxia, important indicators of tumor response to various forms of therapy. Currently, the high cost of the DOT system is mainly because of three components, the cost of laser diodes, the cost of optical switches, and the cost of detectors, Photon Multiplier Tubes (PMT). With recent advances in photonics, the performance of light-emitting diodes (LEDs) is becoming increasingly comparable in terms of output power and spectral width. One of the most appealing strengths of LEDs is the cost, which is several dollars at a similar output power level as that of laser diodes. Besides, LEDs have demonstrated to be safer and more reliable in medical use due to their high resistance to physical lacerations, heat, and electrical damage. Because of the low cost of LEDs, multiple sources can be installed simultaneously. As a result, the expensive and fragile optical switch can be eliminated. On the detector side, silicon-based avalanche photodiodes (APDs) have the advantage of low cost, similar or even better sensitivity

and resolution in the red and near-infrared spectral regions. The aims of this project are 1) to test the different types of LEDs in near-infrared range, and design the driving circuit, and test the modulation of LEDs at different frequencies; 2) to test the APDs as detector, and build the receiver system, test the light coupling, and compare the efficiency with PMT.

A Data Visualization System for Wireless Sensor Network Using Thingsboard

Julia Shin
Prof. Xin-Zhou Wei

The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the Internet, collecting and sharing data. Data Visualization provides us with a way to display this avalanche of collected data in meaningful ways that clearly present insights hidden within this mass amount of information. This can assist us in making fast, informed decisions with more certainty and accuracy than ever before. Our system combines sensing network with cloud-based visualization tools. Using Arduino Uno as the main controller, the DHT22 sensor collects temperature and humidity data which is connected to the Wi-Fi network by means of the ESP8226 module. The data gathered from the sensor is stored onto Thingsboard through the MQTT protocol. Thingsboard, an open source platform for IoT, will generate a real time graphical representation of the data on its dashboard. This application allows people to analyze the condition of the smart home or smart building to ensure that the environment is optimal comfort and energy efficient.

Implementing READ (Reading Effectively Across Disciplines) in the Classroom

Anisa Shkembi
Prof. Michael Gotesman

Biology 1101 is the first introductory biological course offered at NYC College of Technology. It is a reading intensive science course, which prepares students for careers in science and medicine. Biology 1101 requires understanding many concepts and the mastering of medical terminology, which can be difficult to learn.

The purpose of this study is to investigate the effects of using annotation a READ (reading effectively across disciplines) strategy to enhance academic performance and achievement for Bio 1101 students. Annotation is a very helpful tool which teaches students how to actively engage in a text. The experimental design of the study involved the use of a pre-assignment and a post assignment challenge to evaluate student progress as well as implementing the aforementioned READ strategy of annotation to enhance student learning. For sample size, twenty students in a

particular section of Bio 1101 administered at New York City College of Technology participated in the study. The first trial was a demonstration of how to read effectively using annotation. All students were advised to read a text on the process of mitosis (the particular subject matter for that lesson). A similar assignment was used in class, where students learned about bacteria and antibiotic resistance. Students were asked to read a short text regarding Bacteria and to answer questions which tested their concentration and reading strategies. Furthermore, READ was implemented to develop and improve the students reading strategies. The results of the study indicate that annotation is a successful and effective strategy that enhances students' performance and therefore, implementation of READ strategies should be encouraged to enhance student learning.

The Privacy Preserving Framework with Virtual Ring and Identity-based Cryptography for Smart Grid

Leonard Sutanto
Prof. Yu-Wen Chen

One of the main challenges in the smart grid is how to efficiently manage the high-volume data from smart meters and sensors and preserve the privacy from the consumption data to avoid potential attacks (e.g., identity theft) for the involved prosumers, retail electricity providers and other clusters of distributed energy resources. This poster proposes a two-layer framework with the cloud computing infrastructure. The virtual ring and identity-based cryptography are utilized in each layer to preserve privacy efficiently. The adopted methods (i.e., virtual ring and identity-based cryptography) are illustrated and the strengths of the proposed framework are discussed.

Modular Design of Elevator Control System

Orouba Tagout
Prof. Farrukh Zia

Modular Design of Elevator Control System is a project that is meant to present a real-life application which is an elevator or lifts. Elevators are used on a daily basis to lift people or merchandise or anything from one floor to another, which inspired me to work in this project. The elevator will be controlled software and embedded systems with the integration of sensors and logic circuits, stepper motor. The mean controller used in this project is the Arduino Uno ATmega328P that comes with its IDE sketch. Arduino Uno is a microcontroller board based on the ATmega328P. For the logic circuit, a multiplexer will be used as the component to control which floor number will be displayed using a seven-segment display.

Video OER for Physics Education

Parikshit Thapa
Profs. Lufeng Leng and Darya Krym

This is a multi-faceted project in physics education, with several complimentary goals. Firstly, students will produce one or more video demonstrations of laboratory experiment(s). These demonstrations will be shared on OpenLab. The intention is to eventually create an expanding OER for students from City Tech and beyond. The demonstrations will include explanations of equipment and procedure which are already available in written form. Additionally, the demonstrations may include personal observations and hints from the students, which can make the videos more fun and useful for future students. Moreover, students will investigate the mechanism of the experiment in greater depth, including identifying sources of systematic error and producing theoretical estimates of some of these. Students will record an explanation and discussion of the results of these advanced activities, and this will also be a resource for future students. Students will do a small study on the efficacy of the tools they have created.

Design and Manufacturing of a Walking Machine

Aneita Torres
Prof. Angran Xiao

Advancements and research in technology takes influence from several different sources, some of which is from nature. For example, vehicles and wheeled machines face the challenge of terrain that is not smooth or small obstacles that animals and humans can simple walk through. Thus, the motivation of our project is to build a quadruped robot that will be able to travel through areas it wouldn't be able to with wheels. This sort of robot can be used to carry needed supplies through areas dangerous for humans without being hindered by the types of obstacles land and air vehicles are held back by.

The main problem that faced with the quadruped robot is understanding and designing how the robot will walk. In nature, for example, a cheetah's leg is deceptively simple in appearance, but complicated to build one-to-one based on the anatomy present that makes it up. As a result, research for the robot is done by looking up other quadruped robots that was built to fit similar needs to our own on google images. The pictures aided with understanding and developing ideas on how the robot is to be designed. The design is made on Solid works to test out its motion. Afterwards, it is printed out through a 3D printer so that it may be test for its function before putting together the final design.

In conclusion, what's learned from the robot's design is how complicated the design can be, especially when replicating a quadruped animal's leg on a scale that is reasonable in a short time span. The design that is aimed to be built is on a smaller scale as to show what such a robot can be able to do.

Internet Connected Smart House

Mellissa Valle
Prof. Farrukh Zia

From controlling the room lights with your smart phone to scheduling events to occur automatically, home automation has taken convenience to a whole new level. Instead of using mechanical switches, you can now conveniently control all the devices in your home from your fingertips. This project involves implementation of a multi-sensor home automation setup using an Arduino microcontroller development kit.

Green Roof System Integrated Soil Methods

Jude Rene Vallon
Prof. Ivan Guzman

Large metropolitan areas like NYC are seeking to integrate sustainability into retrofitting buildings for the development of green infrastructure. Among the many environmental issues of urbanization, the UHI (urban heat island) effect and stormwater runoff are of particular interest when it comes building structures. Individual buildings can contribute towards mitigating these effects with implementation of vegetative rooftops, i.e. Green Roofs. Commercial buildings are currently receiving government incentives and new constructions are required to include green roof installations. However, if existing buildings are considering the addition of a green roof on an existing roof, they must factor in the large cost of engineering the roof to support increased dead and live loads due green roof infrastructure, growing media, vegetation and foot traffic. Thus, if the green roof installations can engineer lighter and practical the ONENYC's 2050 green deal can be more inclusive of existing buildings. This research project utilizes the ASTM E2399 standard and builds on previous work presented during the Geo Congress 2019 in conducting a parametric study of the effects of using different textiles (cotton, polyester and linen) on the mentioned mechanical properties of soil. Using the Brooklyn Navy Yard - Brooklyn Grande (BG) soil, the project consists of assessing the impact of an array of re-purposed textiles integrated into lightweight engineered soil in order to observe its effects on the reduction in load, hydraulic conductivity and water retention capacity. In integrating textile fabrics into the soil material at different percentages, it would result in textile replacing soil grains by volume and thus reducing the weight of the soil; and moreover, potentially modify the soil classification.

Keywords: Green Roof, Integrated Soil, Repurposed Textile, Heat Island Mitigation, Stormwater Mitigation

Peer-Assisted Learning in Calculus II: Examining Gender Differences

Xiaoqing Wu
Prof. Janet Liou-Mark

Mathematics is a topic in which undergraduate students find challenging, particularly for females. By providing a peer-assisted workshop during the semester, undergraduates are offered academic support throughout the course. New York City College of Technology, though a Department of Education Minority Science and Engineering Improvement Program (DOE MSEIP) grant, has adopted the Peer-Led Team Learning (PLTL) instructional model in a few Calculus II sections. Peer Leaders engage the students one-hour a week in working on selected problems sets in a collaborative setting. This project examines if there are gender differences in Calculus II class in 1) PLTL workshop attendance, 2) departmental final grade, and 3) Calculus II course grade. Results showed that there were no statistically significant gender differences in all three areas. Hence, the PLTL workshops may be an intervention that may help females succeed in higher-level mathematics courses if they persist in the course.

Sleep-Wake Disturbances in Mild Traumatic Brain Injury: Meta-analysis of Literature and Modeling of Cerebral Tissue Vulnerability

XiangFu Zhang

Profs. Subhendra Sarkar, and Mary A. Browne,

In this project, we would like to suggest a progressive consequence of mild traumatic brain injury (mTBI) with a focus on sleep disturbance, which is the most common complaint in patients with mTBI. The etiology of sleep disturbance after mTBI is unclear. As previous research works suggest, the pineal gland region is susceptible to mechanical damage from mTBI and other thalamic regions are also vulnerable to perfusion damage as a result of mTBI. Based on findings that we gathered from multiple neurobiological and imaging literatures, we constructed a suitable hypothesis that the pineal gland and thalamic regions play an important role in regulating sleep are under influence by the dynamic load from cerebrospinal fluid and hypo-perfusion, which could lead to endocrine imbalance from pineal malfunction and causes sleep disturbance as well as impaired circulation of cerebrospinal fluid to attribute to worsening other sequelae of mTBI.

Kinetic Study of Amine Cured Epoxy Resins

Xiaona Zhou
Profs. Swati Neogi, Diana Samaroo, and Urmi Ghosh-Dastidar

An epoxy resin is a molecule with more than one epoxy group (or cyclic ether) which can be hardened into an usable plastic by the use of substance groups such as amines, amides, acid anhydrides, phenols and metal oxides in a process known as curing. Curing of epoxy resins has received increasing attention as they can be used for various applications like coatings, electronic materials, adhesives because of their high adhesion strength, and good heat resistance. Cured kinetics of epoxy resins can be studied by different techniques which are mostly based on chemical changes such as differential scanning calorimetry (DSC), infrared spectroscopy (IR) and dielectric spectroscopy. In this study, the DSC technique was used to investigate the kinetics of the epoxy resin cured under isothermal conditions. During spring 2019 and summer 2019 we worked on this project and focused on performing a Kinetic Study of Amine Cured Epoxy Resins based on the available data and also data that were collected by Nadia Rodriguez during April 2018 trip to the Indian Institute of Technology, Kharagpur, India. A kinetic equation was confirmed through nonlinear regression with R-squared greater than 0.95 at different temperatures.

An Enticing Study of Prime Numbers of the Shape $p = x^2 + y^2$

Xiaona Zhou
Prof. Satyanand Singh

We will study and prove important results on primes of the shape $p = x^2 + y^2$ using number theoretic techniques. The theorem was posited by Albert Girard in 1625 and again by Fermat in 1640. Euler was the first one to proof this theorem. Many mathematicians have proved this theorem using different methods. This project is taken from a book called “An Open Door to Number Theory.”. The whole project consists of 13 exercises, and when we proved all the exercises, we would have proved the theorem. This project is an extension of Zagier’s one sentence proof. This presentation is readily accessible to an advanced undergraduate student and lay the groundwork for future studies.