



Book of Abstracts

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Project Title: Climate Change, Myth or Fact?

Fariza Abbasova, Ilhom Bakiyev, Mimi Zang, and Richie Singh,
Prof. Ann Ngana-Mundeke

Climate change refers to the significant, long-term changes in the global climate. The global climate is the connected system of sun, earth and oceans, wind, rain and snow, forests, deserts and savannas, and everything people do. Global warming is the slow increase in the average temperature of the earth's atmosphere because an increased amount of heat from the sun is being trapped in the earth's atmosphere and not radiated out into space.

In this paper we try to explore the issues related to climate change and suggest some possible solutions to these issues. Climate change has created many issues all over the world, but we focus on New York for our project. A recent attempt by New York to reduce plastic waste came into effect March 1, 2020. However, how effective is this? By switching to paper bags, we would also be destroying trees in order to create these bags. One of the very well-known ways to fight climate change is forest restorations which helps reduce our carbon footprint. By destroying trees to create bags for consumers to use, we would be halting any progress of reducing the vast amount of CO₂ present in the air. In our opinion for more efficient methods we need to use more radical methods in countries such as Japan and Norway. Japan was to hold the 2020 olympics in Tokyo in which they used 78,985 tons of recycled electronics, including 6.1 million recycled cell phones, to create the olympic medals. Japan is very well known for recycling that its national recycling rates for aluminium cans come in annually at well over 90%. There also exists a zero waste town, Kamikatsu, Japan, where they officially have 45 categories for recycling.

Norway had switched 100% of thier public transportation to the electric busses.

The question why we cannot use similar method and when we start using those methods? We believe that the only way to achieve some result is to start acting now.

Assessing Participants' Responses to Dental Hygiene Care Provided by Dental Hygiene Students at NYCCT During the Spring Semester 2020

Alona Abdullaieva, Yujing Mei, and Wen Wen Dong

Profs. Susan Davide, and Audra Haynes

This study is a continuum of dental screenings provided at the CUNY Graduate Center's Wellness Fair in April 2019. Following a dental screening provided by dental hygiene students and an online survey, participants received complimentary care at NYCCT's Department of Dental Hygiene Clinic. Upon completion of treatment care, participants completed a post-treatment survey to determine the overall satisfaction of the 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. CUNY Human Subject Research Exempt Status granted by the University Integrated Institutional Review Board (IRB); file #2018-1000.

Designer Threads, Gender Embracement, and Androgynous Dressing

Deborah Aderounmu
Prof. Alyssa Adomaitis

Arguably, this new generation is redefining the meaning of gender (Steinmetz, 2017) stepping past the belief that we are living in a world where sexuality and gender come in only two ways. How has gender and dress made an impact on identity and today's fashion? Accordingly, research is critical to validate the effects of gender expression, dress, and power of dress being a communicator of identity.

The aim of this study is to better understand the terms dress, gender, identity, Androgyny, gender-bending, gender-fluidity, and gender-neutrality (Salam, 2019), selecting and synthesizing various literature reviews to find corresponding items to better understand this project, how companies/brands are meeting demands of a changing clientele, how designers are responding to millennials and generation Z (Bain, 2015), responding to gender expression, how people dress to tell their story, whether in trying to tell their gender, age or class.

In this decade, expressing gender in a way that feels right is not really about one article of clothing or a particular type of style, but it is more about fluidity. Nail polish, accessories, shoes are no longer restricted to a particular gender.

The data collected and studied will confirm that typically mainstream ideas of man and woman based on clothing alone are no longer the best identifiers. It was found that the conventional assumptions of gender are too limiting, men and women or whatever noun an individual identifies as do not have to dress a certain way, millennials are rewriting the customs and refashioning clothes so that they can dress and accessorize in whatever way feels right to them.

Research on Optimization of Faculty Office Hours

Fabliha Afia
Dr. Pamela Brown, Prof. Nan Li

The purpose of this research is to determine how students' approach towards, and utilization of the faculty office hours were in General Chemistry, CHEM 1110 in 2018-2019. The faculty office hours are there for students to understand the material and to excel at the course. The survey results of two terms, Fall 2018 and Spring 2019, will be used as a guidance to improve the office hour so that students can make the best out of it.

The first phase of the project consisted of analysis of raw data survey 110 student PRE-survey results, administered at the beginning of the semester and 75 post-survey results, administered at

the end of the semester from among almost 140 students in fall 2018. The data was sorted, cleaned and evaluated to develop strategies for faculty to employ to increase participation in office hours and their value. Based on this evaluation, two chemistry faculty implemented strategies to increase student utilization of faculty office hours in Spring 2019. These strategies included intentionally and frequently discussing the advantages of attending office hours in class and in correspondence with students. The same pre and post-survey was then administered in these sections. Evaluation of changes in PRE and POST survey results with and without the intervention showed an improvement in the utilization of faculty office hours with this intervention. The findings of this research thus lead to a better understanding of the effectiveness of strategies for improving office hour utilization. These findings support the importance of faculty communication about office hours and its impact on utilization, and hopefully, improvements in student learning and success. Although a larger sample size would result in more compelling results, this study adds to understanding of how to address the challenges related to under-utilization of office hours.

Drones' Effect on People's Lives

Nazma Akter, and Zahida Yasmin
Prof. Katie Albany

Our Topic of Choice will be on the ever-changing evolution of drones in our daily lives. Only a couple of years ago the public mass was able to acquire drones and use them in a commercial sense. We already see drones being used in the military as a means of surveillance as well as for targeted attacks. But in the hands of the public, a drone can not only be a hobby, pastime, but also a feat in protecting and enriching the lives of all of mankind.

The UAV (Unmanned Aerial vehicle) or better known as the drone was first created in 1916 during the First World War and was designed as the first pilotless aircraft. These aircrafts were used for aerial photography to gain advantages over the opposing forces as a small aircraft can be brought into enemy lines easier and more inconspicuously. Drones continued to advance as in 1930 the U.S Navy began experimenting with radio-controlled aircrafts, leading to the first mass-produced UAV in the U.S.

In today's time, we are seeing drones being used as more than just a cheap and effective way to get aerial photography. They are being armed and retrofitted with sensors and highly advanced AI cameras to perform automated jobs, such as crop control and atmosphere monitoring. An article found on VOA news claims that drones can now help farmers grow better crops by installing various sensors to the aircraft and perform a fly-by over the field to provide data that will help identify problem areas for farmers. As we can see just from this, drones are now being used in farming life and can continue to evolve even further to provide assistance like

search and rescue operations, or even the simplest thought, such as being able to deliver your online shopping packages to your doorstep. The drone has come a long way in its first conceptualization from a military surveillance device to now an automated worker for the working class.

As for the future outlook of drones we can see drones eventually carrying small to large scale 3D printers to be sent out to repair infrastructure as well as be able to develop a form of firefighting by retrofitting devices that can help stop a fire and even begin operations to rescue civilians trapped under rubble or by surrounding flames. In the future, drones may play a strong role in forensic analysis by equipping highly advanced sensors with AI recognition in order to examine a crime scene from multiple angles and at a faster rate than normal human being.

How Does the Use of Dyes in the Clothing Industry Impact the Environment?

Amber Alicea
Prof. Mac Donald

The production of clothing has caused irreversible damage to our planet on a global scale. The harm caused during and after as the clothing is worn has caused extensive pollution and is overlooked by many. Believe it or not, the largest clothing manufacturers are in China, India and South Korea. Clothing production is mainly done in China, they are responsible for a large amount of the world dye consumption. China and India are also major exporters of dyes as well as large quantities of important raw materials, and intermediate dye chemicals.

The production of clothing has caused irreversible damage to our planet on a global scale. The idea of using dyes started due to fierce price competition, globalized world trade and fast fashion. Price competition called for cheaper production alternatives, in order to buy low and sell at an affordable price. We all love shopping at affordable price points but overlook the unfair and harmful process taken. The toxic dyes used in clothing production cause not only extensive harm to our planet but to our skin, respiratory airways and increase allergic reactions. This is extremely alarming due to the fact that clothing is something we use everyday for protection. As the clothing dye industry grows, more water is being contaminated, and an increase of planetary harm is occurring everyday. My research will focus on the production volume and environmental harm that has occurred, what is being done and how it can be changed. The environmental damage the clothing industry has caused needs to be addressed and we need to find ways to implement sustainable clothing production. Waste and toxins are released by the clothing industry during production, and as the fabrics are washed and disposed of. Sustainable clothing production can be difficult to attain but it is possible, and it is less destructive to our planet.

Service-Learning in a Safe Environment: Protecting Interns Against Discrimination and Sexual Harassment

Mercedes Aznar, and Sarah Frederique
Prof. Jeannette Espinoza

Title VII of the Civil Rights Act of 1964 bans discrimination based on sex (sex discrimination has been held to encompass discrimination based on sexual harassment) in the workplace towards employees. Title IX of the Education Amendment Act of 1972 protects against discrimination on the basis of sex within educational institutions, programs or activities which receive federal financial assistance. In our research we look into the lack of protections against sexual harassment and sex discrimination for unpaid interns, who are not considered employees. Through the analysis of scholarly articles and legal publications we found that unpaid interns are not covered under Title VII because they are not considered employees. Unpaid interns are not covered by Title IX either if the workplace is not an educational institution. Findings in this study reinforce the urgency to find solutions to this problem that leaves unpaid interns unprotected against sex discrimination and sexual harassment.

Data Visualization System for wireless Sensor Network

Mamadou Bah
Prof. Xinzhou Wei

Internet of Things (IoT) is the interconnection between physical objects through the internet. The IoT is widely used in our everyday life to solve real-life problems to facilitate our quality of life. For example, IoT is used to collect and monitor data from our environment, buildings, transportations, health systems, etc... One application of IoT is the Wireless Sensor Network (WSN) that uses Sensors to collect data from the environment wirelessly. The purpose of this research is to use WSN to design a real time temperature monitoring system for smart building using XBee modules. In order to do that, we build an XBee based wireless sensor network using a mesh configuration which is composed of routers and a coordinator, and we configure them using XCTU, the official configuration program for XBee radio. The system collects temperature data from the sensor and display the data using Matplotlib with Python. Then, we test the link quality of the wireless transition to the system. The system displays real time smart building temperature, it is low cost, efficient, and cross platform application of IoT.

Cultural Diversity in Health Communication

Aseel Bazrouk
Prof. David Lee

Abstract: Patients come from all different backgrounds and cultures so how do healthcare providers communicate with them to find out their needs to get the treatment necessary. How do healthcare providers adapt and bring awareness to health messages to diverse audiences? How do healthcare providers reach those target audiences? This is an important project because we want to ensure that the patients understand what is going on in healthcare and so that patients are able to make their own decisions when it comes to health. Health care providers are dealing with diverse population's every day. But how do we convey these messages? Some ways to convey these messages could be by creating posters. Another way of carrying out these messages is by educating the doctors about the different cultures, religions, genders, and languages. Informing the healthcare providers and letting them know that different patients interact differently depending on where they are from. Healthcare professionals must understand the health disparities amongst people. Providing the patient with an interpreter if necessary, understanding that some patients might be comfortable with a female doctor visa versa, some patients might not be able to understand what is going on, and etc.

Cellular and Hormonal Changes on Long Term High-Fat Diet Exposure in Mice

Travis Caraballo
Prof. Sanjoy Chakraborty

Obesity is defined as a condition in which there is an energy surplus than the energy expenditure which is an excess accumulation in fat. Obesity is one of the major medical problems in America leading to several diseases like cardiovascular disease, type II diabetes, stroke and hypertension etc. Obesity has become an epidemic in America. About 27% of Americans are now considered obese. Generally, women are found to have a greater body mass as fat with deposit in the lower appendages and depositions of fat in men are in the abdominal regions. The role of a High Fat Diet (HFD) and its direct correlation with gender, age, hormone and cellular changes has become an important question that needs to be addressed at this present time. The aim of this study is to determine the effect of long-term exposure to high fat induced obesity in male and female mice model, through the cellular, hormonal, and morphological changes in various tissues.

Designing an Efficient and Automated Switchable All-optical Fiber Based Variable Optical Attenuator (VOA) to Variable Coupler (VOC)

Ralph Castro Ramirez
Prof. Muhammad Ummy

Two merged ring cavities are used to develop a simple compact, low cost SOA-based bidirectional tunable fiber ring laser source. The lasing tunable range can be changed by using Semiconductor Optical Amplifiers (SOAs) with operating wavelengths in different regions of the spectrum. This research proposes a bidirectional tunable fiber ring laser structure based on ($N > 1$) number of SOAs, that has a great potential for achieving a high power laser source that uses low power optical components.

Is Shielding an Outdated Method for Hip Procedure?

Xiaotong Du, Jasmin Silvestry, and Kristen Sukhdeo
Prof. Eric Lobel

Radiologic technologists, radiologists and pretty much anyone who work with x-rays engage in the practice of shielding. Shielding is one of the three cardinal rules of radiologic protection, the other two being time and distance. Every radiology textbook available to students overstates this form of protecting the patient from one of the most harmful imaging modalities, radiography. Nevertheless, is shielding an outdated method for hip procedures? To answer this question, a literature-based analysis on much more recent studies done by experts reviewed the guidelines and current reasons for shielding, culminating the statistics of shielding from various research. The efficacy of proper shielding in protecting the patient was compared with the incidence of improper shielding. Finally, the discussion will weigh whether the shield is a necessary tool in the field of radiologic protection or not. Based on the research reviewed, it was concluded that, in regard to hip radiography exams, hip shielding should not be applied because the potential harm to the patient was shown not to be reduced. The most valuable implication for this research is the potential to reduce patient dose by NOT shielding, satisfy ALARA and remove an archaic practice in the modern radiology facility.

Replacing a Single Tooth: Single Implant vs. Three Unit Bridge

Ibeth Erazo, and Aneeza Hussain
Prof. Daniel Alter

There are more than two options for restoring a single tooth but our research include three unit bridge and single-tooth implant. In this paper, we discuss the advantages and disadvantages of these methods and factors that must be considered when choosing between them for the replacement of a single tooth. Although in some cases a three unit bridge is the most appropriate choice, implants have the advantage of allowing preservation of the integrity of sound teeth adjacent to the edentulous area. Many factors must be considered when choosing between a 3-unit bridge and an implant for the replacement of a single tooth. Often the bias of the dentist plays a role rather than objective appraisal of the treatment options. There are advantages and disadvantages to both forms of treatment.

Key words: three Unit Bridge; dental implants; single tooth; dental prosthesis, implant-supported; tooth loss

Design and Prototyping of a Lifter using Additive Manufacturing Technology

Astrid Frank
Prof. Angran Xiao

Everyday employees in offices and factories alike have to make frequently but short trips in order to deliver small and light objects such as documents and mails. This can be time consuming and distracting. In this project, we designed a Lifter that is capable of moving and lifting objects about 30 lb. in Weight and 2ft in Hight. By creating a 3D model of the Lifter on Inventor, we will be able to observe the product before manufacturing and conduct a simulation of its kinematic and static behaviors. This prototype, inspired by the scissor lift, will be small in size, to be able to easily maneuver in small spaces, in hopes to takeover delivering small objects and improving employees work efficiency.

Bracelet Reminder for Alzheimer's

Jennifer Islam, and Caroline Rodriguez
Prof. Farrukh Zia

This project involves the design, construction and testing of a personal reminder device for elderly who suffer from Alzheimer's using a clock system and LED wearable technology. The device consists of an RGB LED strip connected to a 7-segment display (which operates as a clock circuit) attached to a microcontroller board. The device uses visual output to alert the user at that certain time the color being emitted represents the reminder the user set for that time. The project involves two phases. In the first phase, an RGB LED strip will be used to make a wearable device and tested to emit color based on a specific reminder. In the second phase, the

RGB LED strip will be connected to clock circuit and tested. Furthermore, this device can benefit people with Alzheimer's by making them feel comfortable while performing their everyday tasks.

Arduino Based Domestic Assistant

Christian Jean-Simon, and Khristian Lang,
Prof. Andy Zhang

Nurses and home aids are hired to assist the elderly in day to day activities, however an innovative means of helping such people are also through the use of robotic technology. The production of robotics in the medical field has grown tremendously as technology continues to advance, however, some people may not be able to afford these advanced tools. The goal of this project is to study and evaluate how one can design and build a cost effective Bluetooth robot, while using additive manufacturing principles to build the body and main components. As the research progresses, improvements such as allowing the robot to detect injury and be able to identify and administer medication will be hopeful. However, for the purpose of an introductory study, the goal is to design and build an affordable Bluetooth controlled prototype with a 3D printed PLA plastic body.

Matrix Exponentials

Wadud Khan
Prof. Nadia Benakli

Matrix exponentials have been studied extensively. They have many applications including control theory, nuclear magnetic resonance spectroscopy and Markov chain process. Matrix exponentials play an important role in higher branches of mathematics such as differential equations and Lie theory. We will discuss different methods for computing the exponential of a matrix and some useful applications.

Sustainability of Star Architects: Santiago Calatrava's Contribution

Iulia Lewis
Prof. Sean Macdonald

Post-industrial, rapidly growing, ever competing cities are battling carbon emission urgencies while desperately seeking to pursue an ever-extending skyline status. Star architects are being employed to save the day. The sustainability advocates are seeing iconic building creation as

expensive and wasteful, calling- in the face of carbon budgets, for “reassessment of the standard of beauty.” But what if they are wrong? In this paper I want to demonstrate how the most expensive, controversial and abstract designer of all is leading the way in sustainability, human equity and creating resilient cities. A few Santiago Calatrava projects from around the world are analyzed, in the plea for never excluding structural art from our sustainable future. Award-winning Spanish architect built major train stations, airports, bridges and public-commissioned structures worldwide in neo-futuristic visionary design that captures the imagination of human spirit. What seems to be less known is how involved in public advocacy and sustainable urbanization Calatrava’s projects and visions are. I will argue for his passion in offering beautiful public spaces for resilient cities. During his 2017 keynote speech addressing UN’s 2030 Agenda for Sustainable Development Goal 9:” Build resilient infrastructure, promote sustainable industrialization and foster innovation,” Calatrava offered his approach for planning urban infrastructure to improve, recover and consolidate urban spaces, turning them into major attractions to show urban innovation by design.

Mobile Robot with Assistive Technology

Joycephine Li
Prof. Farrukh Zia

This is a continuation of the ‘Hardware Implementation of Assistive Technology’ research project. SuperHERO is a long term project that upgrades the 30 year old Heathkit Educational Robot (HERO) and combines both old and modern technology to help people with disabilities. Previous studies had shown success with testing modern technology and the robot arm’s individual motors and assembling the circuitry. This project will focus on testing the robot’s overall movements, including the head motor, and attaching the arm after the arm is tested successfully. The current phase involves redesigning the arm in a 3D design software, TinkerCAD. The circuitry is then attached to the 3D printed arm for testing using a microcontroller device, Arduino, before attaching back to the robot. The robotic arm consists of rotary and extension movements and the gripper consists of open and close movements which will be tested with sample code after attaching sensors to trigger this extension movement. The translation and open and close movements would help people with limited arm movements to reach and grab an object.

What is the Role of Philosophy in Learning English for new English Language Learners at NYCCT?

ZhiHong Liu
Prof. Lubie Alatraste

This project focused on examining the role of philosophy and life view in language learning because, for new English learners, language learning brings challenges, not just linguistic but philosophical too. Sometimes, students do not know how to approach their new life environment and language learning, and sometimes, they do not have the cultural and other resources to help them. The article by Irving M. Copi (1951, p. 427) suggests that language can lead to misunderstanding and thinkers will most likely view language with alarm. This means learners will be fearful and apprehensive of the language and the new environment. This idea relates to those students who have just started to learn English and are having a hard time doing it. In the present research study, we wanted to see if philosophical standing can help students learn language and manage their life better if they know or use philosophical constructs to help them. The method we used to collect data is a survey. We designed 4 survey questions and piloted them first to see if they are well designed. In order to examine the role of philosophy for new English learners we sent out the survey directly in an email targeting those new English learning students here in City Tech. The survey included the following questions: Have you ever learned philosophy? Does philosophy help you learn other subjects better? and so on. After having over 20 participants/students from City Tech answer the survey, our results show that the majority of the students who learned philosophy before find that it helps them in their English readings. And even better, most of them find philosophy helpful in different categories of their life, such as solving issues in their life, and improving their mind set when facing problems. We thus conclude that philosophical principles and knowledge can aid students in their language learning and management of their school activities and life goals.

Electro-Oculogram in Assistant Technology

Akeem Louigarde

Prof. Chen Xu

In this project, we demonstrate the application of a wireless electro-oculogram in assistant technology. Many disable patients and amputees can't move their hands to communicate with their computers without having to touch the computer's screen or maneuver the mouse on the screen. We design an electro-oculogram system in which electrodes pick up eight coordinated signals of eye movement. The system includes a differential op-amp, filters, two Bluetooth modules and two Arduino control boards. The signals can be used to control a wireless keyboard or mouse. We expect our application will open the door to help disable patients and amputees to access computers and other technologies.

The device uses three electrodes to pick up signals from the eye movements. These signals then transfer to the differential op-amp module followed by customized filters to clean the noise. After this procedure, signals are controlled by two Arduino boards and communicated between two Bluetooth modules. Currently, the digital data can be transmitted from the leader Bluetooth module to the follower module, and we are testing the accuracy of communication between them. Next step is to use the transmitted data to control mouse movement.

The Most Impacting Factors in Training

Dung Mai
Prof. Nan Li

This project is about establishing a framework which can be used to study the efficiency of a training program and determine the most influential factors for that training program. The method that is used for this study is Lasso Regression. This fitting method can yield better prediction accuracy and model interpretability. All statistical computing and graphical displays in this project is done in R, a programming language.

Roboqueen 3D

Jensy Maldonado
Prof. Farrukh Zia

Roboqueen is a persistent research project in the Department of Computer Engineering Technology. It is being designed as a full body interactive robotic mannequin in response to the needs of the fashion technology industry by using inexpensive cardboard slices and aluminum frame for the body and low-cost open source hardware devices such as Raspberry Pi, Arduino and servo motors for head and arm movement. In the current phase of the project Roboqueen's circuits and hardware components will be improved and updated with the help of 3D printed circuits, integrated circuits, and sensors. Currently, the cardboard hands are being replaced with 3D printed fingers and wrist to add functionality that previously did not exist. Servo motors connected to Arduinos hidden in the forearm will be used to move the fingers and pick up and hold objects in the hand. Moreover, Google Voice AI assistant will be implemented to make the mannequin more responsive.

Sensor Data Analysis in Smart Building

Manuel A. Mane Penton
Prof. Li Geng

Data analysis and Machine Learning are destined to evolve the current technology infrastructure by solving technology and economy demands present mainly in developed cities like New York. This research proposes a machine learning (ML) based solution to alleviate one of the main issues that big buildings such as CUNY campuses have, that is the waste of energy resources. The analysis of data coming from the readings of different deployed sensors such as CO₂, humidity and temperature can be used to estimate occupancy in a specific room and building in general. The outcome of this research established a relationship between the CO₂, temperature and humidity values of the room and occupancy, by applying Machine Learning models. The result, together with the implementation of an automatic infrastructure for light and HVAC systems, can be used to save money and resources.

Planning a New Highway: The Politics of Redlining in Brooklyn

Farai Matangira
Prof. Michael Duddy

Redlining was a program practiced in the United States primarily during the 1940s through 1960s by which residents in primarily urban areas defined as “hazardous,” that is low-income, poorly maintained neighborhoods, were denied access to the essential services such as mortgages and property insurance necessary to sustain their homes and neighborhoods. Redlining was a form of racial profiling since the vast majority of the residents were minorities. During the postwar period particularly with the passage after the Federal Highway Act of 1956, money flowed into new highway projects and the routes they followed generally sliced their way through redlined neighborhoods. To many municipal administrations, highways had the “double advantage” of accommodating automobile traffic while eliminating urban decay and slum-like conditions through the use of federal dollars.

This study explores the highway system of Brooklyn, specifically the Brooklyn-Queens Expressway through the lens of a neighborhood affected – Brooklyn Heights. What guided the decisions made by the master builder, Robert Moses, and the borough presidents such as Raymond Ingersoll and John Cashman, in choosing the route of this highway? What was this neighborhood like before the highway, and who were the people displaced? These are some of the questions explored here.

Classification Method using Python and R

Afsana Mimi
Prof. Nan Li

This project is about to predict the factor, party of the legislators in terms of their roll call votes using Office of Clerk US House of Representatives Data Sets collected in 2019 and 2018. As a by-product, we can use our model to identify which legislators behave differently as the majority in the same party. The method we used in Classification method (Decision Tree). Since the files was in .xml files, the python was used to convert in .csv files, SAS was used to clean data, and all other calculations and graphical presentations are performed using the R software.

Uptake of Co(II) Ions from Aqueous Solutions by Low-cost Biopolymers and their Hybrid

Mohamadia Nassar

Prof. Abel Navarro

Alginate hydrogel beads (AB), spent peppermint leaf (PM) and a hybrid adsorbent of these two materials (ABPM) were studied as potential biosorbents of Cobalt (II) ions form aqueous solutions. Cobalt ion is a commonly underestimated pollutant that is responsible for several health problems. Discontinuous batch experiments were conducted at room temperature to evaluate the effect of solution acidity and mass of adsorbent on the adsorption of Co(II) ions. The interfering effect of salinity, presence of surfactants, an organic dye, and Pb(II) ions were also studied to resemble the application of these adsorbents in real wastewater. Equilibrium results indicate that Co(II) uptake is maximized at pH values higher than 5, with adsorbent doses of 200 mg, 200 mg, and 120 mg for AB, PM and ABPM, respectively. Co(II) adsorption followed the trend $AB > ABPM > PM$ with Adsorption percentages of 77%, 71% and 64%, respectively. Salts had a strong negative effect on the adsorption due to the increase of the ionic strength and the competition for adsorption sites. Presence of Pb(II) ions, surfactant and dye BY57 had a slightly negative effect on the adsorption, apparently due to their interaction with different adsorption sites that do not interfere with the removal of Co(II). A polar-electrostatic adsorption mechanism is proposed based on the experimental results. Scanning electron microscopy indicates that adsorbent have appropriate morphological and textural properties, and also that ABPM encapsulated most of the PM inside of the hydrogel beads. These experimental results revealed that AB, PM and ABPM are promising adsorbents for the elimination of Co(II) ions from aqueous solutions under different experimental conditions. These biopolymers are proposed as eco-friendly alternatives for the removal of heavy metal ions at lower costs than conventional techniques.

Low-temperature Low Energy Electro-Optical Converter for Quantum Computers and Quantum Communication

Shaina Raklyar,
Prof. German Kolmakov

Early prototypes of quantum computer do exist but in their current form they do not outperform existing computers. The key limitation of the current quantum computing technology is in the absence of scalability in quantum computers that is, the maximum achievable number of simultaneously connected qubits in quantum processors. The risks could be mitigated through the Low-temperature Low Energy Electro-Optical Converter for Quantum Computers and Quantum Communication. The setup in our proposed technology is based on the polariton drag in a semiconducting structure within an optical cavity. The input electric pulse signal from the qubit readout is mixed with an input continuous wave (CW) optical signal due to strong exciton-photon interactions, propagates to the optical output in a form of exciton polaritons and finally, leaves the converter as optical pulses through the output optical waveguide.

Low Cost Drone Development Using Early Gyroscopic Models

Carlos Salas Osorio
Prof. Angran Xiao

Drones have grown to be very popular in the last several years due to lower costs and its usage in photography. However, while the costs of drones have certainly decreased, many drones are still in a high price range, going up to a thousand dollars. For this research, I intend on developing a drone that is low cost in materials and uses a traditional gyroscope for flight stabilization. Through the use of the Autodesk Inventor, I have created a design for a drone that would be 3D printed. This design is meant to be low cost yet robust like an average drone. Furthermore, by removing the need of an electronic gyroscope, the complexity of calibrating a smooth flight is removed. The drone would instead be outfitted with a spinning motor at the center that would rotate at a high speed in order to keep it stable

Effect of Silicon Carbide Whisker and Fumed Silica on Geopolymer Mechanical Strength

Sukhpaul Sehmbi
Prof. Akm S Rahman

Geopolymers have transpired as a capable alternative to ordinary types of cements, due to their much desired thermal, mechanical and physical properties. Typically for geopolymers and their composites, they have a limited compressive strength. Therefore, they should be strengthened for wider applications. Such as bone replacement, high thermic and ultrahigh strength concrete. As an extension of the current research, the plan is to generate solid understanding on the mechanical properties with the addition of SiCw at higher volume fractions. Therefore, a variety of mechanical tests will be performed including Flexural strength and Dynamic Mechanical strength. This research presents a simplistic method for enhancing the compressive strength by integrating silicon carbide whiskers (SiCw) into a geopolymer matrix. In order to evaluate the effect of SiCw, two batches were tested, 0 vol% SiCw/Geopolymer and 2 vol% SiCw/Geopolymer. Mechanical testing was done on the samples and an average compressive strength value was obtained. For the first batch, 0 vol% SiCw/GP, an average of 46.52 MPa was obtained. For the second batch, 2 vol% SiCw/GP, an average compression test value obtained was 61.02 MPa. Due to the bridging effect among the SiCw whiskers, the sample batch with 0 vol% SiCw possess higher porosity and lower density, and thus lower thermal stability and thermal conductivity as compared to 2 vol% SiCw. Thus, an increase in the compressive strength from the first sample to the second sample was observed.

Joystick Control Circuit

Umaira Shah
Prof. Farrukh Zia

This project is based on the concept of using Analog Input / PWM Output subsystems in a Computer Controlled System. An analog joystick that moves through the x and y axis is used to provide analog input to a computer. Using the map feature, the x and y axis measurements are used to control a servo motor and move it to certain degrees wherever joystick is moved or toggled. Joystick x and y axis position values are printed on the computer's Serial Monitor screen. To complete this project an LCD screen will be added that will print the specific degrees to which the servo motor is moving. To summarize, this project will use the joystick to control a servo motor and the LCD screen will display the degrees of movement of the servo motor.

Advanced Smart House

Lubna Sharmin
Prof. Farrukh Zia

"Design is not just what it looks like and feels like. The design is how it works" -Steve Jobs. The purpose of this research project is to control the room lights with a smartphone and schedule

events to occur automatically. In this generation, home automation has taken convenience to a whole new level. Instead of using mechanical switches, one can now conveniently control all the devices in one's home from their fingertips. Advanced Smart House involves the implementation of a multi-sensor home automation setup using an Arduino microcontroller development kit combined with a 3D printed small scale prototype of a smart house.

Lasso Regression to Predict the Influencing Factor of Pollution in Five Big Cities

Shubha Shrestha

Prof. Nan Li

This project is carried out to learn the factors that influence the pollution using the PM2.5 Data of five big cities of China pollution Data set. This project will be basically finding the influencing factor on PM2.5 with respect to pollution in Chinese cities as variables assigned of data. The Y-variable in this date set is PM2.5. Lasso regression is used to find the desired fit by selecting the variables whereas, linear regression is not used since the model is not perfect in other words linear regression gives greater error. All the required calculations and graphical representations of graphs, histograms are carried out by R console for statistical computation.

Pain Management: Genetic Basis for Racial Disparities?

Brittany Taylor

Prof. Aida Egues

Pain is one of the top reasons for doctor visits in the United States. Research has shown that it is common for minority patients to receive inadequate treatment for pain when compared with white patients. This may be partly due to a widespread misconception that non-white people feel less pain than white people. The aim of this study was to use four single nucleotide polymorphisms (SNPs) in the COMT gene (rs4633, rs4680, rs4818, rs6269), which codes for the enzyme catechol-O-methyltransferase and has been linked to pain perception, and test for significant differences between populations. Data from the 1000 Genomes Project was used to compare allele and genotype frequencies between 26 different populations. Each population was tested for Hardy-Weinberg equilibrium (HWE), and a few populations were not in HWE. For each SNP, ANOVA tests were performed on the allele frequencies and genotype frequencies for all 26 populations. The ANOVA tests found no significant differences between populations, which indicates none of the populations have a genetic predisposition in this gene to feeling more or less pain. Clinicians should not make pain management decisions based on racial

stereotypes. If the goal is to personalize treatment, DNA sequencing and considering other individual characteristics might be a better approach.

Global Tip Calculator

Tatyana Taylor

Prof. Marcos S. Pinto

Android mobile application that displays the amount of gratuity for services received in a restaurant or places of food consumption

- . The application can be ported to iOS devices.
- . The app can be used anywhere in the world, but the current list of countries is not comprehensive.
- . The app will show the appropriate amount of tip to be added to the cost of services.
- . The amount of tip ranges from 5% to 25% of the cost of services worldwide.

Note that in general tipping shows how generous the customer is, but in some places, like in Asia, it is interpreted as a form of disrespect.

Using Data Mining to Identify the Most Influential Factors in Training Results

Xiaoqing Wu

Prof. Nan Li, and Lin Zhou

In this project, we will establish a framework that can be used to find the most significant factor that affects the outcomes of training results. Training results are closely related to a few factors including the preparation of participants, the number of attended workshops, the time and length of the workshops, etc. We will design a machine learning method to train the system to pick up the factor of the most significance. This type of work can be used in the future to study the performance of students and provide guidance to curriculum.

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

XiangFu Zhang

Prof. Subhendra N. Sarkar, and Mary A. Browne

Sleep disturbance is a frequent complaint for patients with mild traumatic brain injury (mTBI), it can prolong recovery, and the oxidative stress from lack of sleep could worsen other secondary damages of mTBI. The common types of sleep disturbance of mTBI include insomnia, daytime sleepiness, and obstructive sleep apnea. Conventional imaging often fails to detect any abnormalities in mTBI, and the etiology of sleep disturbance is still unclear. Based on the analysis of current published neurobiological and imaging literature, multiple factors could play a role leading to sleep disturbance in mTBI, however, we have focused on the diencephalon, melatonin and serotonin. We constructed a hypothesis that sleep disturbance may be caused by increased tau protein and decreased serotonin consequent to the dynamic load to pineal gland and hypothalamus by cerebrospinal fluid (CSF) during and after mild head trauma. A geometric model supporting this is under preparation in analogy with Alzheimer's progression in less actives and Parkinson's cases with upper body rigidity. In both situations CSF dynamics is abnormal and tau protein increases while serotonin/melatonin levels drop. Our model of impaired circulation of CSF leading to inefficient transportation of sleep-related protein, and excessive encounter of vulnerable tissues (Pineal gland and Hypothalamus for example) with reactive oxygen species due to abnormal CSF dynamics may contribute to dysfunction of sleep governing neuron.

An In-depth Look at p-adic Numbers

Xiaona Zhou

Prof. Satyanand Singh

In this study, we consider p-adic numbers. We will also study the p-adic norm representation of real number, which is defined as $Q_p = \{ \sum_{j=m}^{\infty} a_j p^j : a_j \in D_p, m \in Z, a_m \neq 0 \} \cup \{0\}$, where p is a prime number. We explore properties of the p-adic by using examples. In particular, we will show that $\sqrt{6}, i \in \mathbb{N}, \sqrt{2} \in \mathbb{Q}_7$. p-adic numbers have a wide range of applications; such as string theory and quantum mechanics, and transportation in porous disordered media in geology.