Book of Abstracts

The Emerging Scholars Program

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Black Male Initiative (BMI)

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Learning to Innovate Websites and Apps Through Knowledge and Understanding of How the Internet Works

Alexon Abreu, Ali Abbas, Bilal Badar
Prof. Daniel Wong

We represent three Computer Systems Technology (CST) students drawn to this project for diverse reasons. We desire to acquire new skills and improve our existing ones. The project description was aligned with our existing interests in social media, application development, and innovation. We also aspire to have a research experience that showcased our knowledge and further established our leadership skills. In general, we came to this undertaking with open minds. Some of us hoped to design a product in the realm of social media. Simultaneously, others sought to learn the use of information by big companies to control human behaviors. We were then hoping to use this knowledge to discover positive uses for this information. Not all of us had predetermined goals we aspired to accomplish entering into this research project. Instead, we all hope that the experience earned would broaden our understanding and knowledge in a similar area of interest. Our interests are to learn more about technology in its various forms. Some of us have existing knowledge in programming languages such as Python and app development. However, other members are just beginning to learn about technology on a more significant level. We strive to further learn about designing websites, video games, and other related products. Ultimately, we are seeking solutions to problems through the use of app development. What interests us about this area of research is the rising interest in communication design. We wish to experience for ourselves this type of study and investigation. In addition, given that all of us, excluding our mentor, are CST majors, we generally do not have access to material outside our field. By taking this opportunity, we enable ourselves to learn new content in a cost-free and enjoyable manner; Journeying with us this experience into future endeavors

Advantages of AMP (Accelerated Mobile Pages)

Saira Nazar
Prof.Marcos Pinto

AMP is an open-source(free) Google library that provides a quicker way to develop web pages that are compelling, smooth, and load near instantaneously to users of mobile devices. The project goes into details of this mobile technology with examples and its application to search results, news, and blog contents.

Analyze and Examine Wildfire Events in California

Alena Hoodith, Safoan Hossain, Sakin Zaman
Prof. Jiehao Huang

Recent studies have shown that the effect of anthropogenic climate change has fueled the wildfire events, leading to an increase in the annual burned areas. This study is meant to examine the wildfire events in California during the 2013 – 2019 period. The dataset contains the time details and location where wildfires have occurred with acres burned. Statistical analysis is used in this study to analyze trends and variability in this time series dataset. In this study, the results have shown the wildfire events in California have been generally increasing from 2013-2018, with significant major peak frequency in 2018. By constructing the frequency table to study each month, the finding concludes that wildfire events happen more frequently in the warmer season (June, July, August) when the temperature is relatively hot and dry, as compared to the cooler season.

ARC scholars– NYCHA's Washington Houses: Architecture Workshop

Farai Matangira, Alfred Dove, Oliver Hadi, Scarlett Morales, Scott Brathwaite
Prof. Naomi Langer-Voss

This team of ARCscholars is working collaboratively, sharing lived experiences, creatively thinking & planning and applying our research discoveries to the proposed design interventions. We seek to address and combat critical issues to foster a measurable improvement in community health, understanding, and relationships. Through enhancing the community at large via housing equity and durability and beauty, we hope that the proposed design improvements will have a direct, indirect, and long-lasting positive effects on the NYCHA communities. We have developed an architectural and urban proposal that will enhance the overall quality and design of our case study development: the NYCHA Washington Houses in Manhattan. Our research included a comprehensive site investigation, an informative discussion with the Resident Leader at the development, and an understanding of planning issues. We met weekly to analyze, discuss, and investigate architectural and urban concepts, and develop specific planning interventions. Personal anecdotes from our NYCHA resident students helped inform the design strategy. Our research informed us that our proposal should address the overall campus in addition to providing specific design interventions. The team focused on three main categories of development; an overall site strategy, proposals for places to inhabit, and designs of elements to observe.

Association between Oral Cancer and Diet

Tashi Choedon, Michelle Klig, Irina Urmi
Dr. Laina Karthikeyan

Oral cancer and other forms of cancer such as face and neck cancers are the most common malignant neoplasms in the world. Most common causes of oral cancer are the use of tobacco and alcohol as well as diet. The connection between diet and oral cancer is that some nutrients provide protection against cancer while some can increase the risks for development and spread of cancer. If you incorporate vegetables, fruits, teas, garlic and cereals in your diet, it may lead to decreased risks for oral cancer as they contain certain bioactive components.

In a meta-analysis done by the researchers from the University of Catanzaro Magna Graecia in Catanzaro, Italy, they evaluated the effect of fruit and vegetable intakes on the occurrence of oral/mouth cancer. The multivariate meta-regression showed that the lower risk of oral cancer associated with fruit consumption was significantly influenced by the type of fruit consumed and by the time interval of dietary recall. There was another study looking at the effects of coffee consumption on oral cancer. The study found that compared to those who did not drink or rarely drank coffee, people with high coffee consumption had a 37% reduced risk of oral cavity/mouth cancer. (Ya-Min Li et al, Oral Surg Oral Med Oral Pathol Oral Radiol., 2016)

Fruits and vegetables are also a good source of vitamins and minerals, including folate, vitamin C and potassium. Researchers continue to investigate the factors that cause oral and oropharyngeal cancers, including ways to prevent it. Whereas there is no proven way to completely prevent this disease, you may be able to lower the risks by making the right dietary choices.

Bernoulli Numbers and Bernoulli Polynomials

Jose Armando Sanchez Diaz & Jian Zhu
Prof. Satyanand Singh

We begin with the study of Bernoulli Numbers, which are defined as the coefficients of the terms of the power series centered about zero of the function, t/e^t−1 . We show that they are rational numbers and connect them to Bernoulli polynomials. The Bernoulli numbers has applications in the study of p-adic numbers, Fermat's last theorem, zeta functions and combinatorics. This is project C, in [1]. We will also establish that the Bernoulli polynomials are in the ring, Q[x], i.e. they are polynomials with rational coefficients. Our work culminates with a method to find closed form expressions of the finite sums of positive powers of integers.

Bifurcating Brooklyn: The Connection to the Verrazano Bridge

Farai Matangira
Prof. Michael Duddy

The construction of the Gowanus Expressway as part of the approach towards the Verrazano Bridge in the 1960s led to the bifurcation of a vibrant neighborhood in Bay Ridge, Brooklyn. Its construction was controversial and was met with strong resistance from the surrounding community, with residents fearing losing their homes and businesses. Their concerns were greatly ignored which led to thousands of residents getting displaced, and hundreds of properties destroyed to accommodate the highway. Today, the area where displaced residents used to call home, is now dominated by a highway, which does little to serve the community it runs through. This culminates into an undesirable neighborhood that has been physically split into two by a burrowing transport system. This study explores the construction of the Gowanus Expressway from the lens of the neighborhood it split. It investigates the reasoning behind the decisions made in the construction of such a destructive highway. How was the route of this highway chosen? Could there have been an alternative route? What was this neighborhood like before the highway, and who were the people displaced? These are some of the questions explored in this study.

The Structure and Analysis of calpains in Tetrahymena thermophila

Derbie Desir
Prof. Ralph Alcendor

Calpains are a family of ubiquitously expressed calcium-dependent, non lysosomal cysteine proteases. Calpains are involved in apoptosis, cellular proliferation, and cell motility. While mostly calcium-dependent, calpains may also be activated through ERK-mediated phosphorylation. Calpains are found in a few eubacteria and almost all eukaryotes, but not found in archaebacteria. *Tetrahymena thermophila* is a ciliate found in fresh water. Remarkably, these cells have two nuclei, one is the germline nucleus, and the other is the somatic nucleus. The germline, the micronucleus, is silent during vegetative growth, while the macronucleus is very active during vegetative growth. Conserved eukaryotic mechanisms have been modified in ciliates to selectively deal with the two genomes. *T. thermophila* has been used as a model to study many cellular processes. However, the role of calpains in these cells is yet to be examined. The purpose of this project was to characterize ***TTHERM_00486970***, a calpain family member from *T. thermophila,* using bioinformatics tools such as MUSCLE (MUltiple Sequence Comparison by Log- Expectation), MAFFT (Multiple Alignment using Fast Fourier Transform), T-Coffee (Tree-based consistency objective function for alignment evaluation), BLASTp (Basic Local Alignment Search Tool), Phylogeny.Fr, SWISS-MODEL and PHYRE2 (Protein Homology/AnalogY Recognition Engine). The protein sequence of ***TTHERM_00486970*** was compared to protein sequences of human calpains. Multiple protein alignments and phylogenetic trees suggest ***TTHERM_00486970*** is more closely related to human calpain 7. However, more analysis is needed to confirm these preliminary results.

Child Detection System For Preventing Hot-car Death Fahmeda Khanom and Touheda Khanom
Prof. Xiahaoi Li

Hot-Car deaths of children due to lack of attention from parents is not a rare tragedy in recent years. The cases of deaths of children are increasing and to approach a solution for this tragedy our project will take a small lead. The objective of the research project is to research and design a compact and low-cost smart IoT device that can help to prevent such tragedies. In this project, we will build a prototype system that can detect if a child is left alone in a closed vehicle. When such an event is detected, the device will send alerts to the child's parents or caregiver through multiple means. If the parents or caregiver do not provide any response after a short period, the device will alert the first responder for immediate action. We will use a Particle Photon which is a compact physical computing platform that will connect to a Cloud that will not require active management of users and reach remote parents, caregivers, or first responders. By the research done so far, we tested different components individually such as temperature sensor, buzzer, potentiometer, photoresistor, and ultrasonic sensor. The sensors are used to detect the presence and motion of adults, children, and temperature conditions inside the vehicle. In the next step of this research project, we will develop, implement, and test our system. We will also further add more features to our system and implement them.

Common Intermediate Language Emulator
Roshel Babayev
DeAndre Badresingh
Prof. Jean Boulet

With the release of .NET framework many languages including C#, VB,NET, and F# compile into bytecode known as common intermediate language (CIL), previously identified as MSIL. For this research project, we've decided to make a CIL emulator. The emulator will emulate the bytecode allowing secure execution, function manipulation, and safely emulate computational functions without having to worry about malicious code execution. With the start of this project, we only thought that this would just be a pure emulator but upon further investigation we've learned that in order to read the body of a method, we first need to get the body along with the instructions there which resulted in the creation of an additional sub library in order to get out the necessary information in feed it into the emulator itself. We've had two options of either creating a fully fledged PE (portable executable) parser or use the built in one by Microsoft. We decided to stick with the built in Microsoft version since the focus of this project is the emulator and not the reader but with all of the work put into the reader anyways it probably would've been a wiser decision to have made a fully fledged PE parser for this. The emulator is built for expansion in order to easily add more support for any future introduced instructions. Overall, this project has shown just how much more there is to just making something as an emulator as while emulation of instructions can be quite intricate in of itself, there are other aspects which you must take into account.

CO_2 Emissions by Countries

Omer Ahmed, Isha Choudhary, Rachica Jean Baptiste
Prof. Mukadder Cinar

Carbon dioxide (CO_2) is a primary greenhouse gas emitted by different human activities. Gases that trap heat in the atmosphere are called greenhouse gases. Too much of these greenhouse gases can cause climate change on Earth. In this project, we will investigate how CO_2 emissions have changed in the world, by countries over the years by analyzing data about CO_2 emissions obtained from Kaggle. We will compare the countries by CO_2 emissions and investigate the cause of them.

Code Cyber: "A Curated Collection of Cybersecurity Career Learning and Preparation Resources"

Jason Lin
Mohammed Zaman
Kazi Tasin
Ethan Pruzhansky
Prof. Patrick J Slattery

Cybercrime is pervasive in today's digitally linked world, and many businesses have employed cybersecurity experts to protect their data. These professionals deal with cyber hacks and need deep knowledge in select areas of expertise to be effective. The project's objective is to investigate five aspects of cyber security as defined by the National Institute of Standards and Technology (NIST). NIST defines these five areas as Identify, Protect, Detect, Respond, and Recovery. We describe how the cybersecurity industry defends against malware assaults, ransomware attacks, crypto-jacking, distributed denial of service (DDOS) attacks, and other cyber security attacks. Following the NIST standard, the first step is determining what assets are deemed high in value and which attackers or hackers are likely to target. After the identification of assets, those assets will need to be secured or protected. One of the best ways to protect against cyber-attacks and viruses is to keep the software, browsers, and operating systems up to date. Protecting data requires robust authentication because only individuals with authorization should have access to accounts accessing valuable data. Even with solid authentication and control over access to valuable data, there is a risk that authenticated users open untrusted files from unknown websites or click on nefarious links in an email or message. Those actions make a user's computer more vulnerable to cyber-attacks. It is difficult to detect a problem when something goes wrong with the systems. Detection and response to an issue working together as quickly as is feasible are critical. Rapid detection and response can cure the problem soon and allow normal work to continue. Detection systems should watch data, networks, and email. Effective response and recovery will require having a backup to restore when information is corrupted. Recovery requires extensive planning. It is critical to plan how to refresh and improve cyber security software. Documentation of incidents detected, including what happened and what lessons may be drawn from the experience, contributes to improvements in the recovery steps. Recover can establish a plan to reduce the risk of future cyber security attacks.

Software Editing Platforms and their Effectiveness in Teaching Software Concepts

Sabina Uddin
Prof. Douglas Moody

The purpose of this research is to evaluate the effectiveness of software editing platforms in teaching software concepts and keeping the user engaged. In recent years, the pedagogy of computer programming has received a great deal of attention as technology has become more prominent and advanced. Additionally, the advent of teaching computational thinking skills has emerged as an important goal in all educational levels including K-12 and university level studies. By evaluating several platforms, including those that use approaches such block coding, editor, and prompt box, we can conceptualize which method would best aid in learning software concepts in addition to triggering interest in coding. The first phase of this project consists of conducting research on UX/UI components to develop a criterion that would be used to evaluate the different software platforms. Our second phase includes using the criterion to compare 3 different platforms whose entry methodologies consist of drag and drop, output box, and editor. Finally, for an experiment, we will conduct a survey that explores participant experiences and interaction with these 3 platforms. A task would be given to participants to execute via the respective platform. After participants complete their task on the given platform, they will be asked to complete a survey reflecting their experiences. Our results indicated that block-based programing may provide a "fun" environment that youth are more bound to explore due to its video game nature. However, it can be redundant when searching for a command and is less flexible than traditional syntax, making manipulation less efficient. For the output box programming, clarity in terms of presentation helps avoid visual distraction and the output box allows users to access commands quicker. However, the output box is less flexible than traditional syntax and may not provide the video game environment. Lastly, python is more flexible in syntax, but terminology may be unfamiliar to human syntax. By furthering our study and expanding our group of participants, we can get further insight on which platform can best aid teaching of computational thinking.

Computational Characterization of Calpains in T.thermophila

Samian Ahmed,
Barakat Adigun,
Tayna Gebhardt,
Samantha Lee
Prof. Ralph Alcendor

The goal of this research project is to give information on TTHERM_00898290, a family member of *Tetrahymena thermophil*a's calpain. Calpains are proteins belonging to the calcium dependent, non-lysosomal cysteine protease family. Most cells have one or more calpains. Humans and many other mammals have 15 different calpains classified as classical or non-classical calpains. Calpains have been shown to be involved in many different processes and activities of cells. For example, research has shown that human calpains are involved in diabetes, cell death, cell cycle control and cell motility. *Tetrahymena thermophili*a are unicellular eukaryotes larger in size than many mammalian cells. They are ciliated Protozoa, which is a major group of unicellular eukaryotes. Dinoflagellates and Apicomplexans are their closest known relatives. Tetrahymena thermophilia locate in freshwater, for example ponds and streams throughout the whole world. They have two nuclei, a macronucleus, involved in vegetative activity, and a micronucleus, which is the germline nucleus. These cells have been used as a model organism in many studies, but the role of calpains in these cells have not been extensively investigated. *T. thermophila* has about 27 different calpians. The goal of this project was to begin characterizing TTHERM_00898290, one of *T. thermophila* calpains, using computational tools. Human calpains and TTHERM_00898290 sequences were aligned using MUSCLE and T-COFFEE. Phylogenetic trees were drawn using Phylogeny.Fr and MEGA. Both SWISS-MODEL and PHYRE2 were used for modeling the protein structure. Preliminary results suggest TTHERM_00898290 is more closely related to human calpains 7.

Computer Controlled System Design

Divya Kaushal
Prof Farrukh Zia

One of the goals of the Computer Engineering Technology program is to prepare students with the knowledge and skills to design, build, test and implement Computer Technology based devices to solve real world problems. This project will focus on researching the use of Systems Theory to develop Computer Technology based devices by following a systematic approach to combine Computer Hardware, Software, Data Communication and other sub-systems as building blocks.

COVID 19 INFECTIONS: IMPACT ON ORGAN SYSTEMS AND APPROACHES TO TREATING AND MANAGING THE IMPACTS.

Keiuno Dawkins
Prof. Olufemi Sodeinde

Infection by the Covid virus known as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes the coronavirus disease 2019 (COVID-19). We reviewed approaches to treating hospitalized patients infected withSARS-CoV-2 and the symptoms of the disease from published literature. To know whether and how the disease impacts organs and organ systems, we collected information on the effects on organs and organ systems as well as the impact of drugs administered in alleviating symptoms and managing the infection. Common signs and symptoms of the disease caused by the infection which may appear two to 14 days after exposure, include fever, tiredness, and cough. Early symptoms may include a loss of taste (ageusia) or smell (anosmia, hyposmia). Other symptoms include shortness of breath and muscle aches among others. COVID-19 affects mainly the respiratory system and the clinical presentation ranges from asymptomatic cases to severe manifestations. In some individuals with comorbidities (having underlying conditions or diseases) Covid-19 caused severe morbidity and mortality, usually in the form of acute respiratory distress syndrome (ARDS). ARDS, heart failure, renal failure, liver damage, shock, and multiorgan failure precipitated death in some patients. The most common comorbidities were diabetes mellitus, hypertension, and obesity. SARS-CoV-2 viral particles were demonstrated within organ-specific cells in the trachea, lung, liver, large intestine, kidney indicating that the disease impacts multiple organs. Hospitalized patients treated in intensive care units (ICUs) received invasive mechanical ventilation and kidney replacement therapy as determined appropriate. Regarding treatment with drugs, the Food and Drugs Administration (FDA) approved the antiviral drug remdesivir for treating hospitalized adults and children aged 12 years or above. Emergency use authorization was granted for the rheumatoid arthritis drug, baricitinib and convalescent plasma therapy. Other FDA-authorized drugs include monoclonal antibody medications such as sotrovimab and casirivimab. The effectiveness of these drug treatment options has not been definitively established.

Lessons Learned regarding Data Loss During Natural Disasters and Their Applicability to Small and Medium Businesses

Svetlana Idrovo-Shindler
Prof. Patrick Slattery

Thousands of business networks and millions of personal computers were damaged because of Hurricane Sandy in 2012. The damage done was estimated to cost billions of dollars for material damages and even more in data loss. Most of the businesses on the East Coast of the United States did not have adequate insurance policies or proper knowledge to guard against data loss. These shortcomings cost those businesses major losses in revenues which drove some to close their business. This research discusses what lessons are learned regarding data loss during natural disasters and their applicability to small and medium businesses. There are many expensive services for large businesses to employ in protecting data and those are typically out of the reach of the small and medium size business. There are meaningful best practices which can be employed regardless of the size of a business. Through scholarly research and research of business publications, conference talks, and other artifacts, a summary of highly effective best practices regarding data loss will provide every business with insight into ways they can protect their data and their business.

Diagnostic Potentials of MRI and PET in Alzheimer's Disease: A Meta Analysis

Jennifer Padilla
Prof. Subhendra Sarkar
Prof. Duke Shereen

The objective of this study is to explore if there exists a relation between brain atrophy in certain cerebral regions and both PET and MRI findings in Alzheimer's Disease. In this regard, endothelial cells are important parts of the Blood Brain Barrier that shield the brain of disease and other pathogens. Certain circulatory proteins also cause inflammation and cognitive impairment. Glucose and other metabolisms can be abnormal in select areas in the frontal lobes, parietal lobes, and deep gray matter such as the pallidal areas, when early onset, for example, autosomal dominant Alzheimer's Disease sets in. This young group is a minority, however, shows patterns better than the majority of late onset Alzheimer's Disease and hence may reveal mechanisms of late onset too.

Effective Communication Between Health Care Professionals and Deaf/Hard-of-Hearing Clients

Catherine Mallol-Nunez
Prof. Merlyn Dorsainvil

Communication is essential to provide proper care to clients. Communication can enhance health and wellness, unless it isn't well established. There aren't specific procedures in place for communicating with clients who are deaf/ hard-of-hearing (HOH). This study reviewed the effectiveness of communication between health care professionals and deaf and/or HOH clients. The research methodology employed was developmental. Two steps were performed for this study. First, a comprehensive review of the current literature was conducted. The review of the literature enabled the author to translate current knowledge into a useful form and recommend effective strategies to improve communication between health care professionals and clients who are deaf/HOH. Second, a summative committee was assembled for the purpose of reviewing the findings of the literature review and the author's recommendations.

There is a need to improve communication with deaf/HOH clients. There were different expectations at health care visits between the study population of deaf/HOH clients and health care professionals. Setting up procedures to effectively communicate with deaf/HOH clients with the use of communication boards, gestures, physical interpreters, online virtual platforms and even mobile apps should be utilized more. Health care professionals should understand the culture of these clients and respect it, as deaf clients do not perceive themselves as disabled. A lack of hearing isn't something they should force themselves to overcome. The summative committee convened and agreed with the author's recommendations. Committee members made additional recommendations of (1) using Apple headphones as hearing aids, (2) an Apple Watch as an alarm, and (3) cultural considerations for communicating with non-English speaking clients who are deaf/HOH.

Electron spectrum in topological nodal line semimetals

Fergus Kouakou
Prof. Oleg Berman

Two frontiers of modern condensed matter research are correlated electron physics and topological Dirac and Weyl semimetals that remain largely separated. The recent studies reveal that correlation effects in Dirac systems are usually weak, with the notable exception of twisted-bilayer graphene. However, there is anticipation that the correlations are enhanced in the recently discovered nodal-line semimetals (NLSMs). NLSMs are the systems that feature extended linear band-crossings along lines/loops in the Brillouin zone. ZrSiSe and ZrSiTe are the examples of NLSMs. Significant correlation effects in a nodal line semimetal compound, ZrSiSe, have been revealed through a combination of optical spectroscopy and density functional theory calculations in 2020. In this study we have obtained the energy spectrum and the wave functions of electrons in nodal line semimetals. The results of our calculations can be used to find the optical conductivity and the spectrum of collective excitations (plasmons) in NLSMs.

Hardware and Software Co-design of Assistive Technology

Modhumita Dey
Prof. Farrukh Zia

In Computer Engineering Technology major, students learn how to combine computer hardware and software to make devices to solve real life problems. In this research project Math, Physics, Computer Hardware, Computer Software knowledge is used to develop a web based Assistive Technology application. Assistive Technology refers to the use of technology to assist people with physical or learning disabilities.

HOW HAS COVID-19 IMPACTED DENTAL HYGIENISTS AND OTHER DENTAL PROFESSIONALS

Nathaly Rojas
Doslyleny Arias
Prof. Susan Davide

This investigation is about the impact that COVID-19 has had on Dental Hygienists and Other Dental Professionals . Dentistry as a whole has been impacted greatly due to new safety measures that have come along with the COVID-19 pandemic. It is important to investigate how the pandemic has affected dentistry to be able to understand how dentistry now has to take enhanced protective measures. These enhanced protective measures are for the protection of the patients and the dental workers.It is also important to study the history of PPE protocolos and how they have changed or improved throughout this pandemic. In this investigation we will understand how Dental Hygienists and Dental professionals jobs were affected both locally and in other places. Also, how their daily PPe protocols have changed. And understanding how dentistry students' curriculum was affected, and what the rates of infection looked like. Some questions that are being posed are " How was your dental workplace affected by COVID-19" and " How were your studies affected by the pandemic " , "How has the PEE protocols made the work environment safe for dental practitioners and the patients". Many surveys have been sent out to Dental Hygienists and other Dental professionals to be able to see the impact that COVID-19 has had on them or their practice. Dental students' curricula have greatly changed due to missing out on educational experiences because of the lockdowns. COVID -19 cut down non emergency dental care due to oral health professionals being at high risk of being infected with COVID-19. While Dental hygienists and other Dental professionals are at high risk, Dental professionals have practiced increased infection control even before COVID-19. This research will have an impact on future studies in my field because it enhances the importance of PPE and infection control. Another importance of this investigation is finding out how effective these PPE protocols are.

How is the disposal of electronic waste contributing to pollution in landfills?
Manjil Itani
Prof. Sean McDonalds

There has been a rapid increase in the production of electronic devices due to high demand. Electronic devices have a finite life and as we produce more devices, we are also producing more waste. What happens to electronic waste such as old phones, computers, and TVs? In this research, I am going to investigate the impact of electronic waste, commonly known as e-waste, on the health and wellbeing of people and the earth. I will look at how developing countries with low-income groups have been affected by e-waste in landfills. I will also be outlining steps that can be taken to avoid the environmental and economic degradation that e-waste can cause.

Implementing A Framework to Designing an Online Survey Tool
Gilbert Page
Prof. Milonas

Properly articulated research problems, objectives, and questions form the foundation for successful research. Further, if data collection is wrong, there is the risk that the entire research becomes useless. If data is erroneous, the research objectives may fail to be answered. Consequently, the findings get mismatched with the research objectives leading to the drawing of wrong conclusions and recommendations. Therefore the research can become invalidated. There are some data collection challenges and mistakes to avoid to collect data that closely matches the research objectives. The use of complicated forms, inadequate identification of the respondent, language barriers, and insufficient responses can hinder the collection of relevant data. The results of the studies in the literature review indicate a lack of a design framework that integrates the pre-data collection tasks with the survey tool and its distribution. The findings within the literature reviews also led to a framework that can inspire the design of an online survey tool. This research is focused on the development of methodology for an online tool which can be used to help avoid these data collection errors. By reviewing literature, available information on challenges to data collection, and how the use of a well-designed online tool should help the collection of more accurate research data.

Implication of Energy Loss Due to Natural Airflow Through Entrance Doors

Syed Ali
Adama Barro
Carlanthony Lanton
Satesh Mahabir
Sherene D. Moore
Cathal O'Toole
Matthew X. Quinones
Istvan Zagyi
Prof. Daeho Kang

Infiltration through entrance doors has had a major effect on the calculation of building heating and cooling loads within the thermal environment. Natural airflow through revolving and other types of entrance doors has impacted building climate, which has attributed to heat loss. It is vital to analyze airflow through entrance openings for a better understanding of air movement, heat dissipation, and building energy consumption. The purpose of this research is to examine scientific literature on infiltration rate, differential pressure, distance of vestibule space, and energy sustainability of entrances; as an essential means in lowering a building's carbon footprint. Some methods that were used in estimating door infiltration rates are qualitative analysis, a pre-experimental design survey, computer simulation and estimation functions, tracer gas measurements, pressure sensors, calculation of air leakages, and the *ASHRAE Standard 90.1*. Studies estimate that infiltration through large openings may take a large percentage of energy consumption in buildings. Future research on entrance infiltration rate is needed to design efficient, high performing vestibule technologies that are beneficial in reducing air infiltration, and energy costs. These innovations would be beneficial in maintaining indoor occupant comfort and decreasing greenhouse gas emissions that are a contributor to climate change.

Inflammation, Fracture and Bone Repair: A Meta Analysis.

Guito Charles and
Maleeha Sheikh
Prof. Subhendra Sarkar

The purpose of this research is to perform a meta analysis on inflammation, fracture and bone repair mechanisms in the presence of surgical implants as practiced by tissue engineering and materials science today. Inflammation is the human body's natural response to an injury that activates the immune system and sends out inflammatory cells. The result is usually pain, swelling, bruising or redness. However the inflammation also affects the body systems not visible in diagnostic imaging. An X-ray exam, often followed by CT in diagnostic imaging departments can map the nature and extent of the fracture and help guide surgical repair or internal fixation using orthopedic devices implanted into the area of interest. When metal is introduced as part of the implant, an oxide layer is formed and metal ions slowly diffuse through the oxide layer and accumulate in the tissue. The implant then becomes surrounded by a layer of fibrous tissue of thickness that is proportional to the amount and toxicity of the dissolution products and to the diffusion rate of metal ions in the adjacent tissues. Our work reviews various advancements in the interfacial interactions of surgical implants that have led to reduced inflammation in patients with metallic implants.

Investigating Project Success Factors in Post-Disaster Rebuilding Efforts in NYC

Flomo, Kalalie; Muhammad, Aalaa; Vallon, Jude; Walters Jr, Calvin
Prof. Anne Marie Sowder

Superstorm Sandy caused a total of nearly $78 billion in damages with more than 25,000 families faced damage to their homes. Drastic changes to the climate, volatile weather patterns, and much-improved reporting, contribute to the increased recording. The “100-year [disaster] event” is no longer synonymous with 1-percent AEP (Annual Exceedance Probability) since that threshold is breached more frequently. Post-Disaster Rebuilding (PDR) is similar to reconstruction in the “modification, conversion or phased complete replacement of an existing facility that involves expansions, additions, interior renovation, or upgrading the functional performance of a facility.” However, PDR goes further in a highly coordinated process involving a multifaceted approach inclusive of all stakeholders and integrated reconstruction management system to accelerate reconstruction processes, and even sometimes with destroyed infrastructure. With limited existing research into the assessment of the goals for a PDR projects, this warrants an investigation of construction success factors as it applies to PDR efforts to improving equitable community resettlement, and sustainable and resilient structural. Implementing these strategies in PDR projects will assist in the further understanding and success of reconstruction projects, and t in this field of work. Surveying data from projects like the Living Breakwaters shows that investing in natural infrastructure is initially costly but there’s significant return on investment from recreational, tourism, research, educational opportunities and the location becoming self-sustaining.

Latest NASA, Boeing and defense activities. For the use of Geopolymers for space construction.

Terrance Bisnauth,
Saim Wasim,
Julio Martinez
Prof. Akm S Rahman.

Geopolymers or the term geopolymer was developed by Davidovits in 1978 to represent a broad range of material that is characterized by chains or networks of inorganic molecules. That are inorganic cementitious binders produced by polymeric reaction between an aluminosilica rich material and an alkali metal hydroxide/silicate liquid, to form a binding gel, which can be utilized to bond fine and course aggregate to produce concrete. So the purpose of this research is to develop lunar regolith based geopolymer concrete and perform differential shielding studies on various geopolymer formulations to determine if sufficient protection from radiation in space environments can be achieved or satisfied. Because earth-based applications have utilized commonly available materials such as metakaolin, fly ash or even rice husk researchers have reproduced lunar regolith to manufacture geopolymer concrete specimen or lunamer by activating the regolith with alkali liquid. So since geopolymers are highly conductive it has being inhanced furthur for the use in electromagnetic (EMI) shielding likewise electrostatic discharge (ESD) application. This was achieved by adding carbon fibres or carbon black, that is a conductive filler material. And the results of this process indicated that conductive geopolymer matrices are very effective in blocking, electromagnetic waves of frequencies, that is greater than one (1) GHz. Similarly, for us to understand the usage of geopolymer in space construction we need to characterize and organize, the radiation shielding effectiveness of lunar concrete and geopolymer. This would be achieved by using a variety of locally available radiation sources. By constructing geopolymer and lunamer concrete matrices and their ability to shield radiation will be evaluated. The matrices will be prepared by combining fly ash, as the pre-curser, barite ($BaSO_4$) and hematite (Fe_2O_3) as the aggregate and metallic chips, which represents the in earth-based construction practices. In addition to this, Boeing, NASA and defense activities would benefit directly from geopolymers from their funded missions to space by providing radiation shielding that could be used for projecting long-term space-based missions. Because cosmic radiation is the critical obstacle that prevents extended human space exploration. So an innovative solution to this adventure to space is to take advantage of the native shielding properties of the planetary material itself and utilize or create subsurface structures with it.

Lookism: An Examination of Inequality in Appearance within Diversity Practices
Hynndie Ozirus
Prof. Alyssa Dana Adomaitis

During the formation of the United States, much of unification has centered on power and the privileged. This history is often painful to speak on in the communities with people of color. Rhodes (2010) discussed cultural injustices of being unattractive in a society appearance- obsessed with potential for "looks" to influence hiring practices, such as better career options and higher pay. The purpose of this was to investigate the issue of how lookism is defined and studied in the media especially in regards to people of color. The review of literature examines the relationship between income, education, as well as Whiteness. Scholars assist in defining and investigating racial discrimination. The goal of this research is to examine academic literature to understand how racial bias has been defined and evaluated in connection to lookism. "Lookism" is a term to describe appearance discrimination or "the practice of discrimination on the basis of physical appearance in the workplace" (Ghodrati, Joorabchi, & Muati, 2015, p.1). In popular literature, it has been called "beauty prejudice" (Etcoff, 1999, p. 1). The notion that a pleasing appearance results in favorable outcomes (e.g., higher wages, promotions) from others is not necessarily new, as literature on physical attractiveness is rather extensive and The Washington Post Magazine first used the term "lookism" in 1978 (e.g., Ayto, 1999). However, the term "lookism" was first recognized as a form of discrimination by authors of the Oxford English Dictionary and American Heritage Dictionary in 2000 (Ghodrati et al.).

Machine Learning Based Image Processing of Astrophotography Images
Mazen Maghazy
Prof. Farrukh Zia

This research paper discusses basic principles to analyze astrophotography images using machine learning. The study focuses on identifying different types of galaxies in astrophotography images obtained through professional telescopes. There are six types of galaxies; elliptical, spiral, intermediate spiral, barred spiral, irregular, and other. But in this research just two types of galaxies, Elliptical and Spiral, will be studied using machine learning. The main goal is to allow the trained model to identify galaxy images using Keras machine learning library written in Python programming language.

Nanomaterials as Promising Photocatalysts for Degradation of Organic or Inorganic Pollutants in Wastewater

Hafsa Noor, Melissa Menifield,
Prof. Ivana Jovanovic

The growing human population, industrialization and urbanization leads to water scarcity and has become one of the major problems that the world faces. Globally, it is likely that over 80 percent of wastewater is being released into the environment without proper control and decontamination methods. There is an increasing demand for clean and sustainable treatment of organic and inorganic pollutants in wastewater. Photocatalysis has been widely studied for the efficient conversion of solar light energy into useful chemical energy. On the other hand, nanomaterials structural components such as their small size, large surface area, high reactivity, and catalytic properties, make them effective materials for removal of pollutants from wastewater. This study is aimed to investigate the use of nanomaterials as photocatalysts, specifically, metal oxide nanoparticles, titanium dioxide (TiO_2) for degradation of pesticides, pharmaceuticals waste, organic dyes, heavy metals, and industrial waste. TiO_2 has been very promising material due to its high photocatalytic activity, low price, and chemical and photostability. In addition, advantages, disadvantages, and limitation of TiO_2 photocatalyst will be addressed.

Neutron Activation Analysis Of Heavy Elements in the Environment

Le Van La
Prof. Vishwas Joshi

The main focus of the research is: application of neutron activation analysis (NAA) to determine concentration and distribution of heavy metals in environmental samples. Due to human activity and industrialization, heavy metal pollutants have been accumulating in the environment. The heavy metal elements (such as: mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), thallium (Tl), and lead (Pb)) tend to be toxic and their presence in the environment is problematic for plant, animal, and human health. The Neutron activation analysis (NAA) is one of nuclear techniques that has many useful applications such as bio-monitoring, biological analysis, environmental research and materials science. One advantage of this technique is the non-destructive analytical method that is suitable for tracing low concentration, especially rare elements, and heavy metal elements. Using NAA, we can find both qualities and quantities characteristics of a specific element. In other words, this technique helps identify the elements in samples, and their concentrations in the sample. The principle of NAA is that traces of various elements can be identified and measured by analyzing the gamma rays they give off after being irradiated with neutrons. The project is conducted online by using, summarizing, analyzing, and organizing relevant literature, articles, and data that are available via open sources, and the world wide web. This project will focus on application of NAA to detection of high atomic numbers or heavy elements in the environment which could cause health problems for plants, animals, and human beings.

Smart Building Entrance System

Umaira Shah, Lipi Haq, Caroline Rodriguez
Prof. Farruk Zia

Controlling the number of people entering or exiting a building and the number of occupants in a building has become important during the COVID Pandemic. The purpose of this research project is to build a smart building entrance to maintain social distancing when entering a building. This research project involves the development of a smart building entrance control system by using low-cost open-source computer hardware and software components. Upon completion of this project, we are expected to operate an automatic door opening system. Performing this research project will help us learn and analyze how an ultrasonic sensor can be implemented to build a smart building entrance system.

Smart Physics

Jake Postiglione
Prof. Giovanni Ossola

In modern day, we stand on the shoulders of tech giants who developed the devices we use every day. Almost everyone has a smart device, and almost every one of those devices has a powerful array of sensors that can be used in the pursuit of science. Expanding upon educational material developed for phyphox, a free-to-use and open-source platform for physics experiments, we are aiming to identify several experiments currently taught in undergraduate physics labs and create versions of the same experiments that take advantage of the existing phyphox toolbox. To aid in the selection and development of experiments, we outlined several factors associated with how an experiment could be improved by phyphox. The first thing we wanted to look at was whether an experiment could be performed at home, or if extra lab material was needed. Next, we wanted to know if the experiment was already available in phyphox or if custom tools would need to be developed by our team. Lastly, and most nuanced, we needed to learn how the sensor data would be recorded by phyphox. Keeping these factors in mind, our team successfully identified several experiments that could be enhanced by using phyphox and were able to demonstrate how to conduct the experiments with the new tooling involved.

Solar Analysis and Control for High Performance Residental Buildings - Case Study

Tiffany Zhang, Tasfia Amir, Oliver Hadi
Prof. Jihun Jay Kim

Urban Heat Island Effect (UHI) has long been an overlooked phenomenon in our built environment. Higher temperatures due to heat capture are occurring in our cities, along with more frequent and intense heat waves that lead to major health risks. The purpose of this research is to identify the causes, and effective mitigation strategies that are applicable to future building design. Finding effective design principles can help in the creation of better building performance while also reducing our negative impact on the environment. By 2050, cities are expected to house 68 percent of the world's population, resulting in an additional 2.5 billion people in need of shelter. Therefore, it is crucial how we design our built environment moving forward. The research breaks into separate phases that helps us better understand and quantify UHI. During the first phase, we researched the cause and effect of Urban Heat Island and looked at existing mitigation strategies and principles. In the second phase, we identified and investigated an existing building recently erected in Manhattan through various environmental performance analysis of. During the last step, we applied some of the relevant mitigation strategies to create a quantifiable comparative analysis between existing and targeted conditions. Our hypothesis for the quantitative comparison is that by applying mitigation strategies to the building, we can reduce the building's heating and cooling energy use and reduce heat emissions around the building. Controlling solar radiation, heat transfer, and air circulation through architectural design decisions, we can prepare our buildings for the current heat vulnerable areas. We hope that our research and findings will help people understand the negative impact of UHI and encourages design professionals to apply UHI mitigation strategies more widely.

Sub-Saharan African Healthcare Access: Patients Are to Pay Upfront for Surgical Procedures

Olorundamilola Okemeta
Prof. Jeremy Seto

The purpose of this study is to look at the resources and current structure of the healthcare system in certain sub-Saharan African countries such as Kenya. Recognizing these challenges after thorough evaluations and research, points at ways to improve the healthcare system in sub-Saharan African countries. However, the sub-Saharan African health system is globally a major concern. With little or less data that aids in creating awareness and pin-pointing specific areas causing healthcare access to deteriorate, this research poster aims at discussing the major facets of the sub-Saharan African countries, particularly with regard to Kenya's healthcare system. It is well-known that sub-Saharan Africa has the lowest ratings for its patients' well-being and medical management. In addition, the African continent has the poorest health data. Consequently, there are social, economic, as well as socio-economic tasks confronting sub-Saharan African countries. So, what are the financial contributions to low infrastructural sub-Saharan countries in terms of medical attention? While Sub-Saharan Africa is at its crossroads, why are patients still required to pay upfront for surgical procedures?

The Ethical Implications of Corporate Usage of Consumer Information and Its Impact on Database Management

Maribel Matos
Prof. Elizabeth Milonas

With the advent of the digital revolution and the creation of personalized digital spaces, there is now more information readily available about any given person online than there might have ever been in a massively consolidated guide, such as a government registry. The intersection of social media with popular culture has led to people being more online than ever and as a result, their data is more commonplace than ever. This data is incredibly valuable, with it helping launch an entire industry centered around harvesting and reselling it, and helping progress pre-existing ones. Valuable information is often mined from corporations, who already benefit from the implicit power of having their consumers' data in controlled databases. These corporate databases are often used to launch targeted marketing, even leaning into being intrusive, depending on the corporation's personal practices. The purpose of this project is to dive into ways that corporations have misused or abused information and otherwise mishandled it, like the Target Breach that occurred back in 2013 and the ethical implications of corporations having such a large scale hold of personal data. This project will go through research articles regarding massive data breaches that have occurred across private companies across the world and draw conclusions as to why these breaches happened and their ethical implications. At the end of the project, a public assessment will be provided for people that would fall into the definition of your everyday consumer to assess how aware they are of how their information is used and how their feedback on the use of it.

The Impacts of Climate Change, Global Warming

Adam Bajwa
Prof. Ann Ngana

This research project discusses the impacts of Climate Change. Scientists inform us that "Climate change relates to change in temperature and weather patterns." Today, climate change is a global issue, its impacts can be felt almost everywhere in the world! In Africa, in Asia, in Europe and here in the United States of America. The rise of temperature and the change in weather show evidence of climate change and global warming. In the past few years, in the United States of America there have been series of hurricanes that have devastated many areas and claimed lives. For examples: Hurricane Irene (2011), Hurricane Sandy (2012), and Hurricane Ida (2021). The economic costs caused by hurricanes are estimated in billion dollars according to the data provided by economists. As an example, the Wall Street Journal estimated the economic costs of damage and catastrophes caused by Hurricane Ida in billion (31 billion dollars).

The Impacts of COVID 19: Economic Impacts

Ceming Zeng
Prof. Annie Mundeke Ngana

Coronavirus which is also known as Covid-19 by its scientific name is a global pandemic that has brought issues that have been dragging people into panic. The World Health Organization (WHO) and the world leaders of most countries if not all have come together to take immediate actions to respond to the calamities that have been caused by Covid-19. As this pandemic is recovering nowadays, our economic systems were affected tremendously by the impacts of COVID-19. The reports for this research project derived from data collected from online reliable resources. The reports will address subjects pertinent the ways our lives were affected by unprecedented economic crisis. In addition, the reports will discuss the changes that are made to our lives today in comparison to our lives before the outbreak, and eventually present some tentative solutions to the crisis.

The use of avatars by humans in the network environment can be used as an extension of the body to gain real effects

Yuehan Guo
Prof. Laureen Park

The avatar and reality have differences and similarities. Now with new technologies, their boundaries have become blurred. The avatar can be a good tool for people to expand different ways of communication, and increase the functions of embodiment. An example of using avatars is vtuber. People try to use these avatars to get some features they don't have, borrow the power of avatars, or become avatars. These avatars are an extension of the human body in a philosophical sense. In research, borrowing the power of avatars can really work (For example, if a person uses an avatar with three arms, after training, he can really control three hands). There are many types and functions of avatars. Based on the functions of the Internet, there is great freedom in the construction of the avatar. Different people have created or borrowed different avatars, such as monsters or beautiful girls. Vtuber and virtual reality technology make the use of avatars easier and more realistic. For this work, I will use scholarly articles and books to support my conclusion . This list is the citations that I use in my current draft of my paper. New articles may be added on the later work.

Using Random Walks to Determine the Equilibrium Temperature
Jianning Luo
Prof. Ariane Masuda

We consider a thin trapezoidal plate that is insulated from heat. Given that the temperatures around the edges of the plate are known, we aim to determine the temperature at a single interior point using the Monte Carlo technique. We start by dividing the surface of the plate into a certain number of net lines. The points of intersection of these lines are called the mesh points. Starting from an interior mesh point, we define a discrete random walk along the net. We then record the temperature at the boundary mesh point first encountered along this random walk. We obtain an estimate for the temperature of the interior mesh point given by the average value of the boundary temperatures recorded for n random walks. A random walk property guarantees that this average value approaches the desired temperature as n increases without bound.

An Analysis of Comparison-based Sorting Algorithms
Edgar Aponte, Jacob Gomez
Prof. Brad Isaacson

Sorting algorithms put elements of a list into an order (e.g., numerical, alphabetical). Sorting is an important problem because a nontrivial percentage of all computing resources are devoted to sorting all kinds of lists. For our project, we implemented 24 comparison-based sorting algorithms from pseudocode and compared them. The algorithms all have their advantages and disadvantages as well as their unique features. We found that Introspective sort (which is a modified version of Quicksort) and Timsort (which is a modified version of Merge sort) were the most efficient.

Comparative Analysis of 3D Printed Denture Resins with Traditional Denture
Caleb Beckwith, Aneeza Hussain
Prof. Gaffar Gailani

The aim of this experiment was to evaluate and identify compression strength between traditionally manufactured acrylic dentures and additive manufacturing resin dentures. Specifically, the dentures produced by Uhler Dental's Reveal line were compared against samples produced on the Formlabs Form 2 SLA, Stereolithography, 3D printer using their Denture Teeth A2 resin to test compression strength to assure they are compatible with the occlusal forces in the oral cavity. Using the ZwickRoell tensile testing machine, it appeared that the acrylic dentures were half as strong as the resin dentures. Then we went ahead to and did a comparative analysis under a microscope to see the micro-properties such as the isotropic uniformity in the resin, layer adhesion, and the microstructure of the two different materials; in general, these two materials appear that resin denture teeth have lesser mean percent porosity values than the acrylic denture teeth. After doing both the compression test and a micro level analysis under the microscope we have determined that the resin denture has the proper strengths and properties to handle the occlusal forces in a human oral cavity.

Direction for Protection: Multimedia Messaging to Address Racial Disparities

Florence F. Litchmore-Smith
Prof. David Lee

The importance and relevance of my Research measure multimedia and technology to decrease pandemic and improve health. The data collected were computerized data from historical pandemic-records; past scientific analysis (economic, race, vaccine and social distance); and new scientific analysis (economic, race, face mask, vaccine, washing hands, and social distances) as cures. The continued research in scientific analysis revised vaccines used to decrease death in pandemics. COVID-2019 pandemic, Direction for Protection uses: Vaccine, mask, washing of hands, social distance, and economic measures to increase health and decrease death. Continued scientific studies will improve factors to decrease pandemics.

Mechanical Characterization of Nano-material Doped Polydimethylsiloxane (PDMS)

YeHun Jeong
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. Similiar 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.

Understanding MR Signal and Noise at Low and High Fields for Weak and Strongly Paramagnetic Substances

Analia Basilicata; Alexandra Solano; Jian Wang; Bleidis Buitrago
Profs. Ubhendra Sarkar, Lazar Fleysher, Duke Shereen

We are exploring the paramagnetic effects of common radiological contrasts on various model biological tissues, in particular, on fresh bananas, apples and sweet potatoes that can absorb such contrast media at concentrations similar to in-vivo applications. The contrasts include Omnipaque, Isoview (iodinated CT contrasts) as well as Gadavist, Eovist and Dotarem (macrocyclic MR contrasts), all of which have organic chelating groups to protect iodine or Gadolinium ions from dispersing in our carbohydrate matrix. We used low as well as high MR systems (1.5 and 3T from two different vendors, General Electric and Siemens) to compare the paramagnetic roles of these contrasts toward spin relaxation behavior in the bioenvironment of native paramagnetic biometals, primarily iron and manganese in these mineral-rich models. Multi-center, multi-vendor equipment tend to differ in signal and image noise characteristics and require standardization of hardware performance for identical MR software sequences. Hence our protocols have been standardized with baseline comparisons in all MR systems. Relaxation results when radiological contrasts compete with native biometals should be more useful to understand the benefits and potential risks of such contrast agents on human tissues.