



NEW YORK CITY COLLEGE OF TECHNOLOGY

CITY TECH

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Home Automation for Physically Challenged Using Arduino

Afroza Aktar

Prof. Farrukh Zia

The main purpose of our project is to make a home automation where multiple home appliance can be controlled using phone or any electronic device. In this system there is two lights, one fan, one automated garage door. Two LEDs are connected in two room and dc motor in the other room. And servo motor was used for garage door. All those things are operated using web application. For this automated system both hardware and software are needed. Main hardware is Arduino uno so for coding part Arduino ide is used. And Blynk app was used for controlling everything through device. Controlling light, fan and door using phone is very useful for people who cannot move easily and who are very old aged. Some extra feature might be added to this system so that it can be more useful to physically challenged people. All knowledge that was learnt from college courses has been used. Like how to use Arduino and how to program it. By the end of our project, a fully working home automation system which can easily be controlled using phone is expected to have. So far, LED and dc motor part are finished which are working fine.

A Computer Vision-based Approach to Improve Urban Building Façade Inspections in Cities

Alexis Torres

Profs. Semiha Ergan and Beyza Kiper

The maintenance and safety of building façades are paramount to ensure safety. Over time, these façades are prone to developing defects, which can pose risks to public safety. Traditional methods of façade inspection are largely manual and depend on the inspector's level of expertise, which can result in undiscovered defects that can lead to injuries or fatalities. This process, while necessary, can be time-consuming and subject to human error, leading to potential oversight of critical defects. In response to these challenges, there is a growing interest in the application of artificial intelligence in the field of façade inspection. This project delves into utilizing AI, particularly deep learning, to identify defects in building façades. However, to achieve high performance in deep learning, the model needs to acquire a massive database of images containing labeled defects on façades. Unfortunately, collecting and labeling large quantities of images of façade defects can be costly and time-consuming. To address this, we employed GANs in this project to solve the data scarcity challenge. Their ability to generate realistic, synthetic images of facade defects provides a means to augment the existing dataset. By creating these synthetic images, GANs effectively expand the range and volume of training data available for the DL model. To ensure the quality and

realism of these synthetic images, we assess them using the Fréchet Inception Distance (FID), a metric designed to evaluate the similarity between generated images and real images, thereby validating the efficacy of our data augmentation approach. With the enhanced dataset, enriched by GAN-generated images, we will train a more robust and accurate DL model capable of reliably identifying a wide array of defects, ultimately contributing to public safety.

City Tech Fun Facts Finder: An Augmented Reality Experience

Alyssa Duran, Bryan Estevez, Cassidy Crespo, Erickson Diaz, Yiyi Zhong
Prof. Jenna Spevack, Prof. Genevieve Hitchings, Prof. Anne Leonhardt

The purpose of this research project is to introduce new students to important campus locations and bring more unity between the different majors at City Tech by creating an Augmented Reality(AR) scavenger hunt. This will allow students to have a better understanding of the variety of buildings and services at City Tech. AR is an emerging medium that superimposes digital content over a user's view of the real world. In our research, we will utilize the AR application Membit TM, "a geolocate augmented reality (AR) storytelling platform," developed and co-founded by Jay Van Buren. We will explore the user experience, focusing on how AR interactions can help to engage people with real-life physical locations.

Exploring the Link: A Review of Obesity and Nonalcoholic Fatty Liver Disease

Jannatul Barsha, Mariam Otero, Ju Young Park, Rosa Quinonez & Amal Hizam
Prof. Sanjoy Chakraborty

Obesity, characterized by excessive fat accumulation due to an energy surplus, is a significant health concern in America, linked to various ailments like cardiovascular disease, type II diabetes, stroke, and hypertension. Currently, around 27% of Americans are obese. Additionally, Nonalcoholic Fatty Liver Disease (NAFLD), affects a vast global populace, and has strong ties to obesity, as they exhibit similar features and co-morbidities. To counteract both conditions, it's important to focus on two main things: exercise and diet. Exercise contributes to calorie burn, weight reduction, and enhanced metabolic well-being. Concurrently, a balanced diet controls food consumption and ensures nutritional equilibrium. This integrated strategy diminishes liver fat buildup and improves overall health. For extreme cases, while medication or surgery might be warranted, diet and exercise are vital for prolonged success in handling NAFLD and obesity. This study aims to examine recent research addressing obesity and NAFLD together.

The Effects of Cinnamon Spice Rum on Gene Expression in *Tetrahymena thermophila*

Ana Muy, Jose Ramon Marte Perez
Prof. Ralph Alcendor

The purpose of this study was to investigate the effects of cinnamon spice rum (CSR) on the protozoan *Tetrahymena thermophila*, a type of eukaryotic organism found in freshwater. This eukaryote shares similarities with human cells and is utilized as an alternative to human and animal tissue cells in the study of molecular biology and genetics. Rum, a type of distilled alcohol derived from fermented sugarcane or molasses, is consumed worldwide. A common practice among consumers is to drink alcohol with spices to add flavor. Cinnamon, the popular name of *Cinnamomum zeylanicum*, is one of these widely used spices as a household ingredient for foods and drinks. Cinnamaldehyde, the active ingredients in cinnamon, is often attributed to claims of cinnamon having antimicrobial, antioxidant, and anti-inflammatory properties. While the use of cinnamon prepared in ethanol and water has been extensively studied, the effects of CSR, a commonly consumed form of rum, have not been examined. We hypothesized that CSR should lead to increased levels of antioxidant genes. CSR was prepared by adding 10g of powdered cinnamon to 50 mL of Soca rum. *Tetrahymena thermophila* cells were then exposed to different volumes of CSR for different time points. MTT assay showed cells survived in 50 – 200 μ L of CSR for up to two weeks, but all died when exposed to 300 μ L of CSR within one hour. On the other hand, cells exposed to 300 – 400 μ L of Soca rum survived for up to two weeks. Gene expression analysis showed various antioxidant genes, including manganese superoxide dismutase (MnSOD), NADPH oxidase (NOX), and thioredoxin (TRX), were differentially expressed over a 24-hour period. These results suggest that CSR may have some benefits at low volumes or concentrations but becomes toxic to these cells at volumes of 300 μ L and above.

Urban Tech: A Deep Energy Retrofit

Kevin Hernandez, Andrew Aucanzhala, Dahrel Cadore
Prof. Kenneth Conzelmann

According to the Federal EPA (Environmental Protection Agency) U.S. buildings produce about 40% of all greenhouse gases which include carbon dioxide (CO₂) e.g. burning of fossil fuels, and methane e.g. factory livestock farms and landfill. Locally, the NYC Department of Buildings (DOB), Sustainable Buildings initiative, states that buildings in NYC account for about 2/3 of greenhouse gas emissions. These harmful gases are warming the planet and adding to Global Climate Disruption, commonly known as Climate Change, but we see this phenomenon as a human-caused disruption because

climate change is a natural part of Earth's life cycle. For this reason, Local Law 97 was created with a goal of carbon neutrality by 2050, which aims to eliminate over the next few decades the burning of all fossil fuels relative to our building stock. As of today, most buildings in New York City are drastically energy inefficient. This includes lack of thermal insulation of any kind in their exterior shells. Our research project will focus on a standard white brick, 17 story apartment structure, built in 1962 of construction typical of this post war period. We will research federal, state and local codes, investigate the best construction methods and materials according to the construction manufacturing industries, and propose possible solutions and a master plan for a major upgrade of the building to meet current energy efficiency standards. Our broader goal is to create a blueprint/template for how similar buildings and the city can benefit from a deep energy retrofit.

Green Roof Media Parametric Study: Enhancing Highway Pavement Strength through Repurposed Fiber Modification of Mechanical and Hydrogeological Soil Properties

Yehya Elfgeeh, Calvin Walters Jr., & Angelis Almanzar
Prof. Ivan L. Guzman

Green roof farms have played a pivotal role in extending the advantages of suburban living to urban environments, offering energy efficiency benefits by reducing the need for excessive heating and cooling in commercial buildings. However, integrating green roof infrastructure, growing media, and vegetation poses a challenge due to the limited load capacity of buildings. To address this, a promising approach involves incorporating repurposed textiles into lightweight engineered soil, ensuring that the additional components maintain a minimal weight. This innovative technique aims to modify the hydraulic properties of the soil without compromising structural integrity. The ongoing project investigates the impact of adding repurposed textiles (with an aspect ratio of 4:1) to lightweight engineered soil, documenting changes in unit weight, water content, and hydraulic conductivity. This study builds upon prior findings, which demonstrated significant alterations in hydrogeological properties when incorporating textile fabric (3% by weight at an aspect ratio of 1:1). Functioning as reinforcement, these fibers enhance the soil's strength, stability, and structural integrity—especially advantageous in erosion-prone areas, regions susceptible to landslides, or locations requiring heightened load-bearing capacity. The outcomes of this parametric study may offer crucial insights, potentially opening avenues for practical implementation in strengthening highway pavements.

Investigating the Success Factors of Transportation Network Construction Project in Post Disaster Rebuilding Efforts in Islamorada

Anissa Ramadini

Prof. Anne Marie Sowder

The infrastructure system is very significant and interdependent. Disruptions in one system can have a significant influence on social life, especially systems that provide connections across space, like transportation and communication networks. For example, the collapse of a main bridge can cause major traffic problems and isolate people altogether, obstruct the evacuation process, and supply chain of materials and goods, and finally delay economic recovery in the long term. The damage to the transportation infrastructure system is usually caused by natural catastrophes and post-disaster rebuilding is commonly done to reconstruct it. Post-disaster rebuilding (PDR) is a series of actions taken following a disaster to reconstruct damaged structures, like buildings and infrastructure, through new construction or renovation projects. Since this is an extremely demanding and difficult process, it is crucial that these complex activities are carefully planned. Following a major disaster, reconstruction efforts without a comprehensive and long-term recovery plan will delay the return of community stability. The primary objective of this research is to examine the problems and obstacles and investigate the success factors of transportation network construction project in relation to postdisaster rebuilding. Analyze case studies to discover which crucial success elements have the most impact on preventing specific project failures. This paper examines the PDR response to the 1935 Labor Day Hurricane that devastated Islamorada in Florida's Upper Keys, leveling structures with 200 mph winds, killing at least 400 people, and destroying the Florida East Coast railroad that connected Islamorada to the Florida peninsula. The PDR issues from this case study are examined in light of the project success themes found in the literature review.

Does Abnormal Biometal Distribution Cause Protein Misfolding Affecting Neuronal Communication and Neurodegeneration: Modeling & Experimental Correlation

Jakiya Akter, Guadalupe Gonzalez, Ishaak Olougodi, Achlyn Genao, Anjalee Rabbani

Prof. Subhendra Sarkar

Heavy metals have been implicated to impede protein folding and promote protein aggregation leading to perhaps protein misfolding disorders including Alzheimer's. High metal absorption in the neurological system is particularly harmful due to it causing oxidative stress, harm mitochondrial function, and interfere with the operation of various enzymes. Environmental toxins may expedite this by chelating essential Biominerals and thus breaking down the functional secondary and tertiary structure of proteins making them non-functional aggregates. The goal of this research is to see

how such toxins expedite water of hydration to redistribute and break down the macromolecular structures. This is being tested by x-ray machine since harder tissue generates greater x-ray absorption and scatter as opposed to fresh fruit models. Currently in our research we're working on separating heavy metals such as iron and copper from light metals like potassium and calcium. For instance in our fruit models and in the brain all of these 4 metals are very important and their relative abundance is usually $K > Ca > Fe > Cu$. From our fruit models such as apples and sweet potatoes it was noted that they lose about 50 percent water over one month. We are learning the X-ray appearance for these 4 metals and the changes in distribution over time, primarily due to aging and heat stress. By doing chemical modeling it will help understand the aggregation of macromolecules in Alzheimer's (proteins in particular). We plan to introduce toxic agents like Gadolinium and Iodine that may act as chelators and selectively chelate some of these metals. As we continue this research we will fulfill the main goal as stated at the beginning of the abstract over the course of 2-3 semesters.

Colorful Future

Antonio Forbes

Prof. Elizabeth Parks

We all have favorite colors and we like to wear specific ones. However, did you know that colors and human emotions have a unique relationship? It's so subtle, we barely realize but it's been a thing since we were children, when brains are very color stimulated. Colors, for some reason, are very interesting and even more interesting to children to the point where it pulls their attention away from what they were doing before. Have you ever realized children will sit and play with colors for hours? because something about them makes them feel a certain way. This is the relation between color and emotion, each one is associated with a certain emotion. Through thorough research such as literature review and photograph analysis, I've come to the conclusion that by integrating specific colors in architecture and interior design in schools, we can boost the morale and performance of children worldwide.

Can Assistive Technology Help Solve Mobility and Congestion Challenges?

Ariana Sampson, Salma Rivera Ruiz

Prof. Farrukh Zia

The C2Smarter Center at NYU and City Tech are working together on this research project that focuses on "equitably reducing congestion" in transportation systems through study and action. The purpose of this specific research project is to investigate the relationship between congestion and the use of transportation networks by

individuals with a range of physical limitations. The project will specifically focus on "Big Data and Planning for Smart Cities." Background study will be done as part of this project's first phase to collect information on how persons with disabilities use transportation networks and the difficulties they encounter. We will use online resources like the Department of Transportation and relevant websites to collect data and information. Similar research projects and earlier studies on the usage of assistive technology related to transportation may also provide information and data. The research findings will be put to use in order to suggest assistive technology-based solutions that would help individuals with impairments get past the obstacles when using the transportation networks. The information and data acquired to identify answers to the study challenge are summarized and given as a research poster as the final deliverables.

Risk of Delay in Construction Due to High Wind

Arnaldo Valenzuela

Prof. Samaneh Gholitabar

Many Construction projects fail to meet their agreed completion date, either by lateness which affects all stakeholders or by the most common causes of construction delay being weather conditions. On-time delivery is very important in construction projects. In this study we are looking into the impact of high wind on construction. The plan is to use historical wind data as well as identifying wind level regulations to halt construction activities. The regulation data will be for a few major cities in the US and around the world. The cities considered for this study are New York, Chicago, London, and Montreal. We are looking to see the impact of wind level regulations on construction delays. The first step is to gather wind regulation data from the building departments of each city, such as Chicago obliging by the occupational safety and health administration (OSHA) Standards of a 40 Mph construction to halt, New York having a 20- 30 mph exceeding crane usage to halt according to the DOB, in addition to Montreal & London following The Health and Safety Executive (HSE) Standards demonstrating 30 mph wind being a hazard for construction continuity . Where then the use of these wind data in those cities can be used to estimate the percentage of delay added to the construction schedule due to high wind level. The General information collected would demonstrate how weather conditions can lead to a decrease of Construction productivity, leading to prevention of work resulting to project completion delay. Overall, the Data collected gives the general contractor a determination of constructing productivity in addition to understanding what's to be expected for project completion.

Employment Restriction and Psychosocial Distress

Brian Flores

Dr. Smita E Dewan

Many individuals immigrate to the United States for working or school opportunities and with different visas that there is to enter the United States the visa has some type of restriction. One type of visa that will prevent Individuals from working in the United States is the H4 visa. The H4 visa holders are mostly women from India who are here based on their husbands holding an H-1B Visa. The H4 visa Is for spouses of certain H-1B visa holders. No restriction for the H4 visa is that the individual with the visa is unable to work in the United States and must depend on their spouse. The issue with the spouses is that they are susceptible to violence physical, and mental health deterioration, and a lack of economic opportunity. This has identified that many women have many health issues and are prone to depression. With this study, it has been discovered that an H4 is not only able to succeed but has struggled in the United States. As a result, it was shown that many H4 women visa holder not only has issues with their well-being in general but also the lack of growth in the United States. These individuals were prone to violence as they were, in many cases unable to provide an income and were dependent on their male counterparts. H-1B visa holders can work legally in the United States it is not for their spouses and in that case, many unfortunates do develop mental health issues like depression after their well-being deteriorates. Life satisfaction also decreases as many do not see that they can improve.

ARCscholars Fall 2023: Architectural Solutions To A Better Quality Of Life For The NYCHA Queensbridge Houses Community

Sofia Bilbao, Erickson Diaz, Kevin Valencia, Cheryah Wilmot, Elijah Walker, Kaylynn Daoud

Professor Naomi Langer-Voss

We are a diverse group of scholars ranging in age, gender, and background from all over New York City. We share a common interest in solving our urban challenges through studying and proposing improvements to the built environment. From professors at CUNY City Tech to NYCHA Design and implementation specialists and NYCHA residents, we encompass a group of scholars united by this common purpose. The work is fostered by architecture students from the City Tech architecture department and Parsons School of Design. We have developed an architectural and urban proposal that will enhance the overall quality and design of our case study development: the NYCHA Queensbridge houses located in Queens, NY. Research informed us that our proposal should address the overall campus and provide specific

design interventions. Students were divided into four groups, based on their interests, and focused on four main categories of development: Live, Work, Play, and Learn. These areas of focus encapsulate a pathway towards an improved quality of life for the residents of the Queensbridge Housing Development. The Live Team design aims to transform the daily working lives of Queensbridge residents by changing a common point residents will encounter: the entrance. The goal of the Learn Team is to provide multigenerational educational opportunities for Queensbridge residents. The goal of the Work Team is to create architectural spaces that residents can use to generate income and move toward self-sufficiency. The goal of the play team is to transform the underutilized parks in the area and maximize the potential by increasing intergenerational activity.

Programming and Control of a ROS-Compatible Mobile Robot

Christian Rosa

Prof. Lili Ma

Simultaneous Localization and Mapping (SLAM). SLAM is the method of constructing a map by estimating current location in an arbitrary space. There are other SLAM variants, including vSLAM, which is the type used by most robot vacuums. In vSLAM cameras are used for pose estimation and map reconstruction, because this method uses lighter equipment and is lower in cost it is the preferred option for companies. In our study, we employed SLAM within the Turtlebot3, which utilizes LiDAR to map spaces. LiDAR is an approach to remote sensing that measures distance using light in the form of a pulsed laser. When compared to vSLAM, LiDAR can scan complicated environments more accurately and effectively. The focus of our work is Simultaneous Localization and Mapping (SLAM) with the Turtlebot3, utilizing LiDAR for precise mapping. While addressing basic teleoperation and troubleshooting, our overarching objective is to automate these tasks through machine learning. Despite challenges with deprecated ROS packages, we've achieved teleoperation and SLAM capabilities, and are actively developing a machine learning-driven approach for future drives.

Secondary Electrons and Compton X-ray Generation in Solid and Heated Biological Sample in the Presence of Radiologic Contrast Media

Vanessa Robinson, Fatima Ahmed, and Daler Djuraev

Prof. Subhendra Sarkar and Evans Lespinasse

Our goal is identification of secondary electrons and Compton photons when externally infused radiological contrast from iodine and gadolinium interferes with calcium and iron in tissues. This could help develop next generation of x-ray methods as well as

mechanistic understanding of toxic effects of radiology contrast materials on living tissue and agriculture. Changes in tissue minerals over time, aging and heat stress are manipulated in our experiments by infusing imaging contrast agents that consist of large atoms like Gadolinium and Iodine. These have chelation properties to alter electron distribution of proteins and carbohydrates of biological matrix. Our experiments try to map such changes by secondary x ray detection and related modeling. We compare the distribution of minerals within the core and cortex of 1 month old Gala apple to four-month-old Gala apples. We do this by imaging these apples using rhodium and silver filters and gradually mapping out the potential spread of minerals. It has been found that is a slight spread of minerals. Within the core of the apples, there has been an approximate 20% change versus within the cortex of the apples, there has been approximately a 24-26% change. Our preliminary data shows high keV x-rays generates more secondary photons in the mineral-rich areas in the apple samples than in tissue regions with a mineral-poor matrix. Although tissue contrast is supposed to be lower at a higher keV, the contrast also depends on existence of heavy metals such as iron. So, the usual lower tissue contrast at a higher keV can actually be manipulated to detect and differentiate between heavy and light minerals in the core and cortex of these Gala apples. One experience shows 36 keV is preferred to map the core of Gala apples have iron and the cortex has potassium while the low energy of 24 keV x-rays cannot differentiate between iron and potassium.

The Processing Method Influence on the Properties of Heat-Activated Denture Base

Kiana Valdez & Dan Hong Chen

Prof. Laura Andreescu

Complete Dentures, designed to replace all missing natural teeth, play a crucial role in addressing the dental needs of a growing population. Recent statistics shows that in 2020 there were approximately 40.99 million Americans fully edentulous and wearing dentures. As the need for affordable complete dentures is expected to soar, the current prices for dentures therefore, it is imperative for dental technicians to research different factors affecting their retention rates. Our investigation concentrates on the restorative aspect, emphasizing what dental technicians can do to enhance denture retention. From a clinical perspective, key components influencing retention include anatomical landmarks, but because of patient's bone reabsorption the dentures' stability decreases and the likelihood of denture displacement is greater. In a restorative context, dental technicians can add retention factors such as post-pal seal and extending borders into the sulcus. For our project, the chosen retention factor is the density of the denture acrylic, by comparing two maxillary dentures fabricated using the same heat-cure dental denture acrylic and processing method. The study involves measuring the density of both dentures and assessing the duration or movements

required for each denture to be dislodged. As students of the Restorative Dentistry program at City Tech, we are engaged to find new solutions to an old problem, leading to increasing the function and longevity of the prostheses and reducing costs, both factors benefiting the dental patients. Furthermore, this project is based on ethical responsibilities of our profession towards promoting the dental patients' health and well-being.

Studying GAMA Galaxies in Relation to the Filaments of the Cosmic Web

Daniel Gallego, Lianys Feliciano, Ena Chia

Prof. Charlotte Welker

The filaments of the cosmic web play a vital role in the evolution of galaxies and their hydrodynamic processes. Building on previous work, we utilize a topology based structure extractor program, DisPerSE, to create filaments from observational data obtained from the Galaxy and Mass Assembly survey. We attempt to create a large data set containing galaxies as well as filament properties. Using this data set we conduct a statistical analysis of important features and correct for strong correlations to mass in the parameters. Furthermore, we try to implement an autoencoder algorithm to reduce the dimensionality of a large data set and make predictions about filament characteristics.

Probabilistic Application in Machine Learning for Real Estate Pricing Analysis

Daohong Qiu

Prof. Satyanand Singh

Explore the integration of probability application in machine learning for the analysis and predict real estate prices. Utilizing R for data analysis, the research primarily focuses on estimating price ranges based on specified house characteristics. By exploring correlations between house features and house prices, including location, size, year built, or amenities, sourced from extensive housing market databases. Initial data processing involves rigorous cleaning and normalization to ensure quality and consistency. Through data analysis, key predictive variables are identified, laying the groundwork for model development. The analysis process will adopt Bayesian Linear Regression and Gaussian Process Regression, capitalizing on their ability to manage uncertainties inherent in real estate pricing. Affirming probabilistic models in handling real estate market complexities. The research not only underscores the growing trend in applying probabilistic approaches to property valuation but also demonstrates their practical utility in generating nuanced market insights. This research contributes to the

evolving field of applied machine learning in real estate, offering an example of predictive analytic.

Mapping the Theaters of Brooklyn's Past: New Additions to a GIS Project

Elena Shefsky

Prof. Christopher Swift

Despite its rich performance culture, Brooklyn remains underrepresented in theater history, eclipsed in fame by the well-known theaters of Manhattan. One of the most populous areas in America, Brooklyn has been an artistic home to actors, playwrights, directors, and impresarios for centuries. That said, there is a dearth of accessible information and scholarship on Brooklyn theaters. My objective was to update an ongoing mapping project, The City Performs, to include information and images of theater buildings from Brooklyn. The project is an interactive, open-source digital map that uses ArcGIS software to georeference data about NYC theaters. I collected data in library archives, unpublished dissertations, and internet databases, using multiple sources to assemble and verify all the necessary information. I found that Brooklyn theaters were a mainstay of affordable, popular entertainment, and many iconic acts and performers had their genesis in the borough. With these new additions in mind, The City Performs continues to be a valuable resource to theater scholars, educators, and anyone curious about New York history.

Recently Discovered Exotic Hadrons

Elizabeth Brandwein

Prof. Boris Gelman

One of the four fundamental forces in nature is the strong nuclear force. Subatomic particles called hadrons that interact via such force are bound systems of quarks and antiquarks, a particular type of elementary particle making up the Standard Model of particle physics. Ordinary hadrons contain either three quarks or a quark-antiquark pair. In the last few decades, hadrons that cannot be described as ordinary three-quark or quark-antiquark combinations have been discovered in several high-energy particle collisions. In my research, I will focus on one such non-conventional or "exotic" hadron recently observed by LHCb collaboration at CERN created in high-energy proton-proton collisions. This new hadron, called a doubly-charmed tetraquark (T_c) is composed of two charm quarks (c), an anti-up quark (\bar{u}), and an anti-down quark (\bar{d}). Due to the properties of the strong nuclear force described by quantum chromodynamics (QCD) each charm quark can pair with one of the anti-quarks as this pairing satisfies the requirement for color neutrality. In this case, the properties of the

doubly-charmed tetraquark (T_c) can be modeled as arising from the interaction between a D^+ and D^* hadrons with the quark contents of cd and cu respectively. The interaction between these two hadrons inside the T_c hadron can be described as giving rise to a molecular-like hadronic system in analogy to the diatomic molecules, such as HCl, bound by shared electrons. In the case of the doubly-charmed tetraquark, the residual strong force holds the two hadrons together to form a weakly bound di-hadron system, as opposed to four separate quarks in an area of space as previously thought. This model of the T_c exotic hadron serves as a non-perturbative model, allowing for a more accurate depiction compared to a time dependent Feynman diagram.

Predicting Forest Fires: An Integrated Approach Using Machine Learning and Environmental Data

Jason Lin, Tanvir Rahman, Ethan Pruzhansky
Prof. Patrick Slattery

Modern methods of detection and prevention are required due to the increasing frequency and intensity of forest fires following global warming. In order to improve the forecast power of forest fires, this research study proposes an integrated strategy that makes use of state-of-the-art machine learning (ML) methods along with significant environmental data. Our research will prepare to create a reliable forest fire prediction model by focusing on regions affected by recent catastrophic occurrences, such as the Maui wildfires and the spike in incidences in California and Canada. The data from the project will be incorporated into ML systems which will anticipate and be able to prevent forest fires using historical data and current environmental conditions. A complete dataset is created by integrating meteorological, geographical, and historical fire data using a multidisciplinary process. The ML algorithms will be trained and validated using this dataset, which takes into account variables like temperature, humidity, wind speed, and previous fire incidents. The results of this study should have a major impact on adaptive forest management and early warning systems. We want to make it easier to implement more sensible plans for lessening the effects of forest fires on ecosystems and populations by providing information about high-risk regions and improving prediction models.

Data Science & Ethics of Private Information

Faria Promi
Prof. Elizabeth Milonas

This research focuses on the moral questions linked to modern data technologies like Big Data and the Internet of Things. These technologies can be, but they are also about

privacy and keeping data secure. We've looked at what experts say about these concerns and discovered that most agree we need to safeguard people's privacy and data. Our research encourages everyone to use these technologies, finding a balance between technological progress and responsible, ethical behavior. This way, we can enjoy the benefits of these technologies while also respecting individuals' privacy and data rights. The study reviews what experts have said about these concerns and highlights the need to balance technology with ethics. It also emphasizes the importance of laws and awareness to ensure responsible and ethical use of these technologies. The goal is to inform and encourage ethical behavior in the digital age.

Assessing the Levels of Autoimmune IgM Antibodies Against dsDNA and its Relationship with Clinical Severity in *P. vivax* Malaria Patients

Fariha Choudhury

Prof. Juan Rivera-Correa

Malaria is a protozoan mosquito-borne disease and one of the top three infectious diseases being a great cause of great morbidity and mortality around the world. Malaria caused by *Plasmodium vivax* accounts for the majority of malaria cases around the world, including in South American countries like Colombia. Malaria ranges in severity of symptoms, ranging from asymptomatic, uncomplicated, and complicated malaria, with the latter one having the highest risk of mortality. The Rivera-Correa lab studies the hypothesis that inadequate immune responses, particularly mediated by autoantibodies (antibodies that target our own body and tissues), promote malaria pathology. His previous publications established that there were higher levels of autoimmune IgG antibodies, including against dsDNA, in complicated over uncomplicated *P. vivax* malaria Colombian patients. The goal of this project is to further elucidate the role of other autoimmune antibody isotypes against dsDNA in this cohort of patients. Specifically, it aimed to detect and quantify IgM against double-stranded DNA (dsDNA). IgM, or Immunoglobulin M, is a type of antibody that plays a crucial role in the immune system's response to infections, being the first antibody made in all immune responses and having functional roles such as complement fixation leading to lysis of cells. It is particularly effective at binding to and neutralizing antigens (foreign substances) in the early stages of an infection. The hypothesis suggests varying levels of autoimmune anti-dsDNA IgM antibodies in patients could signal differences in the immune response between uncomplicated and complicated malaria cases. Levels of autoimmune anti-dsDNA IgM antibodies were measured in samples of patients with different severities of malaria (uncomplicated and complicated cases) and compared to endemic controls who did not have the infection at that time. Indirect Enzyme-Linked Immunosorbent Assay (ELISA) was used as a serological technique to detect the antibodies against dsDNA. The findings show

various levels of autoimmune anti-dsDNA IgM antibodies in uncomplicated and complicated patient samples. The findings of this work could have implications for the development of new diagnostic tools that can aid the prediction of malaria severity.

Advancement of the Measurement of the Indoor Environment in Building Entrance

Ferasuddin Siddiqui and Abdellah Gessra

Prof. Daeho Kang

Natural airflows through large openings in buildings such as doors and windows have a large impact in building energy consumption. It also significantly affects the indoor environmental quality (IEQ). Many studies investigated how to estimate infiltration by field measurements, analytical analysis and computational analysis. Most studies focused on a few factors as the quantification of infiltration is very complicated. The impact of infiltration on building energy consumption and the IEQ needs to be better understood. This study is to advance the method of field measurement on infiltration. Literature review will be done to find the most practical method. Once main factors are identified, a field measurement plan will be developed. A pilot measurement will be done to establish a detailed plan.

Universal Design

Husnain Khan

Prof. Bruce Hannah

Universal design is important because it helps with diverse disabilities. What is universal design and why do we need it? People design buildings, products or environments to make them accessible to people in need. Also, it minimizes the need for assistive technology, results in products compatible with assistive technology, and makes products more usable by everyone. Where can universal design be found? It's practical everywhere you go, such as public transport, parks, shops and services, and sidewalks. Universal design is affected by several categories: people with disabilities, who are perhaps the most visible group affected by universal design, and parents with young children. Universal design can greatly benefit parents with strollers or young children. Wider sidewalks, curb cuts, family restrooms, and easily accessible amenities cater to their needs. In conclusion, basically everyone benefits from it. Universal design doesn't just benefit specific groups, it can enhance convenience and usability for everyone. For example, automatic doors, and intuitive technology interfaces make environments more user-friendly for all individuals globally.

Hacking Learning and Motivation: Gamifying Education in a Post Covid-19 World

Irina Chernyavskiy

Prof. Jonas Reitz

With the Covid 19 pandemic forcing people to work and go to school remotely, engagement and motivation caused by the Covid 19 pandemic. Education is no exception to this rule; the impacts of Covid-19 are widely felt by the school communities. There has been at least 6 months of learning loss in math if not entire grade levels. Gamification can be part of the solution to low engagement and motivation of students in math classes. There are two levels of gamification in classrooms; those are shallow and deep gamification. With shallow gamification the setup for a lesson is mostly regular except with a few extra elements like different ways to group students and awarding of challenges, rewards and sometimes even “quests”. There is also deep gamification where how learning is taking place is a significantly different lesson set up that is often done through integrating more technology into the classroom. I performed a literature review and created a lesson plan and gamified activity on parabola, focus and directrix for a high school Algebra II class. The effects of gamification can also be looked at for learning progress of special education students post Covid-19. Gamification can provide students with motivation and deeper levels of learning than a regular class.

Unmasking Shadows: Unraveling Crime Patterns in New York City's Boroughs

Jack Hachicho and Muhammad Hassan Butt

Prof. Marcos Pinto

New York City's crime dynamics have been on the rise for decades. Brooklyn and The Bronx have been disproportionately affected. This research aims to understand the crime landscape in these boroughs to formulate effective policies. Using crime data from official sources, statistical analyses, and data visualizations, the study identifies patterns and trends. The data encompasses over 400,000 reported incidents collected over the past 10 years, meticulously categorized by borough, crime type, and demographic information. Brooklyn has the highest overall crime rate, followed by The Bronx. Most shooting victims are Black. This highlights the need for holistic community programs to address systemic issues contributing to violence. Notably, many minor victims emerge, particularly in The Bronx and Brooklyn. Boroughs with higher crime rates require increased funding for enhanced security measures, including strategic law enforcement initiatives, community policing, and technology-based solutions to deter criminal activities. Investing in education is crucial for breaking the cycle of crime. Allocating more resources to education budgets in highly impacted boroughs can

contribute to positive long-term changes in community dynamics and socioeconomic conditions.

Climate Change Impact on Bridge Scour Risk in NY State

Muhammad Hassan Butt

Prof. Samaneh Gholitaber

Bridge scour is the primary cause of bridge failure in the United States. The risk of scour related failures increases in the wake of severe storms. Enhancing the resiliency of the transportation network and its ability to withstand future major weather events is largely dependent on the efficacy of bridge scour mitigation programs. In this study, a risk analysis model is going to be applied using a geographic information system (GIS) platform. The intent is to evaluate the impact of climate change on bridge scour and evaluate the risk associated with it. Data required for the model are obtained from the National Bridge Inventory (NBI), using climate change hazard maps for the next 20 years and geospatial maps of various factors contributing to the bridge scour. Implementing all the data in a GIS software, a normalized future risk map of bridge scour failure in New York State will be provided. The maps can be used to identify and prioritize bridges for scour-related inspection and mitigation works.

Structural Inequities, Climate Change, and Health Outcomes in Puerto Rico: A Case Study

Julie Lynch

Prof. Katherine Gregory

The healthcare delivery system in Puerto Rico faces several limitations, including limited resources, physician shortages, high poverty rates, and infrastructure challenges. These limitations contribute to poor health outcomes on the island. Puerto Rico's healthcare system operates with limited financial resources, resulting in disparities in funding compared to the 50 U.S. States. In terms of health outcomes, Puerto Rico faces challenges such as lower life expectancy, higher rates of chronic diseases like diabetes and obesity, and a higher infant mortality rate compared to the mainland United States. In comparison to Hawaii, Puerto Rico generally experiences poorer health outcomes. Hawaii has higher life expectancy, lower rates of chronic diseases, and a higher number of healthcare providers per capita. Climate change also plays a significant role in health outcomes in Puerto Rico. The island is vulnerable to extreme weather events, which can lead to increased risk of infectious diseases, mental health impacts, and damage to healthcare infrastructure. To address these challenges, policy recommendations include increased funding, investment in health education and

prevention programs, climate change mitigation and adaptation measures, and expanded health insurance coverage. Overall, improving the healthcare delivery system in Puerto Rico requires addressing the limitations, investing in resources, and implementing policies that prioritize access to quality healthcare services, especially in the face of climate change and ongoing challenges.

The Impacts of Climate Change

Junxi Chen

Prof. Annie Nagna-Mundeke

In recent years, rainfall and hurricanes have increased in the United States. For example: the Ian hurricane in 2022 attacked the Eastern United States. The reason for a lot of this is climate change. There are also many problems with climate change. I did some research on the effects of climate change. It has been nearly six months since it has not snowed in New York City, which is unusual. This is global warming. Also, climate change will change human skin color and hair color.

Home-Made ROS-Compatible Robot Using VEX Mobile Base and Raspberry PI

Justin Bartholomew

Prof. Lili Ma

In this project, we developed a home-made ROS compatible autonomous mobile robot using parts from VEX robotics kits and Raspberry PI. The Robot Operating System (ROS) is a set of software libraries and tools that help to build robot applications. By constructing a ROS-comparable robot, we are able to utilize the functions and tools provided by the ROS libraries. Our robot is equipped with an onboard laser sensor, the RPLidar. By using the ROS SLAM toolbox, a map was created as the robot moves in its environment. The RPLidar sensor, which outputs distances from the robot to the nearest obstacles, also helps for obstacle avoidance. Our robot includes the VEX mobile base, a third-party motor control board, and a Raspberry PI. The Raspberry PI runs Linux, controls the motor board, and communicates with the RPLidar sensor. We have successfully achieved map building and obstacle avoidance. The robot's functionalities are thus significantly improved, being able to tackle real-world problems.

Understanding Gender Identity Through Intersectionality Theory

Karlique Caesar

Prof. Alyssa Dana Adomaitis

The purpose of this paper will be to examine the expression of varying identities in addition to gender among LGBTQIA+ individuals. After interviewing individuals in the LGBTQIA+ community residing in the United States previous research suggests several identities are expressed in addition to gender. LGBTQIA+ individuals residing in the United States will be interviewed. These interviews will be transcribed and analyzed for themes. Identities in addition to gender discussed should be inclusive of included ethnicity, personality, social economic status, and profession. Dress can be used in particular to express personality, socioeconomic status and profession. The use of dress to express gender versus other identities depended on the context and life phase of the individual. This research contributes to an understanding of how dress is used for self-expression among the LGBTQIA+ community.

Key terms : gender, identity, dress, intersectionality theory

Fabrication of 2D Semiconductor Materials by Exfoliation Method

Keven Cruz, Pedro Sotomayor, Mikheil Vardoshvili

Prof. Vitaly Dorigan

The TMX, transition-metal dichalcogenide, belongs to the family of semiconductor materials that have layered structures. We separate the layers and achieve thin flakes using scotch tape on both sides of the TMX and we can get up too many or one single monoatomic layer. Hence, we can use 2D material instead of 3D material with the same chemical composition. Such materials are needed as an active element for the quantum connectors, devices that will interconnect quantum computers into clusters and networks. In this project, we use the exfoliation technique to produce thin flakes of WS₂ and MoSe₂ semiconductor materials. The flakes are transferred onto a silicon chip. Achieving this will help us get one step closer to developing quantum computers that will advance other technologies such as artificial intelligence, cryptography, mathematics, drug development, and energy industries.

Implicit Bias Among Health Professionals

Kimora Toussaint

Prof. Javiela Evangelista

Racism and implicit bias are prevalent in healthcare, which may affect patient well-being. One way implicit bias is most evident is in language. Negative descriptors, such as “sickler”—a term used for those diagnosed with Sickle Cell Disease (SCD), influence how health providers view their patients and determine pain medication prescriptions. Patient experience, such as prior use of opioids or using words that imply substance abuse, may block patients from accessing prescriptions and proper care. Black, Indigenous, and People of Color (BIPOC) are disproportionately affected by such negative descriptors. Among other adverse impacts, treating patient pain accounts for mental health or sleep issues and increases the number of unnecessary visits to the hospital. How patients are described in their Electronic Medical Records (EMRs) reveals prejudice in health practices, which may prevent adequate care and impact interactions with future health providers. Prejudices and biases are also presented in non-verbal communication, such as glances or facial expressions. This poster will include an analysis of peer-reviewed articles on data collection experiments and language use in Electronic Medical Records. In the end, methods for health professionals to acknowledge and address their unconscious biases, including health equity education, will be presented.

From Seed to Plate: The Study of Viable Hydroponic Plants for Utilization in Culinary Labs at NYCCT

Madelyn Kelly

Prof. Tracy Zimmermann

This project explores the feasibility of cultivating various edible plants and herbs in a hydroponic setting within the urban confines of New York City. The primary objective is to enhance the Culinary and Pastry Kitchens within the Hospitality Department at New York City College of Technology. Given the challenges associated with procuring locally sourced, fresh vegetables and herbs in the city environment, this research aims to mitigate issues related to transportation, seasonality, and availability that often burden the restaurant industry. The significance of this research lies in its potential to contribute to the development of sustainable and efficient methods for vegetable production, thereby alleviating the impact of seasonal constraints on the supply chain. The research unfolds in two phases:

- Phase one involves achieving a successful yield of products and ensuring the proper maintenance of the university's hydroponic system to guarantee its optimal functionality and the overall health of the cultivated plants.

- Phase two, the focus shifts to evaluating the integration of the hydroponic system within the culinary and pastry kitchens of the Hospitality Department.
 - Key variables to be analyzed include usable weight, time from seed to sprout, time from sprout to harvest, and regeneration cycles.
 - The collected data will provide insights into the hydroponic system's efficacy in terms of yield and product quality.

Post-research, subsequent studies can concentrate on identifying specific products in demand within the department, enabling a more efficient utilization of this hydroponic medium in the kitchens.

Lunar Geopolymer 3D Printing

Maria Hashmi

Prof. AKM Rahman

Extraterrestrial travel and housing are topics that have come up in recent times. There is a possibility of living on the moon. To address the challenges of extraterrestrial travel and lunar habitat construction, research is underway to develop a cost-effective geopolymer utilizing lunar dust for 3D printing on the Moon. Utilizing lunar dust offers the advantage of reducing the need for transporting materials from Earth, thereby conserving storage space. The idea of using materials already at the location (in situ) dramatically reduces costs. This research investigates the composition of lunar maria (LMS) and lunar highlands (LHS) to determine the necessary additives and binders for a robust geopolymer capable of withstanding lunar conditions. By examining aluminum and silicon ratios and employing Potassium Hydroxide (KOH), the goal is to create a durable and resource-efficient lunar geopolymer.

Hydration and Alkali Halides in Biology-Structure of Water in Proteins Studied by X-ray

Somdat Kissoon, Jasper Cheung, Michael Li

Profs. Subhendra Sarkar, Eric Lobel and Zoya Vinokur

The degree of hydration in biological samples are studied by our group using soft x rays with and without the presence of alkali halide salt impurities. Sodium and Potassium ions organize biological water differently and influence cell hydration of tissues. The goal is to see how alkali halide salts influence bulk water in porous fruits to redistribute. Harder fruit matrix mimics dense or dehydrated human tissue (due to cellularity, biominerals) and absorb more x-rays. Regions that draw more water would have less x-ray scatter while concentrated alkali metals (from fruit or from external infusion) would alter the water distribution and increase scatter photon generation. In

our fruit models that mimic brain tissue the metals have relative abundance of $K > Ca > Fe > Cu$. The main goal in this project is to develop filters and protocols to distinguish among all of these minerals based on photoelectric and Compton effects.

Biomimetic Passive Cooling in Arid Climates: Architectural Innovations from Egypt

Mohammad Mostafa

Prof. Michael Duddy

This study investigates the potential of biomimetic passive cooling techniques in arid regions, with a focus on Egyptian desert environments. It explores the integration of nature-inspired designs and materials in architecture to enhance living conditions without relying on conventional air conditioning. The research is grounded in the principles of biomimicry, examining natural organisms and ecosystems that have adapted to extreme heat, aiming to apply these insights to human habitats. By analyzing the unique challenges posed by hot climates, the study proposes innovative design strategies that emulate natural cooling processes. This approach not only promises to improve living standards in hot regions but also aims to reduce the urban heat island effect. The outcomes include the development of sustainable building materials and the formulation of architectural designs suitable for extreme heat, potentially applicable globally. This research represents a significant step towards eco-friendly and energy-efficient architectural solutions in hot and arid climates.

Developing Facial Recognition for Android Mobile

Mohammed Amin

Prof. Marcos Pinto

Face Recognition (FR) technology is rapidly advancing, with its applications permeating various sectors including security, marketing, healthcare, and social media. Its versatility allows for implementations such as biometric identity verification, enhancing public safety, and personalizing user experiences. Face Recognition systems function by analyzing unique facial features and comparing them to databases, utilizing methodologies such as machine learning algorithms and neural networks. The OpenCV library, a pivotal open-source tool in this domain, facilitates real-time computer vision and image processing capabilities. This library supports numerous applications, from diagnosing genetic disorders to powering smart banking solutions. For mobile environments, developers have options ranging from APIs on iOS and Android platforms to third-party services like Microsoft's Face API and Amazon Rekognition. The machine learning android mobile app, leveraging OpenCV and Java, exemplifies the practical integration of these technologies. By employing extensive

datasets, such as the Viola-Jones algorithm in OpenCV, Face Recognition systems enhance their accuracy, providing robust solutions across diverse applications.

Build and Design a Keystudio Smart Home Kit

Noarin Laima

Prof. Farrukh Zia

The Keystudio Smart Home Kit is a flexible and innovative platform that helps makers explore the exciting world of home automation and IoT (Internet of Things) applications. This comprehensive kit, designed by Keystudio, combined a wide range of sensors, modules, and components, all compatible with the popular Arduino microcontroller platform. This kit includes various sensors, such as temperature and humidity sensors, motion detectors, and invisible receivers, allowing users to monitor and control their environment effectively. The compatibility with the Arduino platform ensures that users can easily program and interface with the components using the Arduino IDE. This accessibility makes the kit suitable for both beginners and experienced developers.

Deep Learning Classification of Gastrointestinal Images

Nora Zougari

Prof. Pegah Khosravi

This research paper is the study of the application of artificial intelligence in deep learning using convolutional neural networks (CNNs) in classifying the diagnosis of gastrointestinal (GI) diseases. It takes a long time to diagnose diseases like esophagitis, polyps, and ulcerative colitis using traditional procedures. With the use of endoscopic image training, deep learning algorithms offer an automatic and effective method for categorizing GI disorders. Deep learning classifies endoscopic pictures into four gastrointestinal disorders (normal, ulcerative colitis, polyps, and esophagitis) using convolutional neural networks (CNNs) like InceptionV3. In this research, a dataset of 6,100 photos from 6,300 patients is divided into test, training, and validation sets. The study uses Keras and TensorFlow to construct a CNN model with the goal of improving healthcare for gastrointestinal disorders. The importance of precise illness identification can be seen in the immune system's reliance on a healthy gastrointestinal tract. The research shows how AI can categorize photos into health groups, such as normal, ulcerative colitis, polyps, or esophagitis, by utilizing CNNs. This automated categorization method guarantees better patient outcomes and lower healthcare costs by improving diagnostic accuracy, efficiency, and dependability. The use of deep

learning in medical imaging increases not just the field of gastroenterology but also the possibility for systemic change in the larger healthcare system. The study indicates that deep learning and artificial intelligence (AI) have the potential to transform the diagnosis of GI diseases by providing a more accurate and efficient categorization system that will improve patient outcomes.

Topic Modeling on Reddit Data for Analysing Mental Health Issues among College Students

Qing Chen

Prof. F. Patricia Medina

Mental health issues among college students have become a prevalent concern, and understanding the main struggles and factors that correlate with poor mental health is essential for institutions to provide better support. This project aims to analyze mental health issues among college students using data from the Reddit platform. By leveraging the Reddit API and employing advanced natural language processing techniques, including BERTopics, we seek to gain insights into the emotional well-being and challenges faced by college students. Incorporating techniques such as embedding, Clustering, and Topic Creation enhances the depth and sophistication of our analysis of mental health issues among college students using Reddit data.

“神經病”: Exploring Conversations About Mental Conversations Among Chinese Parent-Child Dyads

Queenie Chau

Prof. Kelsey Binion

U.S. Asian/Asian American adults are less likely to receive mental health services compared to non-Hispanic White adults. Cultural barriers influence seeking professional help. In Asian cultures, mental illness is a family matter, not an individual problem. Because mental health is perceived as a weakness and a Western concept, talking openly about sadness, disappointment, and/or depression is rarely encouraged. Therefore, this intense stigma influences disparities in mental health prevention and utilization. Relying on frameworks, like the disclosure decision-making model, can assist in describing individuals' decision-making about sharing non-visible, health-relevant information with others. When the personal information is stigmatized, like mental health, disclosure can be challenging. Asian/Asian Americans may encounter additional disclosure issues due to cultural norms. Acknowledging these complexities, this study examined how Chinese young adults disclosed their mental health challenges to their Chinese parents. Two research questions (RQs) were posed: What are the barriers to

disclosing about mental health?; and, What are the implications of disclosing about mental health? To answer the RQs, participants were recruited via social media and semi-structured interviews were conducted, which were recorded and transcribed. A thematic analysis was conducted to identify emerging themes. Themes were determined by Owen's (1984) criteria: recurrence, repetition, and forcefulness. Six Chinese young adults (average age=25.6; SD=2.8) participated. All were Asian (specifically Chinese), Non-Hispanic/Latinx, single/not married, and had some college experience. The majority (66%) identified as male. For RQ1, participants reported three barriers to wanting or being able to disclose their mental health challenges to their parents: stigma, fear of parent's reaction, and parent's lack of understanding about mental health. Participants discussed how mental health stigma limits family conversations about mental health. Further, participants expressed that with their parents' limited knowledge of mental health information there were no open conversations; thus, they had to navigate their challenges alone. Lastly, with mental health's stigma, participants feared disclosing, because they did not want to upset their parents. This communicative behavior upholds the Chinese values. For RQ2, participants mentioned four implications of disclosing about mental health: manifesting toxicity within relationships, establishing distance, receiving no emotional support, and regretting the disclosure. Participants did not feel supported after disclosing to a parent; therefore, they regretted their decision. Regret stemmed from receiving negative responses (e.g., yelling, complaining) and no emotional support from parents, which created relationship challenges. To address the interpersonal issues, participants created distance (e.g., moving out, limiting interactions) and sought out social support resources elsewhere (e.g., friends, professional therapy). The participants' initial disclosure was not positive; thus, it continued to perpetuate stigma, silence, and conflict. This study provides a realistic, yet troubling, perspective about how Chinese young adults struggle to communicate their mental health challenges to their parents. This is significant as prior research shows that parents play an essential role in helping adolescents seek assistance with mental health challenges. Future research should examine Chinese parents' perspectives about mental health disclosure with children; then, interventions should be created to address these communication barriers in order to improve mental health care for Asian/Asian Americans.

Coastal Shoreline Monitoring Using Urban Landscaping Approach

Rokhaya Ndiaye

Prof. Jieun Yang

The New York City coastline has lost over half of its tidelands since colonial times due to urban development, erosion, and sea level rise. To provide more pragmatic solutions to coastal protection, this research delves into the advantages of living and coastal shorelines as a resilient alternative to traditional gray infrastructure, unveiling their potential in safeguarding our shores and nurturing thriving ecosystems and habitats for marine life. Living shorelines offer nature-based coastal protection in flood-prone areas and stand out from seawalls, floodwalls, and riprap by providing valuable wildlife habitat, sequestering blue carbon, and enhancing human well-being. Monitoring living shorelines is vital to understand their impact on communities, safeguard coastal ecosystems, and foster resilient coastal zones. This study investigates the geomorphological features, soil composition, and flora dynamics of estuarine ecosystems in New York City (NYC). The research provides valuable insights for sustainable urban planning, infrastructure development, and environmental preservation efforts among communities that are most vulnerable to flooding and storm surge damage.

Research objectives are:

- Identify critical factors that promote shoreline stability and ecological functionality through comprehensive field surveys, geospatial mapping, and data analysis.
- Identify and assess stable sediment patterns, appropriately sloped shorelines, and distributed vegetation that emerge as pivotal components of resilient living shorelines.
- Calculate Environmental Justice (EJ) and Social Vulnerability Indices (SVI) to identify and map the vulnerable communities in the proposed living shoreline study sites across NYC.

In conclusion, preliminary studies and research conducted during Fall 2023 concludes that for optimized living shorelines' restoration and longevity, a sustainable framework through continuous monitoring and data collection during extreme weather events and sharing data across various stakeholders is critical. Further measurements are necessary for fostering resilient ecosystems, and safeguarding communities against coastal hazards. Integrating the urban landscaping designs with ecological restoration can provide more robust and sustainable living shoreline protection and restoration of habitats and protect communities from floods and other hazardous weather events. A holistic framework and approach are needed that includes - advocacy, literacy campaign, engagement and involvement of marginalized and EJ communities and coordinated efforts and participation of federal, local government, community organizations and educational institutions.

Exploring AI Integration in Robotics for Adaptive Navigation Technique and Enhanced Utility

Ruyel Rodrigues

Profs. Lili Ma and Benito Mendoza

The objective of this study was to incorporate Artificial Intelligence into the locomotive behavior of the robot and observe the impact it has on the robot's performance. Robotic autonomy is typically constrained by static programmed behavior, whereas an AI-driven robot is better equipped for adaptive evolution in its actions. It is important for a robot that is deployed in the real world to navigate uncertain terrain because it will frequently face obstacles that are unknown. The process started by selecting an appropriate Linux operating system and the corresponding Robot Operating System (ROS) conducive to AI algorithm development. After running simulations that checked the robots environment, the robots sensor and motor functions. The machine learning program was formed and executed to test and examine the robot's approach to navigate to its goal. Series of trials with slightly adjusted features were performed to fine tune the algorithm. With a reliable algorithm established, the environments were updated to introduce complexity in room design and new obstacles. The findings in this research demonstrated that the robot that navigated with artificial intelligence had a significantly better chance of reaching its goal than a typical statically programmed robot. Due to the nature of robots without AI, it is impossible to train it without encountering the same obstacles repeatedly, something that the AI driven robot learned to adapt to with each trial. The result is a robot that appears to have some level of awareness of itself and its surroundings that is much better equipped for real world deployment. In an effort to create robots that support human lives and contribute to the betterment of our livelihood, these findings demonstrate a step towards achieving that goal using AI in robotics.

Effect of Cadmium on Calpains in Tetrahymena Thermophila.

Safia Abdemeziem

Prof. Ralph Alcendor

Understanding the impact of environmental stressors on the activity of calpains in protists has yet to be addressed. Cadmium is known to be harmful to humans, and understanding its effects on microorganisms like Tetrahymena Thermophila can contribute to our further understanding of potential health risks. T. thermophila is a protozoan, and as a eukaryote, it possesses similar cell structure and function to our cells. The use of these cells has contributed to knowledge of histones, the cell cycle, and cell survival. Calpains are calcium-dependent cysteine proteases expressed in mammals and many other organisms. They have been shown to function in cell cycle

progression, and have been implicated in cancer and diabetes. *T. thermophila* possesses about 26 different calpains; however, the functions of these calpains have not been examined in *T. thermophila*. Therefore, the purpose of this research was to investigate the impact of oxidative stress on calpains in *Tetrahymena thermophila*. Cells were exposed to different concentrations of cadmium, a potent inducer of oxidative stress, followed by cell survival analysis and gene expression patterns of selected antioxidant genes. MTT assay showed that cells were able to survive in 10–20 μM of cadmium for up to two weeks. On the other hand, doses of 30 μM and above were very toxic to these cells. At these concentrations, cells were unable to survive after 24 hours. Gene expression analysis showed that two calpains, THERM_00196650 and THERM_00471200, were differentially expressed. The expression of THERM_00196650 decreased in the presence of 20, 50, and 100 μM of cadmium, while the expression of THERM_00471200 increased. These results suggest that calpains may be involved in cadmium-induced oxidative stress in *T. thermophila*. Further investigation of these cadmium induced effects could contribute significantly to our understanding of the interplay between environmental stressors, calpain activity, and cellular responses in protists and humans.

Interborough Express (IBX) Project

Sandya Persaud

Prof. Navid Allahverdi

Efficient transportation is the backbone of urban connectivity, facilitating the seamless movement of people and goods. The Interborough Express (IBX) project purpose is to provide quick transit services to currently underserved areas in Brooklyn and Queens, improving their access to 17 different subway lines and the Long Island Rail Road. This project is important because it will result in various beneficial effects. 1) Improving access to jobs and other destinations in Brooklyn, Queens and Manhattan. 2) Providing a faster commute which is expected to take 40 minutes. 3) Advancing equity within the transportation network. 4) Reducing congestion on roads within the communities such as on the BQE. 5) Helping those who need to travel within the corridor. The IBX route was chosen because it will provide optimal service for riders at the best value, establishing new transit options for close to 900,000 residents of the neighborhoods, as well as for the 260,000 people who work in Brooklyn and Queens. Throughout this research I will be conducting literature review and identifying challenges associated with the construction of this project.

Vertical Farming

Sara Fares

Prof. Jill Bouratoglou

In response to the growing challenges of urbanization, limited space, and the increasing demand for sustainable and locally sourced food, the proposed vertical farming building aims to revolutionize urban agriculture in New York City by integrating modular vertical gardens, aromatic herbs wall, aquaponic vertical farms, and indoor vineyards. This multifaceted approach not only maximizes space efficiency but also enhances the visual aesthetics of the urban landscape while fostering community engagement, education, and sustainable food production. By leveraging these innovative vertical farming techniques tailored to the unique characteristics of New York City, this project seeks to create a model for urban agriculture that addresses the city's pressing environmental concerns and contributes to a more resilient and food-secure future.

Effectiveness of Remdesivir Drug in Treatment of Covid-19 Patients

Sasha Blenman

Prof. Annie Nagna-Mundeke

The COVID-19 pandemic was a huge catastrophe for the society as it led to a high number of confirmed cases and reported deaths across the globe. It was caused by a deadly virus named severe acute respiratory syndrome coronavirus 2 (SARS-COV 2). Some of its common symptoms included sore throat, chills, and fever. Multiple treatment interventions were explored and implemented by healthcare professionals to cure the disease as it was a novel disease, and the treatment was unknown. The current research explored the literature to examine the effectiveness of Remdesivir as a treatment intervention for Covid positive patients. Existing literature was explored focusing on US-based studies and remdesivir was identified as one of the most effective and promising treatment interventions to cure Covid 19 symptoms among hospitalized and non-hospitalized patients with severe and mild to moderate symptoms of the disease. It was found to be one of the most cost-effective pharmacological treatments.

Ethical AI in Criminal Justice

Silma Khan

Prof. Elizabeth Milonas

This research paper delves into the intersection of artificial intelligence (AI) and ethics within the field of criminal justice. As AI technologies continue to advance, their integration into criminal justice systems raises significant ethical considerations. The study examines the ethical implications of AI deployment in various stages of the criminal justice process, including predictive policing and decision-making algorithms. Through a comprehensive analysis of existing literature, case studies, and ethical frameworks, the paper discusses potential biases, discrimination, and accountability challenges seen through AI systems within the legal field. The research explores the importance of transparency, fairness, and accountability in the development and deployment of AI tools and algorithms. The paper discusses the pivotal importance that these technologies aligning with societal values and human rights.

The Impacts Of Climate Change On Health

Taspia Sultana

Prof. Annie Ngana-Mundeke

A major danger to human health is climate change. It impacts not just the physical surroundings but every facet of human and natural systems, encompassing social and economic circumstances as well as the operation of health care systems. Hence, it is a threat multiplier that threatens to undo decades of advancements in health. In this study, we talk about all the crucial effects climate change has on our health.

Housing Insecurity In CUNY Schools

Tiya Williams

Prof. Elizabeth Milonas

This project delves into the multifaceted issue of home insecurity within the student community of City University of Technology (CUNY). Through comprehensive surveys, meticulous data analysis, and an in-depth exploration of various aspects such as housing instability, food insecurity, and financial stress, the primary goal is to ascertain the depth of home insecurity experienced by CUNY students. By uncovering these insights, this research endeavors to illuminate the unique hurdles faced by CUNY students, shedding light on the intricate dynamics between home insecurity and its implications on academic performance and overall well-being. Understanding these complexities is pivotal in devising targeted interventions and support systems that

cater specifically to the needs of CUNY students grappling with home insecurity. Ultimately, the project's overarching aspiration is to advocate for initiatives that can effectively alleviate home insecurity, thereby enhancing the college experience and fostering an environment conducive to the growth of CUNY students.

Energy Harvest Sensors

Tomas Valentin

Prof. Li Geng

This research presents a comprehensive investigation into Energy Harvesting Sensors and their role in fostering sustainable air quality monitoring. The primary objective is to explore the viability of energy harvesting technologies in energizing sensor networks devoted to the real-time collection of air quality data, emphasizing the reduction of environmental impact and maintenance demands. The study delves into the integration of energy harvesting mechanisms, including solar, piezoelectric, and kinetic energy, to power advanced sensor nodes capable of detecting pollutants, particulate matter, and gas concentrations. The findings of this research highlight the significant benefits of energy harvesting sensors, including enhanced sustainability, long-term operation, cost efficiency, reduced environmental impact, wireless deployment, and versatility. These attributes make energy harvesting sensors valuable tools for achieving efficient and environmentally conscious air quality monitoring. As a result, this research not only contributes to the advancement of sensor technology but also holds promise for creating more resilient and self-sustaining systems in the broader context of environmental monitoring and management.

Enhancing Data Security in Cloud Computing: A Comprehensive Study

Valon Dellovci

Prof. Patrick Slattery

In the rapidly evolving digital landscape, cloud computing has become pivotal for businesses and organizations worldwide. However, this reliance on cloud services for storing and processing sensitive data underscores the critical need for robust data security protocols. This research project touches into the realm of cloud computing security, with a particular focus on identifying and mitigating prevalent security vulnerabilities and threats. The project aims to answer two fundamental questions: First, what are the most common security vulnerabilities in cloud environments, and what strategies can effectively reduce these risks? Second, how do various encryption techniques influence the performance and security of data stored in the cloud? Through a systematic examination of existing security practices and vulnerabilities, the study

seeks to develop enhanced strategies for data protection in cloud environments. This involves evaluating current encryption techniques, their impact on system performance, and their effectiveness in safeguarding data. The outcomes of this research are expected to contribute significantly to the field of cloud computing security. By providing insights into the complexity of data vulnerabilities and the effectiveness of encryption methods, the study aims to guide the development of more secure and efficient cloud computing solutions. This is not only vital for the integrity and confidentiality of sensitive data but encouraging trust in cloud-based services, which is essential for the continued growth and innovation in various sectors relying on cloud technologies.

The Benefits of Simulated EHR Case Studies for Undergraduate Students

Yeshe Dolma

Prof. Sitaji Gurung

This study uses two distinct patient profiles: John James Sheppard Sr. an older adult with a slight hearing impairment, and Alicia Watson an adolescent. The primary purpose of this research project is to identify the importance of simulated Electronic Health Records (EHR) cases in tailoring healthcare interventions to individuals with different characteristics, preferences, and conditions. The methodology approach involves the review of EHR Go cases, a comprehensive literature review, and an exploration of patient management in ethical scenarios. First, a comparative study was done to evaluate the effectiveness of personalized Health Coaching (HC) in improving glycemic control for John James Sheppard with Type II Diabetes (DM2). The finding demonstrated that the HC intervention exhibited significantly better outcomes for diabetic management. Next, the study examines the potential impact of telemedicine and family support on managing Type I Diabetes, focusing on Alicia Watson. The findings highlight the potential benefits of telemedicine and the role of family support in managing youth diabetes. Additionally, the outcomes of this study will promote curriculum development in healthcare and provide students with valuable lessons for ethical decision-making in their future careers as healthcare professionals. In conclusion, this research contributes to the development of personalized healthcare plans and ethical education, providing the foundation for future advancements in healthcare tailored to individual needs and demographics.