



Book of Abstracts

The Emerging Scholars Research Program

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Student Researchers	Faculty Mentors	Department	Project Title	Page
Serifat Adebola, Nadia Rodriguez And Rabea Bagum	Prof. Diana Samaroo Prof. Urmi-Gosh Dastidar	Biomedical Informatics, Applied Mathematics in Financial Science	Development of Kinetic Model of Epoxy Resin from Isothermal Differential Scanning Calorimetry (DSC)	11
Nashrin Akter	Prof. Randolph Schurtz	Social Science	Piaget's and Vygotsky's Ideas of Children's Self-Talk Revisited	11
Rafaela Alba	Prof. Angran Xiao	Mechanical Engineering Technology	Operation and Demonstration of CNC Router	11
Wisam Ali, Ilhom Bakiyev and Travis Caraballo	Prof. Sanjoy Chakraborty	Biomedical informatics	Differential Effect of High Fat Diet (HFD) in Male and Female Mice	12
Ouri Alkada, Sadia Mahzabin	Prof. Marcos Pinto	Computer Information Systems	Predicting Breast Cancer Type (Benign or Malignant)	12
Abdullah Allaoa, Xiaolan Wu	Prof. Mai Zahra	Biomedical Informatics, Applied Chemistry	Study of the Interactions between Newly Synthesized Opioid Analgesics and Mu and Delta and Kappa Membrane Proteins	13
Rabia Arif	Prof. Farrukh Zia	Computer Engineering Technology	Open Source Computer Hardware and Software Implementation of Assistive Technologies	13

Evan Banks, Elena Zimareva, Afolabi Ibitoye	Prof. Alexander Aptekar	Computer Science	The Urban Oasis	14
Juan Barraza, Yuping Zhang	Prof. Navid Allahverdi	Mechanical Engineering Technology	Mechanical Properties of Lightweight Concrete	14
Jelani Barro, Haoxiang Cui, Demba Diop and Lev Chesnov	Prof. Daeho Kang	Environmental Control Technology and Facilities Management	Measurement of Airflow through Entrance Doors	15
William Bennett	Prof. Jeremy Seto	Biomedical Informatics	Microbiome Analysis of Ticks Guts	16
Savannah Blodgett, Aoron Hollingston-Harris and Christopher Navarrete	Prof. Reneta Lansiquot	Communication Design	Chronicling the Achievements and Activities of Honors Scholars at City Tech	16
Eduardo Bravo	Prof. Ivana Jovanovic	Applied Chemistry	Photocatalytic Activity of Porphyrins and Polyoxometalate Compounds	17
Leonardo Chiang	Prof. Xiaohai Li	Computer Engineering Technology	Controller Development for Miniature Unmanned Aerial Vehicles (UAVs)	17
Mukadder Cinar	Prof. Boyan Kostadinov	Applied Mathematics	Using Big Data Analysis to Investigate Where it pays to Attend College	17

Dayana Cobos	Prof. Diana Samaroo, Dr. Mai Zahran	Biomedical Informatics	Molecular Docking of an Iso-Bacteriochlorin Compound on the Surface of Two Proteins, Bovine and Human Serum Albumin	18
Justin Colon	Prof. Masato Nakamura	Mechanical Engineering Technology	Combustion Chamber Research and Construction	18
Catherine Correa	Prof. Alexander Aptekar	Building Technology	Fabric Casting	18
Kimberly De La Santa	Prof. Marcos Pinto	Computer Systems	Designing Smart Applications using Augmented Reality (AR)	19
Tasha Deeroop	Prof. Farrukh Zia	Computer Engineering Technology	Voice Controlled Door Lock	19
Marco Dwyer, Davit Khomasuridze, Evelyn Richardson	Prof. Anne Leonhardt Prof. Satyanand Singh	Architectural Technology	Optimization and Topology in Design and Fabrication - From the Math-world to Architecture	20
Eleazer Espinosa Jr	Prof. Alyssa Adomaitis	Science In Business and Technology of Fashion	Dress and Identity: Any Inclusion of Many	20
Juan Estrella	Prof. Benito Mendoza	Computer Engineering Technology	Using Augmented Reality in Engineering Education	21

Juliano Everett, Zechariah Ilmot and Mubinjon Satymov	Prof. Oleg Berman	Applied Computational Physics	Comparative Study of Qubits	22
Marcia Fontenelle	Prof. Mai Zahran	Bio Informatics	Drug Screening from a Library of Thousands of Compounds to Inhibit the Function of BACEI	22
Kayla Ford	Prof. Marcos Pinto	Computer System Technology	Raspberry Pi RFID Attendance System	22
David Friedman Nadia Rodriguez	Prof. Ashwin Satyanarayana	Applied Mathematics - Financial	An Ensemble Approach to Cleaning Large Datasets	23
Jean Pierre Gomez	Prof. Estaban Bieta	Architectural Technology	Exploring Works Flows from 3ds Max to Unity	23
Miguel Gomez	Prof. Alberto Martinez	Applied Chemistry	Interaction of Ionophoric Polyphenols with Human Serum Albumin (HSA)	24
Johnny Guevara	Prof. Mai Zahran Prof. Alberto Martinez	Biomedical Informatics	Modeling Potential BACE1 Inhibitors	24
Kerolos Hanna	Prof. Ozlem Yaser	Mechanical Engineering Technology	Mechanical Characterizations of PDMS	25

Tevin Harris	Prof. George Guida	Computer Information System	Virtue at the Coffee House: Poetry and Community in America	25
Kyaw Htun	Prof. Navid Allahverdi	Civil Engineering Technology	Comparison of Air-content Measurement by Volumetric Method and Pressure Method for Different Aggregates in Freshly Mix Concrete	26
Qui Huang	Prof. Mai Zahran	Biomedical Informatics	Influence of Amino Acid Alphabet Reduction on Protein Structure	27
Muzahidul Islam	Prof. Masato Nakamura	Mechanical Engineering Technology	Physical Modeling of Combustion Chamber	27
Ayesha Javed	Prof. Farrukh Zia	Computer Engineering Technology	Home Automation IoT Device	28
Ann Jean	Prof. Monica Berger Prof. Alexander Aptekar	Architectural Technology	Real Estate Development in Brooklyn Heights Before and After the Brooklyn Bridge	28
Shmuel Kamensky	Prof. Boyan Kostadinov	Computer Science/AS	Developing Computational Thinking Projects with R and Python	29
Hashim Kayani	Prof. Brad Isaacson	Computer Information Systems	Sorting Algorithms Visualized	29
Jane Lynnel Ladaban	Prof. Xiaohai Li	Computer Engineering Technology	Wearable Vision System for Scene Understanding	29

Dianna Landi	Prof. Diana Samaroo	Applied Chemistry	Circular Dichroism Profiles of Bovine and Human Serum Albumin and Calf-Thymus DNA	29
Mary Lee	Prof. Zoya Vinokur	Radiology	A Study of Cultural Competence and Implicit Bias amongst Healthcare Students	30
Vivian Liang	Prof. Zoya Vinokur	Radiology	A Study of Cultural Competence and Implicit Bias amongst Healthcare Students	30
Jun Ming Liang	Prof. Zhou Zhang	Mechanical Engineering	Remote Control Car	30
Amy Lin	Prof. Robert Walljasper	Hospitality Management	Exploring the Essences of Contemporary Desserts to Reimagine and Create a Modern Dessert	31
Christian Lopez Olajide Odesanya	Prof. Andy Lopez	Mechanical Engineering	Low Cost Drone for Medical Applications	31
Calwayne Malcom	Prof. Akm Rahman	Mechanical Engineering Technology	Development of Polymer Matrix Composites	31
Gabriela Martinez Yuying Xian	Prof. Ting Chin	Architectural Technology	Mapping Brooklyn Civic Center	32
				32

Mathyln Mckie	Prof. Jihun Kim	Architectural Technology	The Adoption of Vernacular Techniques by New York City to Decrease the Use of Mechanical Heating and Cooling	
Kevin Mei	Prof. Jean Hillstrom	Applied Math in Financial Science	An Analysis of Factors Affecting Emotional Regulation and Vagal Tone in an Expressive Writing Paradigm	33
Claire Mirocha	Prof. Mariya Bessonov	Mathematics	Probabilistic Models for Populations Dynamics	33
Estrella Moreira	Prof. Farrukh Zia	Computer Engineering Technology	IoT Enabled Wearable Technology	33
Gene Nadela	Prof. Xiaohai Li	Computer Engineering Technology	Servo Network Based Heteromorphism Robot	34
George Nwankwo Hashir Qureshi	Prof. Viviana Acquaviva	Computer Information Systems	C.H.E.S.S.	34
Wolf Pamphile	Prof. Stephanie Boyle	Paralegal Studies	Killing Them Softly with Kindness: The Congregation of the Order of Our Lady of the Apostles and British /French Colonial rivalries in the Egyptian Delta at the end of the 19th Century	35
Hashir Qureshi	Prof. Boyan Kostadinov	Computer Systems Technology	Developing Computational	35

			Thinking Projects with R and Python	
Syeda Nazia Rahman	Prof. Farrukh Zia	Computer Engineering Technology	Design of IoT Enabled Computer Controlled System	36
Samiha Riham	Prof. Farrukh Zia	Computer Engineering Technology	City Tech Talk and Roll Bot	36
Andre Rodriguez	Prof. Ashwin Satyanarayana	Computer Science	Computer Applications of Calculus	37
Mian Shabbir Anh Trieu	Prof. Satyanand Singh	CST (Software Development)	Recurrence Relations and Computational Complexity	37
Harmandeep Singh	Prof. Boyan Kostadinov	Computer Science	Developing Computational Thinking Project with R and Python	37
Arooba Sohail	Prof. Farrukh Zia	Computer Engineering Technology	Home Automation IoT Device- Hardware Implementation	38
Jennifer Solomon	Prof. Farrukh Zia	Computer Engineering	Controlling a Car with AI Voice Recognition	38
Rumana Hassin Syed	Prof. Farrukh Zia	Computer Engineering Technology	RoboQueen Blynked	38
Paulina Szymanska	Prof. Zoya Vinokur	Radiologic Technology & Medical Imaging	A Study of Cultural Competence and Implicit Bias among Healthcare Students	39

Suleyman Turac	Prof. Benito Mendoza	Computer Engineering Technology	Enhancing Learning about Electrical Circuits Components Using Augmented Reality Apps	39
Wellington Verduga	Prof. Benito Mendoza	Computer Engineering Technologies	An Augmented Reality App to Aid Learning about Ohm's Law	40
Jiamian Zhao	Prof. Angran Xiao	Mechanical Engineering	Design and Manufacturing of a Polar 3D Printer	40

1- Development of Kinetic Model of Epoxy Resin from Isothermal Differential Scanning Calorimetry (DSC) Data

Serifat Adebola

Nadia Rodriguez

Rabea Begum

Prof. Diana Samaroo

Prof. Urmi-Gosh Dastidar

An epoxy resin is a molecule with more than one epoxy group (in other words, cyclic ether) which can be hardened into a usable plastic by the use of substance groups such as amines, amides, acid anhydrides, phenols and metal oxides in a process known as curing. Curing of epoxy resins has received increasing attention as they can be used for various applications like coatings, electronic materials, adhesives because of their high adhesion strength, and good heat resistance. Cured kinetics of epoxy resins can be studied by different techniques which are mostly based on chemical changes such as differential scanning calorimetry (DSC), infrared spectroscopy (IR) and dielectric spectroscopy. In this study, the DSC technique was used to investigate the kinetics of the epoxy resin cured under isothermal conditions.

2- Piaget's and Vygotsky's Ideas of Children's Self-Talk Revisited

Nashrin Akter

Prof. Randolph Schurtz

The research compares the theories of cognitive development of both Piaget and Vygotsky. For Piaget, language development derives from cognitive development. Vygotsky, in contrast, thought of language as a preeminently social process, but also one in which children learned more sophisticated ways in which to organize themselves. Two children of different ages were observed engaging in self talk. The results of the observations revealed interesting differences in the ways the children spoke to themselves. In conclusion, it shows that both Piaget's cognitive development and Vygotsky's social interaction is important for language development.

3- Operation and Demonstration of CNC Router

Rafaela Alba

Prof. Angran Xiao

A CNC router is a computer operated machine that can perform various machining jobs automatically. This project sought to demonstrate an application of a custom made CNC router by milling out a detailed ATAT from the film Star Wars Episode V: The Empire Strikes Back. The design has a lot of detail, and would take a very long time if completed by hand. The use of the CNC router makes it great for hobbyists and those with little woodworking experience. For this particular project, CAD software Inventor was used to draw a 2-dimensional outline of the ATAT, which was uploaded to CAM software, MasterCAM. MasterCAM produced the g-code that would guide the router to mill the figure on wood. The project is a good demonstration of CAD and CAM integration, as well as the capability of the custom made CNC router.

4- Differential Effect of High Fat Diet (HFD) in Male and Female Mice

Wisam Ali

Ilhom Bakiyev

Travis Caraballo

Prof. Sanjoy Chakraborty

Obesity has become an epidemic in America. About 27% of Americans are now considered obese. Obesity is a disorder caused by accumulation of excess adipose tissue. The rule of a high fat diet (HFD) and its direct correlation with regards to health has become one of the most important subjects of our time. It has a far-ranging negative effect on health including high blood cholesterol, dyslipidemia, insulin resistance, glucose intolerance, cardiovascular disease and some type of cancers and poor female reproductive health. The aim of this study is to analyze the effect of high fat induced obesity in male and female mice model. The roles of the students in this project was to search renowned online journal portals and find recently published searched articles in the related field. Research skills include: reading, writing, organizing analyzing, tabulation and presentation of obtained data.

5- Predicting Breast Cancer Type (Benign or Malignant)

Ouri Alkada

Sadia Mahzabin

Prof. Marcos Pinto

One of the usage of Artificial Intelligence is in machine learning where we try to build machine that mimic the way we think. The project consists of creating a software that can make prediction of the type of cancer a patient has depending of nine (9) most used patient's characteristics related to cancer diagnosing. The student will research the subject, design and implement an algorithm that results an acceptable level of accuracy in the diagnosing of a cancer as either benign or

malignant. The student will filter out the sources of the subject in question and select the best sources for the project development among loads of Web libraries. The student will employ knowledge of programming language and machine learning algorithms.

6- Study of the Interactions between Newly Synthesized Opioid Analgesics and Mu and Delta and Kappa Membrane Proteins

Abdullah Allaoa

Xiaolan Wu

Prof. Mai Zahra

The Angucyclines are a class of natural products containing a characteristic carbon tetracyclic ring structure (ABCD ring) and featuring a wide range of biological functions, including antibiotic, antitumor, antiviral and antifungal properties. This extraordinarily therapeutic character has interested many chemists to develop efficient methodologies to synthesize the tetracyclic backbone of the Angucyclines. Construction of the BC ring configuration appears as the main synthetic challenge. We are developing a practical synthesis of the BC ring system by coupling a suitably substituted Phthalide and an activated Alkyne through a tandem Michael addition/Dieckmann cyclization. We have been successful in the synthesis of the Phthalide and the Enyne components as well as the Michael coupling of these two precursors. Presently, we are focusing on establishing better coupling conditions to include the Dieckmann cyclization as well as the installation of the A ring through a ring-closing metathesis of the BC ring adduct.

7- Open Source Computer Hardware and Software Implementation of Assistive Technologies

Rabia Arif

Prof. Farrukh Zia

Assistive technology is a device or equipment, modified or customized, that is used to maintain, increase, or improve the functional capabilities of individuals with disabilities.” Assistive technology devices and services are for individuals with disabilities when needed regardless of the category of disability. This research project involves gathering information about the use of open source hardware and software in creating assistive technology devices to help people with disabilities and implement source technology based solutions. It also includes gathering background information and data through tutorials and hands-on-learning; analyze information; synthesize, implement and present a solution.

8- Solar and Rain Catching Canopy. Urban Oasis

Evan Banks

Elena Zimareva

Afolabi Ibitoye

Prof. Alexander Aptekar

The Urban Oasis is designed to work within existing “Pocket Parks” in New York City as a combined rainwater collector, personal electronics charging station and resting designation for New Yorkers. Intended to not only lessen the demand on the city power grid by using renewable energy to charge devices, the urban oasis is also intended to mitigate grey water overflow in the sewer system and, in general, serve as a model for responsible environmental stewardship in urban areas. The important technical aspects of the canopy specifically to be analyzed were a) how much rainwater could the canopy be expected to collect per operating season b) what the optimal solar panel angle based off of New York’s specific geographical location was to maximize solar collection and c) how many full device charges could be expected per operating day. Information was gathered from various local and state organizations. The first prototype is constructed of locally sourced lumber and is currently being assembled by hand using power and hand tools. Based off of historical rainfall data taken from NOAA as well as the design square footage of the canopy, expected total annual rainfall collection was calculated to be 311 gallons. Using sun angle calculations taken from existing solar charts and averaging optimal angles across each month, it was determined that a fixed angle of 60° would be optimal for solar collection. Based off of the specs of the specific solar panel being used and using research from existing sources of information on solar panels, the urban oasis is expected to produce 147 watt hours per day (which approximates as about 27 cellular phone charges per day.) While construction is still underway, the density of the material being used has necessitated design changes to aid in its structural stability. Additionally, New York City specific code is still being researched and officials being consulted to determine the legal hurdles still to overcome and long-term viability of the project existing in a public space.

9- Mechanical Properties of Lightweight Concrete

Juan Barraza

Yuping Zhang

Prof. Navid Allahverdi

Advancements in concrete technology are moving quickly and discovering mixtures that can generate concrete that is lightweight and have desirable mechanical properties are on demand, not only for their cost-effective benefits, but also for their durability. This research investigates the mechanical properties of lightweight concrete and seeks methods to fabricate different structure designs made without steel reinforcements, from mixtures containing organic impurities like sticky rice, as well as glass-fiber composite materials, and light aggregate produced from 100% postconsumer recycled glass. In the attempt to partake in an ACI (American Concrete Institute) competition, several concrete bowling ball structure designs were produced with different mixtures, with the goal to obtain a total mass not exceeding 5.5 kg, and a spherical diameter no more than 200mm \pm 15mm. These structures allowed for practical identification of change in properties such as mass differentiation, strength and rolling motion. The first concrete ball consisted of common mixture materials for concrete, with slight modifications from the 1 cement: 2 sands: 3 gravel ratios. Instead, the ratios used by volume were 1.5 cement: 2 sand: 3 gravel: 1.5 water, resulting in a total mass of 7.46 kg. To reduce the mass of the structure other alternative mixtures were considered. The next set of concrete balls had mixtures that contained Sticky rice, a new presented light aggregate named “Aero”, less water content, fiber glass “MM20” reinforcement and Styrofoam. Moreover, the internal design was changed to have a 127mm diameter polystyrene ball core. These modifications decreased the total mass significantly to about 4.75 kg. Furthermore, in order to evaluate the mechanical properties comprising these designs, the concrete bowling balls underwent a compressive test load, to measure variables like their strain, stress and deformation. The deflection of deformation recorded went by a difference of 5mm. The last concrete ball with mass of 5.00 kg, measured to have a 5mm deflection at about 8340 Newton, 10mm deflection at 8452 Newton, 155mm at 8896, 20mm at 9341 Newton and 25mm at 9786 Newton before fracturing. In comparison to the first few concrete balls, the amount of stress presented on the last design was kept relatively constant, while reduction of mass succeeded. Overall, the continuation of finding more results of mechanical properties on lightweight concrete and careful design considerations are essential to discover new building concrete supply that could help economically and perhaps environmentally. Additional concrete bowling balls are being fabricated, and more strain/stress, deformation test results are becoming apparent, as comparisons are made with the previous results gathered from the experiments conducted in the early stages of this research.

10- Measurement of Airflow through Entrance Doors

Jelani Barro

Haoxiang Cui

Demba Diop

Lev Chesnov

Prof. Daeho Kang

There have been many studies on the impact of infiltration through the building envelope, not many studies have focused on the air flow through the entrance doors of buildings. This research will show the quantification of air flow rates and the implication of the effects on energy flows. This implication can have a great impact on the energy footprint of a building and can be costly. This research is an ongoing process throughout the course of a year, during which measurements of the: temperature, relative humidity, CO2 levels, and the frequency of door openings using occupancy sensors. Differential pressure and air velocity over the doors are recorded using two pressure differential transmitters. All sensors are placed strategically throughout the lobbies with a weather station monitoring the outdoor environment. The data is primarily focused on the indoor thermal environment, within 10-20 ft. of the entrances in both the Voorhees and Environmental buildings of the NYC College of Technology campus. The project seeks to present the results of the measurements taken. Findings so far have proven that the indoor thermal environment in the lobby areas significantly varies during cold and windy outdoor weather. With future studies, the results will enable us to identify the impact of the energy flow through entrance doors on the energy footprint of the building.

11- Microbiome Analysis of Ticks Guts

William Bennett

Prof. Jeremy Seto

Ticks are vectors for pathogen and disease transmission. The focus of tick research is often on the detrimental effects caused by the pathogens found inside the ticks, however, some focus has been shifted towards researching the natural microbiota already present and trying to determine if host-pathogen interactions are influenced by the gut microbiota. Lone star, Deer / Black-Legged, and Dog ticks at each life stage (larval, nymph, adult) had their guts collected and analyzed. Larvae were unfed, nymphs had fed once, and the adults have fed at least twice. Three samples of each species adult male and female were collected along with three samples of their nymph (not sexed) and larval stages. The Lone star tick at adult, nymph, and larval samples each comprised mostly of *Anaerococcus Octavius* while the adult, nymph, and larval samples of the Deer and Dog ticks each comprised of different organisms. In the long run, this can imply that some microbiota are conserved between the different life stages of certain species of ticks. This information can be used for future research on the effects microbiota have on their host.

12- Chronicling the Achievements and Activities of Honors Scholars at City Tech

Savannah Blodgett

Hollingsworth-Harris

Christopher Navarette

Prof. Reneta Lansiquot

Scholars, the Honors Scholars Program newsletter contains articles, student achievements, and experiences as well as information on program activities. A student-driven publication, volume 5, issue 2 continues to showcase our skills serving as photographers, graphic artists, technical writers, and editors. Responsibilities crucial to this major interdisciplinary project include attending scholarly presentations and workshops, conducting interviews, creating layouts, editing texts, taking photos, meeting deadlines, and integrating feedback.

13- Photocatalytic Activity of Porphyrins and Polyoxometalate Compounds

Eduardo Bravo

Prof. Ivana Jovanovic

Keggin type polyoxometalates [POM], $XW_{12}O_{40}^{n-}$, X= P and Si are metal oxide clusters that have strong photochemical properties and can undergo multiple redox reactions while keeping their structure and integrity unchanged. Metalloporphyrins [Por], such as zinc-5,10,15,20-tetraphenylporphyrin (ZnTPP) and zinc-meso-tetrakis (N-methyl-4-pyridinium) porphyrin ZnTMPyP⁴⁺, are well known for their good absorption of visible light, diverse photonic and chemical properties, and are promising for the environmental application. In order to study photocatalytic properties of these compounds, the model reaction used is the reduction of metal ions to form metalnanoparticles Por and POM can transfer their electrons upon irradiation with light for the reduction of metal ions and form metal nanoparticles. The formation of nanoparticles is analyzed by UV-Vis absorption and fluorescence spectroscopy. Transmission electron microscopy [TEM] will be used in order to find information about morphology, size and distribution of nanoparticles.

14- Controller Development for Miniature Unmanned Aerial Vehicles (UAVs)

Leonardo Chiang

Prof. Xiaohai Li

The research team focuses on building functional multirotor copters in an accurate, efficient manner. Thus far, we have learned the different types of terminologies, types of multirotor copters, basic configurations and necessary parts of a functioning drone. Continuing to the next phase of the project, we plan on designing the respective frame for the quadcopter, as well as, testing and tuning the different components of the drone. Once done, we predict that the project will be able to fly in closed areas and later, in open areas.

15- Using Big Data Analysis to Investigate Where it pays to Attend College

Mukadder Cinar

Prof. Boyan Kostadinov

We will use public data with salaries by college, region and academic major to do big data analysis using R, and investigate where in the US it pays to attend College, given the salaries after graduation, compared to the college tuition. Students know that their starting salary will be different depending on what type of school they attend, on their majors and other factors. We will look at how graduates do on average, ten years after graduating from College, depending on various factors.

16- Molecular Docking of an Iso-Bacteriochlorin Compound on the Surface of Two Proteins, Bovine and Human Serum Albumin

Dayana Cobos

Prof. Diana Samaroo

Porphyrins are compounds that are widely studied due to their ability to be used in a diversity of applications. The human serum albumin and bovine serum albumin are key players in the transportations of molecules within the biological systems. In our research the focus will be in finding the binding sites and analyses of interactions of Isobacteriochlorin, which was synthetically prepared, with HSA and BSA. This will lead us to a step closer in understand the intramolecular focus that are used in the transportation or absorption of such molecules. This will be done by using Molecular docking. Molecular docking is a computational approach for the prediction of ligand-receptor bind sites.

17- Combustion Chamber Research and Construction

Justin Colon

Prof. Masato Nakamura

Waste to energy power plants are important because they can burn waste that is produced by cities. A waste-to-energy power plant produces energy by combusting municipal solid waste. This will free up space in landfills as well as produce energy for the city. We will compare both the forward acting grate and reverse acting grate to see which method is best because it is important to analyze the mixing of the waste. Our task will be to create a simulation to better understand the mixing of the waste. Overall, this technology will be very beneficial to the sustainability of a smart city because it will put waste to good use instead of leaving it to take up space.

18- Fabric Casting

Catherine Correa

Prof. Alexander Aptekar

For this project I wanted to explore, research and test different casting strategies. The goal project cast is to create a useful and sculptural pieces with a minimum formwork. I am utilizing

my own concrete formula (fibers) for to this project because of the heaviness of the material will be in contrast to the design of the form. This abstract is formed by a number of curves and deducting the amount of material used. Forming this organic structure but at the same maximizing its strength with the material. This serves as an advantage to an effective way to new design with less labor, less material and more strength. During my study I made different approaches with a set of trials in order to conclude which method was more effective. Dry cast concrete was one of the methods in order to maximize strength in the structure. With the use of fabric I was able to create a mix and add water within the outside. This would help the structure making it easier to maintain its shape and provide extra strength. Though the fabric chosen had a low fraction void and wasn't able to consume the water and began to deteriorate. As a result some of the changes are in the choice of fabric. This should be implemented in order to avoid deterioration of the dry cast and reinforce the concrete or just creating a mix that will then be poured into the fabric allowing it to cure instead of adding water. Allowing more stability within the structure. This allows for further use in the water to cement ratio in order for the structure to withhold.

20- Designing Smart Applications using Augmented Reality (AR)

Kimberly De La Santa

Prof. Marcos Pinto

Augmented Reality is rapidly developing in popularity because it brings elements of the virtual world, into our real world. Augmented Reality (AR) is a variation of Virtual Reality (VR). VR technologies immerses a user inside an imaginary environment. While immersed, the user cannot see the real world around them. In contrast, AR allows the user to see the real world, with virtual objects and information intertwined. Therefore, AR supplements reality and enhances the things we see, hear, and feel. This research project will implement a Web page that gives the user the opportunity to experiment with AR using WebAR.

21- Voice Controlled Door Lock

Tasha Deeroop

Prof. Farrukh Zia

The aim of this project is to develop a voice control door lock that will provide security against intrusion when the home owner is not home and is very useful for a disabled person. This project is a smartphone-controlled, internet-connected deadbolt actuator powered by a microcontroller that can be added onto any existing door lock without any modifications to the door. It consist of a high torque servo motor, LEDs to notify the user whether the door is locked or unlocked and a push button that is used to operate the lock manually. The servo motor will be connected to the door

knob and *it can be unlocked over a Bluetooth connection using a smartphone and a custom voice controlled app*. After a successful voice recognition the data will be sent to the Internet of Things (IoT) server which will inform the user when someone locks/unlocks the door.

22- Optimization and Topology in Design and Fabrication - From the Math-world to Architecture

Marco Dwyer

Evelyn Richardson

Davit Khomasuridze

Prof. Anne Leonhardt

Prof. Satyanand Singh

The project explores the foundations of topology behind the computer-aided generation of a torus and other complex forms utilizing the tools of Wolfram Mathematica and Robert McNeel's Grasshopper and Kangaroo. The process involves first researching the properties of an area of topology, generating models from mathematical inputs, analyzing these for form optimization, and then 3D printing for visualization of form. Finally, the team will create more iterations to explore the architectural potential of this form as a pavilion.

23- Dress and Identity: Any Inclusion of Many

Eleazer Espinosa Jr

Prof. Alyssa Adomaitis

Dress consists of all modifications and supplements added to the human body. Dress includes not only visual changes that can be seen by the eye but changes to the body that involves taste, smell, sound, and touch of the body. Dress supplements are inclusive of hats, shoes, and jewelry. Dressing the body using modifications and supplements hinder and/or facilitate communication (Roach-Higgins & Eicher, 1992). According to Eicher, "dress is a coded sensory system of non-verbal communication that aids in human interaction in space and time" (1995, p.1). "It is also a definition that is free of personal or social valuing or bias, usable across national and cultural boundaries, and inclusive of all phenomena that can be accurately be designated as dress" (Roach-Higgins & Eicher, 1992, p.1).

In recent times, there has been a paradigm shift with regards to gender prompting cultural changes not only in conversation, but in many facets of society. Gender identity is defined as "one's internal, deeply-held sense of one's gender as male, female, or something else entirely." (Encyclopedia Britannica, 2016, p.1). The question being asked is "What is gender?" And "How

do we define gender?” Many individuals no longer identify with “he” or “she” or “male” or “female” dichotomies. “Other” or “fill in the blank” no longer suffices; neither do male or female public restrooms. On the New York City’s Commission of Human Rights website, readers are not provided with gender identification definitions for further understanding or clarification, but instead there are definitions of gender identity and gender expression. For example, at universities, such as University at California Berkeley, definitions could be found on online lexica. Thirty-one genders are defined including *two-spirit* or an individual who is “Native American who have attributes of men and women, have distinct gender and social roles in their tribes, and are often involved with mystical rituals (shamans),” and *Genderqueer* or an individual who identifies with “neither man nor female, is between or beyond genders, or is the combination of genders.” In another example of broadening the gender concept, individuals who live in New York City can choose from thirty-one (31) different gender identities to select preferred gender for governmental purposes (Hasson, 2017).

Businesses that do not accommodate those individuals who identify on the list of protected gender identities such as: *gender queer*, *gender bender*, *two spirit*, and *gender gifted*, can face a six-figure fine, up to a \$250,000 in an anti-discrimination law suit on the basis of gender identity and gender expression or if “an establishment refuses to address someone by their preferred pronoun” (Beaman, 2016, p. 1). *The purpose of this concept paper is investigate different gender identities as defined in current literature and to propose research and teaching strategies for dress scholars that incorporate these definitions.*

24- Using Augmented Reality in Engineering Education

Juan Estrella

Prof. Benito Mendoza

Augmented Reality is an interactive mixture between the real world and computerized images that capture the audience’s attention. Devices that support augmented reality improve the image of the real-world surroundings with simulated physical input such as sound, video, or graphics overlaid on top of the real-world view. In recent years, augmented reality has improved beyond expensive military applications and has now entered a wide variety of domains. In engineering education, AR technologies can serve as a learning aid as well as a basis for innovation. The technology provides 3-D visualizations that allow to: (i) observe flaws in designs before the building process starts; (ii) see phenomena that are invisible to the naked eye, such as electromagnetic fields; (iii) incorporate features of the real world, machinery, facilities, etc. We present a mobile application that aims to be an aid for students in the course EMT1240 Introduction to Computer Engineering Technology. Our mobile app makes use of AR technologies to enhance learning about electrical circuits by bringing alive some of the diagrams in the lab manual of the class. It provides animated 3D models where students can play and experiment, to understand how to use basic components in the circuits’ diagrams work and the relationship between voltage, resistance, and current.

25- Comparative Study of Qubits

Juliano Everett

Zechariah Ilmot

Mubinjon Satymov

Prof. Oleg Berman

In quantum computing, a quantum bit ("qubit") is a unit of quantum information. A qubit is a two-level quantum system. The developing of qubits with optimal properties, related to quantum entanglement and possibilities of control the states of qubits, is very important for quantum computing applications. We analyzed various types of qubits. There are at least five major quantum computing approaches being explored worldwide: silicon spin qubits, ion traps, superconducting loops, diamond vacancies and topological qubits. We compared the advantages and disadvantages in the properties of all these qubits for applications for quantum computing. We analyzed possible strategies to improve control of these types of qubits.

26- Drug Screening from a Library of Thousands of Compounds to Inhibit the Function of BACE1

Marcia Fontenelle

Prof. Mai Zahran

Alzheimer's Disease (AD) is a chronic neurodegenerative disease that is said to be one of the leading causes of dementia and death in the United States. AD is a disease commonly found in older adults that progresses over time. An abnormal buildup of beta-amyloid peptide is one of the initial events in AD. This form large amounts of amyloid plaques between the nerve cells that can disrupt the function of neuronal synapses. The amyloid precursor protein (APP) is an integral membrane protein present on the surface of nerve cells and contains the amyloid beta (AB) peptide sequence. Beta-secretase (BACE1) helps produce beta-amyloid peptide by cleaving APP. The cleaving of secretase at the C-terminus of AB sequence, resulted in AB42 and AB40 isoforms. These two major isoforms have been considered to play a dire role in AD. The purpose of this research is to identify therapeutic agents that will gradually deplete an enzyme called BACE1, using computer tools and drug screening from a library of thousands of compounds.

27- Raspberry Pi RFID Attendance System

Kayla Ford

Prof. Marcos Pinto

In an emerging technological society, utilizing technology in given scenarios can improve a situation drastically. Within education, technology can dramatically change the classroom. Education is a powerful catalyst within society it deserves as much assistance as possible. By providing assistance to the classroom we could cut down the time wasted and increase time spent utilizing educational objectives. The intention is to provide an optimal attendance system for primary schools that utilizes Radio Frequency Identification (RFID) technology with a Raspberry pi to sign in students. Teachers would be able to yield information from the website provided which graphically displays students within a class and students currently present. By providing this technology to teachers, they will be able to maximize their time. The result is a carefully crafted classroom effort to measure student attendance and provide useful statistics. Currently, the research is still being conducted, we hope this project will lead to a more effective and proactive approach to the classroom setting.

28- An Ensemble Approach to Cleaning Large Datasets

David Friedman

Nadia Rodriguez

Prof. Ashwin Satyanarayana

In any dataset, there is random variation that is outlying from the target phenomenon. This random variation creates ‘noisy’ data, which causes lower classification accuracy when generating predictive models. To address this, we present FIND (Filter Noisy Data), a new tool that silences noisy data through an ensemble filtering technique. We combine the predictions of multiple base models, each of which is learned using a traditional algorithm, then use a majority vote technique to identify and filter noise from a given dataset. FIND is written in Python, and works on a growing set of platforms and data formats.

29- Exploring Works Flows from 3ds Max to Unity

Jean Pierre Gomez

Prof. Estaban Bieta

In architecture, there’s always been a desire to experience and become immerse into forms of architecture. In this paper we looked at using Unity 3d a cross platform game engine developed by Unity Technologies, which is primarily used to develop both three-dimensional and two-dimensional video games and simulations for computers, consoles, and mobile device as a virtual reality engine. Using Autodesk 3ds max, 3d models were constructed for visualization purposes with advanced materials bitmaps and lighting setups. The unity engine isn’t capable of reading bitmaps, so translating it to diffuse maps is necessary, which are recognized. The results are to

create a virtual reality generated space with full texture maps and lighting to allow for individuals to become immersed into the architectural spaces and elements. With this research we hope to show the possibilities of using virtual reality to enhance the learning experience within architecture classes adding more realism and visualization to the learning experience.

30- Interaction of Ionophoric Polyphenols with Human Serum Albumin (HSA)

Miguel Gomez

Prof. Alberto Martinez

The distribution, excretion, activity and toxicity of a drug are determined, at least in part, by its interactions with serum proteins. Human serum albumin (HSA), the most abundant blood plasma protein, reversibly binds pharmaceuticals, mainly at the hydrophobic cavities of subdomains IIA and IIIA. A series of ionophoric polyphenols, which serve as potential anti-Alzheimer's disease agents, have been synthesized, studied and are now being explored for their possible transport mechanism. In line with this, the molecular docking of the ionophoric polyphenols with HSA has been studied by molecular modeling techniques to obtain potential binding sites and types of intermolecular forces. Obtained from PDB, a binding HSA model with a 2.01 Å resolution and 0.243 free R-value was used to dock with ionophoric polyphenols. Using 9 Amino camptothecin as the initial ligand and control for the HSA, computational docking models were obtained, describing multiple potential docking locations. Optimal possible docking sites would be located in subdomains IIA and IIIA with weak interactional and intermolecular forces between the polyphenols and HSA.

31- Modeling Potential BACE1 Inhibitors

Johnny Guevara

Prof. Mai Zahran

Prof. Alberto Martinez

Alzheimer's disease (AD) is a fatal progressive neurodegenerative disease, currently it is the 6th leading cause of death in the United States, while active AD treatments are merely symptomatic and fail to slow or halt the progression of AD. A wealth of evidence suggests that accumulation of amyloid beta (AB) peptide deposits in the brain play a central role in the pathogenesis of AD. AB peptide production is catalyzed by the beta-site amyloid precursor protein cleaving enzyme 1 (BACE1); hence, BACE1 is a therapeutic target for AD. In our previous work, six potential BACE1 inhibitors were previously synthesized and biologically evaluated by *in vitro* inhibition FRET-based assays. The aim of this work was to implement an ensemble-based docking approach to study the underlying molecular interactions between compounds 1-6 and flexible conformations

of BACE1. We performed a 50 ns MD simulation of an apo-BACE1 structure and docked compounds 1-6 to an ensemble of BACE1 conformations obtained among the simulation time. In general, docking results revealed compounds 3 and 5 exhibiting the most favorable binding affinities to BACE1 while retaining the best experimental % BACE1 inhibition and IC₅₀ values. Further calculations of noncovalent interactions showed compounds 3 and 5 hydrogen bonding to the catalytic Asp32 and Asp228 residues, as well as exhibiting several stabilizing hydrophobic and π - π interactions in the active site. Overall, our computational results correlate well with our experimental results, they provide crucial information about the inhibiting mechanism behind our potential BACE1 inhibitors and highlight the importance of addressing protein flexibility in docking simulations.

32- Mechanical Characterizations of PDMS

Kerolos Hanna

Prof. Ozlem Yaser

Tissue Engineering has been studied to develop tissues as an alternative approach to the organ regeneration. Successful artificial tissue growth in regenerative medicine depends on the precise scaffold fabrication as well as the cell-cell and cell-scaffold interaction. Scaffolds are extracellular matrices that guide cells to grow in 3D to regenerate the tissues. Cell-seeded scaffolds must be implanted to the damaged tissues to do the tissue regeneration. Scaffolds' mechanical properties and porosities are the two main scaffold fabrication parameters as the scaffolds must be able to hold the pressure due to the surrounding tissues after the implantation process. In this research, scaffolds were fabricated by using micro-molding. During the fabrication process, first PDMS was mixed with Nano-materials and then it was baked in the oven for 2 hours. This preliminary research showcases that mechanical characterization of PDMS based scaffolds can be altered with nano-material concentration.

33- Virtue at the Coffee House: Poetry and Community in America

Tevin Harris

Prof. George Guida

This coming year I will enter the final phase of research for this project to which I've devoted five years of my life. The project explores performances of poetry as a pervasive alternative to mainstream culture and media. The resulting book, *Virtue at the Coffee House*, will benefit both a scholarly and a lay audience, by examining a large body of community poetry and by describing the role poetry and the social and cultural milieu it creates play in the lives of communities and individuals; most often in the lives of those most subject to social, political and economic inequality, or most concerned with the effects of such inequality, whose most viable platform in a world dominated by corporate media is the local poetry venue.

Performances of poetry have always formed a part of American life, from the great houses and circles of Native American societies to the coffee houses and libraries of contemporary cities and towns. For the continent's earliest human inhabitants, as for early European colonists, these performances for centuries served clearly defined, often sacred purposes. Performances of poetry in their contemporary American settings have tended to take on Aristotelian functions of catharsis and consciousness-raising. But these functions are not the entire story. Over the last half-century, readings and similar events have proliferated to the point that they serve the patrons of strip malls, chain bookstores and small public libraries as well as the denizens of Bohemian clubs and coffee houses. Across the “United States of Poetry” (Pellington) participants in these events have built communities of enormous social and educational value, and, in the process, have developed a viable alternative to mass media participation and consumption.

Of these performances, certain effects are clear, but a variety of social and aesthetic questions remain. How do contemporary performances of poetry differ from city to city, region to region, and from city to suburb or small town? To what extent do they constitute an alternative to mainstream culture and news? How do they change the lives of communities and individuals in different settings? By engaging communities directly, this study will consider current practice, and especially the social and cultural significance of poetry in performance, in context of its constant presence in American life.

34- Comparison of Air-content Measurement by Volumetric Method and Pressure Method for Different Aggregates in Freshly Mix Concrete

Kyaw Htun

Prof. Navid Allahverdi

The percentage of air content of the concrete is a necessary part of concrete mixtures exposed to thawing and freezing environments such as concrete bridges, roads, and pavements. In this research, the high percentage of air content of fresh concrete is compared to air content of different concrete mix design. The durability of concrete will vary based on the type of materials used in the freshly mixed concrete, supplementary cementitious materials, chemical mixtures, aggregates, and water ratio. The method of measuring the air content of freshly mixed concrete in this research is according to the ACI – Concrete Air Test ASTM C 173 (Volumetric Method of lightweight Aggregates, Fibers, Styrofoam, Polyethylene Eco-friendly recycled plastic pellets, perlite, recycled concrete and textiles. These materials can be tested for air-content, slump, temperature, and unit weight test according to the American Society for Testing and Materials –ASTM Standard. ASTM – C231 Pressure meter method will be used for accuracy purpose. The main comparison is to see the total percentage of air content versus the durability of concrete. The standard test specimen is cylindrical molds 4 inches in diameter by 8 inches in height. The durability and strength of concrete will be investigated after testing the compression test according

to ASTM C39 Concrete Cylinder Compression Testing. The best concrete mix design will be the higher air content with a maximum strength which can result in high durability in concrete.

35- Influence of Amino Acid Alphabet Reduction on Protein Structure

Qui Huang

Prof. Mai Zahran

Protein folding is a complex and sometimes resource-intensive process. To reduce this complexity, lighten the calculation process, and possibly help with de novo protein design, scientists have been exploring the field behind reduced amino acid alphabet. Previous studies have shown that protein with reduced amino acid alphabet can maintain essential protein function; this is achieved by replacing amino acid with others that are similar in properties. However, there remains the question of which amino acid is to be replaced by which. The objective of this research is to examine the 18,000 different alphabet substitution algorithm as produced by a recent study¹. Each alphabet replacing algorithm will be tried against 200 unique proteins obtained from the PDB database. This research will be using homology modeling tool to align the original protein sequence to the reduced version and perform comparative modeling to obtain its structure. Correlations between Root Mean Square Deviation and the model's scoring function will help identify the best reduced alphabet substitution.

36- Physical Modeling of Combustion Chamber

Muzahidul Islam

Prof. Masato Nakamura

Waste accumulation has been a dramatic problem for society incessantly and has increased exponentially with the rapid development of industries, restaurants and the vast number of products that people use on a daily basis. For years now, this has been an issue of great concern and the only remedy being left is to build an efficient Waste-to-Energy (WTE) power plant that could convert wastes to valuable energy along with saving thousands of acres of lands that are currently being wasted for storing and decomposing of these waste materials. The primary step of the WTE process involves mixing waste particles together and burning them inside a Mass-Burn Waste-to-Energy combustion chamber. The process itself is a delicate one as municipal solid wastes (MSW) are extremely heterogeneous. One of our main concern for building the physical model was controlling this combustion process. The model will allow us to better understand the mixing of the MSW as it will involve putting trashes of various shapes, sizes and properties. Hence, efficiency will be achieved by understanding the trash input and by gradually improving the geometric and operational parameters of the model. Afterwards, experimental data will be collected from the physical model to create stochastic models, using computer programs, that will

better allow us to visualize and improve the mixing of the trash and hence the input. The combination of stochastic and physical models will enable us to create an efficient forward acting grate combustion chamber that will not only help us to get pure energy out of waste products but will also ensure for a cleaner, smarter city - apprehending a better living!

37-Home Automation IoT Device

Ayesha Javed

Prof. Farrukh Zia

Internet of Things (IoT) is the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data. This research project involves making IoT devices with the use of embedded circuits, combined with developing program code to make everything work together. In this research project low cost open source hardware and software will be used to design, build and test a programmable Internet of Things (IoT) device to implement remote sensing of home temperature and humidity and remote control of lights, fans and other appliances through the Internet. Electrical circuits, computer hardware, software programming and wireless networking knowledge gained from the classroom and laboratory is employed in this research project to develop key components of a small-scale Internet of Things framework.

This project is divided into two parts. One student worked on the hardware implementation of the IoT device and the associated low level embedded systems programming of the sensors and circuits. Another student worked on the second part of the project primarily dealing with high level programming that facilitates data communication between IoT nodes and IoT Analytics website.

38- Real Estate Development in Brooklyn Heights Before and After the Brooklyn Bridge

Ann Jean

Prof. Monica Berger

Prof. Alexander Aptekar

The neighborhood of Brooklyn Heights developed as a residential enclave in the 1830's because of the invention of steam power ferries which made commuting to lower Manhattan reliable and inexpensive. Today, traveling along its charming Brownstone lined streets recalls a past that is forever preserved through its status as a historic district. Technological advances are drivers of widespread societal change. Often this progress leads to the development of new infrastructure which is at the core of urban development, affecting real estate values and demographics. The opening of the Brooklyn Bridge in 1883 did much to reshape the socio-economic and architectural character of the two areas it connected, lower Manhattan and the Brooklyn waterfront (DUMBO) and Brooklyn Heights. This project documents real estate price changes in Brooklyn Heights as the Brooklyn Bridge, a major infrastructure, was being constructed. Quantitative analysis of real

estate listings from the Brooklyn Daily Eagle provides a baseline that can be used to compare fluctuations in value of properties in a case study block bounded by Poplar Street to the north, Hicks Street to the east, Middagh Street to the south and Poplar Street to the west. Property value are extrapolated from conveyances from the Brooklyn Department of Finance as properties are transferred from one party to another. As new infrastructure can affect property values and stimulate neighborhood change, this research provides a methodology to examine this relationship.

39- Developing Computational Thinking Projects with R and Python

Shmuel Kamensky

Prof. Boyan Kostadinov

In 1847 the Hungarian physician Ignaz Semmelweis discovers the health benefits of hand washing. Dr. Semmelweis saved thousands of lives by requiring handwashing at his hospital after analyzing medical data he had collected. In this project, we will analyze the same medical data and draw conclusions based on the data analysis, following the footsteps of Dr. Semmelweis.

40- Wearable Vision System for Scene Understanding

Jane Lynnel Ladaban

Prof. Xiaohai Li

The purpose of this research project is to help phonetically impaired people become more adaptable to their surrounding environments. Not many people are familiar with American Sign Language (ASL) Alphabet, and this creates a tremendous communication gap. With that being said, the research team implemented a C++ program and made use of a 3D Camera to translate sign language hand symbols into transcribed letters. We predict that the project will be furthered by starting to turn these letters into words and later translate these into phrases and sentences. This kind of technology is essential because this will make the communication between two parties even more effective.

41- Circular Dichroism Profiles of Bovine and Human Serum Albumin and Calf-Thymus DNA

Dianna Landi

Prof. Diana Samaroo

Circular dichroism (CD) spectroscopy was employed to determine the folding properties of proteins (bovine and human serum albumin, BSA and HSA, respectively and if possible calf-thymus DNA). This technique was used to determine the folding structure: secondary or tertiary structure (alpha or beta-sheets) of the proteins. We optimized the conditions of CD spectroscopy by looking at different buffers and concentration. We report in this presentation our findings in comparison to literature. BSA and HSA are predominantly alpha helices.

42- A Study of Cultural Competence and Implicit Bias amongst Healthcare Students

Mary Lee

Tiffany Yip

Prof. Zoya Vinokur

In response to the growing issue of health care disparities amongst the diverse populations in the United States, more medical programs are including cultural competency education as part of their undergraduate curriculum. As students in the healthcare field, we want to be able to understand and provide care that best serves the needs of a culturally diverse patient body. This study aims to look at whether healthcare students at City Tech are able to clearly define and understand the concepts of cultural competence and implicit bias in their healthcare encounters. Our research will be expanding upon existing data from the previous year, but we will also be opening the scope of the project to include non-healthcare students as well. To understand how the general student population perceives their healthcare encounters, we will be distributing a revised questionnaire that is loosely based on the criteria outlined in the Tool for Assessing Cultural Competence Training (TACCT) developed by the Liaison Committee on Medical Education (LCME). We are also updating the survey questions to be more relevant and more sensitive to today's communities. Our focus is to improve our data analysis based on how we present the questions on the survey. For instance, we've changed a question about homophobia to "gender preference for health care provider," which we believe seems less biased and better reflects the data we are interested in. In conclusion, we will revise and improve upon the previous questionnaire and expand it to include the perspective of the general student body.

Link to the TACCT: <https://www.aamc.org/initiatives/tacct/>

43- A Study of Cultural Competence and Implicit Bias amongst Healthcare Students

Vivian Liang

Prof. Zoya Vinokur

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44- Exploring the Essences of Contemporary Desserts to Reimagine and Create a Modern Dessert

Amy Lin

Prof. Robert Walljasper

Everyone has room for dessert after a delicious meal, but before you take a bite, have you ever thought about what is the essence of a great dessert? The purpose of this research project is to identify core components of contemporary dessert, explore pastry creativity, and development of dessert menu. Data will be collect from fining dining establishments and international counterparts through literature. An analysis of texture, flavors and components will be prepared to identify commonalities. Further research into pastry chefs will be conducted through literature, periodicals, and interviews to discover what influences or inspires their creativity. The research will be applied in developing a creative work or signature dish to be exhibited in professional competition adjudicated by industry experts including a certified master chef. Becoming a professional patisserie is what most pastry students aspire to achieve. Continued research in this area can enhance the development of taste, technique, esthetics, and critical thinking of Hospitality Management students seeking to enter the culinary or pastry field.

45- Low Cost Drone for Medical Applications

Christian Lopez

Olajide Odesanya

Prof. Andy Lopez

The age of drones has arrived, and now emergency drones are providing much-needed help to isolated and disaster relief areas. Nurses, doctors, surgeons, blood bank operators, and other healthcare professionals are beginning to encounter drone-based services in many settings. Though the drone cannot replace Emergency Services, it is a bridge for first responders. Drones can make the difference in a life or death situation. Often, in such cases, time is crucial as victims must wait for help to arrive. Yet high-tech drones could shorten that waiting period significantly. But, the understanding of this new technology is key for a correct implementation. Our goal is to explore and determine the most reliable way to manufacture a Low-Cost Drone for Medical Applications.

46- Development of Polymer Matrix Composites

Calwayne Malcom

Prof. Akm Rahman

Polymer matrix composite (PMC) is a lightweight, high strength and heat resistance composite material that consist of a variety of short or continuous fibers bound together by an organic polymer matrix. PMCs are one of the best if not the best alternatives to conventional metals and ceramic materials. To gain a better understanding of PMC and its uses various devices, more particularly medical devices, will be fabricated using fiber reinforced matrix composite that meet industrial needs and standards. This will involve the development of molds of various metals and shape in order to fabricate PMCs of desired dimensions.

47- Mapping Brooklyn Civic Center

Gabriela Martinez

Yuying Xian

Prof. Ting Chin

Prior to the planned civic center that endures in downtown Brooklyn today, a naturally occurring civic center once existed that evolved through a combination of circumstance, function, time, and place. This project will document the historical evolution of the civic ensemble that encompassed this naturally occurring municipality in order to analyze the development of the surrounding urban fabric and its systems of organization. A methodology for collecting, analyzing, and graphically documenting historical maps will be tested and evaluated. The results will ultimately be used to document and study the development of the current condition of the Brooklyn Civic Center, analyze its performance and impact on Downtown Brooklyn, and develop proposals and recommendations for its improvement.

48- The Adoption of Vernacular Techniques by New York City to Decrease the Use of Mechanical Heating and Cooling

Mathyln Mckie

Prof. Jihun Kim

As I began my research project I decided that I needed a deeper understanding of what the word vernacular meant and how it is used in architecture. Upon further research, I realized that vernacular techniques meant techniques that were indigenous to a specific climate and location. The only difference is that many of these locations are either third world or underdeveloped countries. I have also done research on some Asian and African countries to get a better understand of how these techniques have been applied and how effective they have proven to be. The method and materials used are not common in the western world in terms of building however modern day items that possesses some of the same characteristic can be substituted. I will be using techniques such as natural ventilation and shading for passive cooling in the warmer months (ineffective in the colder months) in conjunction to thermal mass and direct solar gain in the colder months for

maximum passive heating. I will provide supporting proven evidence of the effectiveness of these techniques to justify them in addition to my own supporting work.

49- An Analysis of Factors Affecting Emotional Regulation and Vagal Tone in an Expressive Writing Paradigm

Kevin Mei

Prof. Jean Hillstrom

An extensive body of literature shows that writing about traumatic or emotional experiences results in improved emotional and physical health and well-being. In Pennebaker's (1997) expressive writing paradigm, participants are instructed either to write about traumatic emotional events or neutral topics over several sessions. Those assigned to the emotional writing condition typically display physical and psychological health improvements over time compared to the control condition (Pennebaker, 1997). This study extends pilot work we did in our lab which found that when participants engaged in cognitive restructuring (subjects were asked to reframe an emotional experience in positive terms i.e., meaning-making), vagal tone improved. A second major difference in our study versus previous published work is that our study assessed the effects of expressive writing on the parasympathetic (e.g., vagal tone) and sympathetic nervous system responses over time.

50- Probabilistic Models for Populations Dynamics

Claire Mirocha

Prof. Mariya Bessonov

Simulating dynamics of a population with a mathematical model gives insight into ecological systems. The stochastic processes behind actual population changes can be complex. Applying mean field theory, we use probabilistic rates to simulate events that alter the population in a system, such as births with cyclic rates, deaths, competition, and local extinctions. We further consider births with random cyclic rates. The behavior of these population models is used to identify conditions that produce “cyclic equilibria” which persist despite the existence of random processes in a model. This method makes the efficient simulation of a large and complex population possible, and can be extended to cover multiple population groups living within the same ecological system.

51- IoT Enabled Wearable Technology

Estrella Moreira

Prof. Farrukh Zia

IoT Enabled Wearable Technology implements the concept of Internet of Things (IoT) in a wearable device using wearable technology. Internet of Things (IoT) is the network of physical devices which enables these devices to connect and exchange data. This project uses sensors such as a gyroscope connected to a wearable micro-controller in this case I am using an Arduino Pro-mini. The information obtained through the sensors will then be sent to an IoT analytics website via Wi-Fi by using an ESP8266 Wi-Fi module. The information collected by the sensor will be available to be viewed and used across the Internet. Besides the website, this project has a local output device which will produce an audio-visual output: light and musical notes, by using an input sensor. The goal of the project is to create a bracelet that will produce musical notes based on the movement of the hand and share the data collected through the internet. This technology can also be used in the medical field to diagnose and monitor people with medical conditions such as arthritis and bone or joint injuries.

52- Servo Network Based Heteromorphism Robot

Gene Nadela

Prof. Xiaohai Li

As mechatronics and automation become more ubiquitous, new forms of robotic interaction will need to be developed. A robot is often restrained to fixed positions and modes in order to perform certain tasks effectively. Some robots may be wheeled but this limits its flexibility. Some may be legged, but this limits its overall speed.

The purpose of this project is to design and develop a humanoid robot, capable of bipedal locomotion as well as motorized, wheeled locomotion. The robot will be utilizing multiple servos working in tandem acting at various joints on the system to produce bipedal motion. It may then alter its form with the same servos into a shape that allows all four motorized wheels to make contact with the ground, and permit vehicular movement along its path. Bipedal motion confers an advantage to robots in terms of flexibility and agility; while wheeled locomotion provides speed. Improving on the existing design, careful measurements are made to produce adapters to augment the robots frame with the addition of wheels and servos. The robot's wheeled movement function is stress tested with various 3D-printed part designs, made so that they do not obstruct its ability to walk. The result is a robot capable of smoothly transforming between wheeled motion and bipedal motion, executing both with consistent, remarkable results.

53- C.H.E.S.S.

George Nwankwo

Hashir Qureshi

Harpreet Gaur

Prof. Viviana Acquaviva

In summer of 2017, we developed a web application named C.H.E.S.S. It stands for, Computerized Homework Exercise System. The goal of CHESS is to create a fun, engaging, accessible, low-to-no cost homework solution for teachers to use in classrooms regardless of discipline. We aim to implement several features through our platform for both instructors and students. On the teacher's side, a feature we plan to complete is the ability for instructors to input question-answer sets, with point values of either 5, 10, 15, or 20 when creating a topic for a specified course. Multiple topics can be created and assigned per course. Given an amount of points for an assignment, a list of topics with their corresponding question-answer sets, an in-progress student feature will randomly generate assignments per student. This semester our goals were to revamp the design of the application to accommodate the new features, complete the teacher's portal of the application, and demonstrate and test a functioning live demo of C.H.E.S.S. in a classroom. Our long-term goal for C.H.E.S.S. is to have a flexible and secure platform that can be tailored to the needs of professor teaching at the college or high-school level.

54- Killing Them Softly with Kindness: The Congregation of the Order of Our Lady of the Apostles and British /French Colonial rivalries in the Egyptian Delta at the end of the 19th Century

Wolf Pamphile

Prof. Stephanie Boyle

The main purpose of our project was to understand the relationship, between the Christian French missionaries and the Arab community in Tanta, Egypt during 1890 and 1902. We began our research by analyzing handwritten correspondence between the missionaries, and their headquarters in France. Our first step was to identify the senders and receivers of each letter. After identifying them, we translating the letters from French to English. As a result, we were able to notice the attitude of the French missionaries towards the Arabs. While the missionaries were providing health services to those in need. They also viewed the Arabs as uneducated and almost uncivilized.

55- Developing Computational Thinking Projects with R and Python

Hashir Qureshi

Prof. Boyan Kostadinov

We will scrape the novel "Moby Dick" from the Project Gutenberg website, where the text of the novel is freely available. Our goal will be to analyze the distribution of words using the Python Natural Language Toolkit to find the most frequent words in "Moby Dick". These natural-language processing tools have many applications in modern data science.

56- Design of IoT Enabled Computer Controlled System

Syeda Nazia Rahman

Prof. Farrukh Zia

This research project will demonstrate a systematic approach to design computer-controlled systems by combining a number of hardware and software based sub-systems or building blocks. Remote monitoring and control of the system will be implemented by using Internet of Things (IoT) technology.

57- Intersecting Spheres and the Global Positioning System GPS

Evelyn Richardson

Prof. Anne Leonhardt

Prof. Satyanand Singh

The Global Positioning System or GPS consists of twenty-four satellites that orbit the earth. These satellites transmit synchronized signals from space to receivers on earth. We can view the transmission of these signals as invisible spheres. In this study will illustrate by geometric considerations and 3-D models how intersecting spheres play a role in predicting the location of the receiver. We will also discuss the ubiquitous applications of the GPS and some of the mathematics and forms it entails.

58- City Tech Talk and Roll Bot

Samiha Riham

Prof. Farrukh Zia

City Tech Talk Bot is a robotics project which combines computer hardware and software technology with mechanical, electrical, data communication and networking technologies to create a working prototype of a computer controlled robotic system. It will be programmed with the help of open source software to greet people using voice synthesis. It will also be able to navigate its way around a room by using sensors to detect people and other nearby objects. The student will do research to gather background information and data; gain required knowledge through tutorials and hands-on learning; analyze information; synthesize, implement and present a solution. Following skills and knowledge learned in the classroom will be employed by the student in conducting the research project: Electrical Circuits, Digital Systems, Mechanisms, Mathematics, and Computer Programming. The student will gain skills and knowledge in the following areas: Gain background knowledge; Conduct background research; Preparation of research report; Oral and written presentation of research project; Computer aided design and simulation.

59- Computer Applications of Calculus

Andre Rodriguez

Prof. Nan Li

Often, students will question why a certain class is required to advance to subjects of more interest to them in their degree. After all, if the subject's material is not apparent in relation to a student's career, then the motivation or interest can potentially be lost. This lack of transparency in classes especially STEM-related, is the focus of this research (specifically for calculus). The study is concerned with how calculus is utilized within a computer program such as MATLAB to estimate antiderivatives. Due to the difficulty of calculating antiderivatives, we use piecewise Interpolation Polynomials to approximate the function for the following experiment. The interpolation methods used were Composite Trapezoidal Rule (whose error is controlled by the higher derivative of the tested function) and Composite Simpson's Rule. While Simpson's rule is overall more accurate than Trapezoidal Rule, its application is limited based on the function. Considering these limitations, knowing which method to utilize was crucial to conserve RAM for MATLAB. We used Composite Trapezoidal and Composite Simpson's to approximate the integral of these functions. We then compared the performance of these methods for various functions, seeing how effective and limited they can be when estimating certain functions. Both methods worked successfully for receiving close approximations for certain functions. For students taking Calculus courses, the application of these two methods is significant for evaluating statistical data and is a prominent example of the applications calculus has in computer programs.

60- Recurrence Relations and Computational Complexity

Mian Shabbir

Anh Trieu

Prof. Satyanand Singh

In this project, we will show how recurrence relations can be used to analyze the computational complexity of divide-and-conquer algorithms. We will use these recurrence relations to estimate the number of operations used by many different divide-and-conquer algorithms. Our studies will also involve the creations of various examples and the use of transformations to extend our studies to a larger group of problems.

61- Developing Computational Thinking Project with R and Python

Harmandeep Singh

Prof. Boyan Kostadinov

In this project, we will build and analyze the network of characters in Game of Thrones, and how it changes over time. Jon Snow, Daenerys Targaryen, or Tyrion Lannister? Who is the most

important character in Game of Thrones? We will look at the character co-occurrence network and its evolution in Game of Thrones. We use a dataset from the Network of Thrones blog.

62- Home Automation IoT Device- Hardware Implementation

Arooba Sohail

Prof. Farrukh Zia

In this research project low cost open source hardware and software is being used to design, build and test a programmable Internet of Things (IoT) device to implement remote sensing of home temperature and humidity and remote control of lights and fans etc through the Internet. Two students are working together on this project. One student is implement hardware building blocks and the other student is implement software building blocks. I do research to gather background information and data; gain required knowledge through tutorials and hands on learning; analyze information; synthesize, implement and present a solution.

63- Controlling a Car with AI Voice Recognition

Jennifer Solomon

Prof. Farrukh Zia

Artificial intelligence has the ability to mimic human behavior. The purpose of my research is to get a more in-depth look on artificial intelligence. As I seek to get a better understanding of the future of artificial intelligences and its advances in the world. I decided that i would create a project around such topic that has seemed to caught the eyes of many, by exploring exactly how advanced artificial intelligence is. I will be creating a project that pushes me to use my prior knowledge of programming to create a self-driving car using voice recognition.

64- RoboQueen Blynked

Rumana Hassin Syed

Prof. Farrukh Zia

RoboQueen is a robotic mannequin that can talk and move and interact with people. This is an ongoing project and in this phase of the project we connect the :ED e-lips of the robotic mannequin and test it with raspberry pi computer sound output. The e-lips is an important part of the project as we are using espeak software on RPi to produce sound output from the speakers and control eye color and e-lips LEDs. We are also using MATLAB and Blynk smartphone app to control the head

and the arm movement in a synchronized way based on kinematics calculations. Also, Alexa is being used for Voice synthesis and voice recognition.

65- A Study of Cultural Competence and Implicit Bias among Healthcare Students

Paulina Szymanska

Prof. Zoya Vinokur

In response to the growing issue of health care disparities amongst the diverse populations in the United States, more medical programs are including cultural competency education as part of their undergraduate curriculum. As students in the healthcare field, we want to be able to understand and provide care that best serves the needs of a culturally diverse patient body. This study aims to look at whether healthcare students at City Tech are able to clearly define and understand the concepts of cultural competence and implicit bias in their healthcare encounters. Our research will be expanding upon existing data from the previous year, but we will also be opening the scope of the project to include non-healthcare students as well. To understand how the general student population perceives their healthcare encounters, we will be distributing a revised questionnaire that is loosely based on the criteria outlined in the Tool for Assessing Cultural Competence Training (TACCT) developed by the Liaison Committee on Medical Education (LCME). We are also updating the survey questions to be more relevant and more sensitive to today's communities. Our focus is to improve our data analysis based on how we present the questions on the survey. For instance, we've changed a question about homophobia to "gender preference for health care provider," which we believe seems less biased and better reflects the data we are interested in. In conclusion, we will revise and improve upon the previous questionnaire and expand it to include the perspective of the general student body.

66- Enhancing Learning about Electrical Circuits Components Using Augmented Reality Apps

Suleyman Turac

Prof. Benito Mendoza

The term Augmented Reality (AR) refers to the technologies that superimpose digital content generated by computers over the user's view of the real world. AR technologies enhance the version of the physical environment with computer-generated sensory input such as sound, video, or graphics overlaid on top of the real-world view. In recent years, AR has moved beyond expensive military applications and has now entered a wide variety of domains. In engineering education, AR technologies can serve as a learning aid as well as a basis for innovation. We present a mobile application that aims to be an aid for students in the course EMT1240 Introduction to Computer Engineering Technology. Our mobile app makes use of AR technologies to enhance learning about electrical circuits by bringing alive some of the diagrams in the lab manual of the

class. It provides animated 3D models where students can play and experiment, to learn about electrical components, such as switches, LED, resistors, etc. With this app, students not only learn how these components should be connected to form a valid circuit, but also learn about their functionality.

67- An Augmented Reality App to Aid Learning about Ohm's Law

Wellington Verduga

Prof. Benito Mendoza

The term Augmented Reality (AR) refers to the technologies that superimpose digital content generated by computers over the user's view of the real world. AR technologies enhance the version of the physical environment with computer-generated sensory input such as sound, video, or graphics overlaid on top of the real-world view. In recent years, AR has moved beyond expensive military applications and has now entered a wide variety of domains. We present a mobile application that aims to be an aid for students in the course EMT1240 Introduction to Computer Engineering Technology. Our mobile app makes use of AR technologies to enhance learning about electrical circuits by bringing alive some of the diagrams in the lab manual of the class. It provides animated 3D models where students can play and experiment, to understand Ohm's Law and the relationship between voltage, resistance, and current.

68- Design and Manufacturing of a Polar 3D Printer

Jiamian Zhao

Prof. Angran Xiao

3D printing is the techniques to fabricate a three-dimensional physical object or assembled from a digital CAD (Computer Aided Design) file. The 3D printing techniques help companies save time and money on modeling a physical part. Almost any shape of model can possible be created in 3D printer. Right now, there are many different kind of 3D printer in the market, and 3D printing technology is still under development. Polar 3D printer is a unique one which using polar coordination system to modeling object more effective. The polar coordination is quite like the Cartesian, except polar coordinate sets describes its points on a circular grid rather than a square. In other words, polar 3D printer can have a rotating/spinning bed and print nozzle can move up, down, left and right.