



# **Book of Abstracts**

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1-Ramsey Numbers

Baikuntha Acharya

Mei Zhu

Prof. Satyanand Singh

The research focuses on the Ramsey number which is denoted by  $R(m, n)$ , and can be viewed as the minimum number of people needed to be in a party such that at least  $m$  of them are friends or at least  $n$  of them are strangers.  $R(m, n)$  can also be used to represent the minimum number of vertices that are needed to obtain at least one red subgraph that has  $m$  vertices or at least one green subgraph that has  $n$  vertices in graph theory. In this research, we will prove various results associated with Ramsey theory that are useful in combinatorics.

2-The Role of Sirtuins in *T. Thermophila*

Emmanuel Adebola

Prof. Ralph Alcendor

*Tetrahymena thermophila* are free-living ciliate protozoa that can be found in fresh water around the world. These organisms are model organisms for biomedical and toxicology studies. Studying these cells has led to important findings such as mechanisms controlling cell cycle, identification of cytoskeleton and discovery of the structure of telomeres and telomerase. These cells are known to be very resistant to temperature and other environmental conditions. Therefore, they are ideal for examining the effect of oxidative stress, OS. Oxidative stress is the imbalance between levels of free radicals and the ability of the body to neutralize these free radicals. High levels of OS can prevent proteins, DNA and other important molecules from functioning. To combat these free radical's organisms, have antioxidants that can neutralize or eliminate these free radicals. Sirtuins are a family of proteins found in almost all living organisms. The name sirtuins comes from yeast silent mating type information regulation 2 or sir2 family of proteins. These genes and proteins have been implicated in a wide variety of cellular functions such as control of circadian clocks, mitochondrial biogenesis, cell death and survival, and longevity. Cells with mutated form or overexpressing sirtuins live longer than normal cells. Mammalian cells have several sirtuins. In other organisms these enzymes have been shown to function in regulation of OS. In *Tetrahymena thermophila*, the role of sirtuins in regulation of OS has not really been examined. This project aims to examine the effect of OS on THD14, one of several *Tetrahymena thermophila* sirtuins. Cells were exposed different concentrations OS inducers: glucose, iron, NaCl, H<sub>2</sub>O<sub>2</sub>, copper and ethanol for 24 - 48 hrs. followed by cell death and mRNA analysis. High concentrations of these OS inducers lead to significant cell death. 500 mM of iron, NaCl, copper and ethanol resulted in 23%, 33%, 34%, and 29% cell death after 24 hrs. H<sub>2</sub>O<sub>2</sub> at 500 μM only caused a 9% reduction in cell survival compared to 49% by 1.0 mM. Glucose at 3% and above induced more than 30% cell death after 24 hrs. So far, THD14 gene expression increased in the presence of increasing concentrations of most of the conditions listed above, with NaCl showing greatest amount of increase, more than 150% increase. On the other hand, both 0% glucose and starvation resulted in lower levels of THD14 gene expression compared to control. These results indicate THD14 may be involved in OS regulation, although the type of involvement may be dependent on the OS inducer.

### 3-Chatbot: A Virtual Assistant

Ouri Alkada

Prof. Marcos Pinto

A chatbot is a computer application supported by rules and artificial intelligence that users can interact with via a chat interface. The project proposes an application which users can ask questions from by typing in their question on a text box and the application responds by redisplaying the user's question and providing the user with a corresponding answer. It is a learning application although the learning domain will be centered in resource locations within Citytech's campus area. The application accesses a database providing it with the question and the algorithm goes through the set of answers looking for a

### 4-In silico study of newly synthesized opioid analgesics bound to three opioid receptors

Abdullah Allaoa

Prof. Mai Zahran

Opioids are the most widely used drugs for the treatment of moderate to severe, chronic pain. They achieve antinociception by activation of mu (MOR-1), kappa(KOR-1), and delta (DOR-1) opioid receptors. Natural products found in kratom plant, *Mitragyna speciosa*, represent diverse chemical groups with opioid activity, providing opportunities to better understand opioid pharmacology. Pharmacology studies show that Mitragynine pseudoindoxyl is a mu agonist/delta antagonist opioid with a signaling bias for G-proteinmediated signaling pathways in vitro and which produced potent antinociception in vivo. Respiratory depression assays along with other behavioral testing also showed that some of the major problems of opioid therapy (physical dependence, respiratory depression, GI transit inhibition) were not observed by the use of Mitragynine pseudoindoxyl in mouse models. In silico docking studies will be carried out to unravel potential differences in receptor interactions with lead compounds.

### 6-Solar and Rain Catching Canopies for a Greener New York

Evan Banks, Afolabi Ibitoye, Langston Clark, Elena Zimareva

Prof. Alexander Aptekar

Our research project is focused on developing a prototype model that collects rainwater for plants watering in NYC "Pocket Parks" and uses solar panels to charge park visitors phones by harnessing nature's resources with today's technology in an effort to beautify, educate, and promote good health and growth of communities and local businesses. During rainstorms in NYC, the grey water overfills sewage systems of NYC pushing Treatment Plants to release water untreated. NYC Department of Environmental Protection encourages people to plant small gardens and instead of asphalt or concrete to absorb rainfall and collect rainwater rather than letting it go to the combined sewer system. For this project, we are collaborating with NYC "Pocket Parks" that are installed throughout Manhattan during spring, summer and fall seasons. A focus of the research is to create a design for the canopy that fits in a park's layout and can collect the power solar rainwater and distribute it to the separate storage clay pots that are located in earth on different levels of the "Pocket Parks". We research the best balance between the demands of water collation and solar energy. The team determined the best angle and size for solar panels to produce enough of power to satisfy the demand of phone charging; calculated the average volume of rainwater to be collected by the canopy from spring through the fall. We created a 3D model of the canopy. Our goal is to use environmentally friendly materials that is why we will mostly use natural materials such as wood and cotton canvas. Since the objective is to create a design that is both affordable and easily duplicable, the features that we considered were: collapsibility, energy output, water catching method, and flexible solar systems. The next part of the project is the creation of a prototype that will be installed in one of the "Pocket Parks." Another big part of the research will be monitoring how well it performs over time and

possibly modifying the canopy. The development includes, the 3D physical model of the solar and rain catching canopy as it integrates into the design of the “Pocket Parks.” A prototype designs were developed and one was selected for prototyping. At this stage of the project, we are in the early stage of assembling the prototype model that we called “Urban Oasis”.

#### 7-Measurement of Airflows through Entrance Doors

Jelani Barro, Haoxiang Cui, Lev Chesnov, Demba Diop  
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 research is an ongoing process throughout the course of a year, of which measurements of the: temperature, relative humidity, CO2 levels, the frequency of door openings, and differential pressure and air velocity over the doors are recorded. The data is primarily focused on the indoor thermal environment, within 10-20 ft. of the entrances. The research is to present the results of the measurements taken. Research findings so far have proven that the indoor thermal environment in the lobby areas through the entrance doors, significantly varies during cold and windy outdoor weather. With future studies, the results of this research will enable us to identify the implication of the impact of the energy flow through entrance doors.

#### 8-Ticked off at City Tech

William Bennett  
Prof. Jeremy Seto

*Amblyomma americanum* (Lone Star tick), *Dermacentor variabilis* (American Dog tick), and *Ixodes scapularis* (Deer tick), are three species of ticks found in the NYC area. Each species has a different feeding status and food source during each developmental life stage resulting in diverse gut microbiomes. This diversification will be analyzed and host-pathogen interactions in these disease vectors will be explored to identify possible interventions for the diseases that they transfer.

#### 9-Zika Virus Regulations in the State of California

Christian Bermeo  
Prof. Naomi Rodriguez

Zika Virus is something that is being spread throughout the world and the United States is no exception to the mosquito-borne disease. Southern states are the most at risk but, what about the other places less susceptible? How are resources being distributed throughout the fifty states, specifically the state of California? Zika can cause many negative health effects on the body, especially on newborns and the elderly. California’s health department being responsible for all citizens in the state, what is being done different in regards to health regulations for a susceptible county like San Diego compared to Alameda, where their likelihood for mosquito-borne transmission is extremely low?

10-Chronicling the Achievements and Activities of Honors Scholars at City Tech  
Savannah Blodgett  
Cherishe Cumma  
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 1 continues to showcase our skills serving as photographers, graphic artists, technical writers, and reporters. Responsibilities crucial to this major interdisciplinary project include going to scholarly presentations, attending workshops, conducting interviews, creating layouts, editing texts, taking photos, meeting deadlines, and integrating feedback.

11-Physical Modeling of a Forward Acting Grate Combustion Chamber  
Giovanni Campos, Justin Colon, Brian Yellis  
Prof. Masato Nakamura

A waste-to-energy (WTE) power plant produces energy through the thermal treatment of municipal solid waste (MSW). In a WTE power plant, the thermal treatment takes place within the combustion chamber. Because MSW consist of materials with various properties, proper mixing of MSW is needed throughout the chamber. Understanding the mixing phenomenon will make the combustion chamber more stable and keep the process efficient. This research focuses on the mixing phenomenon of coal particles on a forward acting grate (FG) combustion chamber. Coal is uniform in size and density, thus offering an easier understanding of the mixing phenomenon in the experiment. To simulate the mixing phenomenon of the coal particles, a physical model of the FG combustion chamber was created. Tracers were also created for the experiment, to keep track on the mixing of the coal particles. The coal and tracers used were approximately the same volume and density. The data from this experiment will be used to calibrate a stochastic model.

12-Design and Manufacturing of a CNC Router  
Jesus Castellanos  
Prof. Angran Xiao

The objective at hand is to design and construct a Computer numerical control (CNC) machine from recycled parts supplied at City Tech. We will then benchmark the machine against other similar products. Next, we will proceed to gather and study data from the general public. This should give us a perspective of our target audience and their wants and needs. Further, this will aid the project's forecasting potential sale initiatives

13-Noise Filtering in Big Data for Predicting Parent Satisfaction  
Jan Way Chen  
Prof. Ashwin Satyanarayana

Big data plays a significant role in decision making for many organizations. Analysis of the data collected provides insights on opportunities for improvement as organizations have leveraged the value that big data brings when it comes to planning and making strategic decisions. Making predictions is an example of the value that big data can bring. There exists an opportunity to use this information in the field of education. However, accuracy is crucial for predictions as it allows organizations, such as schools, to make better informed decisions. Our goal is to test the

effectiveness of our filtering technique on the publicly available Kaggle Students' Academic Performance Dataset [1] to better predict parent satisfaction of schools. Our filtering technique incorporates the use of multiple classifiers to identify noisy records in the dataset. We attempt to show that the removal of these noisy records from the training dataset allows the classifiers to create improved models that can be used to predict parent satisfaction of schools with higher accuracy. Parents' satisfaction serves as one of the measures of a school's ability to provide quality education to children. Given the ability to weigh attributes affecting parents' satisfaction, schools can identify areas of improvement, providing them with an opportunity to better align their goals with that of parents.

#### 14-An application of Machine Learning Algorithms to Track Cancer Data

Mukadder Cinar  
Prof. Johann Thiel

The Centers for Disease Control (CDC) United States Cancer Statistics: Incidence and Mortality Web-based (USCS) reports are publicly available datasets containing important cancer statistics from 1999 to 2014. As the CDC states, these datasets are available "to public health planners and others to monitor the burden of diseases and to implement cancer prevention and control programs." The goal of this project is to study these datasets using machine learning tools and techniques implemented in Python. We will compare cancer trends between states, certain cancer incidence rates over time, and incidence and mortality rates between different types of cancer.

#### 15-Designing Smart Web Pages Using AngularJS

Kimberly De La Santa  
Prof. Marcos Pinto

One of the newest trends in dynamic Web page design is the use of angularJS. AngularJS is a JavaScript Model-View-Controller (MVC) based framework that creates single-page web applications. A Single-Page web applications (SPA) is a one entry point HTML page that can be replaced or updated independently, without refreshing the whole page during each user action. The idea behind using AngularJS in web applications is to make sure that it is running smoothly and it is easy to maintain. AngularJS uses model templates and data binding to make what would take us several lines of JavaScript, into something we can achieve with HTML.

#### 16-To Compare Human Calpains in Tetrahymena Thermophila Using MSA

Princessa Dominique  
Prof. Ralph Alcendor

Calpains are a set of genes present in vertebrates and many other organism. Based on research in human, chaplains are known to be proteases. These genes name derives from their calcium dependence and cysteine protease activity. Calpains are known for their role in cell cycle, cell survival and are even known to be involved in diseases such as diabetes and cancer. There are sixteen different calpains in mammals, with several of these showing tissue specificity. For example, calpain 9 is specific to the gastrointestinal tracts, while calpain 1 is ubiquitously expressed. Although numerous studies have been conducted on calpains, all the functions of these genes have not been identified.

*Tetrahymena thermophila* are unicellular eukaryotes that can thrive in diverse temperatures and environments. Although unicellular, this organism shares a myriad of similarities with humans. For

example both organisms have somatic and germline gene information. However, unlike human beings and many other eukaryotes, *Tetrahymena thermophila* has two nuclei, a macro- and micronuclei. The macronuclei store the somatic gene information while the micronucleus stores the germline gene information. *T. thermophila* has been used for numerous studies, however, the role of calpains have not been significantly studied in these organisms. These organisms have more than 27 different calpains, almost twice the number found in humans.

Therefore, the goal of this project is to use computational tools to begin characterizing a *T. thermophila* calpain family member, THERM\_00387030. Preliminary analysis using NCBI database, BLASTp (Basic Local Alignment Search Tool), and MUSCLE (Multiple Sequence Comparison by Log-Expectation) shows THERM\_00387030 is more closely related to 15. These results suggest that THERM\_00387030 may share similarities in structure and function to human calpain 15.

#### 17-Clinical Nursing Practice and Oral-Systemic Health

Bora Durrsi & Amy Kwok

Prof. Aida Egues

The goal of this research project is to examine the link between oral and systemic health and continue to explore oral health in general, since research is lacking in this field. This project will help identify gaps in current literature and help further research on the connection between oral health and its effect on overall systemic health. Research will be focused on peer-reviewed journals in the health profession and social-science literature. Oral health will be researched at all ages, beginning in infancy and extending all the way to older adults and the elderly population.

#### 18-Topology and Optimization in Design and Fabrication

Marco Dwyer, Asli Oney, Faith Kakshak, Herald Sadmojo and Xiaoneng Tang

Prof. Anne Leonhardt

Prof. Satyanand Singh

From an architectural design perspective, after a design concept is arrived at, a designer needs to analyze potential weaknesses in supporting load capacities and material usage. This project explores the foundations of the topology behind computer aided generation of gyroids, and other complex forms, utilizing the tools of Wolfram Mathematica and Robert McNeel's Grasshopper and Kangaroo. Models were generated from parametrized mathematical inputs and analyzed for form-optimization and then 3D printed to visualize their final shape. Some of the simulations were based on the study of the Klein bottle and the Möbius strip. This process will allow designers and engineers to take advantage of optimization techniques of pure forms to becoming something more tangible and efficient when designing a physical object such as a pavilion or a structure.

#### 19-A Web Application for Search of Near-Me Graduate Schools

Stefan Falciglia

Prof. Marcos Pinto

Media has always swayed public opinion about how hackers are determined to gain our information against our will and use it against us. We're also told by the companies we pay huge amounts for the phones, and get our services from purport that our confidential data is safe and secure with them. What do we do when laws are later enacted to give governmental figures loopholes to bypass our 4th amendment right to privacy. An app was created to service students that are looking for graduate programs in their area without retaining their data. We as consumers sign our lives away with the Agree

to Terms & Conditions because we accept that companies will be intrusive but once upon a time it was just for their own use. Times have changed, and a time of our peripheral devices being used to track our every step is here, via location based applications. A user's personal data is of the highest importance and this website intends to make sure not keep the users sensitive data logged, this will be done by using a clear button on the bottom of the page. By doing this we hope to gain data on the user preference through the amount of hits on the page and incorporate a voluntary survey to measure user experiences. This theoretically can be used others to see if other applications can be created with privacy in mind to start raising awareness and increasing the goal of protecting user's data rights.

## 20-Web Speech API: An Interesting Conversation with Your Browser

Reem Flifel

Prof. Marcos Pinto

Technology has been evolving throughout the years and it still is. Technology has helped people a lot by assisting them such as making a difficult task much easier. For instance, a person may face a tough day at work or so and would like to have someone who can listen to them, but they might not find someone available at the moment. So, interacting with technology can make them feel better. In my research, I have created a Web application where a website not only talk to you, but it can also listen to you as well.

The application makes use of the Web Speech API in order to implement such attributes to the website. Thus, I have investigated a way to create a realistic interaction between a human and a website. During the research, I have studied this topic by researching it in addition to employing my knowledge of JSP, JavaScript, HTML, and Web design with the help of the class and the mentor whom I'm taking with. Moreover, I have learnt more about human and technology in the aspects of realistic interactions in addition to designing a demo website and implementing the Web Speech API.

What I have gained through this research and work which could also be considered as making my project unique from similar applications would be managing my time and acquiring the knowledge of focusing on the project's idea in order to keep only the best sources of literary assistance to complete the project within the time allotted.

## 21-Antioxidant Properties of Caffeine by the DPPH and the AAPH Assays

Miguel Gomez, Sinji Shibutani

Prof. Alberto Martinez

Caffeine is a well-known short-term stimulating agent that exerts its activity by crossing the blood brain barrier and binding adenosine receptors. The long-term effects of this commonly consumed substance are less clear but some evidence indicates that it might have a positive impact on cognition. Recent studies support caffeine's favorable effects against cognitive decline and Alzheimer's disease (AD). AD is the most prominent form of dementia, affecting more than 5 million Americans and 28 million people around the world. There is a predicted 3-fold increase over the next 50 years as consequence of the raise in life expectancy, the aging population and the lack of any effective treatment. The amyloid hypothesis postulates that plaque a depositions or partially aggregated soluble A trigger a neurotoxic cascade resulting in AD pathology. Another important hallmark of the disease is the abundance of reactive oxygen species (ROS). In this project, we have studied the antioxidant properties of caffeine by the DPPH and the AAPH assays in order to provide a potential link with caffeine's anti-AD capacity. Results from both assays show little to no ability to scavenge free radicals for caffeine when compared to resveratrol, a well-known

antioxidant polyphenol. To further test caffeine's anti-AD ability, future experiments will aim at investigating inhibition effects on a plaque formations.

#### 22-Pairs Trading Simulation

Adam Gronowski

Prof. Boyan Kostadinov

Pairs Trading is a risk neutral trading strategy that can be used under a variety of market conditions. The idea is to take two securities that are linked somehow, such as HP and Dell are linked together through making computers. Testing to see if both the stocks trend around their mean over the window of time being observed, it is then possible to implement pairs trading to trade both of the stocks in conjunction with each other, and hedging your position.

#### 23-Investigation of Degradation Rates for Poly (ethylene glycol) Diacrylate (PEGDA) for Engineered Scaffolds

Kerolos Hanna

Prof. Ozlem Yasar

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 photolithography and different concentrations of Poly(ethylene glycol) Diacrylate (PEGDA) which is a biocompatible and biodegradable material was used as a fabrication material. After the scaffolds were fabricated they were placed to the stir plate and they were weighted in every hour to see the degradation rate. This preliminary research showcases that degradation rate of the PEGDA-based photopolymerized scaffolds can be altered with PEGDA concentration.

#### 24-Practical Design of a Bipedal Robot

Warren Oscar Hunter

Prof. Yu Wang

Fifty years ago, the first digitally operated robots were large, expensive industrial machines. Today, the applications and utility of robotic devices have begun to expand into everyday life, and continue to expand as robotics components become smaller and more affordable. The larger goal of this research is to build a fully functional bipedal robot that can be used as a platform for future academic research into robotics. Research was conducted into the applications of the various mechanical components commonly used in the design of robotic devices, including electrical power systems, motor systems, gear systems, hydraulic systems as well as the basic dynamics of bipedal robots. A robotic system was designed with the goal of carrying out tasks that mimic basic human interactions (grasping objects, basic locomotion, etc).

The goal of the immediate research was to create a plan for the robot and begin the initial phase of the project, which is the construction of the lower half of the robotic system. To that effect, materials were

selected and obtained for the project, an electrical power system was designed, and a mechanical power transmission system was also designed. In addition, a single board computer, the Raspberry Pi, was selected as the control unit for the system. PVC piping was selected as the main component for the frame of the robot because it is light, yet strong and inexpensive. The electrical power system consists of a 12V switching power supply with separate step-down DC-DC power converters for each leg to provide the necessary voltage and current for the motors and electronics. The mechanical system is based on high torque (20-30 Kg-cm) servo motors with the addition of a gear reduction of approximately 5:1, which increases the torque of the motors to handle the weight of the components. In order to transfer the power from the motor to the leg components to create a working leg model, a coupling system also had to be designed. Once the leg components are finished, the next phase of the project will be the creation of the digital control system. This will involve programming the servo motors to act in concert, and with feedback from electronic components such as an inertial measurement unit, to move the system using the zero moment point concept for robotic locomotion.

#### 25-Modular Multirotor Aerial System

Ladaban Jane Lynnel

Prof. Xiaohai Li

The purpose of this research is to improve the existing surveillance systems. For this to be achieved, the research team built an X-shaped quadcopter from scratch to customize its settings. The team thoroughly investigated the basic configurations of unmanned aerial vehicles (UAVs) and meticulously selected the quadcopter frame design, flight controller, propellers, motors, speed controllers, transmitter, and receiver for this project. Thus far, we have managed to test the brushless direct current (BLDC) motors using Arduino, balance the propellers, program the electronic speed controllers (ESCs) and the flight controller, and assemble these to the frame. The group is currently working on the quadcopter test stand design, which is needed to set up the Proportional-Integral-Derivative (PID) settings of the drone to enhance its stability. Then, we plan on including accessories such as camera, sensors, etc. to get closer to our goal of reverse-engineering a multi-rotor copter and developing it overtime.

#### 26-Sensing the Environment with Internet of Things

Ayesha Javed, Arooba Sohail

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. IoT applications can vary from collecting small scale data such as room temperature, to something as big as collecting personal health information. This research project involves making IoT nodes with embedded circuits, combined with several different physical and environment sensors, as well as developing program code to make everything work together. The slave nodes send the sensor data to a master node wirelessly and the master node forwards the sensor data to IoT analytics web-site on the Internet that decides an output action. 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, by using open source software and low cost open source computer hardware devices. This project is divided into two parts. One student will work on the hardware implementation of the IoT nodes and the associated low level embedded systems programming of the sensors. Another student will work on the second part of the project primarily dealing with high level programming that facilitates data communication between IoT nodes and IoT Analytics website.

## 27-Consensus Sequence in IC1 loop of Class C G Protein Coupled Receptors

Ashleigh Leger, Nathan Astrof

Prof. Mai Zahran

G Protein coupled receptors (GPCRs) are made of seven-transmembrane helices that have the capability to bind extracellular substances. Upon binding, signals are transmitted to an intracellular molecule called a G protein. To properly function, GPCRs must be positioned on the cell surface. The failure to locate GPCRs is implicated in a number of diseases. In class A GPCRs, a specific highly conserved single amino acid (LEU) in the first intracellular (IC) loop regulates the proper expression of the protein on the cell membrane. However, this specific amino acid is not detectable in all types of GPCRs. In this study, bioinformatics tools are utilized to extract and align sequences of the ten Class C proteins. The sequences of these proteins were aligned using a transmembrane alignment tool and a consensus sequence for IC loop1 was found.

## 28-Go-Kart Version 2.0

Alexis Luna, Alisha Sevilla, Ridwanul Hoque

Prof. Angran Xiao

The Go-Kart version 2.0 is a continuation of an existing design. The current design is an electricity-powered vehicle with a seat placed between two batteries powering the go-kart and along front section for the driver to sit comfortably depending on their height, held together by a metal frame. For this project, the main frame and component placement will be altered to make up for flaws in the original design, as well as adding a body to complete the design and make it look like an actual go kart.

## 29-Urban Microclimate Analysis

Gabriela Martinez and Yuying Xian

Prof. Jihum Kim

This project is an exploration on building environmental performance. On it we will use different advanced simulation tools like Design Builder and Climate Consultant to analyze a recommended building. We are focusing on the Manayaking Visitor Center in Sullivan County, New York as our case study. Our first studies included analyzing the site conditions and elements such as wind, sun, climate, and weather. We studied the environment surrounding the building and its climate using the two software mentioned above. We found that during the winter, we should block the wind and get more sun in. However, in the summer, we should increase the wind and provide shadows to make it a comfortable place. From the site analysis we moved on to explore various materials that can be use in the walls and windows to simulate energy in order to reducing the amount of energy consumed by the building and make it more sustainable.

## 30-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.

### 31-The optimization of Solar Energy: Measuring Natural Energy in Real-Time with Environmental Sensor Data

Wes Oler

Prof. Alexander Aptekar

Traditional photovoltaic (PV) power systems are placed on rooftop structures. A Sustainable Vertical Façade (SVF) offers a solution to the challenges of implementing PV power systems due to urban congestion, and demands for sustainable, urban housing. This design shift is crucial for urban cities as buildings often have more vertical exposure than rooftop exposure. As a case study, the vertical array of photovoltaic cells on the southern façade of the Solar Decathlon 2015 DURA home provides the full demand of electrical energy in the passive house standard. The new research focus for a SVF could become a source of vital information for environmental research.

Environmental sensors are used for a wide range of purposes. In many instances, the events being measured create very large and complex data sets. The file sizes of these data sets often require an equally large and complex computer to parse, and sort the data that is being analyzed. The research of a sustainable vertical façade is based on the initial presumption that the PV power system of the SVF capture radiant energy throughout the year, and shade the southern exposure of a building. This results in an interior space that remains at a comfortable living temperature, while minimizing heat transfer of material and the building insulation. The relationship between insulation and thermal resistance is a vital factor in the construction of a net-zero energy system with passive house standards. Based on this information, we seek to utilize modern techniques of deep-learning computer algorithms to test the efficiency and applicability of a SVF that responds to changes in environmental conditions (air humidity, temperature, solar radiation) to maximize the retention of thermal and radiant energy.

### 32-To Examine the Effect of Resveratrol on *Tetrahymena Thermophila*

Shazeda Omar and Bashrat Sultana

Prof. Ralph Alcendor

*Tetrahymena thermophila* is an organism with cilia or hair like structures, found in fresh water in different parts of the world. These cells have two nuclei, a macronucleus, MAC, and a micronucleus (MIC). These cells are easy to grow and do not require sophisticated facility to grow and maintain them. As eukaryotes, they are great models to understand how human cells function. They have provided information on cell cycle control, DNA structure and function, and the role of important cytoskeletons. Although these organisms have been used in many studies, the effect of resveratrol has not been examined fully. Resveratrol is a plant-based compound found in fruits like grapes and berries, and nuts. Studies have demonstrated that resveratrol has many health benefits. These benefits range from protection from heart disease to extension of lifespan in some organisms. Resveratrol has been shown to function by neutralizing the toxic effects of free radicals. High levels of free radicals are known to result in oxidative stress (OS). Oxidative stress is induced by free radicals which can lead to damage to lipids, proteins and DNA. Cells depend on antioxidants to combat the toxic effects of OS. Failure to neutralize these free radicals lead to diseases such as cancer, diabetes, heart disease and aging. Although numerous studies

have shown resveratrol is protective against oxidative stress (OS), the full effect of resveratrol is still unknown and therefore more studies on resveratrol and OS are needed. Additionally, the effects of resveratrol in other organisms are well documented; however, very little has been done to examine the effect of resveratrol on OS in *Tetrahymena thermophila*.

33-C.H.E.S.S.

Hashir Qureshi

Prof. Viviana Acquaviva

Debt-ridden college students often find it prohibitive to afford software for online homework that can cost up to \$150 per class. We at C.H.E.S.S. (Computerized Homework Exercise SyStem) have created an economical, secure and user-friendly online homework system.

Through C.H.E.S.S., students login and take personalized homework assignments for their classes. If they answer incorrectly, the system displays a hint to assist them and affords them one extra attempt. Students can access assignments' descriptions, open submission dates, grading policy, and current grade through a "hub" page. C.H.E.S.S. also provides an intuitive management system for instructors, who can easily create and customize the assignments.

We are currently working on creating a larger set of questions and hints in the database, on testing performance and stability, and on making the application go live. We have presented C.H.E.S.S. at the CUNY-wide IT conference, and requested feedback from faculty in different disciplines to determine which features would make C.H.E.S.S. more likely to be widely adopted. Our long-term plan for C.H.E.S.S. is to have a system that is flexible and secure and can be tailored to the needs of college and high-school instructors.

34-Arduino Controlled Light Bulb

Syeda Nazia Rahman

Prof. Farrukh Zia

Energy saving LED light bulbs are becoming common. They are replacing traditional light bulbs in many applications because they are becoming cheaper. This project uses Arduino micro-controller to control LED light bulb by using infrared signal. Both the brightness and color can be changed. Moreover, Arduino can be programmed to control the light bulb from other sources such as sensors, smart phone etc, and through the internet. The current phase of this project involves the use of a smart phone to control the light bulb through the micro-controller via the Bluetooth wireless interface. Some of the real-world applications of this technology are room lighting, party lighting, stage show lighting, store displays and fashion industry.

35-Roboquin Speech Synthesis and Recognition

Samiha Riham, Jennifer Solomon

Prof. Farrukh Zia

A robotic mannequin (Roboquin) is designed and developed using inexpensive construction materials and low-cost open-source computer hardware and software, as a research platform for applications in several areas such as display model for e-textiles, wearable technology and fashion technology; interactive mannequin to be used in social robotics research projects; 3D physical modeling and simulation; computer controlled system design; and kinematics based movement control.

Human robot social interaction has become one of the active areas of research in robotics. In this ongoing research project, we have an opportunity to create an interactive robotic mannequin that can interact

with people in different ways. This project is divided into two parts. One student worked on the Speech Synthesis implementation to make the mannequin speak. I worked on Speech Recognition implementation using Amazon Alexa and Google Voice to make the mannequin understand some basic voice commands from the user, and act accordingly. It responded to voice commands by answering questions from the internet. Controlling the servos in mannequin using voice command is currently being tested.

### 36-Scaffold Fabrication for Cell Viability Analysis

William Santiago  
Prof. Ozlem Yasar

One of the principle challenges in Tissue Engineering, especially with the production of large tissue constructs, is the cell survivability within the scaffolds. Cells can show healthy growth within the scaffolds if biocompatible materials are used to generate the scaffolds. In this project, collaborative work will be done between the SET Research Laboratory at the department of Mechanical Engineering Technology and Biomedical Engineering/Biology departments at City College and City Tech to fabricate the scaffolds and to do the cell viability tests. Our preliminary results show that cells can survive within the PEGDA based scaffolds if 20% of PEGDA is used to fabricate scaffolds.

### 37-Conjugate Gradient Method Analysis

Farjana Shati  
Prof. Ezra Halleck

We study the solving of linear systems with sparse coefficient matrices, specifically using the iterative Conjugate Gradient Method. We focus on the effect that preconditioning has on solving various test families of systems. Choices for preconditioning are available and we investigate the effect of these choices on the convergence rate in solving each of the test families.

### 38-The Optical Absorption in Double Layers of Novel Two-Dimensional Nanomaterials Due to Excitonic Transitions

Gurkaran Singh and timothy Takona  
Prof. Oleg Berman

The goal of the research project is to calculate the optical absorption coefficients in double layers 2D nano-materials due to excitonic transitions between ground and excited states. In order to achieve this we first calculated the Schroedinger equation for the dipolar exciton. An exciton is a Bond state formed by an electron and an electron hole that are held together by coulomb attractions. An exciton forms when a photon absorbed by a semi-conductor transfer just enough energy to transfer an electron from the valance band, into the conduction band, allowing the formation of a positively charged electron hole. In 2D nano-materials, an electron in one mono-layer is bound to a hole in a seperate, parallel mono layer. This material is known a TMDC. TMDC's (Transition metal dichalcogenide) are semiconductors of the from  $MX^2$  (M = Mo or W, and X denotes a chalcogenide X = S, Se, or Te). They are 2D materials with a layer of M in between two layers of X. In order to calculate the wave functions and eigen energies of the dipolar excitons we wrote a python script to solve Schroedinger equation. Because an exciton consist of a hole and an electron, we solved the Schroedinger equation for a simple harmonic oscillator.

### 39-IoT Enabled Wearable Technology

Rumana Hassin Syed

Prof. Farrukh Zia

In this project, we are working towards “Wearable Internet of Things”. Sounds funny, but it’s not. The main idea of the project is to implement the concept of Internet of Things (IoT) in a wearable device (wearable technology). This is done by connecting one or more sensors such as a gyroscope, to a wearable microcontroller e.g. ESP8266. The information obtained through the sensors is then sent to an IoT analytics website via Wi-Fi and is available to view and use across the Internet. Besides the website, there is a local output device connected to the microcontroller, which produces an output such as light or sound, by using the input sensor.

### 40-3D Nutrient Delivery Network Fabrication for the Engineered Tissues

Joyce Tam

Prof. Ozlem Yasar

In the field of tissue engineering, design and fabrication of precisely and spatially patterned, highly porous scaffolds/matrixes are required to guide overall shape of tissue growth and replacement. Although Rapid Prototyping fabrication techniques have been used to fabricate the scaffolds with desired design characteristics, controlling the interior architecture of the scaffolds has been a challenge due to CAD constrains. This study aims to overcome these design and fabrication limitations. In this work, research is expanded fabrication of scaffolds which have inbuilt micro level fluidic networks/channels. These channels serve as material delivery paths to provide oxygen and nutrients for the cells. Scaffolds with inbuilt hollow channels are fabricated with “photolithography” in layer by layer fashion to control the internal architecture. The preliminary research shows that, photolithography can be used to fabricate the scaffolds with the inbuilt 100µm channel sizes.

### 41-Horizontal violence in nursing: The male perspective

Thomas Tracy

Prof. Aida Euges

As a predominately female profession, nursing has a history of interpersonal abuse in the workplace. Theories exist about female gender and the perpetuation of violence in nursing within the literature on interpersonal violence in nursing. Discussion of the disconcerting topic is making a resurgence as of late across the profession. A review of the literature within the past 5 years reveals mostly descriptive work on the synonymous interpersonal violence, horizontal violence, lateral violence, workplace abuse, and bullying. Little is specifically found on the male perspective, experience, or effect on the behavior. Findings do speak to the importance of embedding in nursing education a culture of teamwork, as well as of collaboration, communication and respect in the workplace, to avoid the significant impact of abuse. Still, more research is needed on abuse within nursing in general, but specifically to address the gap regarding the male perspective on abuse in nursing, to examine the curtailing of absenteeism, financial loss to institutions, poor performance, and reduction of overall quality of patient care within nursing.

#### 42-Flow Cytometry and Cytokine Analysis Methods in R

Nina Tretiakova

Prof. Jeremy Seto

Flow cytometry generates population data on individual cells. Proprietary methods to handle data from flow cytometers require user guidance that is sometimes arbitrary. Similar data can be generated from Luminex cytokine assays that multiplex analyze measurements. The panopoly of data from these assays becomes complex to manage and perform bulk statistics in their raw data states. Through use of R packages, the data will be extracted to glean meaningful information. Statistical methods applied across the entirety of the data can be employed to identify sub-populations and identify complex trends through clustering. These nascent exercises will provide the basis for automated data handling to assist in rapid batch analysis.

#### 43-Decryption Using Markov Chain Monte Carlo Simulations

Jeffrey Tumminia

Prof. Boyan Kostadinov

We use Markov Chain Monte Carlo simulations of a random walk in R to uncover the decryption function of a message encrypted with a substitution cipher. Using an approximated transition matrix of the characters in the English language derived from famous literature and properties of Markov Chains, we develop a method for evaluating the accuracy of the decryption function. Our goal is to maximize the accuracy of the estimated decryption function by transforming the function through each step of the simulation and comparing the accuracy to encourage the walk to travel towards the true decryption of the coded message. We find that with a large enough message, the simulation will decode the message in a few thousand iterations to a high degree of accuracy.

#### 44-Systems Biology Modeling of Survival and Differentiation Pathways

Jessica Valentin

Prof. Jeremy Seto

Biology Modeling is an important technique that involves the use of computer algorithms, data structures, and mathematics to visualize biological systems such as cellular activities including signal transduction pathways which can be valuable to determine survival and differentiation Pathways. A signal transduction pathway is a pathway that demonstrates the biochemical activities within a cell after ligand binding to a receptor. This is important because activation of different signal pathways can lead to “diverse physiological responses, such as cell proliferation, death, and differentiation.” (Tocris Bioscience, 2017) VEGFA or Vascular endothelial growth factor-A, is essential for endothelial cells for angiogenesis. Angiogenesis is the formation of new blood vessels which involves migration, and differentiation. Modeling VEGFA and its interaction with VEGFR2 receptor, can be essential to better understand the pathways that lead to migration, differentiation, and survival for growth of blood vessels.

#### 45-A "Real" Peak into the Future of Virtual Reality

Martin Witkowski

Prof. Marcos Pinto

WebVR is a javascript API (Application Programming Interface) that makes it possible to experience virtual reality(VR) in the browser. This research proposes to design a demo Web site that includes VR experience. The Web site accesses existing libraries of real world places through a Virtual Reality gadget, for example a headset VR goggles. There is also the possibility of adding user input to the VR experience, such as a hand-held controller with some degree of orientation (3 degrees or 6 degrees) that provide both orientation and location information.

#### 46-Synthesis of a Model of the BC Ring System of Oxygenated Angucyclines

Xiaolan Wu and Abdullah Allaoa

Prof. Tony E Nicolas

Angucycline is a subclass of natural antibiotics, containing a characteristic tetracyclic ring structure, and featuring a wide range of biological functions, including antitumor, antiviral and antifungal properties. This extraordinarily therapeutic character has interested many chemists to develop efficient methodologies on synthesizing the tetracyclic ring system of angucycline. Construction of the BC ring configuration appears as a synthetic challenge. Successful installation of hydroxyl groups at the AB junction would pave the way for efficient syntheses. As a continuation of the previous work done on this system, our synthetic methodology focuses on the coupling of a suitably substituted Phthalide and an activated Alkyne through a tandem Michael addition/Dieckmann cyclization. The synthesis of the required phthalide and alkyne components is discussed, as well as our efforts towards the coupling components.

#### 47-From Form To Code

Yuying Yang, Svetlana Belopukhova, with Michell Cardona, Seok Yoon,

Prof. Anne Leonhardt

Starting with basic geometry to give shape to ideas, our research investigates the overall general construction of a catenary surface with points, lines, and planes. This surface is made of many buildable parts. We are exploring a variety of modular systems with the use of algorithmic tools like rhino, grasshopper, python, and the kangaroo plugin. Our first studies analyze catenary surfaces imbued with material effects. The tools we are using assist our exploration of different forms of geometry and examines the physical deformations caused by gravity and overall construction of the design. Additionally we are exploring materials that cast and reflect light and how all of these parts are assembled. The end result will be a suspended parametric installation piece in Voorhees lobby.

#### 48-Cost and Stress Analysis of a Bionic Hand

Jiamian Zhao

Prof. Gaffar Gailani

In this project, we are working on the analysis of a prosthetic bionic hand for below-the-elbow amputees. The prosthetic hand was designed and built for daily use. In the United States, many amputees are living in poverty. Therefore, the challenge in creating a bionic hand is low cost hand and optimized mechanics. The cost of the hand, the static and kinetics must well calculated. The analysis determines the material for the bionic hand which requires strength and light weight. A computer aided design (CAD) software, Autodesk Inventor, has been used to create the design, as well as to simulate finger motions. Additive manufacturing (by use of a 3D printer) is used to make prototypes of all components. The challenge now is to integrate mechatronic components (i.e. motors, controllers, and more) into the design and allow the mechanism to function. The final stage of the work will be use the collected data to improve the existed design.

#### 49-Trend in the Residential Energy Consumption

Xuebin Zou

Prof. Johann Thiel

The U.S. Energy Information Administration (EIA) periodically conducts a survey known as the Residential Energy Consumption Survey (RECS). As the name implies, the RECS surveys are sample collections of various energy-related characteristics of homes throughout the U.S. The most recently released data, from 2009, is freely available to the public. In this project, our aim is to use machine learning tools and techniques implemented in Python to determine trends and classify the data according to different energy-usage aspects.