

WELCOME AND GREETINGS

Join ZOOM Meeting

[https://us02web.zoom.us/j/6986910931?](https://us02web.zoom.us/j/6986910931?pwd=TUhkMFAvNkY0c1pQQ0dmTis2WkQwdz09)

[pwd = TUhkMFAvNkY0c1pQQ0dmTis2WkQwdz09](https://us02web.zoom.us/j/6986910931?pwd=TUhkMFAvNkY0c1pQQ0dmTis2WkQwdz09)

Meeting ID: 698 691 0931

Passcode: Poster

1:00 pm

Dr. Russell Hotzler

President

Dr. Pamela Brown

Interim Provost

Dr. Justin Vazquez-Poritz

Dean, School of Arts & Sciences

Dr. Gerarda Shields

Dean, School of Technology & Design

Dr. David Smith

Dean, School of Professional Studies

1:15 pm–2:00 pm

Two-minute Poster Presentation by Faculty

The program is organized by topics rather than by departments. Frequently the presentations are cross-disciplinary or difficult to assign to the discipline represented by the department with which the presenter is affiliated.

Photoreduction of Tc-99 Pertechnetate to Low-valent Tc(IV) Using Titanium Dioxide

Ivana Jovanovic¹, Colleen M. B. Gallagher², Benjamin P. Burton-Pye³, Wayne W. Lukens Jr.⁴ and Lynn C. Francesconi²

¹Department of Chemistry, New York City College of Technology

²Department of Chemistry, Hunter College

³Department of Chemistry, Lehman College

⁴Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley

Technetium-99 (⁹⁹Tc) is a fission product present in large amounts in nuclear waste sites. It has nine oxidation states and long half-life (211,000 yr). Pertechnetate, TcO_4^- as the most stable form in aerobic environment makes ⁹⁹Tc challenging to isolate and stabilize during nuclear waste disposal. The immobilization of ⁹⁹Tc has been achieved via reduction of TcO_4^- to relatively insoluble TcO_2 , which is then immobilized in glass or ceramic. Here, we investigate TiO_2 as a photocatalyst to reduce Tc^{+7} to Tc^{+4} upon UV irradiation. X-ray Absorption Spectroscopy shows reduction to Tc + 4 in the solution and on the surface of TiO_2 nanoparticles up to 90%. We postulate that TiO_2 can be a waste form for the incorporation of Tc^{+4} .

Insights into the Interaction of Ionophoric Polyphenols with Human Serum Albumin (HSA)

Alberto Martinez¹, Mai Zahran², Miguel Gomez¹, Johnny Guevara² and Rosemary Pichardo-Bueno²

¹Department of Chemistry, NYC College of Technology

²Department of Biological Sciences, NYC College of Technology

Alzheimer's disease (AD) is the most common form of dementia that affects more than six million Americans and more than 40 million people around the world. The incidence is expected to rapidly increase due to the lack of any effective treatment. In previous work we synthesized a family of five ionophoric polyphenols (compounds **1-5**) that targeted important aspects related to AD. Here, in order to gain insights into their potential therapeutic value, we have tested the ability of compounds **1-5** to interact with human serum albumin (HSA), as potential transport mechanism in the bloodstream, by means of fluorescence spectroscopy and molecular dynamics simulations. Overall, our results suggest that HSA could be an efficient transport mechanism of the compounds on their path to the brain.

Study a System on Chip for Collaborative Classic and Quantum Computation in NISQ Era

N. Wu¹, Y. Hu¹, F. Song¹ and X. Li²

¹Department of Computer Science and Technology, Nanjing University, China

²Department of Computer Systems Technology, NYCCT CUNY

We study an on-chip quantum computational system at a certain scale in the presence of noise. These conditions can be summarized as the noisy intermediate-scale quantum (NISQ). It is a big challenge to build feasible architectures, control flows and quantum algorithms for a noisy medium scale quantum condition. The paper studies a framework of quantum computing chip, containing both classical and quantum parts. In the classical part, we use an on-chip machine learning algorithm to generate short depth circuits, which are crucial to reduce the calculation errors in quantum computers. Furthermore, this part is efficient for the quantum circuit synthesis, which deduces the equivalent circuit of an algorithm. With this framework, quantum program project developers only need to focus on the design, no need to consider the underlying hardware details. It maintains the transparency of quantum computers as its counterpart classical computers.

Quantum Central Limit Theorem and Statistical Hypothesis Testing in Discrete Quantum Walk

Y. Hu¹, N. Wu¹, F. Song¹ and X. Li²

¹Department of Computer Science and Technology, Nanjing University, China

²Department of Computer Systems Technology, New York City College of Technology

Discrete quantum walk is one of the de facto models of quantum computation and an efficient tool to develop quantum search algorithms. Although the theoretical model of quantum walks is straightforward, there are many complex scenarios such as coherence decay and/or decoherence in the implementations. It is hard to test experimentally if quantum walk works, or it just decays into a version of classic random walk. We propose a quantum central limit theorem (QCLT) for discrete quantum walks and conduct the statistical hypothesis testing for the standard or decayed walker probability distribution for imperfect quantum walks based on the QCLT. A reliable statistical analysis result is obtained for the imperfect distribution by the experimental quantum walk study.

Distributed Cross-Community Collaboration for the Cloud-Based Energy Management Service

Yu-Wen Chen / Computer Systems Technology

Customer participation is a critical factor for integrating the distributed energy resources via demand response and demand-side management programs, especially when customers become prosumers. Incentives need to be delivered by the energy management service to attract prosumers to operate their distributed energy resources and electricity loads grid-friendly actively. The cloud-based energy management service enables virtual trading for customers within the same community to minimize cost and smooth the fluctuation. With the potential fast-growing number of service providers and customers, the needs exist for efficiently collaborating across multiple service providers and customers. This paper proposes the distributed cross community collaboration (XCC) for the cloud-based energy management service to enable collaboration across multiple communities and service providers. The XCC can efficiently handle large-scale variables and data with various allocated computing resources and is formulated as an alternating direction method of multipliers optimization problem. This paper also introduces a cross-community adjustment to avoid the overwhelmed exchanged data and computations among multiple communities under uncertainty. Performances are evaluated in experiments with the discussions.

From Classroom to Online Education – An Educator’s Insights

Mary Tedeschi / Computer Systems Technology

Face-to-face activities at universities became difficult in the spring of 2020 with the worldwide outbreak of the SARS virus version COVID19. Within a short period, all face-to-face classes were cancelled and replaced with remote lectures utilizing online Learning Management Systems (LMS) and video conferencing. The large scale of online education has exposed a number of problems and challenges that although somewhat known have taken on greater significance. This paper describes online teaching models, learning styles, engagement and interaction models to create a foundation for a set of patterns that capture ways of dealing with these problems – solutions that have been developed and applied for online education even before the pandemic hit but are now being more broadly used. Definitions of user experience may be vague and conflicting, as each student and school is unique. The motivation of this paper was the pandemic; however, the findings show engagement as being positive, and yet still exploratory. This work contributes to the understanding of how we can apply patterns for online education and shows the start of a whole new pattern language as we move forward with a new educational model.

Integration of Raspberry Pi with White Cane to Assist the Visually Impaired

A. Baez, J. Hernandez, A. Louigarde, Z. Yu, A. Carranza / Computer Engineering Technology

There are 2.2 billion people in the world who have near or distant visual impairment according to data from the World Health Organization (WHO). According to the Perkins School for the Blind, only 2% to 8% of blind people use white canes. This is because 90% of them have accidents when using walking sticks. We implemented a system to help the visually-impaired by upgrading the white cane with four essential elements: An electrical-setup employing a simple computer board (Raspberry Pi), connected to an HC-SR04 ultrasonic distance sensor that measures the distance to an object using ultrasonic sound

waves, and voice feedback that alerts the owner of nearby objects with a speaker. Finally, a Raspberry Pi Camera for real-time object detection using a deep learning algorithm “YOLO” is integrated into our system. The elements in the white cane are situated in the blind spots that cause accidents to the owner.

Assessing Password Security Using Machine Learning for Cybersecurity

R. Morris, M. Bennett, A. Carranza / Computer Engineering Technology

Password cracking is a method used to obtain or discover a secure password. It can be used in cases of a forgotten password or a locked-out account. However, it is widely used for malicious intent. This includes gaining unauthorized access to a system to obtain private/personal information. To prevent these attacks and properly secure an account, a strong, unique password is necessary. We demonstrate how Machine Learning can be used to assess password security. We employ the scikit python library to read a dataset of passwords into the model’s data frame, and the Python data package pandas to train the model to recognize and analyze basic combinations of characters. We create four passwords, with varying combinations and use Natural Language Processing (NLP) to compare them to the data base and determine their strength.

Low Cost Home Security System Using Raspberry PI

E. Alam, I. Ahmed, K. Zhao, M. Cano, A. Carranza / Computer Engineering Technology

Home security systems are very important solutions for modern homes. High-tech companies such as ADT and Google provide home security services at a very high cost. As an alternative to the above we provide a low-cost home security system using Raspberry Pi. Our solution is a powerful and small-size system that can be used as a decent Home Security System. Our Home Security System consists of a main door lock, python programming language and OpenCV package, Keypad Number Entry, USB camera, RFID sensor and a solenoid 12V DC electric lock. A PIR sensor is used to detect motion of visitors and to capture images via the USB webcam and send a notification to the home owner’s email. Our system also uses an alarm system, live streaming video and static pictures.

First Layer Network Hack: Importance of Strong WiFi Password

E. Chen, A. Kocab, Y. Guan, R. Rashed, A. Carranza / Computer Engineering Technology

With the consumer demand, vendor solutions and industry standards, wireless network technology is factual and is here to stay. Wireless Local Area Networks or WiFi networks are a priority nowadays. To fill the wireless demands, WiFi product vendors and service contributors are exploding up as quickly as possible. A strong WiFi password can prevent hackers and others from accessing a wireless network, viewing traffic and even stealing sensitive data - yet, WiFi is not unbreakable. Hence, we have created a simple application for regular users to generate strong WiFi passwords. We verify the effectiveness of our solution by ethically hacking the WiFi Password. To improve the efficiency, we created a Graphical User Interface (GUI) application by integrating the common password cracking tools. Our GUI penetration tool is less labor intensive and resource hungry to find password vulnerabilities to protect the networks from attackers.

Smart Environment System (SES) with Arduino

F. Quintana, A. Carranza / Computer Engineering Technology

We all were born to grow and learn. Technology is not different from this paradigm. In the past decades technology has grown at a tremendous pace, and according to an article in The New York Times “all appliances will eventually be smart ones.” The Smart Environment System (SES) implementation is based on the Arduino micro-controller that allows the user to control lights and check the temperature remotely far from home via the Internet. The user is able to manage the temperature in the house by turning on/off the Air-Conditioning unit (AC), the lighting system and thermostat before arriving home to get a warm or cool cozy environment in the house.

Performance Analysis of Password Attacking Tools

S. Ghani, K. Mounie, T. Emptage, A. Carranza / Computer Engineering Technology

Kali Linux is an open-source, Debian-based Linux distribution geared towards various information security tasks, one of which is password attack. This Operating System (OS) is used by many people for hacking and exploiting security breaches. Kali Linux provides many built-in tools that can be used to breach security measures of different devices. We have experimented with the following tools: “Hydra”, “John the Ripper” and “Findmyhash” as password attack applications. We report the performance analysis and evaluation of the above mentioned tools, indicating how well each goal is accomplished for the designated task.

A Friendly Reminder App

R. Rios, C. Cortez, J. Ramirez, A. Carranza / Computer Engineering Technology

Unlike computers, humans have a hard time remembering everything. It has become hard for people to remember many things due to the fact we are capable of using only 20% of our brain’s capacity for memory-forming. Seemingly simple tasks such as a doctor’s appointment, items on a grocery shopping list, etc., can easily be forgotten. We have designed, developed and implemented a reminder application using the Android Studio. The app provides frequent voice reminders to the user whenever there is an action list to be executed. The application has the capability for the operator to input memos that would be set on a timer. Upon receiving the notification, the operator has the option to carry out the instructions, disregard, reset or turn off the application.

Bitcoin Prediction Using Deep Learning

T. Shorma, S. Almarines, D. Denis, S. Rahman, A. Carranza / Computer Engineering Technology

Bitcoin has suddenly gotten a lot of attention from stakeholders and the general public as a result of its recent price increase. Multiple academics have examined numerous elements that impact the price of Bitcoin and the patterns underlying its fluctuations using various analytical and predictive approaches, since Bitcoin has been considered as a financial asset and is traded through many cryptocurrency exchanges. Among the various forms of virtual currencies, Bitcoin is widely accepted by various groups: investors, academics and dealers. We have developed efficient deep learning-based prediction models that perform machine learning based classification and regression models for predicting Bitcoin price movements and prices in short and

medium terms, especially long short-term memory (LSTM) and gated recurrent unit (GRU), to deal with Bitcoin price volatility and achieve high precision. These practical models are of high performance, scoring 65% accuracy for next day forecast and 62%-64% accuracy for seven-nine day forecast.

Java Operated Airline Reservation System

L. Pierre-Louis, I. Ahmed, K. Alexander, A. Miah, A. Carranza / Computer Engineering Technology

Airline reservation systems allow airlines to operate an integrated passenger processing database. This system manages airline schedules, fare tariffs, passenger reservations and ticket records. Airlines direct distribution work within their own reservation system. We have used Java as a web-based program to create an airline reservation system. Our solution operates a wide range of airline works including the use of modules where we implemented different methods that helps a new customer register for an account, allow existing customers to login to their account, ticket reservation and payment option. A database management system is used to store and manipulate all information and provide data access for authorized users. A server is used to help deploy and run our application on the local host that generates a local URL and port number with the project name.

Performance Analysis of Programming Languages Used in Machine Learning Models

F. Molla, Ch. Dowridge, H. Furman, A. Carranza / Computer Engineering Technology

Machine Learning (ML) is an application of Artificial Intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. ML provides the user with insights and analysis of massive amounts of data by way of algorithms: computer code written to learn patterns in datasets and make predictions or inferences. The purpose of this study is to determine which of several programming languages is best suited to executing ML algorithms in specific environments. The programming languages C++ , Java and Python are vehicles to execute in different environments: Windows, Linux Virtual machines (Parrot OS & Ubuntu) and Raspbian Linux distribution installed in a Raspberry Pi. The metrics gathered include time to completion, memory utilized and CPU usage. Finally, we present to the reader observations made as to which language is superior in each environment.

Arduino Four Digit Door Lock System with Notification

J. Dominguez, H. Akinwunmi, F. Tetteh, A. Carranza / Computer Engineering Technology

We live in a society that is rapidly advancing towards a future where technology and comfort is paramount to our everyday living. We have designed, developed and implemented an affordable door lock system that will be accessible via a four-digit programmable code. We used a 3D printer, Solid Works and Arduino microcontroller to realize our door lock solution. Our system uses a video camera to record and send an email notification whenever movement is detected.

Fiber-Based Continuous Optical Beat Laser Source to Generate Terahertz Wave using Lithium Niobate Crystal Embedded in the Fiber

Muhammad A Umyy, Ralph Castro /
Department of Electrical & Telecommunications Engineering Technology

Abstract: A novel design of a continuous optical beat laser source generating terahertz (THz) by using periodically poled lithium niobate (ppLN) crystals, arranged along a predetermined direction is discussed. A Ti diffused region is applied on the surface of ppLN crystal and an array of gold nanowires are applied on the Ti diffused region to form a gold metal-insulator-metal (MIM) element that optimizes coupling and channeling of THz radiation into gold nanowires. The all-fiber, a widely tunable C-band SOA-based THz generator provides a simple, stable, compact and cost-effective THz source by embedding these ppLN crystals in a fiber filament configuration resulting in less absorption and producing high output power.

A Simple Infrastructure Modification for Smart Intersections for Integration in Semi-/Full-Autonomous Vehicle Systems in Multiple Municipality Domains

Zory Marantz / Department of Electrical & Telecommunications Engineering Technology

Intelligent Transportation Systems (ITS) and their integration with automated driving systems (ADS) are the guaranteed future. There is no doubt to the future of V2X systems being implemented in all developed countries. However, there is a definite lag in the acceptance of autonomous vehicles into mainstream society. Currently, the systems in use still require human intervention due to certain uncertainties in driving conditions that have yet to be resolved in an automated sense, such as lane guidance and dynamic cruise control. The controlled intersection is one of those scenarios that is still heavily researched. This paper briefly investigates a method to retrofit these controlled intersections to expedite the progress towards full autonomy while minimizing the costs for municipalities to upgrade their systems.

Patients' Lung Debris Cleaning Nanorobot: Optimize Electromagnetic Field and Its Excitation Mechanism to Precisely Control Nanorobot in Real Time

Zhou Zhang / Department of Mechanical Engineering Technology

Patients suffer from acute respiratory distress syndrome (ARDS) because the debris of damaged lungs occupies the alveolus. To remove the debris, medical nanorobots can be employed to clean the blocked respiratory path. Currently, medical nanorobots are investigated to fight diseases by assuming to work inside human bodies. They can be in various forms (plate, particles, tubes, wires) and powered by acid, liquid, magnetic field, or ultrasound wave. The nanorobots motorized by various powers are good candidates in the near future. In addition, the complexity inside the human body suggests that the power sources involving the human-body itself (acid or liquid) are not so reliable. So, the external power source should be a reasonable solution to improve the robustness of the nanorobots. Currently, the common external power sources include magnetic and ultrasound, and after comparing their other applications, the magnetic power is better for fighting disease. Hence, the magnetic is selected to power nanorobot here. The proposed project will focus on the optimization of the excitation mechanism, and real-time analysis and control of the electromagnetic field in order to find an efficient way to remove the debris in the patients' lungs.

GRAPHIC ARTS

Pirate Queens: Creating Research-based Illustrations which Emphasize Cultural and Historical Authenticity

Sara Gómez Woolley / Department of Communication Design

Pirate Queens is a lushly illustrated non-fiction book for middle-grade readers, which profiles six different women from six different cultures and time periods, who turned to piracy and ruled their day. It was extensively researched in collaboration with the National Geographic team, with the purpose of creating illustrations which are engaging, realistic, artistic and above all accurate. The illustrations in the book have been vetted by the world's leading pirate experts and historians.

My main area of academic interest lies in the space where feminism, identity, and young adult literature, intersect. My commitment is to tell stories that reflect the diverse, multi-layered people that are our global community; stories which are carefully researched, high quality, and with emphasis on cultural and historical authenticity. Pirate Queens aligns perfectly with this personal mission.

INTERDISCIPLINARY

E-NEST: Enhanced Noyce Explorer, Scholar, Teacher Development for High-Need Schools in New York City

Fangyang Shen, Janine Roccasalvo /
Department of Computer Systems Technology

The Noyce project at City Tech supported through the Robert Noyce Teacher Scholarship program addresses the problem of the STEM teachers' shortage in New York City. The project's mission is the development of K-12 New York State certified Math and Technology teachers to teach in NYC high-need schools through internships, scholarships and summer programs to train prospective STEM teachers. The project will be modeled after the successful implementation of our previous Noyce project with the Engagement, Capacity, and Continuity Trilogy model, which will expand the impact of the Noyce program and student experiences.

ORGANIZING COMMITTEE

Roman Kezerashvili,
Founder and Chair

Candido Cabo

Peter Dinh

Andrea Ferrogli

Anna Matthews

Alexander Rozenblyum

Hans Schoutens

Stephen Soiffer

Nadia Stoyanova Kennedy

Mai Zahran

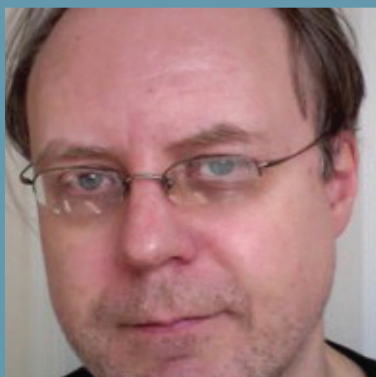
The Committee would like to acknowledge the valuable contributions of Lu Xue and Jamie Markowitz in creating the gallery and designing the program for this event.



First row l to r:
Roman Kezerashvili,
Candido Cabo



Second row l to r:
Andrea Ferrogli
Anna Matthews



Third row l to r:
Alexander Rozenblyum
Hans Schoutens



Fourth row l to r:
Stephen Soiffer
Nadia Stoyanova Kennedy
Mai Zahran