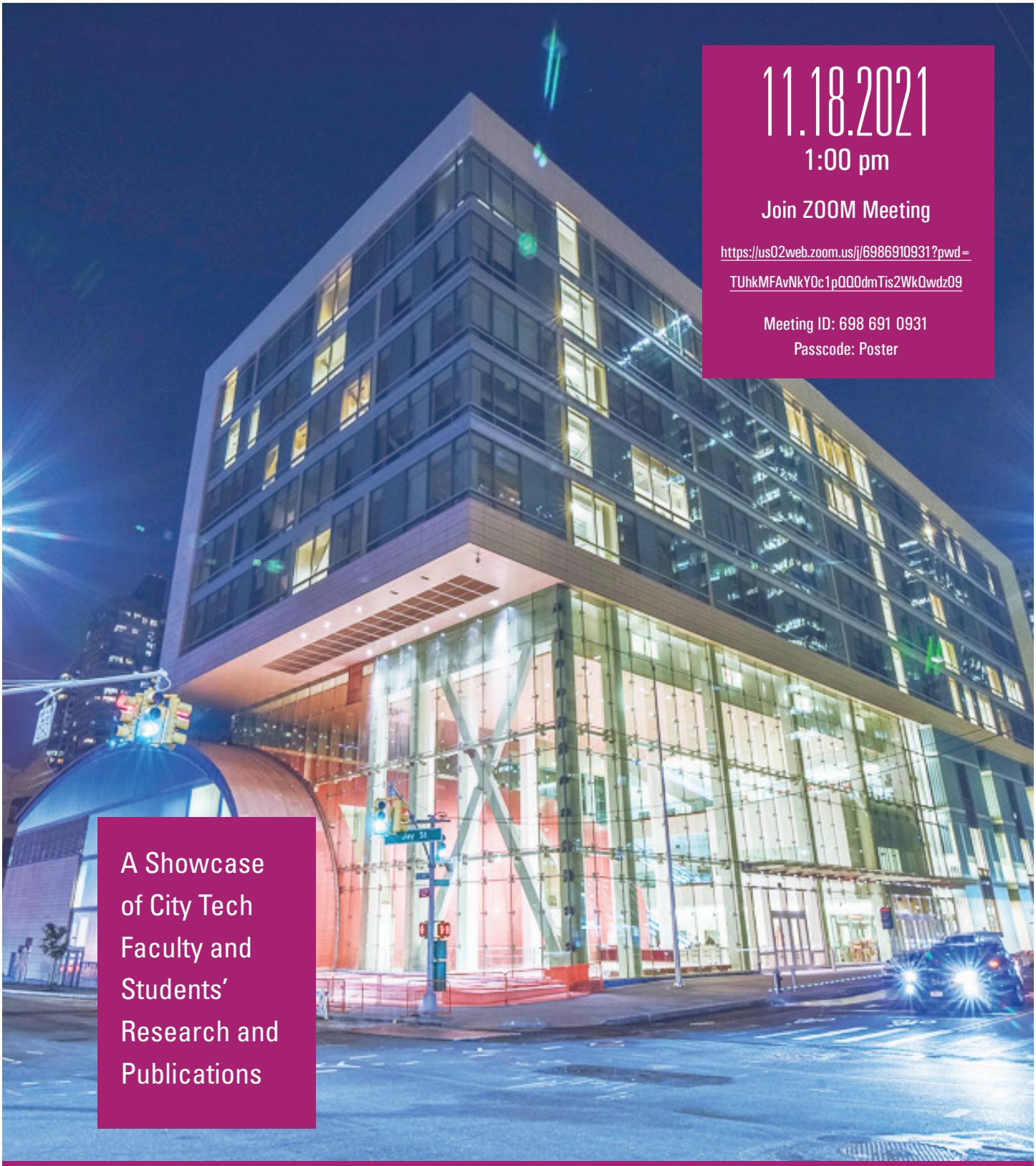

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A Showcase of City Tech Faculty and Students' Research and Publications

19th ANNUAL

POSTER SESSION

AFRICAN AMERICAN STUDIES

BIOLOGY AND HEALTH SCIENCES

BUSINESS

CHEMISTRY

COMPUTER ENGINEERING AND INFORMATION SYSTEM TECHNOLOGY

HOSPITALITY MANAGEMENT

HUMANITIES, SOCIAL SCIENCES AND ENGLISH

LAW AND PARALEGAL

MATHEMATICS

PHYSICS

ELECTRICAL AND MECHANICAL ENGINEERING TECHNOLOGY

GRAPHIC ARTS

WELCOME AND GREETINGS

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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.

POSTER SESSION

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https://openlab.citytech.cuny.edu/postersession2021/

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3 Anna Matthews. Monoclonal Antibodies: Exploring the Impact, Possibilities and Adverse Effects in Dentistry.

4 Isis Marsh, Rosalie Forrester and Allison Fody. Occlusal Trauma and Periodontal Diseases: The Implications of Occlusal Trauma Should be Part of a Comprehensive Periodontal Examination.

5 Laura Andreescu and Sevastiani Perselis. Removable Partial Dentures are Still Used Today for Several Reasons.

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2 **Isis Marsh, Rosalie Forrester and Allison Fody**. Occlusal Trauma and Periodontal Diseases: The implications of occlusal trauma should be part of a comprehensive periodontal examination.

3 **Subhendra Sarkar, Evans Lespinasse, Zoya Vinokur and Jodi-Ann Douglas**. Transmetallation in Living Tissues Explored by Multi Modality Radiological Imaging: Experiments and Modeling to Understand Metal-induced Toxicity as a Factor in Neurodegenerative Diseases.

4 **Alyssa D. Adomaitis and Diana Saiki**. Attitudes towards Wearing Masks among Young Adults.

5 **Rachel Raskin**. Understanding the State-Sponsored Automatic Enrollment IRA Plans.

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15 **Viviana Vladutescu**. Dynamic Alignment of Transmission Telescope.

ABSTRACTS OF PRESENTATIONS

AFRICAN AMERICAN STUDIES

Statelessness in the Western Hemisphere: An Ethnographic Analysis of Testimonies

Javiela Evangelista / African American Studies Department

In 2013, the Dominican Republic's Constitutional Tribunal ruling 168/13 retroactively revoked the citizenship of over 200,000 Dominican nationals of Haitian descent, thus creating the fifth largest stateless population in the world at the time, and the largest in the Western Hemisphere to date. The ruling simply made legal the longstanding, racialized and clandestine practice of converting Haitian descendant Dominican citizens into foreigners, a status relegated to Haitian migrants, the parent(s) of Dominicans of Haitian descent. The ruling, as well as the laws that precede it, demonstrate how anti-blackness and racialization are processes through which citizenship is measured and mobilized by states to reorder society and formalize hierarchies.

BIOLOGY AND HEALTH SCIENCES

Infective Endocarditis

Dora-Ann Oddo / Dental Hygiene Department

Infective endocarditis is an infection of the inner lining of the heart, frequently involving the heart valves. Dental health professionals must have a thorough understanding of this serious, albeit rare, infection of the heart because some dental and dental hygiene procedures in at-risk patients may increase the risk of this potentially life-threatening infection. Sequela of an infective endocarditis infection may lead to heart failure, stroke, heart valve damage requiring valve replacement or death.

Monoclonal Antibodies: Exploring the Impact, Possibilities and Adverse Effects in Dentistry

Anna Matthews / Dental Hygiene Department

Comprising a large and fast-growing group of medications with diverse therapeutic targets, monoclonal antibodies have a wide-ranging variety of current and potential therapeutic applications. The first monoclonal antibody was generated in 1975 and since then progress in biotechnology allowed for development of these biologic drugs that lessen the risk of immune response and permit much wider use. The field of mAbs has progressively grown since its introduction. Despite their specificity and generally good tolerability, mAbs are not without adverse effects, including oral and peri-oral – some severe enough to warrant therapy discontinuation. As the variety, number and therapeutic indications for mAbs continue to increase, the chance of encountering patients using these biologics in the dental settings will correspondingly grow. This review of literature facilitates dental providers' knowledge of the conditions managed with mAbs, their therapeutic and adverse effects, as well as interactions with other drugs and supplements, which is vital to providing safe dental treatment.

Occlusal Trauma and Periodontal Diseases: The Implications of Occlusal Trauma Should be Part of a Comprehensive Periodontal Examination

Isis Marsh [1], Rosalie Forrester [2], Allison Fody [2]

[1] Department of Dental Hygiene at New York City College of Technology
[2] Department of Dental Hygiene at Farmingdale State University

Historically, the role of occlusal trauma in periodontal diseases has been a misunderstood and controversial topic in the dental field. A thorough knowledge of the current state of evidence on the connection between occlusion and periodontal diseases is essential for dental hygienists to offer appropriate and comprehensive periodontal therapy to patients exhibiting signs of traumatic occlusion. Occlusal discrepancies that may result in trauma are often missed during routine dental examinations. Dental hygienists who can accurately identify occlusal trauma may be better suited to provide referral guidance to patients as they generally have more consistent contact with patients. This review evaluates the research between the connection of occlusion and periodontal diseases and provides therapeutic recommendations based on evidential findings of occlusal trauma in patients diagnosed with periodontal diseases.

Removable Partial Dentures are Still Used Today for Several Reasons

Laura Andreescu and Sevastiani Perselis / Restorative Dentistry Department

Removable Partial Dentures are dental prosthesis designed to replace multiple missing teeth for dental patients. This type of dental treatment is safe and efficient and, with the new advances in dental materials and fabrication methods, they are much better suited to restore patients' oral function and esthetics. Removable Partial Dentures can have advantages which are widely used in clinical practice. Though, due to the obvious harmful effects associated with current RPDs, there is an urgent need to enhance materials and fabrication procedures. To better care for the rising partially edentulous population, RPD techniques must continue to innovate and improve. When it comes to caring for partially edentulous patients, a combination of improved materials, digital design, research and education aims to improve their quality of life. This presentation gives an overview of the RPD and the new innovations, the advantages and disadvantages.

Transmetallation in Living Tissues Explored by Multi Modality Radiological Imaging: Experiments and Modeling to Understand Metal-induced Toxicity as a Factor in Neurodegenerative Diseases

Subhendra Sarkar, Evans Lespinasse, Zoya Vinokur, Jodi-Ann Douglas / Department of Radiologic Technology & Medical Imaging.

The primary goal in this interdisciplinary project is direct observation and imaging localization of transmetallation (metal displacement) among heavy metals in live tissue when perturbed by lanthanide or iodinated macrocyclic medical contrast agents. This is, presumably the first group of such observations, an extension of transmetallation observed in seabed and polluted lands by toxic industrial wastes. We offer two novel components; first, we postulate that key metal displacements could be the root cause of metallo-protein or metallo-carbohydrate breakdowns in living organisms disrupting homeostasis, and second, non-invasive imaging of transmetallation in real time in intact tissues, not demonstrated before. Biometal reorganization due to transmetallation, for example, by radiological contrast media, has dire consequences impacting ecosystem including our endocrine and neurological well being. Current approaches using invasive microscopies and analytical techniques are quite destructive and hence may not reproduce disruption of tissue homeostatic mechanism from contaminants or environmental heat/cold/free radical stressors. We use low energy Mammographic X-ray that is sensitive to light and heavy metal topography and high-field MRI that offers non-invasive localization based on direct molecular interactions and breakdowns of tissue proteins or carbohydrates as native metals or hydration layers are displaced by controlled infusion of external macrocyclics in model tissues.

BUSINESS

Innovation in the Fashion Industry: Lane Bryant Case Study

Denise H. Sutton / Department of Business

Lena Himmelstein, the founder of the plus-size women's apparel brand Lane Bryant, started her business in 1904 in New York City catering to pregnant women who needed maternity wear. This marked a shift in cultural and sociological ideas about pregnant women, and a move away from Victorian Era notions of femininity and middle-class women's confinement to the domestic sphere.

Research on Lane Bryant is practically non-existent, and yet there is great potential for providing a historical overview of the development of the plus-size segment of the fashion industry in the United States. With the growing interest in and expansion of this area of fashion—as seen in new plus-size fashion lines, consumer demand for more variety in plus-size style, and the call for greater diversity in the fashion industry overall—a comprehensive look at the development of Lane Bryant is timely and relevant.

*The Lane Bryant Case Study is a chapter in a book project under contract with Rowman & Littlefield publishers, tentatively titled: *Fashion Innovation in the 20th Century: The Relevance Rule*.

Attitudes towards Wearing Masks among Young Adults

Alyssa Dana Adomaitis [1] and Diana Saiki [2]

[1] Department of Business
[2] Ball State University

On April 1, 2020, CDC declared wearing a mask was an important safety precaution to prevent the spread of the COVID-19 virus (Ryan, 2020). Subsequent research supported the importance of wearing masks, analyzed policy, and identified groups that wore masks. Chernozhukov et. al. (2020) investigated the influence of various U.S. policies that were implemented which slowed the rate of infection. Mask policies were found to be more effective when compared to business closures and stay-at-home orders. Mask wearing in varying age groups have been examined, because COVID-19 has been found to cause noticeable illness in older adults. Results from several studies suggest that young adults do not consistently follow safety measures. One survey discovered young adults, particularly those residing in rural locations, were not wearing masks as often as older adults (Haischer et al., 2020). A report published by the CDC found that populations ages 18 to 29 were least likely to wear masks (Hutchins et al., 2020). Limited studies have examined how attitudes among young adults about masks impact mask wearing.

Understanding the State-Sponsored Automatic Enrollment IRA Plans

Rachel Raskin / Department of Business

Certified Public Accounting (CPA) practitioners often face increasing complexity when attempting to give retirement plan advice to business-owner clients. The problem is exacerbated as the baby boomers age and access to retirement savings plans are uneven across states. As retirement savings throughout the country dwindle, the alarming gap in retirement plan access and participation continues to widen.

Numerous state reforms across the nation have begun to address the retirement plan savings problem. This research helps CPA practitioners to understand the magnitude of the issue, details a state-by-state summary of State-Sponsored Automatic Enrollment IRA Plans, and offers considerations that may be useful to advise clients.

CHEMISTRY

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

Ivana Jovanovic [1], Colleen M. B. Gallagher [2], Benjamin P. Burton-Pye [3], Wayne W. Lukens Jr. [4] and Lynn C. Francesconi [2]

[1] Department of Chemistry, New York City College of Technology
[2] Department of Chemistry, Hunter College
[3] Department of Chemistry, Lehman College
[4] Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley

Technetium-99 (^{99}Tc) 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 ^{99}Tc challenging to isolate and stabilize during nuclear waste disposal. The immobilization of ^{99}Tc 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 TiO2 can be a waste form for the incorporation of Tc^{+4}.

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

Alberto Martinez [1], Mai Zahran [2], Miguel Gomez [1], Johnny Guevara [2] and Rosemary Pichardo-Bueno [2]

[1] Department of Chemistry, NYC College of Technology
[2] Department 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.

COMPUTER ENGINEERING AND INFORMATION SYSTEM TECHNOLOGY

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

N. Wu [1], Y. Hu [1], F. Song [1] and X. Li [2]

[1] Department of Computer Science and Technology, Nanjing University, China
[2] Department 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. Hu [1], N. Wu [1], F. Song [1] and X. Li [2]

[1] Department of Computer Science and Technology, Nanjing University, China
[2] Department 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. Quintuna, 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 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.

Content Analysis of Two-year & Four-year Data Science Programs in the United States

Elizabeth Milonas [1], Duo Li [2], Qiping Zhang [3]

[1] Department of Computer Systems Technology, NYC College of Technology
[2] Shenyang City University
[3] Long Island University

Higher education is now preparing a generation of workers with the skills required to enter the Data Science domain. Many colleges and universities are offering Data Science programs that vary in terms of core courses and electives. This research study evaluated 136 associate and undergraduate data science programs in the U.S. and identified similarities in course offerings and program structure. The research questions answered as a result of this study are: 1) what are the characteristics of Data Science programs, and 2) what are the common core courses and competencies in these programs. There are various private and public colleges offering data science programs across the U.S. These programs vary in core credits and degrees; however, the data science competencies recommended by ACM are being implemented across all programs regardless of the major or department. To pursue an interest in data science, one should seek a B.S. degree in one of the three most prominent majors; data science, data analytics, or math and statistics. The study provides a roadmap for institutions developing new Data Science programs or updating older programs by informing understanding of the breadth and width of associate and undergraduate Data Science programs in the U.S.

Cybersecurity XDR: A Panacea for a Secure Virtual World

Marcos Pinto / Department of Computer Systems Technology

XDR (eXpanded Detection and Response) system makes use of artificial intelligence to rank, prioritize and catalogue computer systems security alerts giving maintenance teams the tools to address the problems by their relevance. Computer systems alerts require security detection and response for endpoints (laptops, for example), server networks, and threats in general. The telemetries generated by security agents (hardware and/or software) are triaged by XDR systems and a prompt response is issued to remediate the problem(s).

HOSPITALITY MANAGEMENT

The Shortening Wars of Mid-Century America

Claire Stewart / Department of Hospitality Management

Many household goods sold in stores are interchangeable. Flour, sugar and shortening, for example, do not have inherent differences. It has long been left then to advertisers to establish distinctions between products; devising campaigns that position brands as unique and superior to competitors.

By early in the 20th Century, eager manufacturers had learned to manipulate Americans' newfound mania for cleanliness. Advertisers linked the factory production of goods to modernity, positioning the family farm as old-fashioned and that from factories as symbols of progress and cleanliness. This was especially evident in the burgeoning grocery industry.

Soap manufacturers, already using fats to make cleaning products, turned their attention to shortening. Advertising promotions pitched shortening as a "pure" and clean alternative to lard.

To sell products, corporations exploited the changes occurring in American culture. Issues of race, gender and immigration were a few of the social forces that challenged previously perceived standards of superiority. Marketing campaigns both soothed and incited the latent fears that underpinned this society in flux. Shortening ads serve as an exemplar of this.

HUMANITIES, SOCIAL SCIENCES AND ENGLISH

Reflective Narratives of Online Peer-Mentoring During Pandemic Times

Genesis Alvarado, Joya Biswas, Marialina Tejada, Shedy Toribio, Mery Diaz / Human Services Department

Engaging students and building connections during their first-year college transition is key to persistence and a sense of belonging (Diaz et al, 2021; Goodlad et al., 2019). Peer-mentoring can be instrumental in this process (Diaz et al., forthcoming; Plaskett, et al., 2018; Phinney et al., 2011). Since the start of the pandemic, however, the higher education landscape has changed, and so has peer-mentoring. Learning has moved primarily online. Enrollment has fallen sharply, particularly at a minority-serving public institution (NSC, 2020). The pandemic has also exacerbated pre-existing challenges for many first-year students at public institutions, and new ones emerged related to the online college experience (Diaz et al, forthcoming). Taken together, these factors impacted our approach to engaging and connecting with students. This poster presentation will share reflexive narratives from our experiences in the online peer-mentoring of first-year students at City Tech during pandemic times. We present both challenges and opportunities for future directions in online peer-mentoring.

Narrative Self-Disclosure through Written Composition by Vietnamese Refugees

Julian Costa [1], Gabriel Da Silva [2]

[1] Department of Humanities, NYC College of Technology
[2] School of CSIS, Pace University

This project examines the self-disclosure of Vietnamese refugees garnered from personal narratives written in a freshman composition course. Carey & Hodgson's (2018) Pastoral Narrative Disclosure (PND) Framework is used to analyze the educational context and introspective process of writing about personal experience. Twenty-one essays, each written by Vietnamese refugees in a 1980s freshman composition course, were examined.

Kádár Era: Dysfunctional Complacency and Nostalgia

Lisa Pope Fischer / Social Science Department

This poster presents the fourth chapter in my new book, *Chorus of Experiences Capturing Moments in Time: From the Siege of Budapest to Goulash Populism*, that uses oral histories of senior Hungarian women to explore the past and the present. This chapter looks at the Kádár era through the eyes of Irén, who outlines some of the serious problems of the period but also shows some nostalgia for the economic stability and sense of community. Though not necessarily a "fair" society, people learned how to work the system, find ways to get short supplied goods, or bribe their way to gain advantage. Part of the prolonged stability of the era may be the perception of economic stability. Festering discontent lays the groundwork for the eventual fall of Communism and the incentive to change. Ironically, from the perspective of today's society, some look back to this period with fondness, what has been referred to as communist nostalgia.

LAW AND PARALEGAL

The Legal and Ethical Challenges of SMART Manufacturing

Marissa J. Moran / Law and Paralegal Studies Department

"Software is driving the advances in today's manufacturing, and this means that ***the mouse is replacing the wrench*** *in many places on today's factory floor."*

Dubbed the next Industrial Revolution, Smart Manufacturing (a/k/a Industry 4.0) is a fully integrated, collaborative manufacturing system designed to meet changing demands and conditions in smart factories, and is poised to revolutionize the way in which manufacturing and business is conducted. Proposed to the U.S. Senate on March 7, 2019, S.715 - Smart Manufacturing Leadership Act is designed to improve the productivity and energy efficiency of the manufacturing sector, develop a national smart manufacturing plan, and provide assistance to small-and medium-sized enterprises/SMEs including grant awards to implement smart manufacturing programs. Despite such benefits, manufacturers will need to consider the legal and ethical challenges surrounding SM, in regard to Artificial Intelligence (AI) and decision-making, AI and patents, and data privacy and security.

MATHEMATICS

The Theory of Compact Spaces

Hans Schoutens / Department of Mathematics

While topological spaces can be very 'wild', compactness introduces enough amount of finiteness to guarantee a much 'tamer' behavior. We would therefore expect that the class of all compact spaces would have a nicer model-theoretic description, and this is indeed the case. It turns out that we can recover the topology on each space just from the properties of the entire structure/category (the class of all compact spaces and the continuous maps between them), as I will explain in this poster. In particular, each structure/category contains a model of Peano Arithmetic, that is to say, it has its own version of the natural numbers.

A Conjugate Directions-Type Procedure for Quadratic Multiobjective Optimization

Ellen H. Fukuda [1], L. M. Graña Drummond [2] and Ariane M. Masuda [3]

[1] Department of Applied Mathematics and Physics, Graduate School of Informatics, Kyoto University
[2] Faculdade de Administração e Ciências Contábeis, Universidade Federal do Rio de Janeiro
[3] Department of Mathematics, New York City College of Technology

We propose an extension of the real-valued conjugate directions method for unconstrained quadratic multiobjective problems. As in the single-valued counterpart, the procedure requires a set of directions that are simultaneously conjugate with respect to the positive definite matrices of all quadratic objective components. Likewise, the multicriteria version computes the step length by means of the unconstrained minimization of a single-variable strongly convex function at each iteration. When it is implemented with a weakly-increasing (strongly-increasing) auxiliary function, the scheme produces weak Pareto (Pareto) optima over infinitely many iterations.

Computational Modeling in the Classroom

Boyan Kostadinov, Nadia Kennedy, Ariane Masuda / Department of Mathematics

We present two projects on computational modeling with real-word data that can help students develop their mathematical maturity and intuition in the context of purely mathematical concepts. One project is related to the oil leaking from the Deepwater Horizon platform that happened in the Gulf of Mexico in 2010. The other is on estimating the area of a lung tumor. The projects have been designed to engage prospective and in-service mathematics teachers in exploring computational modeling and problem-solving.

Solving the Membership Problem for Certain Subgroups of $SL_2(\mathbb{Z})$

Sandie Han, Ariane M. Masuda, Satyanand Singh and Johann Thiel / Department of Mathematics

For positive integers u and v, let $L_u = \begin{bmatrix} 1 & 0 \\ u & 1 \end{bmatrix}$ and $R_v = \begin{bmatrix} 1 & v \\ 0 & 1 \end{bmatrix}$. Let $G_{u,v}$ be the group generated by L_u and R_v. The membership problem for $G_{u,v}$ asks the following question: given a 2-by-2 matrix $M = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, is there a relatively straightforward method for determining if M is a member of $G_{u,v}$? In the case where $u=2$ and $v=2$, Sanov was able to show that simply checking some divisibility conditions for $a, b, c,$ and d is enough to make this determination. In a previous paper, the authors answered this question by finding a characterization of matrices M in $G_{u,v}$ when $u,v \geq 3$ in terms of the short continued fraction representation of b/d. By modifying our previous work, we are able to extend our previous result to the more difficult case where $u,v \geq 2$ with $uv \neq 4$.

PHYSICS

Photonic Switching Devices by Means of Polariton Redistribution in TMDC's: A Comparative Analysis Between Ψ-shaped and Y-shaped Channel Guides

Patrick Serafin, German Kolmakov / Physics Department

Using the Langevin equation, we numerically model the stochastic diffusive dynamics of a dipolariton gas in an optical microcavity with a $MoSe_2$-WS_2 TMDC bilayer. The dipolariton particles, which are a three-way mixture of direct exciton, indirect exciton and cavity photon, are considered to be confined in a Ψ-shaped channel guide (with and without a buffer branch) as well as a Y-shaped channel guide. By variance of channel parameters such as electric field angle and electric driving force, we are able to study the resulting dipolariton branch redistributions. We are able to attain performances of $>90\%$ in both channel geometries for particular channel parameters, while making comparative analyses between the varying channel geometries. Our results open the route towards the development of room temperature based photonic switching devices for various channel guide geometries.

Rydberg Magnetoexcitons in Phosphorene

A. Spiridonova and R. Ya. Kezerashvili / Physics Department

We study direct and indirect magnetoexcitons in Rydberg states in phosphorene monolayers, bilayer, and van der Waals heterostructure in an external magnetic field applied perpendicular to the monolayer or heterostructure within the framework of the effective mass approximation. Binding energies of magnetoexcitons are calculated by numerical integration of the Schrödinger equation using the Rytova-Keldysh potential for direct magnetoexcitons and both the Rytova-Keldysh and Coulomb potentials for the indirect one. We report exciton binding energies (E_B), the energy contribution from the magnetic field to binding energies, and diamagnetic coefficients (DMCs) and show that they strongly depend on the effective masses of electron and hole. We demonstrate that phosphorene is a novel category of 2D semiconductors where E_B and DMCs can be tuned by the magnetic field and the system design.

Simulating the Motion of a Rotating Asymmetric Object

A. Ferroglia[1], M. C. N. Fiolhais[2], D. A. Ramirez[2]

[1] Physics Department, NYCCT
[2] Science Department, BMCC

The rotational motion of an asymmetric object that is not subject to an external torque shows interesting features when the object has an initial angular velocity that is almost parallel to the principal axis that corresponds to the intermediate moment of inertia. In that case, the frame of reference formed by the principal axes flips periodically in the laboratory frame in a surprising way. This behavior is sometimes referred to as the Dzhanibekov effect.

The purpose of this paper is to show how a numerical solution of Euler's equations for a spinning asymmetric object allows one to obtain in a simple way the position of the object's principal axes at each instant in time and to visualize the motion of the rotating object in the laboratory frame. With the procedure outlined in this work it becomes straightforward to write a code that produces an animation of the motion of the rotating object. This exercise could allow students to apply several numerical techniques to a simple but non-trivial problem.

Quantum Entanglement Between Excitons in Two-Dimensional Materials

G. P. Martins[1], O. L. Berman[2], G. Gumbs[3] and Y. E. Lozovik[4]

[1] CUNY Graduate Center
[2] Physics Department, New York City College of Technology
[3] Hunter College
[4] Institute of Spectroscopy, Russian Academy of Sciences

We establish a mathematical model for exploring the dynamics of 2 excitons on a two-dimensional material embedded on an optical microcavity. We have investigated the time evolution of the concurrence, a measurement of quantum entanglement between two excitons for both a system with and without dissipations. We reached the counterintuitive conclusion that, under some conditions, the presence of dissipation can lead to an increase on average to concurrence of the system.

ELECTRICAL AND MECHANICAL ENGINEERING TECHNOLOGY

Dynamic Alignment of Transmission Telescope

Viviana Vladutescu / Department of Electrical & Telecommunications Engineering Technology

The experiment presented simulates a surrogate transmission telescope system in laboratory setting and presents the model used in the correction of the outgoing beam. The results of the model show a nonlinear dependence between the outgoing and the reference beam, indicating the necessity of a minimum of two metrology instruments placed along the optical system for increased pointing precision.

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

Muhammad A Ummy, 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 Roccosalvo /
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 Ferroglia

Anna Matthews

Alexander Rozenblyum

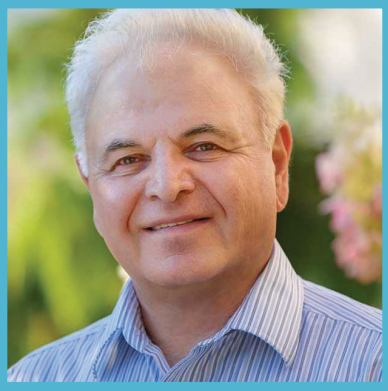
Hans Schoutens

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 Ferroglia
Anna Matthews

Third row l to r:
Alexander Rozenblyum
Hans Schoutens

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