HATS OFF TO SPRING SEMESTER!

Dear students, faculty, and alumni of the GC’s Computer Science community,

It is hard to believe that time has flown by for another academic year. After two years of uncertainty with the COVID-19 pandemic, we finally see lights of the return of normalcy. More and more GC classes, seminars and events have went back to in person meetings over the past Spring 22 semester. I am sure there will be more opportunities to see everyone on campus in the Fall.

But before then, I hope you enjoy reading this newsletter and learn all about our amazing GC CS department with so many wonderful people and achievements, and I wish all of you a safe, relaxing and joyful summer break!

Ping Ji, Executive Officer (Chair)

#crypto
#STS

In "e-Dog: Modeling Storefront Accessibility and Exploring Unknown Environments," Dr. Hao Tang (new faculty member at the GC, see below for introduction) discussed the potential of GPS-enabled electronic guide dogs in helping visually-impaired people navigate environments.

#GPS
#computervision
#assistivetech

Professor Mikael Vendejo-Johansson hosted a book launch to discuss his new co-written textbook, Topological Data Analysis with Applications (Cambridge).

#TDA
#datascience
April 13, 2022  **_PANEL DISCUSSION_**

In "End-to-End Network Programmability with P4," Nate Foster (Cornell), Nick McKeown (Stanford), and Jennifer Rexford (Princeton) were in a panel discussion, with research presentations by Costin Raicu (Bucharest), Jeongkeun Lee, (Intel) and Minlan Yu (Harvard).

### networks

April 27, 2022  **_TALK_**

Professor Yu-Wen Chen (new faculty member, see below for introduction) gave a talk titled "The Applications and Security for the Distributed Optimization and Learning."

### machinelearning
### smartgrid
### epistemicmodeling

May 22, 2022  **_TALK_**

Distinguished Professor Sergei Artemov gave a talk titled "Beyond Knowledge of the Model."

### logic
### philolog
### epistemicmodeling

**Abstract:** This talk presents an application service to enable distributed cross-community collaboration based on the alternating direction method of multipliers (ADMM) algorithm for the cloud-based energy management service. This talk will demonstrate the use of the ADMM algorithm and how to decouple and solve the large-scale optimization model. The second part of the talk focuses on the security needs for federated learning (FL), a distributed learning paradigm that allows multiple user devices to train a global ML model collaboratively without sharing local data with the central server or other users. This talk will discuss vulnerabilities in the typical FL and present a shuffling and regrouping-based framework (SAGE) to defend FL systems against poisoning attacks. SAGE can mitigate the attack effectiveness and deceive attackers with the master models’ poor performance.

**Abstract:** The principal motivation of this work is to display the sense in which the epistemic reading of a Kripke model tacitly requires common knowledge of the model, CKM. This requirement significantly restricts the amount of epistemic situations we are able to consider. We explore possible worlds epistemic models in a general setting without CKM assumptions and show that such models can be identified with observable submodels of Kripke models. We argue that such observable models offer a new level of generality and conceptual clarity in epistemic modeling. Similar analysis applies to intuitionistic models.
ANNOUNCEMENTS

Professional Update form:
The GC CS department invites students, faculty, and alumni to submit updates on their recent academic activities and accomplishments through the form (see QR code).

Share with us any professional activities (research activities which may be of interest to the GC CS community, as well as publications, talks, awards). We hope this fosters a sense of connectedness to the varied activities we have going on at the GC, and helps promote your accomplishments. Direct any questions to jchung1@gc.cuny.edu.

NEWS

#differentialmodels
#appliedmath

A paper co-written by Dr. Alexey Ovchinnikov's (Queens College) was recognized by Wiley as being one of the top-cited articles of 2020-2021. The article, "Global Identifiability of Differential Models." was published in Communications on Pure and Applied Mathematics.
Professor Susan L. Epstein (Hunter) was appointed chair of the Executive Councillor for AAAI, the world’s AI association. She was also named chair of its Ethics Committee.

A paper co-written by Avinash Jairam (PhD), Dr. Tzipora Halevi (Brooklyn College), and Theodore Raphan (PhD) was published in *Frontiers in Computer Science Journal*. The paper, titled "Improving Mobile Device Security by Embodying and Co-adapting a Behavioral Biometric Interface," was presented as a poster in a department poster competition last fall and won 1st prize. https://doi.org/10.3389/fcomp.2022.754716

A paper co-written by Yiming Tang (PhD), Allan Spektor (MA alum), Dr. Raffi Khatchadourian (Hunter), and Dr. Mehdi Bagherzadeh (Oakland) was accepted to the formal tool demo track at the 2022 ISCE, with a 50% acceptance rate.

The article, titled “A tool for rejuvenating feature logging levels via Git histories and degree of interest." will be available in May 2022.

Last year, these researchers also co-produced “Automated Evolution of Feature Logging Statement Levels Using Git Histories and Degree of Interest," which will take part in the International Conference on SANER ’22.
GC researchers to tackle new Deep Learning technology at IEEE

A paper co-written by Tatiana Castro Vélez (PhD), Dr. Raffi Khatchadourian (Hunter), Mehdi Bagherzadeh (Oakland), and Dr. Anita Raja (Hunter) has been accepted to the main technical research track at the IEEE/ACM SIGSOFT 2022 International Conference on Mining Software Repositories (MSR), with a 32.6% acceptance rate.

"We are studying a new hybridization technology that tries to combine the best of both worlds of two execution styles: graph and eager," said Tatiana, who is a current PhD student at the GC and the first-author of the paper.

(cont'd on next page)
"We are trying to fill a gap in how hybridization is used in real-world Deep Learning applications. Advances in DL are likely futile if these technologies cannot be utilized."

- Tatiana Velez (PhD)

"This technology is being applied to Deep Learning systems, for which it is important to support responsiveness," she continued. "We found some challenges in successfully applying hybridization and that these are underexplored. This work is important because we are trying to fill a gap in how hybridization is used in real-world DL applications. Advances in Deep Learning are likely futile if these technologies cannot be effectively utilized."

Dr. Khatchadourian said that this project is a follow-up to the group's previous paper (ICSE '21) on technical debt and refactorings in Machine Learning systems, which are more general than Deep Learning systems. He said, "In that work, we found (manual) refactorings (source-to-source, semantics-preserving program transformations)–were applied in those systems mainly to model code. We wanted to understand if similar software evolution issues arose in Deep Learning (DL) systems."

The conference will take place later this year in Pittsburgh and is co-located with ICSE 2022.

To see more about the article -- titled "Challenges in migrating imperative Deep Learning programs to graph execution: An empirical study" -- click this link: shorturl.at/kIDEX

Recently, Tatiana has also been selected to participate in the 2022 Computing Research Association-WP Grad Cohort for Women. She took part in a NSF-funded workshop for the cohort earlier this year in New Orleans.

Tatiana said, "The experience was very fulfilling. This Workshop was dedicated to enhancing our journey in our Ph.D. as an underrepresented sector in this field. The lessons I learned here are ones I will take for the remaining of my Ph.D. journey and things I will continue sharing with my community."

A special congratulations to Tatiana for publishing her first full conference paper as first-author in the second year of her Ph.D. studies! Also congrats to Raffi, Mehdi and Anita, and thank you for all of your hard work!
Anita Raja and Raffi Khatchadourian win NSF grant for Deep Learning study

Professors Raffi Khatchadourian and Anita Raja (Hunter College) received a 3-year research grant from the NSF Software & Hardware Foundations program as co-Principal Investigators. The project, entitled “Practical Analyses and Safe Transformations for Imperative Deep Learning Programs,” was granted a total amount of $599,974.

Abstract: Learning often occurs by pattern recognition. Software systems learn by using algorithms to recognize patterns and draw inferences from existing data and apply the inferences to previously unseen data. Deep Learning (DL) is a kind of machine learning algorithm inspired by neural networks of human brains. A DL model learns decision logic from a large set of examples. A classic application is image processing, where a model may learn to recognize particular images through training with many sample images. While software systems that incorporate DL models involve large amounts of data, they still have to be efficient and responsive. This project is expected to increase DL system robustness, reliability, and scalability, positively impacting computer vision, autonomous driving, medicine, and extremism identification. Tools developed as a result of this project are also expected to democratize the Artificial Intelligence workforce as they will assist data scientists and software engineers of varying proficiencies in writing quality DL code. Such tools can potentially contribute to a diverse, globally competitive STEM workforce and increase US economic competitiveness. This project will also promote software engineering concepts in machine learning by augmenting and creating several undergraduate and graduate courses. Dissemination will occur through publicly distributing datasets, papers, open-source software, and Open Educational Resources.

DL frameworks increasingly make various tradeoffs to balance the often competing requirements of reliability, usability, and generality. Popular DL frameworks have historically embraced graph-based, deferred execution-style (low-level) Application Programming Interfaces. While efficient, (legacy) systems using such interfaces are cumbersome, error-prone, and difficult to debug, maintain, and port. Contrarily, (modern) eager execution-style DL APIs facilitate higher-level, imperative, and Object-Oriented (Python) programs that are easier to debug, less error-prone, and more extensible have consequently emerged at the expense of run-time performance. Though hybrid approaches aim to bridge the two paradigms, they necessitate a non-trivial amount of technical metadata and exhibit several limitations and known issues on the use of native program constructs. This project is expected to contribute practical analyses and safe transformations for modern imperative and Object-Oriented DL programs that markedly improve their reliability and scalability. First, various software engineering artifacts will be mined for bug fixes, (manual) refactorings (semantics-preserving source-to-source program transformations), and missed opportunities in efficiently executing imperative DL code. Then, novel analyses and refactorings for automatically (i) migrating legacy, deferred execution-style DL code to more robust imperative DL code and (ii) specifying how their otherwise eagerly-executed imperative DL code should be reliably and efficiently executed as graphs at run-time will be formulated. Finally, novel analyses for detecting performance bottlenecks and semantic errors associated with graph-based execution of imperative, otherwise eagerly-executed DL code will be designed. This contribution is significant because it fills the void of techniques, methodologies, and tools for effectively developing—and evolving long-lived—trustworthy and efficient DL systems that pervasively use imperative and Object-Oriented DL programming.
THE GC WELCOMES 2 NEW FACULTY MEMBERS

Dr. Yuwen Chen (City Tech)

Where were you before the GC?
Before the GC, I joined the New York City College of Technology as Assistant Professor, after earning my Ph.D. in Computer Engineering from Iowa State University and a MS degree in Electrical Engineering from Columbia University.

What is your area of specialization, and what are you interested in these days?
I have an interdisciplinary research background, including cloud-based energy management, large-scale optimization, demand response, electric vehicle charging scheduling, mobile communication, fairness, and peer-to-peer networking. My research interests span a range of topics in data analysis, cybersecurity, smart grid, cloud computing, optimization, communication networking, and the Internet of Things. My recent focus is on enabling intelligent (learning-based) operations for various objectives (such as optimal operations, scheduling, and security issues) in both smart grid and networking environments.

What are your interests outside of CS?
Outside of CS, I like playing basketball, softball, hiking, and swimming. In addition, I enjoy watching movies and attending cultural events such as music concerts, Broadway shows, and art exhibitions.

What are you looking forward to about life and work at the GC?
I look forward to collaborating on research with the GC faculties and students (in networking, security, and data science groups) and contributing to some large projects and the growth of the CS department at the GC. I also look forward to mentoring graduate students and teaching graduate courses in advanced subjects.

What upcoming courses will you be teaching?
I’ll teach computer security, network security, digital forensics, and data security, privacy, and ethics at CityTech. I also look forward to teaching courses in GC in networking, security, and data science.
Dr. Hao Tang (BMCC)

Where were you before the GC?
I have been teaching at the CIS department at BMCC since 2012.

What is your area of specialization, and what are you interested in these days?
My research expertise spans the areas of computer vision, human-computer interaction, mobile augmented and virtual reality, and various applications in education, surveillance, and assistive technologies.

My current NSF project is to develop a virtual guide dog, similar to an autonomous car, which can provide people who are blind or have low vision with easy and comfortable travel experiences.

What upcoming courses will you be teaching?
I'll teach machine learning at GC and it allows me to meet many talented students from different departments or programs. I'm excited to teach this course and we will work on some interesting machine learning projects.

What are your interests outside of CS?
My hobbies are reading and traveling.

What are you looking forward to about life and work at the GC?
The GC provides me with a great opportunity to collaborate with talented graduate students and well-known faculty and researchers. It allows me to share more interesting research projects done by GC faculty/students with my students at BMCC. Additionally, I'm also interested in contributing to the CS department at GC and participating in various departmental committees.

The GC gives a warm welcome to our new faculty members!
CONGRATULATIONS!

The GC celebrates the 2022 graduating cohort of the Computer Science PhD program!

Haripriya Chakraborty  Soumi Maiti
Nur Dean           Xiaoke Shen
Yu-chi Hu           Pedro Soto
Abdul Khan          Xiaojin Ye
Raj Korpan
CONGRATULATIONS!

The GC celebrates the 2022 graduating cohort of the Data Science M.S. program!

Adam Catto
Xinyue Chang
Alvaro Reyes
Tianyu Gao
Lu Liu

Edward Heronzy
Bi Wu
Xilin Zhu
Frank Schiro
Garg Shweta
Congratulations to the Class of 2022! As we prepare for graduation, MS graduates Bi Wu and Adam Catto look back at their 2 years at the GC.

What was your background coming into the GC?

I came from a marketing analytics background. I finished my master degree in Marketing at NYU in 2019 and worked at MediaCom (advertising agency) as a data analyst from 2019 to 2020.

Tell us about a course you particularly enjoyed.

My favorite courses were Big Data analytics by Prof. Huy Vo and NLP by Prof. Alla Rozovskaya. Both courses have a good balance of theoretical and practical knowledge and became very useful later on in my professional development.

How did your interests change or evolve at CUNY?

I became very interested in the application of machine learning and data modeling in marketing data, for example AB testing and Marketing channel attribution modeling. I also became passionate about building and deploying dashboards/visualizations as web applications.

Where are you headed after graduation?

I will be working at Amazon on the Exports and Expansion team as a business intelligence engineer. I’m excited about the future possibilities, I think I will want to try different roles in the future like data scientist and product manager and eventually start my own business.

Any advice for current/future students?

Make friends, socialize and network. There are a lot of talented and amazing people in the program!
What was your background coming into the GC?

Coming into the GC, my background was in math and philosophy – I had previously focused my research on formal methods in philosophy.

Tell us about a course at the GC which you remember as a favorite memory.

I really enjoyed project-based electives like Artificial Intelligence (with Professor Sos Agaian) and Computational Biology (with Professor Lei Xie); both professors encouraged creativity and fostered flexible, independent research-focused class environments. Similarly, the most memorable and best learning experience I've had at the GC was during the capstone project, supervised by Professor Anita Raja. The opportunity to simultaneously work on (i) a project shared across multiple research groups and institutions and (ii) a project of my own design was enormously transformative, and has been most impactful in my development as a scientist/engineer by a large margin.

How did your interests change or evolve at CUNY?

I had initially developed an interest in the mathematical underpinnings of data science, as well as AI. Through (a) working on projects in the field of Machine Learning for Healthcare in the Distributed Artificial Intelligence Laboratory, (b) coursework in computational biology and bioinformatics, and (c) a research internship at Johnson & Johnson working on a digital health project, my research interests converged towards computational biology and biomedical informatics.

Where are you headed after graduation?

I have accepted a Data Scientist position in the neuroscience department at the Icahn School of Medicine at Mount Sinai, where I will be working on applications of ML towards biomedical problems.

Any advice for current/future students?

Actively make sure that you do not overburden yourself. It's too often the case that we find every minute of our days overtaken by work, especially when work can be done from anywhere, and when going to school while working a full- or part-time job. Burnout is very, very real. Schedule a fixed set of hours during which you will work, and do not work outside of those hours. Exercise regularly, get enough sleep consistently, and explicitly make time for what is meaningful to you outside of work – you'll find that the quality of your work will improve as well. Georgetown CS professor Cal Newport nicely summarized what I've described with the line “Do Less, Do Better, Know Why”.

Adam Catto (MS 2022)
PH.D DISSERTATION DEFENSES

Di Wu, June 13
BiTRDF: Extending RDF for BiTemporal Data

Yitzchak Novick, May 25
An Analysis of the Friendship Paradox and Derived Sampling Methods

Soumik Dey, May 25
Grammar Competition Explored in Two Case Studies: NS Stage and Old English

Nihal Vatandas, April 27
On the Cryptographic Deniability of the Signal Protocol

Students, alumni, and faculty: Please share any recent research activities and professional updates with the GC CS department, using this QR code. Email PR-related questions to jchung1@gc.cuny.edu.