

# MULTICAST

THE DEPARTMENT OF COMPUTER SCIENCE AT THE UNIVERSITY OF ROCHESTER



## Remembering Professor Randal C. Nelson

Story on pg. 4



**HAJIM**  
SCHOOL OF ENGINEERING  
& APPLIED SCIENCES  
UNIVERSITY of ROCHESTER

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# 2019–2020 in Retrospect



*Sandhya Dwarkadas*

**2019–2020 was a tumultuous year to say the least!** It started out with the usual energy, activity, buzz, and challenges, and ended in a year that will be remembered by all. In the middle of March, in reaction to the looming pandemic, all of us scrambled to handle the sudden changes in our ability to mingle and interact—faculty and staff moved all operations, including instruction and research, online, while students had to find a safe space to finish up the spring semester.

In the midst of all this chaos, Randal Nelson, our colleague of many years, passed away unexpectedly on April 19, leaving our community in shock. Randal was an integral part of our department, influencing graduate and undergraduate education alike, and adding in innumerable ways to the life and culture of the department.

Despite these challenges and the unexpected loss of a dear colleague, our students, staff, and faculty rose to the occasion. Our CS community remained supportive, involved, and inclusive. Randal's robot construction class valiantly completed their class projects with the help of Ted Pawlicki, who volunteered to step in and guide the course to completion. The Computer Science Undergraduate Council (CSUG) stepped up its volunteer tutoring efforts online. Classes were completed online, research continued remotely, and all of us learned to settle into the new reality of juggling home and work in the same physical space, each of us in our own unique circumstances.

Gabby Stillman, our graduating senior and president of CSUG, aptly said, "As computer scientists, the ability to adapt to the unknown has always been an important skill to develop, and COVID-19 was no exception to that. I found the department's response to be encouraging; CSUG kept tutoring, a virtual town hall allowed us all to connect and share feedback with faculty, and we even found a way to celebrate the graduating class. My hope for a post COVID world is that we take all the empathy, willingness to collaborate, and understanding we've seen and continue it once things are 'normal' again. Fostering an inclusive, accessible environment in CS has always been a passion of mine, and our response to COVID makes me feel like we can continue to make positive changes in the future." Indeed, Gabby, and congratulations to you and your classmates!

As did most of the country and the rest of the world, we celebrated the achievements of our students virtually this past year: 13 students graduated with a doctoral degree; 29 with a master's degree; 125 with a bachelor's degree; and 45 with a minor.

**We welcomed two new faculty members and several new staff members this past year:** Fatemeh Nargesian (PhD from University of Toronto) in the area of data management and Adam Purtee (a URCS PhD alum) on the instructional track. We also saw much transition among our staff. Staff Accountant Beth Corrigan retired; Graduate Program Coordinator Michelle Kiso moved to Baltimore, Maryland, after having a baby; Undergraduate Program Coordinator Brynn Wilkins moved to Ithaca, New York, to work at Cornell University; and, most recently, Undergraduate Coordinator Danielle Vander Horst joined Duke University to pursue a PhD in archeology. We wish them all the best and are excited for the new chapters in their lives. Losing so many well-loved and excellent staff has been mitigated by the excellence of our new hires: Jennifer Brennan, Sara Klinkbeil, Elaina McKie, Amanda Rigolo, and Emily Tevens. We truly appreciate how they have stepped up through these difficult times.

**On the education front,** there were several much-needed additions as well as exciting new offerings. Given our growing major, our introductory and core required courses are now taught each semester, increasing flexibility in curriculum planning for the students. Zhen Bai and Ted Pawlicki each received Sykes awards to develop new courses in AR/VR Interaction Design and Quantum Computing, respectively, this past fall and spring. We worked with faculty in the Goergen Institute for Data Science, the Department of Philosophy, and the Simon Business School, to improve our interdisciplinary curricular offerings, including a cluster in the ethics of technology and an information system track for our business majors.

**On the research front,** many of our faculty members conducted interdisciplinary research, with collaborations across multiple departments in the Medical Center, the Warner School of Education, humanities and social sciences, brain and cognitive science, physics, the Laboratory for Laser Energetics (LLE), as well as all of the departments within the Hajim School of Engineering. Several of our faculty have also attracted a number of visiting international scholars and students to participate in their research.

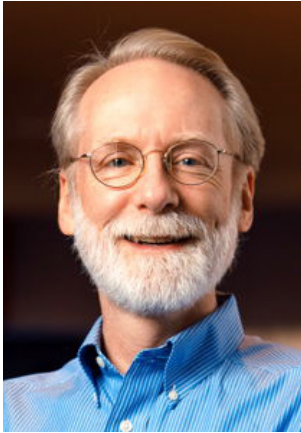
**On the outreach front,** the University's Women in Computing and Minorities in Computing (WiC-MiC) student group earned themselves recognition for their outreach to local high schools and various Girl Scout troops. WiC-MiC received the 2020 Meliora Values Award for Equity from the University (and Rukimani PV the Jane R. Plitt Award for her leadership and advocacy for women in computing). Zhen Bai and Chenliang Xu participated in the GIDS pre-college summer school. Yuhao Zhu participated in the University's Upward Bound program for math and science.

I pass the baton to Michael with hope, with pride in what we have accomplished, and with knowledge that the department is in good hands and is well positioned to weather this pandemic storm.

Wishing all of you good health,

*Sandhya*

# Looking Forward to 2021



**Michael Scott**

**Greetings to all our URCS alumni and friends!** I am delighted to be writing this note as the new chair of Computer Science. It's a role I filled for three years back in the late 1990s and twice since then on a briefer, interim basis—but the job today is very different, and I'm looking forward to the challenge.

I am enormously grateful to Sandhya Dwarkadas for her gifted leadership over the past six years. It has been a time of tremendous growth and change; thanks to

Sandhya, we are well positioned for the future. I also want to express my gratitude to Randal Nelson, my friend of over 30 years, who helped in so many ways to shape the department's culture, strengthen its research and teaching, and guide generations of students. Randal was a delightfully quirky, creative, and generous colleague; we miss him dearly.

As everyone surely knows, the issues facing the department in September of 2020 are very different from what I imagined when I agreed to become chair back in February. Last spring, our courses moved into an "emergency online" mode over the span of just a few days; this fall they must be taught more deliberately online or in a "hybrid" mode. Many incoming students aren't able to be with us in person. Those who *are* here have limited access to the building. The University—and, by extension, the department—are under great financial pressure. CSC 400, our signature intro course for the PhD program, will be delayed until spring for the first time in more than 40 years (and it won't, of course, be taught by Randal Nelson).

Yet the department remains in a position of strength. Our annual budget now exceeds \$9 million, and we continue to enjoy great success with external research funding. Lane Hemaspaandra will be hosting a postdoc under the NSF/CRA Computing Innovation Fellows program. Zhen Bai, Robbie Jacobs, Jiebo Luo, Sree Pai, Chenliang Xu, and Yuhao Zhu are all active in the University AR/VR initiative. Sree Pai and Sandhya Dwarkadas are collaborating on exciting new approaches to high-performance computing at the Laboratory for Laser Energetics. In the midst of the pandemic, Jiebo Luo's group has been doing amazing work to track the virus using social media. We have several brilliant new assistant professors, two freshly promoted associate professors (congratulations, Ehsan and John!), one freshly promoted full professor (congratulations, Daniel!), and plenty of enthusiasm left in old-timers like me. We are blessed with an amazing staff led by Eileen Pullara and Jim Roche, and our students, at all levels, are a never-ending fount of verve and creativity.

At the border between research and teaching, at least five faculty members received major supplements from the National Science Foundation this year to support research experiences for undergraduates. Ehsan Hoque is offering a special pandemic-inspired course this fall on how AI might mitigate social disruption. Fatemeh Nargesian is offering a new course on data management, Yuhao Zhu a new course on mobile visual computing, and Daniel Štefankovič a new course on sampling algorithms. Ted Pawlicki pioneered a course this past year on quantum computing. Adam Purtee launched a separate graduate-only version of our introduction to AI.

It's hard to know, as I write this, when we will return to some post-COVID sense of "normal," or what exactly that will look like. There is no doubt, however, that computing is destined to play an ever greater role across the spectrum of human endeavor—in business, society, government, science, the arts, and entertainment. Over the next three years, my top priority will be to strengthen and extend our connections to other disciplines on campus—to enrich our undergraduate majors, recruit ever more talented students, grow the CS faculty, collaborate with allied disciplines, and expand our research portfolio. Computing today is much more than computer science. At Rochester, it spans data science, audio and music engineering, digital media studies, visual and cultural studies, computational biology, the Laboratory for Laser Energetics, the Center for Integrated Research Computing, and a host of departments and programs in the Medical Center. Leveraging these connections can be a win for everyone involved.

My wishes to all our readers for a safe and productive year. Keep in touch. Come visit when you can. Contribute if you're able (see the call-out box on page 5). Let me know of your hopes for the department. My (virtual) door is always open.

Yours,

**Michael**



*Computer Science major Nurfajri Rafiuddin '21 works on a laptop on the Eastman Quad at the start of the semester.*

“Randal was one of the most passionate, direct, and meticulous people I’ve ever met. Being the instructor of an ‘intro to research’ seminar, a course required for all incoming PhD students in computer science, he touched the lives of many graduate students.”



# REMEMBERING PROFESSOR RANDAL C. NELSON

**It is with great sadness that we report that Professor Randal Nelson passed away on April 19, 2020. Professor Nelson had been undergoing treatment for cancer but had been active in the department throughout, and his death was sudden and unexpected.**

Professor Nelson joined the department in 1988 and was a prominent researcher in the area of computer vision. Much of his work focused on recognition of objects and actions for real-time control in robots. He advised a total of seven PhD graduates at Rochester.

Many readers of *Multicast* will remember Randal as a teacher; he impacted every incoming PhD student for many years by teaching the introductory graduate seminar CS 400, which he approached as an introduction to the culture and practice of

research in computer science. He also developed a number of unique classes for undergraduates. His Robot Construction class was an intensive team experience in which students designed and built a new robot from the ground up each year. One year’s robot moved like a snake, while the next year’s was a spheroid blob that was able to roll along the ground by slightly expanding one side while contracting the other. Randal’s class on Creative Computation aimed to give students a seat-of-the-pants engineering sensibility through back-of-envelope estimation problems. (Quick—do you have any atoms in your body that were once part of Julius Caesar?)

Randal contributed to the life of the department in many ways, and in particular he volunteered to lead the committee for PhD admissions for many years. This

is probably the most labor-intensive committee assignment one can take, given the huge number of applications to read and consider. It is also the most vital to the future of the department, and Randal always strove to build a balanced and cohesive class. He believed that the department should put the interests of its students first.

Randal played in our department’s very own rock band, the Algo-Rhythms, with Ted Pawlicki, Chris Brown, and Marty Guenther. He was always an interesting person to talk to in the hallway, whether it was about scanner technology or his latest personal projects that ranged from cataloging wildflowers to smelting iron from sand in a homemade furnace. He leaves a void that will be very difficult to fill.



### SPYRIDOULA GRAVANI (URCS PHD

**STUDENT):** “Randal was one of the most passionate, direct, and meticulous people I’ve ever met. Being the instructor of an ‘intro to research’ seminar, a course required for all incoming PhD students in computer science, he touched the lives of many graduate students. Coming from a different country, Randal’s classes helped me to quickly get acquainted with a new and quite different reality. I will always be grateful to him for these lessons. As the head of the committee for admitting new graduate students, he was always very organized and energetic! He deeply cared for the department and wanted all events to be a success. He was never afraid to speak his mind, even if that would not please everyone. I found this aspect of his personality very refreshing.”

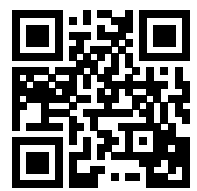
### LENHART SCHUBERT (URCS PROFESSOR):

“I was greatly saddened by the sudden and premature loss of my esteemed colleague Randal. He was a creative, incredibly versatile contributor to all our departmental missions and activities, bringing high standards and savvy insights to all he did, along with a great sense of fun—including the performance of satirical songs that brightened our festive occasions. I was impressed with the scope and depth of Randal’s knowledge right from my arrival in 1988. Randal and I were in a lunch group, and at one point the conversation took a turn towards the interpretation of quantum mechanics. I had recently audited a course on the philosophy of quantum mechanics at the University of Alberta and thought that a tidbit I had learned about the violation of hidden-variable theories by certain quantum-mechanical properties of orthohelium would impress. However, Randal—whose physics expertise I had little inkling of—promptly countered with simpler evidence for the same conclusion, and he had a better intuitive grasp of his example than I had of mine! I also particularly remember Randal’s astute

questioning of some of our colloquium speakers; we could be sure of our faculty candidates’ secure command of their area if they were able to handle “the full Nelson”! Over the years I had many conversations with Randal on topics ranging from AI to politics to cosmic theories. His views were always insightful and often surprising. Whenever I walk down a couple of doors from my own office, I will remember going past his and seeing the festively decorated and lit-up skeleton looking out at me through the glass partition long after Halloween or Día de Muertos, and I will miss the chance to chat with him.”

### BENED HEDERGAARD ’22 (PRESIDENT, UR ROBOTICS):

“I came to know him best when I took his course, CSC 230: Robot Construction, during this past spring semester. From that experience I came to understand that Professor Nelson had a very particular view of robotics. His viewpoint on mechanical intelligence, or designing physical systems whose very construction leads to intelligent behavior, was new to me. The creative robots he designed and readings he assigned (pages upon pages of which he wrote himself just for the course) showed a deep appreciation for the art of fabricating such systems. Under his keen eye for precision, I saw many of the machines throughout the Robotics Lab (Wegmans 2007) in full use during the first half of the semester. Even when the semester moved online, he did everything he could to pivot the class to build robots at home, mail us supplies, and stay connected on the course’s Facebook group. It was all too surreal to hear of his passing when that very morning he had emailed me about my robot’s progress. I’m grateful to have had the chance to better meet him during that semester. I hope that the club he helped found (UR Robotics) can continue to bring a love for creating robots to campus for years to come.”



## Making a Difference in Memory of Randal

In memory of Randal and in recognition of his commitment to recruiting and retaining the very best graduate students, the department has established the **Randal Nelson Graduate Student Fund**. Our goal is to raise at least \$25,000 to create a self-sustaining endowment in support of URCS graduate students—for research funding, academic fellowships and awards, conference attendance costs, etc., as determined by the department chair. Donations in Randal’s honor can be made at <http://uofr.us/nelson>.

Professor Hoque designs new course:

# Living during a pandemic: Can AI help mitigate?

**Less than a year ago, no one knew of SARS-CoV2. Now the virus, a thousand times smaller than a dust mite, has disrupted modern society on an unimaginable scale. Like WWII or the 9/11 attacks, the pandemic is leaving—and will leave—a permanent imprint on the world’s psyche.**

Ehsan Hoque was slated to teach a class on the interpretability of deep learning in the fall 2020 semester. The days of early March were full of excitement as he was putting the syllabus together for the fall class. Then the lockdown happened. Like every other family in the US, we were occupied with “online crisis schooling” for our children, worried about our aging parents, cognizant about the privacy implications of contact tracing apps, and trying to keep up with our productivity and well-being by continuing to be connected with the world.

Hoque noticed an opportunity to study these problems while living it through the lens of AI. When he requested to change the class to one on the pandemic, the department chair enthusiastically agreed. The Wadsworth C. Sykes Engineering Faculty Award also provided support and resources to help design the class.

## **What is the theme of the class?**

The name of the class is “Living during a pandemic: Can AI help mitigate?” The question mark at the end was added to express uncertainty. We plan to study the pandemic through political, geographical, and socio-economical lenses to identify the positive impact of AI as well as the consequential harm in combating the coronavirus on a global scale.

## **What is the biggest lesson for CS students in the class?**

“That which is measured improves.”—Karl Pearson, founder of mathematical statistics.

One of the fundamentals of computer science is to define metrics that are objective, repeatable, standardized, and, often, explainable. There is comfort in knowing that when the metrics are validated, they will often lead to improved outcomes and contribute to global equity. However, those metrics need to be critically evaluated, especially during a pandemic, with a focus on the socioeconomic digital divide, the authenticity of data, the self-sufficiency of an economy, geographical isolation, the clarity of communication, religious boundaries, and citizen compliance. The pandemic has presented itself as an opportunity for our students to study these important topics through structured data and their nuances on a global scale.

**The biggest lesson for CS students in the class:  
“That which is measured improves.”**

—Karl Pearson, *founder of mathematical statistics*

Professor  
Ehsan  
Hoque

Hoque and his students plan to study the pandemic through political, geographical, and socio-economical lenses to identify the positive impact of AI as well as the consequential harm in combating the coronavirus on a global scale.

### What are the sample topics covered in the class?

The class has become a moving target as new data, studies, and research papers are being published every single day. We have curated some of the latest materials in the field to cover the following topics in the class:

- **Contact tracing apps and privacy (how to slow the spread without giving up individual privacy).**
- **The future of education (the stress on parents thrust into home-schooling their kids, the transformation of academic institutions creating online classes).**
- **The future of productivity (work-life balance, attention management).**
- **Equitable allocation of a vaccine for the coronavirus.**
- **Equity and access to health care.**
- **Socio-economic, geographic, and religious boundaries while combating COVID-19.**
- **Well-being (telemedicine, robotics, social media, remote sensing).**

### How do I follow the class?

The entire class is being conducted online through a live website that will archive the generated knowledge, themed videos, and resources. You can access it at [www.livingduringapandemic.com](http://www.livingduringapandemic.com).

## New Faculty News: **Fatemeh Nargesian** Data intelligence for the discovery of digital truth



**Fatemeh Nargesian** joined the department in fall 2019 as an assistant professor after receiving her PhD from the University of Toronto. Nargesian's

research focuses on data intelligence that includes the curation and analysis of data in such a way that it can be used to promote better decision making and benefit AI.

With the unprecedented growth in the volume of publicly available Open Data from governments, academic institutions, and companies alike, a new dimension is added to the data intelligence world: the number of datasets is multiplying. Nargesian's research has been focused mainly on finding the "digital truth," that is, discovering and integrating data that accurately reflects reality. Discovering the digital truth among unknown and noisy datasets in the wild requires a search functionality beyond the simple keyword search that is predominately used by search engines for web pages.

To alleviate the lack of sophisticated search functionalities, Nargesian has developed search algorithms to identify datasets that can be unioned or joined with existing data from a data scientist. The discovered data can serve as additional features or training samples for AI and data analytics. For example, suppose a data scientist wants to build a model to predict greenhouse gas emission at geographical locations. The scientist starts with a dataset that contains samples for only a few geographical locations. To have a model that generalizes and reflects reality, the dataset must contain comprehensive data for various geographical locations. Nargesian's research builds principled probabilistic models and distribution-aware algorithms to find datasets that can be aligned and merged with a query dataset. A model trained on the original greenhouse

emission dataset then benefits from new features for the included locations. The table join search algorithm developed by Nargesian and her collaborators formulates this enrichment process as a classic set overlap search problem by considering attributes as sets and joinable values as the overlap between sets.

An alternative to search is navigation. In this paradigm, a user navigates through an organizational structure to find datasets of interest. In her recent work, Nargesian focuses on creating navigation graphs in which nodes represent represent sets of datasets and edges which indicate subset relationships among nodes. Building upon graphical models and structure learning, Nargesian's research solves the problem of finding the optimal organization of datasets that allows data scientists to navigate most effectively.

At URCS, Nargesian is working with undergraduate and graduate students on a variety of topics, including semantic set similarity search, co-occurrence counting in data streams, and fair data generation. Nargesian and a group of undergraduate students are launching the UR Data Link, a search engine that enables dataset discovery and data bias profiling for tens of thousands of datasets.

Since fall 2019, Nargesian has introduced two new courses: Data Management Systems and Advanced Topics in Data Management. The first course focuses on the fundamentals of data systems, including data models, database theory, transactions, query execution, and query optimization. The second course introduces students to a variety of topics and state-of-the-art techniques in data management with an emphasis on data discovery and integration, data for ML, sampling for approximate query answering, data understanding, and fairness in data management. In the "fairness in data management" module of this course, students study techniques for fair and stable ranking and fair data integration. In this course, students obtain research experience through a semester-long project.

## Faculty Research: Jiebo Luo

### Data mining to better understand the social impacts of COVID-19



**Public attitudes during the opening phases of the coronavirus pandemic were “mined” from Twitter messages by the research group of Professor Jiebo Luo. After an initial study on the use and implications of controversial terms like “Chinese virus” and “Wuhan virus,” which was published by the *IEEE Transactions on Big Data* and featured by *IEEE Spectrum*, the flagship magazine and website of the IEEE, the group also**

- **compared how college students responded differently from the general public to the pandemic,**
- **monitored increasing feelings of depression as COVID-19 spread,**
- **studied consumer hoarding behaviors resulting from the pandemic.**

Nine current and former Rochester computer and data science students are among the coauthors of the studies. Their findings were shared recently in a lightning presentation for chairs of computer science PhD-granting departments and heads of major industrial research labs at the Computing Research Association (CRA) Virtual Conference in July.

“We hope these studies can raise awareness among researchers and

the general public of how COVID-19 is influencing public opinion and impacting peoples’ mental health as well as provide government agencies and civil organizations actionable information for setting policies and practices to best deal with COVID-19,” says Luo. Luo also intends to incorporate the methodologies and results into the popular Data Mining course, which he has developed and taught for the past eight years. Students enrolled in his fall 2020 class will build on and extend the research on COVID-19 as the pandemic continues to evolve.

During the past decade, people have increasingly relied on Twitter and other social media platforms to express their feelings. This has provided researchers with a wealth of “in the moment” information to detect shifts in public opinion on key social and political issues, to track the spread of disease, and even to identify restaurants that might be sources of food poisoning. Twitter, in particular, is a rich source of data because the millions of tweets posted by its members each day are easily accessible using an application programming interface. However, Twitter also poses challenges to researchers because it strictly limits the number of

words per tweet. Luo’s group describes how it has capitalized on recent advances in machine learning and data mining to overcome these challenges. The group created a process that “combines deep learning model scores with psychological textual features and users’ demographic information” to detect signs of depression among Twitter users.

Here’s a closer look at the group’s recent findings about COVID-19 and Twitter:

#### Hoarding behavior

This is an example of how social media can be a “double-edged sword,” the researchers report. “While it is a rich source for obtaining useful information concerning the pandemic, it also shapes the fears. For instance, when posts of panic buying of toilet paper and hand sanitizers proliferate on social media platforms, people might make panic purchases after they see such posts.”

The researchers analyzed the hoarding patterns of 43,102 Twitter users and found “significantly higher” anxiety associated with hoarding-related tweets. Concerns spiked in early March on the availability of toilet paper and in early March and end of March for medicines, then declined for both categories; concerns about the availability of food continued to rise through the end of April. The highest proportion of Twitter users engaged in hoarding were in urban areas.

#### College students

From a pool of Twitter users who follow official Twitter accounts of the 200 top-ranked US universities, the researchers obtained 73,787 COVID-19–related tweets from 12,776 users, 3,460 of whom were college students.

The students tended to be more preoccupied with COVID-19 issues that affected them personally—for example, school closures—and news from areas close to their homes. They tended to respond even more negatively than the general public to the spread of the pandemic and frequently expressed negative feelings about how social distancing and school closures were affecting their work and study environments. About 81.3 percent



expressed dislike for remote learning. Many blamed East Asians for the disruptions in their lives.

### Depression levels

The researchers created a dataset of 5,150 Twitter users, half of who were identified as suffering from depression based on prepandemic tweets, with the other half serving as a control group. “This is by far the largest [English-language] Twitter depression dataset,” the researchers say.

Depression levels are plotted for both groups starting with reports of the first confirmed US case on January 21, the declaration of a national emergency on March 13, and South Carolina’s stay-at-home order on April 7. Interestingly, feelings of depression increased in the control group but decreased among depression sufferers after the report of the first US case. The depression levels of both groups increased after the national emergency was announced.

The researchers also looked at trends in three states: Florida, California, and New York. Twitter users in Florida were the most likely to talk about lifestyle changes caused by the pandemic, while New Yorkers were the most likely to talk about the impact on hospitals—no doubt reflecting the high number of cases in that state. Twitter users in California and Florida were more likely to comment on government policies on COVID-19. Florida’s lower overall depression rates than the two other states and the US in general—both before and after the virus outbreak—may be due to “a lower depression rate overall... irrespective of the pandemic,” the researchers report.

Now, COVID-19 is surging in other states that were still relatively unaffected when the studies were conducted. Mask wearing has become even more politicized and educators at all levels are debating how best to resume classes this fall. And the outcome of this fall’s presidential election may hinge on still unforeseen twists and turns of COVID-19.

Luo says his team will continue to mine Twitter to help researchers and the public better understand the social impacts of this deadly and rapidly evolving pandemic.

# 2019–2020 Highlights



*Samuel Triest*



*Sifan Ye*



*Jianyuan Zhong*



*Ashely Tenesaca*



*Zhengyuan Yang*

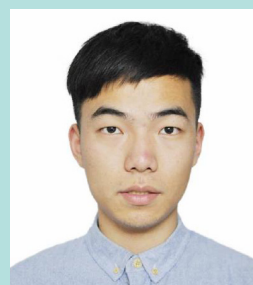
## Student Awards

- Four undergraduate students, **Samuel Triest '20**, **Sifan Ye '20**, **Jianyuan Zhong '20**, and **Ashely Tenesaca '21**, were awarded the Computing Research Association (CRA) Honorable Mentions in 2020.
- Graduate student **Zhengyuan Yang** was awarded the 2020 Twitch Research Fellowship.
- Graduate student **Lele Chen** was awarded the University’s 2020 Barnard fellowship, in recognition of his strong research record.

## Teaching and Faculty Awards

- Graduate student **Laasya Bangalore** was awarded the 2020 Edward Peck Curtis Award for her excellence in teaching as a graduate TA.
- **Chen Ding** was awarded the 2020 Lewis Award for undergraduate teaching and research mentorship.
- **Michael Scott** was awarded the 2020 William H. Riker Award for graduate teaching and research mentorship.
- **Henry Kautz** was awarded the Association for the Advancement of Artificial Intelligence (AAAI) Robert S. Engelmere Memorial Lecture Award.
- **Ehsan Hoque** was named an “emerging leader” by the National Academy of Medicine in 2020.

## Congratulations!



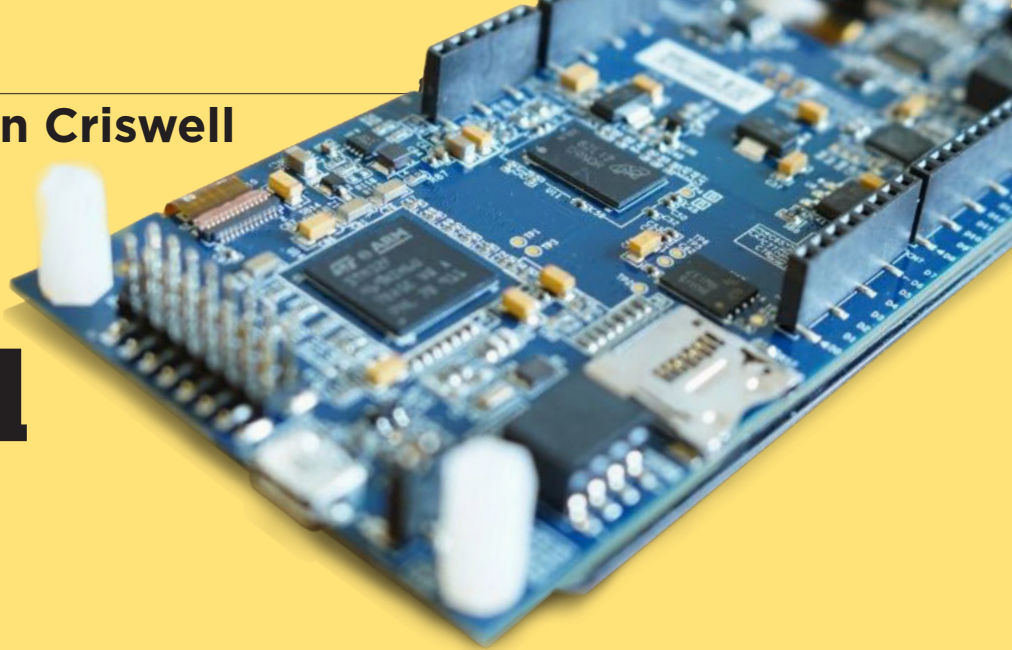
*Lele Chen*



*Laasya Bangalore*

Faculty Research: **John Criswell**

# Securing Embedded Systems



Computing is now entrenched in all facets of everyday life. Not only do we use computing in our daily work, we use computing devices nearly every day and everywhere. Drones use computers to perform increasingly complicated tasks. Internet of Things (IoT) devices listen to our requests and provide answers to our questions. Computers run our refrigerators, freezers, light bulbs, and other smart home appliances. We wear computers on our wrists to measure how far we run, we use them in our door locks to keep our homes secure, and we integrate them into medical devices to keep us well.

Unfortunately, the security of computing systems has not kept pace with their increasing ubiquity. All of these systems run legacy code from a bygone era, riddled with security vulnerabilities stemming from weak tools incapable of helping developers build “secure-by-construction” software. Over the past several years, the

Rochester Security Group, led by Professor John Criswell, has been hard at work creating practical and effective defenses for today’s computing systems. They have created defenses for vulnerable operating system (OS) kernels, invented new defenses for IoT devices, and devised new methods to analyze and measure security.

The work on IoT devices has provided significant challenges. Many IoT devices have limited processing power and memory. To accommodate these limitations, programmers still write the operating system and application code for these systems in C. This makes code running on these devices susceptible to memory safety attacks which corrupt control data (such as return addresses) to take control of devices. We need to devise defenses that are effective with low overheads.

The Rochester Security Group has developed two defenses, PicoXOM and Silhouette, that thwart such attacks. The first system, PicoXOM, mitigates multistage memory safety attacks that first read the program code out of memory using a buffer over-read before launching a classic buffer overflow code reuse attack. Such two-stage attacks defeat address space layout randomization (ASLR) and other code randomization defenses. Such attacks could be mitigated if the hardware allowed memory to be

configured so that it is executable but not readable. Alas, ARM processors used in embedded microcontrollers lack this feature.

PicoXOM creates embedded ARM systems that are both efficient and secure from code leakage attacks. Embedded ARM processors have a special debugging feature called a Debug Watchpoint and Trace (DWT) unit. Unlike debugging features on other processors, a DWT can be configured to trigger a trap when a range of addresses is read or written. PicoXOM configures a DWT register to generate a trap if any memory within the

**Over the past several years, the Rochester Security Group, led by Professor John Criswell, has been hard at work creating practical and effective defenses for today’s computing systems.**

code segment is read. With this approach, PicoXOM prevents code leakage attacks with 0.33 percent performance overhead and a modest 5.89 percent code size overhead.

While PicoXOM provides strong protection, there are still a small number of sophisticated attacks that can defeat it. This is because PicoXOM still permits corruption of data memory by memory safety attacks. In order to provide stronger

## Graduate Alumni Notes

protection, a defense must protect the integrity of key data within a program. To this end, Criswell's group built Silhouette.

Silhouette is an efficient protected shadow stack system for ARM embedded systems. These systems have two key features which permit Silhouette to provide an efficient shadow stack. First, these systems provide basic read, write, and execute memory protection using a Memory Protection Unit (MPU) and unprivileged and privileged processor modes. Second, the instruction set provides a special type of store instruction (named STRT) which checks the unprivileged mode permission bits even when the processor is operating in privileged mode. While most likely meant as a way of allowing an OS kernel to act like application code, Criswell and his team observed that they could use these special store instructions to create two distinct protection domains. In Silhouette, a special region of memory called the shadow stack exists within one protection domain, and only regular stores may write to it. All other memory is within the second protection domain, and both regular and unprivileged stores may write to it. The Silhouette compiler transforms application code so that a regular store writes a copy of the return address to the shadow stack while all other application stores use unprivileged stores to write to memory. In this way, Silhouette ensures that buffer overflows can never corrupt the return address on the shadow stack, preventing attackers from launching code injection and code reuse attacks. Criswell's experiments show that Silhouette incurs only 1.3 percent geometric mean performance overhead on CoreMark Pro and 3.4 percent geometric mean overhead on the BEEBS benchmarks.

**To learn more about what the Rochester Security Group is doing or to see their publications, please visit their web page at [www.cs.rochester.edu/u/criswell](http://www.cs.rochester.edu/u/criswell).**

### Diane Litman (PhD '86)

In March, I was honored to receive the University of Pittsburgh's Provost's Award for Excellence in Doctoral Mentoring. My mentoring style was heavily influenced by my own experience in James's lab back in the 1980s, and this summer I will be graduating my 11th PhD student since joining Pitt in 2001. This summer I am also one of the keynote speakers at the 21st Annual Meeting of the Special Interest Group on Discourse and Dialogue (SIGDIAL 2020). I will be speaking on "Argument Mining, Discourse Analysis, and Educational Applications," one of the research areas of my PETAL (Pitt Educational And Language technology) lab. Finally, our son has just completed his first year of a U of R PhD program, and I am looking forward to sharing my academic regalia with him in several years. Unfortunately, Gary Cottrell informed me that by the time I acquired them to hood my own PhD students, the University had changed from gold to blue robes. Even though I thus don't actually have the regalia from the time I myself graduated, they are still pretty spectacular with the resplendent dandelion!

### Isidore Rigoutsos (MS '87)

My lab at Thomas Jefferson University (TJU) has been studying short RNA regulators of messenger RNA abundance. Even though both my MS and PhD degrees are in computer science, after graduation I fell in love with molecular biology and genetics and have been working in this field for almost 28 years. Beginning in 2013, my lab started generating evidence that in both healthy and diseased tissue, the regulatory molecules that are present (and thus the molecules that are regulated by them) differ by sex, population of origin, and race/ethnicity. By now we have published more than two dozen articles where we show this phenomenon for three large categories of regulatory molecules and in many disease contexts. These dependencies are relevant for (precision) medicine because we essentially showed that different people control their protein

production differently in ways the community had not anticipated before. That is, there is no such thing as a "one disease." We also showed that the regulatory molecules differ by tissue type and disease type even though they are produced from the same short piece of DNA. In other words, *in the same individual*, the same exact short piece of DNA will produce different regulators in different tissues of this person. Again, this is something the community had not anticipated.

Also, UR and TJU have recently launched a program that offers early assured admission to TJU's Sidney Kimmel Medical College (see page 19 for more details).



**Barun Chandra (MS '88)**

Barun Chandra is an associate professor at the University of New Haven.

### Ronald Loui (PhD '88)

"I've published again this year on privacy and analytics. The Air Force invested in the start-up I cofounded. Meanwhile, I am teaching Linux and scripting to hundreds of undergraduate students at Case Western Reserve University in Cleveland, Ohio. I am constantly telling the students stories about great Rochester people. For example, I just realized that Noemi Berry, who did tape backups for us in the Hylan Building, was doing serious shell scripting (and Perl) for networking companies in Silicon Valley. Also, I recently learned that Richard Thaler, my favorite economist for decades, did his undergraduate studies at Case Western Reserve University, received his PhD degree from the University of Rochester, and, upon completion, was a faculty member at Rochester for a few years. We also shared the same postdoc advisor at Stanford."

# Graduate Alumni Notes



## David Coombs (PhD '92)

Raytheon recently merged with United Technologies. The new company is called Raytheon Technologies. I am still an Engineering Fellow (in the top few percent of engineers in the company). Also, I continue to serve on the Air Force Scientific Advisory Board. This fall, I will vice chair the Air Force Hypersonics Science and Technology review panel.

## Mark Crovella (PhD '94)

In 2018, Mark completed five years as chair of computer science at Boston University. During his time as chair, BU/CS grew enormously: the student body grew from 300 to 700 majors, faculty grew from 19 to 31 on tenure track, and plans for a new building to house CS at BU were finalized. Mark then spent a year's sabbatical at Universite Pierre et Marie Curie in Paris, along with his family (kids ages 4 and 8). During that year he tried to improve his French but his kids still correct his accent. Since returning he has been working mainly in the areas of computational

biology and fairness and transparency of machine learning.

## Massimo Poesio (PhD '94)

In 2017, I was awarded a £2.5M grant by the EU's European Research Council. Since then, I have been able to pursue all of the research questions I wanted to pursue, which has been great. If people want to know more, they can either have a look at the project's website, [dali.eecs.qmul.ac.uk/](http://dali.eecs.qmul.ac.uk/) (in particular at the games for collecting language annotations we are developing), or they can follow our games and NLP channel on YouTube at [youtube.com/channel/UCNKIKPFV0BOIRRQ8ZQfInTQ](https://youtube.com/channel/UCNKIKPFV0BOIRRQ8ZQfInTQ). Also, I finally have my own "massimopoesio" website: [massimopoesio.org](http://massimopoesio.org).

## Terry Riopka (MS '95)

Terry Riopka has been promoted to vice president of research at Aware, Inc.

## Louis Hoebel (PhD '98)

I'm still in Little Switzerland, North Carolina. I've spent the past year rock climbing around various crags in North Carolina in preparation for Alpine climbing. Last September, I did get one trip to the actual country of Switzerland and managed a few hikes and moderate climbs. With the virus, all of my international trips are postponed. I did manage a few days in Colorado at Rocky Mountain National Park. The picture is on the trail to Long's

Peak just days before they closed the park in March. During the lockdown, I built a couple of climbing walls in my garage. Ready to hit the mountains at a moment's notice.

## Galen Hunt (PhD '98)

My daughter Emma, who was born while I was in graduate school, was married this last summer (pre-Covid-19). Picture shows us demonstrating our amazing winking skills.

## Amon Seagull (PhD '00)

I moved to Texas in January to become Austin College's director of Institutional Research and Assessment. My wife and I were excited for the opportunity to move to Texas, closer to our older son. I am delighted to have returned to a liberal arts college environment, where I began my career upon leaving UR 20 years ago!

## Eduardo Pinheiro (MS '00)

This year, I published my first children's book (for kids ages 2-5). A second book will be published later this month, with a third coming in the next months.

## Nathan Blaylock (PhD '05)

Our oldest son, Diego, (born at Strong and occasional baby visitor to the CS lounge) just graduated from high school and has volunteered to serve a two-year mission

## Undergraduate Alumni Notes

for the Church of Jesus Christ of Latter-day Saints. We just found out he has been assigned to serve in the area of Austria, Switzerland, and southern Germany, which is especially exciting because of our family ties to Germany. We'll be sad to lose him for two years but proud that he has chosen to volunteer his time to serve others.

### Matthew Boutell (PhD '05)

Matt joined professors around the country in supporting their students online during the COVID-19 quarantine this spring. He already had some experience with recording instructional videos so pushed through to record videos of his data structures course as well. Here is a picture of his makeshift home recording studio that he used during the height of the quarantine, equipment compliments of Rose-Hulman.

### Ellen Campana (PhD '07)

I am a director in Artificial Intelligence and Advanced Analytics at KPMG. In addition, I have joined the Advisory Board for San Francisco State University (SFSU) Big Data Certificate Program.

### Aaron Gorenstein (MS '11)

I was promoted to senior software engineer on the Microsoft Visual C++ Compiler Team in September 2019. In addition, my wife and I managed to move into a co-op (condo) in Westchester, New York, in late January 2020. In retrospect, very close timing before the lockdowns. Since August 2018, I've greatly enjoyed volunteering as a tutor for data structures and algorithms (now remotely) at Pursuit (pursuit.org), a NYC nonprofit to help underprivileged young adults break into the software world.

P.S. Everyone in the CS department may be tickled to know that, occasionally, online orders translate our apartment number from 6E5 into 600000. So far, we've still managed to receive everything (I think . . .). It's a fun software bug!

### Jacob Brock (MS '15)

Jacob Brock has been skiing in Idaho.



### Brian Immerman '04

I moved to New Haven, Connecticut, where I am now the rabbi at Congregation Mishkan Israel.

### Seema Plaisier '04

My name is Seema Plaisier, formerly Seema Bhopale when I was at URCS from 2000 to 2004. I wanted to share a job update: my place of work is now the Translational Genomics Research Institute (TGEN) in Phoenix, Arizona. After nearly six years getting my PhD and 10 years doing bioinformatics consulting, science demonstrations for kids, and being a full-time care taker to my two daughters, I have returned to the work force as a computational scientist at the Collaborative Center for Translational Mass Spectrometry at TGEN. My job has to do with data analysis, integration, and storage of protein expression data from personalized medicine trials for cancer patients. [The photo was] taken when I first started this past fall. I am still using all of the great skills and knowledge I got from my time at U of R! I hope you are all doing well and staying safe in these crazy times. If there are any students who are thinking about bioinformatics/computational biology as a subspecialty, please don't hesitate to send them my way.



### Luke Guerrero '05

I left Brand Networks in 2018 and I am now with a company called CherryCircle Software.

### Dan Horowitz '05

I am cofounder and CTO of Smylen, which is an online marketplace for dental treatment. We also offer dental plans to business and individuals looking for ongoing savings. I left 1010data when we were seed-funded in 2019 and are now growing rapidly in the tri-state metro NYC area.

### Zaiming (Michael) He '06

My partner and I just welcomed our first child, Evan Zhiyong He!

# Undergraduate Alumni Notes

## Steven Frink '13

I'm now working as a software engineer with Amazon, specifically working on the S3 team in AWS.

## Mitchell Gordon '16

Last month, Apple included me in their first class of PhD Fellows in AI/ML! To read the article, visit [machinelearning.apple.com/updates/introducing-apple-scholars-aiml](https://machinelearning.apple.com/updates/introducing-apple-scholars-aiml).

## Som Liengtiraphan '17

I am pursuing a master of science degree at NYU Tandon School of Engineering in integrated digital media. I currently work as a graduate design lab coordinator at the school's MakerSpace.

## Shengbo Ge '18

I'm currently working as a software engineer at Amazon!

## Manan Hora '18

Manan Hora started the YouTube channel "Manan Hora" during quarantine.

## Justin Maldonado '18

I worked on #SpotifyWrapped in 2019 on the artist data stories. The campaign was awarded one Webby and five People's Voice Webbies in May of 2020. To read the article, visit [winners.webbyawards.com/2020/social/general-social/entertainment/128802/spotifywrapped](https://winners.webbyawards.com/2020/social/general-social/entertainment/128802/spotifywrapped).

## Marcelina Martynek '18

Right after I graduated in 2018, I went on a five-month backpacking trip around South America, an experience I am truly grateful for. Fast forward to this past November, and I accepted a job as a research specialist in a neuroscience lab at the University of Pennsylvania and moved to Philly. Some of the main questions we ask are: How does our environment guide neural development? and How does the emerging neural architecture support perception and behavior? Our research combines neuroimaging, behavioral psychophysics, and electrophysiology to understand how intrinsic and experience-driven processes interact throughout development to shape

brain organization and behavior. Our current focus is on neural development supporting visual object recognition across mammalian species. It's a challenging but rewarding position that I really enjoy. I continue to stay active with the UR Alumni network as I am a member of the Young Alumni Council in the Philly region and I'm also a Steering Committee member for the NY Metro Women—a UR Alumni group for women. As for the future, I'm currently taking the steps to apply to graduate school, hopefully starting in fall 2021!



# Congratulations Class of 2020!



Ahmad, Muhammad  
 Alzaid, Alanoud Humoud  
 Bell, Diarra  
 Bhuiyan, Abrar Shahriyar  
 Blumberg, Samuel Jack  
 Boddewyn, Matthew C  
 Bose, Shagun  
 Brager, Carolina I  
 Brar, Jason S  
 Brentnall, Casey A  
 Calabresi, Brent Arthur  
 Case, Laurance G  
 Chavrimootoo, Michael Chris  
 Chen, Long  
 Chen, Weikai  
 Douge, Patrice M  
 Du, Haozhi  
 Du, Yuchen  
 Duan, Junhan  
 Emmel, Clayton John  
 Ervin, Jessica L  
 Fair, Brandon Michael  
 Fan, Gao  
 Fan, Sicong  
 Ferreiras, Kelvin Ramon

Gamage, Dilshawn  
 Gandhi, Divyanshu  
 Gao, Yuebai  
 Guo, Kehao  
 Hawthorn, Henry  
 Heeger, Liam  
 Helmrich, Martin Christoph  
 Helterbrand, Noah Alexander  
 Hess, Peter William  
 Hussein, Youssef M. E. S.  
 Ilacqua, Giovanni  
 Ji, Jie  
 Joseph, Clifford J  
 Kagaju, Melissa  
 Kaizer, Thomas G  
 Kautz, Alex  
 Kaveti, Sailesh  
 Keshishyan, Lusine  
 Kessey-Ankomah Jr., Kwaku  
 Kimmelman, Max C  
 Kjellqvist, Christopher  
 Kong, Weituo  
 Lafortune, Jason P  
 Levy, Aaron B  
 Li, Jimmy Y

Li, Linan  
 Li, Yan  
 Lin, Kelly  
 Liu, Rebecca  
 Liu, Yingtao  
 Liu, Zhendong  
 Lomakin, Denis O.  
 Lu, Xin  
 Lukegord, Zac J  
 Lutfy, Moustafa M. I. M.  
 Martinez Rubio, Clara  
 Mccloud, Nathan T  
 Meyer, Edan J  
 Mohamed, Haytham A. A.  
 Moreno, Jacquelyn Elizabeth  
 Morton, Olivia G  
 Mulhall, Kenji T  
 Murante, Matthew Thomas  
 Neupane, Bepen K  
 Palmisciano, Jessica  
 Pan, Sichen  
 Pauly, Tyler  
 Pearson, Michael A  
 Penfield, Jillian M  
 Pon, Brendon

Pope, Ian M  
 Prathivadi-Bhayankaram, Sarmishtha Venkatesh  
 Priya, Pooja  
 Qayum, Adeel  
 Qi, Tongtong  
 Qin, Yichao  
 Ra, Yongsoo  
 Racicot, Ryan M  
 Ro, Daniel J  
 Rocas, Alejandro S  
 Romano, Nicholas J  
 Schell, Saralinda E  
 Schultz, Colin Parker  
 Shafran, Jonah W  
 Shan, Mingyuan  
 Sharma, Prikshet  
 Shems, Matthew Joshua  
 Sheng, Zeyu  
 Shi, Forest  
 Siatitse, Yawo Alphonse  
 Siegle, Aiden F  
 Simons, Hannah  
 Son, Richard  
 Stillman, Gabrielle  
 Strauch, Emma R  
 Sun, Qiuyue

Swanson, Matthew Isaac  
 Tello, Ariel  
 Tran, Minh Nhat  
 Triest, Samuel Shao  
 Tsao, Andrea D  
 Vasavong, Linda  
 Wai, Hnin Oo  
 Wang, Jingyi  
 Wang, Xuanyang  
 Wen, Melissa Ruiqi  
 Wilson, William Tyler  
 Wolkoff, Joshua Holladay  
 Woo, Daniel P  
 Xu, Jianguyong  
 Xu, Oliver  
 Yang, Qiaoyu  
 Ye, Sifan  
 Yin, Shidi  
 Young, Jarrod B  
 Zainulabdeen, Salih Ammar Wajih  
 Zheng, Jiayang  
 Zhong, Jianyuan  
 Zhou, Meiwen  
 Zinja, Sisipho

## Former URCS Staff: **Where are they now?**



*Vander Horst*

### **Dani Vander Horst** Undergraduate Program Coordinator, 2018-2020

An alumna of the U of R, Dani held an Honors BA in classics and archaeology and graduated as a Take Five Scholar in 2017; she continued on to earn an MA in archaeology from Cornell University in 2019. Though her own area of research was seemingly removed from computer science, Dani very much enjoyed her time as the undergraduate coordinator for the department. Not only did she learn crucial aspects of how academic departments function, but she was able to gain a new perspective on how the work computer science students conduct can impact so many other fields across the broad spectrum of academia, including her own. Dani is very grateful for her time in CS, and will remember the students, staff, and faculty fondly. She looks forward to taking all that she has learned at URCS with her onto her next journey as she pursues a PhD in classical archaeology at Duke University.

### **Marty Guenther** Undergraduate Program Coordinator, 1992-2017

I've been quite busy since my retirement in December 2017. We did some pre-pandemic travel to Ireland and Scotland in 2018. I had both knees replaced in 2019 (February and October) to get me in tip-top shape for my next adventures. I have been tracing my family roots on Ancestry.com and had planned to return to Ireland



*Guenther*

in June 2020, but that trip was postponed. I still plan to go back there and connect with a distant cousin. I am attempting to read all the books on PBS' Great American Read Top 100 books but I'm still open to suggestions for other interesting or fun reads. I was feeling socially distant (before the pandemic) and began taking bridge lessons in November to meet new people. I will have forgotten everything by the time we can sit at a table across from one another. Currently my gardening and exercise efforts keep the calories burning.

One of the special outcomes of the pandemic has been "grandma school" via Skype with my five- (now six-) year-old grandson, Cooper, three days a week for two hours to let his poor parents work at home. My older grandchildren (now 15 and 13) like to Facetime but not on any schedule. As many would remember, I have had a business to sell my photography since 2008, and this summer was difficult as all craft shows were canceled. I have a new venture! I've opened a shop-within-a-shop in a collaborative for women entrepreneurs. It's called the WeShop at 7310 E. Main St. in Lima, New York. Thanks to all the experience in computer science, I've managed to create my webpage ([www.decoratography.com](http://www.decoratography.com)) and make a social media presence on Instagram ([decoratographymartyguenther](https://www.instagram.com/decoratographymartyguenther)) and Facebook (Decoratography). I owe that all to Computer Science, my coworkers, and students keeping me in touch with technology! Please stay in touch.



*Wilkins*

### **Brynn Wilkins** Undergraduate Program Manager, 2017-2019; Student Worker, 2013-2015

**Current location:** Ithaca, New York.

**Current occupation:** Undergraduate program coordinator for food science, viticulture, and enology at Cornell University.

**Side hustle:** Freelance photographer, videographer, and designer.

**Hobbies:** Too many . . . horseback riding/polo, animal shelter photography, gaming, cats, daydreaming, attempting to smash the patriarchy, and my most recent obsession: breadmaking (specifically sourdough).

**Future goals:** I'm hoping to obtain a master's degree at Cornell while working full time here.

**Dream job(s):** Filmmaker and/or photographer for National Geographic, Animal Planet, or the Discovery Channel.

**Top bucket list items:** Stunt horseback riding for a film, baking on The Great British Baking Show, underwater videography for Shark Week. A girl can dream, right?

**To my CS family:** I miss you all so much! I'm so grateful for the wonderful experiences I had in CSB and Wegmans Hall and feel so fortunate to have met so many talented, dedicated, and caring people while working in this very special department.





Meeker



Forster



Kiso

### **Pat Mitchell**

**Department Coordinator, 2007–2018**

I've been away from the Computer Science department for a few years now and have really enjoyed retirement! I now have time to garden, sew, and play golf. Since retirement, my husband and I have also enjoyed traveling. So far, we have traveled to Florida, Toronto, and, every spring, we go to Hilton Head Island, South Carolina, for a month to sharpen our golf games. We enjoy our grandchildren and like to attend their lacrosse, hockey, and soccer games. After COVID, I look forward to traveling more and socializing with friends.

### **Peggy Meeker**

**Graduate Program Coordinator, 1975–2007**

Back in 2001, while still working at URCS, I started coursework at Colgate Rochester Crozer Divinity School. It took a while, completing one or two courses a semester, but in 2007 I retired from the U of R in order to do a full-time ministerial internship, and in 2008 I graduated with a Master of Divinity degree. The years since then have flown by, and in 2018 I retired again, this time for good, I think! I had an amazing ten years as a Unitarian Universalist minister: one year in religious education, five years as the organizing minister of a new church, three years as a chaplain at Strong Memorial Hospital, and one year as interim minister at First Universalist Church here in Rochester. This photo of me was taken at City Hall during that interim year, at a meeting at which I helped advocate for a Police

Accountability Board. In August of 2011, I married my beloved life partner, Marie Gibson. We have three wonderful children, six grandchildren, and two rescue kitties, all of whom I adore. Last fall, after delaying several times, we traveled to Ireland, England, and Scotland, where we “found” many ancestors and had lots of great beer and pub food. I'm grateful we went when we did, because these days we're spending our time staying safe at home. No complaints, though—I'm happily pursuing all the hobbies for which I never before had enough time, especially working in the garden.

### **Jill Forster**

**Administrator, 1974–2003**

I started working in the Department of Computer Science from its inception on August 1, 1974. As the years passed, my husband and I were looking forward to moving down South, where we vacationed regularly, so I took early retirement on March 31, 2003. We moved to Bluffton, South Carolina, which is 12 miles from Hilton Head Island and 17 miles from Savannah, Georgia. The weather is great, there is water all around us, and it is easy to just get in the car and drive to other places.

When we first moved, I was so used to working that I couldn't just spend my days on the beach, so I found a few part-time jobs, working three days a week. But that didn't last very long because then my employers changed the job descriptions to make them full time. After a few years,

I decided to give up on employment and began doing volunteer work. I taught Sunday School at my church and served on the church council for a three-year term. I also volunteered to be a tutor for the Literacy Volunteers of the Low Country for several years and actually saw three adults get to read and write. Needless to say, my volunteer work kept me much too busy.

A few years ago, my husband and I divorced. My brother and his wife recently moved down here as well as two of my cousins. My brother's daughter and her family live in Charleston (which is just over a one-hour drive from me). I get to see her two young children (a four-year-old boy and a baby girl who just turned one) quite often. I am lucky to be in fairly good health. Most of all, I am very happy to be living in the South, where the sun is out almost every day, which is quite different than the weather in Rochester.

### **Michelle Kiso**

**Graduate Program Coordinator, 2015–2019**

Mario, Julian, and I are enjoying life in central Maryland. We are lucky that Mario has been able to work from home since March, but we miss everyone at UR. I especially miss the CS staff (hi, Eileen!) and all the graduate students (and their antics), but I am having so much fun being a stay-at-home mom to little Julian.

# Students Attend the 2019 Grace Hopper Celebration



*Meiwen Zhou '20 on the colorful  
GHC steps of the Orange County  
Convention Center*



*Shagun Bose '20 and Gabby  
Stillman '20 at the NBC  
Universal employer booth*

The annual Grace Hopper Celebration (GHC) is the world's largest gathering for Women in Tech and attracted more than 25,000 attendees in Orlando, Florida, in October 2019. The conference draws together women and allies from across the tech and computing industries, granting an unparalleled opportunity to network, learn, and engage with their peers and allies. GHC, in partnership with AnitaB.org, seeks to achieve 50/50 intersectional gender equity in tech by 2025.

With hundreds of speakers, workshops, and employers, GHC is a fundamental and foundational experience for many URCS students. For the past few years, the department has committed to sending 15-20 undergraduate women to attend GHC on fully funded scholarships, with another 10-15 students typically joining the trip on their own funds. URCS students have been particularly successful at GHC, gaining internships and jobs at premier employers such as Microsoft, Nike, Intuit, Cisco, Apple, and Disney, as well as many start-up companies and not-for-profits. The trip is a huge milestone in each academic year, requiring considerable coordination from staff to arrange conference registrations, airline tickets, hotel reservations, in-town transportation, and student reimbursements.

## Student experiences from the 2019 GHC

**Meiwen Zhou, Class of 2020:** "For months, I woke with another no-reply rejection email in my mailbox, and I couldn't be discouraged more. However, GHC allowed me to finally meet actual people—leading women, especially those who shine in industry and academia. They didn't offer me a position right away, but through our conversations I was able to step back and examine my own strengths, weaknesses, and, moreover, what I truly value when searching along my career path."

**Anindini Singh, Class of 2021:** "Attending the Grace Hopper conference was a formative experience in my professional development. The sheer number of female technologists in attendance itself was encouraging of the ability to succeed in a predominantly male industry. The numerous interactions with software engineers and project managers, be it at the career fair or in mentoring sessions, helped me in making more informed choices about which professions to pursue in tech and skills to refine."

**Shagun Bose, Class of 2020:** "I had a ton of questions about my career path and goals when I first entered the conference halls, but after talking to various amazing women and attending workshops and sessions, I exited with answers. And I am still in touch with the people I connected with back then."

## UR and Sidney Kimmel Medical College Collaborate to Offer Computational Medicine Program Opportunity

Computational medicine is an emerging discipline uniting the power of computer and data sciences and clinical application in medicine and research. In fall 2019, Isidore Rigoutsos '87 (MS), a professor of biology and the founding director of the Computational Medicine Center at Thomas Jefferson University in Philadelphia, came to the University of Rochester with an idea for a collaborative effort between Rochester and Thomas Jefferson University's Sidney Kimmel Medical College (SKMC), providing a great opportunity for undergraduate and master's students interested in pursuing this new integrative field.

The Computational Medicine Program offers current students preferred admission to SKMC through an early assurance program that affords students early exposure to SKMC faculty during a summer institute, secures placement in the program, and waives the Medical College Admission Test.

Entry to the Computational Medicine Program is highly competitive. Due to the blended nature of this program, required coursework in pre-med sciences as well as computer and data sciences is necessary. There are tracks for computer science majors and for electrical and computer engineering majors. Typically, undergraduate students apply during the second semester of their sophomore year; master's-level students are considered on an individual basis. To learn more, see Computational Medicine Program at [rochester.edu/college/ccas/handbook/computational-medicine.html](http://rochester.edu/college/ccas/handbook/computational-medicine.html).



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Alumni" on Facebook**

## Recent PhD Graduates

### Rupam Acharyya

*Approximating Partition Functions of Spin Systems and Its Applications*

Postdoc, SUNY Buffalo

**Faculty Advisor:** Daniel Štefankovič

### Mohammad Rafayet Ali

*Feedback Strategies on Verbal and Nonverbal Cues to Improve Communication Skills*

Postdoc, University of Rochester

**Faculty Advisor:** Ehsan Hoque

### Scott Ames

*Theoretical and Practical Efficiency of Cryptographic Primitives*

**Faculty Advisor:** Muthu

Venkatasubramaniam

### Ritwik Bose

*Towards Resolving Ambiguity in Semantic Parsing with Hints*

Visiting Assistant Professor, Knox College

**Faculty Advisor:** James Allen

### Brian Dickinson

*Improving Our Understanding of Society through Global Patterns of Human Mobility*

Assistant Professor, Grove City College

**Faculty Advisor:** Henry Kautz

### Yang Feng

*Localizing Content in Videos via Textual and Visual Queries*

Software Engineer, Google Cloud AI

**Faculty Advisor:** Jiebo Luo

### Nabil Hossain

*Creative Natural Language Generation: Humor and Beyond*

AI Research Scientist, Intel

**Faculty Advisor:** Henry Kautz

### Xiangru Lian

*Large Scale Optimization for Deep Learning*

Senior Research Scientist, Kwai Inc.

**Faculty Advisor:** Ji Liu

### Haofu Liao

*Deep Learning Methods for Medical Image Computing*

Applied Scientist, Amazon Web Services

**Faculty Advisor:** Jiebo Luo

### Jansen Orfan

*Toward Deep Language Understanding: Methods for Learning Conceptual Knowledge from Definitions*

Lecturer, Rochester Institute of Technology

**Faculty Advisor:** James Allen

### Haichuan Yang

*Sparse Learning for Model Optimization*

Research Scientist, Facebook

**Faculty Advisor:** Ji Liu

### Jianbo Yuan

*Towards Knowledge Incorporation in Multimodal Healthcare Analytics*

Applied Scientist, Amazon Fashion Science

**Faculty Advisor:** Jiebo Luo

### Xiong Zhang

*Contextualized Exploratory Programming Using Webpages as Substrates*

Research Scientist, Facebook

**Faculty Advisor:** Philip Guo

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SCHOOL OF ENGINEERING  
& APPLIED SCIENCES  
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