

## SE4: ICs in Pandemics

### Organizers:



**Negar Reiskarimian**  
MIT, Cambridge, MA



**Zeynep Toprak-Deniz**  
IBM, Yorktown Heights, NY

### Co-Organizers:

**Kathy Wilcox**, AMD, Boxborough, MA  
**Alice Wang**, Everactive, Santa Clara, CA  
**Jane Gu**, University of California, Davis, CA  
**Ulkuhan Guler**, Worcester Polytechnic Institute, Worcester, MA  
**Yaoyao Jia**, NC State University, Raleigh, NC  
**Alicia Klinefelter**, Nvidia, Durham, NC  
**Rikky Muller**, University of California, Berkeley, Berkeley, CA  
**Farhana Sheikh**, Intel, Hillsboro, OR  
**Yildiz Sinangil**, Apple, Bay Area, SF  
**Trudy Stetzler**, Halliburton, Houston, TX  
**Vivienne Sze**, MIT, Cambridge, MA  
**Rabia Yazicigil**, Boston University, Boston, MA  
**Deeksha Lal**, Anokiwave, Billerica, MA  
**Dina Reda El-Damak**, University of Science and Technology,  
Zewail City, Egypt

### Moderator:



**Ulkuhan Guler**  
Worcester Polytechnic Institute  
Worcester, MA

The COVID-19 pandemic has imposed a powerful test across the globe. As the current pandemic unfolds, revolutionary social and economic changes have accelerated that would otherwise have taken decades to materialize, especially the digital transformation enabling virtual presence. The IC industry continues to forge ahead, providing the building blocks for innovations that improve the economic and social prosperity of the world. From smarter robots to automation, from connected medical devices to AI-driven data analytics, cost-effective, secure, portable and high-accuracy IC technology is already in place. This evening event brings together experts from industry and academia in cloud-connected biosensors, advance algorithms and artificial intelligence (AI) to discuss our preparedness to combat the spread of infectious diseases now and in the future. The talks will feature recent work on accelerated drug discovery, enhanced contact tracing, continuous remote patient monitoring and data analysis with related security and privacy concerns.

## Distinguished Speakers

8:15 - 8:35 AM

### Accelerating Innovation with Confidence: A Look at Cloud Security (All the Way Down to the Transistors!)

**Hillery Hunter**, *CTO of IBM Cloud, IBM*



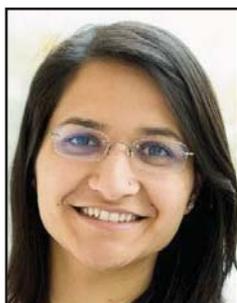
As the current pandemic has driven demand for computing, cloud has been the place many academics, pharmaceuticals, and tech companies have turned for readily-available, highly-elastic computing. At the same time, in the general population, many remain skeptical of the cloud — where indeed are all those cloud computers? is data protected sufficiently when stored in the cloud? This talk will example how custom ICs are being used today to help protect data in the cloud, and how processors designed with confidential computing in mind can help researchers and enterprises compute in the cloud with confidence.

**Hillery Hunter** is CTO of IBM Cloud, responsible for technical strategy for IBM's cloud-native and infrastructure offerings. Prior to this role, she served as Director of Accelerated Cognitive Infrastructure in IBM Research, leading a team doing cross-stack (hardware through software) optimization of AI workloads, producing productivity breakthroughs of 40x and greater which were transferred into IBM product offerings. Her technical interests have always been interdisciplinary, spanning from silicon technology through system software, and she has served in technical and leadership roles in memory technology, Systems for AI, and other areas. She is a member of the IBM Academy of Technology and was appointed as an IBM Fellow in 2017. Hillery is a BS, MS, and PhD graduate of the University of Illinois at Urbana-Champaign.

8:35 - 8:55 AM

### Building a Time Machine for Drug Discovery and Healthcare Research

**Perna Dogra**, *Senior Product Manager – AI for Healthcare, Nvidia*



Globally we are witnessing unprecedented times with the COVID-19 outbreak. Tackling the world's most pressing challenges in healthcare requires massively powerful computing resources to harness the capabilities of AI. As research and clinical healthcare organizations formulate and implement AI strategies it is mission critical to have a powerful foundation of software and hardware infrastructure that is domain specialized. In this talk, we will discuss how Nvidia is accelerating the pace of innovation for Healthcare research and drug discovery with our partner ecosystem and the impact of computing infrastructure to solve one of the greatest challenges of our times.

**Perna Dogra** is a Senior Product Manager for Healthcare at NVIDIA, where she leads the Clara Application Framework, focused on enabling researchers and data scientists to transform the medical imaging industry with technology for real-time analysis, artificial intelligence and advanced visualization. Perna is passionate about driving GPU Computing to Healthcare and building a rich partner ecosystem. Prior to joining NVIDIA, Perna was a Senior Graphics Software Engineer bringing the power of GPUs to Gaming and Professional Visualization. Perna holds an MS in Computer Engineering from the University of Florida, Gainesville.

## Invited Talks

8:55 - 9:10 AM

### AI-Enhanced Neural Prostheses

**Mahsa Shoaran**, *Assistant Professor of Electrical Engineering, Center for Neuroprosthetics, EPFL*



Among the many negative impacts of the current pandemic, the resulting ‘mental health crisis’ has received less attention yet causing dramatic increases in depressive symptoms and anxiety in the population globally. Implantable neural prostheses hold the promise to offer new therapies for brain disorders when symptoms no longer improve with medications and other treatments. However, existing brain implants do not adequately meet the clinical needs for severe psychiatric illness and other disabling neurological conditions. In this talk, I will present an overview of our research on the use of machine learning and algorithmic tools in neural prosthesis design. Our goal is to enable more effective neuromodulation therapies for a variety of neurological and neuropsychiatric disorders in future.

**Mahsa Shoaran** is currently an Assistant Professor in the Institute of Electrical Engineering and Center for Neuroprosthetics of EPFL. From 2018 to 2020, she was an Assistant Professor at the School of Electrical and Computer Engineering at Cornell University, and a Postdoctoral Fellow at Caltech from 2015 to 2017. She received her PhD from EPFL and her B.Sc. and M.Sc. from Sharif University of Technology. Mahsa is a recipient of the 2018 Google Faculty Research Award in Machine Learning, and the Swiss NSF Postdoctoral Fellowship. Her research interests include low-power circuit design for neural interfaces, machine learning hardware, and neuromodulation therapies for neurological disorders. Dr. Shoaran serves on the Technical Program Committee of the IEEE CICC, and as subcommittee chair in BioMedical Electronics for the IEEE International Conference on Electronics Circuits and Systems.

9:10 - 9:25 AM

### Pandemics - An Opportunity for Biomedical IC?

**Milin Zhang**, *Assistant Professor, Department of Electronic Engineering, Tsinghua University*



The unexpected Covid-19 caused a worldwide health crisis. The entire society puts on a lot of efforts to stop the spread of it. Covid-19 is definitely a disaster to our society. It drew more attention to the healthcare and biomedical industry. The integrated circuits play an important role in various nowadays biomedical devices. There may be some beneficial longer-term impacts on biomedical IC designers.

**Milin Zhang** is an associate professor in the department of Electronic Engineering, Tsinghua University. She received the B.S. and M.S. degrees in electronic engineering from Tsinghua University, Beijing, China, in 2004 and 2006, respectively, and the Ph.D. degree in the Electronic and Computer Engineering Department, Hong Kong University of Science and Technology (HKUST), Hong Kong. After finishing her doctoral studies, she worked as a postdoctoral researcher at the University of Pennsylvania (UPenn). She joined Tsinghua University as an Assistant Professor in the Department of Electronic Engineering in 2016. Her research interests include designing of traditional and various non-traditional imaging sensors, such as polarization imaging sensors and focal-plane compressive acquisition image sensors. She is also interested in various biomedical sensing applications and new sensor designs. She serves and served as the TPC member of ISSCC, CICC, A-SSCC and BioCAS. She is the Chapter chair of the SSSC Beijing chapter. She has received the Best Paper Award of the BioCAS Track of the 2014 International Symposium on Circuits and Systems (ISCAS), and the Best Paper Award (1st place) of the 2015 Biomedical Circuits and Systems Conference (BioCAS). She received the Thousand Youth Talents Award in 2016.