School of Engineering Ming Hsieh Department of Electrical and Computer Engineering

Integrated Systems

Tackling the Energy Limitations in Miniaturized Internet of Everything Devices

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Date: Friday, September 16th, 2022 - Time: 2:00pm -Location: EEB 248 Refreshments will be served

Abstract: Following Moore's law and Bell's law, miniaturization of electronic devices is continuously transforming the human life and the society. The next generation miniature devices are envisioned to ubiquitously connect physical objects in the world, digitizing cities, homes, industries, and human health and medicine. The major challenge in building these emerging hardware platforms is achieving all the desired sensing, computing, communication, and security functionalities under extreme power and size constraints. In this talk, I will present our recent efforts on unconventional circuit and systems designs to enable millimetric implantable bioelectronic medicine, and escalating security and intelligence of all sorts of edge devices. We take holistic design approaches to alleviate the energy issues without compromising system usability, exploring cross-disciplinary co-design opportunities from materials and devices, all the way up to computing algorithms and programming languages. Specifically, I will present (1) magnetoelectric power and data transfer technologies to millimeter-sized battery-free bioelectronic implants, with system integrations and validations; (2) hardware-enabled foundational security primitives and modules fitting stringent power and cost budgets; and (3) processing in-memory systems for deep learning and stream processing with cross-layer designs.

Biography:



Dr. Kaiyuan Yang is currently an Assistant Professor of ECE at Rice University, USA. He received his B.S. degree in Electronic Engineering from Tsinghua University, China, in 2012, and his Ph.D. degree in Electrical Engineering from the University of Michigan, Ann Arbor, MI, in 2017. His research interests include digital and mixed-signal circuit and system design for secure and intelligent microsystems, bioelectronics, and hardware security.

Dr. Yang is a recipient of the 2022 National Science Foundation (NSF) CAREER award, 2016 IEEE SSCS Predoctoral Achievement Award, and multiple best paper awards from

premier conferences in various fields, including 2021 IEEE Custom Integrated Circuit Conference (CICC), 2016 IEEE Symposium on Security and Privacy (Oakland), 2015 IEEE International Symposium on Circuits and Systems (ISCAS), and the Best Student Paper Award finalist at 2022 RFIC and 2019 CICC. He is currently serving as an associate editor of IEEE TVLSI and a co-chair of SSCS Houston chapter.

Hosted by Prof. Hossein Hashemi, Prof. Mike Chen and Prof. Constantine Sideris Organized and hosted by Vinay Chenna (<u>vchenna@usc.edu</u>).