KEYNOTE ADDRESSES

Monday, November 13, 2017

Quantum Computing: Revolutionizing Computation Through Quantum Mechanics

Dr. Krysta Svore - *Microsoft Research*

In 1981, Richard Feynman proposed a device called a "quantum computer" to take advantage of the laws of quantum physics to achieve computational speed-ups over classical methods. Quantum computing promises to revolutionize how and what we compute. Over the course of three decades, quantum algorithms have been developed that offer fast solutions to problems in a variety of fields including number theory, optimization, chemistry, physics, and materials science. Quantum devices have also significantly advanced such that components of a scalable quantum computer have been demonstrated; the promise of implementing quantum algorithms is in our near future. I will attempt to explain some of the mysteries of this disruptive, revolutionary computational paradigm and how it will transform our digital age.

Dr. Krysta Svore is a Principal Researcher and Research Manager at Microsoft Research, where she leads the Quantum Architectures and Computation (QuArC) group. Dr. Svore joined Microsoft Research in 2006 and started the QuArC group in 2010. Her research focuses on the development and implementation of quantum algorithms, including the design of a scalable, fault-tolerant software architecture for translating a high-level quantum program into a low-level, device-specific quantum implementation. She has also developed techniques for protecting quantum computers from noise, including methods of quantum error correction, establishment of noise thresholds, and the development of improved decoders. She spent her early years at Microsoft developing machine-learning methods for web applications, including ranking, classification, and summarization algorithms. Her work in machine learning has expanded to include quantum algorithms for improve machine learning methods. Dr. Svore was recently appointed as a member of the Advanced Scientific Computing Advisory Committee of the Department of Energy and chaired the 2017 Quantum Information Processing Conference. Svore received an ACM Best of 2013 Notable Article award. In 2010, she was a member of the winning team of the Yahoo! Learning to Rank Challenge. Dr. Svore is honored as a Kavli Fellow of the National Academy of Sciences. She is a Senior Member of the Association for Computing Machinery (ACM), serves as a representative for the Academic Alliance of the National Center for Women and Information Technology (NCWIT), and is an active member of the American Physical Society (APS). Dr. Svore has authored over 65 papers and has filed over 20 patents. She received her PhD in computer science with highest distinction from Columbia University and her BA from Princeton University in Mathematics with a minor in Computer Science and French.

Wednesday, November 15, 2017

How EDA Could Save the World (of Computing)

Todd Austin - *Univ. of Michigan*

With the end of Moore's Law arriving soon, there is much concern for the future of computing. Rightly, much of the research community's focus has turned toward heterogeneous parallel architectures, whose application-specialized designs hold the promise to overcome the lost benefits of silicon dimensional scaling. In this talk, I will make the case that the future success of computing has less to do with "how" we design these architectures and more about "how much" will it cost to bring them to the market. My claim is that unless the EDA community can develop technologies and methodologies to lower design costs by at least 100x, no affordable solutions will emerge to close the Moore's Law scaling gap. To get people thinking in this direction, I will present five new research directions that could slash the cost of future hardware designs, ideas that run the gamut from reusable accelerators, to fabless custom silicon, and open-source hardware.

Todd Austin is a Professor of Electrical Engineering and Computer Science at the University of Michigan in Ann Arbor. His research interests include computer architecture, robust and secure system design, hardware and software verification, and performance analysis tools and techniques. Currently Todd is director of C-FAR, the Center for Future Architectures Research, a multi-university SRC/DARPA funded center that is seeking technologies to scale the performance and efficiency of future computing systems. Prior to joining academia, Todd was a Senior Computer Architect in Intel's Microcomputer Research Labs, a product-oriented research laboratory in Hillsboro, Oregon. Todd is the first to take credit (but the last to accept blame) for creating the SimpleScalar Tool Set, a popular collection of computer architecture performance analysis tools. Todd is co-author (with Andrew Tanenbaum) of the undergraduate computer architecture textbook, "Structured Computer Architecture, 6th Ed." In addition to his work in academia, Todd is founder and President of SimpleScalar LLC and co-founder of InTempo Design LLC. In 2002, Todd was a Sloan Research Fellow, and in 2007 he received the ACM Maurice Wilkes Award for "innovative contributions in Computer Architecture including the SimpleScalar Toolkit and the DIVA and Razor architectures." Todd received his PhD in Computer Science from the University of Wisconsin in 1996.