University of Rochester
Department of Electrical and Computer Engineering
Distinguished Speaker Colloquia

Accuracy-Aware Systems: Signal Processing and Control

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11:00 AM – 12:00 PM
Computer Studies Building (CSB) 209

Abstract: Computer scientists have traditionally striven for (and assumed) exact computation. However, when we deal with the physical world, it is worth questioning our assumptions about the degree of exactness required. We will discuss accuracy-awareness in two different contexts: image compression and control. We explored accuracy-aware techniques for image compression, based on subthreshold logic, in collaboration with Prof. Saibal Mukhopodhyay's group. Subthreshold logic is of interest for its very low energy operation. We developed an improved theory for error analysis of subthreshold logic operation. We used this to develop a subthreshold logic module for the discrete cosine transform (DCT). However, our results showed that net energy gains in the DCT were offset by energy losses in the memory system due to poor compression. We developed alternative accuracy-aware algorithms based on quantization that avoid this problem. We explored the relationship between schedulability and stability in control systems in collaboration with Prof. Fumin Zhang's group. Both control theory and real-time systems theory traditionally view the sample period as involate. However, most real-time scheduling algorithms do introduce jitter in the execution interval of tasks. Until recently, the relationship between the schedulability of tasks and the stability of the control system had not been explored. We used Lyapunov analysis to show that, for a class of simple control systems running under rate-monotonic analysis, the goals of stability and schedulability are, in fact, consistent.

Bio: Marilyn Wolf is Farmer Distinguished Chair and Georgia Research Alliance Eminient Scholar at the Georgia Institute of Technology. She received her BS, MS, and PhD in electrical engineering from Stanford University in 1980, 1981, and 1984, respectively. She was with AT&T Bell Laboratories from 1984 to 1989. She was on the faculty of Princeton University from 1989 to 2007. Her research interests include cyber-physical systems, embedded computing, embedded video and computer vision, and VLSI systems. She has received the ASEE Terman Award and IEEE Circuits and Systems Society Education Award. She is a Fellow of the IEEE and ACM and an IEEE Computer Society Golden Core member.

Light refreshments will be provided.