Computing systems have seen tremendous growth over the past few decades in their capabilities, efficiency, and deployment use cases. The relatively slower progress in in-memory technology compared with that in processing units has continued to exacerbate the memory wall problem in the standard Von-Neuman architecture. One viable solution is in-memory computing, where computing and storage are performed alongside each other. Another concurrent development in computing is the maturation of domains that are error-resilient while being highly data and power intensive. These include machine learning, pattern recognition, computer vision, image processing, and networking. This shift in the nature of computing workloads has given weight to the idea of "approximate computing", in which device efficiency is improved by sacrificing tolerable amounts of accuracy in computation. This study presents a mathematically rigorous foundation for the synthesis of approximate in-memory logic and its mapping to RERAM crossbars using search-based and graphical methods. Results are demonstrated on standard computing benchmarks and fundamental image processing kernels.

Major: Computer Science

Educational Career:
Bachelor's of Electrical Engineering, BS, 2009, University of Engineering and Technology, Lahore Pakistan
Master's of Electrical Engineering, MS, 2014, University of Central Florida
Master's of Computer Science, MS, 2017, University of Central Florida

Committee in Charge:
Prof. Mark Heinrich, Chair, Computer Science
Prof. Gary Leavens, Co-Chair, Computer Science
Talat Rahman, Physics
Ulas Bagci, Computer Science
Murat Yuksel, Electrical and Computer Engineering

Approved for distribution by Prof. Mark Heinrich, Committee Chair, on October 11, 2019.

The public is welcome to attend.