Announcing the Final Examination of Soheil Salehi Mobarakhe for the degree of Doctor of Philosophy

Time & Location: February 24, 2020 at 2:30 PM in Research 1 103
Title: Energy-Efficient Signal Conversion and In-Memory Computing using Emerging Spin-based Devices

New approaches are sought to maximize the signal sensing and reconstruction performance of Internet-of-Things (IoT) devices while reducing their dynamic and leakage energy consumption. Recently, Compressive Sensing (CS) has been proposed as a technique aimed at reducing the number of samples taken per frame to decrease energy, storage, and data transmission overheads. CS can be used to sample spectrally-sparse wide-band signals close to the information rate rather than the Nyquist rate, which can alleviate the high cost of hardware performing sampling in low-duty IoT applications. In my dissertation which is funded by an NSF EECS project, I am focusing on adaptive signal acquisition and conversion circuits utilizing spin-based devices to achieve a highly-favorable range of accuracy, bandwidth, miniaturization, and energy trade-offs while co-designing the CS algorithms. The use of such approaches specifically targets new classes of Analog to Digital Converter (ADC) designs providing Sampling Rate (SR) and Quantization Resolution (QR) adapted during the acquisition by a cross-layer strategy considering both signal and hardware-specific constraints. Extending CS and Non-uniform CS (NCS) methods using emerging devices is highly desirable. Among promising devices, the 2014 ITRS Magnetism Roadmap identifies nanomagnetic devices as capable post-CMOS candidates, of which Magnetic Tunnel Junctions (MTJs) are reaching broader commercialization. Thus, my proposed research is well-motivated by the established aims of academia and industry.

Major: Computer Engineering

Educational Career:
Bachelor's of Computer Engineering, BS, 2014, Isfahan University of Technology
Master's of Computer Engineering, MS, 2016, University of Central Florida

Committee in Charge:
Ronald F. DeMara, Chair, ECE
Nazanin Rahnavard, ECE
Deliang Fan, ECEE
Amro Awad, ECE
Annie Wu, CS

Approved for distribution by Ronald F. DeMara, Committee Chair, on February 3, 2020.

The public is welcome to attend.