CECS Seminar

"Intermittent Learning on Harvested Energy"

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Abstract: Years of technological advancements have made it possible for small, portable, electronic devices of today to last for years on battery power, and last forever - when powered by harvesting energy from their surrounding environment. Unfortunately, the prolonged life of these ultra-low-power systems pose a fundamentally new problem. While the devices last for years, programs that run on them become obsolete when the nature of sensory input or the operating conditions change. The effect of continued execution of such an obsolete program can be catastrophic. For example, if a cardiac pacemaker fails to recognize an impending cardiac arrest because the patient has aged or their physiology has changed, these devices will cause more harm than any good. Hence, being able to react, adapt, and evolve is necessary for these systems to guarantee their accuracy and response time. We aimed at devising algorithms, tools, systems, and applications that will enable ultra-low-power, sensor-enabled, computing devices capable of executing complex machine learning algorithms while being powered solely by harvesting energy. Unlike common practices where a fixed classifier runs on a device, we take a fundamentally a different approach where a classifier is constructed in a manner that it can adapt and evolve as the sensory input to the system, or the application-specific requirements, such as the time, energy, and memory constraints of the system, change during the extended lifetime of the system.

Biography: Dr. Shahriar Nirjon is an assistant professor of computer science at the University of North Carolina at Chapel Hill, NC. He is interested in Embedded Intelligence – the general idea of which is to make resource-constrained real-time and embedded sensing systems capable of learning, adapting, and evolving. Dr. Nirjon builds practical cyber-physical systems that involve embedded sensors and mobile devices, mobility and connectivity, and mobile data analytics. His work has applications in the area of remote health and wellness monitoring, and mobile health. Dr. Nirjon received his Ph.D. from the University of Virginia, Charlottesville, and has won a number of awards including four Best Paper Awards at Mobile Systems, Applications, and Services (MOBISYS 2014), the Real-Time and Embedded Technology and Applications Symposium (RTAS 2012), Distributed Computing in Sensor Systems (DCOSS '19), and Challenges in AI and Machine Learning for IoT (AIChallengeIoT '20). Dr. Nirjon is a recipient of the NSF CAREER Award in 2021. Prior to UNC, Dr. Nirjon has worked as a Research Scientist in the Networking and Mobility Lab at the Hewlett-Packard Labs in Palo Alto, CA.

Host: Prof. Mohammad Al Faruque