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CECS Seminar

"Self-Aware Polymorphic Architecture (SAPA) Systems"

Michel Kinsy

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Thursday, January 19th
11:00am - 12:00 p.m. PST
Location: EH 2430

Abstract: In this talk, we introduce our Self-Aware Polymorphic Architecture (SAPA) design approach to support emerging context-aware applications and mitigate the programming challenges caused by the ever-increasing complexity and heterogeneity of high-performance computing systems. Through the SAPA design, we examine the salient software-hardware features of adaptive computing systems that allow for (1) the dynamic allocation of computing resources depending on program needs (e.g., the amount of parallelism in the program) and (2) automatic approximation to meet program and system goals (e.g., execution time budget, power constraints, security, and computation resiliency) without the programming complexity of current multicore and manycore systems. The proposed polymorphic computer architecture framework applies machine learning algorithms and control theory techniques to the application execution based on information collected about the system runtime performance trade-offs. It has heterogeneous reconfigurable cores with fast hardware-level migration capability, self-organizing memory structures and hierarchies, an adaptive application-aware network-on-chip, and a built-in hardware layer for dynamic, autonomous resource management. Our prototyped architecture performs extremely well on a large pool of applications.

Biography: Michel A. Kinsy is the director of the ASU Secure, Trusted, and Assured Microelectronics (STAM) Center. He is an Associate Professor in the Ira A. Fulton Schools of Engineering at Arizona State University. Dr. Kinsy focuses his research on secure computer architecture, hardware-level security, and efficient hardware design and implementation of post-quantum cryptography systems. Before joining the ASU faculty, Dr. Kinsy was an associate professor in the Department of Electrical and Computer Engineering at Texas A&M University (TAMU) where he also served as the Associate Director of the Texas A&M Cybersecurity Center (TAMC2). He also held faculty positions at Boston University and University of Oregon. From 2013 to 2014, he was a fully cleared Member of the Technical Staff at the MIT Lincoln Laboratory. Dr. Kinsy is an MIT Presidential Fellow and an Inaugural Skip Ellis Career Award recipient. He earned his PhD in Electrical Engineering and Computer Science in 2013 from the Massachusetts Institute of Technology (MIT).

Hosted By: Prof. Fadi Kurdhai