



**CECS**

**CENTER FOR EMBEDDED & CYBER-PHYSICAL SYSTEMS  
UNIVERSITY OF CALIFORNIA · IRVINE**

## **CECS Seminar**



### ***“Runtime Monitoring of Distributed Cyber-physical Systems”***

**Borzoo Bonakdarpour**

Professor, Department of Computer Science and  
Engineering, Michigan State University

Monday, May 23<sup>rd</sup>  
2:00-3:00 p.m. PST  
Location: DBH 3011

**Abstract:** We consider the problem of detecting violations of specification in the signal temporal logic over distributed continuous-time and continuous-valued signals in cyber-physical systems (CPS). We assume a partially synchronous setting, where a clock synchronization algorithm guarantees a bound on clock drifts among all signals. We introduce a novel retiming method that allows reasoning about the correctness of predicates among continuous-time signals that do not share a global view of time. The resulting problem is encoded as an SMT problem and we introduce techniques to solve the SMT encoding efficiently. Leveraging simple knowledge of physical dynamics allows further runtime reductions. We will discuss case studies on monitoring a network of autonomous ground vehicles, a network of aerial vehicles, and a water distribution system.

**Biography:** Borzoo Bonakdarpour is currently an Associate Professor of Computer Science at Michigan State University. His research interests include formal methods and its application in distributed systems, computer security, and cyber-physical systems. He has published more than 100 articles and papers in top journals and conferences. His work in these areas have received multiple best paper awards from highly prestigious conferences, including, RV'21, SRDS'17, SSS'14, and SIES'10. He chaired the Technical Program Committee of the SRDS'20, SSS'16, and RV'14 conferences.