

# Colloquium

**Dr. Nok Wongpiromsarn**

**DATE:** Monday, April 22nd, 2019

**TIME:** 4:00pm - 5:00pm

**LOCATION:** 223 Atanasoff Hall

## Design, Verification and Optimization of Embedded Control Systems: Applications in Autonomy, Sensor Networks and Traffic Control

The difficulties in designing reliable embedded control systems stem from the complexity of both control and distributed (concurrent) computing systems. Design flaws in these systems may arise from the unforeseen interactions among the computing, communication and control components. Motivated by the challenges of finding this type of bugs, in this talk, I will present mathematical frameworks, based on formal methods, to facilitate the design and analysis of such systems. An expressive specification language of linear temporal logic is used to specify the desired system properties. Our approach incorporates methodology from computer science and control, including model checking, theorem proving, synthesis of digital designs, hybrid system theory, reachability analysis, Lyapunov-type methods and receding horizon control. The practicality of the proposed frameworks is demonstrated through several applications, including autonomous vehicles, sensor networks and traffic control.



Tichakorn (Nok) Wongpiromsarn is a principal research scientist at Nutonomy, working on behavior specifications for autonomous vehicles. Prior to joining Nutonomy, she was a postdoctoral associate at the Singapore-MIT Alliance for Research and Technology (SMART) where her work included formal methods, mobility on demand, traffic control and transportation pricing as part of the Future Urban Mobility project. She received the B.S. degree in mechanical engineering from Cornell University and the M.S. and Ph.D. degrees in mechanical engineering from California Institute of Technology. During her Ph.D., she was involved in the DARPA Urban Challenge, where she led the Systems team for Team Caltech. Her research spans several areas of

computer science and control, including hybrid systems, distributed control systems, formal methods, transportation networks and situational reasoning and decision making in complex, dynamic and uncertain environments. Most of her work draws inspiration from practical applications, especially in robotics and transportation.