Title:

Model-based verification of complex dynamical systems with applications in engineering and biology

Abstract:

How can we efficiently certify that autonomous vehicles will achieve required safety and performance in the presence of modeling uncertainties and environmental disturbances? How can we quantify risks in safety critical and high cost applications? Can we guide scientists and engineers to design the most informative next experiment/test? Motivated by these and similar questions, I will present my recent work on computational tools that aid decision-making under uncertainty. The focus will be on computational tools for the robustness and performance analysis of nonlinear dynamical systems. I will demonstrate examples on the analysis of controlled flight dynamics and autocatalytic networks in biology. Additionally, I will briefly discuss my current work on provably correct design strategies for cyber-physical systems and on uncertainty and complexity management in the intersection of control theory, computer science, and computational engineering.

Bio:

Ufuk Topcu is a postdoctoral scholar in Control and Dynamical Systems and the Center for Advanced Computing Research at the California Institute of Technology. His research focuses on verification, validation, and uncertainty management for complex systems and engineering and scientific applications of optimization and systems theory. He received his Ph.D. in 2008 from the University of California, Berkeley.