Spring 2015 Colloquium
Temple University
Computer and Information Sciences

Automated Formal Analysis of Distributed Systems
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Abstract:
The past twenty years have witnessed significant advances in formal modeling, system verification and testing of network protocols. However a long-standing challenge in these approaches is the decoupling of a formal reasoning process and the actual distributed implementation. This talk presents my work on bridging formal reasoning and actual implementation in various distributed systems. First, in the context of Internet routing systems, I will present the Formally Safe Routing (FSR) toolkit, that combines the use of declarative networking, routing algebra, and SMT solver techniques, in order to synthesize faithful distributed routing implementations from verified network models. I will also describe our work on scaling up the FSR toolkit on Internet-scale configurations. Our core technique uses a configuration rewriting calculus for transforming large network configurations into smaller instances, while preserving routing behaviors. Next, in the context of the emerging software-defined networks, I will present our reactive synthesis approach for rigorous and scalable management of network controllers. Finally, I will conclude with a discussion of my ongoing and future work, on using database techniques for orchestrating software-defined network applications.

Bio:
Anduo Wang is a postdoctoral associate in the Department of Computer Science at the University of Illinois at Urbana-Champaign. She received her Ph.D. degree from the Computer and Information Science Department at the University of Pennsylvania in 2013. She received her M.S. degree in Computer Science from University of Pennsylvania in 2009, and her B.S. degree in Computer Science from Tianjin University in 2004. Her research interests center on the application of formal methods, database and programming languages techniques that enable us to create distributed systems that are functionally correct, scalable, and easy to manage.