

# Formal Inductive Synthesis for Cyber-Physical Systems

Sanjit A. Seshia

University of California, Berkeley, California, USA

Cyber-physical systems are computational systems tightly integrated with physical processes. Examples include modern automobiles, fly-by-wire aircraft, software-controlled medical devices, robots, and many more. The design of these systems can be very challenging due to their hybrid discrete-continuous nature and also because their operating environments can be highly uncertain and even adversarial. In this talk, I will describe how formal inductive synthesis — algorithmic synthesis from examples with formal guarantees — can be brought to bear on some important problems in the modeling, design, and analysis of cyber-physical systems. Both theory and industrial case studies will be discussed, with a special focus on the automotive domain.

Sanjit A. Seshia is an Associate Professor in the Department of Electrical Engineering and Computer Sciences at the University of California, Berkeley. He received an M.S. and Ph.D. in Computer Science from Carnegie Mellon University, and a B.Tech. in Computer Science and Engineering from the Indian Institute of Technology, Bombay. His research interests are in dependable computing and computational logic, with a current focus on applying automated formal methods to problems in cyber-physical systems, computer security, electronic design automation, and synthetic biology. His Ph.D. thesis work on the UCLID verifier and decision procedure helped pioneer the area of satisfiability modulo theories (SMT) and SMT-based verification. He is co-author of a widely-used textbook on embedded systems and has led the development of technologies for cyber-physical systems education based on formal methods. His awards and honors include a Presidential Early Career Award for Scientists and Engineers (PECASE) from the White House, an Alfred P. Sloan Research Fellowship, the Frederick Emmons Terman Award for contributions to electrical engineering and computer science education, and the School of Computer Science Distinguished Dissertation Award at Carnegie Mellon University.