

# Keynote: On the Road to Self-Driving IC Design Tools and Flows

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## Abstract

At today's leading edge, critical scaling levers for semiconductor product companies include design cost, quality and schedule. To reduce time and effort in IC implementation, fundamental challenges must be solved. **First**, the need for (expensive) humans must be removed wherever possible. Humans are skilled at predicting downstream flow failures, evaluating key early decisions such as RTL floorplanning, and deciding tool/flow options to apply to a given design. Achieving human-quality prediction, evaluation and decision-making will require new machine learning- (ML)-centric models of both tools and designs. **Second**, to reduce design schedule, focus must return to the long-held dream of single-pass design. Future design tools and flows that never require iteration and never fail (but, without undue conservatism) demand new paradigms and core algorithms for parallel search in design automation. **Third**, learning-based models of tools and flows must continually improve with additional design experiences. Therefore, the EDA and design ecosystem must deploy new infrastructure for ML model development and sharing.

At UCSD, a recently launched U.S. DARPA project, OpenROAD ("Foundations and Realization of Open, Accessible Design"), seeks to develop electronic chip design automation tools for 24-hour, "no-human-in-the-loop" hardware layout generation. The project aims to combine several new approaches in chip design — ML, parallel optimization and "extreme partitioning" of the design problem — to develop a fast, autonomous design process. Today's talk will sketch a few waypoints "on the road to self-driving IC design tools and flows", framed as opportunities for collaborations that span ML, IC design, EDA and academia.

## Curriculum Vitae



Andrew B. Kahng is Professor of CSE and ECE and holder of the endowed chair in HPC, at UC San Diego. He was visiting scientist at Cadence (1995-97) and founder/CTO at Blaze DFM (2004-06). He is coauthor of 3 books and over 400 journal and conference papers, holds 34 issued U.S. patents, and is a fellow of ACM and IEEE. He served as general chair of DAC, ISPD and other conferences, and from 2000-2016 as international chair/co-chair of the ITRS Design and System Drivers working groups. He is currently PI of "OpenROAD", an \$11.3M U.S. DARPA project targeting open-source, autonomous ("no humans") tools for IC implementation.