

Research Days Abstract Submission

Abstract Title:

Machine Learning for High Performance, Energy-Efficient and Reliable NoCs

Primary Presenter Full Name: Ke Wang

Co-presenter Full Name(s):

Co-Author Full Name(s): Ahmed Louri

Abstract Text (should not exceed 400 words):

With continued aggressive technology scaling, Network-on-Chips (NoCs) architectures are facing three major challenges including minimizing power consumption, scaling performance and providing a reliable and robust communication limited by area, power, and cost constraints. Researchers have proposed various techniques individually tackling these challenges, while few efforts to date have simultaneously targeted improving power, performance, and reliability together. Due to the complexity of the interactions among three competing objectives and explosion of design space, it is harder to manually design rules and strategies for interconnection system for optimizing power, reliability, and performance.

In our research, we use Machine Learning (ML) algorithms, which can work with high-dimensional data and automatically infer complex decisions, to balance reliability, performance, and energy efficiency for NoCs. We first use supervised ML algorithms to build predictive decision models, which can optimize competing goals of two of the three targets (e.g. reliability and performance, performance and power, etc.). We further use reinforcement learning (RL) to eschew the prediction step and automatically learn a decision policy that directly maps system-level states to optimal decisions which can yield maximum benefits on reducing power, enhancing reliability, and improving performance simultaneously.