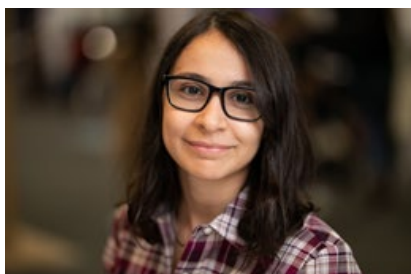


# Automated Analysis and Implementation for Modern Networks



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## Abstract

Modern computer networks are complex distributed systems, with thousands of heterogeneous software and hardware components working together to deliver traffic from sources to destinations. They serve online services that demand much more than basic network connectivity, asking for certain levels of performance, security, and reliability from the network. Meeting these growing expectations requires running increasingly sophisticated functionality in networking software and hardware. Yet, we still lack proper tools and techniques to analyze and implement these advanced functionalities and, instead, mostly rely on manual error-prone processes to ensure that the network can fulfill the requirements of the various applications it has to serve.

In this talk, I will discuss how my research helps bridge this gap by automating the analysis and implementation of such advanced network functionality. First, I will focus on transport-layer algorithms. These algorithms are key to providing high performance for different classes of traffic but are quite challenging to implement on high-speed network hardware due to their interdependent complex operations. I will present a hardware architecture that can be programmed, with modest development effort, to execute new transport algorithms at 100Gbps. Next, I will focus on automated reasoning about network performance. Network performance depends on packet-level interactions between different traffic flows, making it easy to overlook corner cases that can cause performance problems. I will demonstrate how to use formal methods to automatically generate traffic patterns that lead to poor performance in a given network. Finally, I will discuss my future plans on using rigorous and automated tools and techniques to create networks that are robust and explainable.

## Bio

Mina Tahmasbi Arashloo is a presidential post-doctoral fellow at the computer science department of Cornell University, working with Nate Foster and Rachit Agarwal. Her research focuses on programmable computer networks, specifically on designing and developing automated processes to program and reason about modern networks. In doing so, she brings in techniques from other computer science disciplines such as formal methods, programming languages, and hardware design. She received her Ph.D. from Princeton University, where she was advised by Jennifer Rexford, and her B.Sc. from Sharif University of Technology. She has been named a Rising Star in Networking and Communications by N2Women in 2021 and has received the ACM SIGCOMM Doctoral Dissertation Award.

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