Title: Fundamental Limits of Communication, Computation, and Storage: An information theoretic perspective

Speaker: Mohammad Ali Maddah-Ali, Bell Labs, Nokia, Holmdel, NJ

Time & Location: Thursday, March 3, 2016 11:00 a.m. ECE 202

Abstract:

The objective of this talk is to investigate the fundamental tradeoffs among communication, computation, and storage, as the major components of the data infrastructures, from an information theoretic perspective. This allows us to challenge the prevailing wisdom on how these components interact and show that the conventional approaches on running these systems can be significantly suboptimum. In particular, we aim to demonstrate that the schemes based on creating and exploiting coding opportunities can substantially improve the performance of the systems. We show that the gain of coding scales with the size of the network and is essential to achieve the fundamental limits of processing and delivering big data.

This talk has two parts: In the first part, we consider cache networks and a fundamental tradeoff between communication and storage. In the second part, we discuss distributed computing systems and a fundamental tradeoff between communication and computing.

The first part of the talk is a joint work with Urs Niesen (Qualcomm Research) and the second part is a joint work with Songze Li (USC) and Salman Avestimehr (USC).

Bio:

Mohammad Ali Maddah-Ali received the B.Sc. degree from Isfahan University of Technology, and the M.A.Sc. degree from the University of Tehran, both in electrical engineering. From 2002 to 2007, he was with the Coding and Signal Transmission Laboratory (CST Lab), Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada, working toward the Ph.D. degree. From 2007 to 2008, he worked at the Wireless Technology Laboratories, Nortel Networks, Ottawa, ON, Canada. From 2008 to 2010, he was a post-doctoral fellow in the Department of Electrical Engineering and Computer Sciences at the University of California at Berkeley. Since September 2010, he has been at Bell Laboratories, Holmdel, NJ, as a communication network research scientist. His research interests include multi-user information theory, wireless communications, and content delivery networks. Dr. Maddah-Ali received NSERC Postdoctoral Fellowship in 2007, mention from the IEEE Information Theory Society for introducing interference alignment in 2009, the best paper award from IEEE International Conference on Communications (ICC) in 2014, and the IEEE Communications Society and IEEE Information Theory Society Joint Paper Award in 2015.