Thursday, Feb. 21st
Scaife Hall Auditorium
Room 125 at 4:30 p.m.
Refreshments at 4:00 p.m.

Dr. Pulkit Grover
Assistant Professor
Carnegie Mellon University

Dr. Pulkit Grover (Ph.D. UC Berkeley’10, B.S.’03, M.S.’05 IIT Kanpur) is an assistant professor at CMU. He is interested in interdisciplinary research directed towards developing a science of information for making decentralized systems (from low-power communication systems to large cyber-physical systems) energy-efficient and stable. He spent 2011-12 as a postdoc at Stanford University. He is the recipient of the Vodafone-US fellowship; the best student paper award at the IEEE Conference in Decision and Control (CDC) 2010; and the 2012 Leonard G. Abraham best paper award from the IEEE Communications Society for his work on energy-efficient communication. For his dissertation research, he received the 2011 Eli Jury Award from the Department of EECS at UC Berkeley.

"Greening" Communications

Communication in Information and Communication Technologies (ICTs: e.g. data-centers, laptops, personal computers, networking equipment, BigData cluster computers) alone is slated to soon consume > 15% of the total electricity generated in the world. “Greening” communications is therefore an urgent and important challenge.

This talk is my personal story of failures and successes in addressing this challenge from a theoretical and practical perspective. While traditional information theory has focused on minimizing just the transmit power, modern (short-distance) communication systems have significant portion of power (often > 50%) consumed in their signal-processing circuitry. The traditional “division of labor” between design of communication strategy and circuits thus stands broken. Joint design of communication strategies and circuits requires researchers in information theory and circuits to come together.

About six years ago, when I started looking at the problem, there was little theory to guide such systems, and little interaction between information theorists and circuits researchers. I will describe our collaborations with circuit researchers, and the ensuing failures and the successes in a theory-practice “ping-pong game”. The resulting enhancement in understanding is enabling us develop the first relevant fundamental limits on total (transmit + circuit) power consumption. These fundamental limits, together with models of processing circuits, are helping us arrive at strategies that can significantly reduce energy consumption in data-center ethernet, chip-to-chip and on-chip communication (I/Os), indoor wireless, “big data” distributed parallel computation etc., even without accounting for possible energy reductions with technology improvements. Simultaneously, these new limits are helping us obtain a deeper and more intuitive understanding of Shannon’s information theory.

Yet, much needs to be done in this new and exciting area, both in theoretical and practical directions. I will discuss open problems and open the floor to discussion and potential collaborations.

ECE Seminar Hosts
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