Department Colloquium

Speaker: Ashish Khisti, University of Toronto
Date: Friday, October 3
Time: 2:30 p.m.
Place: Jeffery 234
Title: Coding for Real-Time Streaming Communication

Abstract: A growing number of multimedia applications require transmission of a stream of source packets under strict delay constraints. It is well known that classical models in information theory do not provide useful guidelines for such systems. In this talk I will show how certain deterministic approximations to statistical channel models can lead to new insights into real-time streaming communications.

In the first part of the talk we will focus on channel coding. We will introduce a class of sliding-window erasure channels with burst and isolated erasures, and propose low-delay error correction codes, MiDAS Codes, that achieve a near-optimal rate over these channels. We explain how the tradeoff between the column-distance and column-span of a code is relevant to the streaming setup and show that MiDAS codes again achieve a near-optimal tradeoff. Through simulations over the Gilbert-Elliott channel and related models, we demonstrate that our proposed codes yield significant performance gains over baseline schemes for a wide range of channel parameters.

In the second part of the talk, we study sequential transmission of correlated sources over a burst-erasure channel when the decoder can tolerate a certain amount of error propagation. We study the minimum achievable compression rate for first-order Markov sources as a function of the burst-length and the error-propagation period. In the achievability part, we show that certain ”hybrid” techniques can provide significant gains over conventional techniques such as random binning and predictive coding. In the converse part, we show how the proposed setup can be related to certain multi-terminal source coding problems.

Bio: Ashish Khisti joined the University of Toronto as assistant professor in September 2009 and holds the Canada Research Chair (Tier II) in Wireless Networks. He obtained his BASc degree from Engineering Sciences (Electrical Option) from the University of Toronto and his SM and PhD degrees from the Massachusetts Institute of Technology (MIT), Cambridge, MA in Electrical Engineering and Computer Science. His research interests are in network information theory and wireless communication systems.

He is a recipient of the HP-IRP award in 2011 and 2012, and an Ontario Early Researcher Award (2012). For his graduate studies, he received the NSERC doctoral fellowship and the HP/MIT alliance fellowship. He is also a recipient of the Morris Joseph Levin Masterworks award and the Harold Hazen teaching assistant award from the EECS department at MIT.