UCF Stands For Opportunity

THE DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE, ECE DIVISION

Presents the Spring 2012 EECS Seminar Series

Azadeh Vosoughi

Department of Electrical and Computer Engineering, University of Rochester

"From Advanced Wireless Communications to Human Auditory Modeling: Detection and Estimation Theory to the Rescue"

Wednesday, February 22, 2012 3:00 p.m. HEC 450

Abstract

One of the main challenges in wireless communications is coping with channel uncertainty. Dealing with this uncertainty, and the limitations it imposes, is tightly related to the specific system and its application. In this talk we consider two systems, namely a wireless bi-directional (two-way) relay-assisted communication system and a wireless distributed detection system. We study the impacts of channel uncertainty on the fundamental performance limits of these two systems and investigate optimal resource allocation that minimize these impacts.

For the bi-directional relay-assisted communications we consider a training-based system, in which receivers learn the channels via employing dedicated pilot symbols. For Gaussian inputs we study the trade-off between the accuracy and the bandwidth/energy costs of channel estimation. We address this problem, from both estimation theoretic and information theoretic perspectives, via considering channel estimation Cramer-Rao lower bound, mutual information, and outage probability as the performance metrics.

Next, we discuss the effects of channel uncertainty on the design and performance of a wireless distributed detection system that is tasked with solving a binary hypothesis testing problem. Considering systems with coherent and non-coherent receptions, we investigate the optimal data fusion rules that maximize the overall system detection reliability and error exponent. Furthermore, we present several detection and data fusion designs that exploit diversity to combat channel uncertainty and enhance system performance.

I will conclude my talk with a brief discussion on mathematical modeling of tone detection for human auditory systems and demonstrate how detection theory can help us significantly improve the state-of-the-art models.

Biography

Azadeh Vosoughi is an Assistant Professor in the Department of Electrical and Computer Engineering at the University of Rochester. She received her BS degree from Sharif University of Technology, Tehran, Iran, in 1997, her MS degree from Worcester Polytechnic Institute, Worcester, MA, in 2001, and her PhD degree from Cornell University, Ithaca, NY, in 2006, all in Electrical Engineering. Her research interests lie in the broad areas of wireless communications and distributed signal processing. She was the recipient of the Furth award in 2006 and was appointed as the Wilmot Assistant Professor in 2009 at the University of Rochester. Dr. Vosoughi received the NSF CAREER award in 2011 for her research on the integration of signal processing and communications for distributed detection systems.