



Spring 2011 Colloquium

Temple University

Computer and Information Sciences

DISTINGUISHED LECTURE

Analytical Foundations for Wireless Networks

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Abstract:

Multi-hop wireless networks are wireless systems in which wireless nodes are capable of relaying other nodes' transmissions. The ability to relay can significantly improve network performance over single hop transmissions. Further, these networks can often be implemented with minimal infrastructure needs and find a myriad of applications that have been extensively studied (e.g., mesh, sensor, MANET systems). While multi-hopping improves performance, it also significantly complicates network design, and traditional ad hoc approaches often result in poor overall performance. Thus, there is a pressing need to develop an analytical foundation that is mathematically rigorous, conceptually unifying, and leads to the development of low-complexity and practically-implementable resource allocation algorithms. In this talk, I will first describe the recent breakthroughs that have taken place in the development of such an analytical framework. In particular, we will discuss the recent successes in the design of "loosely coupled" cross-layer architectures that allows network protocols to be viewed as optimizers and layering as a functional consequence of mathematical decomposition. We will show that a rigorous approach to design that accounts for complexity and scalability can lead to substantial performance gains over traditional approaches used in the state-of-the-art design of wireless systems. The gains can be achieved by the intelligent design of cross-layer solutions that extract efficiency and yet maintain a high degree of modularity and robustness to imperfect decision making. While substantial strides have been made in achieving high throughput and stability, many interesting problems are still open. In the latter half of the talk, I will describe some of these critical open problems, the various challenges that they pose, and preliminary work on how to resolve them.

Bio:

Ness B. Shroff received his Ph.D. degree in EE from Columbia University in 1994. He joined Purdue university immediately thereafter as an Assistant Professor in the school of ECE. At Purdue, he became Full Professor of ECE in 2003 and director of CWSA in 2004, a university-wide center on wireless systems and applications. In July 2007, he joined The Ohio State University as the Ohio Eminent Scholar of Networking and Communications, and endowed Chaired Professor of ECE and CSE. Since 2009, he also serves as a (Guest) Chaired professor of Wireless Communications at Tsinghua University, Beijing, China. His research interests span the areas of wireless and wireline communication networks. He is especially interested in fundamental problems in the design, control, performance, pricing, and security of these networks. Dr. Shroff is a past editor for IEEE/ACM Trans. on Networking and the IEEE Communication Letters. He currently serves on the editorial board of the Computer Networks Journal. He has chaired various conferences and workshops and co-organized workshops for NSF to chart the future of communication networks. Dr. Shroff is a Fellow of the IEEE and an NSF CAREER awardee. He has received numerous best paper awards for his research, e.g., at IEEE INFOCOM 2008, IEEE INFOCOM 2006, IEEE IWQoS 2006, Journal of Communication and Networking 2005, Computer Networks 2003, and one of two runner-up papers at IEEE INFOCOM 2005.