Non-convexity issues in optimal resource allocation in wireless networks

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ABSTRACT

This talk will focus on the problem of resource allocation and scheduling in wireless networks. In this context the inherent utility functions are non-concave. However, the current network optimization algorithms deal are only suited for the concave case. The non-convexity results in a duality gap and the fact that the KKT conditions do not hold.

In the talk I will discuss the consequences of non-convexity in designing distributed schemes. In particular, I will discuss the problem of joint power and rate allocation as well as the issues of scheduling multiple users that we term power scheduling focussing on the downlink.

In the first part we will show how a good distributed algorithm can be developed and that the framework also provides us with the means of studying the optimality of scheduling (single user (TDMA type) vs multi-user (CDMA type)) policies.

In the second part we will show how to solve a general multi-user scheduling problem when utilities are non-convex. By exploiting the framework of sub-differentials we show simple, distributed algorithms can be developed that yield substantial performance improvements while assuring some degree of fairness.

Biography: The speaker was educated at the Indian Institute of Technology, Bombay (B.Tech, 1977), Imperial College, London (MSc, DIC, 1978) and UCLA (PhD, 1983). He has served on the faculties of Columbia University, NY (USA) and INRS-Tèlecommunications, Montreal, Canada . From 1996-99 he held the Chair in Operational Research in the Dept of Math, University of Essex (UK) and was Professor of Electrical Engineering at Purdue University, West Lafayette, IN (USA) during 1999-2005. He is currently a University Research Chair Professor at the Department of ECE, University of Waterloo, Waterloo, Canada.

His research interests are in performance and design of high-speed networks, game theory and pricing and in applied probability and queueing.

He is a Fellow of the IEEE and the Royal Statistical Society and serves on the editorial board of the IEEE/ACM trans. on Networking and a guest editor for an upcoming Special Issue of the IEEE JSAC devoted to optimization and pricing in networks.