



**The Hong Kong Polytechnic University
Department of Applied Mathematics**

Colloquium

On

Delay-Aware Radio Resource Management for Wireless Systems

by

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Abstract

Cross-layer radio resource control plays a critical role in modern wireless systems. Unlike the role of the resource control in fixed line network (maintaining fairness among users / flows), resource control in wireless networks affect the physical layer capacity, interference in wireless networks as well as user quality of service. Radio resource control can be viewed as a complex stochastic optimization in which “cross-layer variables” (such as transmit power, beamforming, user scheduling) are dynamically controlled to optimize “cross-layer objectives” (such as throughput, fairness, delay) based on stochastically evolving system states (such as channel fading, queue length). One important example is to minimize the delay performance in wireless networks because most data applications are delay-sensitive. However, such control is highly non-trivial because of the complex coupling between the time-varying PHY (modeled by information theory) and the queue dynamics (modeled by queueing theory). In this talk, we shall outline the basic framework of cross layer radio resource control and elaborate why this is a difficult problem. We briefly survey existing approaches and illustrate two promising solution frameworks using two examples in wireless system. The first approach corresponds to the use of distributed online stochastic learning algorithms to solve the Bellman equation. The second approach corresponds to closed-form value function approximation using a virtual continuous time system and perturbation analysis.

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Time : 11:00 a.m. – 12:00 noon

Venue : HJ610, The Hong Kong Polytechnic University

*** * * ALL ARE WELCOME * * ***

Biography

Vincent obtained B.Eng (Distinction 1st Hons) from the University of Hong Kong (1989-1992) and Ph.D. from the Cambridge University (1995-1997). He joined the Bell Labs from 1997-2004 and the Department of ECE, Hong Kong University of Science and Technology (HKUST). He is currently a Professor and the Founding Director of Huawei-HKUST Joint Innovation Lab at HKUST. Vincent has published more than 200 IEEE journal and conference papers and has contributed to 30+ US patents on various wireless systems. In addition, he is also the key contributor of four IEEE standard contributions to IEEE 802.22 (WRAN / Cognitive Radio). His current research focus includes robust cross-layer radio resource optimization for wireless systems, interference mitigation techniques for wireless networks, convergence analysis of distributed algorithms as well as multi-timescale stochastic control and network optimization. He has obtained three IEEE best paper awards and is currently an area editor of IEEE Transactions on Wireless Communications, area editor of IEEE Signal Processing Letters, EUARSIP Wireless Communications and Networking as well as guest editor of JSAC. He is a Fellow of IEEE, Senior Research Fellow of Croucher Foundation and Changjiang Chair Professor at Zhejiang University.