**Integrating Machine Learning and Signal Processing for Wireless Communications and Sensing**

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This talk gives a general overview of integrating data-driven machine learning tools with model-based signal processing, for solving physical-layer problems associated with wireless applications, including wireless communications, wireless sensing and the emerging coexistence of the two systems. The machine learning tools are broadly divided into two categories, namely structured optimization and deep neural networks. The first category consists of various compressed sensing and low-rank signal processing techniques; whereas the second category includes deep unfolding, generative adversarial networks  (GAN) and deep reinforcement learning (DRL).  Through a number of physical-layer signal processing problems, such as channel estimation, blind data detection, interference mitigation, beamforming, target localization and tracking, we illustrate that these machine learning tools, when properly tailored to specific signal models, can significantly enhance the system performance. In the meantime, the real-time and mobile nature of many wireless applications motivate the development of ``portable’’ machine learning algorithms.

**Bio:**

Xiaodong Wang (S'98-M'98-SM'04-F'08) received the Ph.D degree in Electrical Engineering from Princeton University. He is a Professor of Electrical Engineering at Columbia University in New York. Dr. Wang's research interests fall in the general areas of computing, signal processing and communications, and has published extensively in these areas. Among his publications is a book entitled ``Wireless Communication Systems: Advanced Techniques for Signal Reception'', published by Prentice Hall in 2003. His current research interests include wireless communications, statistical signal processing, and machine learning. Dr. Wang received the 1999 NSF CAREER Award, the 2001 IEEE Communications Society and Information Theory Society Joint Paper Award, and the 2011 IEEE Communication Society Award for Outstanding Paper on New Communication Topics. He has served as an Associate Editor for the IEEE Transactions on Communications, the IEEE Transactions on Wireless Communications, the IEEE Transactions on Signal Processing, and the IEEE Transactions on Information Theory. He is a Fellow of the IEEE and listed as an ISI Highly-cited Author.