Title: Optimal linear precoding for finite alphabet signaling in wireless systems and networks

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Abstract: Finite alphabet signaling refers to commonly used discrete-constellation modulations in practical communication systems, such as PAM, PSK or QAM. In this talk, we will discuss how to increase the data rates or throughput via linear precoding in wireless systems and networks such as multiple-input multiple-output (MIMO) systems, multiple access channels, broadcast channels, wiretap channels, and cognitive radio networks. We will present background, theoretical results, hardware implementation, and experimental results for maximizing the mutual information-based achievable data rate or throughput. Our results demonstrate that precoding or optimal power allocation for finite alphabet signaling can be radically different from that for conventionally-treated Gaussian signaling. Our examples show that the finite-alphabet signaling-based approach provides not only higher achievable data rate but also lower coded bit error rate than the approaches that design the precoder under the Gaussian input assumption. Further research topics will be discussed in this talk as well.

Biography:

Chengshan Xiao is an IEEE Fellow and Professor of Electrical and Computer Engineering at Missouri University of Science and Technology. He is currently serving as a Program Director in the Division of Electrical, Communications and Cyber Systems at National Science Foundation. His research interests include wireless communications, signal processing, and underwater acoustic communications. He is the holder of three U.S. patents. Tow of his algorithms had been implemented in Nortel's base station radios after successful field trials and network integration.

Dr. Xiao has served on the Board of Governors, Fellow Evaluation Committee, and Distinguished Lecturer of the IEEE Communications Society. He was the Editor-in-Chief of IEEE Transactions on Wireless Communications, the Technical Program Chair of the 2010 IEEE International Conference on Communications, Cape Town, South Africa, and the founding Chair of IEEE Wireless Communications Technical Committee. He received several distinguished awards including 2014 Humboldt Research Award, 2014 IEEE Communications Society Joseph LoCicero Award, and 2015 IEEE Wireless Communications Technical Committee Recognition Award.