
Electrical & Computer Engineering
S E M I N A R
Louisiana State University

**Coherence Diversity: A New Source
of Gains in Wireless Communication**

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Abstract—Wireless nodes in the same network often have link gains with different coherence time or coherence bandwidth due to differences in mobility and local scattering. The coherence time and its effect on acquiring channel state information (CSI) will become ever more important because 5G wireless communication is expected to move into the millimeter wave bands, where Doppler spread is larger compared with previous generations of cellular wireless, therefore the issues of training and CSI acquisition will become more acute. In this talk, a newly discovered diversity phenomenon will be discussed that has a direct impact on the problem mentioned above. Diversity is a well-known principle that leverages differences in channel gains at different times, spatial locations, or different users, to harness gains in wireless communication. Coherence diversity is a new mechanism in the downlink that leverages the disparity between the coherence time or coherence bandwidth of different nodes in a wireless network to arrive at significant gains. In order to harness coherence diversity, a method called product superposition is presented whose main feature is to allow the signal of one user to disappear into the equivalent channel for another user, thus removing interference in one direction. The application of product superposition is demonstrated in two-user channels with disparity in coherence time (slow and fast users), in coherence frequency, or both. Time permitting, extensions to multi-user scenario will be discussed.

Bio—Aria Nosratinia is Erik Jonsson Distinguished Professor and associate head of the electrical engineering department at the University of Texas at Dallas. He received his Ph.D. in Electrical and Computer Engineering from the University of Illinois at Urbana-Champaign in 1996. He has held visiting appointments at Princeton University, Rice University, and UCLA. His interests lie in the broad area of information theory and signal processing, with applications in communication theory and wireless communications. Dr. Nosratinia is a fellow of IEEE for contributions to multimedia and wireless communications. He is area editor for the IEEE Transactions on Wireless Communications. He has been an editor for the IEEE Transactions on Information Theory, IEEE Transactions on Image Processing, IEEE Signal Processing Letters, IEEE Wireless Communications (Magazine), and Journal of Circuits, Systems, and Computers. He has received the National Science Foundation career award, and the outstanding service award from the IEEE Signal Processing Society, Dallas Chapter. He has served as the secretary of the IEEE information theory society, treasurer for ISIT, publications chair for the IEEE Signal Processing Workshop, as well as member of the technical committee for numerous conferences. Dr. Nosratinia is a registered professional engineer in the state of Texas.

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