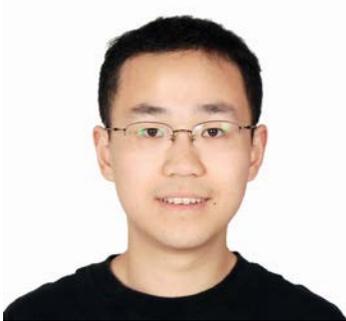# Illinois Center for Wireless Systems

ICWS Seminar Series

DEGREES OF FREEDOM OF THE INTERFERENCE CHANNEL: INFORMATION DIMENSION AND SINGLE-LETTER FORMULA

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141 Coordinated Science Lab

Abstract: The degrees of freedom of the K-user additive-noise interference channel determine the asymptotic growth of the maximal sum rate as a function of signal-to-noise ratio. Determining the degrees of freedom has been an active and challenging research subject, in view of the fact that the sum-rate capacity remains unknown. Built upon the concept of information dimension introduced by Alfred Renyi in 1959, we give a general formula for the degrees of freedom as a function of the channel matrix involving maximization of a sum of information dimensions over K input distributions. Known results are recovered and generalized as corollaries of this general approach. The singular structure of the optimal input distribution is revealed and connections to fractal geometry are drawn. As an important auxiliary result, we also develop new additive-combinatorial inequalities for Shannon entropy and information dimensions.

Biography: Yihong Wu received the B.E. degree from Tsinghua University, Beijing, China, in 2006 and the M.A. and Ph.D. degrees from Princeton University, Princeton, NJ, in 2008 and 2011, all in electrical engineering. He is currently a postdoctoral fellow with the Statistics Department, the Wharton School, University of Pennsylvania, Philadelphia, PA.

His research interests are in information theory, high-dimensional statistical inference and decision theory, communications, approximation theory and optimal transportation.

Dr. Wu was a recipient of 2011 Marconi Society Paul Baran Young Scholar Award and the Best Student Paper Award at the 2011 IEEE International Symposiums on Information Theory (ISIT). His final year of graduate studies was supported by a Princeton University Honorific Wallace Memorial Fellowship (2010-2011).