

Title: Fading Channels: Capacity and Channel Coding Rate in the Finite-Blocklength Regime

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Abstract:

Information-theoretic studies on the fundamental limits of communication over wireless fading channels typically rely on simplifying assumptions, such as perfect channel state information (CSI), infinite blocklength, and vanishing probability of error. Although these assumptions are reasonable for most of the current wireless communication systems, they may be inaccurate for next-generation wireless systems. Indeed, next-generation wireless systems will need to support a much wider range of features, such as ultra-high data rate, extremely low latency, and low energy consumption, for which the assumptions listed above may not be valid. In this talk I will discuss the fundamental limits of fading channels under a set of assumptions that are more relevant for future wireless systems. In particular, I will consider three scenarios: capacity of massive MIMO channels without a priori CSI; maximal achievable rate for a given blocklength over a quasi-static MIMO fading channel; minimum energy required to transmit k bits over a MIMO fading channel. I will also discuss how familiar information-theoretic tools when applied appropriately lead to sharp characterization of the fundamental limits in these scenarios.

Bio: Wei Yang received the B.E. and M.E. degree from the Beijing University of Posts and Telecommunications, Beijing, China, in 2008 and 2011, and the Ph.D. degree in Electrical Engineering from Chalmers University of Technology, Gothenburg, Sweden, in 2015. In the summers of 2012 and 2014, he was a visiting student at the Laboratory for Information and Decision Systems, Massachusetts Institute of Technology, Cambridge, MA. Since 2015, he has been a postdoctoral research associate at Princeton University. He is the recipient of a student paper award at the 2012 IEEE International Symposium on Information Theory (ISIT), Cambridge, MA, and the 2013 IEEE Sweden VT-COM-IT joint chapter best student conference paper award. His research interests are in the areas of information and communication theory.