One-Bit Precoding in Massive MIMO: Algorithm Design and Performance Analysis

Speaker: Zheyu Wu (Chinese Academy of Sciences)
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Abstract: One-bit precoding is a promising way to achieve hardware-efficiency in massive MIMO systems and has gained growing research interests in recent years. However, the one-bit nature of the transmit signal poses great challenge to precoding design as well as performance analysis. In this talk, we will present some recent results on one-bit precoding. We will focus on both non-linear and linear-quantized precoding schemes. In particular, for non-linear precoding, we introduce a new negative $\ell 1$ penalty approach, which is based on an exact penalty model that penalizes the one-bit constraint into the objective with a negative $\ell 1$-norm term. The negative $\ell 1$ penalty approach achieves a better trade-off in complexity and symbol error rate (SER) performance than existing approaches. For linear-quantized precoding, we give an aysmptotic performance analysis for a wide class of precoders and derive the optimal precoder within the considered class. Different from existing Bussgang-decomposition-based analyzes, our analytical framework is based on random matrix theory (RMT), which is more rigorous and can be extended to more general cases.