

A Generalization of the I-MMSE Formula

Jian Song
University of Hong Kong

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Abstract: Unveiling a fundamental relationship between information theory and estimation theory, the I-MMSE formula by Guo, Shamai and Verdu has far-reaching theoretical significance and numerous practical applications. On the other hand, its influences to date have been restricted to channels without feedback, due to the lack of extension of the I-MMSE formula to feedback channels. In this talk, we propose a generalization of the I-MMSE formula for Gaussian channels with feedback. Our approach is based on a very simple observation, which can be applied to other scenarios, such as a simple and direct proof of the classical de Bruijn's identity.