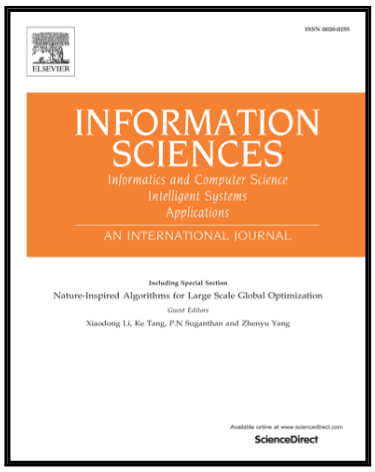

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Chernoff Information between Gaussian Trees

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Abstract

In this paper, we deal with Gaussian graphical classifiaction problem. We aim to provide a systematic study of the relationship between Chernoff information and topological, as well as algebraic properties of the corresponding Gaussian graphs for the underlying graphical testing problems. We first show the relationship between Chernoff information and generalized eigenvalues of the associated covariance matrices. It is then proved that Chernoff information between two Gaussian trees sharing certain local subtree structures can be transformed into that of two smaller trees. In this way, we provide a sequence of equivalent Gaussian tree pairs in terms of Chernoff Information. Under our proposed grafting operations, bottleneck Gaussian trees, namely, Gaussian trees connected by one such operation, can thus be simplified into two 3-node Gaussian trees. Thereafter, we provide a thorough study about how Chernoff information changes when small differences are accumulated into bigger ones via concatenated grafting operations, as well as partial ordering. In the end, we propose an optimal linear dimension reduction method based on generalized eigenvalues for the purpose of classification, which is proved to achieve maximum Chernoff information among all linear transformations.

Keywords: Gaussian trees, Chernoff information, subtree grafting operation, generalized eigenvalue, classification dimension reduction

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