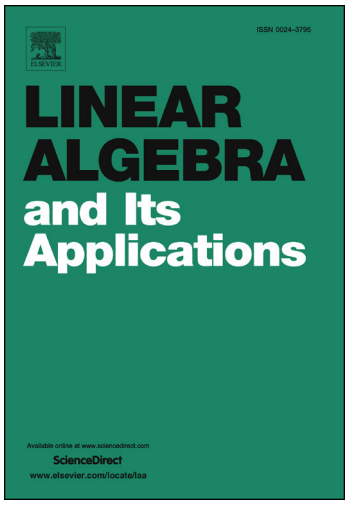

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Diagonality Measures of Hermitian Positive-Definite Matrices with Application to the Approximate Joint Diagonalization Problem

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Abstract

In this paper, we introduce properly-invariant diagonality measures of Hermitian positive-definite matrices. These diagonality measures are defined as distances or divergences between a given positive-definite matrix and its diagonal part. We then give closed-form expressions of these diagonality measures and discuss their invariance properties. The diagonality measure based on the log-determinant α-divergence is general enough as it includes a diagonality criterion used by the signal processing community as a special case. These diagonality measures are then used to formulate minimization problems for finding the approximate joint diagonalizer of a given set of Hermitian positive-definite matrices. Numerical computations based on a modified Newton method are presented and commented.

Keywords: Diagonality measure, positive-definite matrices, Riemannian distance, Bhattacharyya distance, Kullback-Leibler divergence, log-det α-divergence, approximate joint diagonalization

2010 MSC: 15B48, 94A17

1. Introduction

In the last three decades, the problem of approximate joint diagonalization (AJD) of a collection of Hermitian positive-definite matrices has attracted an increasing attention from researchers within the statistics, signal processing and applied mathematics communities. In statistics, its is used to solve the common

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