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On an eigenvalue inequality involving the Hadamard product [☆]

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Abstract

Let A, B be $n \times n$ positive definite matrices. Then for $0 \leq t \leq 1$

$$\prod_{i=k}^n \lambda_i(A \circ B) \geq \prod_{i=k}^n \lambda_i((A \#_t B)(A \#_{1-t} B)) \geq \prod_{i=k}^n \lambda_i(AB), \quad k = 1, \dots, n.$$

This gives a weighted extension of a result of Ando [1]. The case where the eigenvalues λ_i are replaced with the singular values σ_i is also considered.

Keywords: inequality, majorization, eigenvalue, singular value

2010 MSC: 15A45, 15A42

1. Introduction

1.1. Notation

Matrices considered here are $n \times n$ complex matrices. We use the following notation throughout this paper:

1. $\lambda_i(A)$ is the i th largest eigenvalue of A if all the eigenvalues of A are real.
2. $\sigma_i(A)$ is the i th largest singular value of A .

[☆]Dedicated to Professor Tsuyoshi Ando on the occasion of his 85th birthday.

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