Title: Some Extensions of Fischer's Inequality

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Abstract: Denote by $\mathbb{B}(n_1, \ldots, n_k)$ the set of block matrices whose (i, j)-blocks are $n_i \times n_j$ complex matrices. Let $A_i \in \mathbb{B}(n_1, \ldots, n_k)$ be positive semidefinite and $D_i \in \mathbb{B}(n_1, \ldots, n_k)$ be block diagonal matrices for $1 \leq i \leq m$. We obtain the following extension of Fischer's inequality:

$$\det\left(\sum_{i=1}^{m} D_i A_i^{p_i} D_i^*\right) \leq \prod_{j=1}^{k} \det\left(\sum_{i=1}^{m} [D_i]_j [A_i]_j^{p_i} [D_i]_j^*\right), \quad 0 \leq p_i \leq 1,$$

where $[A_i]_j$ is the j-th main diagonal block of A_i. In addition, if A_i and D_i are nonsingular, the reverse inequality holds when $-1 \leq p_i \leq 0$. We also extend these two results to a larger class of matrices, namely, matrices whose numerical ranges are contained in a sector.

This is a joint work with Daeshik Choi and Pingping Zhang.