SOME DECOMPOSITIONS OF MATRIX VARIANCES

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Abstract: When $D$ is a density matrix and $A_1$, $A_2$ are self-adjoint operators, then the standard variance is a $2 \times 2$ matrix:

$$\text{Var}_D(A_1, A_2)_{i,j} := \text{Tr} (DA_i A_j) - (\text{Tr} DA_i)(\text{Tr} DA_j) \quad (1 \leq i, j \leq 2).$$

The main result in this work is that there are projections $P_k$ such that $D = \sum_k \lambda_k P_k$ with $0 < \lambda_k$ and $\sum_k \lambda_k = 1$ and $\text{Var}_D(A_1, A_2) = \sum_k \lambda_k \text{Var}_{P_k}(A_1, A_2)$. In a previous paper only the $A_1 = A_2$ case was included and the relevance is motivated by the paper [8].


Keywords and phrases: Density matrix, variance, covariance, decomposition, projections.

The full text is available HERE