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MINIMAX ESTIMATION OF THE MEAN MATRIX OF THE MATRIX-VARIATE NORMAL DISTRIBUTION

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Abstract: In this paper, the problem of estimating the mean matrix $\mathbf{\Theta}$ of a matrix-variate normal distribution with the covariance matrix $\mathbf{V} \otimes \mathbf{I}_m$ is considered under the loss functions, $\omega \operatorname{tr}((\boldsymbol{\delta} - \mathbf{X})'\mathbf{Q}(\boldsymbol{\delta} - \mathbf{X})) + (1-\omega) \operatorname{tr}((\boldsymbol{\delta} - \mathbf{\Theta})'\mathbf{Q}(\boldsymbol{\delta} - \mathbf{\Theta}))$ and $k[1 - e^{-\operatorname{tr}\left((\boldsymbol{\delta}-\mathbf{\Theta})'\mathbf{\Gamma}^{-1}(\boldsymbol{\delta}-\mathbf{\Theta})\right)}]$. We construct a class of empirical Bayes estimators which are better than the maximum likelihood estimator under the first loss function for $m > p+1$ and hence show that the maximum likelihood estimator is inadmissible. For the case $\mathbf{Q} = \mathbf{V} = \mathbf{I}_p$, we find a general class of minimax estimators. Also we give a class of estimators that improve on the maximum likelihood estimator under the second loss function for $m > p+1$ and hence show that the maximum likelihood estimator is inadmissible.

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