Adaptive minimax tests for large covariance matrices with incomplete data

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Abstract. *We observe n independent p-dimensional Gaussian vectors with missing coordinates, that is each value (which is assumed standardized) is observed with probability $a > 0$. We investigate the problem of minimax nonparametric testing that the high-dimensional covariance matrix of the underlying Gaussian distribution is the identity matrix, using these partially observed vectors. Here, n and p tend to infinity and a tends to 0, asymptotically.*
We assume that the covariance matrix belongs to a Sobolev-type ellipsoid with some "smoothness" parameter. When this parameter is known, we give asymptotically minimax consistent test procedure and find the minimax separation rates, under some additional constraints on n, p and a. We show that, in the particular case of Toeplitz covariance matrices, the minimax separation rates are faster by a $\sqrt{p}$ factor. We note how the "missingness" parameter a deteriorates the rates with respect to the case of fully observed vectors ($a = 1$).
We also propose adaptive test procedures, that are free of the smoothness parameter in some interval, and show the loss of ratewith respect to the non adaptive procedures.