Estimating Population Eigenvalues From Large Dimensional Sample Covariance Matrices

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Abstract:

Let $B_n = (1/N)T_n^{1/2} X_n X_n^* T_n^{1/2}$ where $X_n = (X_{ij})$ is $n \times N$ with i.i.d. complex standardized entries, and $T_n^{1/2}$ is a Hermitian square root of the nonnegative definite Hermitian matrix T_n. This matrix can be viewed as the sample covariance matrix of N i.i.d. samples of the n dimensional random vector $T_n^{1/2}(X_n)_{\cdot 1}$, the latter having T_n for its population covariance matrix. Quite a bit is known about the behavior of the eigenvalues of B_n when n and N are large but on the same order of magnitude. These results are relevant in situations in multivariate analysis where the vector dimension is large, but the number of samples needed to adequately approximate the population matrix (as prescribed in standard statistical procedures) cannot be attained. Work has been done in estimating the eigenvalues of T_n from those of B_n. This talk will introduce a method devised by X. Mestre, and will present an extension of his method to another ensemble of random matrices important in wireless communications.