Principal Component Analysis for a Spiked Population Model with Largest eigenvalues of the Same Asymptotic Order of Magnitude

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We consider a spiked covariance model for which its first p largest population eigenvalues have the same asymptotic order of magnitude and the rest are equal to one. In this talk we show that the use of Principal Component Analysis under this covariance model, gives that the first p sample eigenvalues and their corresponding eigenvectors are consistent when the dimension of the data goes to infinity and is greater than the sample size. We also present the joint convergence of the first $p \geq 2$ sample eigenvalues in our model. We will see that in this case the sample eigenvectors corresponding to the first p sample eigenvalues are subspace consistent when both the dimension of the data and the sample size tend to infinity. We also show the weak convergence of the p dimensional vector of ratios of sample eigenvalues to population eigenvalues when the sample size is fixed and the dimension goes to infinity. The limiting distribution of this vector is the joint distribution of the ordered eigenvalues of a Wishart random matrix.