

## **New Expressions for the Extreme Eigenvalues of Beta Random Matrices**

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We will present new identities for the hypergeometric function of a matrix argument, which lead to new expressions for the extreme eigenvalues of the beta random matrix ensembles – Laguerre, Wishart, and MANOVA.

The new expressions have lower computational complexity than the existing ones. All known expressions for the eigenvalues of the random matrix ensembles are in terms of the hypergeometric function of a matrix argument. This function is infinite series of Jack functions summed over all integer partitions. Using algebraic identities for the hypergeometric function and we are able to reduce the set of partitions over which the summation needs to take place and in certain cases (e.g., the trace of the beta Wishart matrix) derive new expressions which require the summation over partitions of just one part.

These new expressions allow for substantial computational savings that are at least an order of magnitude faster and even better for random matrices with “spiked” covariances.

Joint work with Raymond Kan.