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Absolute continuity of limiting spectral distributions of Toeplitz and Hankel random matrices

Abstract

There are many models of random symmetric square matrices for which the empirical distribution of eigenvalues converges to a non-random limiting distribution. Starting with Wigner, a powerful method to show this has been the method of moments, which works by first showing that the trace of any power of the matrix converges (after scaling appropriately) to a numbers, and secondly that these numbers form the moment sequence of a unique probability measure. However, it is in general a difficult problem to determine properties of a distribution, such as the absolute continuity or smoothness of density, from the moment sequence. In this talk we work with random Toeplitz and Hankel matrices and show the absolute continuity of the corresponding limiting distributions. The existence of the limiting distribution was already shown by Bryc, Dembo and Jiang (2003/06) and the absolute continuity was settled for the Toeplitz case by Sen and Virag (2011). The result is new for the Hankel matrix. Our methods also work for Toeplitz and Hankel matrices defined by certain other groups such as Zd. The key idea is to write the random matrix under consideration as a sum of two or more independent random circulant-like matrices.

All this is joint work with Anish Mallick.