

Spectra of mildly random matrices

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Abstract: Random-matrix eigenvalue statistics are believed to be universal in the sense that they are conjectured to arise for many strongly correlated point processes, even some deterministic ones. It is therefore of interest to study matrix ensembles containing relatively few random variables. We introduce ensembles of $N \times N$ Hermitian matrices, which depend on only $\mathcal{O}(N)$ random variables. The construction is motivated by ergodic theory and involves evaluating the complex exponential function at integer arguments of random polynomials. We prove that the global and local eigenvalue statistics of these ensembles are described by the Wigner semicircle law, a hallmark of random matrix statistics. The result relies on showing that oscillatory deterministic cancellations combine well with the better understood probabilistic cancellations. Based on joint work with Arka Adhikari and Horng-Tzer Yau.