

Some applications of the moment method in random matrix theory

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Abstract:

We shall discuss some applications of the moment method to eigenvalue statistics of random matrices (hopefully, from a unified point of view). (I) Introduction, the basic combinatorial technique, Wigner's law (with Wigner's original proof), and perhaps the results of Kesten and McKay (on the spectrum of d -regular graphs). (II) The distribution of extreme eigenvalues: Soshnikov's theorem. We shall state the theorem, explain the basic idea of Soshnikov's original proof, and then – in more detail – a proof from a joint work with Ohad Feldheim. (III) Sparse random matrices and periodic band matrices. We shall try to explain the motivation to study these classes of matrices and discuss some results from the physical literature. Then we shall state and prove some rigorous results on the eigenvalues close to the edge of the spectrum and the corresponding eigenvectors.

No preliminary knowledge is presumed.