

Numerical analysis and random matrix theory

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Numerical analysis and random matrix theory have long been coupled, going (at least) back to the seminal work of Goldstine and von Neumann (1951) on the condition number of random matrices. The works of Trotter (1984) and Silverstein (1985) incorporate numerical techniques to assist in the analysis of random matrices. One can also consider the problem of computing distributions (i.e. Tracy-Widom) from random matrix theory. In this talk, I will discuss different numerical analysis problems: (1) sampling random matrices and (2) using them to analyze the halting time (or runtime) of numerical algorithms. For the latter, I will focus primarily on recent proofs of universality in runtime for the (inverse) power method, the QR algorithm and the Toda algorithm. This is joint work with P. Deift, G. Menon, S. Olver and R. Rao.