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Regularity conditions in the CLT for random matrices

A classical result in random matrix theory is that for wide classes of Hermitian matrices, Linear Spectral Statistics of the form $\sum_{i=1}^{N} f(\lambda_i)$ have asymptotic Gaussian fluctuations in the limit of large dimension $N \to \infty$. For Wigner matrices, the limiting variance is a Sobolev-type norm, the $H^{1/2}$ norm of the function expressed in the basis of Chebyshev polynomials. Conjecturally, the CLT should hold as soon as the expression for the limiting variance is finite, but most results on the CLT require significantly stricter regularity conditions. In this talk we will review recent progress on this conjecture.

Joint work with P. Sosoe.