Universität Bielefeld | Fakultät für Physik & Fakultät für Mathematik

AG Zufallsmatrizen

Seminar

Torben Krueger

University of Bonn

Random matrices with slow correlation decay

The resolvent of a large dimensional self-adjoint random matrix approximately satisfies the matrix Dyson equation (MDE) up to a random error. We show that for random matrices with arbitrary expectation and slow decay of correlation among its entries this error matrix converges to zero both in an isotropic and averaged sense with optimal rates of convergence as the dimension tends to infinity. This result requires a delicate cancellation (self-energy renormalization) which is seen through a diagrammatic cumulant expansion that automatically exploits the cancellation to all orders. Furthermore, we provide a comprehensive isotropic stability analysis of the MDE down to the length scale of the eigenvalue spacing. This analysis is then used to show convergence of the resolvent to the non-random solution of the MDE and to prove that the local eigenvalue statistics are universal, i.e. they do not depend on the distribution of the entries of the random matrix under consideration (Wigner-Dyson-Mehta spectral universality). [Joint work with Oskari Ajanki & Laszlo Erdös & Dominik Schröder]

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