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## Random normal matrices and Bergman kernels

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### Abstract

A normal matrix may have general complex eigenvalues. In the well-understood Ginibre case, the eigenvalues cluster asymptotically with uniform density in the unit disk. Moreover, recently, Rider and Virag studied the fluctuations of the eigenvalues in the Ginibre case, and obtain GFF asymptotically in the open disk. Here, in collaboration with Y. Ameur and N. Makarov, we consider rather general smooth weights in place of the Fock weight of the Ginibre ensemble, and obtain the clustering of eigenvalues to a droplet, as well as a GFF description of the asymptotic fluctuations. A key element in the analysis is the fact that we have a determinantal process based on reproducing kernels of a polynomial weighted Bergman space. Asymptotics of these polynomial kernels is possible by modifying the well-known asymptotics of Bergman kernels, studied by Fefferman in the 1970s, Boutet de Monvel and Sjostrand in the 1970s and 1980s. Our approach is based on the recent method of Berman, Berndtson, and Sjostrand.