Density of Eigenvalues in a generalized Joglekar-Karr Quasi-Hermitian Matrix Model

Joshua Feinberg
Physics Department, University of Haifa at Oranim and Technion
joshua@physics.technion.ac.il

We discuss a slight generalization of the model of random quasi-hermitian matrices introduced by Joglekar and Karr several years ago in Phys. Rev. E83 (2011) 031122. This generalized ensemble is comprised of $N \times N$ matrices $M = AF$, where A is a complex-hermitian matrix drawn from the $U(N)$-invariant probability distribution $P(A) = \frac{1}{Z}\exp[-N\mathrm{Tr}V(A)]$ (Z is a normalization factor and $V(A)$ is typically some polynomial), and F is a strictly-positive hermitian matrix. (In the original Joglekar-Karr model, A was taken to be a Gaussian random matrix.) With no loss of generality (due to $U(N)$ symmetry), F can be taken to be diagonal. The matrix M is non-hermitian, of course, but can be brought to a hermitian form $H = \sqrt{F}A\sqrt{F}$ by means of a similarity transformation. All its eigenvalues are therefore real. Bringing some powerful tools of Random Matrix Theory to bear, we obtain, in the large-N limit, explicit analytical expressions for the density of eigenvalues of M.