Hermitian matrices coupled in a chain: eigenvalue correlations and spacing functions

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We consider p complex $n \times n$ random hermitian matrices A_1, ..., A_p coupled in an open chain so that the probability density of the matrix elements contains the coupling only of the type $\exp[\mathrm{tr}(\sum_{j=1}^{p-1} c_j A_j A_{j+1})]$.

The probability density of the np eigenvalues is then written as a single $np \times np$ determinant. The correlation functions are the densities of ordered sets of k_j eigenvalues of A_j within small intervals around x_{j1}, ..., x_{jk_j} for $j = 1$, ..., p. Each of these correlation functions is proportional to a determinant obtained by removing the rows and columns corresponding to the ignored eigenalues in the initial $np \times np$ determinant.

The spacing functions are the probabilities of finding exactly k_j eigenvalues of the matrix A_j in the domain I_j for $j = 1$, ..., p. The generating function of these spacing functions is expressed as a Fredholm determinant.

These results generalize those for the one matrix case known for a long time.

References

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