

Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

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Title: *Finite free probability and hypergeometric polynomials*

We will begin with a quick introduction to the finite free additive and multiplicative convolutions. These are binary operations of polynomials that behave with respect to the roots and can be understood as a finite analogue of free probability that involves only discrete measures. We will use these convolutions to systematically construct hypergeometric polynomials with real roots. Hypergeometric polynomials are the particular case of general hypergeometric function ${}_iF_j$ where one of the parameters is a negative integer $-n$. Understanding for which parameters these polynomials are real-rooted is an active area of research, where the previously known results are for very specific families of parameters and use a wide range of different methods. Since finite free convolutions also preserve interlacing, we directly obtain some interlacing results for certain families of hypergeometric polynomials. Moreover, the known limit behavior of finite free convolutions allows us to write the asymptotic root distribution of some hypergeometric polynomials as free convolutions of Marchenko-Pastur, reversed Marchenko-Pastur, and free beta laws. This is a joint work with Andrei Martinez-Finkelshtein and Rafael Morales (arXiv:2309.10970)