Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

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Title: *Tensor free independence and central limit theorem*

Voiculescu's notion of asymptotic free independence applies to a wide range of random matrices, including those that are independent and unitarily invariant. In this work, we generalize this notion by considering random matrices with a tensor product structure that are invariant under the action of local unitary matrices. Assuming the existence of the "tensor distribution" limit described by tuples of permutations, we show that an independent family of local unitary invariant random matrices satisfies asymptotically a novel form of freeness, which we term *tensor freeness*. It can be defined via the vanishing of mixed "tensor free cumulants", allowing the joint tensor distribution of tensor free elements to be described in terms of that of individual elements. We present several applications of these results in the context of random matrices with a tensor product structure, such as partial transpositions of (local) unitarily invariant random matrices and tensor embeddings of random matrices. Furthermore, we propose a tensor free version of the central limit theorem, which extends and recovers several previous results for tensor products of free variables. This is joint work with Ion Nechita.