Wednesday 6 April 2023: 12:00-12:30

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Title: Universality-based concentration for sums of dependent random matrices.

Abstract: How close is the sum of a sequence of random matrices to its expectation? This question is important in a wide range of applications. To name a few: the question occurs in the analysis of time series, in the study of community detection algorithms, and in spectral graph theory. The subject of this talk are matrix concentration inequalities: non-asymptotic bounds on the probability that the sum deviates significantly from its expectation. I will particularly focus on the case where the random matrices are generated by a Markov chain.

Our results build on a recent breakthrough by Bandeira, Boedihardjo, and van Handel. Their results give rise to matrix concentration inequalities with a sharp leading-order term which is provided by free probability theory. However, they rely on the restrictive assumption that the random matrix under consideration has Gaussian entries. The non-Gaussian case can fortunately be reduced to the Gaussian case due to a universality principle by Brailovskaya and van Handel. Their universality principle assumes that summands are independent; this assumption is not satisfied in my case as there is some dependence associated with the Markov chain. I will outline how we extend the proof to this dependent setting and emphasize some of the subtleties involved.