

MATRIX CONCENTRATION INEQUALITIES WITH DEPENDENT SUMMANDS AND SHARP LEADING-ORDER TERMS

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This talk concerns sharp concentration inequalities for sums of dependent random matrices. In particular, we focus on summands which are generated by a ψ -mixing Markov chain. The leading-order term of the concentration inequality is provided by free-probability theory and is often asymptotically sharp.

A key challenge in the proof is that techniques based on classical cumulants, which have been used by Brailovskaya and van Handel (2022) in a setting with independent summands, fail to produce efficient estimates in the Markovian model. Our approach is instead based on Boolean cumulants and a change of measure argument.

If time permits, I will discuss an application related to community detection in block Markov chains. Our result here leads to new insights. In particular, the fact that the free-probabilistic leading-order term is asymptotically sharp allows us to improve upon a result of Sanders and Senen-Cerda (2023).