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The Localization Transition in the Ultrametric Ensemble

This talk focuses on a Dyson-hierarchical analogue of the power-law random band matrices with Gaussian entries whose variances decay in a suitable ultrametric. The model can be constructed recursively by alternating between averaging independent copies of the matrix and running Dyson Brownian motion and we use this observation to prove the existence of a localization transition. We map out the entire localized regime in terms of Poisson statistics and eigenfunction decay. We also prove random matrix universality and the existence of maximally extended eigenfunctions beyond the mean-field regime. In this regime, the model has a well defined infinite-volume limit for which we prove the Holder-continuity of the spectral measures. This talk is based on joint work with Simone Warzel.