THE $1/N$ EXPANSION IN RANDOM TENSOR MODELS

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Matrix models are a highly successful framework for the analytic study of random two dimensional surfaces with applications to quantum gravity in two dimensions, string theory, conformal field theory, statistical physics in random geometry, etc. . The size of the matrix, N, endows a matrix model with a small parameter, $1/N$, and its perturbative expansion can be reorganized as series in $1/N$. The leading order contribution consists in planar graphs (corresponding to planar surfaces). As planar graphs form a summable family, matrix models undergo a phase transition to a continuum theory of random, infinitely refined, surfaces. In higher dimensions matrix models generalize to tensor models. In the absence of a viable $1/N$ expansion tensor models have for a long time been less successful in providing an analytically controlled theory of random higher dimensional topological spaces.

This situation has drastically changed recently. Models for a generic complex tensor have been shown to admit a 1/N expansion dominated by graphs of spherical topology in arbitrary dimensions and to undergo a phase transition to a continuum theory. I will present an overview of these results and discuss their implications.

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