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Convergent sequences of sparse graphs: A large deviations approach

The theory of converging graph sequences is well developed for the class of dense graphs. The theory of converging sparse graph sequences, however, is far less understood. We show that prior definitions of converging sparse graph sequences are inadequate to capture important graph theoretic and statistical physics properties, and introduce a new definition based on the large deviations theory. We show that the new definition implies most the known types of convergences and conjecture that sparse random graphs are converging in the sense of the new definition. Establishing this conjecture will have an important implications for the theory of spin glasses.

Joint work with Jennifer Chayes and Christian Borgs.