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Rigorous analysis of pure states of spin glass models on sparse random graphs

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Disordered models on Bethe lattices, i.e., the random d -regular graph, emerge naturally both in the context of the mean field treatment of spin glasses as well as in computer science where they arise as generic random instances of constraint satisfaction problems (CSPs).

Their analysis has been performed in the physics literature through the non-rigorous cavity method technique developed in the context of statistical physics of spin glasses. These lectures are devoted to show how this method can be turned into a rigorous probabilistic tool to analyze the Gibbs measure of such models and how this can be used to establish a series of rigorous results on prototypical CSPs.

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