

Institut für Optimierung und Diskrete Mathematik

Vortrag im Seminar Diskrete Mathematik und Optimierung

05.03.2013, 14:15

Seminarraum C208, Steyrergasse 30, 2. Stock

Catching the k -NAESAT Threshold

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The best current estimates of the thresholds for the existence of solutions in random constraint satisfaction problems ('CSPs') mostly derive from the first and the second moment method. Yet apart from a very few exceptional cases these methods do not quite yield matching upper and lower bounds. According to deep but non-rigorous arguments from statistical mechanics, this discrepancy is due to a change in the geometry of the set of solutions called condensation that occurs shortly before the actual threshold for the existence of solutions. To cope with condensation, physicists have developed a sophisticated but non-rigorous formalism called Survey Propagation, which yields precise conjectures on the threshold values of many random CSPs. In this talk I will discuss a new Survey Propagation inspired method for the random k -NAESAT problem, which is one of the standard benchmark problems in the theory of random CSPs. This new technique allows us to overcome the barrier posed by condensation rigorously, and prove very accurate estimates for the k -NAESAT threshold; in particular, we verify the statistical mechanics conjecture for this problem. This is joint work with Amin Coja-Oghlan.

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