An empirical complexity study for a 2CPA solver

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Abstract

The computational decision problem CPA, which has already been studied by the authors in some other papers, is a variant of the probability satisfiability problem PSAT defined by Papadimitriou as a computational problem, but already known since the works of Boole and de Finetti. In this paper we study its behaviour of a simple algorithm, which can solve CPA instances, when it is applied to the, still NP-complete, subproblem 2CPA, whose instances have at most two literals per clause. We locate, as it is done for some satisfiability problems (for instance SAT) a critical value for the ratio $\alpha = m/n$, where m is the number of binary clauses present in the instance and n is the number of events. This point divides "almost all coherent" instances from "almost all not coherent"; moreover the most difficult instances lies near this point. One of the problem we have solved is how to generate fair random 2CPA instances, i.e. avoiding logically unsatisfiable or trivially incoherent instances.

Keywords: Probability assessments, Coherence decision, NP-complete problems, Simplification rules.