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# ATHENS *Pr*OBABILITY COLLOQUIUM

Saturday May 28, 2016  
Math Dept, University of Athens

**“Phase transitions  
in random constraint satisfaction problems”**

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**Abstract:**

Constraint satisfaction problems (CSPs) are ubiquitous in computer science and they also serve as important models in several other disciplines. In an instance of a CSP we are given a set of variables that can be assigned values in a specified domain, and a set of constraints that involve subsets of the variables and specify forbidden assignments to them. The problem is to determine an assignment to the variables such that no constraint is violated. Prominent examples are the satisfiability problem and the graph coloring problem. Many important CSPs are NP-hard; we know of no efficient algorithm that finds solutions, and we have only very limited knowledge about the source of the apparent hardness. On the other hand, several CSPs seem to undergo a dramatic change – a so-called phase transition – regarding their solvability as the number of constraint surpasses some critical value. Empirically, the point of this transition is the hotbed of the most difficult instances for today’s state of the art algorithms. In this talk I will present a short survey on recent work regarding the determination of such phase transitions, and I will report on the general progress in this active and interdisciplinary area.

***APrOC* 2015**

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