

STATISTICS COLLOQUIUM

MONDAY, SEPTEMBER 20, 2010

TALK: 4:00 PM — SCIENCE CENTER RM. 309

RECEPTION: 5:15 PM — SCIENCE CENTER, 7TH FLOOR

"Randomized Algorithms with Splitting: Why the Classic
Randomized Algorithms do not Work and how to make them Work"

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ABSTRACT

We show that the original classic randomized algorithms for approximate counting in NP-hard problems, like for counting the number of satisfiability assignments in a SAT problem, counting the number of feasible colorings in a graph and calculating the permanent, typically fail. They either do not converge at all or are heavily biased (converge to a local extremum). We also show how their performance could be dramatically improved by combining them with the classic splitting method, which is based on simulating simultaneously multiple Markov chains. We present several algorithms of the combined version, which we simply call the splitting algorithms. As compared to the randomized algorithms, the proposed splitting algorithms require very little warm-up time while running the MCMC from iteration to iteration, since the underlying Markov chains are already in steady-state from the beginning. What is required is only fine tuning, i.e. keeping the Markov chains in steady-state while moving from iteration to iteration. We discuss its complexity properties and present extensive simulation studies with both the splitting and randomized algorithms for different NP-hard counting problems.