



THE UNIVERSITY OF CHICAGO

Department of Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

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Efficient Learning and Optimization Algorithms by a Local Entropy Measure

THURSDAY, December 3, 2015 at 4:30 PM
133 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

We will discuss the role that subdominant states play in the design of algorithms for large scale optimization problems. We shall take as representative case the problem of learning random patterns with binary synapses in single layer networks. The standard statistical physics results show that this problem is exponentially dominated by isolated solutions that are extremely hard to find algorithmically. By a novel large deviation method we find unexpected analytical evidence for the existence of subdominant and extremely dense regions of solutions. Numerical experiments confirm these findings. We also show that the dense regions are surprisingly accessible by simple learning protocols, and that these synaptic configurations are robust to perturbations and generalize better than typical solutions. These outcomes extend to synapses with multiple states and to deeper neural architectures.

The large deviation measure we introduced for the analytic study also suggests how to design general optimization algorithms based on local entropy maximization.

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