Manfred Opper

Title: Replica method with approximate inference

The replica method has been used over many years to compute a variety of exact learning curves
in the so-called teacher student scenario for single layer neural network architectures in the thermodynamic limit. Such computations are
made possible by idealised assumptions on simple, often i.i.d. Gaussian distributed input data.

In recent years, there has been an increasing interest to extend replica results to learning with real world data, e.g. by approximating input distributions of network activation functions
using second order statistics determined by empirical data.

In this talk (based on earlier work [1]) I will discuss an alternative framework
for making the replica method applicable to learning on real data. Approximating
the distribution of the replicated and averaged system using approximate inference
methods (such as the variational approach), and by assuming
replica symmetry, one can obtain approximations for effective marginal densities. This
approach could possibly deal with more general assumptions on data generation,
avoiding the need for specifying explicit 'teacher' networks.

[1] Dörthe Malzahn and Manfred Opper J. Stat. Mech. (2005) P11001