
Score matching and nonparametric estimators of drift functions for stochastic differential equations*

Manfred Opper

Abstract

Score matching is a technique for estimating non-normalised probability densities from data. It avoids the complications of computing the normaliser of the density which would be needed e.g. for maximum likelihood or Bayesian estimators. The method was introduced in [1] and has recently been generalised to a nonparametric, kernel based setting [2] where it often outperforms more classical techniques such as kernel density estimators.

In this talk I will discuss a relationship between score matching and learning in stochastic dynamical systems. Properly generalised, the method allows for an estimate of the drift functions for certain classes of stochastic differential equations. I will show the relation to Bayesian estimators for the drift and give applications to second order stochastic differential equations. [Joint work with Philipp Batz and Andreas Ruttner (TU Berlin)]

References:

- [1] Hyvärinen. Estimation of Non-Normalised Statistical Models by Score Matching, JMLR, 2005.
- [2] Sriperumbudur, Fukumizu, Kumar, Gretton and Hyvärinen, Density Estimation in Infinite Dimensional Exponential Families, arXiv:1312.3516v3, 2014.