

**Integral curve estimation:
Methodology and applications to diffusion tensor imaging**

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Abstract

A vector field is observed at random locations with additive noise. The corresponding integral curve is to be estimated based on the data. First, we will introduce and study an estimation procedure. Second, we will obtain lower bounds for the functions of deviations between true and estimated integral curves. In particular, we will show that our estimation procedure yields estimates, which have the optimal rate of convergence in minimax sense. Third, we will discuss generalizations of the model.

The problems of this nature arise in diffusion tensor imaging, a modern brain imaging technique that combines MRI with measurements of the diffusion tensor at discrete locations in the cerebral white matter. The integral curves are used to model axonal fibers in brain. In medical research it is important to estimate and map these fibers. In the talk we address some statistical aspects pertinent to this estimation problem.