Abstract:

We describe a LIDAR data set in which each object is reasonably high dimensional, and for which classification is the ultimate object. Initial attempts at building a classifier based on deconvolution perform poorly. The data though come from a physical experiment that has both a backscattering structure and a linear partial differential equation (PDE) structure. We exploit both to build much better classifiers without doing deconvolution. Our main focus is on estimating the parameters of the PDE to be used as input for the classifier. We develop spline and kernel-based semiparametric approaches to estimate the parameters of linear PDE models. In linear PDE, simulation studies show that the new methods are comparable, and both outperform other available methods in terms of estimation accuracy. The kernel method can be used for nonlinear PDE. The PDE parameters can be used to explain the extremely good classification behavior.