Statistical analysis of learning with minimum error entropy criterion

Ding-Xuan Zhou

Department of Mathematics, City University of Hong Kong

mazhou@cityu.edu.hk

Abstract

The classical least squares method minimizes the variance of the error variable and is perfect to deal with problems involving Gaussian noise. When the noise is non-Gaussian, minimum error entropy (MEE) criterion may perform better and provide efficient learning algorithms by minimizing error entropies in various ways. In this talk we consider the consistency of an empirical MEE algorithm in a regression setting. The error entropy consistency, which requires the error entropy of the learned function approximates the minimum error entropy, is shown to be always true if the bandwidth parameter tends to 0 at an appropriate rate. The regression consistency, which requires the learned function approximates the regression function, however, is a complicated issue. We prove that the error entropy consistency implies the regression consistency for homoskedastic models where the noise is independent of the input variable. But for heteroskedastic models, a counter-example is used to show that the two types of consistency do not coincide. A surprising result is that the regression consistency is always true, provided that the bandwidth parameter tends to infinity at an appropriate rate. Fourier transform plays a crucial rule in our analysis.

Keywords: minimum error entropy, learning theory, consistency, regression