MICHIGAN STATE UNIVERSITY
Department of Statistics and Probability

COLLOQUIUM

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Locally Weighted Nearest Neighbor Classifier and Its Theoretical Properties

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Zoom

Abstract

Weighted nearest neighbor (WNN) classifiers are fundamental non-parametric classifiers for classification. They have become the methods of choice in many applications where limited knowledge of the data generation process is available a priori. There exists a vast room of flexibility in the choice of weights for the neighbors in a WNN classifier. In this talk, I will introduce a new locally weighted nearest neighbor (LWNN) classifier, which adaptively assigns weights for different test data points. Given a training data set and a test data point x_0, the weights for classifying x_0 in LWNN is obtained by minimizing an upper bound of the conditional expected estimation error of the regression function at x_0. The resultant weights have a neat closed-form expression, and therefore the computation of LWNN is more efficient than some existing adaptive WNN classifiers that require estimating the marginal feature density. Like most other WNN classifiers, LWNN assigns larger weights for closer neighbors. However, in addition to the ranks of neighbors' distances, the weights in LWNN also depend on the raw values of the distances. Our theoretical study shows that LWNN achieves the minimax rate of convergence of the excess risk, when the marginal feature density is bounded away from zero. In the general case with an additional tail assumption on the marginal feature density, the upper bound of the excess risk of LWNN matches the minimax lower bound up to a logarithmic term.

Zoom details can be found at: https://stt.natsci.msu.edu/stt-colloquium-zoom-info/

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