

On Maximum Depth Classification

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Abstract

Over the last couple of decades, data depth has emerged as a powerful exploratory and inferential tool for multivariate data analysis, and it has wide applications in different fields of statistics. This paper investigates a possible use of data depth in nonparametric discriminant analysis where different notions of statistical depth functions are used to construct robust classification rules. Along with the popular depth functions like half-space depth and simplicial depth, we have studied the performance of spatial depth proposed by Serfling (2002) following the idea of spatial quantiles introduced by Chaudhuri (1996) and Koltchinskii (1997). Spatial depth is computationally less expensive than the other existing depth functions and gets less affected by the curse of dimensionality. We use some simulated examples and some benchmark data sets as well to compare the performance of these depth based classifiers, and the large sample properties of their misclassification rates have been investigated under appropriate regularity conditions.

Keywords and Phrases : Data depth, elliptic symmetry, location shift models, Mahalanobis distance, Vapnik Chervonenkis dimension.