Local Classification Methods for Heterogeneous Classes

Julia Schiffner and Claus Weihs
Technische Universität Dortmund, Germany

Abstract. Many classification methods, for example LDA, QDA or Fisher discriminant analysis (FDA), assume the classes to form homogeneous groups. But in practical applications heterogeneous classes that consist of multiple subclasses can often be observed. In such cases local classification methods that take the local class structure, i.e. the subclasses, into account can be beneficial. In package klaR (Weihs et al., 2005) the function loclda that performs localized linear discriminant analysis (Czogiel et al., 2007) is already available. Now, three more local classification methods are added.

The first two methods, the common components classifier and the hierarchical mixture classifier (Titsias and Likas, 2002), rely on modeling the class conditional densities by means of gaussian mixtures. The third method, local Fisher discriminant analysis (LFDA), was proposed by Sugiyama (2007). FDA seeks for a projection of the data into a subspace such that the between-class scatter is maximized and the within-class scatter is minimized. In LFDA the projection additionally has to fulfill the condition that nearby data points in the same class are kept close to each other and thus the local class structure is preserved.

The three local methods and their implementations in R are presented and their usefulness is demonstrated in several examples.

References