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ROBUST DETS AND DETMM ESTIMATORS FOR DISCRIMINANT ANALYSIS

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Abstract. Discriminant analysis (DA) is one of the most popular models that obtain rules to describe the separation between two or more groups of data. In addition, linear and quadratic DA are considered as classical classifier, which allow for classification of new observations into one of the known groups given that the parameters of DA are unknown and they have to be estimated from the data sets. In the classical approaches, discriminant rules often used the empirical mean and covariance matrix of the data, because these estimates are highly affected by outlying data and become inappropriate at contaminated data sets. Robust DA is constructed based on robust estimates instead of the classical way. In this paper, the DetS and DetMM estimators for location and scatter are used to construct the discriminant rules. Result show that these estimator are highly resistant to outlier observations. Then, the probability of misclassification is estimated by applying the highly robust estimators. Finally, the influence of the new estimator is investigated through simulation and application to real data.

Keywords. Robust Estimation, DetMCD, DetS, DetMM Linear discriminant analysis.

AMS (MOS) subject classification: This is optional. But please supply them whenever possible.

1 Introduction

We assume that we have p-diminution (variable) of n observation, which is sampled from the l different population $\pi_1, \ldots, \pi_l$. In addition, $n = \sum_{j=1}^{l} n_j$ and we can denote the observation by $\{x_{ij} : j = 1, \ldots, l, i = 1, \ldots, n_j\}$. The separation between observations can be described by the rule that from the discriminant analysis (DA), which allows the classification of new observation into one of the existing populations. The DA problem arises when we assign an individual to one of the π_j population. Normally, the j populations considered to originate from multivariate normal population. Where n_j is the size of sample from population j for each of the l different group.