1 Introduction

It may be convenient to first reduce the dimensionality of the origin data before doing discriminant analysis with a large number of variables. Principal component analysis or factor analysis is often applied for such dimension reduction. "Eigenvalues" are often considered when taking corresponding principal components or factors as the variables to discriminate data. However, the principal component or factor which has large variance may not contain more quantity of information for discrimination than the other which has smaller variance. Thus, if we use the principal components or factors chosen by eigenvalues as discriminators we may not receive a good discriminant result.

Here, we suppose that our data are from a mixture of two multivariate normal distributions with the same covariance matrix. Mardia, Kent and, Bibby (1979, p.323) identified a test statistic that can be used to provide the discriminant power of a set of variables. Chang (1983) considered the Mahalanobis distance computed base on some given principal components and used this distance to measure the quantity of information for discrimination corresponding to these given principal components.

In Section 2, we introduce these two methods demonstrated by Mardia et al. and Chang, respectively. In Section 3, we apply these two methods to measure the discriminant power after doing factor analysis. In Section 4, we first do principal component analysis and factor analysis on a simulation data set. Two principal components and two factors are selected based on the discriminant powers of Mardia et al. and Chang. These two principal components and two factors are found to be different and better (based on error rates) from those two corresponding to the largest eigenvalues. Moreover, we simulate three groups of data and apply the method of Mardia et al. to select discriminant variables and discuss the discriminant result. Finally, we give conclusions in Section 5.