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AN INTER-CLASS FEATURE SELECTION PROCEDURE

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In a classification study, the problem of feature selection should be addressed in two separate cases, (i) intra-class, and (ii) inter-class feature selection. In the former, one is interested in selecting features which are best for the representation of a class, whereas in the latter, we try to select features which are best for the discrimination between classes.

In this paper, an inter-class feature selection procedure, based on a hierarchical cluster analysis, is presented. The basic concept is to perform a stepwise clustering on the weighted feature vectors in a m dimensional space, where m is the number of classes considered. The n dimensional class prototypes, where n is the number of features, are weighted by a dissimilarity vector in such a way that the weighted feature vectors have the following properties: (i) the magnitudes of these vectors correspond to the discriminatory power of those features, and (ii) the distance between two vectors corresponds to the similarity between those two features. Finally, a hierarchical clustering technique, single linkage, is used to reduce dimensionality in each pass.

Various steps in the procedure are explained in an illustrative example, followed by results obtained with this procedure on a 47 dimensional multi-spectral data set of remotely sensed data acquired in a wildlife detection study. The objective of this study is to utilize remote sensing techniques for deer census. A field experiment was conducted to obtain statistical distributions of reflectance spectra over the range of 0.5 to 1.1 μm of deer, snow, juniper, and other competing background objects. The mean direction

angle is used as the prototype spectral signature for each class. Performance of the feature selection procedure applied to this remotely sensed data was very satisfactory in two and three class situation. The features selected are those associated with unique aspects of the spectral signatures that one would expect to be important.