*A Survey of Hyperspectral Image Classification in Remote Sensing*

The overall objective of hyperspectral image classification procedures is to automatically categorize all pixels in image into land cover classes (Lu & Weng, 2007 [5]). Based on the spectral features, several classification algorithms have been used in this field.

* *Maximum likelihood classification.*

Maximum likelihood decision rule is based on Gaussian estimate of the probability density function of each class. Maximum likelihood classifier evaluates both the variance and covariance of the spectral response patterns in classifying an unknown pixel.

* *Neural networks classifier.*

Neural networks (Atli.J et al., 1995 [1]) have been applied successfully in various fields. Neural networks are networks which need a long training time but are relatively fast data classifier. For very high dimensional data, the training time of a neural network can be very long and the resulting neural network can be very complex. This leads to the importance of feature reduction mechanisms for neural networks.

* *Decision trees.*

Decision tree classifier breaks a complex classification problem into multiple stages of simpler decision-making processes (Safavian and Landgrebe, 1991 [10]). Decision trees are trees that classify instances by sorting them based on feature values. Each node in a decision tree represents a feature in an instance to be classified, and each branch represents a value that the node can assume (Murthy,1998 [7]).

* *Support Vector Machine (SVM)*

Specific attention has been dedicated to support vector machines for the classification of remotely sensed images recently (Hermes et al., 1999; Roli & Fumera, 2001; Hung et al., 2002 [4]). The interest in growing Support Vector Machines (Vapnik, 1998; Burges, 1998; <http://www.kernal-Machines.org/tutorial.html> [11]) is confirmed by their successful implementation in numerous other pattern recognition applications like biomedical applications (El-Naqa et al., 2002 [2]), image compression (Robinson & Kecman,2003 [9]), and three dimensional object recognition (Pontil & Verri, 1998 [8]).

* *Knowledge based Classifiers.*

Different kinds of ancillary data, such as digital elevation model, soil map, housing and temperature are readily available; they may be incorporated into a classification procedure in different ways.

* *Contextual Classifiers.*

In contextual classifiers, the spatially neighboring pixel information is used. Contextual classifiers are developed to cope with the problem of intraclass spectral variations (Gong and Howarth, 1992 [3]). To improve the classification results, it exploits spatial information among neighboring pixels (Magnussen et al., 2004 [6]).

In general, pixel-based classification algorithms are widely used for hyperspectral image classification. However, the accuracy may not meet the necessity because of the impact of the mixed pixel problem and may realize higher accuracy for medium and coarse spatial resolution images. For fine spatial resolution data, although mixed pixels are reduced, the spectral variation within land classes may decrease the classification accuracy. Object-based classification approaches are most optimal for fine spatial resolution data.

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