Effects of Training Sizes and Dimensionality on NN and SVM Performance: A Comparative Study

Nivedita Candade, Research Assistant
Dr. Barnali Dixon, Assistant Professor
University of South Florida, St. Petersburg
140 Seventh Ave South, St. Petersburg, FL 33701.
Phone: 727 553 4863
ncandade@mail.usf.edu
bdixon@stpt.usf.edu

Landuse/landcover (LULC) classification is an important part of many remote-sensing applications. Landsat 5 provides a great historical dataset for landuse change studies. Researchers in this filed are continually attempting to use new methods to use classification accuracy. Commonly used classifications routines include parametric and non parametric classification methods. Over past two decades we have seen increase in neural networks (NN) application to landuse classification. More recently, a new pattern recognition technique, based on the Statistical Learning Theory called the Support Vector Machines (SVMs), has been introduced to the remote sensing community. In general this study aims at comparing performances of SVMs with a more commonly used pattern recognition techniques such as NN. Studies have shown that successful application of either NN and SVM depends on the properties of training data such as dimensionality and the size of the training sets. The specific objectives of this study are to conduct sensitivity analysis of SVM and NN: i) to the number of training pixel per class and (ii) to the number of discriminatory variables (input dimensionality) of training data. This study used training date sets consist of 30, 50, 100 and 150 pixels per class for the objective 1. A 3 band images were compared to a 6 band images for the objective 2. A Landsat image for summer of 1998 for Desoto county in Florida (path 16 and row 41) was used in this study. The study attempted to classify 7 LULC categories. The results show that SVM and NN are sensitivity to the number of training pixels used per class. In general SVM classified images with higher accuracy as the size of training data increases. When compared to the 3 band image to 6 band image the SVM consistently show higher classification accuracy (by 5%) for all of the training size expect 30pixels.