INTEGRATING SVM TOOLS IN ERDAS IMAGINE 8.7 FOR USDA'S CONSERVATION RESERVE PROGRAM MAPPING AND COMPLIANCE MONITORING

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ABSTRACT

Our overall goal is to investigate the utility of Support Vector Machine (SVM) based semi-supervised classification in Conservation Reserve Program (CRP) mapping and compliance monitoring. CRP is USDA's largest conservation program that encourages landowners and farmers to plant grasses over a period of 10-15 years to increase fertility and soil quality. Periodic inventorying and compliance monitoring of the enrolled tracts has become essential to supervise their maintenance and compliance to program requirements set by USDA. Image data classification using SVM employs machine-learning algorithm that extracts pixel values and other parameters using spectral rationing technique for a specific class and learns its characteristics by deriving a model from these parameters. The pixels in the input image falling within each class are then identified and classified based on this model. We have integrated SVM Tools into Erdas Imagine 8.7 to perform classification and to simplify other image processing tasks. Our integrated system consists of five tools including Band Extraction, CRP Extraction, SVM Train, SVM Predict and SVM to Image tools. Using these user friendly tools, one can easily extract training sets for a particular species class and generate classified outputs. We use one-class SVM (OCSVM) to identify and classify one CRP cover species at a time based on corresponding species training data set. The procedure is repeated for other species and the resulting output images are composited to obtain a single classified image. We tested the integrated system on Landsat TM data (radiometrically and geometrically rectified) for Texas County, Oklahoma. A 37-band stack data set was developed using the spectral bands, Normalized Difference Vegetation Index (NDVI), and other band ratios from the image data for two seasons. A sparse vector representation data format was derived from both the 37-band stack and the reference (ground-truth) data. Results from our analysis show an overall classification accuracy ranging from 86% to 91% for 14 CRP cover types.