# SUPERVISED LEARNING ALGORITHMS UPGRADE TO THE HIA TOOLBOX

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**Abstract** – In the last years many supervised learning algorithms such as the Bayes or Minimum Distance classifiers among several methods have been used for the processing and classification of hyperspectral and multispectral imagery using software tools such as the Hyperspectral Image Analysis (HIA) toolbox. Nowadays, supervised learning algorithms with higher accuracy have been incorporated in the fields of remote sensing and biomedical applications to name a few. In this work, we will present the update made to the HIA Toolbox by integrating the Support Vector Machine (SVM) and Artificial Neural Network (ANNs) classifiers to facilitate and expand its use to researchers across research domains.

The HIA Toolbox is implemented in the MATLAB numerical computing environment. In this first prototype we take advantage of MATLAB built in tools and functions (e.g. **fitcsvm**, **predict**, **patternne**, **train** and **net**) that are usually hard to understand, especially when trying to manipulate data in order to fit their functions' requirements inputs and adapted them to work for the case of classification of hyperspectral data. With the motivation to build a user-friendly toolbox, we developed a routine in MATLAB that obtains the user's data and adapt them to the format needed for the inputs functions mentioned above. Combining the MATLAB classifiers routine and our own functions, we have upgraded the HIA toolbox which can take any hyperspectral image with their corresponding training and testing data to classify them using SVM or ANNs. The training and testing data are provided by the user as coordinates of a polygons which represent regions (classes) in the hyperspectral images. The HIA Toolbox is responsible to label all the pixels inside the specific polygon and made classes of training and testing pixels. After this phase, we can build our model (one versus all) and proceed to classify our data.

We present numerical experiments generating the classification maps and accuracies of hyperspectral images and compare the performance of the different classifiers already exist in the HIA toolbox versus SVM and ANNs. All experiments were performed using the well-known Indian Pines Hyperspectral data set.