**Spectral Processing**

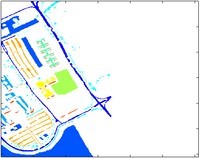
**Homework 3 – Remote Sensing**

**Due Date: May 3, 2021**

**Problem 1:** Apply a SVM classifier to the next images. You will find the hyper-spectral images and theirs classification maps in the next link:

<http://www.ehu.eus/ccwintco/index.php/Hyperspectral_Remote_Sensing_Scenes>

* Indian Pines: image collected by AVIRIS sensor over the Indian Pines test site in Northwestern Indiana. Use the 145 x 145 image with 224 spectral bands, and 16 information classes.
* Pavia University Scene: image collected by ROSIS sensor over Pavia, northern Italy. Use the 610 x 640 image with 103 spectral bands, and 9 information classes.



*Figure 1: Indian Pines Figure 2: Pavia University*

*Groundtruth Groundtruth*

For each image, (a) select training and testing samples, and (b) set the classifier parameters seeking to obtain a good classification. Include in the report (a) how the parameter where selected, (b) confusion matrix, (c) classification map, and (d) a discussion of your results.

**Problem 2:** Using the selected image from Homework 2, apply a SVM classifier to one of the three selected images (i.e. Lansat, Sentinel, Hyperion). It is necessary to select (a) the number of classes, (b) training samples, and (c) testing samples. These can be selected using your knowledge about the regions and the visual exploration. Include in the report (a) how the parameter where selected, (b) confusion matrix, (c) classification map, and (d) a discussion of your results.

**Problem 3:** Use VCA (Vertex Component Analysis) for linear unmixing of Cuprite image. VCA implementation can be found in the next links:

Matlab: <http://www.lx.it.pt/~bioucas/code.htm>

Python: <https://github.com/Laadr/VCA>

Cuprite image is available on the next link (use cuprite95bs\_ss).

<https://itmeduco-my.sharepoint.com/:f:/g/personal/mariatorres_itm_edu_co/EuLE9e_Bm6JNi31jinsbM-kBxoaugtFQy73_E-UwECC22Q?e=pL83E7>

It is necessary to select the number of endmember to perform the linear unmixing using VCA. Please, include in the report (a) how the number of endmember was selected, (b) the spectral signatures for each endmember, (c) the abundance maps, and (d) presents a analytical validation of your results using the classification map (NewClassMapCuprite.mat) for cuprite found in the last link.

**Problem 4:** Use VCA for linear unmixing of Hyperion image selected in Homework 2.It is necessary to select the number of endmember to perform the linear unmixing using VCA. Please, include in the report (a) how the number of endmember was selected, (b) the spectral signatures for each endmember, (c) the abundance maps, and (d) presents a analytical comparison with the classification results obtained in the problem 2.