**Remote Sensing**

**Homework 2**

**Due date: March 15, 2021**

**This homework needs to be complete on March 15, 2021 at 11:55 p.m. You can use any references, but any indication of dishonesty will get you a 0.0. You need to send a document in PDF with a technical report and a zip file with the MATLAB/python scripts to the email mariatorres@itm.edu.co**

# Problem 1: Satellite data

Download three images captured over the same Earth site by Landsat, Sentinel and Hyperion. The date of capture can be different for each sensor; consider that it is recommended to use data from Hyperion before 2014. You can use the platform EarthExplorer. You need the reflectance images, for that select the correct level of processing before download de image. For Hyperion, you can send me the ID of the data, and I will do the atmospheric correction using ENVI (Please, send the information before Wednesday, March 3).

Write the scripts to visualize the image with the follow options:

a) Show one single band

1. RGB images using true-color (select the suitable bands according the sensor)
2. RGB image using infrared color (CIR)
3. RGB image from three selected bands

You can use any method for image enhancement for the visualization, but you need to work with the original data the other parts of the homework. Include in the technical report, samples for each image and the detail of the used enhancement methods.

# Problem 2: Filtering

Select one noise band for each image. Apply a linear filtering. Select a suitable parameter of size of windows and other filter parameters to obtain an acceptable noise reduction. Include in the report: a graphic comparison between the original and filtered bands, the selected parameters, as well as a numeric comparison between the original and filtered images using the mean square error.

# Problem 3: Principal component analysis

Apply PCA to each image (Landsat, Sentinel and Hyperion). Include in the report the N principal component for each image. Research the criteria to select the value of N from the data. Discuss how you can use the information provided by PCA for remote sensing.

# Problem 4: Vegetation index

Compute the follow vegetation index for each spectral image. Include in the report, a graphic comparison among the vegetation indexes. Discuss your results and how you can use this information for remote sensing applications.

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