

Spatial-Spectral Processing
Homework 3 – Remote Sensing
Due Date: November 3, 2019

Problem 1: Using the classification maps obtained in the *Problem 1 of HW2* for Indian Pines and Pavia University hyperspectral images, apply a majority vote approach to improve the classification results. For spatial windows of 3x3, 5x5, and 9x9, select the most common label as the class for the center pixel. For each image and window size present (a) confusion matrix, (b) classification map, and (d) a discussion of your results and the comparison with the obtained in HW2.

Problem 2: Implement a segmentation method for hyperspectral imagery (you can use Matlab and Python code from the web). Apply the segmentation to Indian Pines, Pavia University, Cuprite, as well as, the selected images from Landsat, Sentinel and Hyperion. This segmentation will be use to improve the spectral classification. Include in the report the segmented images.

Problem 3: Using the segmented images from Indian Pines, Pavia University and Cuprite, implement a spatial-spectral classification approach with the framework presented in the Figure 1. For the pixel-wise classification, use the results obtained in HW2.

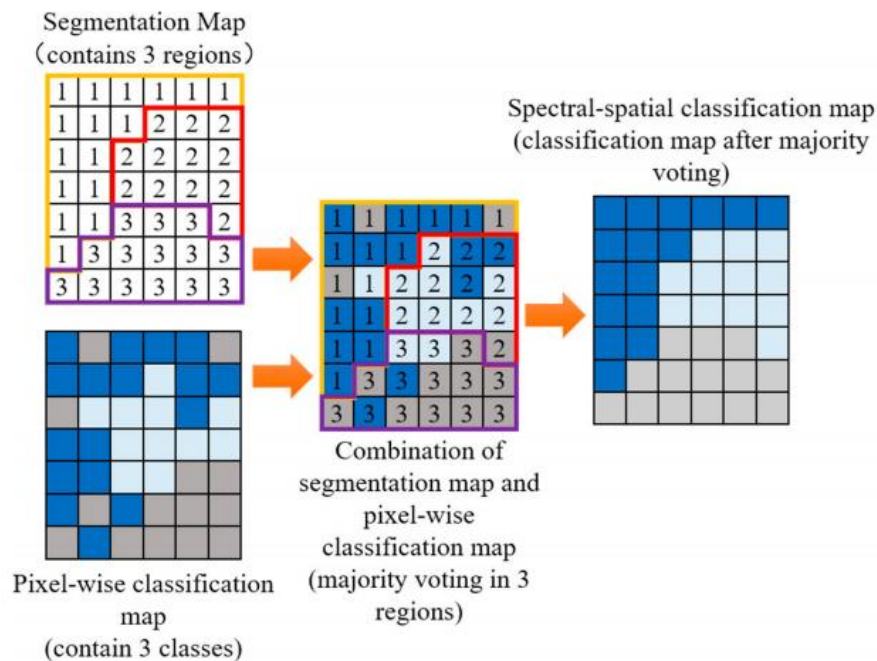


Figure 1: Spatial-spectral classification approach

For each image and window size present (a) confusion matrix, (b) classification map, and (d) a discussion of your results and the comparison with the obtained in HW2 and problem 1.

Problem 4: Apply the same framework of Problem 3 to the selected images of Landsat, Sentinel and Hyperion. For each image and window size present (a) confusion matrix, (b) classification map, and (d) a discussion of your results and the comparison with the obtained in HW2.

Problem 5: Using the segmentation results for Cuprite, compute a mean spectral signature for each region. Then, use VCA (Vertex Component Analysis) for linear unmixing of the set of mean spectral signatures obtained from the segmented Cuprite image. 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, (d) presents a analytical validation of your results using the classification map for Cuprite, and (e) a comparison with the obtained results in HW2.

Problem 6: Use the same approach than Problem 5 to unmix Hyperion image. 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, (d) presents a analytical comparison with the classification results obtained in the problem 4, and (e) a comparison with the unmixing results in HW2.