12.01.2024

Photogrammetry and Remote Sensing
Exercise 4

1. Maximum-Likelihood – Bayesian Classification

1.1 Given are two clips of a Landsat satellite image with 7 different spectral channels. Use these to perform a Gaussian Naïve Bayes classification. The target classes are water, vegetation, forest, glacier, snow, rock and shadow. For both clips a label image with the class for each pixel is available. Use the train data to learn a model.

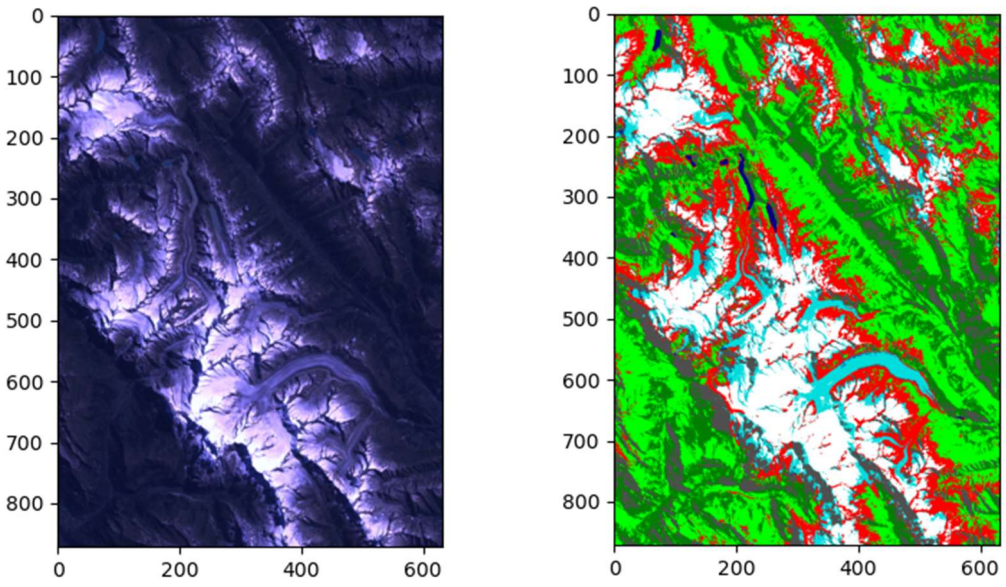
1.2 Use the trained model to predict the test region.

1.3 Calculate the confusion matrix and compute all accuracies (user accuracy, producer accuracy and kappa coefficient).

1.4 Visualize the RGB image for both train and test regions from the given channels.

1.5 Compare the predicted image with the ground truth (label image of the test region). Analyze the results (where was the classification successful? where do errors occur?).

1.6 Repeat the classification only using the RGB channels. How does the confusion matrix and the predicted image change? Visualize both and describe the changes.



Hints:

- A sample script to load the train data is given on Moodle
- Use *label2rgb*(...) function to convert the label image into a meaningful RGB image
- For creating, training and predicting use the following functions:

```
from sklearn.naive_bayes import GaussianNB
clf = GaussianNB()
clf.fit(X_train, y_train)
y_predicted = clf.predict(X_test)
```

- Before these can be used, the train data and labels must be flattened into one vector (*reshape*(...))
- To compute the confusion matrix use:

```
from sklearn.metrics import confusion_matrix
C = confusion_matrix(y_test,y_predicted)
```