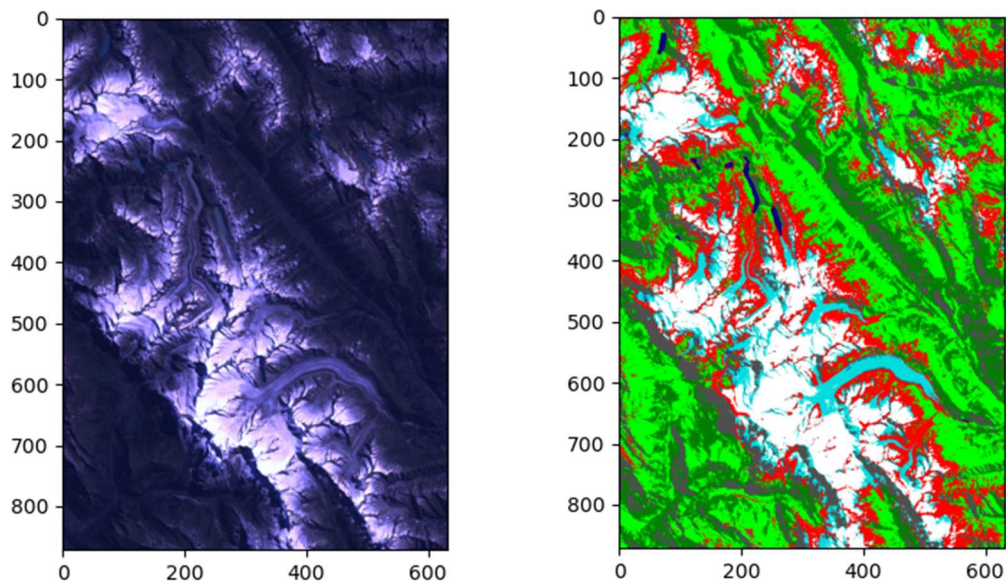


# Photogrammetry and Remote Sensing

## 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)
```