Project # 3: Object Recognition
CSC 391: Introduction to Computer Vision

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1 Datasets

There are five small datasets provided to you for this project via Google Drive. These datasets are:

- Agriculture: these are several images of the rainforest showing patches of land that have been converted into pastures for cattle raising or plantations of different fruit trees.

- Mining: These images show parts of the rainforest that have been cleared for gold mining using sluicing and dredging techniques. These types of mines produce large piles of tailings that look like small craters from the sky. There are also often waterbodies left behind and soil devoid of vegetation.

- Palm: These are images of canopies among which palm trees can be identified at various scales. For example three images are closeups showing palm trees clearly. A fourth image taken at higher altitude shows much more canopy with palm trees spread out but still identifiable. A fifth image shows the a region of the rainforest at much higher altitude but with high resolution. Palm trees are still identifiable.

- Rivers: This dataset contains high altitude images of the rainforest with various rivers prominently displayed among the canopy.

- Satellite: These images were taken by the Landsat-8 satellite and provide a view of the large parts of the Amazon through various spectral bands. An explanation of what information can be obtained from each band is provided here: `https://www.usgs.gov/media/images/landsat-8-band-designations` For example, band 3 shows parts of the Earth reflecting green light (0.53 - 0.59 μm), while band 7 shows those parts reflecting light in the short-wave infrared region (2.11 - 2.29 μm).

These datasets are a tiny sample of over 5 Terabytes of data currently in a server in the Biology department.

2 Recognition Problems

There are many recognition problems that are of interest for the datasets mentioned above. Here are some of the tasks that could be addressed:

- Given an image from the agriculture dataset, does the image contain a specific target such as a patch of farmland? (Yes, No).

  The same type of task can be specified for images in the mining, palm, and satellite datasets.

- Given an image from the palm dataset, label all the occurrences of palm trees in the image with text labels or bounding boxes.

  The same type of task can be specified for images in the mining dataset.

- Given an image of rivers dataset, does the image contain a river? (Yes, No). Delineate the rivers banks for all rivers found in the image.

  The same type of task can be specified for images in the satellite dataset.

3 Resources

There are a number of online resources that cover object detection using image feature encoding followed by classification via K-NN, Naive Bayes, SVMs, etc. Here are two such resources:

- `https://www.learnopencv.com/image-recognition-and-object-detection-part1/`
- `http://www.deepcore.io/2017/04/18/generating-and-applying-a-bag-of-visual-words-model-for-image-classification/`

Use these resources as well any others you might find online to implement a solution for one of the recognition problems previously shown. I will also be providing sample codes over the next few days.