

CS 558: Homework Assignment 3 - Image Classification

Collaboration Policy. Homeworks will be done individually: each student must hand in their own answers. It is acceptable for students to collaborate in understanding the material but not in solving the problems. Use of the Internet is allowed, but should not include searching for previous solutions or answers to the specific questions of the assignment.

Late Policy. No late submissions will be allowed without consent from the instructor.

Submission Format. Electronic submission on Canvas is mandatory. Submit a zip file containing:

- a pdf file with the source code (excluding libraries), the output.
- the code

Problem : Image Classification. Using the images in the ImClass directory. The objective of this problem is to classify each image of the **test** set into one of three classes: coast, forest or “insidecity”. The representation will be in the form of three separate histograms of the R, G and B color channels. Each histogram will have 8 bins. Therefore, each image will be represented by 24 numbers. These representation should be computed for all images in the training set. The class labels of the 12 images in the training set will be considered known.

When computing the histograms make sure that all pixels are counted exactly 3 times, once in each color channel. Include a verification step that will be submitted with your code.

During testing, each image is classified independently of all other images in the test set. Use the same function to compute the representation and assign to the test image the label of the training image that has the “nearest” representation. The “nearest” representation should be computed using the Euclidean distance in the 24D histogram space. In other words, use the 1-nearest neighbor classifier. (You can use brute force search for the nearest neighbor due to the small size of the training set.)

Your code should print a sting like the following for each image:

```
Test image 1 of class 2 has been assigned to class 1.
```

Compute the accuracy of your classifier and include it in the report.

Repeat the above experiments and show results for:

1. Changing the number of bins for each histogram (originally 8) to 4, 16, 32, meaning that the each image will be represented 12, 48, 96 numbers respectively.
2. Use 8 bins for each histogram, but classify a test sample using 3-nearest neighbor classifier.

Requirements and notes.

- You can use any programming language.
- You are allowed to use image reading and writing functions, as well as plotting functions.
You can convert the images to a different format for reading them.