

PART A:

- 1) a) Returns all the natural numbers up to and including the function parameter value in a random order.
- b) i) Creates a 3 x 3 matrix. ii) Select 2nd row of aforementioned matrix.
- c) i) Creates a vector of values from 1501 to 2000. ii) Selects indices of those values larger than 1850. iii) Creates a vector composed of values taken from indices selected in (ii).
- d) i) Creates a vector of length 10. Sets each value in the vector to 22. ii) Sums up all the values in aforementioned array.
- e) i) Sets up a vector of natural numbers up to and including 100. ii) Reverses the order of values in the aforementioned vector.

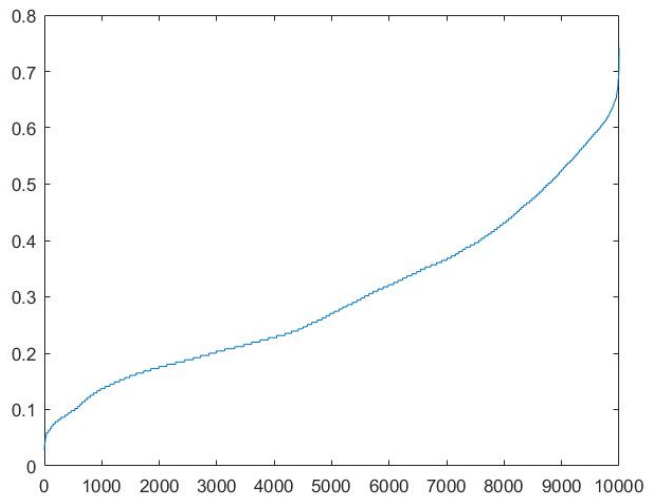
2)

Original Image:

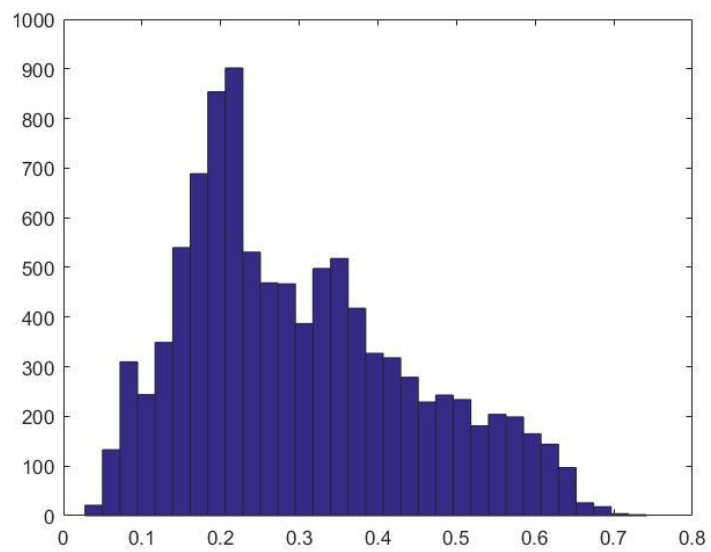


a)

CS 206
HW1
Stanislav Listopad
04/16/2017



b)



c)

CS 206
HW1
Stanislav Listopad
04/16/2017



d)



e)



f)

CS 206
HW1
Stanislav Listopad
04/16/2017

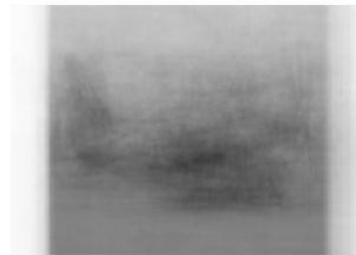


g) Min Value = 0; $r = 1065$; $c = 1$;

h) 5

PART B:

1)



2)



3)

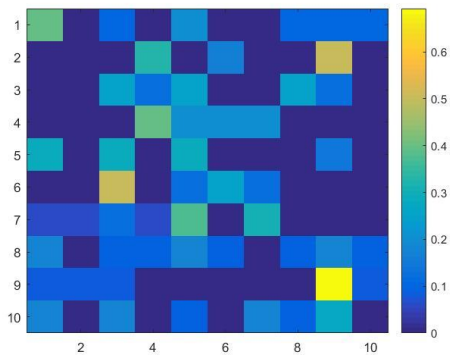


4) The ships and airplanes are oriented the same way in all of the images. Therefore, adding mirror flipped images into the mix results in a more distorted average image.

PART C:

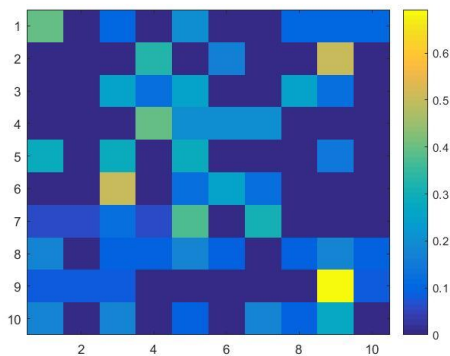
Utilized 5,000 training images & 100 test images.

3) Average Classification Rate: 26.81%



4) $K = 1$;

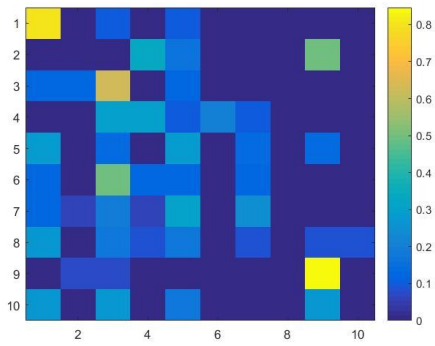
Average Classification Rate: 26.81%



CS 206
HW1
Stanislav Listopad
04/16/2017

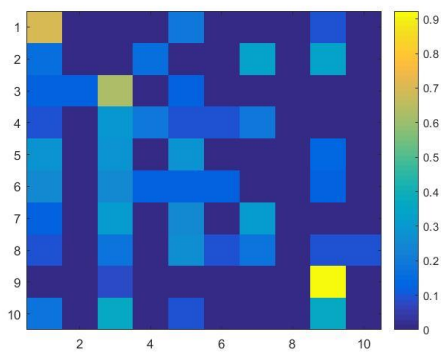
K = 3;

Average Classification Rate: 31.07%



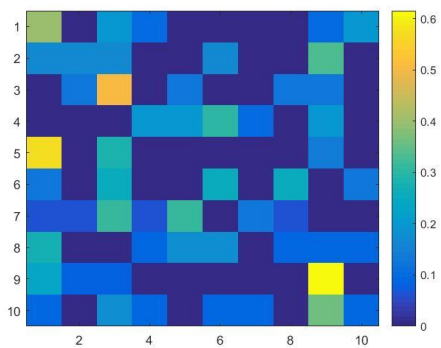
K = 5;

Average Classification Rate: 31.71%



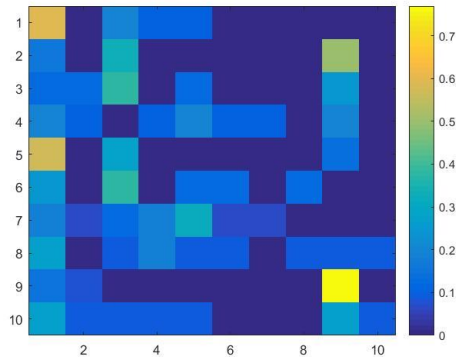
5) K = 1;

Average Classification Rate: 24.39%



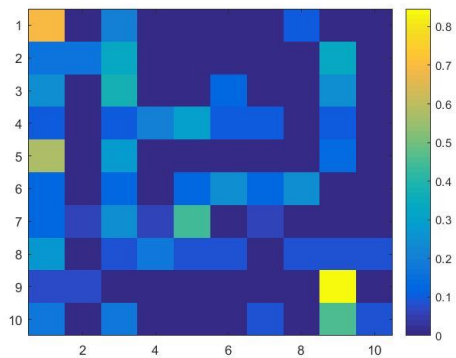
K = 3;

Average Classification Rate: 22.14%



$K = 5$;

Average Classification Rate: 27.82%



6) Classification (kNN) algorithm with Euclidian distance $K = 5$ performs the best. Higher K values tend to perform better. Euclidian distance measure seems to be a better label predictor than cosine angle measure.

Effect of K value on prediction accuracy:

Assumption: images in the same category look similar. Therefore, any images similar to a given image are likely to be in the same category. By examining multiple similar images and selecting the most frequently occurring label we are increasing the chance of predicting the correct category.

All categories were especially prone to being considered airplanes and birds. This could be due to the fact that airplane & bird images are especially diverse in shape, color, and background. In contrast, ship images were consistently well predicted. This is likely because majority of ship images have the same background (water).

CS 206
HW1
Stanislav Listopad
04/16/2017

Airplanes & Birds:



Ships:

