ECE 271A Quiz 1

1st Yifan Wu
yiw084@ucsd.edu

***Abstract*—The goal of this problem is to segment the "cheetah" image into its two components, cheetah (foreground) and grass (background).**

I. Problems

A.

Using the training data in TrainingSamplesDCT 8.mat, what are reasonable estimates for the prior probabilities?

There are two matrices, TrainsampleDCT_BG and TrainsampleDCT_FG for foreground (cheetah) and background (grass) samples respectively.

- The prior $P_{Y=Cheetah} = 0.8081350729086723$
- The prior $P_{Y=grass} = 0.1918649270913277$

B. *Using the training data in TrainingSamplesDCT 8.mat, compute and plot the index histograms $P_{X|Y}(x|cheetah)$ and $P_{X|Y}(x|grass)$.*

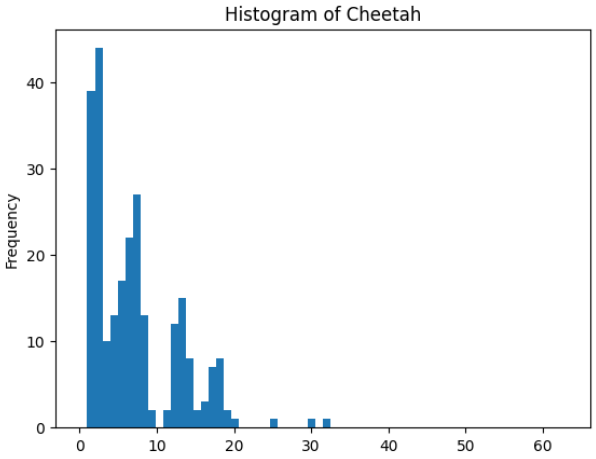

Fig. 1. *Histogram of $P_{X|Y}(x|cheetah)$*

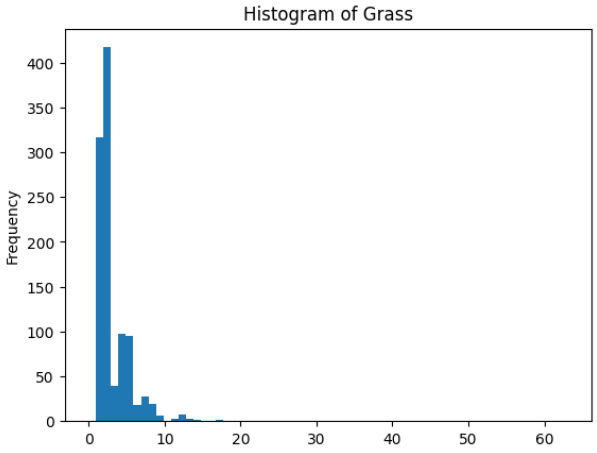

Fig. 2. *Histogram of $P_{X|Y}(x|grass)$*

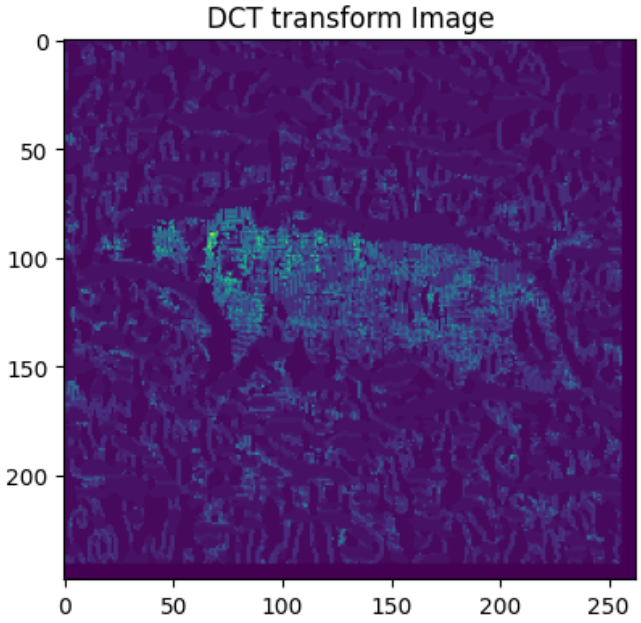

Fig. 3. *DCT Transformed Image*

C.

For each block in the image cheetah.bmp, compute the feature X (index of the DCT coefficient with 2nd greatest energy). Compute the state variable Y using the minimum probability of error rule based on the probabilities obtained in a) and b). Store the state in an array A. Using the commands imagesc and colormap(gray(255)) create a picture of that array.

D.

The array A contains a mask that indicates which blocks contain grass and which contain the cheetah. Compare it with the ground truth provided in image cheetah mask.bmp and compute the probability of error of your algorithm.

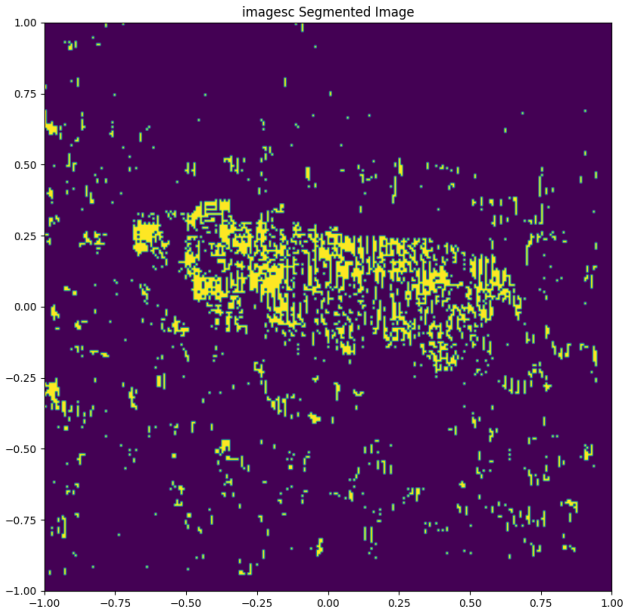

Fig. 4. *Imagesc Segment*

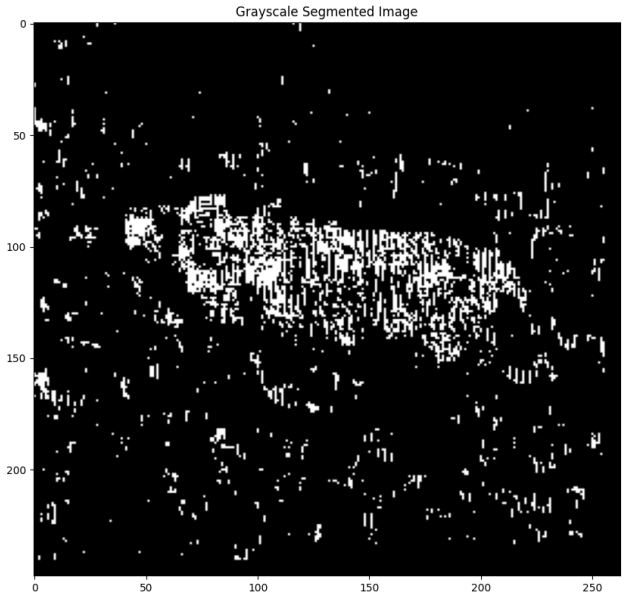

Fig. 5. *Gray-scale Segment*

- The probability of error: **0.17544155525573413**
- The probability of error in foreground: **0.15150864712375814**
- The probability of error in background: **0.02393290813197596**

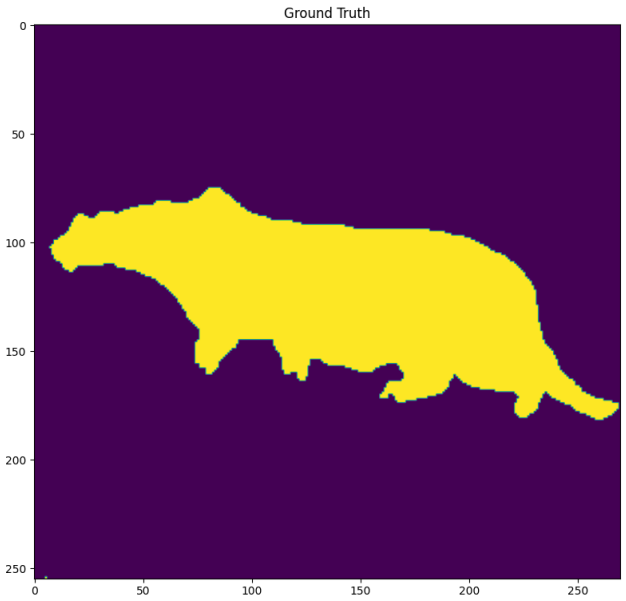

Fig. 6. *Ground Truth*