Assignment #1

Computer Problem Solution

a) Using the training data in **TrainingSamplesDCT8.mat**, what are reasonable estimates for the prior probabilities?

Solution:
Two priors probabilities, $P_Y(cheetah)$ and $P_Y(grass)$, could be estimated based on the number of vectors in the training set. The estimation of $P_Y(cheetah)$ and $P_Y(grass)$ are:

$$P_Y(cheetah) = N_{FG}/(N_{FG} + N_{BG}) \tag{1}$$

$$P_Y(grass) = N_{BG}/(N_{FG} + N_{BG}) \tag{2}$$

where

N_{BG} is the number of vectors in matrix **TrainsampleDCT_BG**

N_{FG} is the number of vectors in matrix **TrainsampleDCT_FG**

b) Using the training data in **TrainingSamplesDCT8.mat**, compute and plot the index histograms $P_{X|Y}(x|cheetah)$ and $P_{X|Y}(x|grass)$.

Solution:
The index histograms is the following picture:

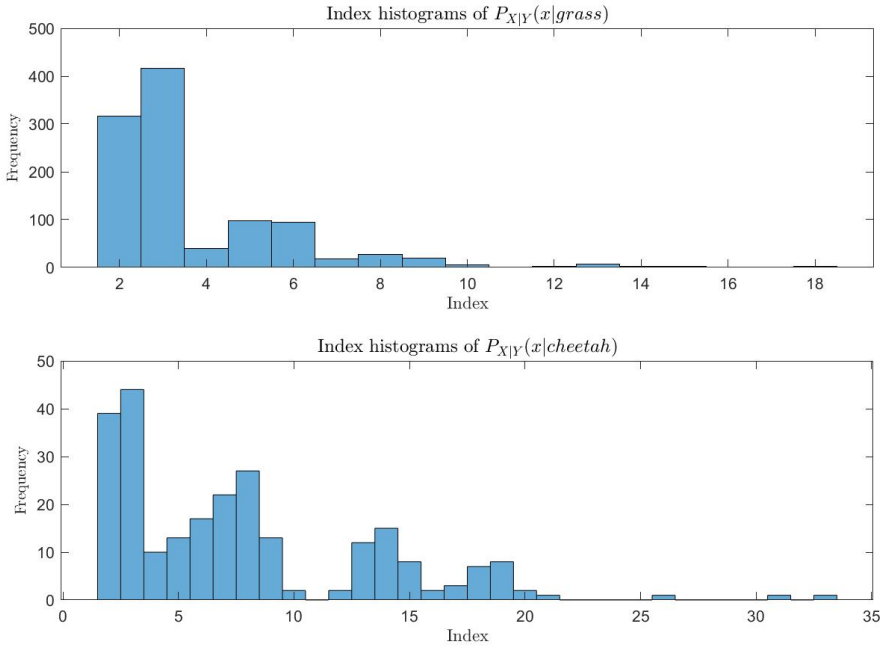

Figure 1: index histograms

The value of $P_{X|Y}(x|cheetah)$ and $P_{X|Y}(x|grass)$ is showed as following histograms:

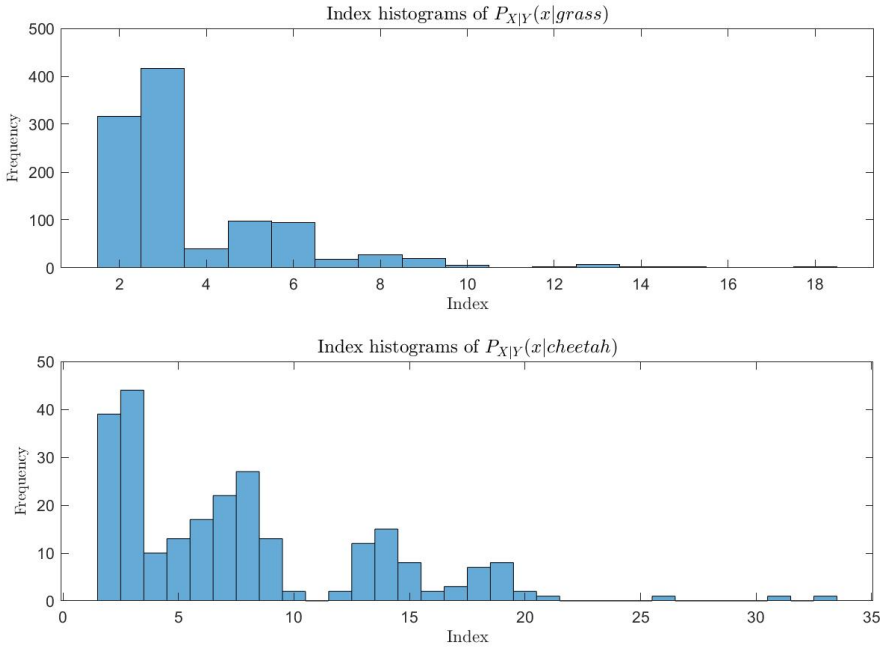

Figure 2: index histograms

1.
$$\forall n(P(n) \rightarrow Q(n)), \tag{3}$$
where

$P(n)$ is "n is an odd integer" and
$Q(n)$ is "n^2 is odd."

2. Assume $P(n)$ is true.
3. By definition, an odd integer is $n = 2k + 1$, where k is some integer.
4.
$$\begin{aligned} n^2 &= (2k+1)^2 \\ &= 4k^2 + 4k + 1 \\ &= 2(2k^2 + 2k) + 1 \end{aligned}$$
5. $\therefore n^2$ is an odd integer. $\square$

c) Let $A = \{1, 2, 3\}$ and $B = \{1, 2, 3, \{1, 2, 3\}\}$:
Then, $A \in B$ and $A \subseteq B$.

d) Let $A = \{1, 3, 5\}$, $B = \{1, 2, 3, \}$, and universe $U = \{1, 2, 3, 4, 5\}$:

$$\begin{aligned} A \cup B &= \{1, 2, 3, 5\}, \\ A \cap B &= \{1, 3\}, \\ A - B &= \{5\}, \\ \bar{A} &= \{2, 4\}, \\ A - A &= \emptyset. \end{aligned}$$