Bolin He

Question a

From the training data, we could obtain their shape and calculate the probability based on commonsense. The result showed

PY(cheetah) = 0.1919
PY(grass) = 0.8081

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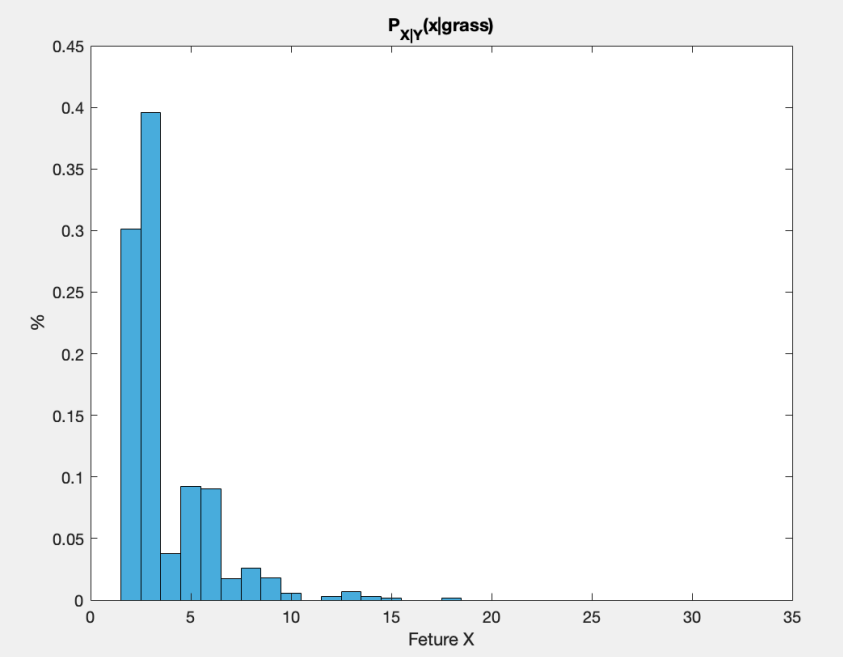
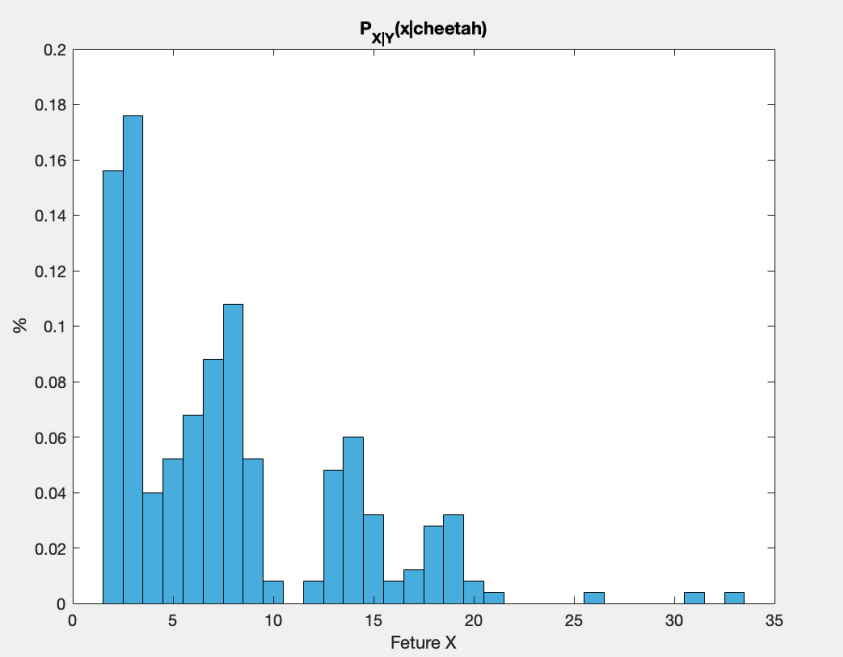
Question b

Firstly, I tried to find the second largest index of the data in TrainingSamplesDCT_8.mat, which were so-called features. And then I plotted the histogram based on the probability of the features.





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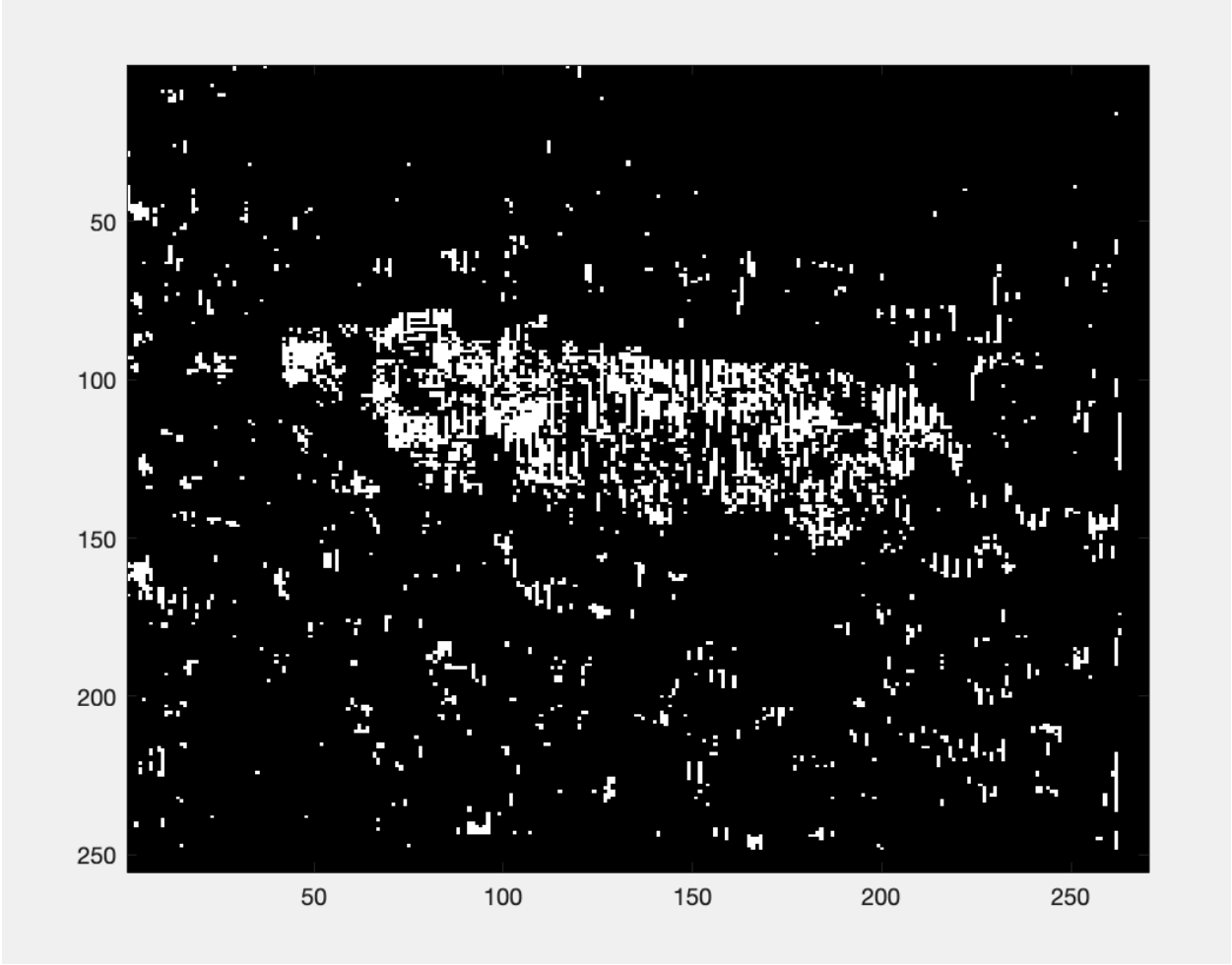
Question c

First, I used sliding window to capture pixels into a 8*8 window from the upper-left cornet, moving one pixel each step.

And then I utilized the Zig-Zag Pattern to rearrange the data from 8*8 to 1*64, separately. I found the feature index and applied loss function to determine which was cheetah and which was grass.

Finally, the figure was plotted below.



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Question d

I assumed that if the data in Seg (the one I plotted in question c and Imask (the one provided) were different, them would be regraded as error. So I could count the pixels that were different in the two matrix.

The result showed that error was 0.1690.

Table of Contents

Bolin He

Oct 14,2019

```
clear all;
clc;
```

Question a

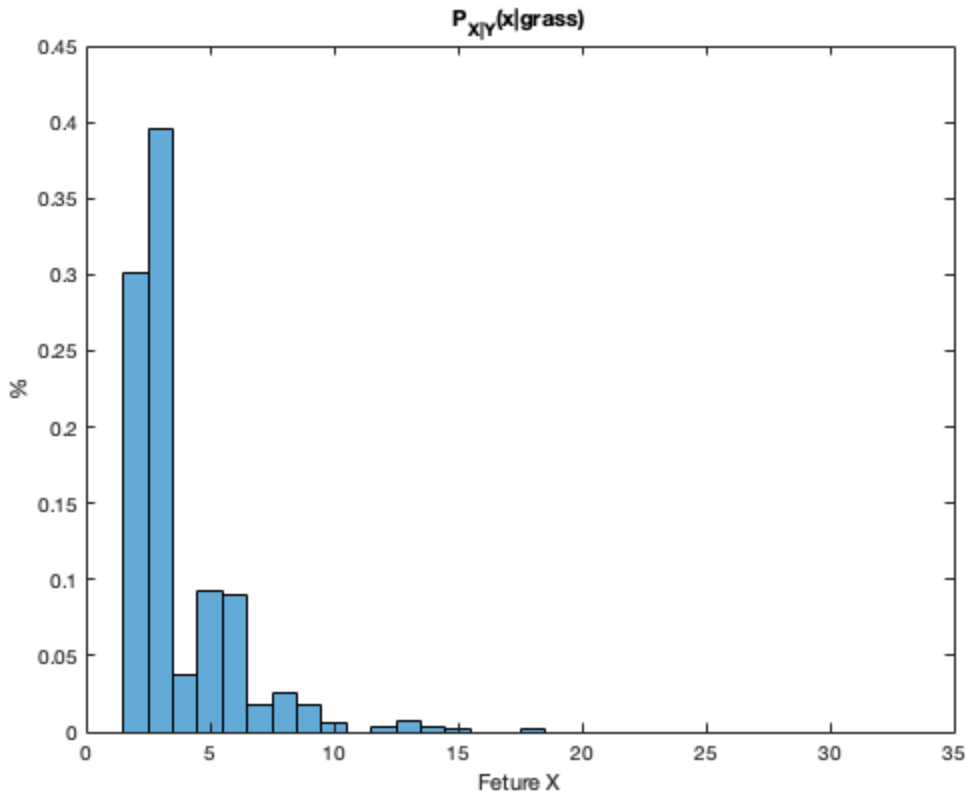
```
load('TrainingSamplesDCT_8.mat');
TB = TrainsampleDCT_BG;
[xtb,ytb] = size(TB);

TF = TrainsampleDCT_FG;
[xtf,ytf] = size(TF);

PY = xtf/(xtf+xtb) % cheetah
PX = xtb/(xtf+xtb) % grass
```

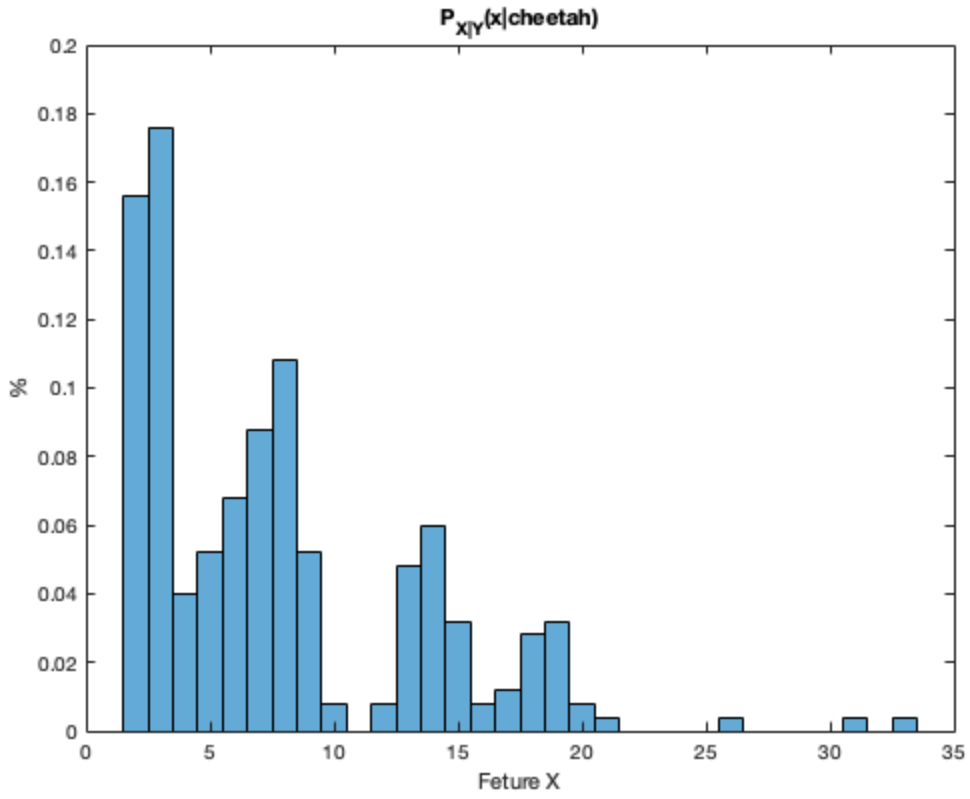
```
PY =

    0.1919


PX =

    0.8081
```

Question b

```
% Find the second largest index
row = 0;
col = 0;
for a = 1:xtb
    [row,col] = max(TB(a,2:end));
    XB(a) = col+1;
end
```

```
row2 = 0;
col2 = 0;
for b = 1:xtf
    [row2,col2] = max(TF(b,2:end));
    XF(b) = col2+1;
end

% Plot the histogram
figure(1)
histogram(XB,'Normalization','probability')
axis([0 35 0 0.45])
title('P_X_|_Y(x|grass)')
xlabel("Feture X")
ylabel("%")

figure(2)
histogram(XF,'Normalization','probability')
axis([0 35 0 0.2])
title('P_X_|_Y(x|cheetah)')
xlabel("Feture X")
ylabel("%")
```



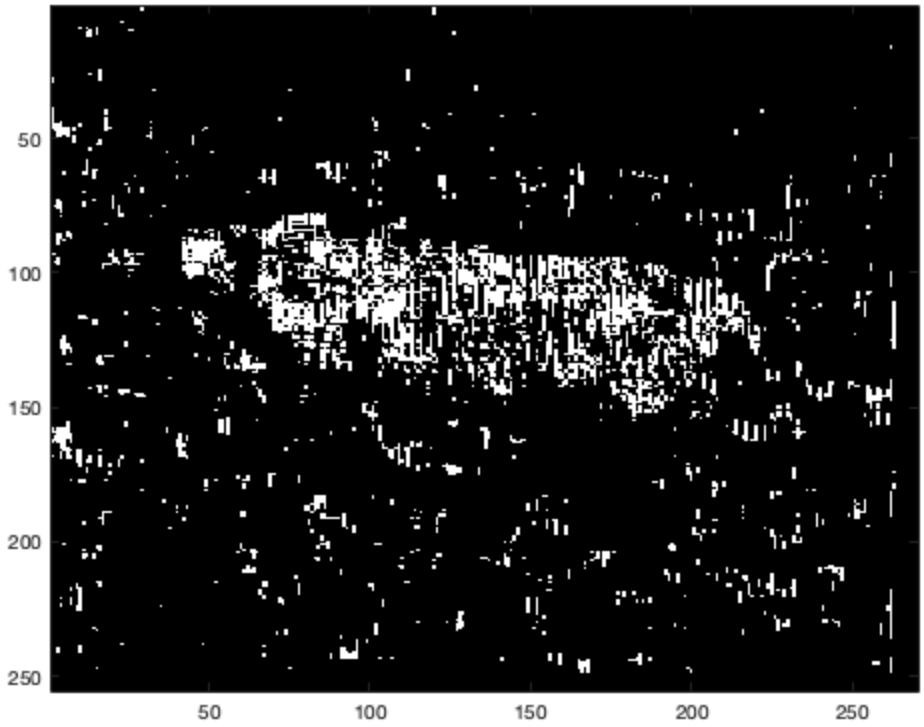


Question c

Load data

```
Imask = imread('cheetah.bmp');
Imask = im2double(Imask);
ZZ = load('Zig-Zag Pattern.txt');
ZZ = ZZ+1;

[x,y] = size(Imask);

% Using sliding window to rearrange data
count = 1;
    for i=1:x-7
      for j=1:y-7
                SW = Imask(i:i+7,j:j+7);
                T = dct2(SW);
                T = abs(T);
                T(1) = 0;
                Rearrange(ZZ) = T;
                Rearrange2(count,:) = Rearrange;
                count = count+1;
        end
    end

[x2,y2] = size(Rearrange2);
```

```
% Find the feature X
for k = 1:x2
    [x3,y3] = max(Rearrange2(k,:));
    X(k) = y3;
end

% Loss function calculation
[numF,orderF] = hist(XF,1:64);
[numB,orderB] = hist(XB,1:64);
count2 = 1;
for p = 1:64
    if PY*numF(p)/250 > PX*numB(p)/1053
       Compare(count2) = p;
       count2 = count2+1 ;
    end
end

% Create figure
count3 = 1;
Seg(255,270)=0;
for i=1:x-7
    for j=1:y-7
        if ismember(X(count3),Compare)
            Seg(i,j) = 1;
        else
            Seg(i,j) = 0;
        end
        count3 = count3 + 1;
    end
end

figure(3);
imagesc(Seg)
colormap(gray(255))
```



Question d

```
Imask = imread('cheetah_mask.bmp');
Imask = im2double(Imask);

% If the data in Seg and Imask are different, we define them as error.
% Count the pixels that are different in two matrix.
count4 = 1;
for i = 1:x
    for j =1:y
        if Seg(i,j) ~= Imask(i,j)
           count4 = count4 + 1;
        end
    end
end

error = count4/(x*y)
```

```
error =

    0.1690
```

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