IT 542: Pattern Recognition and Machine Learning

Assignment 2

ID:201916006

Name- Mayank Sharma

(1) Draw 200 samples each from N(10,20) and N(20,25). From these samples calculate sample means and sample variances. Consider these as the parameters for two new Gaussian distributions. Consider the apriori probabilities as (0.5,0.5), (0.3,0.7) and (0.7,0.3).Draw 40 random numbers from [5,20]. Classify each of these random numbers as sample from one of the two Gaussian distributions obtained from samples using three sets of apriori probabilities.

Code:

```
from scipy.stats import norm
import matplotlib.pyplot as plt
import numpy as np
mu1,mu2,sigma1,sigma2=10,20,20,25
s1 = np.random.normal(mu1, sigma1, 200)
s2 = np.random.normal(mu2, sigma2, 200)
# Calclulating sample means
smu1=s1.mean()
smu2=s2.mean()
ssigma1=s1.var()
ssigma2=s2.var()
random_nos= np.random.randint(5, 20, 40)
pdf1=1/(ssigma1*np.sqrt(2*np.pi))*np.exp(-(random_nos-smu1)**2/(2*ssigma1**2))
pdf2=1/(ssigma2*np.sqrt(2*np.pi))*np.exp(-(random_nos-smu2)**2/(2*ssigma2**2))
p1,p2=0.5,0.5
p3,p4=0.3,0.7
p5,p6=0.7,0.3
set1=[]
set2=[]
set3=[]
for i,j in zip(pdf1,pdf2):


  A=i*p1
  B=j*p2
```

```
    C=i*p3
    D=j*p4
    E=i*p5
    F=j*p6
    if(A>=B):
        set1.append('class:pdf1')
    else:
        set1.append('class:pdf2')
    if(C>=D):
        set2.append('class:pdf1')
    else:
        set2.append('class:pdf2')
    if(E>=F):
        set3.append('class:pdf1')
    else:
        set3.append('class:pdf2')
print('Classes of 40 Samples using '+str(p1)+','+str(p2)+' as apriori probabilities:\n',*set1,sep='\n')
print('\n')
print('Classes of 40 Samples using '+str(p3)+','+str(p4)+' as apriori probabilities:\n',*set2,sep='\n')
print('\n')
print('Classes of 40 Samples using '+str(p5)+','+str(p6)+' as apriori probabilities:\n',*set3,sep='\n')
```

Output:

```
Classes of 40 Samples using 0.5,0.5 as apriori probabilities:

class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
```

class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1

Classes of 40 Samples using 0.3,0.7 as apriori probabilities:

class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2
class:pdf2

Classes of 40 Samples using 0.7,0.3 as apriori probabilities:

class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1

class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1
class:pdf1