*#program 5*

**import** **numpy** **as** **np**

**import** **pandas** **as** **pd**

*#creating a dataset*

data = pd.DataFrame()

*#creating target variable*

data['Gender'] = ['male','male','male','male','female','female','female','female']

*#creating our feature variables*

data['Height'] = [6,5.92,5.58,5.92,5,5.5,5.42,5.75]

data['Weight'] = [180,190,170,165,100,150,130,150]

data['Foot\_Size'] = [12,11,12,10,6,8,7,9]

*#view the data*

print("**\n** Dataset")

print("")

print(data)

*#create an empty data frame*

person = pd.DataFrame()

*#creating some feature values for this single row*

person['Height'] = [5]

person['Weight'] = [130]

person['Foot\_Size'] = [6]

*#view the data*

print('**\n** Test Instance: ')

print(" ")

print(person)

n\_male = data['Gender'][data['Gender'] == 'male'].count()

n\_male

n\_female = data['Gender'][data['Gender'] == 'female'].count()

n\_female

*#total rows*

total\_ppl = data['Gender'].count()

total\_ppl

*#no of males divided by the total rows*

p\_male = n\_male / total\_ppl *#(4/8)*

p\_male

p\_female = n\_female / total\_ppl *#(4/8)*

p\_female

*# group the data by gender & calculate the means of each feature*

*# for eg - height = (6+5.92+5.58+5.92) / 4*

data\_means = data.groupby('Gender').mean()

data\_means

*#calculate of mean*

print('**\n** Dataset Mean')

print(" ")

print(data\_means)

*# calculate the data variance*

*# variance = summation of((mean - x) \*\* 2) / n*

data\_variance = data.groupby('Gender').var()

print(data\_variance)

*#mean for male*

male\_height\_mean = data\_means['Height'][data\_means.index == 'male'].values[0]

male\_weight\_mean = data\_means['Weight'][data\_means.index == 'male'].values[0]

male\_footsize\_mean = data\_means['Foot\_Size'][data\_means.index == 'male'].values[0]

print("male\_height\_mean: ", male\_height\_mean)

print("male\_weight\_mean: ", male\_weight\_mean)

print("male\_footsize\_mean: ", male\_footsize\_mean)

*#variance for male*

male\_height\_variance = data\_variance['Height'][data\_variance.index == 'male'].values[0]

male\_weight\_variance = data\_variance['Weight'][data\_variance.index == 'male'].values[0]

male\_footsize\_variance = data\_variance['Foot\_Size'][data\_variance.index == 'male'].values[0]

print("male\_height\_variance: ",male\_height\_variance)

print("male\_weight\_variance: ",male\_weight\_variance)

print("male\_footsize\_variance: ",male\_footsize\_variance)

*# for female now*

*# mean for female*

female\_height\_mean = data\_means['Height'][data\_means.index == 'female'].values[0]

female\_weight\_mean = data\_means['Weight'][data\_means.index == 'female'].values[0]

female\_footsize\_mean = data\_means['Foot\_Size'][data\_means.index == 'female'].values[0]

print("female\_height\_mean: ", female\_height\_mean)

print("female\_weight\_mean: ", female\_weight\_mean)

print("female\_footsize\_mean: ", female\_footsize\_mean)

*#variance for female*

female\_height\_variance = data\_variance['Height'][data\_variance.index == 'female'].values[0]

female\_weight\_variance = data\_variance['Weight'][data\_variance.index == 'female'].values[0]

female\_footsize\_variance = data\_variance['Foot\_Size'][data\_variance.index == 'female'].values[0]

print("female\_height\_variance: ",female\_height\_variance)

print("female\_weight\_variance: ",female\_weight\_variance)

print("female\_footsize\_variance: ",female\_footsize\_variance)

*# create a function which calculates p(x|y)*

**def** p\_x\_given\_y(x,mean\_y, variance\_y):

*#input the arguments into a probability density function*

p = 1/(np.sqrt(2\*np.pi\*variance\_y))\* np.exp((-(x-mean\_y) \*\* 2)/(2\*variance\_y))

**return** p

*# numerator of the posterior if the unclassified observation is a male*

print('**\n** Probability male: ')

prob\_male = p\_male\*p\_x\_given\_y(person['Height'][0],male\_height\_mean,male\_height\_variance)\* p\_x\_given\_y(person['Weight'][0],male\_weight\_mean,male\_weight\_variance)\* p\_x\_given\_y(person['Foot\_Size'][0],male\_footsize\_mean,male\_footsize\_variance)

print(prob\_male)

print('**\n** Probability female: ')

prob\_female = p\_female\*p\_x\_given\_y(person['Height'][0],female\_height\_mean,female\_height\_variance)\* p\_x\_given\_y(person['Weight'][0],female\_weight\_mean,female\_weight\_variance)\* p\_x\_given\_y(person['Foot\_Size'][0],female\_footsize\_mean,female\_footsize\_variance)

print(prob\_female)

**if**(prob\_male > prob\_female):

print("target label: Male")

**else**:

print("target label: Female")