PROGRAM 1:

```
# Step 1 : Importing dataset and libraries
import csv
a = []
with open('enjoysport.csv','r') as csvfile:
    for i in csv.reader(csvfile):
        a.append(i)

# Step 2 : Finding total no. of attributes and decalring initial hypothesis
num_attribute = len(a[0]) - 1
hypothesis = ['0']*num_attribute

# Step 3 : Main Algorithm
print("Initial Hypothesis, H0 : ")
print(hypothesis)

for i in range(0,len(a)):
    if (a[i][num_attribute] == 'yes'):
        print("\nInstance ", i+1, "is", a[i], "is +ve")

        for j in range(0,num_attribute):
            if (hypothesis[j] == '0' or hypothesis[j] == a[i][j]):
                hypothesis[j] = a[i][j]
            else :
                hypothesis[j] = '?'
        print("Hypothesis " , i+1 , " : ", hypothesis)
        print()
    elif(a[i][num_attribute] == 'no'):
        print("\nInstance ", i+1, "is", a[i], "is -ve ")
print()
print("The maximally specific hypothesis is : ")
print(hypothesis)
```

OUTPUT:

```
Initial Hypothesis, H0 :
['0', '0', '0', '0', '0', '0']

Instance  1 is ['sunny', 'warm', 'normal', 'strong', 'warm', 'same', 'yes'] is +ve
Hypothesis  1  :  ['sunny', 'warm', 'normal', 'strong', 'warm', 'same']


Instance  2 is ['sunny', 'warm', 'high', 'strong', 'warm', 'same', 'yes'] is +ve
Hypothesis  2  :  ['sunny', 'warm', '?', 'strong', 'warm', 'same']


Instance  3 is ['rainy', 'cold', 'high', 'strong', 'warm', 'change', 'no'] is -ve

Instance  4 is ['sunny', 'warm', 'high', 'strong', 'cool', 'change', 'yes'] is +ve
Hypothesis  4  :  ['sunny', 'warm', '?', 'strong', '?', '?']


The maximally specific hypothesis is :
['sunny', 'warm', '?', 'strong', '?', '?']
```

PROGRAM 2:

```
### Step 1 : Importing necessary libraries and dataset
import csv
a = []


with open('enjoysport.csv','r') as dataset:
    reader = csv.reader(dataset)
    for row in reader:
        a.append(row).
        print(row)
num_attributes = len(a[0]) - 1


### Step 2 : Declaring initial hypothesis - general and specific
s = ['0'] * num_attributes
g = ['?'] * num_attributes


print("Most Specific hypothesis S0 : " + str(s))
print("Most General hypothesis G0 : " + str(g))
### Step 3 : Creating a version space
It will contain the final valid hypothesis for the given data.
version_space = []
### Step 4 : Writing the main algorithm
for i in range(0,len(a)):
    if(a[i][num_attributes] == 'yes'):
        print("Instance " + str(i+1) + " +ve ")
        for j in range(0,num_attributes):
            if (s[j] == '0' or s[j] == a[i][j]):
                s[j] = a[i][j]
            else:
                s[j] = '?'
        for j in range(0,num_attributes):
            for k in range(1,len(version_space)):
```

```
            if(version_space[k][j] != '?' and version_space[k][j]!=s[j]):
                del version_space[k]
        print("S" + str(i+1) , s)
        print("G" + str(i+1) , version_space)
    if(a[i][num_attributes] == 'no'):
        print("Instance " + str(i+1) + " -ve ")
        print("S" + str(i+1),s)
        print("G" + str(i+1))
        for j in range(0,num_attributes):
            if(s[j]!=a[i][j] and s[j] !='?'):
                g[j] = s[j]
                #appending the generic hypothesis
                version_space.append(g)
                #resetting the generic hypothesis to [?,?,?,?,?,?]
                g = ['?']*num_attributes
        print(version_space)
    print()

# appending the specific hypothesis
version_space.append(s)
print()
print("Final Version Space : " , version_space)
```

OUTPUT:

```
Instance 1 +ve
S1 ['sunny', 'warm', 'normal', 'strong', 'warm', 'same']
G1 []

Instance 2 +ve
S2 ['sunny', 'warm', '?', 'strong', 'warm', 'same']
G2 []

Instance 3 -ve
S3 ['sunny', 'warm', '?', 'strong', 'warm', 'same']
G3
[['sunny', '?', '?', '?', '?', '?'], ['?', 'warm', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', 'same']]

Instance 4 +ve
S4 ['sunny', 'warm', '?', 'strong', '?', '?']
G4 [['sunny', '?', '?', '?', '?', '?'], ['?', 'warm', '?', '?', '?', '?']]


Final Version Space :  [['sunny', '?', '?', '?', '?', '?'], ['?', 'warm', '?', '?', '?', '?'], ['sunny', 'warm', '?', 'strong', '?', '?']]
```

PROGRAM 4:

```
import numpy as np
X = np.array(([2,9],[1,5],[3,6]), dtype = float)
Y = np.array(([92],[86],[89]), dtype = float)

X = X/np.amax(X,axis = 0)
Y = Y/100

def sigmoid(x):
   return 1/(1 + np.exp(-x))
def sigmoid_grad(x):
   return x*(1-x)
epoch = 1000
eta = 0.2
input_neurons = 2
hidden_neurons = 3
output_neurons = 1
wh = np.random.uniform(size=(input_neurons,hidden_neurons))
bh = np.random.uniform(size=(1,hidden_neurons))

wout = np.random.uniform(size = (hidden_neurons,output_neurons))
bout = np.random.uniform(size=(1,output_neurons))
for i in range(epoch):
   h_ip = np.dot(X,wh) + bh
   h_act = sigmoid(h_ip)
   o_ip = np.dot(h_act,wout) + bout
   output = sigmoid(o_ip)

   Eo = Y - output
   outgrad = sigmoid_grad(output)
   d_output = Eo*outgrad
```

```
    Eh = d_output.dot(wout.T)
    hiddengrad = sigmoid_grad(h_act)
    d_hidden = Eh * hiddengrad

    wout += h_act.T.dot(d_output)*eta
    wh+=X.T.dot(d_output)*eta

print("Normalized Input : \n", str(X))
print("Actual Output : \n", str(Y))
print("Predicted Output \n: ", output)
```

OUTPUT:

```
Normalized Input :
 [[0.66666667 1.        ]
 [0.33333333 0.55555556]
 [1.         0.66666667]]
Actual Output :
 [[0.92]
 [0.86]
 [0.89]]
Predicted Output
:  [[0.89787544]
 [0.8758127 ]
 [0.89648915]]
```

PROGRAM 5:

```
### Step 1 : Importing Library and dataset
import math as m
result = [[9.2,85,8,"pass"],
        [8,80,7,"pass"],
        [8.5,81,8,"pass"],
        [6,45,5,"fail"],
        [6.5,50,4,"fail"],
        [8.2,72,7,"pass"],
        [5.8,38,5,"fail"],
        [8.9,91,9,"pass"]]
g = [7.6,60,8]
k = int(input("Enter K : "))
no_attr = len(result[0]) - 1
distance = []
### Step 3 : Finding distances
for i in range(0,len(result)):
    x = 0
    for j in range(0,no_attr):
        x = x + m.pow(g[j]- result[i][j], 2)
    #we append the distances of every instance on the main list(result) to use it in future
    result[i].append(m.sqrt(x))
    distance.append(m.sqrt(x))
# we sort the distance list to find the nearest k distances
distance.sort()
### Step 4  : Finding nearest distances
NN = []
pass_ = 0
fail_ = 0
```

```
for i in range(0,k):
    NN.append(distance[i])


for j in range(0,k):
    for i in range(0,len(result)):
        if(result[i][len(result[0]) - 1] == NN[j]):
            if(result[i][len(result[0]) - 2] == "pass"):
                pass_ = pass_ + 1
            else:
                fail_ = fail_ + 1
### Step 5 : Printing the nearest neighbours and result
print("Nearest Neighbours (distances): " + str(NN))


if(pass_ > fail_ ):
    print("Outcome : Pass")
else:
    print("Outcome : Fail")
```

OUTPUT:

```
Nearest Neighbours (distances): [10.82635672791175,
12.056533498481228, 15.380507143784303,
20.028979005431108, 21.01927686672403]
Outcome : Pass
```

PROGRAM 6:

```
import csv
a = []
with open('play_tennis.csv','r') as dataset:
   for i in csv.reader(dataset):
      a.append(i)
a.pop(0)
print(a)
case = []
no_attributes = len(a[0]) - 2

for i in range(0,no_attributes):
   x = input("Attribute " + str(i+1))
   case.append(x)

print("The given case is : " + str(case))
positive = 0
negative = 0

# finding positive and negative instances

for i in range(0,len(a)):
   if(a[i][len(a[i]) - 1] == "Yes"):
      positive = positive + 1
   if(a[i][len(a[i]) - 1] == "No"):
      negative = negative + 1

print(positive)
print(negative)
#finding positive and negative probabilities
prob_pos = positive/len(a)
prob_neg = negative/len(a)
```

```
NB_pos = prob_pos
NB_neg = prob_neg


j = 1
count_pos = 0
count_neg = 0


for i in range(1,no_attributes+1):
   count_pos = 0
   count_neg = 0
   for j in range(0,len(a)):
      if case[i-1] in a[j]:
         if(a[j][len(a[0])-1] == "Yes"):
            count_pos = count_pos + 1
         if(a[j][len(a[0])-1] == "No"):
            count_neg = count_neg + 1
   # print(count_pos,count_neg)
   x = count_pos/positive
   y = count_neg/negative


   NB_pos = NB_pos * x
   NB_neg = NB_neg * y
if(NB_pos > NB_neg) :
   print(str(case) + " corresponds to YES")
else:
   print(str(case) + "corresponds to NO")
```

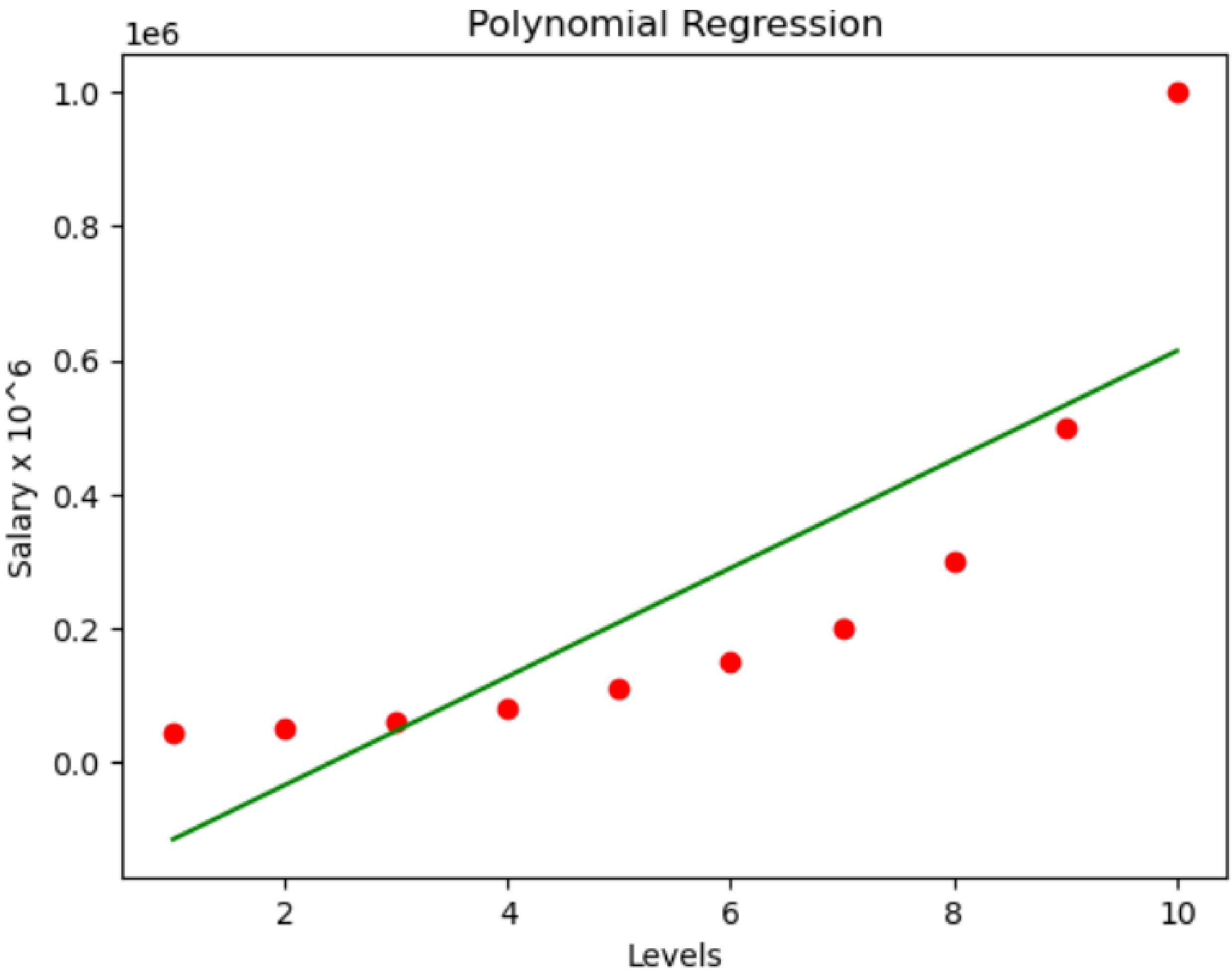
OUTPUT :

```
['Sunny', 'Cool', 'Normal', 'Strong'] corresponds to
YES
```

PROGRAM 7:

```
import matplotlib.pyplot as plt
from scipy import stats
import pandas as pd

dataset = pd.read_csv('Position_Salaries.csv')
x = dataset.iloc[:,1].values
y = dataset.iloc[:, -1].values

print("levels :", x)
print("Salaries : ", y)

std_err = stats.linregress(x,y)

def myfunc(x):
   return slope*x + intercept

mymodel = list(map(myfunc, x))

plt.scatter(x,y)
plt.plot(x,mymodel)
plt.title('Salary vs Experience')
plt.xlabel('Years of experience')
plt.ylabel('Salary')
plt.show()
```

OUTPUT:

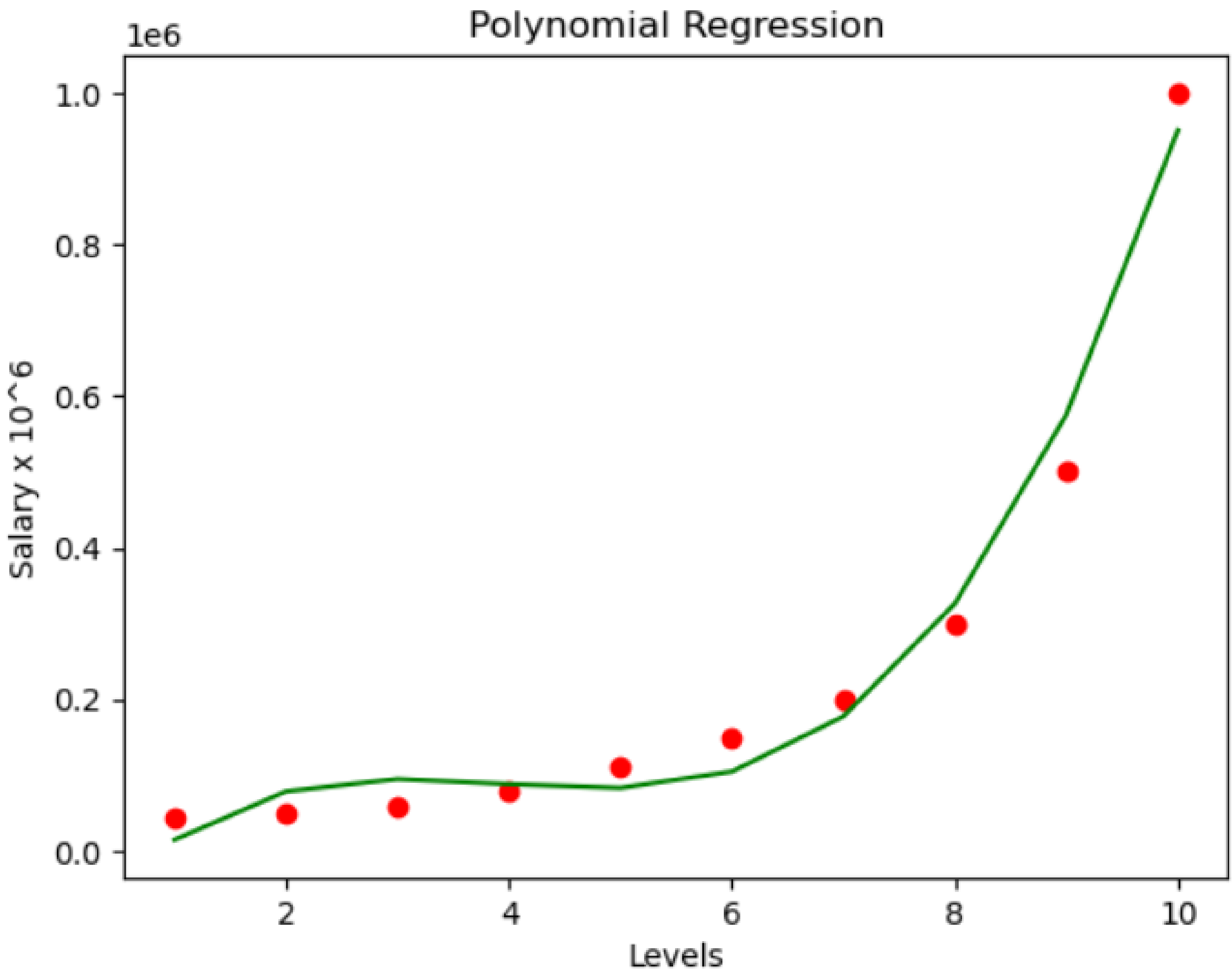


Polynomial Regression
1e6
1.0
0.8
0.6
0.4
0.2
0.0
Salary x 10^6
2
4
6
8
10
Levels

PROGRAM 8:

```
import numpy as np

import matplotlib.pyplot as plt

import pandas as pd


datas = pd.read_csv('Position_Salaries.csv')

x = datas.iloc[:, 1:2].values

y = datas.iloc[:, 2].values

from sklearn.linear_model import LinearRegression

lin = LinearRegression()


lin.fit(x, y)


from sklearn.preprocessing import PolynomialFeatures


poly = PolynomialFeatures(degree = 3)

x_poly = poly.fit_transform(x)


poly.fit(x_poly,y)

lin = LinearRegression()

lin.fit(x_poly,y)


plt.scatter(x,y,color= 'red')


plt.plot(x, lin.predict(poly.fit_transform(x)), color = 'green')

plt.title('Polynomial Regression')

plt.xlabel('Levels')

plt.ylabel('Salary x 10^6')


plt.show()
```

OUTPUT:



Polynomial Regression
1e6
1.0
0.8
0.6
0.4
0.2
0.0
Salary x 10^6
2
4
6
8
10
Levels

PROGRAM 9:

```
import numpy as np

import pandas as pd

dataset = pd.read_csv("breastcancer.csv")

x = dataset.iloc[:,:-1].values

y = dataset.iloc[:,-1].values

from sklearn.model_selection import train_test_split

x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.30,random_state = 2)

from sklearn.preprocessing import StandardScaler

sc = StandardScaler()

x_train = sc.fit_transform(x_train)

x_test = sc.transform(x_test)

from sklearn.linear_model import LogisticRegression

classifier = LogisticRegression(random_state = 0)

classifier.fit(x_train, y_train)


LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
          intercept_scaling=1, l1_ratio=None, max_iter=100,
          multi_class='warn', n_jobs=None, penalty='l2',
          random_state=0, solver='warn', tol=0.0001, verbose=0,
          warm_start=False)

from sklearn.metrics import confusion_matrix, accuracy_score

y_pred = classifier.predict(x_test)

cm = confusion_matrix(y_test, y_pred)

print(cm)

accuracy_score(y_test, y_pred)
```

OUTPUT:

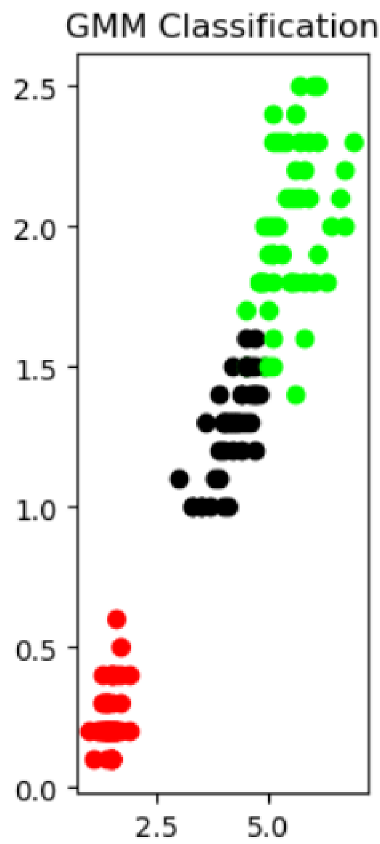
```
[[117   8]
 [  6  74]]

0.9317073170731708
```

PROGRAM 10:

```
from sklearn.cluster import KMeans
from sklearn.mixture import GaussianMixture
import sklearn.metrics as metrics
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

names = ['Sepal_Length','Sepal_Width','Petal_Length','Petal_Width', 'Class']
dataset = pd.read_csv("IRIS.csv")
X = dataset.iloc[:, :-1]
label = {'Iris-setosa': 0,'Iris-versicolor': 1, 'Iris-virginica': 2}
y = [label[c] for c in dataset.iloc[:, -1]]
plt.figure(figsize=(14,7))
colormap=np.array(['red','lime','black'])

plt.subplot(1,3,1)
plt.title('Real')
plt.scatter(X.petal_length,X.petal_width,c=colormap[y])

gmm=GaussianMixture(n_components=3, random_state=0).fit(X)
y_cluster_gmm=gmm.predict(X)
plt.subplot(1,3,3)
plt.title('GMM Classification')
plt.scatter(X.petal_length,X.petal_width,c=colormap[y_cluster_gmm])
print('The accuracy score of EM: ',metrics.accuracy_score(y, y_cluster_gmm))
print('The Confusion matrix of EM:\n ',metrics.confusion_matrix(y, y_cluster_gmm))
```

OUTPUT:

```
The accuracy score of EM:  0.36666666666666664
The Confusion matrix of EM:
  [[50  0  0]
 [ 0  5 45]
 [ 0 50  0]]
```



PROGRAM 11:

```
import pandas as pd

import numpy as np

import plotly.express as px

import plotly.graph_objects as go

import plotly.io as pio

pio.templates.default = "plotly_white"


data = pd.read_csv("CREDITSCORE.csv")

print(data.head())


print(data.info())


from sklearn.model_selection import train_test_split

x = np.array(data[["Annual_Income", "Monthly_Inhand_Salary",

              "Num_Bank_Accounts", "Num_Credit_Card",

              "Interest_Rate", "Num_of_Loan",

              "Delay_from_due_date", "Num_of_Delayed_Payment",

              "Credit_Mix", "Outstanding_Debt",

              "Credit_History_Age", "Monthly_Balance"]])

y = np.array(data[["Credit_Score"]])


xtrain, xtest, ytrain, ytest = train_test_split(x, y,

                                                test_size=0.33,

                                                random_state=42)

from sklearn.ensemble import RandomForestClassifier

model = RandomForestClassifier()

model.fit(xtrain, ytrain)


print("Credit Score Prediction : ")

a = float(input("Annual Income: "))

b = float(input("Monthly Inhand Salary: "))

c = float(input("Number of Bank Accounts: "))

d = float(input("Number of Credit cards: "))
```

```
e = float(input("Interest rate: "))
f = float(input("Number of Loans: "))
g = float(input("Average number of days delayed by the person: "))
h = float(input("Number of delayed payments: "))
i = input("Credit Mix (Bad: 0, Standard: 1, Good: 3) : ")
j = float(input("Outstanding Debt: "))
k = float(input("Credit History Age: "))
l = float(input("Monthly Balance: "))


features = np.array([[a, b, c, d, e, f, g, h, i, j, k, l]])
print("Predicted Credit Score = ", model.predict(features))
```

OUTPUT :

```
Credit Score Prediction :
Annual Income: 19114.12
Monthly Inhand Salary: 1824.843333
Number of Bank Accounts: 2
Number of Credit cards: 2
Interest rate: 9
Number of Loans: 2
Average number of days delayed by the person: 12
Number of delayed payments: 3
Credit Mix (Bad: 0, Standard: 1, Good: 3) : 3
Outstanding Debt: 250
Credit History Age: 200
Monthly Balance: 310
Predicted Credit Score =  ['Good']
```

PROGRAM 12 :

```
# Importing libraries and functions
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
iris = pd.read_csv("IRIS.csv")

# Dataset Exploration
print(iris.head())
print()
print(iris.describe())

# Identifying the unique values of the result.
print("Target Labels", iris["species"].unique())

import plotly.io as io
import plotly.express as px
fig = px.scatter(iris, x="sepal_width", y="sepal_length", color="species")
fig.show()

#Seggregating dataset
x = iris.drop("species", axis=1)
y = iris["species"]
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y,test_size=0.2,random_state=0)

from sklearn.neighbors import KNeighborsClassifier
knn = KNeighborsClassifier(n_neighbors=1)
knn.fit(x_train, y_train)

x_new = np.array([[6, 2.9, 1, 0.2]])
prediction = knn.predict(x_new)
print("Prediction: {}".format(prediction))
```

OUTPUT:

```
Prediction: ['Iris-setosa']
```

PROGRAM 13:

#Importing packages and functions

```
import numpy as np

import pandas as pd

import matplotlib.pyplot as plt

import seaborn as sns

from sklearn.model_selection import train_test_split

from sklearn.tree import DecisionTreeRegressor
```

#Importing the dataset

```
data = pd.read_csv("CarPrice.csv")
```

#Data Exploration

```
data.head()

data.shape

data.isnull().sum() #Checking if the dataset has NULL Values

data.info()

data.describe()

data.CarName.unique()
```

#Analysing correlations & using heatmap

```
print(data.corr())

plt.figure(figsize=(20, 15))

correlations = data.corr()

sns.heatmap(correlations, cmap="coolwarm", annot=True)

plt.show()
```

#Training a Car Price Prediction Model

```
predict = "price"

data = data[["symboling", "wheelbase", "carlength",

        "carwidth", "carheight", "curbweight",

        "enginesize", "boreratio", "stroke",

        "compressionratio", "horsepower", "peakrpm",
```

```
            "citympg", "highwaympg", "price"]]
x = np.array(data.drop([predict], 1))
y = np.array(data[predict])

from sklearn.model_selection import train_test_split
xtrain, xtest, ytrain, ytest = train_test_split(x, y, test_size=0.2)

from sklearn.tree import DecisionTreeRegressor
model = DecisionTreeRegressor()
model.fit(xtrain, ytrain)
predictions = model.predict(xtest)

from sklearn.metrics import mean_absolute_error
model.score(xtest, predictions)
```

OUTPUT:

```
1.0
```

PROGRAM 14:

#Importing Libraries and functions

```
import pandas as pd

import matplotlib.pyplot as plt

import seaborn as sns
```

#Importing Dataset

```
dataset = pd.read_csv("HousePricePrediction.csv")
```

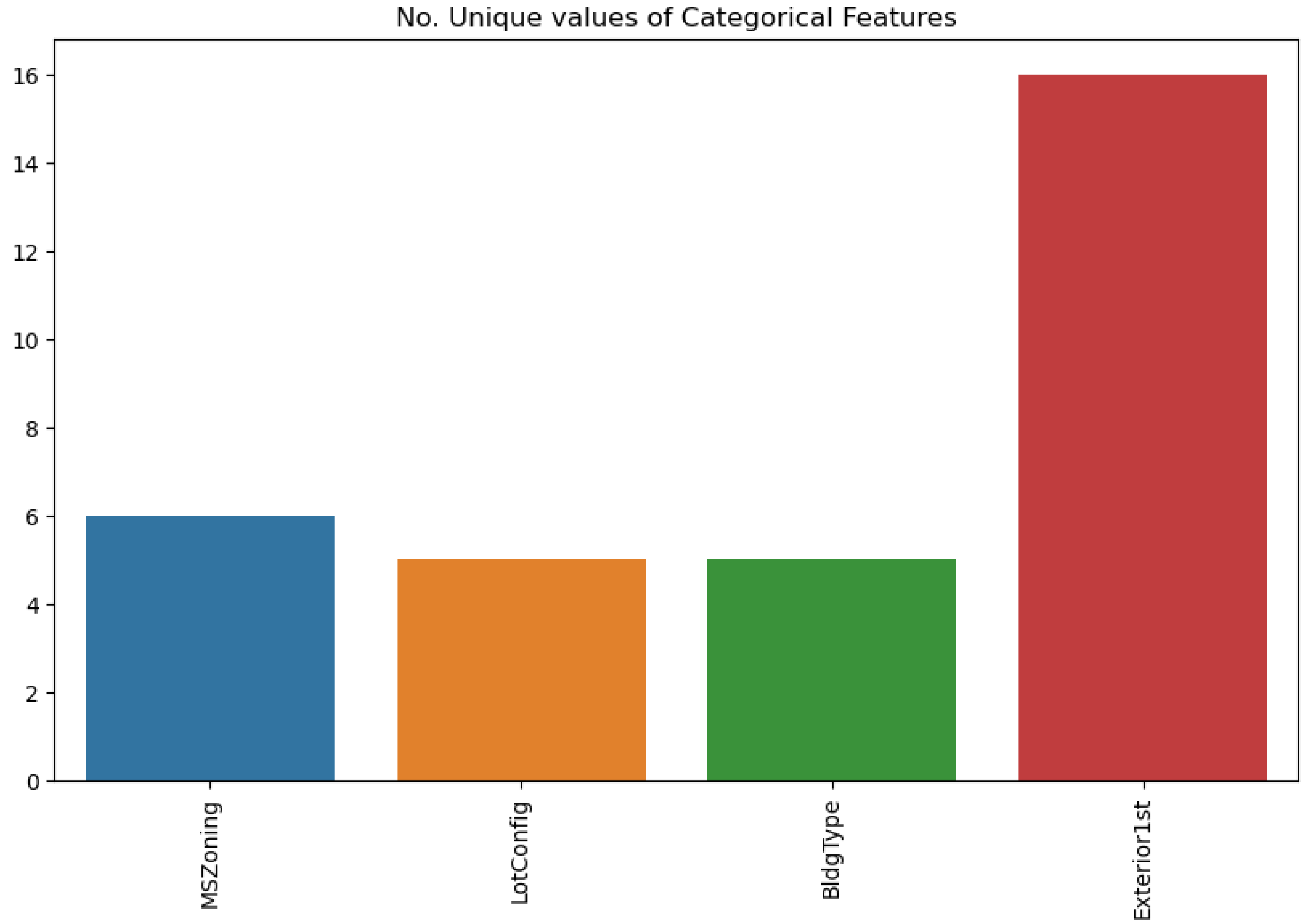
#Exploring dataset

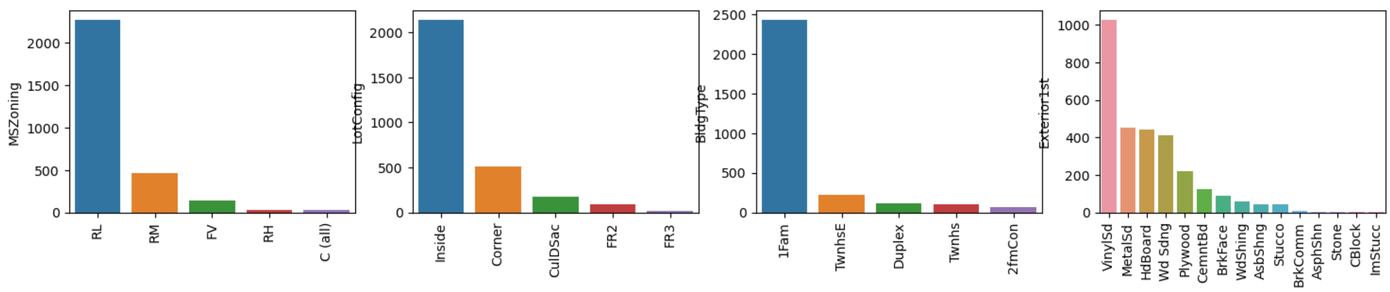
```
print(dataset.head(5))

dataset.shape

obj = (dataset.dtypes == 'object')

object_cols = list(obj[obj].index)

print("Categorical variables:",len(object_cols))


int_ = (dataset.dtypes == 'int')

num_cols = list(int_[int_].index)

print("Integer variables:",len(num_cols))


fl = (dataset.dtypes == 'float')

fl_cols = list(fl[fl].index)

print("Float variables:",len(fl_cols))


plt.figure(figsize=(12, 6))

sns.heatmap(dataset.corr(),

        cmap = 'BrBG',

        fmt = '.2f',

        linewidths = 2,

        annot = True)


unique_values = []

for col in object_cols:

        unique_values.append(dataset[col].unique().size)

        plt.figure(figsize=(10,6))

plt.title('No. Unique values of Categorical Features')
```

```
plt.xticks(rotation=90)
sns.barplot(x=object_cols,y=unique_values)

plt.figure(figsize=(18, 36))
plt.title('Categorical Features: Distribution')
plt.xticks(rotation=90)
index = 1

for col in object_cols:
	y = dataset[col].value_counts()
	plt.subplot(11, 4, index)
	plt.xticks(rotation=90)
	sns.barplot(x=list(y.index), y=y)
	index += 1
dataset.drop(['Id'],axis=1,inplace=True)
dataset['SalePrice'] = dataset['SalePrice'].fillna(dataset['SalePrice'].mean())
new_dataset = dataset.dropna()
new_dataset.isnull().sum()

from sklearn.preprocessing import OneHotEncoder
s = (new_dataset.dtypes == 'object')
object_cols = list(s[s].index)
print("Categorical variables:")
print(object_cols)
print('No. of. categorical features: ',len(object_cols))

OH_encoder = OneHotEncoder(sparse=False)
OH_cols = pd.DataFrame(OH_encoder.fit_transform(new_dataset[object_cols]))
OH_cols.index = new_dataset.index
OH_cols.columns = OH_encoder.get_feature_names()
df_final = new_dataset.drop(object_cols, axis=1)
df_final = pd.concat([df_final, OH_cols], axis=1)
from sklearn.metrics import mean_absolute_error
from sklearn.model_selection import train_test_split
```

```
X = df_final.drop(['SalePrice'], axis=1)
Y = df_final['SalePrice']

X_train, X_valid, Y_train, Y_valid = train_test_split(X, Y, train_size=0.8, test_size=0.2, random_state=0)

from sklearn import svm
from sklearn.svm import SVC
from sklearn.metrics import mean_absolute_percentage_error

model_SVR = svm.SVR()
model_SVR.fit(X_train,Y_train)
Y_pred = model_SVR.predict(X_valid)

print(mean_absolute_percentage_error(Y_valid, Y_pred))

#LinearRegression
from sklearn.linear_model import LinearRegression

model_LR = LinearRegression()
model_LR.fit(X_train, Y_train)
Y_pred = model_LR.predict(X_valid)

print(mean_absolute_percentage_error(Y_valid, Y_pred))
```

OUTPUT:


No. Unique values of Categorical Features
16
14
12
10
8
6
4
2
0
MSZoning
LotConfig
BldgType
Exterior1st


MSZoning
RL
RM
FV
RH
C (all)
LotConfig
Inside
Corner
CulDSac
FR2
FR3
BldgType
1Fam
TwnhsE
Duplex
Twnhs
2fmCon
Exterior1st
VinylSd
MetalSd
HdBoard
Wd Sdng
Plywood
CemntBd
BrkFace
WdShing
AsbShng
Stucco
BrkComm
AsphShn
Stone
CBlock
ImStucc

PROGRAM 15:

#Import Necessary Libraries and functions

from sklearn.naive_bayes import GaussianNB

from sklearn.naive_bayes import MultinomialNB

from sklearn import datasets

from sklearn.metrics import confusion_matrix

#Load the iris dataset

iris = datasets.load_iris()

#GaussianNB and MultinomialNB Models

gnb = GaussianNB()

mnb = MultinomialNB()

#Train both GaussianNB and MultinomialNB Models and print their confusion matrices

y_pred_gnb = gnb.fit(iris.data, iris.target).predict(iris.data)

cnf_matrix_gnb = confusion_matrix(iris.target, y_pred_gnb)

print("Confusion Matrix of GNB \n",cnf_matrix_gnb)

y_pred_mnb = mnb.fit(iris.data, iris.target).predict(iris.data)

cnf_matrix_mnb = confusion_matrix(iris.target, y_pred_mnb)

print("Confusion Matrix of MNB \n",cnf_matrix_mnb)

OUTPUT:

```
Confusion Matrix of GNB
 [[50  0  0]
 [ 0 47  3]
 [ 0  3 47]]
Confusion Matrix of MNB
 [[50  0  0]
 [ 0 46  4]
 [ 0  3 47]]
```

PROGRAM 16:

```
import numpy

import pandas as pd

import numpy as np

from sklearn.model_selection import train_test_split

from sklearn.tree import DecisionTreeClassifier

from sklearn.linear_model import LogisticRegression

from sklearn.naive_bayes import BernoulliNB

from sklearn.neighbors import KNeighborsClassifier

from sklearn.linear_model import PassiveAggressiveClassifier

from sklearn.metrics import classification_report


iris= pd.read_csv("D:/GEO/BE COURSES/LAB/DATASET/IRIS.csv")

print(iris.head())


x = iris.drop("species", axis=1)

y = iris["species"]

from sklearn.model_selection import train_test_split

x_train, x_test, y_train, y_test = train_test_split(x, y,test_size=0..10,random_state=42)


#x = np.array(data[["Age", "EstimatedSalary"]])

#y = np.array(data[["Purchased"]])


#xtrain, xtest, ytrain, ytest = train_test_split(x, y, test_size=0.10, random_state=42)

decisiontree = DecisionTreeClassifier()

logisticregression = LogisticRegression()

knearestclassifier = KNeighborsClassifier()

#svm_classifier = SVC()

bernoulli_naiveBayes = BernoulliNB()

passiveAggressive = PassiveAggressiveClassifier()


knearestclassifier.fit(x_train, y_train)

decisiontree.fit(x_train, y_train)

logisticregression.fit(x_train, y_train)
```

```
passiveAggressive.fit(x_train, y_train)


data1 = {"Classification Algorithms": ["KNN Classifier", "Decision Tree Classifier",
                                       "Logistic Regression", "Passive Aggressive Classifier"],
      "Score": [knearestclassifier.score(x,y), decisiontree.score(x, y),
                logisticregression.score(x, y), passiveAggressive.score(x,y) ]}
score = pd.DataFrame(data1)
score
```

OUTPUT:

	Classification Algorithms	Score
0	KNN Classifier	0.973333
1	Decision Tree Classifier	1.000000
2	Logistic Regression	0.980000
3	Passive Aggressive Classifier	0.826667

PROGRAM 17:

#importing necessary libraries

```
import numpy as np

import pandas as pd

import matplotlib.pyplot as plt

import seaborn as sns

from sklearn.model_selection import train_test_split

from sklearn.preprocessing import StandardScaler

from sklearn.linear_model import LogisticRegression

from sklearn.metrics import accuracy_score
```

#importing dataset

```
data = pd.read_csv("mobile_prices.csv")

print(data.head())

plt.figure(figsize=(12, 10))

sns.heatmap(data.corr(), annot=True, cmap="coolwarm", linecolor='white', linewidths=1)
```

#data preparation

```
x = data.iloc[:, :-1].values

y = data.iloc[:, -1].values

x = StandardScaler().fit_transform(x)

x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.20, random_state=0)
```

 # Logistic Regression algorithm provided by Scikit-learn:

```
from sklearn.linear_model import LogisticRegression

lreg = LogisticRegression()

lreg.fit(x_train, y_train)

y_pred = lreg.predict(x_test)
```

#accuracy of the model:

```
accuracy = accuracy_score(y_test, y_pred) * 100

print("Accuracy of the Logistic Regression Model: ",accuracy)
```

#predictions made by the model:

```
print(y_pred)
```

(unique, counts) = np.unique(y_pred, return_counts=True)

price_range = np.asarray((unique, counts)).T

print(price_range)

OUTPUT:

```
[[  0  95]
 [  1  90]
 [  2  97]
 [  3 118]]
```

PROGRAM 18:

```
from sklearn import datasets
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.linear_model import Perceptron
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import accuracy_score

iris = datasets.load_iris()
X = iris.data[:, [2, 3]]
y = iris.target

X_train, X_test, y_train, y_test = train_test_split(
 X, y, test_size=0.3, random_state=1, stratify=y)
sc = StandardScaler()
sc.fit(X_train)
X_train_std = sc.transform(X_train)
X_test_std = sc.transform(X_test)

ppn = Perceptron(eta0=0.1, random_state=1)
ppn.fit(X_train_std, y_train)
y_pred = ppn.predict(X_test_std)

print('Accuracy: %.3f' % accuracy_score(y_test, y_pred))
print('Accuracy: %.3f' % ppn.score(X_test_std, y_test))
```

OUTPUT:

```
Accuracy: 0.978
Accuracy: 0.978
```

PROGRAM 19:

```
import numpy as np

import pandas as pd


dataset = pd.read_csv("breastcancer.csv")

X = dataset.iloc[:, :-1].values

y = dataset.iloc[:, -1].values


from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.25, random_state = 0)

from sklearn.preprocessing import StandardScaler

sc = StandardScaler()

X_train = sc.fit_transform(X_train)

X_test = sc.transform(X_test)


from sklearn.naive_bayes import GaussianNB

classifier = GaussianNB()

classifier.fit(X_train, y_train)

GaussianNB(priors=None, var_smoothing=1e-09)


from sklearn.metrics import confusion_matrix, accuracy_score

y_pred = classifier.predict(X_test)

cm = confusion_matrix(y_test, y_pred)

print(cm)

accuracy_score(y_test, y_pred)
```

OUTPUT:

```
[[99  8]
 [ 2 62]]
0.9415204678362573
```

PROGRAM 20:

```
import pandas as pd

import numpy as np

from sklearn.model_selection import train_test_split

from sklearn.linear_model import LinearRegression

import plotly.io as io

io.renderers.default='browser'


data = pd.read_csv("futuresale prediction.csv")

print(data.head())

print(data.sample(5))

print(data.isnull().sum())


import plotly.express as px

import plotly.graph_objects as go

figure = px.scatter(data_frame = data, x="Sales",

                y="TV", size="TV", trendline="ols")

figure.show()


figure = px.scatter(data_frame = data, x="Sales",

                y="Newspaper", size="Newspaper", trendline="ols")

figure.show()


figure = px.scatter(data_frame = data, x="Sales",

                y="Radio", size="Radio", trendline="ols")

figure.show()


correlation = data.corr()

print(correlation["Sales"].sort_values(ascending=False))

x = np.array(data.drop(["Sales"], 1))

y = np.array(data["Sales"])
```

```
xtrain, xtest, ytrain, ytest = train_test_split(x, y,   test_size=0.2, random_state=42)

model = LinearRegression()

model.fit(xtrain, ytrain)

print(model.score(xtest, ytest))

features = [[TV, Radio, Newspaper]]

features = np.array([[230.1, 37.8, 69.2]])

print(model.predict(features))
```

OUTPUT:

```
Corelations :
Sales         1.000000
TV            0.901208
Radio         0.349631
Newspaper     0.157960
Name: Sales, dtype: float64
Score :  0.9059011844150826
[21.37254028]
```