MADHA ENGINEERING COLLEGE

(Affiliated to Anna University and Approved by AICTE, New Delhi) Madha Nagar, Kundrathur, Chennai-600069

DEPARTMENT OF Master of Computer Application

MC4311

Machine Learning Laboratory

R-2021

LAB MANUAL

MC4311 **MACHINE LEARNING LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- To understand about data cleaning and data preprocessing
- To familiarize with the Supervised Learning algorithms and implement them in practical situations.
- To familiarize with unsupervised Learning algorithms and carry on the implementation part.
- To involve the students to practice ML algorithms and techniques.
- Learn to use algorithms for real time data sets.

LIST OF EXPERIMENTS :

1. Demonstrate how do you structure data in Machine Learning
2. Implement data preprocessing techniques on real time dataset
3. Implement Feature subset selection techniques
4. Demonstrate how will you measure the performance of a machine learning model
5. Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data sets.
6. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using the standard Heart Disease Data Set.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file.
8. Write a program to implement k-Nearest Neighbor algorithm to classify the data set.
9. Apply the technique of pruning for a noisy data monk2 data, and derive the decision tree from this data. Analyze the results by comparing the structure of pruned and unpruned tree.
10. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
11. Implement Support Vector Classification for linear kernels.
12. Implement Logistic Regression to classify problems such as spam detection. Diabetes predictions and so on.

TOTAL: 60 PERIODS

LAB REQUIREMENTS:

Python or any ML tools like R

COURSE OUTCOMES:

On completion of the laboratory course, the student should be able to

CO1: apply data preprocessing technique and explore the structure of data to prepare for predictive modeling

CO2: understand how to select and train a model and measure the performance.

CO3: apply feature selection techniques in Machine Learning

CO4: construct Bayesian Network for appropriate problem

CO5: learn about parametric and non-parametric machine Learning algorithms and implement to practical situations

Exercise No. : 01 Date:	**Demonstrate how you structure data in Machine Learning**

Aim:

Write a program to demonstrate how you structure data in Machine Learning

Procedure:

Step 1: Start the Jupiter notebook.
Step 2: Create a new Python 3 (ipykernel) file
Step 3:import the library pandas
Step 4: Read the CSV file
Step 5: Print the Dataset
Step 6: End the program

Program:

In [1]:
```
import pandas as pd
```

In [2]:
```
df=pd.read_csv("student.csv")
```

In [3]:
```
df
```

Out[3]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
1	101	654.0	NaN	2.0	1
2	102	NaN	65.0	45.0	0
3	103	84.0	87.0	67.0	1
4	104	1.0	5.0	78.0	1
5	105	67.0	34.0	NaN	0

In [6]:
```
df.head(2)
```

Out[6]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
1	101	654.0	NaN	2.0	1

In [7]:
```
df.tail(2)
```

Out[7]:

	Reg. no.	M1	M2	M3	result
4	104	1.0	5.0	78.0	1
5	105	67.0	34.0	NaN	0

Result:

The above program was executed successfully. Hence, the output is verified

Exercise No. : 02 Date:	**Implementing Data Preprocessing techniques on real time dataset**

Aim:

Write a program to implementing Data Pre-processing techniques on real time dataset

Procedure:

Step 1: Start the Jupiter notebook.
Step 2: Create a new Python 3 (ipykernel) file
Step 3: import the library pandas
Step 4: Read the CSV file
Step 5: Cleaning the missing values with NaN
Step 6: Filling the missing values by giving number
Step 7: And Filling the values using forward, backward fill and average value
Step 8: Print the Dataset
Step 9: End the program

Program:

```
In [1]: import pandas as pd
```

```
In [2]: df=pd.read_csv("student.csv")
```

```
In [3]: df
```

Out[3]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
1	101	654.0	NaN	2.0	1
2	102	NaN	65.0	45.0	0
3	103	84.0	87.0	67.0	1
4	104	1.0	5.0	78.0	1
5	105	67.0	34.0	NaN	0

```
In [6]: df.describe()
```

Out[6]:

	Reg. no.	M1	M2	M3	result
count	6.000000	5.000000	5.00000	5.00000	6.000000
mean	102.500000	292.000000	235.00000	47.40000	0.500000
std	1.870829	331.910379	419.85295	29.12559	0.547723
min	100.000000	1.000000	5.00000	2.00000	0.000000
25%	101.250000	67.000000	34.00000	45.00000	0.000000
50%	102.500000	84.000000	65.00000	45.00000	0.500000
75%	103.750000	654.000000	87.00000	67.00000	1.000000
max	105.000000	654.000000	984.00000	78.00000	1.000000

In [7]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6 entries, 0 to 5
Data columns (total 5 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   Reg. no.  6 non-null      int64
 1   M1        5 non-null      float64
 2   M2        5 non-null      float64
 3   M3        5 non-null      float64
 4   result    6 non-null      int64
dtypes: float64(3), int64(2)
memory usage: 368.0 bytes
```

In [8]:
```
df.isnull().sum()
```

Out[8]:
```
Reg. no.    0
M1          1
M2          1
M3          1
result      0
dtype: int64
```

In [9]:
```
df.dtypes
```

Out[9]:
```
Reg. no.      int64
M1          float64
M2          float64
M3          float64
result        int64
dtype: object
```

In [10]:
```
df.shape
```

Out[10]:
```
(6, 5)
```

In [11]:
```
df1=df.fillna("n")
```

In [12]:
```
df1
```

Out[12]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
1	101	654.0	n	2.0	1
2	102	n	65.0	45.0	0
3	103	84.0	87.0	67.0	1
4	104	1.0	5.0	78.0	1
5	105	67.0	34.0	n	0

In [13]:
```
df2=df.fillna(5)
```

In [14]:
```
df2
```

Out[14]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
1	101	654.0	5.0	2.0	1
2	102	5.0	65.0	45.0	0
3	103	84.0	87.0	67.0	1
4	104	1.0	5.0	78.0	1
5	105	67.0	34.0	5.0	0

dictionary

In [15]:
```
df1=df.fillna({'chol':1,'fbs':2})
```

In [16]:
```
df1.isnull().sum()
df1
```

Out[16]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
1	101	654.0	NaN	2.0	1
2	102	NaN	65.0	45.0	0
3	103	84.0	87.0	67.0	1
4	104	1.0	5.0	78.0	1
5	105	67.0	34.0	NaN	0

Carry forward

In [17]:
```
df1=df.fillna(method="ffill")
df1
```

Out[17]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
1	101	654.0	984.0	2.0	1
2	102	654.0	65.0	45.0	0
3	103	84.0	87.0	67.0	1
4	104	1.0	5.0	78.0	1
5	105	67.0	34.0	78.0	0

Backward fill

In [18]:
```
df1=df.fillna(method="bfill")
df1
```

Out[18]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
1	101	654.0	65.0	2.0	1
2	102	84.0	65.0	45.0	0
3	103	84.0	87.0	67.0	1
4	104	1.0	5.0	78.0	1
5	105	67.0	34.0	NaN	0

Fill avg value ¶

In [19]:
```
df1=df.interpolate()
df1
```

Out[19]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
1	101	654.0	524.5	2.0	1
2	102	369.0	65.0	45.0	0
3	103	84.0	87.0	67.0	1
4	104	1.0	5.0	78.0	1
5	105	67.0	34.0	78.0	0

Drop NA row/column

In [20]:
```
df1=df.dropna()
df1
```

Out[20]:

	Reg. no.	M1	M2	M3	result
0	100	654.0	984.0	45.0	0
3	103	84.0	87.0	67.0	1
4	104	1.0	5.0	78.0	1

Result:

The above program was executed successfully. Hence, the output is verified

Exercise No. : 03 Date:	**Implementing Feature subset selection techniques**

Aim:

Write a program to implement Feature subset selection techniques

Procedure:

Step 1:Import pandas to create DataFrame
Step 2:Make DataFrame of the given data
Step 3:Variance Threshold feature selector that removes all low-variance features.
Step 4:It will zero variance features
Step 5: Drop the error data
Step 6: Print the DataFrame

Program:

```
In [1]: import pandas as pd
```

```
In [2]: data = pd.DataFrame({"A":[1,2,3,4,5,6],
                             "B":[7,8,9,10,11,12],
                             "C":[0,0,0,0,0,0],
                             "D":[21,54,32,85,35,2]})
```

```
In [13]: data
```

Out[13]:

	A	B	C	D
0	1	7	0	21
1	2	8	0	54
2	3	9	0	32
3	4	10	0	85
4	5	11	0	35
5	6	12	0	2

```
In [4]: from sklearn.feature_selection import VarianceThreshold
```

```
In [5]: var_thres = VarianceThreshold(threshold = 0)
```

```
In [6]: var_thres.fit(data)
Out[6]: VarianceThreshold(threshold=0)
```

```
In [7]: var_thres.get_support()
Out[7]: array([ True,  True, False,  True])
```

```
In [8]: data.columns[var_thres.get_support()]
Out[8]: Index(['A', 'B', 'D'], dtype='object')
```

```
In [9]: constant_columns = [column for column in data.columns if column not in data.columns[var_thres.get_support()]]
```

```
In [10]: print(len(constant_columns))
1
```

```
In [11]: for feature in constant_columns: print(feature)
C
```

```
In [12]: data.drop(constant_columns, axis = 1)
```

Out[12]:

	A	B	D
0	1	7	21
1	2	8	54
2	3	9	32
3	4	10	85
4	5	11	35
5	6	12	2

Result:

The above program was executed successfully. Hence, the output is verified

Exercise No. : 04 Date:	**Demonstrate how you will measure the performance of a machine learning model**

Aim:

Write a program to demonstrate how you will measure the performance of a machine learning model

Procedure:

Step 1:Import the Dependencies
Step 2:Load the csv data to a Pandas DataFrame
Step 3:Split the Features and Target
Step 4:Split the Data into Training data & Test Data
Step 5: Train the LogisticRegression model with Training data
Step 6: Find accuracy on training data&accuracy on test data
Step 7: Import the confusion matrix and again find the accuracy of the data
Step 8: Train and Test the data with Precision
Step 9: Recall for training and testing data predictions
Step 10: F1 score for training and testing data predictions

Program:

In [1]:
```
import pandas as pd
df=pd.read_csv("diabetes.csv")
df
```

Out[1]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1
...	...	...	...	...	...	...	...	...	...
763	10	101	76	48	180	32.9	0.171	63	0
764	2	122	70	27	0	36.8	0.340	27	0
765	5	121	72	23	112	26.2	0.245	30	0
766	1	126	60	0	0	30.1	0.349	47	1
767	1	93	70	31	0	30.4	0.315	23	0

768 rows × 9 columns

In [2]:
```
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
```

In [4]:
```
df['Outcome'].value_counts()
```

Out[4]:
```
0    500
1    268
Name: Outcome, dtype: int64
```

In [5]:
```
X = df.drop(columns='Outcome', axis=1)
Y = df['Outcome']
```

In [6]:
```
print(X)
```

```
     Pregnancies  Glucose  BloodPressure  SkinThickness  Insulin   BMI  \
0              6      148             72             35        0  33.6
1              1       85             66             29        0  26.6
2              8      183             64              0        0  23.3
3              1       89             66             23       94  28.1
4              0      137             40             35      168  43.1
..           ...      ...            ...            ...      ...   ...
763           10      101             76             48      180  32.9
764            2      122             70             27        0  36.8
765            5      121             72             23      112  26.2
766            1      126             60              0        0  30.1
767            1       93             70             31        0  30.4

     DiabetesPedigreeFunction  Age
0                       0.627   50
1                       0.351   31
2                       0.672   32
3                       0.167   21
4                       2.288   33
..                        ...  ...
763                     0.171   63
764                     0.340   27
765                     0.245   30
766                     0.349   47
767                     0.315   23

[768 rows x 8 columns]
```

In [7]:
```
print(Y)
```

```
0      1
1      0
2      1
3      0
4      1
      ..
763    0
764    0
765    0
766    1
767    0
Name: Outcome, Length: 768, dtype: int64
```

In [8]:
```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2,
stratify=Y, random_state=2)
```

In [9]:
```
print(X.shape, X_train.shape, X_test.shape)
```

```
(768, 8) (614, 8) (154, 8)
```

In [10]:
```
model = LogisticRegression(max_iter=1000)
```

In [11]:
```
model.fit(X_train, Y_train)
```

Out[11]:
```
LogisticRegression(max_iter=1000)
```

In [12]:
```
from sklearn.metrics import accuracy_score
```

In [13]:
```
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(Y_train, X_train_prediction)
print(training_data_accuracy)
```

```
0.7882736156351792
```

In [14]:
```
print('Accuracy on Training data :', round(training_data_accuracy*100, 2),
'%')
```

```
Accuracy on Training data : 78.83 %
```

In [15]:
```
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(Y_test, X_test_prediction)
print(test_data_accuracy)
```

```
0.7597402597402597
```

In [16]:
```
print('Accuracy on Training data :', round(test_data_accuracy*100, 2),
'%')
```

```
Accuracy on Training data : 75.97 %
```

In [15]:
```
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(Y_test, X_test_prediction)
print(test_data_accuracy)
```

```
0.7597402597402597
```

In [16]:
```
print('Accuracy on Training data :', round(test_data_accuracy*100, 2),
'%')
```

```
Accuracy on Training data : 75.97 %
```

In [20]:
```
import seaborn as sns
sns.heatmap(cf_matrix, annot=True)
```

Out[20]:
```
<AxesSubplot:>
```

In [21]:
```
from sklearn.metrics import precision_score
precision_train = precision_score(Y_train, X_train_prediction)
print('Training data Precision =', precision_train)
```

```
Training data Precision = 0.7530120481927711
```

In [22]:
```
precision_test = precision_score(Y_test, X_test_prediction)
print('Test data Precision =', precision_test)
```

```
Test data Precision = 0.717948717948718
```

In [23]:
```
from sklearn.metrics import recall_score
recall_train = recall_score(Y_train, X_train_prediction)
print('Training data Recall =', recall_train)
```

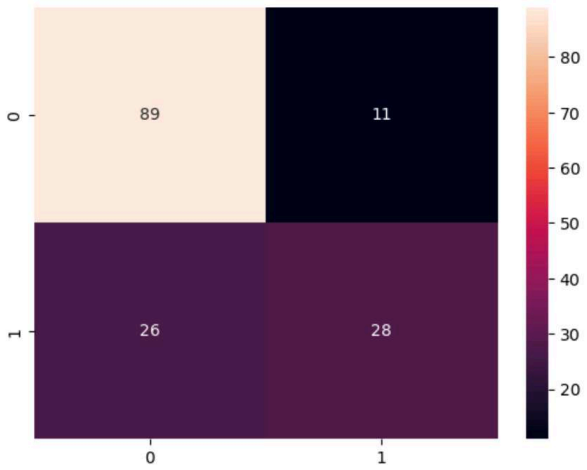
```
Training data Recall = 0.5841121495327103
```

In [24]:
```
recall_test = recall_score(Y_test, X_test_prediction)
print('Test data Recall =', recall_test)
```

```
Test data Recall = 0.5185185185185185
```

In [25]:
```
from sklearn.metrics import f1_score
f1_score_train = f1_score(Y_train, X_train_prediction)
print('Training data F1 Score =', f1_score_train)
```

```
Training data F1 Score = 0.6578947368421052
```



In [26]:
```
f1_score_test = recall_score(Y_test, X_test_prediction)
print('Test data F1 Score =', f1_score_test)
```

```
Test data F1 Score = 0.5185185185185185
```

In [27]:
```
def precision_recall_f1_score(true_labels, pred_labels):
    precision_value = precision_score(true_labels, pred_labels)
    recall_value = recall_score(true_labels, pred_labels)
    f1_score_value = f1_score(true_labels, pred_labels)
    print('Precision =',precision_value)
    print('Recall =',recall_value)
    print('F1 Score =',f1_score_value)
```

In [28]:
```
precision_recall_f1_score(Y_train, X_train_prediction)
```

```
Precision = 0.7530120481927711
Recall = 0.5841121495327103
F1 Score = 0.6578947368421052
```

In [29]:
```
precision_recall_f1_score(Y_test, X_test_prediction)
```

```
Precision = 0.717948717948718
Recall = 0.5185185185185185
F1 Score = 0.6021505376344085
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 05A Date:	**Write a program to implement the naïve Bayesian classification for a sample training data set**

Aim:

Write a program to implement the naïve Bayesian classification for a sample training data set. Compute the accuracy of the classifier, with Titanic test data sets.

Procedure:

Step 1:Import the Dependencies
Step 2:Load the csv data to a Pandas DataFrame
Step 3:Split the Features and Target
Step 4:Split the Data into Training data & Test Data
Step 5: Train the GaussianNB model with Training data
Step 6: Find accuracy on training data&accuracy on test data
Step 7: Use the cross validation and again find the accuracy of the data with training data.

Program:

In [1]:
```
import pandas as pd
```

In [24]:
```
df = pd.read_csv("titanic.csv")
df.head()
```

Out[24]:

	PassengerId	Name	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Survived
0	1	Braund, Mr. Owen Harris	3	male	22.0	1	0	A/5 21171	7.2500	NaN	S	0
1	2	Cumings, Mrs. John Bradley (Florence Briggs Th...	1	female	38.0	1	0	PC 17599	71.2833	C85	C	1
2	3	Heikkinen, Miss. Laina	3	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S	1
3	4	Futrelle, Mrs. Jacques Heath (Lily May Peel)	1	female	35.0	1	0	113803	53.1000	C123	S	1
4	5	Allen, Mr. William Henry	3	male	35.0	0	0	373450	8.0500	NaN	S	0

In [25]:
```
df.drop(['PassengerId','Name','SibSp','Parch','Ticket','Cabin','Embarked'],axis='columns',inplace=True)
df.head()
```

Out[25]:

	Pclass	Sex	Age	Fare	Survived
0	3	male	22.0	7.2500	0
1	1	female	38.0	71.2833	1
2	3	female	26.0	7.9250	1
3	1	female	35.0	53.1000	1
4	3	male	35.0	8.0500	0

In [26]:
```
inputs = df.drop('Survived',axis='columns')
target = df.Survived
```

In [5]:
```
# inputs.Sex = inputs.Sex.map({'male': 1, 'female': 2})
```

In [27]:
```
dummies = pd.get_dummies(inputs.Sex)
dummies.head(3)
```

Out[27]:

	female	male
0	0	1
1	1	0
2	1	0

In [28]:
```
inputs = pd.concat([inputs,dummies],axis='columns')
inputs.head(3)
```

Out[28]:

	Pclass	Sex	Age	Fare	female	male
0	3	male	22.0	7.2500	0	1
1	1	female	38.0	71.2833	1	0
2	3	female	26.0	7.9250	1	0

In [29]:
```
inputs.drop(['Sex','male'],axis='columns',inplace=True)
inputs.head(3)
```

Out[29]:

	Pclass	Age	Fare	female
0	3	22.0	7.2500	0
1	1	38.0	71.2833	1
2	3	26.0	7.9250	1

In [30]:
```
inputs.columns[inputs.isna().any()]
```

Out[30]:
```
Index(['Age'], dtype='object')
```

In [10]:
```
inputs.Age[:10]
```

Out[10]:
```
0    22.0
1    38.0
2    26.0
3    35.0
4    35.0
5     NaN
6    54.0
7     2.0
8    27.0
9    14.0
Name: Age, dtype: float64
```

In [31]:
```
inputs.Age = inputs.Age.fillna(inputs.Age.mean())
inputs.head()
```

Out[31]:

	Pclass	Age	Fare	female
0	3	22.0	7.2500	0
1	1	38.0	71.2833	1
2	3	26.0	7.9250	1
3	1	35.0	53.1000	1
4	3	35.0	8.0500	0

In [12]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(inputs,target,test_size=0.3)
```

In [13]:
```
from sklearn.naive_bayes import GaussianNB
model = GaussianNB()
```

In [14]:
```
model.fit(X_train,y_train)
```

Out[14]:
```
GaussianNB(priors=None, var_smoothing=1e-09)
```

In [15]:
```
model.score(X_test,y_test)
```

Out[15]:
```
0.7835820895522388
```

In [16]:
```
X_test[0:10]
```

Out[16]:

	Pclass	Age	Fare	female	male
309	1	30.000000	56.9292	1	0
839	1	29.699118	29.7000	0	1
110	1	47.000000	52.0000	0	1
872	1	33.000000	5.0000	0	1
235	3	29.699118	7.5500	1	0
411	3	29.699118	6.8583	0	1
32	3	29.699118	7.7500	1	0
562	2	28.000000	13.5000	0	1
542	3	11.000000	31.2750	1	0
250	3	29.699118	7.2500	0	1

In [17]:
```
y_test[0:10]
```

```
Out[17]: 309    1
         839    1
         110    0
         872    0
         235    0
         411    0
         32     1
         562    0
         542    0
         250    0
         Name: Survived, dtype: int64
```

```
In [18]: model.predict(X_test[0:10])
```

```
Out[18]: array([1, 0, 0, 0, 1, 0, 1, 0, 1, 0], dtype=int64)
```

```
In [19]: model.predict_proba(X_test[:10])
```

```
Out[19]: array([[0.00455992, 0.99544008],
                [0.91382024, 0.08617976],
                [0.88164575, 0.11835425],
                [0.92347978, 0.07652022],
                [0.09084386, 0.90915614],
                [0.99093305, 0.00906695],
                [0.09094857, 0.90905143],
                [0.97923786, 0.02076214],
                [0.0516967 , 0.9483033 ],
                [0.9909573 , 0.0090427 ]])
```

```
In [34]: from sklearn.model_selection import cross_val_score
         cross_val_score(GaussianNB(),X_train, y_train, cv=5)
```

```
Out[34]: array([0.75396825, 0.784     , 0.76612903, 0.82258065, 0.77419355])
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 05B Date:	**Write a program to implement the naïve Bayesian classification for a sample training data set**

Aim:

Write a program to implement the naïve Bayesian classification for a sample training data set. Compute the accuracy of the classifier, with Spam test data sets.

Procedure:

Step 1:Import the Dependencies
Step 2:Load the csv data to a Pandas DataFrame
Step 3: Categorize the target of data
Step 4:Splitting the Data into Training data & Test Data
Step 5: Import CountVectorizer to vectorize the data
Step 6: Import the MultinomialNB model and find the accuracy of the data
Step 7: Import the Pipeline model and find the accuracy of the data by cross validating the vectorized data with trained data.

Program:

In [1]:
```
import pandas as pd
df = pd.read_csv("spam.csv")
df.head()
```

Out[1]:

	Category	Message
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...

In [2]:
```
df.groupby('Category').describe()
```

Out[2]:

	Message			
	count	unique	top	freq
Category				
ham	4825	4516	Sorry, I'll call later	30
spam	747	641	Please call our customer service representativ...	4

In [3]:
```
df['spam']=df['Category'].apply(lambda x: 1 if x=='spam' else 0)
df.head()
```

Out[3]:

	Category	Message	spam
0	ham	Go until jurong point, crazy.. Available only ...	0
1	ham	Ok lar... Joking wif u oni...	0
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...	1
3	ham	U dun say so early hor... U c already then say...	0
4	ham	Nah I don't think he goes to usf, he lives aro...	0

In [4]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(df.Message,df.spam)
```

```
In [5]: from sklearn.feature_extraction.text import CountVectorizer
        v = CountVectorizer()
        X_train_count = v.fit_transform(X_train.values)
        X_train_count.toarray()[:2]

Out[5]: array([[0, 0, 0, ..., 0, 0, 0],
               [0, 0, 0, ..., 0, 0, 0]], dtype=int64)

In [6]: from sklearn.naive_bayes import MultinomialNB
        model = MultinomialNB()
        model.fit(X_train_count,y_train)

Out[6]: MultinomialNB()

In [8]: X_test_count = v.transform(X_test)
        model.score(X_test_count, y_test)

Out[8]: 0.9877961234745154

In [9]: from sklearn.pipeline import Pipeline
        clf = Pipeline([
            ('vectorizer', CountVectorizer()),
            ('nb', MultinomialNB())
        ])

In [10]: clf.fit(X_train, y_train)

Out[10]: Pipeline(steps=[('vectorizer', CountVectorizer()), ('nb', MultinomialNB())])

In [11]: clf.score(X_test,y_test)

Out[11]: 0.9877961234745154

In [12]: clf.predict(emails)

Out[12]: array([0, 1], dtype=int64)
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 06 Date:	**UsingBayesian model to demonstrate the diagnosis a heart patients using the standard heart disease data set.**

Aim:

Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis a heart patients using the standard heart disease data set.

Procedure:

Step 1:Import the dependencies
Step 2:Load the csv data to a Pandas Data Frame
Step 3:Import BayesianModel and train the data
Step 4:Import MaximumLikelihoodEstimator and estimate the maximum likelihood of the data
Step 5:Use the ValidationElimination method on the model to inferencing the data.
Step 6:Display the maximum likelihood probability of the target data.

Program:

In [1]:
```
import numpy as np
import pandas as pd
import csv
```

In [2]:
```
from pgmpy.estimators import MaximumLikelihoodEstimator
from pgmpy.models import BayesianModel
from pgmpy.inference import VariableElimination
```

In [3]:
```
hD = pd.read_csv('heart.csv')
hD = hD.replace('?', np.nan)
hD
```

Out[3]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	63	1	3.0	145.0	233.0	1.0	0.0	150.0	0.0	2.3	0.0	0.0	1	1
1	37	1	2.0	130.0	250.0	0.0	1.0	187.0	0.0	3.5	0.0	0.0	2	1
2	41	0	1.0	130.0	204.0	0.0	0.0	172.0	0.0	1.4	2.0	0.0	2	1
3	56	1	1.0	120.0	236.0	0.0	1.0	178.0	0.0	0.8	2.0	0.0	2	1
4	57	0	0.0	120.0	NaN	0.0	1.0	163.0	1.0	0.6	2.0	0.0	2	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
298	57	0	0.0	140.0	241.0	0.0	1.0	123.0	1.0	0.2	1.0	0.0	3	0
299	45	1	3.0	110.0	264.0	0.0	1.0	132.0	0.0	1.2	1.0	0.0	3	0
300	68	1	0.0	144.0	193.0	1.0	1.0	141.0	0.0	3.4	1.0	2.0	3	0
301	57	1	0.0	130.0	131.0	0.0	1.0	115.0	1.0	1.2	1.0	1.0	3	0
302	57	0	1.0	130.0	236.0	0.0	0.0	174.0	0.0	0.0	1.0	1.0	2	0

303 rows × 14 columns

In [9]:
```
model = BayesianModel([('age','target'),('sex','target'),('trestbps','target'),('cp','target'),('target','restecg'),
('target','chol'),('target','fbs'),('target','thalach'),('target','exang'),('target','oldpeak'),('target','slope'),
('target','ca'),('target','thal')])
```

In [5]:
```
print('\n Learning CPD using Maximum Likelihood estimators')
model.fit(hD,estimator = MaximumLikelihoodEstimator)
```

```
 Learning CPD using Maximum Likelihood estimators
```

In [6]:
```
print('\nInferencing with Bayesian Network')
hD_infer = VariableElimination(model)
```

```
Inferencing with Bayesian Network
```

In [10]:
```
print('\n 1. Probability of heatdesease given evidence = restecg :1')
q1 = hD_infer.query(variables = ['target'], evidence = {'restecg':1})
print(q1)
```

```
 1. Probability of heatdesease given evidence = restecg :1
+-----------+---------------+
| target    |   phi(target) |
+===========+===============+
| target(0) |        0.4031 |
+-----------+---------------+
| target(1) |        0.5969 |
+-----------+---------------+
```

In [8]:
```
print('\n 2. Probability of heatdesease given evidence = cp:2')
q2 = hD_infer.query(variables = ['target'], evidence = {'cp':2})
print(q2)
```

```
 2. Probability of heatdesease given evidence = cp:2
+-----------+---------------+
| target    |   phi(target) |
+===========+===============+
| target(0) |        0.4862 |
+-----------+---------------+
| target(1) |        0.5138 |
+-----------+---------------+
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 07 Date:	**Apply EM algorithm to cluster a set of data stored in a .csv file**

Aim:

Write a program to apply EM algorithm to cluster a set of data stored in a .csv file

Procedure:

Step 1:Imported libraries and dataset
Step 2:loading data-set for EM algorithm
Step 3:Defining EM Model
Step 4:Training of the model
Step 5:Predicting classes for our data
Step 6:Accuracy of EM Model

Program:

In [1]:
```
#Imported libraries and dataset

from sklearn import datasets

from sklearn.cluster import KMeans

from sklearn.utils import shuffle

import numpy as np

import pandas as pd
```

In [2]:
```
#loading data-set for EM algorithm

iris = datasets.load_iris()

X = pd.DataFrame(iris.data)

Y = pd.DataFrame(iris.target)
```

In [3]:
```
#Defining EM Model
from sklearn.mixture import GaussianMixture
model2=GaussianMixture(n_components=3,random_state=3425)

#Training of the model

model2.fit(X)
```

Out[3]:
```
GaussianMixture(n_components=3, random_state=3425)
```

In [4]:
```
#Predicting classes for our data

uu= model2.predict(X)

#Accuracy of EM Model

from sklearn.metrics import confusion_matrix

cm=confusion_matrix(Y,uu)

print(cm)

from sklearn.metrics import accuracy_score

print(accuracy_score(Y,uu))
```

```
[[ 0  0 50]
 [45  5  0]
 [ 0 50  0]]
0.03333333333333333
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 08 Date:	**Implement k-Nearest Neighbour algorithm to classify the dataset**

Aim:

Write a program to implement k-Nearest Neighbour algorithm toclassify the dataset

Procedure:

Step 1:
Step 2:
Step 3:
Step 4:
Step 5:
Step 6:

Program:

```
In [1]: import pandas as pd
        from sklearn.datasets import load_iris
        iris=load_iris()
```

```
In [3]: iris.feature_names
```

```
Out[3]: ['sepal length (cm)',
         'sepal width (cm)',
         'petal length (cm)',
         'petal width (cm)']
```

```
In [4]: iris.target_names
```

```
Out[4]: array(['setosa', 'versicolor', 'virginica'], dtype='<U10')
```

```
In [5]: df=pd.DataFrame(iris.data,columns=iris.feature_names)
```

```
In [6]: df.head()
```

Out[6]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2

```
In [7]: df['target']=iris.target
        df.head()
```

Out[7]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target
0	5.1	3.5	1.4	0.2	0
1	4.9	3.0	1.4	0.2	0
2	4.7	3.2	1.3	0.2	0
3	4.6	3.1	1.5	0.2	0
4	5.0	3.6	1.4	0.2	0

In [8]:
```
df[df.target==1].head()
```

Out[8]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target
50	7.0	3.2	4.7	1.4	1
51	6.4	3.2	4.5	1.5	1
52	6.9	3.1	4.9	1.5	1
53	5.5	2.3	4.0	1.3	1
54	6.5	2.8	4.6	1.5	1

In [9]:
```
df[df.target==2].head()
```

Out[9]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target
100	6.3	3.3	6.0	2.5	2
101	5.8	2.7	5.1	1.9	2
102	7.1	3.0	5.9	2.1	2
103	6.3	2.9	5.6	1.8	2
104	6.5	3.0	5.8	2.2	2

In [18]:
```
df['flower_name']=df.target.apply(lambda x:iris.target_names[x])
```

In [19]:
```
df.head()
```

Out[19]:

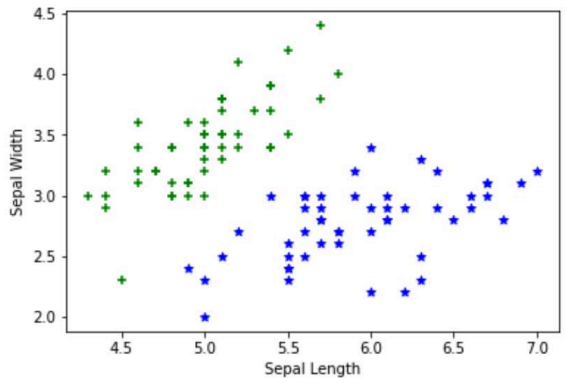
	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target	flower_name
0	5.1	3.5	1.4	0.2	0	setosa
1	4.9	3.0	1.4	0.2	0	setosa
2	4.7	3.2	1.3	0.2	0	setosa
3	4.6	3.1	1.5	0.2	0	setosa
4	5.0	3.6	1.4	0.2	0	setosa

In [20]:
```
df0=df[:50]
df1=df[50:100]
df2=df[100:]
```

In [21]:
```
import matplotlib.pyplot as plt
%matplotlib inline
```

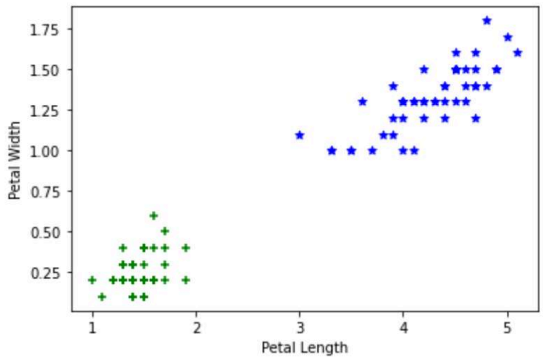
In [31]:
```
plt.xlabel('Sepal Length')
plt.ylabel('Sepal Width')
plt.scatter(df0['sepal length (cm)'],df0['sepal width (cm)'],color="green",marker='+')
plt.scatter(df1['sepal length (cm)'],df1['sepal width (cm)'],color="blue",marker='*')
```

Out[31]:
```
<matplotlib.collections.PathCollection at 0x2388bc49cd0>
```



In [32]:
```
plt.xlabel('Petal Length')
plt.ylabel('Petal Width')
plt.scatter(df0['petal length (cm)'],df0['petal width (cm)'],color="green",marker='+')
plt.scatter(df1['petal length (cm)'],df1['petal width (cm)'],color="blue",marker='*')
```

Out[32]:
```
<matplotlib.collections.PathCollection at 0x2388c9cf1f0>
```



In [23]:
```
from sklearn.model_selection import train_test_split
x=df.drop(['target','flower_name'],axis='columns')
y=df.target
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=1)
```

In [24]:
```
len(x_train)
```

Out[24]:
```
120
```

In [26]:
```
len(x_test)
```

Out[26]:
```
30
```

In [34]:
```
from sklearn.neighbors import KNeighborsClassifier
knn=KNeighborsClassifier(n_neighbors=10)
```

In [35]:
```
knn.fit(x_train,y_train)
```

Out[35]:
```
KNeighborsClassifier(n_neighbors=10)
```

In [36]:
```
knn.score(x_test,y_test)
```

Out[36]:
```
0.9666666666666667
```

In [37]:
```
knn.predict([[4.8,3.0,1.5,0.3]])
```

Out[37]:
```
array([0])
```

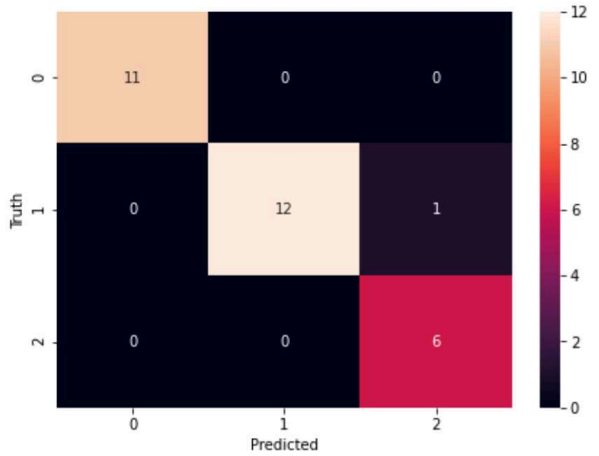
In [38]:
```
from sklearn.metrics import confusion_matrix
y_pred=knn.predict(x_test)
cm=confusion_matrix(y_test,y_pred)
```

In [39]:
```
cm
```

Out[39]:
```
array([[11,  0,  0],
       [ 0, 12,  1],
       [ 0,  0,  6]], dtype=int64)
```

In [40]:
```
%matplotlib inline
import matplotlib.pyplot as plt
import seaborn as sn
plt.figure(figsize=(7,5))
sn.heatmap(cm,annot=True)
plt.xlabel('Predicted')
plt.ylabel('Truth')
```

Out[40]:
```
Text(42.0, 0.5, 'Truth')
```



In [41]:
```
from sklearn.metrics import classification_report
```

In [42]:
```
print(classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        11
           1       1.00      0.92      0.96        13
           2       0.86      1.00      0.92         6

    accuracy                           0.97        30
   macro avg       0.95      0.97      0.96        30
weighted avg       0.97      0.97      0.97        30
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 09 Date:	Derive a decision tree from the dataset

Aim:

Write a program to drive a decision tree from the dataset

Procedure:

Step 1:
Step 2:
Step 3:
Step 4:
Step 5:
Step 6:

Program:

In [1]:
```
import pandas as pd
```

In [2]:
```
df = pd.read_csv("salaries.csv")
df.head()
```

Out[2]:

	company	job	degree	salary_more_then_100k
0	google	sales executive	bachelors	0
1	google	sales executive	masters	0
2	google	business manager	bachelors	1
3	google	business manager	masters	1
4	google	computer programmer	bachelors	0

In [3]:
```
inputs = df.drop('salary_more_then_100k',axis='columns')
```

In [4]:
```
target = df['salary_more_then_100k']
```

In [5]:
```
from sklearn.preprocessing import LabelEncoder
le_company = LabelEncoder()
le_job = LabelEncoder()
le_degree = LabelEncoder()
```

In [6]:
```
inputs['company_n'] = le_company.fit_transform(inputs['company'])
inputs['job_n'] = le_job.fit_transform(inputs['job'])
inputs['degree_n'] = le_degree.fit_transform(inputs['degree'])
```

In [7]:
```
inputs
```

Out[7]:

	company	job	degree	company_n	job_n	degree_n
0	google	sales executive	bachelors	2	2	0
1	google	sales executive	masters	2	2	1
2	google	business manager	bachelors	2	0	0
3	google	business manager	masters	2	0	1
4	google	computer programmer	bachelors	2	1	0
5	google	computer programmer	masters	2	1	1
6	abc pharma	sales executive	masters	0	2	1
7	abc pharma	computer programmer	bachelors	0	1	0
8	abc pharma	business manager	bachelors	0	0	0
9	abc pharma	business manager	masters	0	0	1
10	facebook	sales executive	bachelors	1	2	0
11	facebook	sales executive	masters	1	2	1
12	facebook	business manager	bachelors	1	0	0

In [8]:
```
inputs_n = inputs.drop(['company','job','degree'],axis='columns')
```

In [9]:
```
inputs_n
```

Out[9]:

	company_n	job_n	degree_n
0	2	2	0
1	2	2	1
2	2	0	0
3	2	0	1
4	2	1	0
5	2	1	1
6	0	2	1
7	0	1	0
8	0	0	0
9	0	0	1
10	1	2	0
11	1	2	1
12	1	0	0
13	1	0	1
14	1	1	0

In [10]:
```
target
```

Out[10]:
```
0     0
1     0
2     1
3     1
4     0
5     1
6     0
7     0
8     0
9     1
10    1
11    1
12    1
13    1
14    1
15    1
Name: salary_more_then_100k, dtype: int64
```

In [11]:
```
from sklearn import tree
model = tree.DecisionTreeClassifier()
```

In [12]:
```
model.fit(inputs_n, target)
```

Out[12]:
```
DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=None,
            max_features=None, max_leaf_nodes=None,
            min_impurity_decrease=0.0, min_impurity_split=None,
            min_samples_leaf=1, min_samples_split=2,
            min_weight_fraction_leaf=0.0, presort=False, random_state=None,
            splitter='best')
```

In [13]:
```
model.score(inputs_n,target)
```

Out[13]:
```
1.0
```

Is salary of Google, Computer Engineer, Bachelors degree > 100 k ?

In [14]:
```
model.predict([[2,1,0]])
```

Out[14]:
```
array([0], dtype=int64)
```

Is salary of Google, Computer Engineer, Masters degree > 100 k ?

In [15]:
```
model.predict([[2,1,1]])
```

Out[15]:
```
array([1], dtype=int64)
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 10 Date:	**Implementing the back propagation algorithm and test the same using appropriate dataset**

Aim:

Write a program to build an Artificial Neural Network by implementing the back propagation algorithm and test the same using appropriate dataset

Procedure:

Step 1:
Step 2:
Step 3:
Step 4:
Step 5:
Step 6:

Program:

In [1]:
```
import numpy as np
X = np.array(([2, 9], [1, 5], [3, 6]), dtype=float)
y = np.array(([92], [86], [89]), dtype=float) # scale units
X = X/np.amax(X, axis=0) #maximum of X array
y = y/100 # maximum test score is 100

class NeuralNetwork(object):
    def __init__ (self): #parameters
        self.inputSize = 2
        self.outputSize = 1
        self.hiddenSize = 3
        self.W1 = np.random.randn(self.inputSize, self.hiddenSize)
        self.W2 = np.random.randn(self.hiddenSize, self.outputSize)

    def feedForward(self, X):
        self.z = np.dot(X, self.W1)
        self.z2 = self.sigmoid(self.z)
        self.z3 = np.dot(self.z2, self.W2)
        output = self.sigmoid(self.z3)
        return output

    def sigmoid(self, s, deriv=False):
        if (deriv == True):
         return s * (1 - s)
        return 1/(1 + np.exp(-s))

    def backward(self, X, y, output): #backward propogate through the network
        self.output_error = y - output # error in output
        self.output_delta = self.output_error * self.sigmoid(output, deriv=True)
        self.z2_error = self.output_delta.dot(self.W2.T) #z2 error: how much our hidden layer weights
        self.z2_delta = self.z2_error * self.sigmoid(self.z2, deriv=True) #applying derivative of sig
        self.W1 += X.T.dot(self.z2_delta) # adjusting first set (input -> hidden) weights
        self.W2 += self.z2.T.dot(self.output_delta) # adjusting second set (hidden -> output) weights
    def train(self, X, y):
        output = self.feedForward(X)
        self.backward(X, y, output)

NN = NeuralNetwork()
for i in range(1000): #trains the NN 1000 times
    if (i % 100 == 0):
        print("Loss: " + str(np.mean(np.square(y - NN.feedForward(X)))))
        NN.train(X, y)
print("Input: " + str(X))
print("Actual Output: " + str(y))
print("Loss: " + str(np.mean(np.square(y - NN.feedForward(X)))))
print("\n")
print("Predicted Output: " + str(NN.feedForward(X)))
```

```
Loss: 0.024912562840868836
Loss: 0.020568438885881255
Loss: 0.017167958121637485
Loss: 0.014471137378264548
Loss: 0.012306361746843379
Loss: 0.010549272872305953
Loss: 0.009108544221234353
Loss: 0.007916223149021984
Loss: 0.006921107548652352
Loss: 0.006084151847431011
Input: [[0.66666667 1.        ]
 [0.33333333 0.55555556]
 [1.         0.66666667]]
Actual Output: [[0.92]
 [0.86]
 [0.89]]
Loss: 0.005375242340215718


Predicted Output: [[0.85079209]
 [0.80977176]
 [0.7961218 ]]
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 11 Date:	**Implement Support Vector Classification for linear kernels**

Aim:

Write a program to implement Support Vector Classification for linear kernels

Procedure:

Step 1:Import necessary dataset from sklearn datasets
Step 2:Import the dependencies
Step 3:Separate the target from the features
Step 4:Split the data into training and test data
Step 5:Import the Standard Scaler and implement it on training and test data
Step 6:Import the SVM model and implement it on the scaled data by setting the kernel as linear
Step 7: Display the accuracy on both training and test data

Program:

In [1]:
```
from sklearn.datasets import load_breast_cancer
```

In [2]:
```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler, StandardScaler
from sklearn.svm import SVC
import pandas as pd
```

In [3]:
```
a = load_breast_cancer()
a.target_names
```

Out[3]:
```
array(['malignant', 'benign'], dtype='<U9')
```

In [4]:
```
df=pd.DataFrame(a.data, columns = list(a.feature_names))
df['diagnosis'] = a.target
df.head(4)
```

Out[4]:

	mean radius	mean texture	mean perimeter	mean area	mean smoothness	mean compactness	mean concavity	mean concave points	mean symmetry	mean fractal dimension	...	worst texture	worst perimeter	worst area	worst smoothness	compa
0	17.99	10.38	122.80	1001.0	0.11840	0.27760	0.3001	0.14710	0.2419	0.07871	...	17.33	184.60	2019.0	0.1622	
1	20.57	17.77	132.90	1326.0	0.08474	0.07864	0.0869	0.07017	0.1812	0.05667	...	23.41	158.80	1956.0	0.1238	
2	19.69	21.25	130.00	1203.0	0.10960	0.15990	0.1974	0.12790	0.2069	0.05999	...	25.53	152.50	1709.0	0.1444	
3	11.42	20.38	77.58	386.1	0.14250	0.28390	0.2414	0.10520	0.2597	0.09744	...	26.50	98.87	567.7	0.2098	

In [5]:
```
X_train, X_test, y_train, y_test = train_test_split(a.data, a.target,stratify=a.target, random_state=42)
print(f"X_train shape: {X_train.shape}")
print(f"X_test shape: {X_test.shape}")
print(f"y_train shape: {y_train.shape}")
print(f"y_test shape: {y_test.shape}")
```

```
X_train shape: (426, 30)
X_test shape: (143, 30)
y_train shape: (426,)
y_test shape: (143,)
```

In [6]:
```
svm = SVC(kernel='linear')
svm.fit(X_train, y_train)
```

Out[6]:
```
SVC(kernel='linear')
```

In [7]:
```
print(f'Accuracy on training subset is: {svm.score(X_train, y_train):.3f}')
print(f'Accuracy on test subset is: {svm.score(X_test, y_test):.3f}')
```

```
Accuracy on training subset is: 0.962
Accuracy on test subset is: 0.951
```

In [8]:
```
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)
```

```
In [9]: svm = SVC(kernel='linear')
        svm.fit(X_train_scaled, y_train)

Out[9]: SVC(kernel='linear')

In [10]: print(f'Accuracy on training subset is: {svm.score(X_train_scaled, y_train):3f}')
         print(f'Accuracy on test subset is: {svm.score(X_test_scaled, y_test):.3f}')

         Accuracy on training subset is: 0.990610
         Accuracy on test subset is: 0.986
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 12A Date:	**Implement Logistic Regression to classify problems such as Spam detection**

Aim:

Write a program to implement Logistic Regression to classify problems such as Spam detection

Procedure:

Step 1:Import the Dependencies
Step 2:Load the csv data to a Pandas DataFrame
Step 3:Split the Features and Target
Step 4:Split the Data into Training data & Test Data
Step 5: Train the LogisticRegression model with Training data
Step 6: Find accuracy on training data&accuracy on test data

Program:

In [ ]:
```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
```

In [ ]:
```
data = pd.read_csv('spam.csv')
```

In [22]:
```
data.head()
```

Out[22]:

	Category	Message
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...

In [23]:
```
data['Message'].value_counts()
```

Out[23]:
```
Sorry, I'll call later
30
I cant pick the phone right now. Pls send a message
12
Ok...
10
Ok.
4
Say this slowly.? GOD,I LOVE YOU &amp;amp; I NEED YOU,CLEAN MY HEART WITH YOUR BLOOD.Send this to Ten special people &amp;amp; u c mira
cle tomorrow, do it,pls,pls do it...     4

..
Haha, my friend tyler literally just asked if you could get him a dubsack
1
Try neva mate!!
1
Ur cash-balance is currently 500 pounds - to maximize ur cash-in now send GO to 86688 only 150p/msg. CC: 08718720201 PO BOX 11
4/14 TCR/W1                              1
Its just the effect of irritation. Just ignore it
1
Booked ticket for pongal?
1
Name: Message, Length: 5157, dtype: int64
```

In [39]:
```
from sklearn import preprocessing
c1=preprocessing.LabelEncoder()
data['Category']=c1.fit_transform(data['Category'])
data['Message']=c1.fit_transform(data['Message'])
```

In [40]:
```
x = data.drop(columns='Message',axis=1)
```

In [41]:
```
y=data['Message']
```

In [42]:
```
x
```

Out[42]:

	Category
0	0
1	0
2	1
3	0
4	0
...	...
5567	1
5568	0
5569	0
5570	0
5571	0

5572 rows × 1 columns

In [43]:
```
y
```

Out[43]:
```
0       1080
1       3126
2        999
3       4121
4       2781
        ...
5567    4025
5568    4596
5569    3313
5570    3932
5571    3437
Name: Message, Length: 5572, dtype: int32
```

In [49]:
```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2)
```

In [50]:
```
print(x.shape,x_train.shape,x_test.shape)
```

```
(5572, 1) (4457, 1) (1115, 1)
```

In [61]:
```
model=LogisticRegression(max_iter=1000)
```

In [62]:
```
model.fit(x_train,y_train)
```

Out[62]:
```
LogisticRegression(max_iter=1000)
```

In [63]:
```
from sklearn.metrics import accuracy_score
```

In [64]:
```
x_train_prediction=model.predict(x_train)
trained_data_accuracy=accuracy_score(y_train,x_train_prediction)
print(trained_data_accuracy)
```

```
0.006057886470720216
```

In [65]:
```
print('Accuracy on training data:',round(trained_data_accuracy*100,2),'%')
```

```
Accuracy on training data: 0.61 %
```

In [67]:
```
x_test_prediction=model.predict(x_test)
test_data_accuracy=accuracy_score(y_test,x_test_prediction)
print(test_data_accuracy)
```

```
0.006278026905829596
```

In [68]:
```
print('Accuracy on test data:',round(test_data_accuracy*100,2),'%')
```

```
Accuracy on test data: 0.63 %
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 12B Date:	**Implement Logistic Regression to classify problems such as Diabetics detection**

Aim:

Write a program to implement Logistic Regression to classify problems such as Spam detection

Procedure:

Step 1:Import the Dependencies
Step 2:Load the CSV data to a Pandas DataFrame
Step 3:Split the Features and Target
Step 4:Split the Data into Training data & Test Data
Step 5: Train the LogisticRegression model with Training data
Step 6: Find accuracy on training data&accuracy on test data

Program:

In [1]:
```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
```

In [2]:
```
data = pd.read_csv('diabetes.csv')
```

In [3]:
```
data.head()
```

Out[3]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1

In [6]:
```
data['Outcome'].value_counts()
```

Out[6]:
```
0    500
1    268
Name: Outcome, dtype: int64
```

In [7]:
```
x=data.drop(columns='Outcome',axis=1)
```

In [9]:
```
y=data['Outcome']
```

In [10]:
```
x
```

Out[10]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
0	6	148	72	35	0	33.6	0.627	50
1	1	85	66	29	0	26.6	0.351	31
2	8	183	64	0	0	23.3	0.672	32
3	1	89	66	23	94	28.1	0.167	21
4	0	137	40	35	168	43.1	2.288	33
...	...	...	...	...	...	...	...	...
763	10	101	76	48	180	32.9	0.171	63
764	2	122	70	27	0	36.8	0.340	27
765	5	121	72	23	112	26.2	0.245	30
766	1	126	60	0	0	30.1	0.349	47
767	1	93	70	31	0	30.4	0.315	23

768 rows × 8 columns

In [11]:
```
y
```

```
Out[11]: 0      1
         1      0
         2      1
         3      0
         4      1
               ..
         763    0
         764    0
         765    0
         766    1
         767    0
         Name: Outcome, Length: 768, dtype: int64
```

```
In [12]: x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,stratify=y,random_state=2)
```

```
In [17]: print(x.shape,x_train.shape,x_test.shape)

         (768, 8) (614, 8) (154, 8)
```

```
In [18]: from sklearn.metrics import accuracy_score
```

```
In [20]: model=LogisticRegression(max_iter=1000)
         model.fit(x_train,y_train)
         x_train_prediction=model.predict(x_train)
         trained_data_accuracy=accuracy_score(y_train,x_train_prediction)
         print(trained_data_accuracy)

         0.7882736156351792
```

```
In [21]: print('Accuracy on training data:',round(trained_data_accuracy*100,2),'%')

         Accuracy on training data: 78.83 %
```

```
In [22]: x_test_prediction=model.predict(x_test)
         test_data_accuracy=accuracy_score(y_test,x_test_prediction)
         print(test_data_accuracy)

         0.7597402597402597
```

```
In [23]: print('Accuracy on test data:',round(test_data_accuracy*100,2),'%')

         Accuracy on test data: 75.97 %
```

Result:

The above program executed successfully. Hence output verified

Exercise No. : 13 **Date:**	**Customer Segmentation using K-Means Clustering**

Aim:

Write a program Customer Segmentation using K-Means Clustering

Procedure:

Step 1:Loading the data from csv file to a Pandas DataFrame
Step 2:First 5 rows in the dataframe
Step 3:Finding the number of rows and columns
Step 4:Getting some informations about the dataset
Step 5:Checking for missing values
Step 6:Finding wcss value for different number of clusters
Step 7: Plot an elbow graph
Step 8:Optimum Number of Clusters = 5
Step 9: Training the k-Means Clustering Model
Step 10: Return a label for each data point based on their cluster
Step 11: Visualizing all the Clusters

Program:

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.cluster import KMeans
```

In [2]:
```
# loading the data from csv file to a Pandas DataFrame
customer_data = pd.read_csv('Mall_Customers.csv')
```

In [3]:
```
# first 5 rows in the dataframe
customer_data.head()
```

Out[3]:

	CustomerID	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40

In [4]:
```
# finding the number of rows and columns
customer_data.shape
```

Out[4]:
```
(200, 5)
```

In [5]:
```
# getting some informations about the dataset
customer_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   CustomerID              200 non-null    int64
 1   Gender                  200 non-null    object
 2   Age                     200 non-null    int64
 3   Annual Income (k$)      200 non-null    int64
 4   Spending Score (1-100)  200 non-null    int64
dtypes: int64(4), object(1)
memory usage: 7.9+ KB
```

In [6]:
```
# checking for missing values
customer_data.isnull().sum()
```

Out[6]:
```
CustomerID                0
Gender                    0
Age                       0
Annual Income (k$)        0
Spending Score (1-100)    0
dtype: int64
```

In [7]:
```
X = customer_data.iloc[:,[3,4]].values
```

In [8]:
```
print(X)
```

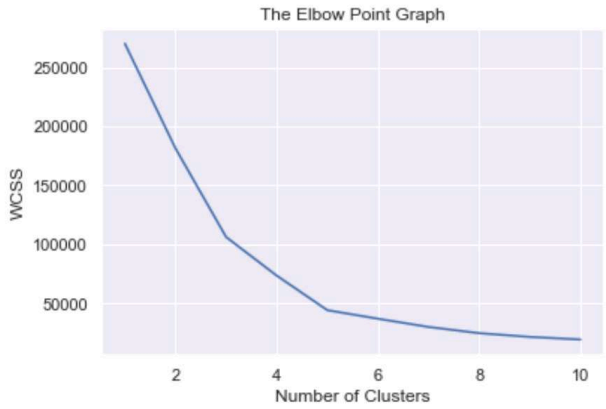
```
[[ 15  39]
 [ 15  81]
 [ 16   6]
 [ 16  77]
 [ 17  40]
 [ 17  76]
 [ 18   6]
 [ 18  94]
 [ 19   3]
 [ 19  72]
 [ 19  14]
 [ 19  99]
 [ 20  15]
 [ 20  77]
 [ 20  13]
 [ 20  79]
 [ 21  35]
 [ 21  66]
 [ 23  29]
```

Choosing the number of clusters

WCSS -> Within Clusters Sum of Squares

In [9]:
```
# finding wcss value for different number of clusters

wcss = []

for i in range(1,11):
  kmeans = KMeans(n_clusters=i, init='k-means++', random_state=42)
  kmeans.fit(X)

  wcss.append(kmeans.inertia_)
```

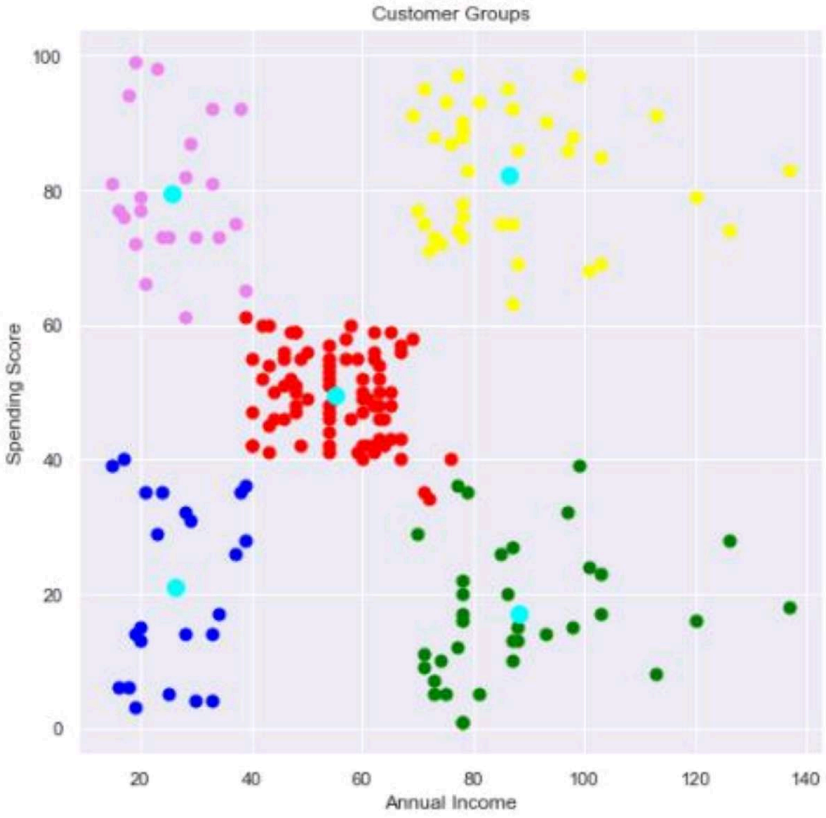
In [10]:
```
# plot an elbow graph

sns.set()
plt.plot(range(1,11), wcss)
plt.title('The Elbow Point Graph')
plt.xlabel('Number of Clusters')
plt.ylabel('WCSS')
plt.show()
```



In [11]:
```
#Optimum Number of Clusters = 5

#Training the k-Means Clustering Model

kmeans = KMeans(n_clusters=5, init='k-means++', random_state=0)

# return a label for each data point based on their cluster
Y = kmeans.fit_predict(X)

print(Y)
```

```
[4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4
 3 4 3 4 3 4 1 4 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 2 0 2 1 2 0 2 0 2 1 2 0 2 0 2 0 2 0 2 1 2 0 2 0 2
 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0
 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2]
```

In [12]:
```
# 5 Clusters - 0, 1, 2, 3, 4
# Visualizing all the Clusters
# plotting all the clusters and their Centroids

plt.figure(figsize=(8,8))
plt.scatter(X[Y==0,0], X[Y==0,1], s=50, c='green', label='Cluster 1')
plt.scatter(X[Y==1,0], X[Y==1,1], s=50, c='red', label='Cluster 2')
plt.scatter(X[Y==2,0], X[Y==2,1], s=50, c='yellow', label='Cluster 3')
plt.scatter(X[Y==3,0], X[Y==3,1], s=50, c='violet', label='Cluster 4')
plt.scatter(X[Y==4,0], X[Y==4,1], s=50, c='blue', label='Cluster 5')
# plot the centroids
plt.scatter(kmeans.cluster_centers_[:,0], kmeans.cluster_centers_[:,1], s=100, c='cyan', label='Centroids')

plt.title('Customer Groups')
plt.xlabel('Annual Income')
plt.ylabel('Spending Score')
plt.show()
```



Result:

The above program executed successfully. Hence output verified

MADHA ENGINEERING COLLEGE

(Affiliated to Anna University and Approved by AICTE, New Delhi) Madha Nagar, Kundrathur, Chennai-600069

DEPARTMENT OF Master of Computer Application

MC4312

Internet of Things Laboratory

R-2021

LAB MANUAL

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4312 INTERNET OF THINGS LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

- To design applications to interact with sensors
- To design and develop IoT application Arduino/Raspberry pi for real world scenario.
- To enable communication between IoT and cloud platforms
- To develop applications using Django Framework

EXPERIMENTS:

PART I:

1. To study various IoT protocols – 6LowPAN, IPv4/IPv6, Wifi, Bluetooth, MQTT.
2. IoT Application Development Using sensors and actuators (temperature sensor, light sensor, infrared sensor)
3. To study Raspberry Pi development board and to implement LED blinking applications.
4. To develop an application to send and receive data with Arduino using HTTP request
5. To develop an application that measures the room temperature and posts the temperature value on the cloud platform.
6. To develop an application that measures the moisture of soil and post the sensed data over Google Firebase cloud platform.
7. To develop an application for measuring the distance using ultrasonic sensor and post distance value on Google Cloud IoT platform
8. Develop a simple application based on sensors.
9. Develop IoT applications using Django Framework and Firebase/ Bluemix platform.
10. Develop a commercial IoT application.

TOTAL: 60 PERIODS

HARDWARE/SOFTWARE REQUIREMENTS:

1. The universal microcontroller development board
2. 8051 Daughter Board
3. Raspberry Pi 3B+ Original
4. Arduino Daughter Board
5. Humidity + IR Sensor Interface
6. Ultrasonic Sensors
7. Open source softwares Django Framework

Exercise no: 1 Date:	Design and develop an event registration form

Aim:

Design and develop an event registration form

Procedure:

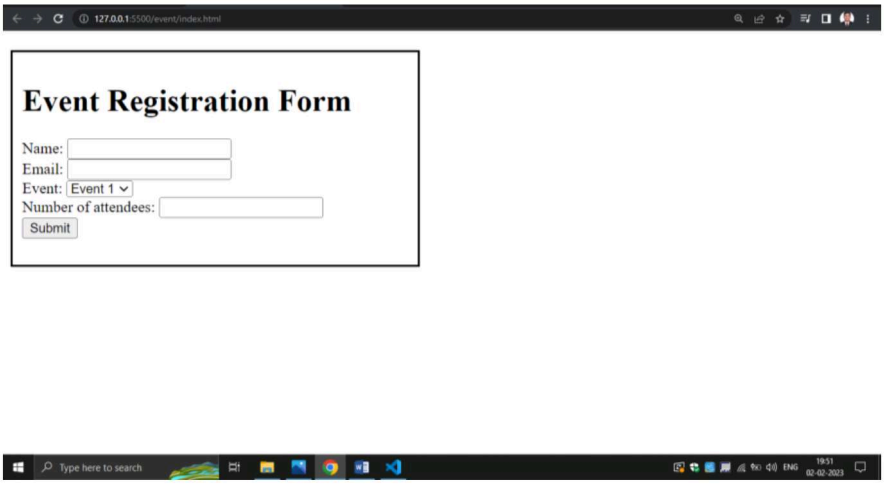
Step 1: Open the code editor.
Step 2: Inside a form tag give the necessary labels and corresponding input fields.
Step 3: Provide a submit button in the form at last.
Step 4: Close the form tag and all other tags opened.
Step 5: Use CSS to style the design.
Step 6: Run the code to check the output.

Program:

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Event Registration Form</title>
   <style>
    .box
      {
         border: 2px solid black;
         margin-top: 20px;
         padding: 10px;
         height: 200px;
         width: 400px;
      }
   </style>
</head>
<body class="box">
  <h1>Event Registration Form</h1>
   <form action="submit_registration.php" method="post">
  <div>
   <label for="name">Name:</label>
   <input type="text" id="name" name="name">
  </div>
  <div>
   <label for="email">Email:</label>
   <input type="email" id="email" name="email">
  </div>
  <div>
   <label for="event">Event:</label>
   <select id="event" name="event">
    <option value="event1">Event 1</option>
    <option value="event2">Event 2</option>
```

```
      <option value="event3">Event 3</option>
    </select>
  </div>
  <div>
    <label for="number_of_attendees">Number of attendees:</label>
    <input type="number" id="number_of_attendees" name="number_of_attendees">
  </div>
  <div>
    <input type="submit" value="Submit">
  </div>
</form>
</body>
</html>
```

Output:



Result:

The above program executed successfully, Hence output verified.

Exercise no: 2 Date:	Design and develop a sticky navbar using floats and SASS

Aim:

Design and develop a sticky navbar using floats and SASS.

Procedure:

Step 1: Open the code editor.
Step 2: Provide the link of the CSS.
Step 3: Use the header tag to provide header to the web page.
Step 4: Inside the nav tag provide the necessary navigation contents.
Step 5: In CSS, provide the styling to the navigation contents.
Step 6: Run the code to check the output.

Program:

index.html

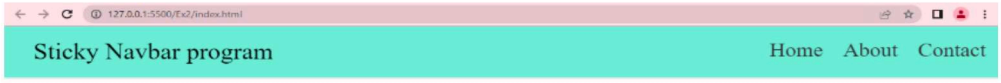
```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Sticky navbar</title>
   <link rel="stylesheet" href="/Ex2/style.css">
</head>
<body>
   <header class="header">
      <nav class="header__nav">
       <ul class="header__list">
         <li class="header__item">Sticky Navbar program</li>
       </ul>
      </nav>
      <nav class="header__nav1">
        <ul class="header__list">
          <li class="header__item"><a href="#" class="header__link">Home</a></li>
          <li class="header__item"><a href="#" class="header__link">About</a></li>
          <li class="header__item"><a href="#" class="header__link">Contact</a></li>
        </ul>
       </nav>
   </header>
</body>
</html>
```

style.css

```
.header {
   position: fixed;
   top: 0;
   left: 0;
   width: 100%;
```

```
  background-color: rgb(109, 236, 215);
  box-shadow: 0 2px 4px rgba(0, 0, 0, 0.1);
 }

 .header__nav {
  float: left;
  margin: 0;
  padding: 20px;
  font-size: 35px;
 }
 .header__nav1 {
  float: right;
  margin: 0;
  padding: 20px;
  font-size: 30px;
 }

 .header__list {
  list-style: none;
  margin: 0;
  padding: 0;
  display: inline-block;
 }

 .header__item {
  display: inline-block;
  margin-left: 20px;

 }

 .header__link {
  color: #333;
  text-decoration: none;
 }
```

Output:



Result:

The above program executed successfully, Hence output verified.

Exercise no: 3 Date:	Design and develop a developer portfolio page

Aim:

Design and develop a developer portfolio page. Develop the layout using flex box and ensure the page is responsive

Procedure:

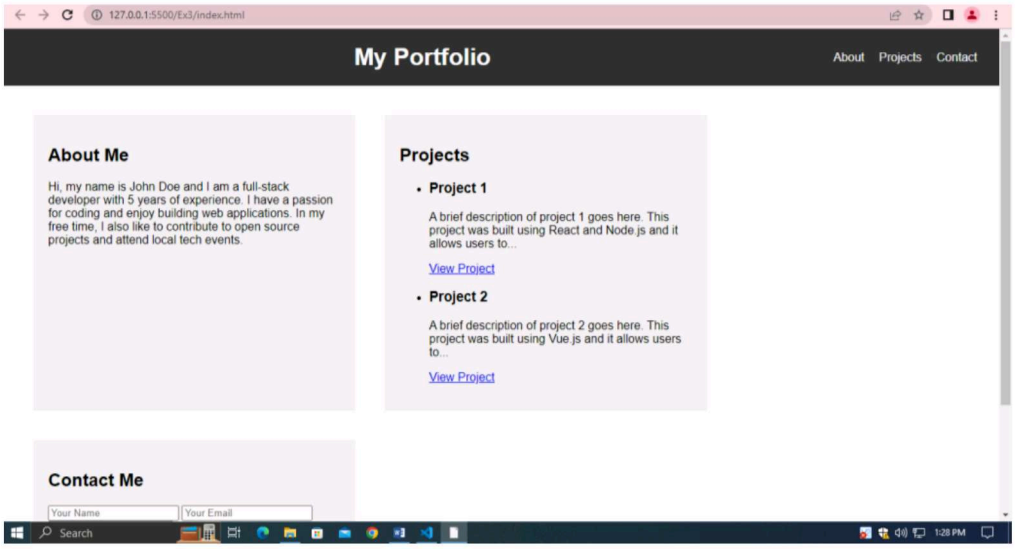
Step 1:
Step 2:
Step 3:

Program:

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <link rel="stylesheet" href="/Ex3/style.css">
    <title>My Portfolio</title>
  </head>
  <body>
    <header>
      <h1>My Portfolio</h1>
      <nav>
        <ul>
          <li><a href="#about">About</a></li>
          <li><a href="#projects">Projects</a></li>
          <li><a href="#contact">Contact</a></li>
        </ul>
      </nav>
    </header>
    <main>
      <section id="about">
        <h2>About Me</h2>
        <p>Hi, my name is John Doe and I am a full-stack developer with 5 years of experience. I have a passion for coding and enjoy building web applications. In my free time, I also like to contribute to open source projects and attend local tech events.</p>
      </section>
      <section id="projects">
        <h2>Projects</h2>
        <ul>
          <li>
            <h3>Project 1</h3>
            <p>A brief description of project 1 goes here. This project was built using React and Node.js and it allows users to...</p>
            <a href="#">View Project</a>
          </li>
          <li>
            <h3>Project 2</h3>
```

```
            <p>A brief description of project 2 goes here. This project was built using Vue.js and it allows users to...</p>
            <a href="#">View Project</a>
          </li>
        </ul>
      </section>
      <section id="contact">
        <h2>Contact Me</h2>
        <form action="#" method="post">
          <input type="text" name="name" placeholder="Your Name">
          <input type="email" name="email" placeholder="Your Email">
          <textarea name="message" placeholder="Your Message"></textarea>
          <button type="submit">Send</button>
        </form>
      </section>
    </main>
    <footer>
      <p>Copyright &copy; 2023 John Doe</p>
    </footer>
  </body>
</html>
```

Output:



Result:

The above program executed successfully, Hence output verified.

Exercise no: 4 Date:	Design and develop pricing card list

Aim:

Design and develop pricing card list which are responsive using plain CSS and Flex box.

Procedure:

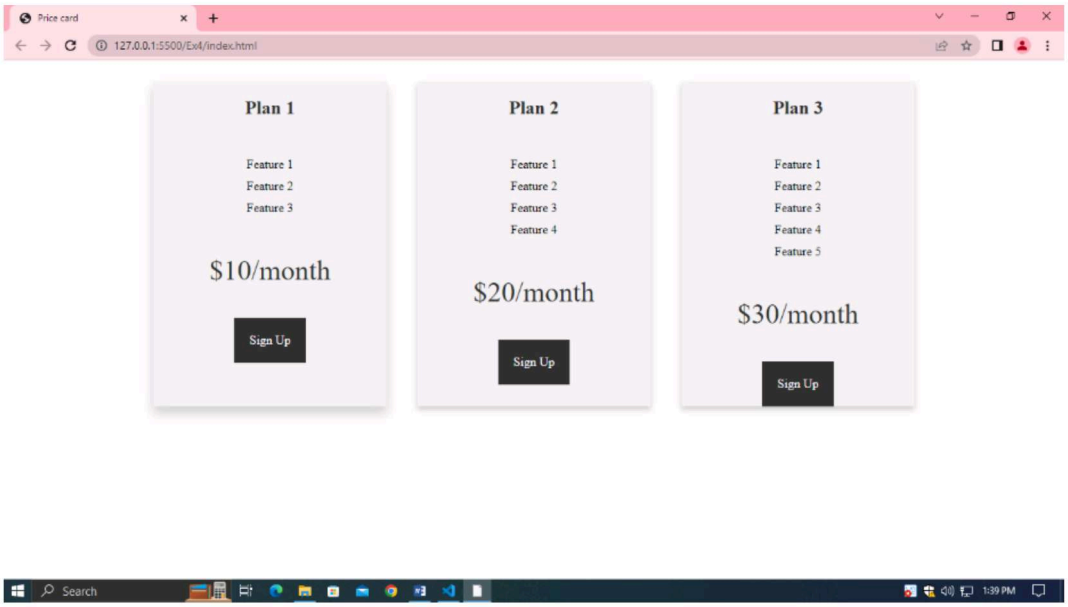
Step 1:
Step 2:
Step 3:

Program:

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Price card</title>
   <link rel="stylesheet" href="/Ex4/style.css">
</head>
<body>
   <div class="price-list">
      <div class="price-card">
       <h3>Plan 1</h3>
       <ul>
         <li>Feature 1</li>
         <li>Feature 2</li>
         <li>Feature 3</li>
       </ul>
       <div class="price">$10/month</div>
       <a href="#" class="sign-up">Sign Up</a>
      </div>
      <div class="price-card">
       <h3>Plan 2</h3>
       <ul>
         <li>Feature 1</li>
         <li>Feature 2</li>
         <li>Feature 3</li>
         <li>Feature 4</li>
       </ul>
       <div class="price">$20/month</div>
       <a href="#" class="sign-up">Sign Up</a>
      </div>
      <div class="price-card">
       <h3>Plan 3</h3>
       <ul>
         <li>Feature 1</li>
         <li>Feature 2</li>
```

```
            <li>Feature 3</li>
            <li>Feature 4</li>
            <li>Feature 5</li>
          </ul>
          <div class="price">$30/month</div>
          <a href="#" class="sign-up">Sign Up</a>
        </div>
      </div>
    </body>
</html>
```

Output:



Result:

The above program executed successfully, Hence output verified.

Exercise no: 5 Date:	**Develop a register form and validate it using JavaScript and display error message in HTML page**

Aim:

Develop a register form and validate it using JavaScript and display error message in HTML page

Procedure:

Step 1:
Step 2:
Step 3:

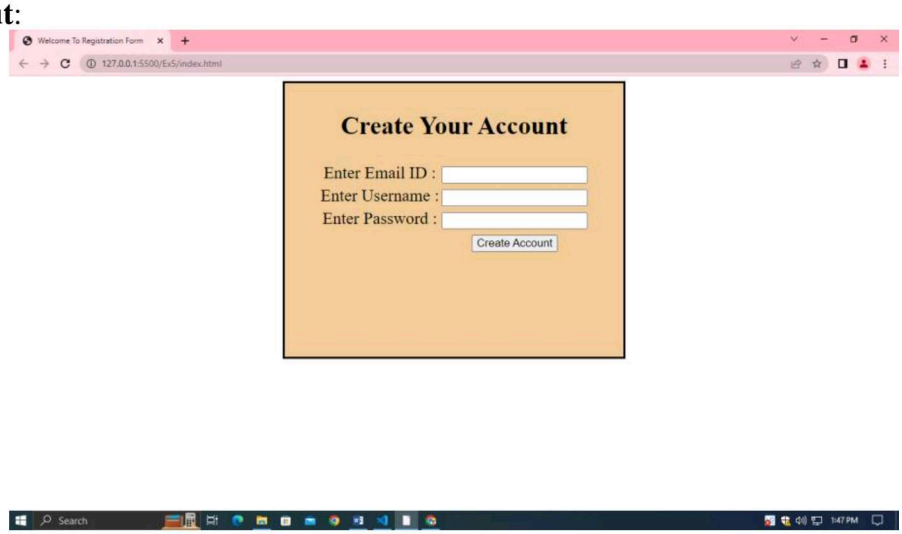
Program:

```
<!DOCTYPE html>
 <html>
 <head>
 <title>Welcome To Registration Form</title>
 </head>
 <script>
  function registration()
       {

            var email= document.getElementById("t2").value;
            var uname= document.getElementById("t3").value;
            var pwd= document.getElementById("t4").value;

    //email id expression code
            var letters = /^[A-Za-z]+$/;
            var filter = /^([a-zA-Z0-9_\.\-])+\@(([a-zA-Z0-9\-])+\.)+([a-zA-Z0-9]{2,4})+$/;

            if(email=='')
            {
                  alert('Please enter your user email id');
            }
            else if (!filter.test(email))
            {
                  alert('Invalid email');
            }
            else if(uname=='')
            {
                  alert('Please enter the user name.');
            }
            else if(!letters.test(uname))
            {
                  alert('User name field required only alphabet characters');
            }
            else if(pwd=='')
            {
                  alert('Please enter Password');
            }
```

```
                else if(!letters.test(pwd))
                {
                        alert ('Upper case, Lower case, Special character and Numeric letter are
required in Password filed');
                }
                else
                {
          alert('Thank You for Login & You are Redirecting to Google');
                        // Redirecting to other page or webste code.
                        window.location = "http://www.google.com";
                }
        }
 </script>
 <style>
  .login
  {
     border: 3px solid black;
     margin: auto;
     height: 400px;
     width: 500px;
     padding: 10px;
     text-align: center;
     font-size: 26px;
     background-color: rgb(241, 206, 153);
  }
  .tb
  {
     font-size: 17px;
  }
 </style>
        <body>
        <!-- create account div -->
  <div class="login">
  <table align="center">
        <h2>Create Your Account</h2>
  <tr>
        <td>Enter Email ID :</td>
        <td><input type="text" id="t2" class="tb" /></td>
        </tr>
        <tr>
        <td>Enter Username :</td>
        <td><input type="text" id="t3" class="tb" /></td>
        </tr>
        <tr>
        <td>Enter Password :</td>
        <td><input type="password" id="t4" class="tb" /></td>
        </tr>
        <tr>
        <td></td>
        <td>
```

```
<input type="submit" value="Create Account" class="tb" onclick="registration()"
/></td>
</tr>
</table>
</div>
<!-- create account box ending here.. -->
</body>
</html>
```

Output:



Result:

The above program executed successfully, Hence output verified.

Exercise no: 6 Date:	**Develop a website that uses the 'jsonplaceholder' API to get posts data and display them in the**

Aim:

Develop a website that uses the 'jsonplaceholder' API to get posts data and display them in the form of a card. Use Flex box to style the cards

Procedure:

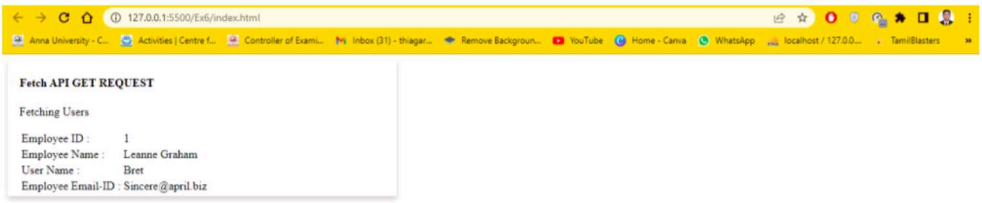
Step 1:
Step 2:
Step 3:

Program:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta http-equiv="X-UA-Compatible" content="IE=edge">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>API CARD</title>
<script>
  const api_url = "https://jsonplaceholder.typicode.com/users";
let i = parseInt(prompt("Enter the User ID: "));
--i;
async function getapi(url)
{
        const response = await fetch(url);
        var data = await response.json();
        console.log(data[i]);
        show(data);
}
getapi(api_url);
function show(data)
{
        let tab = `<tr>
                        <td>Employee ID : </td>
                        <td>${data[i].id}</td>
                </tr>
                <tr>
                        <td>Employee Name : </td>
                        <td>${data[i].name}</td>
                </tr>
                <tr>
                        <td>User Name : </td>
                        <td>${data[i].username}</td>
                </tr>
                <tr>
                        <td>Employee Email-ID : </td>
                        <td>${data[i].email}</td>
```

```
                    </tr>`;
            document.getElementById("demo").innerHTML = tab;
        }
        </script>
        <style>
          .card
        {
        box-shadow: 0 4px 8px 0 rgba(0,0,0,0.2);
        transition: 0.3s;
        width: 40%;
        }
        .card:hover
        {
        box-shadow: 0 8px 16px 0 rgba(0,0,0,0.2);
        }
        .container
        {
        padding: 2px 16px;
        }
        </style>
        </head>
        <body>
          <div class="card">
                    <imgsrc="img_avatar.png" alt="Avatar" style="width:50%">
                    <div class="container">
                    <h4><b>Fetch API GET REQUEST</b></h4>
                    <p>Fetching Users</p>
                    <table id="demo"></table>
                    </div>
            </div>
        </div>
        </body>
        </html>
```

Output:



Result:

The above program executed successfully, Hence output verified.

Exercise no: 7 Date:	**Develop a php server that Creates, Reads, Updates and Deletes Todo and save them in MySQL database**

Aim:

Develop a php server that Creates, Reads, Updates and Deletes Todo and save them in MySQL database MySQL database.

Procedure:

Step 1:
Step 2:
Step 3:

Program:

```
<?php
$servername = "localhost";
$username = "root";
$password = "";
$dbname = "demo";

// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection
if ($conn->connect_error) {
   die("Connection failed: " . $conn->connect_error);
}

// Create Todo
if ($_SERVER['REQUEST_METHOD'] === 'POST' && isset($_POST['create_todo'])) {
   $text = $_POST['text'];
   $sql = "INSERT INTO employees (text) VALUES ('$text')";
   if ($conn->query($sql) === TRUE) {
      echo "Todo created successfully";
   } else {
      echo "Error creating Todo: " . $conn->error;
   }
}

// Read Todos
if ($_SERVER['REQUEST_METHOD'] === 'GET') {
   $sql = "SELECT id, text FROM employees";
   $result = $conn->query($sql);
   if ($result->num_rows > 0) {
      $todos = [];
      while ($row = $result->fetch_assoc()) {
         $todos[] = $row;
      }
      echo json_encode($todos);
   } else {
```

```
        echo "No Todos found";
    }
}

// Update Todo
if ($_SERVER['REQUEST_METHOD'] === 'POST' && isset($_POST['update_todo'])) {
    $id = $_POST['id'];
    $text = $_POST['text'];
    $sql = "UPDATE employees SET text='$text' WHERE id=$id";
    if ($conn->query($sql) === TRUE) {
        echo "Todo updated successfully";
    } else {
        echo "Error updating Todo: " . $conn->error;
    }
}

// Delete Todo
if ($_SERVER['REQUEST_METHOD'] === 'POST' && isset($_POST['delete_todo'])) {
    $id = $_POST['id'];
    $sql = "DELETE FROM employees WHERE id=$id";
    if ($conn->query($sql) === TRUE) {
        echo "Todo deleted successfully";
    } else {
        echo "Error deleting Todo: " . $conn->error;
    }
}

$conn->close();
?>
```

Exercise no: 8 Date:	**Develop a php server that registers and authenticates user session and stores user data in MySQL database.**

Aim:

Develop a php server that registers and authenticates user session and stores user data in MySQL database.

Procedure:

Step 1:
Step 2:
Step 3:

Program:

login.html

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Document</title>
</head>
<body>
   <form action="/Ex8/session.php" method="post">
      <label for="username">Username:</label>
      <input type="text" id="username" name="username">
      <br><br>
      <label for="password">Password:</label>
      <input type="password" id="password" name="password">
      <br><br>
      <input type="submit" value="Login" name="login">
   </form>
</body>
</html>
```

index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">

   <title>Document</title>
</head>
```

```
<body>
    <form action="/Ex8/session.php" method="post">
        <label for="username">Username:</label>
        <input type="text" id="username" name="username">
        <br><br>
        <label for="email">Email:</label>
        <input type="email" id="email" name="email">
        <br><br>
        <label for="password">Password:</label>
        <input type="password" id="password" name="password">
        <br><br>
        <input type="submit" value="Register" name="register">
    </form>
</body>
</html>
```

session.php

```
 <?php
// Connect to the database
$servername = "localhost";
$username = "root";
$password = "";
$dbname = "demo";

// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection
if ($conn->connect_error) {
    die("Connection failed: " . $conn->connect_error);
}

// Check if the form has been submitted
if (isset($_POST['register'])) {
    // Get the form data
    $username = $_POST['username'];
    $email = $_POST['email'];
    $password = $_POST['password'];

    // Hash the password
    $password_hash = password_hash($password, PASSWORD_BCRYPT);

    // Check if the email and username are unique
    $query = "SELECT * FROM users WHERE email='$email' OR username='$username'";
    $result = $conn->query($query);

    if ($result->num_rows > 0) {
        // Email or username already exists
        echo "Email or username already exists, please choose another.";
```

```
    } else {
        // Insert the new user
        $query = "INSERT INTO users (username, email, password) VALUES ('$username',
'$email', '$password_hash')";

        if ($conn->query($query) === TRUE) {
            // User registered successfully
            echo "User registered successfully.";
        } else {
            // Error occurred
            echo "Error: " . $conn->error;
        }
    }
} elseif (isset($_POST['login'])) {
    // Get the form data
    $username = $_POST['username'];
    $password = $_POST['password'];

    // Get the user from the database
    $query = "SELECT * FROM users WHERE username='$username'";
    $result = $conn->query($query);

    if ($result->num_rows == 0) {
        // User not found
        echo "User not found.";
    } else {
        // User found
        $user = $result->fetch_assoc();

        // Verify the password
        if (password_verify($password, $user['password'])) {
            // Password is correct
            // Start a new session
            session_start();
            $_SESSION['user_id'] = $user['id'];
            $_SESSION['username'] = $user['username'];

            // Redirect to the home page
            header('Location: home.php');
            exit;
        } else {
            // Password is incorrect
            echo "Password is incorrect.";
        }
    }
}

// Close the connection
$conn->close();
```

Output: