Practical No 1

Aim: Implementing k-means classification Technique.

Description :-

The algorithm will categorize the items into k groups of similarity. To calculate that similarity, we will use the euclidean distance as measurement.

The algorithm works as follows:

First, we initialize k points, called means, randomly. We categorize each item to its closest mean and we update the mean's coordinates, which are the averages of the items categorized in that mean so far. We repeat the process for a given number of iterations and at the end, we have our clusters.

Methods :-

1. numpy.random.randint(low, high=None, size=None) :-

   Return random integers from low (inclusive) to high (exclusive).

2. matplotlib.pyplot.figure(figsize=(x,y)) :-

   Create a new figure, or activate an existing figure.

3. matplotlib.pyplot.scatter(x, y, color ='k') :-

   With Pyplot, you can use the scatter() function to draw a scatter plot.

4. matplotlib.pyplot.xlim(*args, **kwargs) :-

   The xlim() function in pyplot module of matplotlib library is used to get or set the x-limits of the current axes.

5. matplotlib.pyplot.ylim(*args, **kwargs) :-

   The ylim() function in pyplot module of matplotlib library is used to get or set the y-limits of the current axes.

6. matplotlib.pyplot.show() :-

   This method is used to display the graph.

7. df.head() :-

   This method is used to obtain size of the dataset.

Program :-

```
## Initialisation

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

df = pd.DataFrame({
    'x': [12, 20, 28, 18, 29, 33, 24, 45, 45, 52, 51, 52, 55, 53, 55, 61, 64, 69, 72],
    'y': [39, 36, 30, 52, 54, 46, 55, 59, 63, 70, 66, 63, 58, 23, 14, 8, 19, 7, 24]
})

np.random.seed(200)
k = 3
# centroids[i] = [x, y]
centroids = {
    i+1: [np.random.randint(0, 80), np.random.randint(0, 80)]
    for i in range(k)
}

fig = plt.figure(figsize=(5, 5))
plt.scatter(df['x'], df['y'], color='k')
colmap = {1: 'r', 2: 'g', 3: 'b'}
for i in centroids.keys():
    plt.scatter(*centroids[i], color=colmap[i])
plt.xlim(0, 80)
plt.ylim(0, 80)
plt.title("Initialisation step __By Mazhar Solkar")
plt.show()

## Assignment Stage

def assignment(df, centroids):
    for i in centroids.keys():
        # sqrt((x1 - x2)^2 - (y1 - y2)^2)
        df['distance_from_{}'.format(i)] = (
            np.sqrt((df['x'] - centroids[i][0]) ** 2 + (df['y'] - centroids[i][1]) ** 2)
        )
    centroid_distance_cols = ['distance_from_{}'.format(i) for i in centroids.keys()]
    df['closest'] = df.loc[:, centroid_distance_cols].idxmin(axis=1)
    df['closest'] = df['closest'].map(lambda x: int(x.lstrip('distance_from_')))
    df['color'] = df['closest'].map(lambda x: colmap[x])
    return df

df = assignment(df, centroids)
print(df.head())

fig = plt.figure(figsize=(5, 5))
plt.scatter(df['x'], df['y'], color=df['color'], alpha=0.5, edgecolor='k')
for i in centroids.keys():
    plt.scatter(*centroids[i], color=colmap[i])
plt.xlim(0, 80)
plt.ylim(0, 80)
plt.title("Assignment Stage __By Mazhar Solkar")
plt.show()
```

```
## Update Stage

import copy

old_centroids = copy.deepcopy(centroids)

def update(k):
    for i in centroids.keys():
        centroids[i][0] = np.mean(df[df['closest'] == i]['x'])
        centroids[i][1] = np.mean(df[df['closest'] == i]['y'])
    return k

centroids = update(centroids)

fig = plt.figure(figsize=(5, 5))
ax = plt.axes()
plt.scatter(df['x'], df['y'], color=df['color'], alpha=0.5, edgecolor='k')
for i in centroids.keys():
    plt.scatter(*centroids[i], color=colmap[i])
plt.xlim(0, 80)
plt.ylim(0, 80)
for i in old_centroids.keys():
    old_x = old_centroids[i][0]
    old_y = old_centroids[i][1]
    dx = (centroids[i][0] - old_centroids[i][0]) * 0.75
    dy = (centroids[i][1] - old_centroids[i][1]) * 0.75
    ax.arrow(old_x, old_y, dx, dy, head_width=2, head_length=3, fc=colmap[i], ec=colmap[i])
plt.title("Update Stage __By Mazhar Solkar")
plt.show()

## Repeat Assigment Stage

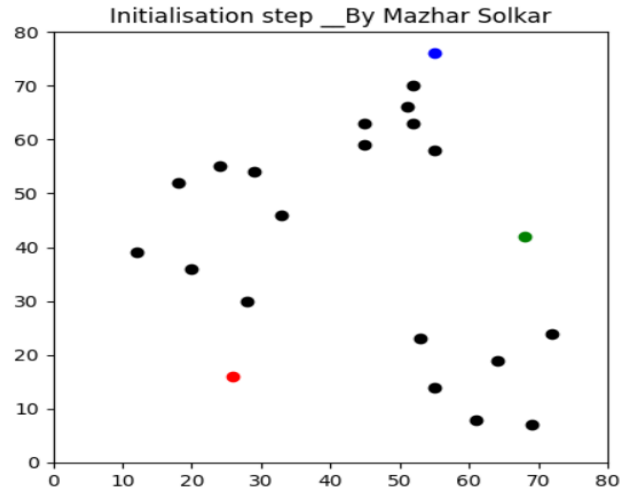
df = assignment(df, centroids)

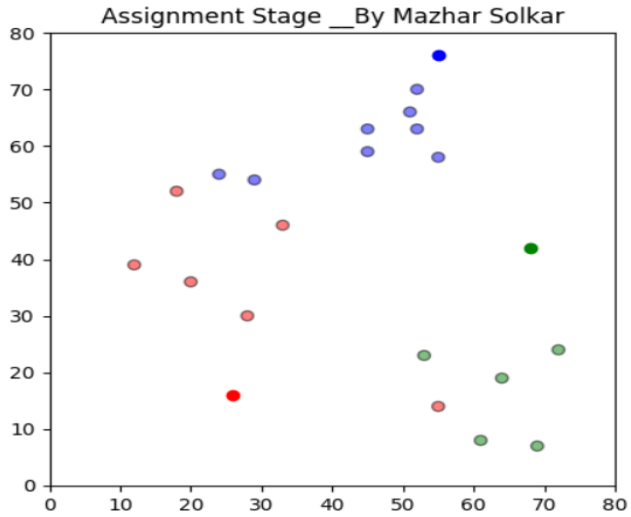
# Plot results
fig = plt.figure(figsize=(5, 5))
plt.scatter(df['x'], df['y'], color=df['color'], alpha=0.5, edgecolor='k')
for i in centroids.keys():
    plt.scatter(*centroids[i], color=colmap[i])
plt.xlim(0, 80)
plt.ylim(0, 80)
plt.title("Repeat Assignment Stage __By Mazhar Solkar")
plt.show()

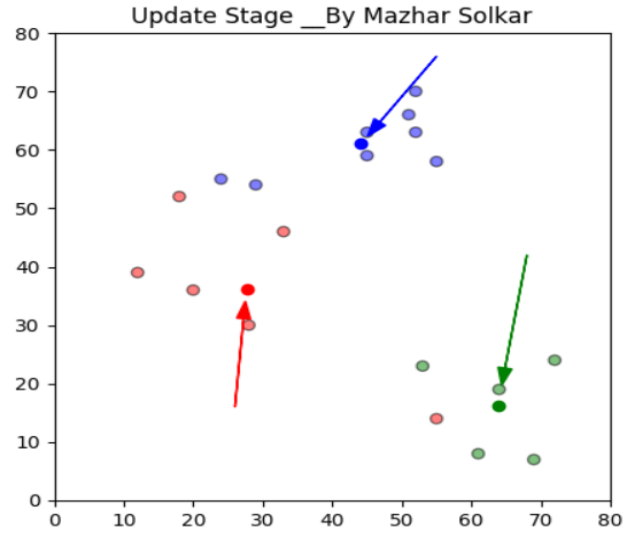
# Continue until all assigned categories don't change any more
while True:
    closest_centroids = df['closest'].copy(deep=True)
    centroids = update(centroids)
    df = assignment(df, centroids)
    if closest_centroids.equals(df['closest']):
        break

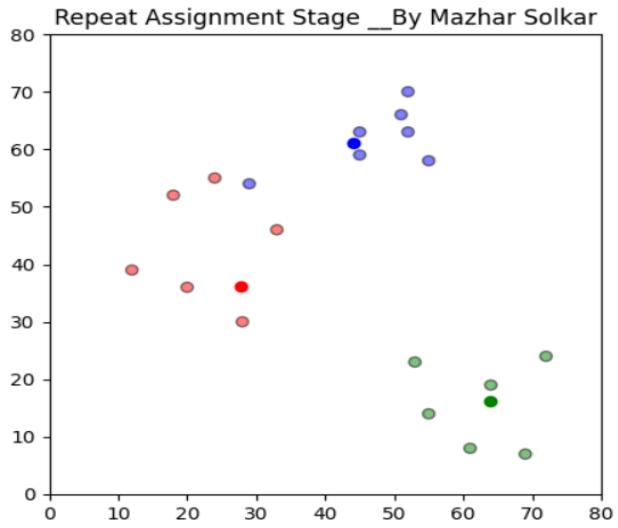
fig = plt.figure(figsize=(5, 5))
plt.scatter(df['x'], df['y'], color=df['color'], alpha=0.5, edgecolor='k')
for i in centroids.keys():
    plt.scatter(*centroids[i], color=colmap[i])
plt.xlim(0, 80)
plt.ylim(0, 80)
plt.title("Final Stage __By Mazhar Solkar")
plt.show()
```

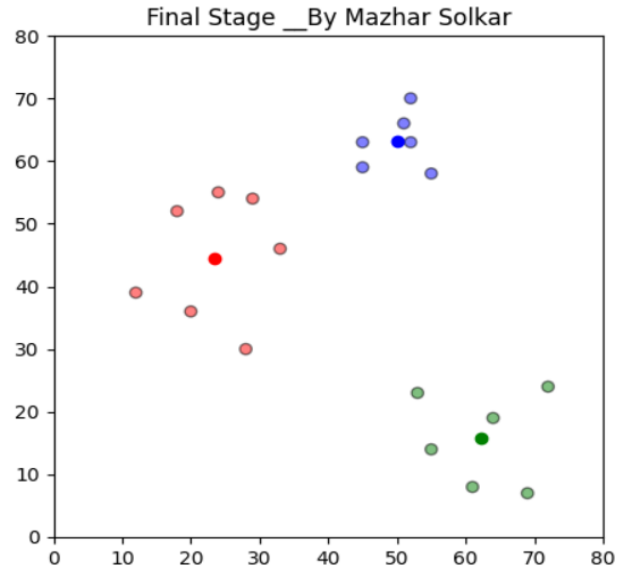
Output :-


Initialisation step __By Mazhar Solkar


Assignment Stage __By Mazhar Solkar


Update Stage __By Mazhar Solkar


Repeat Assignment Stage __By Mazhar Solkar
0
10
20
30
40
50
60
70
80


Final Stage __By Mazhar Solkar
0
10
20
30
40
50
60
70
80

Practical No 2

Aim: Implementing Linear Regression

Description: -

Linear regression is one of the easiest and most popular Machine Learning algorithms. It is a statistical method that is used for predictive analysis. Linear regression makes predictions for continuous/real or numeric variables such as **sales, salary, age, product price,** etc.

Linear regression algorithm shows a linear relationship between a dependent (y) and one or more independent (y) variables, hence called as linear regression. Since linear regression shows the linear relationship, which means it finds how the value of the dependent variable is changing according to the value of the independent variable.

Methods :-

1. pd.read_csv(inputfilename) :-

    This method is used to read the csv files.

2. dataframe.iloc[:,[colno_1,colon_3]] :-

    This method is used to fetch specific row of specific columns.

3. train_test_split(x,y,test_size=0.25,random_state=0) :-

    This method is used to split dataframe into training and testing dataset.

4. StandardScaler() :-

    This method is used for feature scaling.

5. SVC(kernel='linear', random_state=0) :-

    This method is used for linear support vector classifier.

6. metrics.accuracy_score(y_test,y_pred) :-

    This method is used to check the accuracy score.

7. model.coef_ :-

    model.coef_ is used to obtain coefficient value and

8. model.intercept_ :-

model.intercept_ is used to obtain intercept value.

9. model.score(waist,weight) :-

This method is used to check the accuracy of the model.

10. model.predict(Waist_new) :-

This method is used to predict the value based on trained dataset.

11. data.corr() :-

This method is used to obtain correlation.

12. lm.fit(waist, weight) :-

fit() is used to train model.

Program :-

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn import linear_model

data=pd.read_csv("C:/0_MSc_IT_Notes/Big Data Analytics/practicals/linear_regression_practical/weightwaist.csv")
print(data)
data.plot(kind='scatter',x='waist_cm',y='weight_kg')
plt.title('__By Mazhar Solkar')
plt.show()

print('\nCorrelation')
print(data.corr())

# Defining dependent and independent variables
waist=pd.DataFrame(data['waist_cm'])
weight=pd.DataFrame(data['weight_kg'])

print('\nwaist')
print(waist)
print('\nweight')
print(weight)

#implementing linear regression
lm =linear_model.LinearRegression()
model = lm.fit(waist,weight)

print('\nCoefficient')
print(model.coef_)
print('\nintercept')
print(model.intercept_)
print('\nscore')
print(model.score(waist,weight))

Waist_new = np.array([97])
Waist_new = Waist_new.reshape(-1,1)
Weight_predict = model.predict(Waist_new)
print('\nWeight_predict')
print(Weight_predict)

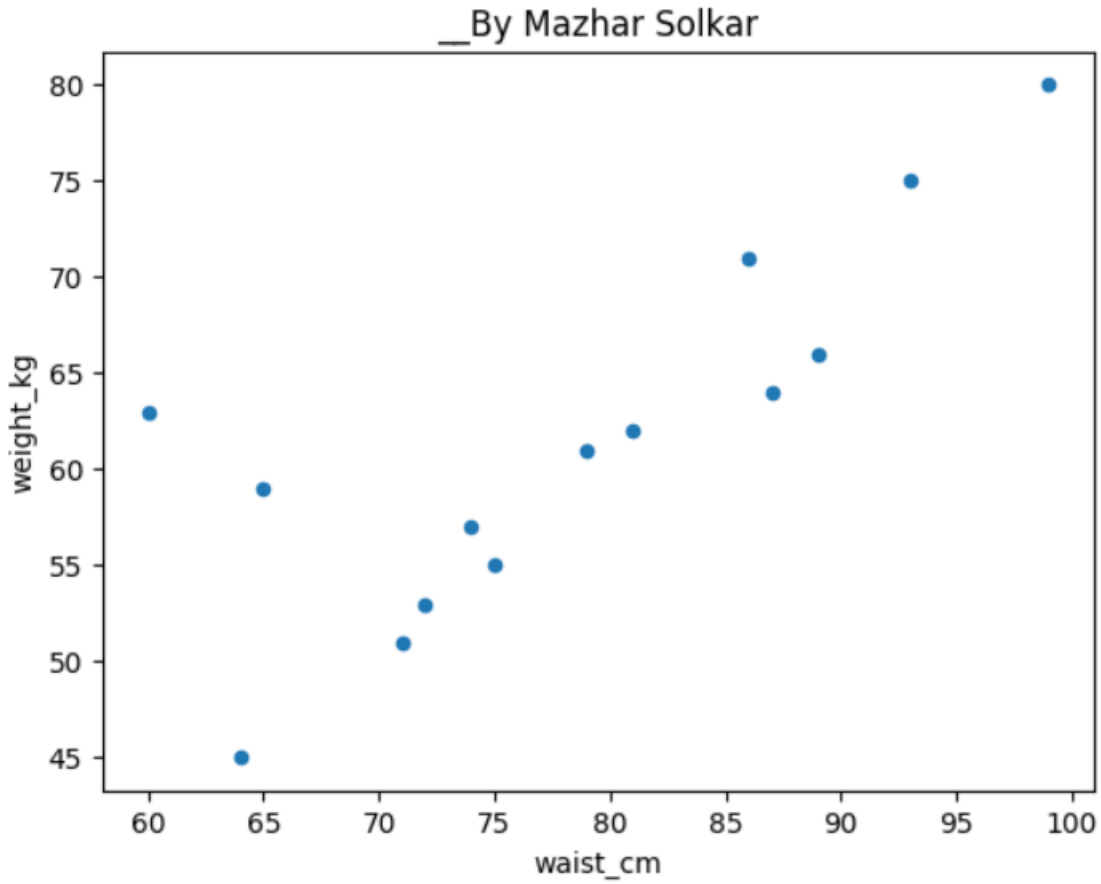
X=([67,78,94])
X=pd.DataFrame(X)
Y=model.predict(X)
Y=pd.DataFrame(Y)
df = pd.concat([X,Y], axis=1, keys=['Waist_new','Weight_predicted'])
print('\ndf')
print(df)

data.plot(kind='scatter',x='waist_cm',y='weight_kg')
plt.plot(waist,model.predict(waist),color='red', linewidth=2)
plt.scatter(Waist_new,Weight_predict, color='black')
plt.title('__By Mazhar Solkar')
plt.show()
print('__By Mazhar Solkar')
```

Output :-

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

Mazhar@DESKTOP-0PG7LTN MINGW64 /c/0_MSc_IT_Notes/Big Data Analytics/practicals (main)
$ python -u "c:\0_MSc_IT_Notes\Big Data Analytics\practicals\linear_regression_practical\linear_regression.py"
    waist_cm  weight_kg
0         71         51
1         89         66
2         64         45
3         74         57
4         87         64
5         93         75
6         79         61
7         81         62
8         75         55
9         72         53
10        65         59
11        60         63
12        99         80
13        86         71
```



```
Correlation
            waist_cm  weight_kg
waist_cm    1.000000   0.798577
weight_kg   0.798577   1.000000

waist
    waist_cm
0         71
1         89
2         64
3         74
4         87
5         93
6         79
7         81
8         75
9         72
10        65
11        60
12        99
13        86

weight
    weight_kg
0          51
1          66
2          45
3          57
4          64
5          75
6          61
7          62
8          55
9          53
10         59
11         63
12         80
13         71

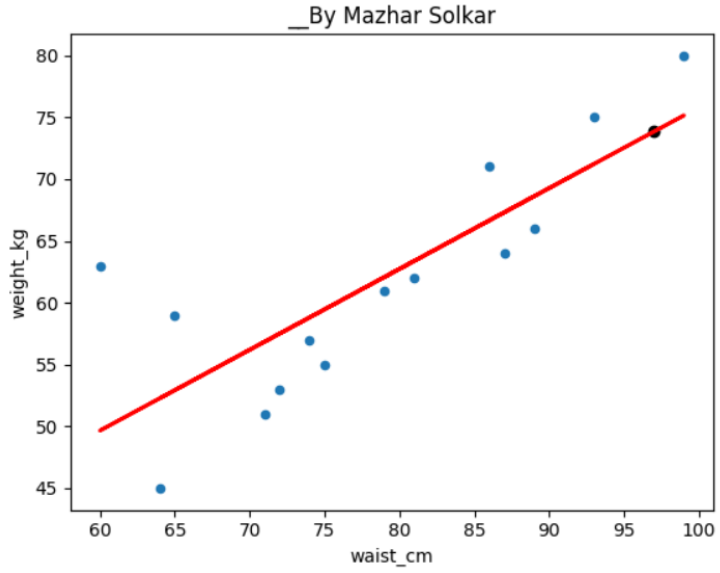
Coefficient
[[0.65405294]]

intercept
[10.41514467]

score
0.6377256319321334

Weight_predict
[[73.85828032]]

df
  Waist_new Weight_predicted
          0                0
0        67        54.236692
1        78        61.431274
2        94        71.896121
__By Mazhar Solkar
```



Practical No 3

Aim : Implementing Logistic Regression.

Description :-

Logistic regression is one of the most popular Machine Learning algorithms, which comes under the Supervised Learning technique. It is used for predicting the categorical dependent variable using a given set of independent variables. Logistic regression predicts the output of a categorical dependent variable. Therefore the outcome must be a categorical or discrete value. It can be either Yes or No, 0 or 1, true or False, etc. but instead of giving the exact value as 0 and 1, it gives the probabilistic values which lie between 0 and 1. Logistic Regression is much similar to the Linear Regression except that how they are used. Linear Regression is used for solving Regression problems, whereas Logistic regression is used for solving the classification problems.

In Logistic regression, instead of fitting a regression line, we fit an "S" shaped logistic function, which predicts two maximum values (0 or 1). The curve from the logistic function indicates the likelihood of something such as whether the cells are cancerous or not, a mouse is obese or not based on its weight, etc. Logistic Regression is a significant machine learning algorithm because it has the ability to provide probabilities and classify new data using continuous and discrete datasets.

Methods :-

LogisticRegression() :-

This method is used to implement logistic regression.

Program :-

```
from sklearn.datasets import make_classification
from matplotlib import pyplot as plt
import pandas as pd

# Generate and dataset for Logistic Regression
x, y = make_classification(
    n_samples=100,
    n_features=1,
    n_classes=2,
    n_clusters_per_class=1,
    flip_y=0.03,
    n_informative=1,
    n_redundant=0,
    n_repeated=0
)

# Create a scatter plot
plt.scatter(x, y, c=y, cmap='rainbow')
plt.title('Scatter Plot of Logistic Regression')
plt.title('__By Mazhar Solkar')
plt.show()

# Split the dataset into training and test dataset
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, random_state=1)

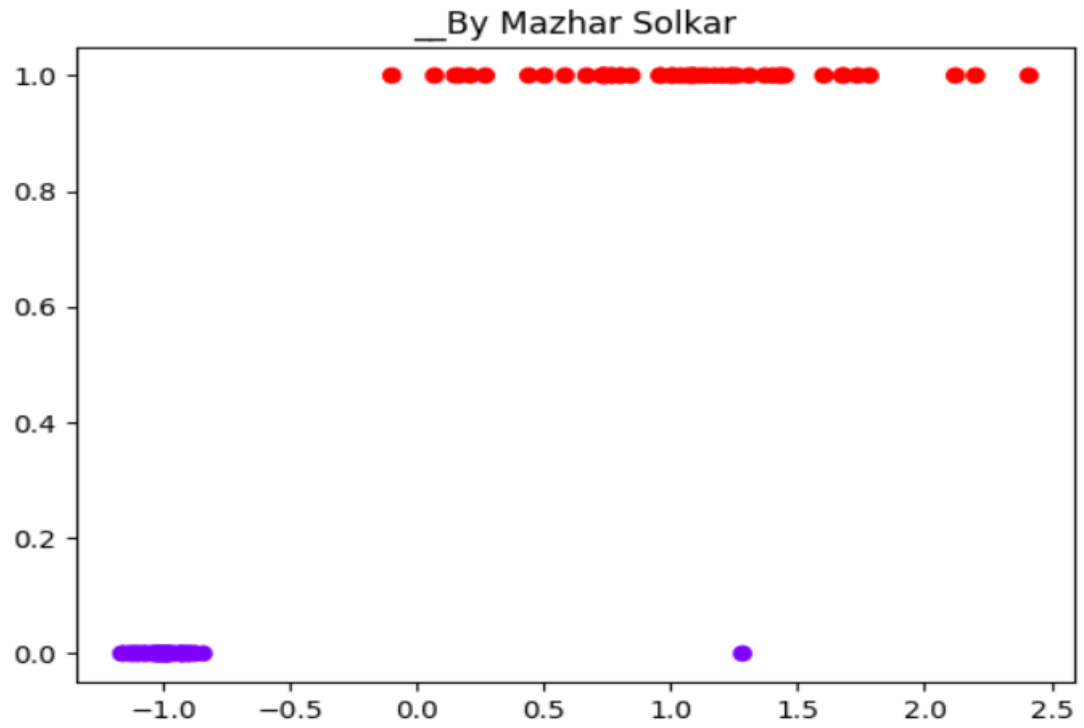
# Create a Logistic Regression Object, perform Logistic Regression
from sklearn.linear_model import LogisticRegression
log_reg = LogisticRegression()
log_reg.fit(x_train, y_train)

# Show to Coeficient and Intercept
print("\n Coefficient_")
print(log_reg.coef_)
print("\n Intercept")
print(log_reg.intercept_)

# Perform prediction using the test dataset
y_pred = log_reg.predict(x_test)

# Show the Confusion Matrix
from sklearn.metrics import confusion_matrix
print("\n Confusion Matrix")
print(confusion_matrix(y_test, y_pred))
print('__By Mazhar Solkar')
```

Output :-



PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
Mazhar@DESKTOP-0PG7LTN MINGW64 /c/0_MSc_IT_Notes/Big Data Analytics/practicals (main)
$ python -u "c:\0_MSc_IT_Notes\Big Data Analytics\practicals\logistic_regression\logistic_regression.py"

 Coefficient_
[[2.77004992]]

 Intercept
[-0.08136218]

 Confusion Matrix
[[11  0]
 [ 1 13]]
__By Mazhar Solkar
```

Practical No 4

Aim: Implement an application that stores big data in MongoDB and manipulate it using python.

Description :-

MongoDB, the most popular NoSQL database, is an open-source document-oriented database. The term 'NoSQL' means 'non-relational'. It means that MongoDB isn't based on the table-like relational database structure but provides an altogether different mechanism for storage and retrieval of data.

SQL databases store data in tabular format. This data is stored in a predefined data model which is not very much flexible for today's real-world highly growing applications. Modern applications are more networked, social and interactive than ever. Applications are storing more and more data are accessing it at higher rates.

Relational Database Management System(RDBMS) is not the correct choice when it comes to handling big data by the virtue of their design since they are not horizontally scalable. If the database runs on a single server, then it will reach a scaling limit. NOSQL databases are more scalable and provide superior performance. MongoDB is such a NoSQL database that scales by adding more and more servers and increases productivity with its flexible document model.

Methods :-

1. MongoClient('localhost:27017') :-

    This method is used to get at which port monodb is running.

2. client.get_database('database_name') :-

    This method is used to access the database.

3. db.records_name :-

    This method is used to access the collection of database.

4. records.count_documents({}) :-

    This method is used to count the number of records in the collection.

5. list(records.find()) :-

    This method is used to print all the records in collection.

6. records.update_one({"$set":{"key","value"}}) :-

This method is used to update one record in collection.

7. records.insert_one({"eno":6,"name":"Raj","location":"India"}) :-

This method is used to insert one record in collection.

8. records.delete_one({"name":"Raj"}) :-

This method is used to delete one record from collection.

Program :-

```
from pymongo import MongoClient
client = MongoClient('localhost:27017')
db = client.get_database('sample')
records = db.employee

print("\n############### Count of Records ###############")
print(records.count_documents({}))

print("\n############### list of records ###############")
print(list(records.find()))

print("\n############### one record updated ###############")
myquery = { "eno" : 4}
newvalues = { "$set":{"ename":"Laxman"}}
records.update_one(myquery,newvalues)
for v in records.find():
    print(v)

print("\n############### one record inserted ###############")
myq1={"eno":6,"name":"Raj","location":"India"}
x=records.insert_one(myq1)
for v in records.find():
    print(v)

print("\n############### one record deleted ###############")
y=records.delete_one({"name":"Raj"})
for v in records.find():
    print(v)
print("\n__By Mazhar Solkar")
```

Output :-

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL Code

```
Mazhar@DESKTOP-0PG7LTN MINGW64 /c/0_MSc_IT_Notes/Big Data Analytics/practicals (main)
$ python -u "c:\0_MSc_IT_Notes\Big Data Analytics\practicals\mongo_practical\mongo.py"

############### Count of Records ###############
5

############### list of records ###############
[{'_id': ObjectId('6258447d8ce536ffffa4f97d'), 'eno': 1.0, 'ename': 'amar', 'deptno': 10.0}, {'_id': ObjectId('
625844aa8ce536ffffa4f97e'), 'eno': 2.0, 'ename': 'arjun', 'deptno': 10.0}, {'_id': ObjectId('625844d18ce536ffff
a4f97f'), 'eno': 3.0, 'ename': 'shruti', 'deptno': 10.0}, {'_id': ObjectId('625845218ce536ffffa4f980'), 'eno':
4.0, 'ename': 'Laxman', 'deptno': 20.0}, {'_id': ObjectId('6258454a8ce536ffffa4f981'), 'eno': 5.0, 'ename': 'sh
am', 'deptno': 20.0}]

############### one record updated ###############
{'_id': ObjectId('6258447d8ce536ffffa4f97d'), 'eno': 1.0, 'ename': 'amar', 'deptno': 10.0}
{'_id': ObjectId('625844aa8ce536ffffa4f97e'), 'eno': 2.0, 'ename': 'arjun', 'deptno': 10.0}
{'_id': ObjectId('625844d18ce536ffffa4f97f'), 'eno': 3.0, 'ename': 'shruti', 'deptno': 10.0}
{'_id': ObjectId('625845218ce536ffffa4f980'), 'eno': 4.0, 'ename': 'Laxman', 'deptno': 20.0}
{'_id': ObjectId('6258454a8ce536ffffa4f981'), 'eno': 5.0, 'ename': 'sham', 'deptno': 20.0}

############### one record inserted ###############
{'_id': ObjectId('6258447d8ce536ffffa4f97d'), 'eno': 1.0, 'ename': 'amar', 'deptno': 10.0}
{'_id': ObjectId('625844aa8ce536ffffa4f97e'), 'eno': 2.0, 'ename': 'arjun', 'deptno': 10.0}
{'_id': ObjectId('625844d18ce536ffffa4f97f'), 'eno': 3.0, 'ename': 'shruti', 'deptno': 10.0}
{'_id': ObjectId('625845218ce536ffffa4f980'), 'eno': 4.0, 'ename': 'Laxman', 'deptno': 20.0}
{'_id': ObjectId('6258454a8ce536ffffa4f981'), 'eno': 5.0, 'ename': 'sham', 'deptno': 20.0}
{'_id': ObjectId('62714195bb6ce05dcad2df50'), 'eno': 6, 'name': 'Raj', 'location': 'India'}

############### one record deleted ###############
{'_id': ObjectId('6258447d8ce536ffffa4f97d'), 'eno': 1.0, 'ename': 'amar', 'deptno': 10.0}
{'_id': ObjectId('625844aa8ce536ffffa4f97e'), 'eno': 2.0, 'ename': 'arjun', 'deptno': 10.0}
{'_id': ObjectId('625844d18ce536ffffa4f97f'), 'eno': 3.0, 'ename': 'shruti', 'deptno': 10.0}
{'_id': ObjectId('625845218ce536ffffa4f980'), 'eno': 4.0, 'ename': 'Laxman', 'deptno': 20.0}
{'_id': ObjectId('6258454a8ce536ffffa4f981'), 'eno': 5.0, 'ename': 'sham', 'deptno': 20.0}

__By Mazhar Solkar
```

Practical No 5

Aim: Implement SVM classification Technique.

Description :-

SVM is a famous supervised machine learning algorithm used for classification as well as regression algorithms. However, mostly it is preferred for classification algorithms. It basically separates different target classes in a hyperplane in n-dimensional or multidimensional space.

The main motive of the SVM is to create the best decision boundary that can separate two or more classes(with maximum margin) so that we can correctly put new data points in the correct class. Because It chooses extreme vectors or support vectors to create the hyperplane, that's why it is named so.

Methods :-

1. StandardScaler() :-

    It is used for feature scaling.

2. SVC(kernel='linear', random_state=0) :-

    This method is used for implementing SVM.

3. metrics.accuracy_score(y_test,y_pred) :-

    This method is used to check the accuracy score of the model.

Program :-

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

# inputfilename = 'C:\0_MSc_IT_Notes\Big Data Analytics\practicals\svm_practical\social.csv'
#make sure to give common slash(forward slash / in path)

inputfilename = 'C:/0_MSc_IT_Notes/Big Data Analytics/practicals/svm_practical/social.csv'
df = pd.read_csv(inputfilename)
print(df)

x = df.iloc[:,[2,3]]
y = df.iloc[:,4]

#Splitting the dataset into the training set and test set
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)

print("Training data:",x_train)
print('******************')
print("Testing data:",x_test)

# Feature scaling
from sklearn.preprocessing import StandardScaler
ss = StandardScaler()
x_train_scaled = ss.fit_transform(x_train)
x_test_scaled = ss.fit_transform(x_test)

#train classifier
from sklearn.svm import SVC
classifier = SVC(kernel='linear', random_state=0)
classifier.fit(x_train_scaled,y_train)

#predicting the test set results
y_pred = classifier.predict(x_test_scaled)
print(y_pred)
from sklearn import metrics
print("accuracy score with linear kernel")
print(metrics.accuracy_score(y_test,y_pred))
print("__By Mazhar Solkar")
```

Output :-

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
Mazhar@DESKTOP-0PG7LTN MINGW64 /c/0_MSc_IT_Notes/Big Data Analytics/practicals (main)
$ python -u "c:\0_MSc_IT_Notes\Big Data Analytics\practicals\svm_practical\svm_college.py"
      User ID  Gender  Age  EstimatedSalary  Purchased
0    15624510    Male   19            19000          0
1    15810944    Male   35            20000          0
2    15668575  Female   26            43000          0
3    15603246  Female   27            57000          0
4    15804002    Male   19            76000          0
..        ...     ...  ...              ...        ...
395  15691863  Female   46            41000          1
396  15706071    Male   51            23000          1
397  15654296  Female   50            20000          1
398  15755018    Male   36            33000          0
399  15594041  Female   49            36000          1

[400 rows x 5 columns]
Training data:      Age  EstimatedSalary
250   44            39000
63    32           120000
312   38            50000
159   32           135000
283   52            21000
..   ...              ...
323   48            30000
192   29            43000
117   36            52000
47    27            54000
172   26           118000

[300 rows x 2 columns]
********************
Testing data:      Age  EstimatedSalary
132   30            87000
309   38            50000
341   35            75000
196   30            79000
246   35            50000
..   ...              ...
146   27            96000
135   23            63000
390   48            33000
264   48            90000
364   42           104000

[100 rows x 2 columns]
[0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0
 0 0 1 0 0 0 0 1 0 0 1 0 1 1 0 0 1 1 0 0 0 0 0 0 1 0 1 0 1 0 0 0 1 1 0 0 0
 0 0 1 0 1 1 1 1 0 0 1 1 0 1 0 0 0 1 0 0 0 0 0 0 1 1]
accuracy score with linear kernel
0.88
__By Mazhar Solkar
```

Practical No 6

Aim: Implement Decision Tree classification Technique.

Description :-

Decision Tree is a supervised learning method used in data mining for classification and regression methods. It is a tree that helps us in decision-making purposes. The decision tree creates classification or regression models as a tree structure. It separates a data set into smaller subsets, and at the same time, the decision tree is steadily developed. The final tree is a tree with the decision nodes and leaf nodes. A decision node has at least two branches. The leaf nodes show a classification or decision. We can't accomplish more split on leaf nodes-The uppermost decision node in a tree that relates to the best predictor called the root node. Decision trees can deal with both categorical and numerical data.

Methods :-

1. MinMaxScaler() :-

    This method is used for feature scaling.

2. DecisionTreeClassifier() :-

    This method is used to implement decision tree

Program :-

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

#read dataset
df=pd.read_csv('C:/0_MSc_IT_Notes/Big Data Analytics/practicals/decision_tree_practical/social.csv')
print(df)

#choose independent(input) and dependent(ouput) variables
x = df.iloc[:,[2,3]]    #x=df[['Age','EstimatedSalary']]
y = df.iloc[:,4]        #y=df['Purchased']

#split dataset into x_train x_test y_train y_test
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)
print(x_train.shape,y_train.shape,x_test.shape,y_test.shape)

# feature scaling
from sklearn.preprocessing import MinMaxScaler
ss = MinMaxScaler()
ss.fit(x_train)
x_train_scaled = ss.transform(x_train)
ss.fit(x_test)
x_test_scaled = ss.transform(x_test)

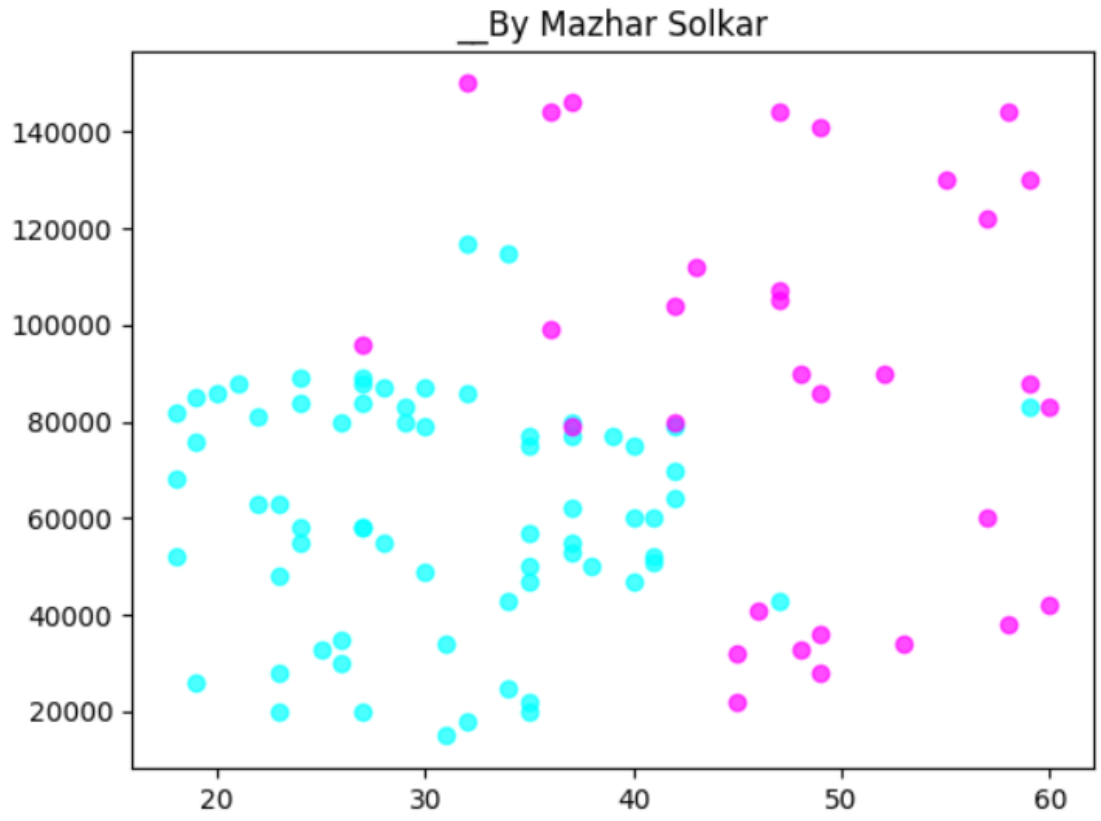
#implement decision tree
from sklearn.tree import DecisionTreeClassifier

classifier = DecisionTreeClassifier()
classifier.fit(x_train_scaled,y_train)
y_predict = classifier.predict(x_test_scaled)

#accuracy score
print("\naccuracy score")
print(classifier.score(x_test_scaled,y_test))

#plot the graph
plt.scatter(x_test[y_test==0]['Age'],x_test[y_test==0]['EstimatedSalary'],c='cyan',alpha=0.7)
#plotting the scatter plot, c is color alpha is for transparency  y_test==0 indicates product not purchased
plt.scatter(x_test[y_test==1]['Age'],x_test[y_test==1]['EstimatedSalary'],c='magenta',alpha=0.7)
plt.title("__By Mazhar Solkar")
plt.show()
print("\n__By Mazhar Solkar")
```

Output :-



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..        ...     ...  ...              ...        ...
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396  15706071    Male   51            23000          1
397  15654296  Female   50            20000          1
398  15755018    Male   36            33000          0
399  15594041  Female   49            36000          1

[400 rows x 5 columns]
(300, 2) (300,) (100, 2) (100,)

accuracy score
0.91

__By Mazhar Solkar
```