Ex. No.: 9 b.
Date: 8/11/23

A PYTHON PROGRAM TO IMPLEMENT K-MEANS MODEL

Aim:

To implement a python program using a K-Means Algorithm in a model.

Algorithm:

1. Import Necessary Libraries:

   Import required libraries like numpy, matplotlib.pyplot, and sklearn.cluster.

2. Load and Preprocess Data:

   Load the dataset.
   Preprocess the data if needed (e.g., scaling).

3. Initialize Cluster Centers:

   Choose the number of clusters (K).
   Initialize K cluster centers randomly.

4. Assign Data Points to Clusters:

   For each data point, calculate the distance to each cluster center. Assign the data point to the cluster with the nearest center.

5. Update Cluster Centers:

   Calculate the mean of the data points in each cluster. Update the cluster centers to the calculated means.

6. Repeat Steps 4 and 5:

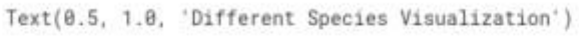
   Repeat the assignment of data points to clusters and updating of cluster centers until convergence (i.e., when the cluster assignments do not change much between iterations).

7. Plot the Clusters:

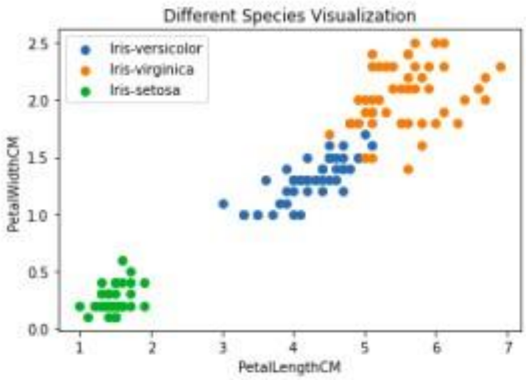
   Plot the data points and the cluster centers to visualize the clustering result.

PROGRAM:

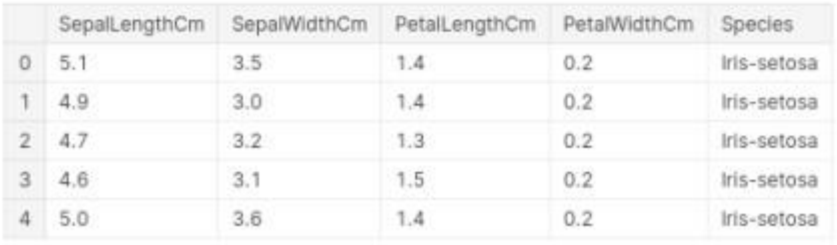
```
data = pd.read_csv('../input/k-means-clustering/KNN (3).csv')  data.head(5)
```



```
Text(0.5, 1.0, 'Different Species Visualization')
```

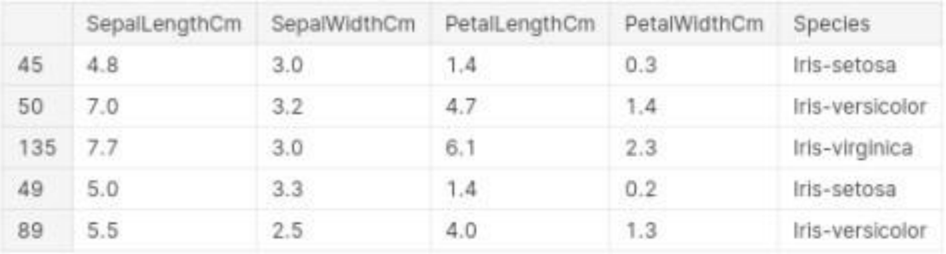


```
req_data = data.iloc[:,1:] req_data.head(5)
```



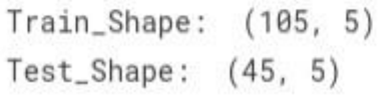
	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

```
shuffle_index = np.random.permutation(req_data.shape[0])
#shuffling the row index of our dataset  req_data =
req_data.iloc[shuffle_index] req_data.head(5)
```



	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
45	4.8	3.0	1.4	0.3	Iris-setosa
50	7.0	3.2	4.7	1.4	Iris-versicolor
135	7.7	3.0	6.1	2.3	Iris-virginica
49	5.0	3.3	1.4	0.2	Iris-setosa
89	5.5	2.5	4.0	1.3	Iris-versicolor

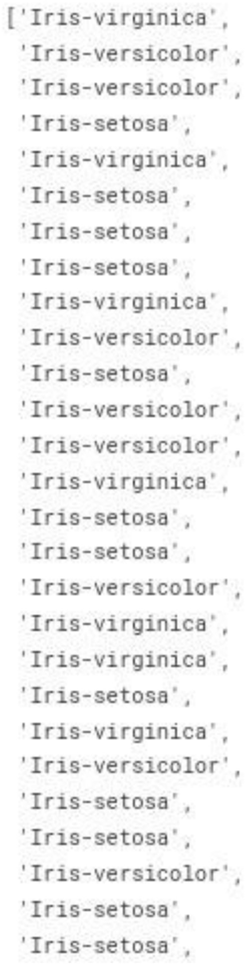
```
train_size = int(req_data.shape[0]*0.7)
train_df = req_data.iloc[:train_size,:]
test_df = req_data.iloc[train_size:,:]
train = train_df.values test =
test_df.values y_true = test[:,-1]
print('Train_Shape: ',train_df.shape)
print('Test_Shape: ',test_df.shape)
```



```
Train_Shape:  (105, 5)
Test_Shape:  (45, 5)
```

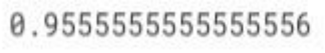
```
from math import sqrt def
euclidean_distance(x_test, x_train):
distance = 0 for i in
range(len(x_test)-1):
distance += (x_test[i]-x_train[i])**2 return
sqrt(distance) def get_neighbors(x_test, x_train,
num_neighbors):
distances = []
```

```
data = [] for i in x_train: distances.append(euclidean_distance(x_test,i))
data.append(i) distances = np.array(distances) data = np.array(data) sort_indexes
= distances.argsort() #argsort() function returns indices by sorting distances data
in ascending order data = data[sort_indexes] #modifying our data based on
sorted indices, so that we can get the nearest neighbors return
data[:num_neighbors] def prediction(x_test, x_train, num_neighbors):
classes = [] neighbors = get_neighbors(x_test, x_train, num_neighbors) for
i in neighbors: classes.append(i[-1]) predicted = max(classes,
key=classes.count) #taking the most repeated class return predicted def
predict_classifier(x_test):
classes = [] neighbors = get_neighbors(x_test,
req_data.values, 5) for i in neighbors:
classes.append(i[-1])
predicted = max(classes, key=classes.count)
print(predicted)    return    predicted    def
accuracy(y_true, y_pred):
num_correct = 0 for i in
range(len(y_true)): if
y_true[i]==y_pred[i]:
num_correct+=1 accuracy
= num_correct/len(y_true)
return accuracy y_pred = []
for i in test:
y_pred.append(prediction(i, train, 5)) y_pred
```



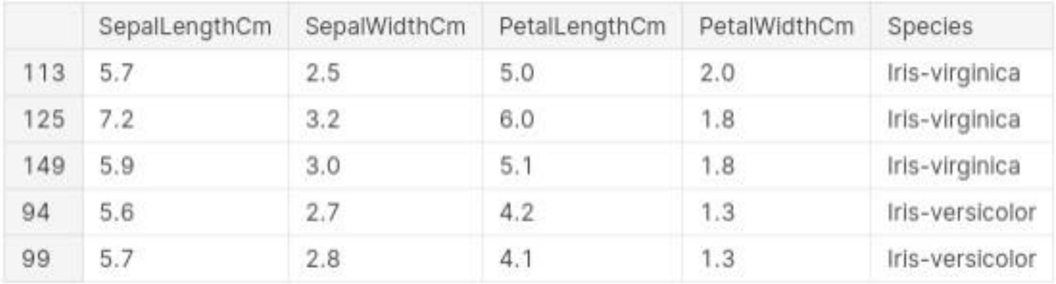
```
['Iris-virginica',
 'Iris-versicolor',
 'Iris-versicolor',
 'Iris-setosa',
 'Iris-virginica',
 'Iris-setosa',
 'Iris-setosa',
 'Iris-setosa',
 'Iris-virginica',
 'Iris-versicolor',
 'Iris-setosa',
 'Iris-versicolor',
 'Iris-versicolor',
 'Iris-virginica',
 'Iris-setosa',
 'Iris-setosa',
 'Iris-versicolor',
 'Iris-virginica',
 'Iris-virginica',
 'Iris-setosa',
 'Iris-virginica',
 'Iris-versicolor',
 'Iris-setosa',
 'Iris-setosa',
 'Iris-versicolor',
 'Iris-setosa',
 'Iris-setosa',
```

```
accuracy = accuracy(y_true, y_pred)
accuracy
```



```
0.9555555555555556
```

```
test_df.sample(5)
```



	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
113	5.7	2.5	5.0	2.0	Iris-virginica
125	7.2	3.2	6.0	1.8	Iris-virginica
149	5.9	3.0	5.1	1.8	Iris-virginica
94	5.6	2.7	4.2	1.3	Iris-versicolor
99	5.7	2.8	4.1	1.3	Iris-versicolor

RESULT:-

Thus the python program to implement the K-Means model has been successfully implemented and the results have been verified and analyzed