

**Roll: 22BEC059**

### ⇒ Using Inbuilt module

```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from tabulate import tabulate

def makeTable(k, n):
    data = pd.read_csv("Iris.csv", header='infer').values

    x = data[:, 1:-1]
    y = data[:, -1]
    x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3)
    centroids = np.zeros(shape=(k, x_train.shape[1]))
    per = np.random.permutation(x_train.shape[0])
    for i in range(k):
        centroids[i, :] = x_train[per[i], :]
    for it in range(n):
        dist = np.zeros(shape=(k, x_train.shape[0]))
        for i in range(k):
            dist[i, :] = np.sqrt(np.sum((x_train - centroids[i, :]) ** 2, axis=1))
        membership = np.argmin(dist, axis=0)
        for i in range(k):
            centroids[i, :] = np.mean(x_train[membership == i, :], axis=0)
        dist = np.zeros(shape=(k, x_test.shape[0]))
        for i in range(k):
            dist[i, :] = np.sqrt(np.sum((x_test - centroids[i, :]) ** 2, axis=1))
        membership = np.argmin(dist, axis=0)
        return [centroids.tolist(), f"Y_Test=
{y_test.astype(int).tolist()}\nMembership= {membership.tolist()}\n."]

k = int(input("Enter the nearest neighbor number(k) : "))
n = int(input("Enter the number of iterations : "))
display = {}
for i in range(1, k + 1):
    ans = makeTable(i, n)
    display[i] = ans
tabulated_data = tabulate(pd.DataFrame(display).T, tablefmt="pretty",
headers=["Centroids", "Comparison"])
print(tabulated_data)
```

⇒ Output:

```
C:\Program Files\Python310\python.exe" "C:\Program Files\JetBrains\PyCharm 2022.3.2\plugins/python\helpers/pydev/pydevconsole.py" --mode=client --host=127.0.0.1 --port=57602

import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['C:\\Users\\JayS\\OneDrive\\Desktop\\Lab Works\\AI ML Classs'])

Python Console
Enter the nearest neighbor number(k) : >> 3
Enter the number of iterations :>> 100

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| |                               Centroids                               | |
-----
| 1 |                             [[5.88, 3.8542857142857147, 3.8400000000000001, 1.2409523809523806]]                            |
| |
| |
| |
| 2 |                             [[5.817142857142856, 3.4228571428571435, 1.5199999999999998, 0.2771428571428572], [6.315714285714283, 2.871428571428572, 4.9314285714285715, 1.6842857142857139]]                            |
| |
| |
| |
| 3 | [[5.7799999999999999, 2.6733333333333333, 4.1666666666666666, 1.29], [6.75609756097559, 3.8097560975609756, 5.497560975609755, 2.002439024390244], [5.00294117647059, 3.411764705882353, 1.464705882352941, 0.23235294117647062]] |
| |
| |
```

Comparison																																					
Y_Test=	[1, 0, 2, 0, 2, 2, 0, 0, 1, 0, 2, 2, 1, 2, 0, 2, 0, 0, 0, 1, 2, 2, 0, 1, 2, 1, 2, 1, 0, 1, 2, 0, 2, 2, 2, 1, 2, 0, 0, 0, 0, 0, 1, 1]																																				
Membership=	[0, 0]																																				
Y_Test=	[1, 2, 2, 2, 0, 2, 0, 2, 2, 2, 0, 0, 1, 0, 1, 0, 1, 1, 2, 0, 1, 2, 1, 0, 1, 2, 0, 2, 0, 1, 2, 1, 1, 1, 0, 0, 0, 2, 0, 2, 1, 2, 0, 0, 1]																																				
Membership=	[0, 1, 1, 1, 0, 1, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1]																																				
Y_Test=	[0, 0, 1, 1, 0, 1, 0, 1, 2, 0, 1, 1, 1, 2, 0, 1, 1, 2, 1, 2, 0, 1, 2, 0, 1, 0, 1, 2, 2, 0, 0, 0, 1, 2, 0, 1, 1, 1, 0, 0, 2, 1, 0, 2, 2]																																				
Membership=	[2, 2, 0, 0, 2, 0, 2, 0, 0, 2, 1, 1, 0, 1, 2, 0, 0, 1, 0, 0, 2, 0, 1, 2, 0, 2, 0, 1, 1, 2, 2, 2, 0, 0, 2, 0, 0, 1, 2, 2, 1, 0, 2, 1, 1]																																				