

## EXPERIMENT NO. 9

1K517C8030

14/12/20

AIM: Write a program to implement K-Nearest Neighbor algorithm to classify the input data set. Print both correct & wrong predictions.

Algorithm:

1. Let  $m$  be the number of training data samples. Let  $p$  be an unknown point.
2. Store the training samples in an array of data points  $arr[]$ . This means each element of this array represents a tuple  $(x, y)$ .
3. For  $i = 0$  to  $m$ :  
Calculate Euclidean distance  $d(arr[i], p)$ .
4. Make set  $S$  of  $K$  smallest distances obtained. Each of these distances correspond to an already classified data point.
5. Return the majority label among  $S$ .

Dataset:

1	total_bill, tip, sex, smoker, day, time, size	35	20.69, 2.45, Female, No, Sat, Dinner, 4
2	16.99, 1.01, Female, No, Sun, Dinner, 2	36	17.78, 3.27, Male, No, Sat, Dinner, 2
3	10.34, 1.66, Male, No, Sun, Dinner, 3	37	24.06, 3.6, Male, No, Sat, Dinner, 3
4	21.01, 3.5, Male, No, Sun, Dinner, 3	38	16.31, 2.0, Male, No, Sat, Dinner, 3
5	23.68, 3.31, Male, No, Sun, Dinner, 2	39	16.93, 3.07, Female, No, Sat, Dinner, 3
6	24.59, 3.61, Female, No, Sun, Dinner, 4	40	18.69, 2.31, Male, No, Sat, Dinner, 3
7	25.29, 4.71, Male, No, Sun, Dinner, 4	41	31.27, 5.0, Male, No, Sat, Dinner, 3
8	8.77, 2.0, Male, No, Sun, Dinner, 2	42	16.04, 2.24, Male, No, Sat, Dinner, 3
9	26.88, 3.12, Male, No, Sun, Dinner, 4	43	17.46, 2.54, Male, No, Sun, Dinner, 2
10	15.04, 1.96, Male, No, Sun, Dinner, 2	44	13.94, 3.06, Male, No, Sun, Dinner, 2
11	14.78, 3.23, Male, No, Sun, Dinner, 2	45	9.68, 1.32, Male, No, Sun, Dinner, 2
12	10.27, 1.71, Male, No, Sun, Dinner, 2	46	30.4, 5.6, Male, No, Sun, Dinner, 4
13	35.26, 5.0, Female, No, Sun, Dinner, 4	47	18.29, 3.0, Male, No, Sun, Dinner, 2
14	15.42, 1.57, Male, No, Sun, Dinner, 2	48	22.23, 5.0, Male, No, Sun, Dinner, 2
15	18.43, 3.0, Male, No, Sun, Dinner, 4	49	32.4, 6.0, Male, No, Sun, Dinner, 4
16	14.83, 3.02, Female, No, Sun, Dinner, 2	50	28.55, 2.05, Male, No, Sun, Dinner, 3
17	21.58, 3.92, Male, No, Sun, Dinner, 2	51	18.04, 3.0, Male, No, Sun, Dinner, 2
18	10.33, 1.67, Female, No, Sun, Dinner, 3	52	12.54, 2.5, Male, No, Sun, Dinner, 2
19	16.29, 3.71, Male, No, Sun, Dinner, 3	53	10.29, 2.6, Female, No, Sun, Dinner, 2
20	16.97, 3.5, Female, No, Sun, Dinner, 3	54	34.81, 5.2, Female, No, Sun, Dinner, 4
21	20.65, 3.35, Male, No, Sat, Dinner, 3	55	9.94, 1.56, Male, No, Sun, Dinner, 2
22	17.92, 4.08, Male, No, Sat, Dinner, 2	56	25.56, 4.34, Male, No, Sun, Dinner, 4
23	20.29, 2.75, Female, No, Sat, Dinner, 2	57	19.49, 3.51, Male, No, Sun, Dinner, 2
24	15.77, 2.23, Female, No, Sat, Dinner, 2	58	38.01, 3.0, Male, Yes, Sat, Dinner, 4
25	39.42, 7.58, Male, No, Sat, Dinner, 4	59	26.41, 1.5, Female, No, Sat, Dinner, 2
26	19.82, 3.18, Male, No, Sat, Dinner, 2	60	11.24, 1.76, Male, Yes, Sat, Dinner, 2
27	17.81, 2.34, Male, No, Sat, Dinner, 4		
28	13.37, 2.0, Male, No, Sat, Dinner, 2		
29	12.69, 2.0, Male, No, Sat, Dinner, 2		
30	21.7, 4.3, Male, No, Sat, Dinner, 2		
31	19.65, 3.0, Female, No, Sat, Dinner, 2		
32	9.55, 1.45, Male, No, Sat, Dinner, 2		
33	18.25, 2.5, Male, No, Sat, Dinner, 4		

62	20.29,3.21, Male, Yes, Sat, Dinner, 2
63	13.81,2.0, Male, Yes, Sat, Dinner, 2
64	11.02,1.98, Male, Yes, Sat, Dinner, 2
65	18.29,3.76, Male, Yes, Sat, Dinner, 4
66	17.59,2.64, Male, No, Sat, Dinner, 3
67	20.08,3.15, Male, No, Sat, Dinner, 3
68	16.45,2.47, Female, No, Sat, Dinner, 2
69	3.07,1.0, Female, Yes, Sat, Dinner, 1
70	20.23,2.01, Male, No, Sat, Dinner, 2
71	15.01,2.09, Male, Yes, Sat, Dinner, 2
72	12.02,1.97, Male, No, Sat, Dinner, 2
73	17.07,3.0, Female, No, Sat, Dinner, 3
74	26.86,3.14, Female, Yes, Sat, Dinner, 2
75	25.28,5.0, Female, Yes, Sat, Dinner, 2
76	14.73,2.2, Female, No, Sat, Dinner, 2
77	10.51,1.25, Male, No, Sat, Dinner, 2
78	17.92,3.08, Male, Yes, Sat, Dinner, 2
79	27.2,4.0, Male, No, Thur, Lunch, 4
80	22.76,3.0, Male, No, Thur, Lunch, 2
81	17.29,2.71, Male, No, Thur, Lunch, 2
82	19.44,3.0, Male, Yes, Thur, Lunch, 2
83	16.66,3.4, Male, No, Thur, Lunch, 2
84	10.07,1.83, Female, No, Thur, Lunch, 1
85	32.68,5.0, Male, Yes, Thur, Lunch, 2
86	15.98,2.03, Male, No, Thur, Lunch, 2
87	34.83,5.17, Female, No, Thur, Lunch, 4
88	13.03,2.0, Male, No, Thur, Lunch, 2

90	24.71,5.85, Male, No, Thur, Lunch, 2
91	21.16,3.0, Male, No, Thur, Lunch, 2
92	28.97,3.0, Male, Yes, Fri, Dinner, 2
93	22.49,3.5, Male, No, Fri, Dinner, 2
94	5.75,1.0, Female, Yes, Fri, Dinner, 2
95	16.32,4.3, Female, Yes, Fri, Dinner, 2
96	22.75,3.25, Female, No, Fri, Dinner, 2
97	40.17,4.73, Male, Yes, Fri, Dinner, 4
98	27.28,4.0, Male, Yes, Fri, Dinner, 2
99	12.03,1.5, Male, Yes, Fri, Dinner, 2
100	21.01,3.0, Male, Yes, Fri, Dinner, 2
101	12.46,1.5, Male, No, Fri, Dinner, 2
102	11.35,2.5, Female, Yes, Fri, Dinner, 2
103	15.38,3.0, Female, Yes, Fri, Dinner, 2
104	44.3,2.5, Female, Yes, Sat, Dinner, 3
105	22.42,3.48, Female, Yes, Sat, Dinner, 2
106	20.92,4.08, Female, No, Sat, Dinner, 2
107	15.36,1.64, Male, Yes, Sat, Dinner, 2
108	20.49,4.06, Male, Yes, Sat, Dinner, 2
109	25.21,4.29, Male, Yes, Sat, Dinner, 2
110	18.24,3.76, Male, No, Sat, Dinner, 2
111	14.31,4.0, Female, Yes, Sat, Dinner, 2
112	14.0,3.0, Male, No, Sat, Dinner, 2
113	7.25,1.0, Female, No, Sat, Dinner, 1
114	38.07,4.0, Male, No, Sun, Dinner, 3
115	23.95,2.55, Male, No, Sun, Dinner, 2
116	25.71,4.0, Female, No, Sun, Dinner, 3

118	29.93,5.07, Male, No, Sun, Dinner, 4
119	10.65,1.5, Female, No, Thur, Lunch, 2
120	12.43,1.8, Female, No, Thur, Lunch, 2
121	24.08,2.92, Female, No, Thur, Lunch, 4
122	11.69,2.31, Male, No, Thur, Lunch, 2
123	13.42,1.68, Female, No, Thur, Lunch, 2
124	14.26,2.5, Male, No, Thur, Lunch, 2
125	15.95,2.0, Male, No, Thur, Lunch, 2
126	12.48,2.52, Female, No, Thur, Lunch, 2
127	29.8,4.2, Female, No, Thur, Lunch, 6
128	8.52,1.48, Male, No, Thur, Lunch, 2
129	14.52,2.0, Female, No, Thur, Lunch, 2
130	11.38,2.0, Female, No, Thur, Lunch, 2
131	22.82,2.18, Male, No, Thur, Lunch, 3
132	19.08,1.5, Male, No, Thur, Lunch, 2
133	20.27,2.83, Female, No, Thur, Lunch, 2
134	11.17,1.5, Female, No, Thur, Lunch, 2
135	12.26,2.0, Female, No, Thur, Lunch, 2
136	18.26,3.25, Female, No, Thur, Lunch, 2
137	8.51,1.25, Female, No, Thur, Lunch, 2
138	10.33,2.0, Female, No, Thur, Lunch, 2
139	14.15,2.0, Female, No, Thur, Lunch, 2
140	16.0,2.0, Male, Yes, Thur, Lunch, 2
141	13.16,2.75, Female, No, Thur, Lunch, 2
142	17.47,3.5, Female, No, Thur, Lunch, 2
143	34.3,6.7, Male, No, Thur, Lunch, 6
144	41.19,5.0, Male, No, Thur, Lunch, 5

146	16.43,2.3, Female, No, Thur, Lunch, 2
147	8.35,1.5, Female, No, Thur, Lunch, 2
148	18.64,1.36, Female, No, Thur, Lunch, 3
149	11.87,1.63, Female, No, Thur, Lunch, 2
150	9.78,1.73, Male, No, Thur, Lunch, 2
151	7.51,2.0, Male, No, Thur, Lunch, 2
152	14.07,2.5, Male, No, Sun, Dinner, 2
153	13.13,2.0, Male, No, Sun, Dinner, 2
154	17.26,2.74, Male, No, Sun, Dinner, 3
155	24.55,2.0, Male, No, Sun, Dinner, 4
156	19.77,2.0, Male, No, Sun, Dinner, 4
157	29.85,5.14, Female, No, Sun, Dinner, 5
158	48.17,5.0, Male, No, Sun, Dinner, 6
159	25.0,3.75, Female, No, Sun, Dinner, 4
160	13.39,2.61, Female, No, Sun, Dinner, 2
161	16.49,2.0, Male, No, Sun, Dinner, 4
162	21.5,3.5, Male, No, Sun, Dinner, 4
163	12.66,2.5, Male, No, Sun, Dinner, 2
164	16.21,2.0, Female, No, Sun, Dinner, 3
165	13.81,2.0, Male, No, Sun, Dinner, 2
166	17.51,3.0, Female, Yes, Sun, Dinner, 2
167	24.52,3.48, Male, No, Sun, Dinner, 3
168	20.76,2.24, Male, No, Sun, Dinner, 2
169	31.71,4.5, Male, No, Sun, Dinner, 4
170	10.59,1.61, Female, Yes, Sat, Dinner, 2
171	10.63,2.0, Female, Yes, Sat, Dinner, 2
172	50.81,10.0, Male, Yes, Sat, Dinner, 3

174	7.25,5.15, Male, Yes, Sun, Dinner, 2
175	31.85,3.18, Male, Yes, Sun, Dinner, 2
176	16.82,4.0, Male, Yes, Sun, Dinner, 2
177	32.9,3.11, Male, Yes, Sun, Dinner, 2
178	17.89,2.0, Male, Yes, Sun, Dinner, 2
179	14.48,2.0, Male, Yes, Sun, Dinner, 2
180	9.6,4.0, Female, Yes, Sun, Dinner, 2
181	34.63,3.55, Male, Yes, Sun, Dinner, 2
182	34.65,3.68, Male, Yes, Sun, Dinner, 4
183	23.33,5.65, Male, Yes, Sun, Dinner, 2
184	45.35,3.5, Male, Yes, Sun, Dinner, 3
185	23.17,6.5, Male, Yes, Sun, Dinner, 4
186	40.55,3.0, Male, Yes, Sun, Dinner, 2
187	20.69,5.0, Male, No, Sun, Dinner, 5
188	20.9,3.5, Female, Yes, Sun, Dinner, 3
189	30.46,2.0, Male, Yes, Sun, Dinner, 5
190	18.15,3.5, Female, Yes, Sun, Dinner, 3
191	23.1,4.0, Male, Yes, Sun, Dinner, 3
192	15.69,1.5, Male, Yes, Sun, Dinner, 2
193	19.81,4.19, Female, Yes, Thur, Lunch, 2
194	28.44,2.56, Male, Yes, Thur, Lunch, 2
195	15.48,2.02, Male, Yes, Thur, Lunch, 2
196	16.58,4.0, Male, Yes, Thur, Lunch, 2
197	7.56,1.44, Male, No, Thur, Lunch, 2
198	10.34,2.0, Male, Yes, Thur, Lunch, 2
199	43.11,5.0, Female, Yes, Thur, Lunch, 4
200	13.0,2.0, Female, Yes, Thur, Lunch, 2

202	18.71,4.0, Male, Yes, Thur, Lunch, 3
203	12.74,2.01, Female, Yes, Thur, Lunch, 2
204	13.0,2.0, Female, Yes, Thur, Lunch, 2
205	16.4,2.5, Female, Yes, Thur, Lunch, 2
206	20.53,4.0, Male, Yes, Thur, Lunch, 4
207	16.47,3.23, Female, Yes, Thur, Lunch, 3
208	26.59,3.41, Male, Yes, Sat, Dinner, 3
209	38.73,3.0, Male, Yes, Sat, Dinner, 4
210	24.27,2.03, Male, Yes, Sat, Dinner, 2
211	12.76,2.23, Female, Yes, Sat, Dinner, 2
212	30.06,2.0, Male, Yes, Sat, Dinner, 3
213	25.89,5.16, Male, Yes, Sat, Dinner, 4
214	48.33,9.0, Male, No, Sat, Dinner, 4
215	13.27,2.5, Female, Yes, Sat, Dinner, 2
216	28.17,6.5, Female, Yes, Sat, Dinner, 3
217	12.9,1.1, Female, Yes, Sat, Dinner, 2
218	28.15,3.0, Male, Yes, Sat, Dinner, 5
219	11.59,1.5, Male, Yes, Sat, Dinner, 2
220	7.74,1.44, Male, Yes, Sat, Dinner, 2
221	30.14,3.09, Female, Yes, Sat, Dinner, 4
222	12.16,2.2, Male, Yes, Fri, Lunch, 2
223	13.42,3.48, Female, Yes, Fri, Lunch, 2
224	8.58,1.92, Male, Yes, Fri, Lunch, 1
225	15.98,3.0, Female, No, Fri, Lunch, 3
226	13.42,1.58, Male, Yes, Fri, Lunch, 2
227	16.27,2.5, Female, Yes, Fri, Lunch, 2
228	10.09,2.0, Female, Yes, Fri, Lunch, 2
229	20.45,3.0, Male, No, Sat, Dinner, 4
230	13.28,2.72, Male, No, Sat, Dinner, 2
231	22.12,2.88, Female, Yes, Sat, Dinner, 2
232	24.01,2.0, Male, Yes, Sat, Dinner, 4
233	15.69,3.0, Male, Yes, Sat, Dinner, 3
234	11.61,3.39, Male, No, Sat, Dinner, 2
235	10.77,1.47, Male, No, Sat, Dinner, 2
236	15.53,3.0, Male, Yes, Sat, Dinner, 2
237	10.07,1.25, Male, No, Sat, Dinner, 2
238	12.6,1.0, Male, Yes, Sat, Dinner, 2
239	32.83,1.17, Male, Yes, Sat, Dinner, 2
240	35.83,4.67, Female, No, Sat, Dinner, 3
241	29.03,5.92, Male, No, Sat, Dinner, 3
242	27.18,2.0, Female, Yes, Sat, Dinner, 2
243	22.67,2.0, Male, Yes, Sat, Dinner, 2
244	17.82,1.75, Male, No, Sat, Dinner, 2



Program:

```

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

from sklearn.datasets import load_iris

data = load_iris()

df = pd.DataFrame(data.data, columns=data.feature_names)
df['class'] = data.target_names[data.target]
df.head()

x = df.iloc[:, :-1].values
y = df['class'].values

print(x[:5])
print(y[:5])

from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2)

from sklearn.neighbors import KNeighborsClassifier
knn_classifier = KNeighborsClassifier(n_neighbors=5)
knn_classifier.fit(x_train, y_train)

predictions = knn_classifier.predict(x_test)
print(predictions)

from sklearn.metrics import accuracy_score, confusion_matrix
print("Training accuracy score is: ", accuracy_score(y_train, knn_classifier.predict(x_train)))

print("Testing accuracy score is: ", accuracy_score(y_test, knn_classifier.predict(x_test)))

print("Training confusion matrix is: \n", confusion_matrix(y_train, knn_classifier.predict(x_train)))

```

```
print ("Testing confusion matrix is : \n", confusion_matrix (y_test,
knn_classifier.predict (x_test)))
```

output:

```
[[5.1 3.5 1.4 0.2]
 [4.9 3. 1.4 0.2]
 [4.7 3.2 1.3 0.2]
 [4.6 3.1 1.5 0.2]
 [5. 3.6 1.4 0.2]]
['setosa' 'setosa' 'setosa' 'setosa' 'setosa']
['setosa' 'versicolor' 'setosa' 'virginica' 'versicolor' 'versicolor'
 'setosa' 'versicolor' 'versicolor' 'virginica' 'versicolor' 'virginica'
 'setosa' 'setosa' 'setosa' 'setosa' 'virginica' 'virginica' 'virginica'
 'setosa' 'versicolor' 'virginica' 'virginica' 'virginica' 'versicolor'
 'setosa' 'versicolor' 'virginica' 'virginica' 'setosa']
Training accuracy Score is : 0.9833333333333333
Testing accuracy Score is : 0.9666666666666667
Training Confusion Matrix is :
[[40 0 0]
 [ 0 41 1]
 [ 0 1 37]]
Testing Confusion Matrix is :
[[10 0 0]
 [ 0 8 0]
 [ 0 1 11]]
```