Practical No. - 4

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Section- A

Semester- 6th

Shift- 1st

Aim:

Write a program to implement K nearest neighbor algorithm. Randomly generate a data of 20 points having x and y values. Also assign positive class label when x or y component is below 26 and negative class label to all other input data. Perform classification by using value of K=1,2,3,4,5.

Code:

```
import random

import math

import time


n=20


points =[]

for i in range(n+1):

    x=random.randint(0,40)

    y=random.randint(0,40)

    points.append([x,y])
```

```
for i in points:
    if i[0]<26 or i[1]<26:
        i.append('p')
    else:
        i.append('n')

a,b=[int(x) for x in input("Enter the test point : ").split()]
k = int(input("Enter the value of k : "))

start=time.time()
for i in points:
    distance = math.sqrt(((a-i[0])*(a-i[0])) + ((b-i[1])*(b-i[1])))
    i.append(distance)

print("X      Y      Class      Distance")
for i in points:
    print("{0}\t{1}\t{2}\t{3}".format(i[0],i[1],i[2],i[3]))

points = sorted(points, key=lambda x: x[3])

nearest = []
for i in range(k):
    nearest.append(points[i])
```

```
print("\n\n\n")
print("K Nearest Neighbors : ")
print()
print("X       Y      Class       Distance")
for i in nearest:
    print("{0}\t{1}\t{2}\t{3}".format(i[0],i[1],i[2],i[3]))

countp=0
countn=0

for i in nearest:
    if i[2]=='p':
        countp+=1
    else:
        countn+=1

print("\n\n")
if countp>countn:
    print("Predicted Class is Positive (P) ")
else:
    print("Predicted Class is Negative (N) ")

end=time.time()

print()
```

```
print("Time Taken by the Algorithm : ",(end-start)*1000," ms")
```

Output:

1. For K=1

```
Enter the test point : 25 22
Enter the value of k : 1
X       Y      Class       Distance
0       18      p       25.317977802344327
30      31      n       10.295630140987
28      17      p       5.830951894845301
17      7       p       17.0
19      14      p       10.0
21      14      p       8.94427190999916
5       11      p       22.825424421026653
10      37      p       21.213203435596427
36      16      p       12.529964086141668
15      13      p       13.45362404707371
8       28      p       18.027756377319946
31      28      n       8.48528137423857
28      40      n       18.24828759089466
9       16      p       17.08800749063506
8       26      p       17.46424919657298
26      36      n       14.035668847618199
34      7       p       17.4928556845359
12      6       p       20.615528128088304
1       32      p       26.0
37      26      n       12.649110640673518
9       36      p       21.2602916254693



K Nearest Neighbors :

X       Y      Class       Distance
28      17      p       5.830951894845301


Predicted Class is Positive (P)

Time Taken by the Algorithm :  2.9959678649902344  ms
```

2. K=2

```
Enter the test point : 21 26
Enter the value of k : 2
X       Y       Class       Distance
9       7        p       22.47220505424423
27      3        p       23.769728648009426
7       21       p       14.866068747318506
30      40       n       16.64331697709324
16      37       p       12.083045973594572
3       17       p       20.12461179749811
27      31       n       7.810249675906654
25      20       p       7.211102550927978
14      5        p       22.135943621178654
19      36       p       10.198039027185569
20      14       p       12.041594578792296
27      21       p       7.810249675906654
21      5        p       21.0
18      28       p       3.605551275463989
8       1        p       28.178005607210743
5       39       p       20.615528128088304
18      27       p       3.1622776601683795
7       2        p       27.784887978899608
28      20       p       9.219544457292887
40      29       n       19.235384061671343
28      33       n       9.899494936611665



K Nearest Neighbors :

X       Y       Class       Distance
18      27       p       3.1622776601683795
18      28       p       3.605551275463989


Predicted Class is Positive (P)

Time Taken by the Algorithm :  2.0008087158203125  ms
```

3. K=3

```
Enter the test point : 27 50
Enter the value of k : 3
X       Y       Class       Distance
26      3        p       47.01063709417264
21      12       p       38.47076812334269
31      0        p       50.15974481593781
19      19       p       32.01562118716424
36      8        p       42.95346318982906
6       3        p       51.478150704935004
22      23       p       27.459060435491963
23      31       p       19.4164878389476
34      6        p       44.553338819890925
2       13       p       44.654227123532216
28      16       p       34.0147027033899
20      33       p       18.384776310850235
8       32       p       26.1725046566048
38      33       n       20.248456731316587
40      32       n       22.20360331117452
1       1        p       55.47071299343465
0       29       p       34.20526275297414
8       19       p       36.359317925395686
37      33       n       19.72308292331602
9       20       p       34.9857113690718
32      14       p       36.345563690772494



K Nearest Neighbors :

X       Y       Class       Distance
20      33       p       18.384776310850235
23      31       p       19.4164878389476
37      33       n       19.72308292331602


Predicted Class is Positive (P)

Time Taken by the Algorithm :  0.9992122650146484  ms
```

4. K=4

```
Enter the test point : 33 35
Enter the value of k : 4
X       Y      Class       Distance
0       16      p       38.07886552931954
0       28      p       33.734255586866
27      17      p       18.973665961010276
16      2       p       37.12142238654117
11      4       p       38.01315561749642
36      14      p       21.213203435596427
35      2       p       33.06055050963308
6       30      p       27.459060435491963
12      37      p       21.095023109728988
13      2       p       38.58756276314948
26      36      n       7.0710678118654755
34      33      n       2.23606797749979
0       10      p       41.400483088968905
26      28      n       9.899494936611665
36      17      p       18.24828759089466
40      8       p       27.892651361962706
14      25      p       21.470910553583888
22      0       p       36.68787265568828
32      36      n       1.4142135623730951
13      21      p       24.413111231467404
2       14      p       37.44329045369811



K Nearest Neighbors :

X       Y      Class       Distance
32      36      n       1.4142135623730951
34      33      n       2.23606797749979
26      36      n       7.0710678118654755
26      28      n       9.899494936611665


Predicted Class is Negative (N)

Time Taken by the Algorithm :  2.9997825622558594  ms
```

5. K=5

```
Enter the test point : 37 37
Enter the value of k : 5
X       Y      Class       Distance
10      11      p       37.48332962798263
1       9       p       45.60701700396552
35      2       p       35.05709628591621
7       3       p       45.34313619501854
38      2       p       35.014282800023196
35      23      p       14.142135623730951
31      40      n       6.708203932499369
17      29      p       21.540659228538015
20      22      p       22.67156809750927
28      26      n       14.212670403551895
33      34      n       5.0
17      29      p       21.540659228538015
7       5       p       43.86342439892262
8       17      p       35.22782990761707
14      40      p       23.194827009486403
16      38      p       21.02379604162864
5       26      p       33.83784863137726
28      16      p       22.847319317591726
21      6       p       34.88552708502482
32      1       p       36.345563690772494
5       1       p       48.16637831516918
```

```
K Nearest Neighbors :

X       Y      Class       Distance
33      34      n       5.0
31      40      n       6.708203932499369
35      23      p       14.142135623730951
28      26      n       14.212670403551895
16      38      p       21.02379604162864


Predicted Class is Negative (N)

Time Taken by the Algorithm :  1.9984245300292969  ms
```