```
 1 C:\Python27\python.exe C:/Users/Fantacy/Desktop/MNIST/
   KNN_MNIST.py
 2 Data loading finished!
 3 I am running through the500th test, and now it is: 'Tue Sep
    17 16:35:58 2019'
 4 I am running through the1000th test, and now it is: 'Tue
   Sep 17 16:59:11 2019'
 5 I am running through the1500th test, and now it is: 'Tue
   Sep 17 17:22:25 2019'
 6 I am running through the2000th test, and now it is: 'Tue
   Sep 17 17:45:31 2019'
 7 I am running through the2500th test, and now it is: 'Tue
   Sep 17 18:08:29 2019'
 8 I am running through the3000th test, and now it is: 'Tue
   Sep 17 18:31:28 2019'
 9 I am running through the3500th test, and now it is: 'Tue
   Sep 17 18:54:27 2019'
10 I am running through the4000th test, and now it is: 'Tue
   Sep 17 19:17:25 2019'
11 I am running through the4500th test, and now it is: 'Tue
   Sep 17 19:40:22 2019'
12 I am running through the5000th test, and now it is: 'Tue
   Sep 17 20:03:17 2019'
13 I am running through the5500th test, and now it is: 'Tue
   Sep 17 20:26:13 2019'
14 I am running through the6000th test, and now it is: 'Tue
   Sep 17 20:49:32 2019'
15 I am running through the6500th test, and now it is: 'Tue
   Sep 17 21:12:55 2019'
16 I am running through the7000th test, and now it is: 'Tue
   Sep 17 21:36:20 2019'
17 I am running through the7500th test, and now it is: 'Tue
   Sep 17 21:59:47 2019'
18 I am running through the8000th test, and now it is: 'Tue
   Sep 17 22:23:11 2019'
19 Runtime is: 23008.9104295 seconds.
20 Walltime is: 'Tue Sep 17 22:36:21 2019'
21 When k = 1, the Confusion matrix is:
22 [819.0, 0.0, 4.0, 3.0, 1.0, 1.0, 4.0, 0.0, 4.0, 3.0]
23 [1.0, 904.0, 6.0, 1.0, 6.0, 0.0, 0.0, 9.0, 4.0, 1.0]
24 [0.0, 3.0, 749.0, 6.0, 0.0, 0.0, 0.0, 2.0, 5.0, 1.0]
25 [0.0, 0.0, 3.0, 845.0, 0.0, 12.0, 0.0, 1.0, 16.0, 5.0]
26 [0.0, 1.0, 0.0, 0.0, 805.0, 2.0, 0.0, 3.0, 3.0, 10.0]
27 [3.0, 0.0, 1.0, 10.0, 2.0, 724.0, 9.0, 0.0, 14.0, 1.0]
28 [3.0, 2.0, 2.0, 0.0, 0.0, 14.0, 817.0, 0.0, 6.0, 0.0]
29 [0.0, 2.0, 10.0, 4.0, 2.0, 1.0, 0.0, 831.0, 1.0, 8.0]
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30 [0.0, 3.0, 0.0, 10.0, 0.0, 2.0, 0.0, 0.0, 708.0, 0.0]
31 [0.0, 0.0, 1.0, 5.0, 17.0, 5.0, 0.0, 9.0, 7.0, 803.0]
32 When k = 3, the Confusion matrix is:
33 [819.0, 0.0, 5.0, 3.0, 2.0, 2.0, 7.0, 1.0, 3.0, 2.0]
34 [1.0, 904.0, 7.0, 1.0, 7.0, 1.0, 0.0, 11.0, 7.0, 1.0]
35 [0.0, 3.0, 744.0, 8.0, 0.0, 0.0, 0.0, 2.0, 3.0, 0.0]
36 [0.0, 0.0, 2.0, 847.0, 0.0, 13.0, 0.0, 0.0, 19.0, 6.0]
37 [0.0, 1.0, 0.0, 0.0, 804.0, 2.0, 1.0, 3.0, 3.0, 6.0]
38 [3.0, 0.0, 1.0, 9.0, 0.0, 722.0, 5.0, 0.0, 14.0, 0.0]
39 [3.0, 2.0, 1.0, 1.0, 1.0, 10.0, 817.0, 0.0, 6.0, 0.0]
40 [0.0, 4.0, 15.0, 5.0, 1.0, 2.0, 0.0, 833.0, 3.0, 6.0]
41 [0.0, 1.0, 1.0, 6.0, 0.0, 3.0, 0.0, 0.0, 706.0, 1.0]
42 [0.0, 0.0, 0.0, 4.0, 18.0, 6.0, 0.0, 5.0, 4.0, 810.0]
43 When k = 5, the Confusion matrix is:
44 [818.0, 0.0, 6.0, 2.0, 1.0, 1.0, 4.0, 1.0, 1.0, 3.0]
45 [1.0, 905.0, 8.0, 1.0, 9.0, 0.0, 0.0, 15.0, 8.0, 2.0]
46 [0.0, 2.0, 741.0, 7.0, 0.0, 0.0, 0.0, 2.0, 3.0, 0.0]
47 [0.0, 0.0, 1.0, 852.0, 0.0, 12.0, 0.0, 0.0, 12.0, 6.0]
48 [0.0, 1.0, 0.0, 0.0, 798.0, 1.0, 0.0, 2.0, 2.0, 6.0]
49 [3.0, 0.0, 1.0, 11.0, 0.0, 723.0, 5.0, 0.0, 15.0, 2.0]
50 [3.0, 2.0, 1.0, 1.0, 1.0, 14.0, 820.0, 0.0, 8.0, 0.0]
51 [0.0, 4.0, 16.0, 4.0, 1.0, 2.0, 0.0, 829.0, 0.0, 6.0]
52 [0.0, 1.0, 1.0, 3.0, 0.0, 4.0, 1.0, 0.0, 710.0, 2.0]
53 [1.0, 0.0, 1.0, 3.0, 23.0, 4.0, 0.0, 6.0, 9.0, 805.0]
54 When k = 7, the Confusion matrix is:
55 [817.0, 0.0, 5.0, 2.0, 1.0, 1.0, 4.0, 1.0, 3.0, 3.0]
56 [1.0, 905.0, 8.0, 5.0, 8.0, 1.0, 0.0, 18.0, 10.0, 2.0]
57 [0.0, 2.0, 742.0, 5.0, 0.0, 0.0, 1.0, 1.0, 2.0, 0.0]
58 [0.0, 0.0, 1.0, 845.0, 0.0, 14.0, 0.0, 0.0, 17.0, 3.0]
59 [0.0, 1.0, 0.0, 0.0, 802.0, 1.0, 0.0, 0.0, 2.0, 6.0]
60 [3.0, 0.0, 1.0, 14.0, 0.0, 716.0, 6.0, 0.0, 12.0, 1.0]
61 [3.0, 2.0, 1.0, 1.0, 0.0, 15.0, 818.0, 0.0, 7.0, 0.0]
62 [0.0, 4.0, 17.0, 5.0, 1.0, 3.0, 0.0, 830.0, 0.0, 7.0]
63 [0.0, 1.0, 1.0, 4.0, 0.0, 3.0, 1.0, 0.0, 706.0, 2.0]
64 [2.0, 0.0, 0.0, 3.0, 21.0, 7.0, 0.0, 5.0, 9.0, 808.0]
65 When k = 9, the Confusion matrix is:
66 [819.0, 0.0, 6.0, 2.0, 1.0, 1.0, 4.0, 1.0, 3.0, 3.0]
67 [1.0, 905.0, 12.0, 5.0, 9.0, 1.0, 1.0, 20.0, 9.0, 1.0]
68 [0.0, 2.0, 738.0, 5.0, 0.0, 0.0, 0.0, 1.0, 2.0, 0.0]
69 [1.0, 0.0, 1.0, 847.0, 0.0, 13.0, 0.0, 0.0, 16.0, 4.0]
70 [0.0, 1.0, 0.0, 0.0, 798.0, 1.0, 0.0, 0.0, 5.0, 7.0]
71 [2.0, 0.0, 1.0, 12.0, 0.0, 716.0, 6.0, 0.0, 12.0, 1.0]
72 [2.0, 1.0, 1.0, 1.0, 0.0, 17.0, 818.0, 0.0, 8.0, 0.0]
73 [0.0, 4.0, 15.0, 5.0, 1.0, 2.0, 0.0, 829.0, 0.0, 9.0]
74 [0.0, 1.0, 1.0, 4.0, 0.0, 3.0, 1.0, 0.0, 705.0, 1.0]
75 [1.0, 1.0, 1.0, 3.0, 24.0, 7.0, 0.0, 4.0, 8.0, 806.0]
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When k = 11, the Confusion matrix is:
[819.0, 0.0, 5.0, 2.0, 2.0, 2.0, 4.0, 0.0, 4.0, 3.0]
[1.0, 906.0, 12.0, 5.0, 10.0, 1.0, 1.0, 21.0, 10.0, 1.0]
[0.0, 2.0, 736.0, 5.0, 0.0, 0.0, 1.0, 1.0, 2.0, 0.0]
[1.0, 0.0, 1.0, 844.0, 0.0, 10.0, 0.0, 0.0, 16.0, 5.0]
[0.0, 1.0, 0.0, 0.0, 795.0, 0.0, 0.0, 2.0, 4.0, 5.0]
[2.0, 0.0, 1.0, 13.0, 0.0, 720.0, 5.0, 0.0, 10.0, 0.0]
[2.0, 1.0, 1.0, 1.0, 1.0, 16.0, 818.0, 0.0, 7.0, 0.0]
[0.0, 4.0, 17.0, 4.0, 1.0, 1.0, 0.0, 827.0, 1.0, 8.0]
[0.0, 1.0, 1.0, 5.0, 0.0, 2.0, 1.0, 0.0, 705.0, 1.0]
[1.0, 0.0, 2.0, 5.0, 24.0, 9.0, 0.0, 4.0, 9.0, 809.0]
When k = 13, the Confusion matrix is:
[818.0, 0.0, 6.0, 2.0, 2.0, 2.0, 4.0, 1.0, 4.0, 3.0]
[1.0, 905.0, 17.0, 5.0, 9.0, 1.0, 0.0, 25.0, 10.0, 2.0]
[0.0, 2.0, 728.0, 4.0, 0.0, 0.0, 1.0, 0.0, 3.0, 0.0]
[1.0, 0.0, 1.0, 843.0, 0.0, 12.0, 0.0, 0.0, 13.0, 5.0]
[0.0, 2.0, 0.0, 0.0, 791.0, 1.0, 0.0, 0.0, 4.0, 5.0]
[3.0, 0.0, 1.0, 14.0, 0.0, 717.0, 5.0, 0.0, 12.0, 0.0]
[2.0, 1.0, 2.0, 1.0, 1.0, 16.0, 819.0, 0.0, 7.0, 0.0]
[0.0, 4.0, 18.0, 6.0, 1.0, 0.0, 0.0, 824.0, 1.0, 8.0]
[0.0, 1.0, 1.0, 3.0, 0.0, 4.0, 1.0, 0.0, 704.0, 2.0]
[1.0, 0.0, 2.0, 6.0, 29.0, 8.0, 0.0, 5.0, 10.0, 807.0]
When k = 15, the Confusion matrix is:
[818.0, 0.0, 6.0, 2.0, 2.0, 2.0, 7.0, 1.0, 4.0, 3.0]
[1.0, 905.0, 17.0, 5.0, 10.0, 2.0, 1.0, 25.0, 11.0, 3.0]
[0.0, 2.0, 729.0, 5.0, 0.0, 0.0, 0.0, 0.0, 3.0, 1.0]
[1.0, 0.0, 2.0, 840.0, 0.0, 12.0, 0.0, 0.0, 15.0, 7.0]
[0.0, 2.0, 0.0, 0.0, 791.0, 1.0, 0.0, 0.0, 4.0, 5.0]
[3.0, 0.0, 1.0, 14.0, 0.0, 716.0, 5.0, 0.0, 11.0, 0.0]
[2.0, 1.0, 1.0, 2.0, 1.0, 16.0, 816.0, 0.0, 7.0, 0.0]
[0.0, 4.0, 16.0, 5.0, 1.0, 1.0, 0.0, 823.0, 1.0, 7.0]
[0.0, 1.0, 1.0, 5.0, 0.0, 3.0, 1.0, 0.0, 703.0, 2.0]
[1.0, 0.0, 3.0, 6.0, 28.0, 8.0, 0.0, 6.0, 9.0, 804.0]
When k = 17, the Confusion matrix is:
[818.0, 0.0, 6.0, 2.0, 2.0, 2.0, 10.0, 1.0, 4.0, 3.0]
[1.0, 904.0, 20.0, 5.0, 9.0, 2.0, 1.0, 28.0, 13.0, 3.0]
[0.0, 2.0, 725.0, 6.0, 0.0, 0.0, 0.0, 0.0, 3.0, 0.0]
[1.0, 0.0, 2.0, 839.0, 0.0, 12.0, 0.0, 0.0, 14.0, 5.0]
[0.0, 3.0, 0.0, 0.0, 791.0, 1.0, 0.0, 1.0, 4.0, 5.0]
[3.0, 0.0, 1.0, 13.0, 0.0, 715.0, 3.0, 0.0, 12.0, 1.0]
[2.0, 1.0, 1.0, 2.0, 1.0, 16.0, 815.0, 0.0, 8.0, 0.0]
[0.0, 4.0, 17.0, 5.0, 1.0, 1.0, 0.0, 819.0, 1.0, 7.0]
[0.0, 1.0, 1.0, 6.0, 0.0, 2.0, 1.0, 0.0, 699.0, 2.0]
[1.0, 0.0, 3.0, 6.0, 29.0, 10.0, 0.0, 6.0, 10.0, 806.0]
When k = 19, the Confusion matrix is:
[818.0, 0.0, 6.0, 2.0, 2.0, 2.0, 9.0, 0.0, 5.0, 3.0]
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[1.0, 904.0, 19.0, 5.0, 10.0, 2.0, 1.0, 28.0, 13.0, 3.0]
[0.0, 2.0, 726.0, 6.0, 0.0, 0.0, 0.0, 0.0, 3.0, 0.0]
[1.0, 0.0, 2.0, 836.0, 0.0, 13.0, 0.0, 0.0, 14.0, 7.0]
[0.0, 3.0, 0.0, 0.0, 787.0, 1.0, 0.0, 3.0, 4.0, 5.0]
[3.0, 0.0, 1.0, 15.0, 0.0, 713.0, 4.0, 0.0, 14.0, 0.0]
[2.0, 1.0, 1.0, 2.0, 1.0, 15.0, 815.0, 0.0, 7.0, 0.0]
[0.0, 4.0, 17.0, 6.0, 3.0, 2.0, 0.0, 817.0, 1.0, 7.0]
[0.0, 1.0, 1.0, 6.0, 0.0, 3.0, 1.0, 0.0, 696.0, 2.0]
[1.0, 0.0, 3.0, 6.0, 30.0, 10.0, 0.0, 7.0, 11.0, 805.0]
When k = 21, the Confusion matrix is:
[818.0, 0.0, 5.0, 2.0, 2.0, 2.0, 10.0, 0.0, 5.0, 4.0]
[1.0, 905.0, 20.0, 8.0, 12.0, 3.0, 2.0, 29.0, 13.0, 3.0]
[0.0, 2.0, 722.0, 5.0, 0.0, 0.0, 0.0, 0.0, 2.0, 0.0]
[1.0, 0.0, 3.0, 836.0, 0.0, 14.0, 0.0, 0.0, 15.0, 5.0]
[0.0, 3.0, 0.0, 0.0, 783.0, 1.0, 0.0, 2.0, 4.0, 5.0]
[3.0, 0.0, 2.0, 14.0, 0.0, 712.0, 3.0, 0.0, 14.0, 0.0]
[2.0, 0.0, 2.0, 2.0, 1.0, 14.0, 814.0, 0.0, 8.0, 0.0]
[0.0, 4.0, 18.0, 5.0, 3.0, 2.0, 0.0, 818.0, 1.0, 9.0]
[0.0, 1.0, 1.0, 6.0, 0.0, 3.0, 1.0, 0.0, 696.0, 2.0]
[1.0, 0.0, 3.0, 6.0, 32.0, 10.0, 0.0, 6.0, 10.0, 804.0]

Process finished with exit code 0

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