

Machine Learning fourth assignment

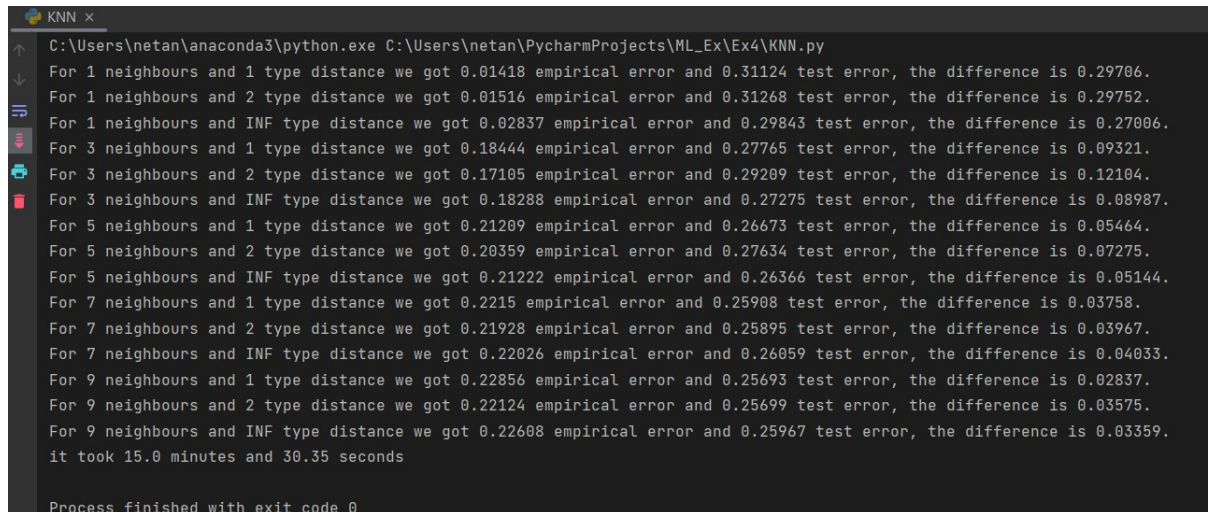
Lior Breitman, ID: 212733257. Netanel Levine: 312512619

17.1.23

1 1

From what we saw, the parameters that minimize the test error are 9 neighbours and L infinity. We Can learn that giving More neighbours increases that train error, but reduces the test error. There is overfitting only if the the number of neighbours is relatively small, here 1 neigh- bour gave a lot of overfitting (0.0175 train error, 0.31 test error)

Haberman results:



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KNN x
C:\Users\netan\anaconda3\python.exe C:\Users\netan\PycharmProjects\ML_Ex\Ex4\KNN.py
For 1 neighbours and 1 type distance we got 0.01418 empirical error and 0.31124 test error, the difference is 0.29706.
For 1 neighbours and 2 type distance we got 0.01516 empirical error and 0.31268 test error, the difference is 0.29752.
For 1 neighbours and INF type distance we got 0.02837 empirical error and 0.29843 test error, the difference is 0.27006.
For 3 neighbours and 1 type distance we got 0.18444 empirical error and 0.27765 test error, the difference is 0.09321.
For 3 neighbours and 2 type distance we got 0.17105 empirical error and 0.29209 test error, the difference is 0.12104.
For 3 neighbours and INF type distance we got 0.18288 empirical error and 0.27275 test error, the difference is 0.08987.
For 5 neighbours and 1 type distance we got 0.21209 empirical error and 0.26673 test error, the difference is 0.05464.
For 5 neighbours and 2 type distance we got 0.20359 empirical error and 0.27634 test error, the difference is 0.07275.
For 5 neighbours and INF type distance we got 0.21222 empirical error and 0.26366 test error, the difference is 0.05144.
For 7 neighbours and 1 type distance we got 0.2215 empirical error and 0.25908 test error, the difference is 0.03758.
For 7 neighbours and 2 type distance we got 0.21928 empirical error and 0.25895 test error, the difference is 0.03967.
For 7 neighbours and INF type distance we got 0.22026 empirical error and 0.26059 test error, the difference is 0.04033.
For 9 neighbours and 1 type distance we got 0.22856 empirical error and 0.25693 test error, the difference is 0.02837.
For 9 neighbours and 2 type distance we got 0.22124 empirical error and 0.25699 test error, the difference is 0.03575.
For 9 neighbours and INF type distance we got 0.22608 empirical error and 0.25967 test error, the difference is 0.03359.
it took 15.0 minutes and 30.35 seconds
Process finished with exit code 0
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2 2

In the squares data set, the test and train error were small from the start, and only grew as we added more neighbours. In the haberman data, as we added more neighbours, the test error decreased. There is no overfitting
squares results:

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For 1 neighbours and 1 type distance we got 0.0084 empirical error and 0.0674 test error, the difference is 0.059.
For 1 neighbours and 2 type distance we got 0.01 empirical error and 0.0696 test error, the difference is 0.0596.
For 1 neighbours and INF type distance we got 0.0138 empirical error and 0.0758 test error, the difference is 0.062.
For 3 neighbours and 1 type distance we got 0.0384 empirical error and 0.0758 test error, the difference is 0.0374.
For 3 neighbours and 2 type distance we got 0.0488 empirical error and 0.089 test error, the difference is 0.0402.
For 3 neighbours and INF type distance we got 0.056 empirical error and 0.1026 test error, the difference is 0.0466.
For 5 neighbours and 1 type distance we got 0.0562 empirical error and 0.0898 test error, the difference is 0.0336.
For 5 neighbours and 2 type distance we got 0.0628 empirical error and 0.1016 test error, the difference is 0.0388.
For 5 neighbours and INF type distance we got 0.0742 empirical error and 0.1158 test error, the difference is 0.0416.
For 7 neighbours and 1 type distance we got 0.0656 empirical error and 0.115 test error, the difference is 0.0494.
For 7 neighbours and 2 type distance we got 0.086 empirical error and 0.1194 test error, the difference is 0.0334.
For 7 neighbours and INF type distance we got 0.1014 empirical error and 0.1292 test error, the difference is 0.0278.
For 9 neighbours and 1 type distance we got 0.097 empirical error and 0.121 test error, the difference is 0.024.
For 9 neighbours and 2 type distance we got 0.1024 empirical error and 0.137 test error, the difference is 0.0346.
For 9 neighbours and INF type distance we got 0.1082 empirical error and 0.1302 test error, the difference is 0.022.
it took 0.0 minutes and 49.94 seconds

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3 3

This Claim is false. In class we proved for a column vector of size 4 that $E[F(w)^2] = ||w||^2$, we can use this and take triangles in 4 dimensions and reduce them to 1 dimension. Every 3 points in 1 dimension will be of area 0, so for every triangle that we take that has area > 0 , the left inequality won't stand.