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1 C:\Users\Sapan\Downloads\4p76Assign1\assign1\venv\Scripts\python.exe C:/Users/Sapan/
  Downloads/4p76Assign1/assign1/main.py
2 Enter 1 for Digits classification, Enter 2 for Cancer classification: 1
3 Enter number of tests to compare (only works on 3), if don't want to run tests just
  single run enter 1: 3
4 Give name to your Test for files: digi_lr
5
6 Test no.: 0
7 Enter number of neurons for hidden layer: 25
8 Enter number of epochs: 25
9 Enter 1 for sigmoid or 2 for tanh activation function: 1
10 Enter learning rate: 0.7
11 Enter Momentum: 0.15
12 Running-----
13 Fold no.: 0
14 Accumulated sum error over epochs: [42468.373171692845, 30847.592174359663, 20514.
  137969947453, 13162.831862997424, 5995.527449395604, 3930.049894551456, 3571.
  9455149217692, 3520.8285117803293, 2966.1537747362568, 2472.010271261893, 2057.
  485049840898, 1634.8241967301278, 1432.1210953166392, 1239.1520499014155, 1131.
  8026084074008, 1002.210433045024, 888.0758616795484, 799.2730490492725, 745.2803017947388
  , 720.7642372901327, 683.6918798569338, 656.8131820568871, 648.8791728557985, 622.
  8636585385101, 588.2717987869058]
15
16 Correct classification validation set: 1604
17
18 Correct classification test set: 3646
19 end of fold
20
21 Running-----
22 Fold no.: 1
23 Accumulated sum error over epochs: [41369.07720232122, 22090.04312258987, 18748.
  806781980376, 17345.74293694203, 15583.683839097597, 12625.038306373322, 12111.
  353818845946, 9916.678489345615, 6236.455442149206, 5711.468044768271, 5595.183704454171
  , 5537.3591879331425, 5439.599505897752, 5401.94333673214, 5354.713434431702, 5324.
  635963008221, 3519.103846983526, 627.9362287629679, 598.5481970263654, 566.8635124475888
  , 547.9047598154968, 534.7678484873591, 523.2281743164148, 516.2663183115385, 497.
  6167929598077]
24
25 Correct classification validation set: 1605
26
27 Correct classification test set: 3699
28 end of fold
29
30 Running-----
31 Fold no.: 2
32 Accumulated sum error over epochs: [47222.72545872186, 45802.58938485275, 36693.
  05489164915, 34538.474316245374, 34533.23134014736, 33603.18862931902, 17176.259703803953
  , 12624.116082754299, 8049.545366841555, 2578.2021628838766, 1851.1268200581922, 1412.
  622973492834, 1243.140085597179, 1080.820435245985, 968.7814622342441, 885.3345041625273
  , 843.1481081126533, 832.0673294238069, 822.4144457915548, 781.5114621322318, 793.
  2113827975638, 779.8351982396849, 714.6752495457152, 687.0447479504949, 637.1755403093254
  ]
33
34 Correct classification validation set: 1592
35
36 Correct classification test set: 3643
37 end of fold
38
39 Running-----
40 Fold no.: 3
41 Accumulated sum error over epochs: [45870.882773485, 37186.90665911401, 29667.
  757831437895, 22904.121142590826, 11519.795863394393, 5004.665262171613, 4009.
  4678817093463, 3044.694154732763, 1989.9630145246856, 1203.772087217751, 980.
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41 8197181201285, 923.8796520273875, 888.4294132402392, 812.453545398888, 791.3414067356407
, 753.7919913367336, 728.1366791293998, 715.9644402663113, 680.8231350700445, 657.
5374392473021, 675.3628273203093, 650.4129180723012, 640.6173272864046, 616.
5172064114757, 616.964878861049]
42
43 Correct classification validation set: 1589
44
45 Correct classification test set: 3671
46 end of fold
47
48 Fold test accuracies%: [91.14999999999999, 92.475, 91.07499999999999, 91.77499999999999
]
49 Fold validation accuracies%: [91.7095483133219, 91.76672384219555, 91.02344196683819,
90.85191538021726]
50 Mean fold validation accuracies%: 91.33790737564323
51
52 Test no.: 1
53 Enter number of neurons for hidden layer: 25
54 Enter number of epochs: 25
55 Enter 1 for sigmoid or 2 for tanh activation function: 1
56 Enter learning rate: 1.7
57 Enter Momentum: 0.15
58 Running-----
59 Fold no.: 0
60 Accumulated sum error over epochs: [36545.666634277266, 18303.354333403302, 12214.
699360901117, 5315.18669202614, 2901.050193152672, 1790.7139688818845, 1358.
6090850890541, 1187.295942591661, 1046.2859333855931, 946.9385868002486, 879.
6337921780816, 804.5717161577037, 794.9705861360708, 758.8315014400445, 720.
4460214950153, 744.6036227691752, 675.3463761795929, 583.8610799010471, 637.
2073456299416, 566.6546378973366, 541.0725228505542, 557.261317834963, 498.
18792651908575, 481.43682757403656, 472.0285491839697]
61
62 Correct classification validation set: 1601
63
64 Correct classification test set: 3702
65 end of fold
66
67 Running-----
68 Fold no.: 1
69 Accumulated sum error over epochs: [26407.741002338702, 14750.702227603346, 10806.
926778184084, 9244.898667502755, 7627.066065595599, 3489.4038656560074, 2951.
820369502206, 2588.376454528826, 1951.7623301640965, 1548.5544047677984, 1429.
9488589343055, 1364.5083636449592, 1420.177335759732, 1365.6034338574, 1276.
6557621285715, 1245.3296627764319, 1262.6059144492588, 1230.1831436653272, 1219.
903833102019, 1199.1361788494282, 1213.2915121667706, 1143.0847747901846, 1130.
288388842078, 1135.167099188824, 1141.7867063248498]
70
71 Correct classification validation set: 1396
72
73 Correct classification test set: 3205
74 end of fold
75
76 Running-----
77 Fold no.: 2
78 Accumulated sum error over epochs: [36046.455582978495, 27668.2353764825, 19968.
876782542127, 13562.855608960883, 8838.859221263872, 2376.7634365031636, 1743.
0533377569125, 1422.3545060004967, 1277.7630794557256, 1146.520910352504, 1036.
798408096207, 948.8549452244258, 949.8154216602842, 878.8614943283856, 846.237560715646
, 754.0623901944508, 804.3365606877511, 774.483185138838, 690.0053255039455, 686.
7166193491877, 607.5600968182689, 651.1181184974761, 595.60485320187, 560.3631454576171
, 589.9485617509561]
79
80 Correct classification validation set: 1605
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81
82 Correct classification test set: 3681
83 end of fold
84
85 Running-----
86 Fold no.: 3
87 Accumulated sum error over epochs: [40667.86309078529, 18901.50782637093, 13729.
327655570281, 6019.0187302999275, 4065.9258860708933, 3725.1892507540333, 2855.
5408217947283, 2057.733227282039, 1376.0142834298604, 1256.692399396239, 1028.
8783081264849, 964.900058766976, 902.0574724825251, 871.0816795134795, 792.7294702710736
, 770.2015911465, 732.3389944851285, 730.9841121523485, 701.131921592542, 694.
2377512136023, 677.3362371615673, 669.0317204988639, 638.0988182470867, 635.
5414704061338, 593.3437421069314]
88
89 Correct classification validation set: 1564
90
91 Correct classification test set: 3630
92 end of fold
93
94 Fold test accuracies%: [92.55, 80.125, 92.025, 90.75]
95 Fold validation accuracies%: [91.53802172670098, 79.81703830760435, 91.76672384219555,
89.42252715837623]
96 Mean fold validation accuracies%: 88.13607775871928
97
98 Test no.: 2
99 Enter number of neurons for hidden layer: 25
100 Enter number of epochs: 25
101 Enter 1 for sigmoid or 2 for tanh activation function: 1
102 Enter learning rate: 2.7
103 Enter Momentum: 0.15
104 Running-----
105 Fold no.: 0
106 Accumulated sum error over epochs: [39730.599392195945, 20350.944596266603, 14446.
80619841186, 7959.1071188431, 5627.2626179132785, 6207.089475812926, 5657.978979737819,
6029.789220170824, 6773.806656316315, 6117.380325529743, 6115.083496996679, 5812.
768576800935, 5677.904821609311, 5113.7808491349815, 4952.814280489222, 4582.
316466498074, 3970.6973491013523, 3540.071173006673, 3060.7488157403545, 1819.
1738635632576, 1381.7146734478713, 1165.0676035356657, 997.9881044186553, 1062.
115063420068, 989.6220241066093]
107
108 Correct classification validation set: 1464
109
110 Correct classification test set: 3376
111 end of fold
112
113 Running-----
114 Fold no.: 1
115 Accumulated sum error over epochs: [30083.65333707001, 6407.1873251836905, 5939.
748017622329, 6990.710014053012, 5895.705922855814, 5890.808021756992, 6012.309168068096
, 6037.43650843955, 5604.326004197435, 5520.547425127056, 5013.543655649603, 5394.
172486390772, 5330.3933495108695, 5144.875884966693, 4992.419626988615, 4941.
167052427764, 4552.045987446941, 4503.85153926634, 4489.703648237054, 4029.511158629343
, 3335.8509059412518, 2957.5161479532317, 2869.1164206669355, 2553.3769770710155, 2491.
137913025265]
116
117 Correct classification validation set: 1102
118
119 Correct classification test set: 2581
120 end of fold
121
122 Running-----
123 Fold no.: 2
124 Accumulated sum error over epochs: [24640.86861051066, 10496.122787479597, 9790.
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124 088248539181, 10181.584776908398, 9888.430717137766, 10153.031606006565, 9922.
370466062093, 9866.802393530841, 9844.830243807837, 9714.668950245683, 9290.35833743727
, 9257.034003081, 5343.74414875143, 4566.926859405014, 4128.313693261231, 3975.
2968404516523, 3473.10304885805, 2691.3081083106704, 2147.7369691009085, 2028.
8647636787632, 1820.9352367601145, 1866.0285957002873, 1952.9355798025088, 1723.
0737416385607, 1500.0692260543435]
125
126 Correct classification validation set: 1302
127
128 Correct classification test set: 2977
129 end of fold
130
131 Running-----
132 Fold no.: 3
133 Accumulated sum error over epochs: [23366.218504283865, 9736.902142649582, 9750.
807470052156, 9742.567619946498, 10278.803144804522, 9585.198423937733, 9738.
632709948542, 10017.189651583105, 9819.820550235465, 9474.988767794284, 9111.
586862043076, 8246.212499435082, 7978.280754407897, 7348.273432709264, 3662.305791907963
, 2011.7429355358827, 1603.817708124908, 1592.0070735881384, 1196.3828671552487, 1058.
418813643184, 1054.922848060206, 998.5562904164701, 974.7643582958885, 882.2106598017494
, 894.7721010017244]
134
135 Correct classification validation set: 1584
136
137 Correct classification test set: 3619
138 end of fold
139
140 Fold test accuracies%: [84.39999999999999, 64.525, 74.425, 90.47500000000001]
141 Fold validation accuracies%: [83.704974271012, 63.00743281875357, 74.44253859348198, 90
.56603773584906]
142 Mean fold validation accuracies%: 77.93024585477416
143
144 Test results:
145     test0    test1    test2
146 0  91.150  92.550  84.400
147 1  92.475  80.125  64.525
148 2  91.075  92.025  74.425
149 3  91.775  90.750  90.475
150 Test stats:
151         test0         test1         test2
152 count    4.000000    4.000000    4.000000
153 mean    91.618750   88.862500   78.456250
154 std      0.651401    5.87383    11.403351
155 min     91.075000   80.12500    64.525000
156 25%     91.131250   88.09375    71.950000
157 50%     91.462500   91.38750    79.412500
158 75%     91.950000   92.15625    85.918750
159 max     92.475000   92.55000    90.475000
160
161 Validation results:
162         test0         test1         test2
163 0  91.709548   91.538022   83.704974
164 1  91.766724   79.817038   63.007433
165 2  91.023442   91.766724   74.442539
166 3  90.851915   89.422527   90.566038
167 Valid stats:
168         test0         test1         test2
169 count    4.000000    4.000000    4.000000
170 mean    91.337907   88.136078   77.930246
171 std      0.468002    5.645535   11.942434
172 min     90.851915   79.817038   63.007433
173 25%     90.980560   87.021155   71.583762
174 50%     91.366495   90.480274   79.073756
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175 75%      91.723842  91.595197  85.420240
176 max      91.766724  91.766724  90.566038
177
178 shapiro test for testing accuracies
179 test0 stats=0.8929, p=0.3967
180 test1 stats=0.7399, p=0.0309
181 test2 stats=0.9741, p=0.8667
182
183 shapiro test for validation accuracies
184 test0 stats=0.8398, p=0.1948
185 test1 stats=0.7671, p=0.0552
186 test2 stats=0.9804, p=0.9041
187
188 ANOVA test
189
190 df_test.iloc[:, 1]  0.964702  1.0  54.188641  0.085956
191 df_test.iloc[:, 2]  0.162505  1.0   9.128124  0.203487
192 Residual           0.017803  1.0           NaN           NaN
193
194 t-tests:
195 Ttest_indResult(statistic=0.932766514980727, pvalue=0.4182456376607418)
196 Ttest_indResult(statistic=1.6225226668006425, pvalue=0.17224392312550346)
197 Ttest_indResult(statistic=2.3047747060122985, pvalue=0.1039599875047625)
198
199 No statistically better mean
200
201 Process finished with exit code 0
202
```