1.

This question trains a one-vs-rest polynomial kernel perceptron on polynomials of degrees such that over 20 iterations. From the training and testing functions, the program derives the training and testing errors and standard deviations for each polynomial degree .

Train Standard Deviations

0.0028100157448148395

0.002376631713456373

0.0019988908757994778

0.0022498917047259026

0.001983868744610059

0.0016783933339908563

0.0016029963496411606

Train Errors

0.15152594783543966

0.10606345791879539

0.09081742403872009

0.08409518687819306

0.08152729228287174

0.0794501210002689

0.07921484269965044

Test Standard Deviation

0.02659702741412829

0.010390784703391056

0.008583438990556934

0.006946259446015748

0.02664805704712137

0.006103038635577457

0.00465131449785794

Test Errors

0.10959677419354838

0.06631720430107527

0.05900537634408602

0.05169354838709676

0.056370967741935486

0.047419354838709675

0.04491935483870968

2.

The average test error is: 0.102

The test error standard deviation is: 0.0190

The average best degree is: 3.45

The best degree standard deviation is: 0.805

Degree, Test Error

0, 0.10256410256410253

1, 0.1282051282051282

2, 0.08333333333333337

3, 0.10897435897435892

4, 0.08012820512820518

5, 0.09294871794871795

6, 0.09294871794871795

7, 0.11538461538461542

8, 0.13782051282051277

9, 0.07371794871794868

10, 0.08653846153846156

11, 0.09935897435897434

12, 0.08653846153846156

13, 0.13782051282051277

14, 0.08974358974358976

15, 0.10576923076923073

16, 0.1217948717948718

17, 0.1217948717948718

18, 0.08653846153846156

19, 0.08653846153846156

Runs, Degree

0,2.0

1,3.0

2,4.0

3,3.0

4,3.0

5,3.0

6,4.0

7,4.0

8,2.0

9,4.0

10,5.0

11,3.0

12,5.0

13,3.0

14,3.0

15,4.0

16,4.0

17,3.0

18,3.0

19,4.0

Q3.

The confusion matrix for run 0 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.217944947177033550.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.21794494717703355]

[1.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.07264831572567791.0+/-0.07264831572567790.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.02.0+/-0.087177978870813540.0+/-0.00.0+/-0.02.0+/-0.087177978870813541.0+/-0.04358898943540677]

[0.0+/-0.01.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.02.0+/-0.1452966314513558]

[0.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.07264831572567790.0+/-0.00.0+/-0.01.0+/-0.07264831572567790.0+/-0.01.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.01.0+/-0.043588989435406771.0+/-0.043588989435406770.0+/-0.00.0+/-0.03.0+/-0.130766968306220250.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.0]

[1.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.0726483157256779]

[1.0+/-0.07264831572567791.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.03.0+/-0.163458710382775431.0+/-0.054486236794258390.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.0]

]

The confusion matrix for run 1 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.07264831572567790.0+/-0.217944947177033551.0+/-0.07264831572567791.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[1.0+/-0.077518193314760482.0+/-0.0622699849077239240.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.0311349924538619622.0+/-0.093161893078637411.0+/-0.077518193314760480.0+/-0.00.0+/-0.0]

[1.0+/-0.043588989435406770.0+/-0.01.0+/-0.043588989435406770.0+/-0.00.0+/-0.02.0+/-0.119999999999999970.0+/-0.01.0+/-0.043588989435406770.0+/-0.087177978870813540.0+/-0.04358898943540677]

[0.0+/-0.01.0+/-0.088486502423313731.0+/-0.054486236794258390.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.054486236794258390.0+/-0.00.0+/-0.01.0+/-0.15246812052943323]

[2.0+/-0.14529663145135580.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.00.0+/-0.01.0+/-0.100000000000000030.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[1.0+/-0.217944947177033550.0+/-0.043588989435406770.0+/-0.043588989435406770.0+/-0.00.0+/-0.00.0+/-0.130766968306220250.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.02.0+/-0.158989866902824240.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.10000000000000003]

[0.0+/-0.07264831572567791.0+/-0.074740291082595510.0+/-0.02.0+/-0.043588989435406771.0+/-0.0217944947177033844.0+/-0.110503896361671882.0+/-0.043588989435406770.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.01.0+/-0.043588989435406770.0+/-0.00.0+/-0.00.0+/-0.163458710382775431.0+/-0.067961386095340940.0+/-0.02.0+/-0.087177978870813541.0+/-0.043588989435406770.0+/-0.0]

]

The confusion matrix for run 2 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.02.0+/-0.127747580972965740.0+/-0.217944947177033551.0+/-0.088486502423313731.0+/-0.088486502423313730.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[0.0+/-0.077518193314760480.0+/-0.0622699849077239240.0+/-0.03.0+/-0.130766968306220251.0+/-0.043588989435406760.0+/-0.0311349924538619620.0+/-0.093161893078637411.0+/-0.086214150918478090.0+/-0.00.0+/-0.0]

[0.0+/-0.043588989435406770.0+/-0.01.0+/-0.067961386095340930.0+/-0.00.0+/-0.03.0+/-0.195240236631694320.0+/-0.00.0+/-0.043588989435406770.0+/-0.087177978870813540.0+/-0.04358898943540677]

[0.0+/-0.00.0+/-0.088486502423313731.0+/-0.075000000000000010.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.075000000000000010.0+/-0.00.0+/-0.02.0+/-0.18119012420965738]

[0.0+/-0.14529663145135580.0+/-0.01.0+/-0.043588989435406761.0+/-0.082731157639939020.0+/-0.00.0+/-0.01.0+/-0.105987420637230990.0+/-0.02.0+/-0.110503896361671880.0+/-0.0]

[0.0+/-0.217944947177033550.0+/-0.043588989435406770.0+/-0.043588989435406770.0+/-0.00.0+/-0.00.0+/-0.130766968306220250.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.164306201276086280.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.03.0+/-0.18498310733685916]

[0.0+/-0.07264831572567792.0+/-0.094045810711969840.0+/-0.02.0+/-0.074106927710531050.0+/-0.0217944947177033840.0+/-0.110503896361671881.0+/-0.052216191092848750.0+/-0.00.0+/-0.02.0+/-0.062269984907723924]

[0.0+/-0.00.0+/-0.043588989435406770.0+/-0.00.0+/-0.00.0+/-0.163458710382775430.0+/-0.067961386095340940.0+/-0.02.0+/-0.230434372436058130.0+/-0.043588989435406770.0+/-0.0]

]

The confusion matrix for run 3 is:

[

[0.0+/-0.00.0+/-0.01.0+/-0.217944947177033550.0+/-0.127747580972965740.0+/-0.217944947177033550.0+/-0.088486502423313730.0+/-0.088486502423313730.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.217944947177033550.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[0.0+/-0.077518193314760480.0+/-0.0622699849077239240.0+/-0.01.0+/-0.165755844542507891.0+/-0.115217186218029070.0+/-0.0311349924538619620.0+/-0.093161893078637410.0+/-0.086214150918478090.0+/-0.00.0+/-0.0]

[1.0+/-0.115217186218029070.0+/-0.00.0+/-0.067961386095340930.0+/-0.01.0+/-0.108972473588516780.0+/-0.195240236631694320.0+/-0.00.0+/-0.043588989435406770.0+/-0.087177978870813540.0+/-0.04358898943540677]

[0.0+/-0.01.0+/-0.135079708978727790.0+/-0.075000000000000010.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.127475487839819630.0+/-0.00.0+/-0.00.0+/-0.18119012420965738]

[0.0+/-0.14529663145135580.0+/-0.00.0+/-0.043588989435406760.0+/-0.082731157639939021.0+/-0.07264831572567790.0+/-0.02.0+/-0.171626208824746630.0+/-0.00.0+/-0.110503896361671880.0+/-0.0]

[0.0+/-0.217944947177033550.0+/-0.043588989435406770.0+/-0.043588989435406770.0+/-0.01.0+/-0.108972473588516781.0+/-0.165755844542507890.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.03.0+/-0.189067521742307180.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.03.0+/-0.2062815632414428]

[1.0+/-0.088486502423313731.0+/-0.104472747588364570.0+/-0.01.0+/-0.088619658527614681.0+/-0.057608593109014530.0+/-0.110503896361671880.0+/-0.052216191092848750.0+/-0.00.0+/-0.00.0+/-0.062269984907723924]

[0.0+/-0.00.0+/-0.043588989435406770.0+/-0.00.0+/-0.03.0+/-0.2250.0+/-0.067961386095340940.0+/-0.01.0+/-0.233063832457976930.0+/-0.043588989435406770.0+/-0.0]

]

The confusion matrix for run 4 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.217944947177033550.0+/-0.127747580972965740.0+/-0.217944947177033551.0+/-0.22893928113026920.0+/-0.088486502423313730.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.217944947177033550.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[0.0+/-0.077518193314760480.0+/-0.0622699849077239240.0+/-0.00.0+/-0.165755844542507890.0+/-0.115217186218029070.0+/-0.0311349924538619620.0+/-0.093161893078637410.0+/-0.086214150918478090.0+/-0.00.0+/-0.0]

[0.0+/-0.115217186218029070.0+/-0.03.0+/-0.11126074816229060.0+/-0.00.0+/-0.108972473588516782.0+/-0.199454293777101860.0+/-0.01.0+/-0.052216191092848751.0+/-0.091014688206837030.0+/-0.04358898943540677]

[0.0+/-0.01.0+/-0.140929454377397960.0+/-0.075000000000000010.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.13404756618454512.0+/-0.108972473588516790.0+/-0.00.0+/-0.18119012420965738]

[2.0+/-0.200000000000000040.0+/-0.00.0+/-0.043588989435406760.0+/-0.082731157639939021.0+/-0.100000000000000030.0+/-0.00.0+/-0.171626208824746630.0+/-0.00.0+/-0.110503896361671880.0+/-0.0]

[4.0+/-0.255495161945931470.0+/-0.043588989435406770.0+/-0.043588989435406770.0+/-0.00.0+/-0.108972473588516782.0+/-0.175839257404154350.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.272940520586038460.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.2062815632414428]

[1.0+/-0.110160867220019010.0+/-0.104472747588364570.0+/-0.00.0+/-0.088619658527614680.0+/-0.057608593109014532.0+/-0.175720738041296040.0+/-0.052216191092848750.0+/-0.00.0+/-0.00.0+/-0.062269984907723924]

[0.0+/-0.00.0+/-0.043588989435406770.0+/-0.00.0+/-0.01.0+/-0.231090410397700761.0+/-0.095637481030074061.0+/-0.07264831572567790.0+/-0.233063832457976930.0+/-0.043588989435406770.0+/-0.0]

]

The confusion matrix for run 5 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.217944947177033551.0+/-0.129203692301375070.0+/-0.217944947177033552.0+/-0.23244104780126054.0+/-0.147218879652295630.0+/-0.00.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.217944947177033550.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[0.0+/-0.077518193314760480.0+/-0.0622699849077239240.0+/-0.00.0+/-0.165755844542507890.0+/-0.115217186218029071.0+/-0.07751819331476050.0+/-0.093161893078637411.0+/-0.107627475439070631.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.115217186218029070.0+/-0.01.0+/-0.11278648330507750.0+/-0.01.0+/-0.111746341765442942.0+/-0.20257620133406290.0+/-0.01.0+/-0.0587453862712916662.0+/-0.106703862562300360.0+/-0.04358898943540677]

[0.0+/-0.00.0+/-0.140929454377397962.0+/-0.075805855827751030.0+/-0.00.0+/-0.018.0+/-0.163458710382775371.0+/-0.13338215252090931.0+/-0.108872855253782610.0+/-0.02.0+/-0.18047006523089762]

[0.0+/-0.200000000000000040.0+/-0.01.0+/-0.115217186218029070.0+/-0.082731157639939020.0+/-0.100000000000000030.0+/-0.00.0+/-0.171626208824746631.0+/-0.108972473588516790.0+/-0.110503896361671880.0+/-0.0]

[0.0+/-0.255495161945931470.0+/-0.043588989435406771.0+/-0.082731157639939030.0+/-0.00.0+/-0.108972473588516781.0+/-0.18387042539063580.0+/-0.00.0+/-0.01.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.00.0+/-0.01.0+/-0.217944947177033580.0+/-0.272940520586038460.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.2062815632414428]

[0.0+/-0.110160867220019011.0+/-0.11256995809207981.0+/-0.0544862367942583960.0+/-0.088619658527614680.0+/-0.057608593109014532.0+/-0.198123137916240730.0+/-0.052216191092848750.0+/-0.00.0+/-0.00.0+/-0.062269984907723924]

[0.0+/-0.01.0+/-0.115217186218029070.0+/-0.00.0+/-0.00.0+/-0.231090410397700761.0+/-0.138069527573771470.0+/-0.07264831572567790.0+/-0.233063832457976930.0+/-0.043588989435406770.0+/-0.0]

]

The confusion matrix for run 6 is:

[

[0.0+/-0.00.0+/-0.01.0+/-0.218213628126201150.0+/-0.129203692301375071.0+/-0.218213628126201152.0+/-0.233797521755766963.0+/-0.161826782253891851.0+/-0.02724311839712920.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.217944947177033550.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[0.0+/-0.077518193314760480.0+/-0.0622699849077239240.0+/-0.00.0+/-0.165755844542507891.0+/-0.123970762682174411.0+/-0.091556442698187480.0+/-0.093161893078637410.0+/-0.107627475439070632.0+/-0.127747580972965740.0+/-0.0]

[0.0+/-0.115217186218029070.0+/-0.00.0+/-0.11278648330507750.0+/-0.00.0+/-0.111746341765442943.0+/-0.21819382649004380.0+/-0.03.0+/-0.118792822568863730.0+/-0.106703862562300360.0+/-0.04358898943540677]

[0.0+/-0.01.0+/-0.140605708553307982.0+/-0.089365044123030040.0+/-0.00.0+/-0.00.0+/-0.163458710382775372.0+/-0.13836533264433611.0+/-0.110711085463220212.0+/-0.05448623679425840.0+/-0.18047006523089762]

[0.0+/-0.200000000000000040.0+/-0.00.0+/-0.115217186218029071.0+/-0.227327468155033570.0+/-0.100000000000000030.0+/-0.00.0+/-0.171626208824746630.0+/-0.108972473588516790.0+/-0.110503896361671880.0+/-0.0]

[0.0+/-0.255495161945931470.0+/-0.043588989435406770.0+/-0.082731157639939030.0+/-0.00.0+/-0.108972473588516780.0+/-0.18387042539063580.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567791.0+/-0.10897247358851680.0+/-0.00.0+/-0.217944947177033580.0+/-0.272940520586038461.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.2062815632414428]

[0.0+/-0.110160867220019012.0+/-0.113910345857714020.0+/-0.0544862367942583963.0+/-0.09951156224483750.0+/-0.057608593109014532.0+/-0.197456042928265160.0+/-0.052216191092848753.0+/-0.05448623679425840.0+/-0.02.0+/-0.07041945914842973]

[0.0+/-0.00.0+/-0.115217186218029070.0+/-0.00.0+/-0.00.0+/-0.231090410397700761.0+/-0.137852452321716450.0+/-0.07264831572567796.0+/-0.273587280406089041.0+/-0.050171580600973720.0+/-0.0]

]

The confusion matrix for run 7 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.218213628126201150.0+/-0.129203692301375070.0+/-0.218213628126201151.0+/-0.237502237726658131.0+/-0.170047293591586241.0+/-0.076234060264716620.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.217944947177033550.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[0.0+/-0.077518193314760480.0+/-0.0622699849077239240.0+/-0.01.0+/-0.166966397151575822.0+/-0.13806952757377150.0+/-0.091556442698187482.0+/-0.11368891796488881.0+/-0.109826445233205810.0+/-0.127747580972965740.0+/-0.0]

[0.0+/-0.115217186218029070.0+/-0.00.0+/-0.11278648330507750.0+/-0.00.0+/-0.111746341765442940.0+/-0.21819382649004380.0+/-0.00.0+/-0.118792822568863730.0+/-0.106703862562300361.0+/-0.22000000000000006]

[0.0+/-0.00.0+/-0.140605708553307982.0+/-0.13333333333333340.0+/-0.00.0+/-0.00.0+/-0.163458710382775370.0+/-0.13836533264433610.0+/-0.110711085463220210.0+/-0.05448623679425842.0+/-0.2017286406151701]

[1.0+/-0.220321734440038030.0+/-0.00.0+/-0.115217186218029070.0+/-0.227327468155033570.0+/-0.100000000000000030.0+/-0.01.0+/-0.193641994986165660.0+/-0.108972473588516790.0+/-0.110503896361671880.0+/-0.0]

[1.0+/-0.26034165586355520.0+/-0.043588989435406770.0+/-0.082731157639939030.0+/-0.00.0+/-0.108972473588516782.0+/-0.221428443420341820.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.00.0+/-0.217944947177033580.0+/-0.272940520586038460.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.02.0+/-0.2836701429477555]

[0.0+/-0.110160867220019010.0+/-0.113910345857714020.0+/-0.0544862367942583961.0+/-0.100835792964884980.0+/-0.057608593109014531.0+/-0.1961685147208910.0+/-0.052216191092848751.0+/-0.0613153025478192640.0+/-0.04.0+/-0.13847955553650254]

[0.0+/-0.00.0+/-0.115217186218029070.0+/-0.00.0+/-0.01.0+/-0.302879697423104170.0+/-0.137852452321716450.0+/-0.07264831572567790.0+/-0.273587280406089040.0+/-0.050171580600973720.0+/-0.0]

]

The confusion matrix for run 8 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.218213628126201150.0+/-0.129203692301375070.0+/-0.218213628126201150.0+/-0.237502237726658131.0+/-0.259037846399608140.0+/-0.076234060264716620.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.217944947177033550.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[0.0+/-0.077518193314760480.0+/-0.0622699849077239240.0+/-0.00.0+/-0.166966397151575821.0+/-0.149003635302409120.0+/-0.091556442698187481.0+/-0.128901692225134920.0+/-0.109826445233205811.0+/-0.14215601757693310.0+/-0.0]

[1.0+/-0.120312094155159661.0+/-0.0435889894354067541.0+/-0.116616303512407580.0+/-0.00.0+/-0.111746341765442941.0+/-0.21653433295193340.0+/-0.00.0+/-0.118792822568863731.0+/-0.111611571340712090.0+/-0.22000000000000006]

[0.0+/-0.02.0+/-0.167329411474625271.0+/-0.138129870452089770.0+/-0.00.0+/-0.00.0+/-0.163458710382775370.0+/-0.13836533264433611.0+/-0.119968167074066390.0+/-0.05448623679425840.0+/-0.2017286406151701]

[1.0+/-0.22530843057659620.0+/-0.00.0+/-0.115217186218029070.0+/-0.227327468155033570.0+/-0.100000000000000030.0+/-0.00.0+/-0.193641994986165660.0+/-0.108972473588516791.0+/-0.127540843131393241.0+/-0.0726483157256779]

[1.0+/-0.260149529651271471.0+/-0.0599999999999999841.0+/-0.09061518146045460.0+/-0.00.0+/-0.108972473588516782.0+/-0.227516788147356070.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851681.0+/-0.21794494717703360.0+/-0.217944947177033580.0+/-0.272940520586038460.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.2836701429477555]

[0.0+/-0.110160867220019013.0+/-0.160991999913912411.0+/-0.067961386095340930.0+/-0.100835792964884981.0+/-0.069776428684764320.0+/-0.1961685147208910.0+/-0.052216191092848750.0+/-0.0613153025478192640.0+/-0.00.0+/-0.13847955553650254]

[1.0+/-0.0217944947177033772.0+/-0.120312094155159660.0+/-0.00.0+/-0.01.0+/-0.301321164946049551.0+/-0.137018728444123440.0+/-0.07264831572567795.0+/-0.28412145290350750.0+/-0.050171580600973720.0+/-0.0]

]

The confusion matrix for run 9 is:

[

[0.0+/-0.00.0+/-0.01.0+/-0.219982243601614420.0+/-0.129203692301375070.0+/-0.218213628126201154.0+/-0.27748475474455580.0+/-0.259037846399608140.0+/-0.076234060264716620.0+/-0.00.0+/-0.0]

[0.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.238484800354236411.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[1.0+/-0.080334542677266380.0+/-0.0622699849077239240.0+/-0.01.0+/-0.16681816031568960.0+/-0.149003635302409120.0+/-0.091556442698187480.0+/-0.128901692225134924.0+/-0.144901248725075432.0+/-0.147372826531894960.0+/-0.0]

[0.0+/-0.120312094155159660.0+/-0.0435889894354067540.0+/-0.116616303512407580.0+/-0.00.0+/-0.111746341765442942.0+/-0.227395131694518420.0+/-0.01.0+/-0.125890197540295760.0+/-0.111611571340712091.0+/-0.22331312097590678]

[0.0+/-0.00.0+/-0.167329411474625270.0+/-0.138129870452089770.0+/-0.00.0+/-0.00.0+/-0.163458710382775370.0+/-0.13836533264433610.0+/-0.119968167074066390.0+/-0.05448623679425845.0+/-0.2796326955927086]

[1.0+/-0.225885602807163330.0+/-0.00.0+/-0.115217186218029072.0+/-0.244375621624671140.0+/-0.100000000000000030.0+/-0.00.0+/-0.193641994986165661.0+/-0.119242400177118210.0+/-0.127540843131393240.0+/-0.0726483157256779]

[0.0+/-0.260149529651271470.0+/-0.0599999999999999842.0+/-0.22813251509691560.0+/-0.00.0+/-0.108972473588516780.0+/-0.227516788147356070.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.21794494717703360.0+/-0.217944947177033580.0+/-0.272940520586038460.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.04.0+/-0.33672751100358095]

[0.0+/-0.110160867220019010.0+/-0.160991999913912410.0+/-0.067961386095340932.0+/-0.11646751710104642.0+/-0.096072166162271561.0+/-0.194833931261921250.0+/-0.052216191092848750.0+/-0.0613153025478192640.0+/-0.01.0+/-0.14015297764534707]

[0.0+/-0.0217944947177033770.0+/-0.120312094155159660.0+/-0.00.0+/-0.00.0+/-0.301321164946049551.0+/-0.242347818801362020.0+/-0.07264831572567790.0+/-0.28412145290350750.0+/-0.050171580600973720.0+/-0.0]

]

The confusion matrix for run 10 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.219982243601614420.0+/-0.129203692301375070.0+/-0.218213628126201150.0+/-0.27748475474455580.0+/-0.259037846399608140.0+/-0.076234060264716620.0+/-0.00.0+/-0.0]

[1.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.238484800354236410.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[1.0+/-0.08527655673230430.0+/-0.0622699849077239240.0+/-0.02.0+/-0.175461197831442071.0+/-0.14891039438385610.0+/-0.091556442698187480.0+/-0.128901692225134921.0+/-0.14463398953809311.0+/-0.147843291660084720.0+/-0.0]

[1.0+/-0.12774486291041220.0+/-0.0435889894354067540.0+/-0.116616303512407580.0+/-0.00.0+/-0.111746341765442941.0+/-0.224778802835324340.0+/-0.01.0+/-0.131424689383661251.0+/-0.118912482824254290.0+/-0.22331312097590678]

[0.0+/-0.00.0+/-0.167329411474625273.0+/-0.164306201276086220.0+/-0.00.0+/-0.00.0+/-0.163458710382775370.0+/-0.13836533264433613.0+/-0.154840868133850420.0+/-0.05448623679425840.0+/-0.2796326955927086]

[2.0+/-0.226824768540789620.0+/-0.03.0+/-0.143176428911739431.0+/-0.243385396536368870.0+/-0.100000000000000030.0+/-0.00.0+/-0.193641994986165660.0+/-0.119242400177118211.0+/-0.128351664032313740.0+/-0.0726483157256779]

[1.0+/-0.27212640036897880.0+/-0.0599999999999999841.0+/-0.244102665104482420.0+/-0.00.0+/-0.108972473588516780.0+/-0.227516788147356070.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851681.0+/-0.226077666104175650.0+/-0.217944947177033582.0+/-0.294008456038635350.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.33672751100358095]

[0.0+/-0.110160867220019010.0+/-0.160991999913912410.0+/-0.067961386095340930.0+/-0.11646751710104641.0+/-0.228720778339976060.0+/-0.194833931261921250.0+/-0.052216191092848750.0+/-0.0613153025478192640.0+/-0.00.0+/-0.14015297764534707]

[1.0+/-0.0238484800354236520.0+/-0.120312094155159660.0+/-0.00.0+/-0.00.0+/-0.301321164946049550.0+/-0.242347818801362020.0+/-0.072648315725677918.0+/-0.32580669115289821.0+/-0.050543916547889320.0+/-0.0]

]

The confusion matrix for run 11 is:

[

[0.0+/-0.00.0+/-0.01.0+/-0.238651812270512550.0+/-0.129203692301375071.0+/-0.238074961934261340.0+/-0.27748475474455580.0+/-0.259037846399608140.0+/-0.076234060264716620.0+/-0.00.0+/-0.0]

[0.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.238484800354236410.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.21794494717703355]

[1.0+/-0.131253374322243850.0+/-0.0622699849077239240.0+/-0.00.0+/-0.175461197831442070.0+/-0.14891039438385610.0+/-0.091556442698187480.0+/-0.128901692225134920.0+/-0.14463398953809311.0+/-0.17255232700707210.0+/-0.0]

[0.0+/-0.12774486291041220.0+/-0.0435889894354067542.0+/-0.234504199083417550.0+/-0.00.0+/-0.111746341765442940.0+/-0.224778802835324340.0+/-0.00.0+/-0.131424689383661250.0+/-0.118912482824254290.0+/-0.22331312097590678]

[0.0+/-0.00.0+/-0.167329411474625270.0+/-0.164306201276086220.0+/-0.00.0+/-0.01.0+/-0.191621371459448660.0+/-0.13836533264433610.0+/-0.154840868133850421.0+/-0.119242400177118210.0+/-0.2796326955927086]

[0.0+/-0.226824768540789620.0+/-0.01.0+/-0.145845529130470552.0+/-0.24996813855926640.0+/-0.100000000000000030.0+/-0.01.0+/-0.19329741045572460.0+/-0.119242400177118211.0+/-0.131013838392515370.0+/-0.0726483157256779]

[3.0+/-0.28818878843178090.0+/-0.0599999999999999841.0+/-0.243418934714984210.0+/-0.01.0+/-0.115217186218029110.0+/-0.227516788147356070.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.226077666104175650.0+/-0.217944947177033581.0+/-0.29962360647244670.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.3398069304767046]

[0.0+/-0.110160867220019012.0+/-0.166993047773058962.0+/-0.095637481030074061.0+/-0.116901124955549590.0+/-0.228720778339976061.0+/-0.193130905049556350.0+/-0.052216191092848750.0+/-0.0613153025478192640.0+/-0.00.0+/-0.14015297764534707]

[0.0+/-0.0238484800354236521.0+/-0.12166154122090060.0+/-0.00.0+/-0.03.0+/-0.30534115339182260.0+/-0.242347818801362020.0+/-0.07264831572567791.0+/-0.32311778354156912.0+/-0.076788828840488740.0+/-0.0]

]

The confusion matrix for run 12 is:

[

[0.0+/-0.00.0+/-0.01.0+/-0.25350973847172030.0+/-0.129203692301375070.0+/-0.238074961934261341.0+/-0.28415108082619340.0+/-0.259037846399608140.0+/-0.076234060264716620.0+/-0.00.0+/-0.0]

[0.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.238484800354236410.0+/-0.10897247358851680.0+/-0.00.0+/-0.01.0+/-0.217944947177033640.0+/-0.21794494717703355]

[1.0+/-0.13225106841296930.0+/-0.0622699849077239240.0+/-0.00.0+/-0.175461197831442072.0+/-0.156460413878754340.0+/-0.091556442698187480.0+/-0.128901692225134920.0+/-0.14463398953809313.0+/-0.190895186482588460.0+/-0.0]

[0.0+/-0.12774486291041220.0+/-0.0435889894354067541.0+/-0.233119094363191450.0+/-0.00.0+/-0.111746341765442946.0+/-0.244401021704965080.0+/-0.00.0+/-0.131424689383661252.0+/-0.122740468726249070.0+/-0.22331312097590678]

[0.0+/-0.00.0+/-0.167329411474625270.0+/-0.164306201276086220.0+/-0.00.0+/-0.00.0+/-0.191621371459448660.0+/-0.13836533264433611.0+/-0.253756499643085160.0+/-0.119242400177118210.0+/-0.2796326955927086]

[1.0+/-0.292297059276479860.0+/-0.00.0+/-0.145845529130470550.0+/-0.24996813855926640.0+/-0.100000000000000030.0+/-0.00.0+/-0.19329741045572460.0+/-0.119242400177118210.0+/-0.131013838392515370.0+/-0.0726483157256779]

[2.0+/-0.28780298044939621.0+/-0.067720832179700151.0+/-0.241959592586126680.0+/-0.01.0+/-0.118368539363764671.0+/-0.225215945754784870.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.226077666104175650.0+/-0.217944947177033580.0+/-0.29962360647244671.0+/-0.119242400177118210.0+/-0.00.0+/-0.01.0+/-0.054486236794258412.0+/-0.34103091257734]

[0.0+/-0.110160867220019010.0+/-0.166993047773058963.0+/-0.13806952757377150.0+/-0.116901124955549590.0+/-0.228720778339976061.0+/-0.19104958338258060.0+/-0.052216191092848750.0+/-0.0613153025478192640.0+/-0.02.0+/-0.15144803708370716]

[0.0+/-0.0238484800354236520.0+/-0.12166154122090060.0+/-0.00.0+/-0.00.0+/-0.30534115339182262.0+/-0.306089527117657360.0+/-0.07264831572567790.0+/-0.32311778354156910.0+/-0.076788828840488740.0+/-0.0]

]

The confusion matrix for run 13 is:

[

[0.0+/-0.00.0+/-0.01.0+/-0.25214254097511540.0+/-0.129203692301375070.0+/-0.238074961934261341.0+/-0.281124442873529562.0+/-0.258627185023797062.0+/-0.095049571593409611.0+/-0.0311349924538619550.0+/-0.0]

[0.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.238484800354236410.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.217944947177033640.0+/-0.21794494717703355]

[0.0+/-0.13225106841296930.0+/-0.0622699849077239240.0+/-0.00.0+/-0.175461197831442070.0+/-0.156460413878754340.0+/-0.091556442698187480.0+/-0.128901692225134922.0+/-0.167889392376535721.0+/-0.190211870175222151.0+/-0.05448623679425841]

[2.0+/-0.140284928310603320.0+/-0.0435889894354067543.0+/-0.245740031232937970.0+/-0.00.0+/-0.111746341765442940.0+/-0.244401021704965080.0+/-0.01.0+/-0.13173381565088380.0+/-0.122740468726249070.0+/-0.22331312097590678]

[0.0+/-0.00.0+/-0.167329411474625270.0+/-0.164306201276086220.0+/-0.00.0+/-0.00.0+/-0.191621371459448661.0+/-0.138490748788502071.0+/-0.25238446201513010.0+/-0.119242400177118214.0+/-0.29884035128401837]

[1.0+/-0.28919749291668661.0+/-0.043588989435406750.0+/-0.145845529130470552.0+/-0.254816972241653561.0+/-0.105987420637230990.0+/-0.00.0+/-0.19329741045572460.0+/-0.119242400177118210.0+/-0.131013838392515370.0+/-0.0726483157256779]

[0.0+/-0.28780298044939621.0+/-0.12265579661982730.0+/-0.241959592586126680.0+/-0.01.0+/-0.154011182855156470.0+/-0.225215945754784870.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.226077666104175651.0+/-0.226077666104175651.0+/-0.297530343924036660.0+/-0.119242400177118210.0+/-0.00.0+/-0.00.0+/-0.054486236794258411.0+/-0.33672751100358084]

[2.0+/-0.121257758009749721.0+/-0.16492302196662290.0+/-0.13806952757377150.0+/-0.116901124955549590.0+/-0.228720778339976063.0+/-0.198540450935310281.0+/-0.0587453862712916660.0+/-0.0613153025478192640.0+/-0.00.0+/-0.15144803708370716]

[0.0+/-0.0238484800354236520.0+/-0.12166154122090060.0+/-0.00.0+/-0.00.0+/-0.30534115339182260.0+/-0.306089527117657360.0+/-0.07264831572567794.0+/-0.36358054998381110.0+/-0.076788828840488740.0+/-0.0]

]

The confusion matrix for run 14 is:

[

[0.0+/-0.00.0+/-0.02.0+/-0.31422376621621420.0+/-0.129203692301375070.0+/-0.238074961934261340.0+/-0.281124442873529560.0+/-0.258627185023797060.0+/-0.095049571593409610.0+/-0.0311349924538619550.0+/-0.0]

[0.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.01.0+/-0.31124748994971830.0+/-0.10897247358851680.0+/-0.00.0+/-0.00.0+/-0.217944947177033640.0+/-0.21794494717703355]

[0.0+/-0.13225106841296930.0+/-0.0622699849077239240.0+/-0.03.0+/-0.189247703206496611.0+/-0.154716980659229450.0+/-0.091556442698187480.0+/-0.128901692225134922.0+/-0.169462268123202921.0+/-0.18741967289174330.0+/-0.05448623679425841]

[1.0+/-0.14420278930882180.0+/-0.0435889894354067541.0+/-0.244573584728994650.0+/-0.00.0+/-0.111746341765442940.0+/-0.244401021704965080.0+/-0.01.0+/-0.135118732955370971.0+/-0.127114045642671840.0+/-0.22331312097590678]

[0.0+/-0.01.0+/-0.187024860943969450.0+/-0.164306201276086220.0+/-0.00.0+/-0.00.0+/-0.191621371459448660.0+/-0.138490748788502070.0+/-0.25238446201513010.0+/-0.119242400177118211.0+/-0.3033379120533549]

[1.0+/-0.285877532728301130.0+/-0.043588989435406750.0+/-0.145845529130470552.0+/-0.263374663078906330.0+/-0.105987420637230990.0+/-0.00.0+/-0.19329741045572460.0+/-0.119242400177118211.0+/-0.135541399905841960.0+/-0.0726483157256779]

[0.0+/-0.28780298044939620.0+/-0.12265579661982731.0+/-0.252822950786601660.0+/-0.01.0+/-0.179381653960982820.0+/-0.225215945754784870.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.226077666104175650.0+/-0.226077666104175651.0+/-0.29377216228453860.0+/-0.119242400177118210.0+/-0.00.0+/-0.00.0+/-0.054486236794258415.0+/-0.3528406549389934]

[0.0+/-0.121257758009749721.0+/-0.164593354125317641.0+/-0.142925777163455610.0+/-0.116901124955549590.0+/-0.228720778339976062.0+/-0.208442012469555320.0+/-0.0587453862712916660.0+/-0.0613153025478192640.0+/-0.00.0+/-0.15144803708370716]

[1.0+/-0.0578791845139511250.0+/-0.12166154122090061.0+/-0.054486236794258410.0+/-0.00.0+/-0.30534115339182261.0+/-0.30376657476497380.0+/-0.07264831572567791.0+/-0.35913924165699190.0+/-0.076788828840488740.0+/-0.0]

]

The confusion matrix for run 15 is:

[

[0.0+/-0.00.0+/-0.01.0+/-0.31204247119027020.0+/-0.129203692301375070.0+/-0.238074961934261343.0+/-0.30189826021991170.0+/-0.258627185023797060.0+/-0.095049571593409610.0+/-0.0311349924538619550.0+/-0.0]

[0.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.31124748994971830.0+/-0.10897247358851680.0+/-0.01.0+/-0.217944947177033640.0+/-0.217944947177033640.0+/-0.21794494717703355]

[0.0+/-0.13225106841296931.0+/-0.122630605095638530.0+/-0.00.0+/-0.189247703206496610.0+/-0.154716980659229450.0+/-0.091556442698187481.0+/-0.158985409846997240.0+/-0.169462268123202920.0+/-0.18741967289174330.0+/-0.05448623679425841]

[0.0+/-0.14420278930882180.0+/-0.0435889894354067541.0+/-0.242758756266413830.0+/-0.00.0+/-0.111746341765442940.0+/-0.244401021704965080.0+/-0.03.0+/-0.19452992937858250.0+/-0.127114045642671840.0+/-0.22331312097590678]

[0.0+/-0.02.0+/-0.18523956936936272.0+/-0.163318205714251850.0+/-0.00.0+/-0.00.0+/-0.191621371459448660.0+/-0.138490748788502072.0+/-0.25083795516641040.0+/-0.119242400177118215.0+/-0.30390498762930623]

[0.0+/-0.285877532728301130.0+/-0.043588989435406751.0+/-0.155994905143850750.0+/-0.263374663078906330.0+/-0.105987420637230990.0+/-0.00.0+/-0.19329741045572461.0+/-0.135079708978727761.0+/-0.144510815686370450.0+/-0.0726483157256779]

[0.0+/-0.28780298044939624.0+/-0.180554700852677890.0+/-0.252822950786601660.0+/-0.01.0+/-0.178722317203718731.0+/-0.222579573785796150.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.226077666104175650.0+/-0.226077666104175650.0+/-0.29377216228453860.0+/-0.119242400177118210.0+/-0.00.0+/-0.00.0+/-0.054486236794258411.0+/-0.3762709942463159]

[0.0+/-0.121257758009749720.0+/-0.164593354125317641.0+/-0.142167619183991573.0+/-0.131499007932765730.0+/-0.228720778339976061.0+/-0.204735074031170221.0+/-0.062366950218780441.0+/-0.065239697364755590.0+/-0.01.0+/-0.1507524941224091]

[0.0+/-0.0578791845139511251.0+/-0.13542973510986220.0+/-0.054486236794258410.0+/-0.01.0+/-0.30480784623964610.0+/-0.30376657476497380.0+/-0.07264831572567791.0+/-0.35440656141072660.0+/-0.076788828840488740.0+/-0.0]

]

The confusion matrix for run 16 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.31204247119027020.0+/-0.129203692301375070.0+/-0.238074961934261341.0+/-0.297788975298824372.0+/-0.278393786206540.0+/-0.095049571593409610.0+/-0.0311349924538619550.0+/-0.0]

[0.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.31124748994971830.0+/-0.10897247358851682.0+/-0.217944947177033670.0+/-0.217944947177033640.0+/-0.217944947177033640.0+/-0.21794494717703355]

[1.0+/-0.131666074656380250.0+/-0.122630605095638530.0+/-0.02.0+/-0.18997757468506630.0+/-0.154716980659229450.0+/-0.091556442698187483.0+/-0.169138504659652832.0+/-0.168524467160546250.0+/-0.18741967289174330.0+/-0.05448623679425841]

[0.0+/-0.14420278930882180.0+/-0.0435889894354067540.0+/-0.242758756266413830.0+/-0.01.0+/-0.238270768630298970.0+/-0.244401021704965080.0+/-0.00.0+/-0.19452992937858250.0+/-0.127114045642671840.0+/-0.22331312097590678]

[0.0+/-0.01.0+/-0.183046964391913873.0+/-0.164672557500500751.0+/-0.019813177016093970.0+/-0.00.0+/-0.191621371459448660.0+/-0.138490748788502072.0+/-0.248950102593405720.0+/-0.119242400177118214.0+/-0.30039478921039336]

[0.0+/-0.285877532728301130.0+/-0.043588989435406750.0+/-0.155994905143850752.0+/-0.28087367743478021.0+/-0.122746350930146440.0+/-0.00.0+/-0.19329741045572460.0+/-0.135079708978727760.0+/-0.144510815686370450.0+/-0.0726483157256779]

[1.0+/-0.33490877696604020.0+/-0.180554700852677890.0+/-0.252822950786601660.0+/-0.00.0+/-0.178722317203718730.0+/-0.222579573785796150.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.226077666104175650.0+/-0.226077666104175650.0+/-0.29377216228453860.0+/-0.119242400177118210.0+/-0.00.0+/-0.01.0+/-0.22185299186623560.0+/-0.3762709942463159]

[0.0+/-0.121257758009749721.0+/-0.161773848995116880.0+/-0.142167619183991574.0+/-0.149071540490810480.0+/-0.228720778339976060.0+/-0.204735074031170222.0+/-0.074543571576401441.0+/-0.06749029154354650.0+/-0.01.0+/-0.14965536724824846]

[0.0+/-0.0578791845139511250.0+/-0.13542973510986220.0+/-0.054486236794258411.0+/-0.0272431183971292081.0+/-0.30222588707741090.0+/-0.30376657476497380.0+/-0.07264831572567796.0+/-0.362766517866879130.0+/-0.076788828840488740.0+/-0.0]

]

The confusion matrix for run 17 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.31204247119027020.0+/-0.129203692301375070.0+/-0.238074961934261340.0+/-0.297788975298824370.0+/-0.278393786206540.0+/-0.095049571593409610.0+/-0.0311349924538619550.0+/-0.0]

[0.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.31124748994971834.0+/-0.238484800354236410.0+/-0.217944947177033670.0+/-0.217944947177033640.0+/-0.217944947177033640.0+/-0.21794494717703355]

[2.0+/-0.132952741250023460.0+/-0.122630605095638530.0+/-0.01.0+/-0.188055026970656242.0+/-0.153550709196618782.0+/-0.097756798860007771.0+/-0.16733940544786892.0+/-0.165595666015673850.0+/-0.18741967289174330.0+/-0.05448623679425841]

[0.0+/-0.14420278930882180.0+/-0.0435889894354067540.0+/-0.242758756266413830.0+/-0.00.0+/-0.238270768630298972.0+/-0.29332811529063260.0+/-0.00.0+/-0.19452992937858250.0+/-0.127114045642671840.0+/-0.22331312097590678]

[1.0+/-0.043588989435406740.0+/-0.183046964391913870.0+/-0.164672557500500750.0+/-0.019813177016093970.0+/-0.00.0+/-0.191621371459448661.0+/-0.139181012234667531.0+/-0.246838376036420920.0+/-0.119242400177118212.0+/-0.2964242439731603]

[1.0+/-0.281964957979435160.0+/-0.043588989435406750.0+/-0.155994905143850751.0+/-0.27691190159898421.0+/-0.128590111076500230.0+/-0.01.0+/-0.193754928252734350.0+/-0.135079708978727760.0+/-0.144510815686370450.0+/-0.0726483157256779]

[1.0+/-0.33066746471677890.0+/-0.180554700852677891.0+/-0.2510242905466410.0+/-0.00.0+/-0.178722317203718732.0+/-0.231300670124407580.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.226077666104175650.0+/-0.226077666104175652.0+/-0.304451921035526040.0+/-0.119242400177118210.0+/-0.00.0+/-0.00.0+/-0.22185299186623561.0+/-0.36749433102203544]

[1.0+/-0.120473073082197440.0+/-0.161773848995116881.0+/-0.14096086434815084.0+/-0.14945260385172272.0+/-0.227820287361185925.0+/-0.202292864232777920.0+/-0.074543571576401441.0+/-0.067501070206982160.0+/-0.01.0+/-0.1483954171990463]

[0.0+/-0.0578791845139511250.0+/-0.13542973510986220.0+/-0.054486236794258410.0+/-0.0272431183971292080.0+/-0.30222588707741092.0+/-0.30390371053637660.0+/-0.07264831572567793.0+/-0.36037615772507670.0+/-0.076788828840488740.0+/-0.0]

]

The confusion matrix for run 18 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.31204247119027020.0+/-0.129203692301375070.0+/-0.238074961934261341.0+/-0.2926746188853462.0+/-0.29308012102711750.0+/-0.095049571593409610.0+/-0.0311349924538619550.0+/-0.0]

[0.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.31124748994971830.0+/-0.238484800354236411.0+/-0.22185299186623560.0+/-0.217944947177033641.0+/-0.22185299186623562.0+/-0.23848480035423641]

[0.0+/-0.132952741250023460.0+/-0.122630605095638530.0+/-0.00.0+/-0.188055026970656240.0+/-0.153550709196618780.0+/-0.097756798860007770.0+/-0.16733940544786891.0+/-0.243985793562488920.0+/-0.18741967289174330.0+/-0.05448623679425841]

[0.0+/-0.14420278930882180.0+/-0.0435889894354067542.0+/-0.299614945106744860.0+/-0.00.0+/-0.238270768630298970.0+/-0.29332811529063260.0+/-0.00.0+/-0.19452992937858250.0+/-0.127114045642671840.0+/-0.22331312097590678]

[0.0+/-0.043588989435406740.0+/-0.183046964391913870.0+/-0.164672557500500750.0+/-0.019813177016093970.0+/-0.01.0+/-0.192344814793063150.0+/-0.139181012234667531.0+/-0.24418467106120161.0+/-0.122119590747940363.0+/-0.29373493357607044]

[2.0+/-0.277655673276261950.0+/-0.043588989435406750.0+/-0.155994905143850751.0+/-0.27296855844625540.0+/-0.128590111076500230.0+/-0.01.0+/-0.191667812773858140.0+/-0.135079708978727762.0+/-0.148033739719153541.0+/-0.0775181933147605]

[0.0+/-0.33066746471677890.0+/-0.180554700852677890.0+/-0.2510242905466410.0+/-0.00.0+/-0.178722317203718730.0+/-0.231300670124407580.0+/-0.00.0+/-0.00.0+/-0.07264831572567790.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.226077666104175650.0+/-0.226077666104175650.0+/-0.304451921035526041.0+/-0.240767003553227780.0+/-0.00.0+/-0.00.0+/-0.22185299186623560.0+/-0.36749433102203544]

[0.0+/-0.120473073082197440.0+/-0.161773848995116880.0+/-0.14096086434815081.0+/-0.146701732295080350.0+/-0.227820287361185920.0+/-0.202292864232777921.0+/-0.081386777522086340.0+/-0.067501070206982160.0+/-0.03.0+/-0.1834160242206692]

[0.0+/-0.0578791845139511250.0+/-0.13542973510986220.0+/-0.054486236794258410.0+/-0.0272431183971292080.0+/-0.30222588707741090.0+/-0.30390371053637660.0+/-0.07264831572567790.0+/-0.36037615772507670.0+/-0.076788828840488740.0+/-0.0]

]

The confusion matrix for run 19 is:

[

[0.0+/-0.00.0+/-0.00.0+/-0.31204247119027020.0+/-0.129203692301375071.0+/-0.309926906705436040.0+/-0.2926746188853460.0+/-0.29308012102711750.0+/-0.095049571593409610.0+/-0.0311349924538619550.0+/-0.0]

[0.0+/-0.21794494717703360.0+/-0.00.0+/-0.00.0+/-0.00.0+/-0.31124748994971830.0+/-0.238484800354236412.0+/-0.30078023538789910.0+/-0.217944947177033640.0+/-0.22185299186623560.0+/-0.23848480035423641]

[1.0+/-0.132399418461979250.0+/-0.122630605095638530.0+/-0.01.0+/-0.18600491415435552.0+/-0.15734164014448310.0+/-0.097756798860007770.0+/-0.16733940544786891.0+/-0.23968667543472751.0+/-0.184297095747962850.0+/-0.05448623679425841]

[0.0+/-0.14420278930882180.0+/-0.0435889894354067540.0+/-0.299614945106744860.0+/-0.00.0+/-0.238270768630298971.0+/-0.28758179355073820.0+/-0.00.0+/-0.19452992937858254.0+/-0.198883900797607730.0+/-0.22331312097590678]

[0.0+/-0.043588989435406740.0+/-0.183046964391913871.0+/-0.248852681830760670.0+/-0.019813177016093970.0+/-0.00.0+/-0.192344814793063150.0+/-0.139181012234667530.0+/-0.24418467106120160.0+/-0.122119590747940360.0+/-0.29373493357607044]

[1.0+/-0.27258866019040320.0+/-0.043588989435406750.0+/-0.155994905143850751.0+/-0.26809722045279110.0+/-0.128590111076500230.0+/-0.02.0+/-0.197697166143406770.0+/-0.135079708978727760.0+/-0.148033739719153541.0+/-0.08621415091847802]

[0.0+/-0.33066746471677890.0+/-0.180554700852677890.0+/-0.2510242905466410.0+/-0.02.0+/-0.215116247642989530.0+/-0.231300670124407580.0+/-0.00.0+/-0.01.0+/-0.099999999999999980.0+/-0.0]

[0.0+/-0.07264831572567790.0+/-0.10897247358851680.0+/-0.226077666104175650.0+/-0.226077666104175650.0+/-0.304451921035526040.0+/-0.240767003553227780.0+/-0.00.0+/-0.00.0+/-0.22185299186623562.0+/-0.381403657559809]

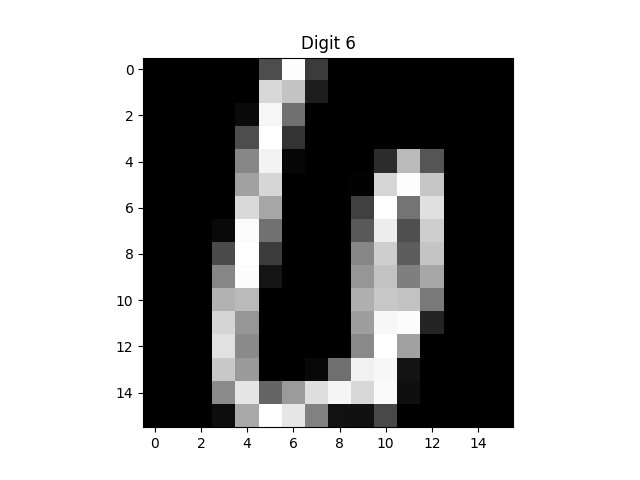
[0.0+/-0.120473073082197440.0+/-0.161773848995116880.0+/-0.14096086434815080.0+/-0.146701732295080351.0+/-0.298862426544388440.0+/-0.202292864232777920.0+/-0.081386777522086340.0+/-0.067501070206982160.0+/-0.00.0+/-0.1834160242206692]

[0.0+/-0.0578791845139511250.0+/-0.13542973510986221.0+/-0.075000000000000010.0+/-0.0272431183971292081.0+/-0.299222223774706030.0+/-0.30390371053637660.0+/-0.07264831572567792.0+/-0.352924211221351540.0+/-0.076788828840488740.0+/-0.0]

]

Q4.

Chart, histogram

Description automatically generatedChart

Description automatically generatedQr code

Description automatically generatedQr code

Description automatically generated with low confidence

Q5.

The average training score for d = 1 is 1.0

The standard deviation of the training score for d = 1 is 0.0

The average test score for d = 1 is 0.9257795698924731

The standard deviation of the test score for d = 1 is 0.0060240849889217065

The average training score for d = 2 is 1.0

The standard deviation of the training score for d = 2 is 0.0

The average test score for d = 2 is 0.9268817204301074

The standard deviation of the test score for d = 2 is 0.005031982347009714

The average training score for d = 3 is 1.0

The standard deviation of the training score for d = 3 is 0.0

The standard deviation of the test score for d = 6 is 0.006732838008039544

The average training score for d = 7 is 1.0

The standard deviation of the training score for d = 7 is 0.0

The average test score for d = 7 is 0.8914247311827956

The standard deviation of the test score for d = 7 is 0.007335262493388952

Q6.

Number of non-zero alpha vector elements per class: [ 26 109 81 55 158 107 41 78 29 54 43 98 37 56 45 65 43 151

183 130 148 89 166 64 51 240 41 81 151 59 120 106 134 121 177 153

69 141 82 29 71 17 86 280 97]

Number of non-zero alpha vector elements per class: [ 25 119 93 77 144 123 40 91 41 44 28 101 51 49 46 69 38 159

226 132 162 92 179 86 43 244 42 77 138 53 111 120 108 119 171 148

63 149 80 27 72 29 78 250 90]

Number of non-zero alpha vector elements per class: [ 33 110 78 74 159 110 40 89 34 55 28 103 56 45 40 60 45 138

178 142 146 82 157 66 48 214 26 70 128 51 117 106 95 108 163 133

52 143 79 24 62 24 67 235 105]

Number of non-zero alpha vector elements per class: [ 36 124 80 75 162 115 51 86 45 47 40 98 41 53 41 64 50 166

210 135 153 93 156 88 44 229 40 68 160 73 111 111 104 103 176 143

65 124 76 21 73 24 79 249 96]

Number of non-zero alpha vector elements per class: [ 32 120 84 59 155 102 32 76 33 49 39 105 53 45 32 55 45 163

200 148 152 86 165 65 52 231 40 70 162 62 123 118 124 117 170 139

64 134 61 36 66 21 84 286 93]

Number of non-zero alpha vector elements per class: [ 24 113 77 56 142 111 42 72 31 43 39 106 57 45 47 66 46 143

192 139 149 84 160 74 43 224 31 66 148 66 119 114 130 114 174 138

69 133 73 33 60 29 80 273 94]

Number of non-zero alpha vector elements per class: [ 27 115 76 60 147 102 43 82 29 42 40 107 58 56 40 71 39 155

213 135 141 104 179 78 53 243 44 73 173 67 115 120 146 113 175 158

69 155 77 38 75 23 78 295 99]

Number of non-zero alpha vector elements per class: [ 27 123 72 69 162 115 48 79 43 44 37 96 57 46 37 70 49 152

199 151 157 89 172 77 47 248 48 65 163 55 110 109 127 99 192 157

65 131 70 34 66 24 85 270 106]

Number of non-zero alpha vector elements per class: [ 26 119 85 69 162 124 39 87 29 49 32 98 46 47 48 65 41 164

200 136 152 88 176 72 48 230 38 66 137 54 110 109 129 109 182 143

68 146 81 23 69 26 73 264 90]

Number of non-zero alpha vector elements per class: [ 32 119 73 50 133 97 41 85 31 44 38 96 50 45 48 69 39 152

186 129 145 94 170 76 46 212 27 63 157 60 89 101 122 114 172 123

59 138 64 26 68 19 79 252 100]

Number of non-zero alpha vector elements per class: [ 34 122 80 72 155 124 40 88 41 52 36 98 51 55 44 77 35 166

206 134 143 87 190 73 47 236 38 60 176 65 116 123 124 119 171 155

70 157 79 25 60 22 85 273 107]

Number of non-zero alpha vector elements per class: [ 28 125 89 74 158 116 47 94 40 54 42 100 56 44 48 63 45 159

213 147 143 94 168 75 53 234 42 65 157 56 110 100 112 123 168 143

69 145 78 24 66 26 64 252 100]

Number of non-zero alpha vector elements per class: [ 25 118 71 58 152 93 37 78 26 52 35 90 54 54 44 72 46 153

204 143 138 93 165 81 47 239 33 66 146 68 115 107 110 114 166 151

51 140 71 31 78 29 78 262 93]

Number of non-zero alpha vector elements per class: [ 22 117 88 73 146 109 40 95 35 53 41 103 57 52 41 60 46 152

183 140 137 84 162 73 55 242 29 73 152 60 119 109 126 122 171 143

70 149 75 26 71 32 76 262 111]

Number of non-zero alpha vector elements per class: [ 28 123 79 79 157 107 49 86 39 50 39 103 54 40 46 70 40 158

200 146 149 84 168 72 41 231 32 56 148 52 123 116 133 106 170 134

69 159 69 32 68 32 73 267 98]

Number of non-zero alpha vector elements per class: [ 26 123 89 70 152 112 47 84 42 47 40 94 56 50 51 67 42 154

189 133 140 96 162 82 39 227 38 63 141 54 108 114 130 104 181 137

69 140 76 32 62 27 87 301 100]

Number of non-zero alpha vector elements per class: [ 34 115 78 73 151 119 45 90 29 51 39 96 54 49 37 71 49 154

189 139 157 89 166 70 39 239 33 58 144 59 117 112 116 113 167 149

67 155 73 24 73 25 79 263 83]

Number of non-zero alpha vector elements per class: [ 23 107 73 57 138 86 34 74 29 55 39 88 54 52 41 65 39 151

196 145 143 81 158 76 49 233 34 68 162 65 110 96 130 105 179 125

71 140 78 31 72 24 77 254 98]

Number of non-zero alpha vector elements per class: [ 35 128 71 75 162 127 41 95 46 49 32 104 53 50 42 70 42 145

207 147 152 98 176 81 36 242 38 71 147 54 118 106 144 117 185 152

77 160 75 29 62 28 82 311 97]

Number of non-zero alpha vector elements per class: [ 28 109 84 71 150 118 43 86 30 46 39 97 53 46 40 62 38 148

204 135 160 80 166 66 52 226 38 65 152 69 119 109 116 120 152 153

69 142 72 27 71 24 81 246 85]

The average training score for d = 1 is 0.8675719279376176

The standard deviation of the training score for d = 1 is 0.002610444721557885

The average test score for d = 1 is 0.9361290322580645

The standard deviation of the test score for d = 1 is 0.005274848424262819

Number of non-zero alpha vector elements per class: [ 18 59 48 31 90 70 25 44 24 32 25 62 24 39 36 52 35 87

110 53 68 65 89 44 30 138 27 39 101 39 53 65 81 70 111 82

39 85 46 19 52 16 60 160 66]

Number of non-zero alpha vector elements per class: [ 20 78 63 43 88 74 29 43 28 33 25 63 26 37 25 40 28 89

115 71 72 56 70 41 40 142 26 43 101 32 65 63 74 64 115 74

40 69 43 19 37 20 49 136 67]

Number of non-zero alpha vector elements per class: [ 16 71 49 44 81 64 30 43 27 33 20 77 28 38 31 44 25 84

111 69 77 62 87 43 27 141 28 36 96 32 66 68 93 64 116 79

41 83 40 20 54 18 54 173 55]

Number of non-zero alpha vector elements per class: [ 17 75 53 52 76 74 30 53 22 37 22 65 30 40 32 45 26 74

103 57 71 61 90 43 34 147 27 36 103 25 63 52 83 69 120 74

48 81 43 20 58 14 60 162 67]

Number of non-zero alpha vector elements per class: [ 25 73 41 47 83 66 32 56 19 26 23 60 30 26 29 42 27 90

108 76 65 64 93 43 33 141 25 41 88 37 74 68 87 61 104 88

46 83 47 21 56 22 53 155 53]

Number of non-zero alpha vector elements per class: [ 23 71 48 52 67 61 34 59 20 33 22 63 29 31 28 46 24 79

120 73 73 62 97 48 34 136 24 41 98 36 68 60 82 67 108 85

45 82 48 25 49 12 61 161 62]

Number of non-zero alpha vector elements per class: [ 15 71 52 34 75 62 22 47 18 32 23 58 34 32 28 53 27 85

103 69 78 60 94 50 32 148 27 46 95 35 61 65 82 60 113 88

41 85 46 20 52 19 45 149 67]

Number of non-zero alpha vector elements per class: [ 24 72 54 45 80 57 32 44 22 28 25 68 27 30 35 53 30 88

110 71 79 60 89 51 26 132 29 36 105 36 62 68 85 59 110 67

30 86 46 19 49 24 50 149 68]

Number of non-zero alpha vector elements per class: [ 23 77 48 44 75 74 33 53 27 34 23 72 32 26 36 50 31 83

108 58 63 54 98 48 29 140 24 46 104 41 50 64 90 63 113 81

35 86 42 18 57 12 61 149 66]

Number of non-zero alpha vector elements per class: [ 15 68 51 49 78 69 29 54 30 32 22 64 29 39 31 46 25 88

112 74 78 56 102 48 30 155 22 40 105 35 66 64 70 65 114 89

36 88 47 24 61 16 56 154 57]

Number of non-zero alpha vector elements per class: [ 21 68 52 50 82 61 31 42 28 31 24 74 31 38 25 35 21 89

110 70 71 61 96 44 37 132 33 46 91 41 69 66 86 66 111 82

35 87 50 16 42 19 60 166 68]

Number of non-zero alpha vector elements per class: [ 16 70 53 49 83 68 29 55 18 29 20 65 26 34 24 43 19 96

102 71 67 59 100 45 34 143 33 47 108 39 67 60 86 56 111 77

43 87 47 15 51 16 50 140 58]

Number of non-zero alpha vector elements per class: [ 20 77 50 52 78 78 33 55 23 35 26 68 35 33 35 33 31 98

111 72 73 65 106 38 39 147 24 46 103 37 68 61 84 64 121 82

42 95 54 19 57 19 60 144 68]

Number of non-zero alpha vector elements per class: [ 15 72 51 32 77 72 26 50 23 28 27 70 27 34 31 51 27 81

107 71 72 61 95 50 35 136 22 44 93 37 67 70 86 70 117 77

44 86 41 25 45 20 41 148 49]

Number of non-zero alpha vector elements per class: [ 19 72 46 50 70 71 29 46 28 35 17 68 30 38 33 50 31 89

111 65 71 63 98 53 28 128 28 42 94 42 68 56 94 66 120 77

45 95 49 20 45 12 60 171 63]

Number of non-zero alpha vector elements per class: [ 13 64 47 50 73 71 27 54 20 37 25 69 32 37 33 47 26 91

111 68 71 60 106 38 34 146 27 46 100 43 73 68 92 55 113 80

46 80 42 18 48 21 49 158 55]

Number of non-zero alpha vector elements per class: [ 23 71 60 51 78 73 33 53 28 36 25 68 27 25 34 45 29 99

111 67 71 55 93 40 30 135 28 41 103 37 73 70 91 72 109 68

46 73 45 21 57 15 58 161 52]

Number of non-zero alpha vector elements per class: [ 16 80 56 52 77 72 30 50 20 33 20 62 28 31 30 43 25 93

112 63 67 64 99 45 37 152 27 44 98 32 55 71 91 67 110 75

40 74 36 24 53 21 46 149 63]

Number of non-zero alpha vector elements per class: [ 15 57 53 35 77 67 23 47 15 32 22 65 32 38 23 46 29 83

97 67 76 67 108 42 33 142 23 50 102 38 73 76 85 65 112 75

42 96 48 24 53 26 49 155 64]

Number of non-zero alpha vector elements per class: [ 20 66 56 49 75 75 30 42 20 34 25 73 27 22 29 45 32 86

105 67 74 48 90 44 35 137 23 34 99 26 60 66 95 66 124 73

36 89 43 21 53 22 46 165 61]

The average training score for d = 2 is 0.9016805592901317

The standard deviation of the training score for d = 2 is 0.0023729021092765428

The average test score for d = 2 is 0.9618548387096775

The standard deviation of the test score for d = 2 is 0.003245793813101053

Number of non-zero alpha vector elements per class: [ 17 60 45 35 64 63 23 50 23 23 19 51 22 30 28 35 23 79

91 54 64 56 77 37 30 112 26 34 72 36 53 51 68 52 97 63

31 69 42 19 43 16 42 122 51]

Number of non-zero alpha vector elements per class: [ 14 68 51 40 64 46 22 47 26 25 15 59 19 27 23 31 26 61

75 55 54 53 61 40 30 115 15 37 94 32 59 56 71 56 102 68

39 79 36 18 49 16 46 116 60]

Number of non-zero alpha vector elements per class: [ 14 67 37 33 68 63 20 50 17 30 20 57 29 32 24 44 30 76

83 58 59 61 76 40 25 112 17 39 79 29 62 50 79 58 97 58

35 70 40 19 42 11 50 123 48]

Number of non-zero alpha vector elements per class: [ 18 54 48 39 60 54 22 52 18 24 23 43 26 29 30 37 24 69

87 60 51 58 84 39 28 119 25 43 93 32 59 46 81 53 98 72

38 73 28 16 40 18 48 125 56]

Number of non-zero alpha vector elements per class: [ 20 66 47 39 70 61 28 43 19 30 11 58 17 30 16 31 20 67

87 60 56 51 87 34 32 118 25 46 78 32 51 52 77 61 89 63

38 65 37 20 47 20 44 119 53]

Number of non-zero alpha vector elements per class: [ 18 51 38 38 67 55 31 44 19 29 15 58 22 28 25 33 14 61

81 61 55 57 91 39 28 121 18 37 83 30 53 51 80 53 96 59

36 80 37 20 43 19 55 130 53]

Number of non-zero alpha vector elements per class: [ 21 68 31 35 67 60 24 46 24 30 14 55 23 27 24 40 17 79

84 59 56 42 76 35 30 123 21 28 89 34 40 46 53 67 110 67

26 75 33 18 40 17 49 114 56]

Number of non-zero alpha vector elements per class: [ 19 66 51 39 62 58 26 51 29 30 21 60 21 35 22 29 22 80

86 64 49 60 71 47 21 109 30 44 85 34 62 52 67 60 102 67

38 81 37 18 51 16 55 125 46]

Number of non-zero alpha vector elements per class: [ 15 62 44 40 74 73 24 33 21 22 21 54 26 28 29 42 27 80

89 60 56 59 78 43 28 118 21 40 76 29 60 49 79 54 100 65

42 79 32 17 43 17 51 118 47]

Number of non-zero alpha vector elements per class: [ 18 66 41 40 78 55 26 43 20 30 22 62 28 27 22 43 19 72

82 62 53 50 78 42 27 116 25 34 76 33 42 42 75 59 87 59

33 75 38 20 42 18 46 129 57]

The average training score for d = 3 is 0.9101371336380748

The standard deviation of the training score for d = 3 is 0.002434675144880804

The average test score for d = 3 is 0.9666129032258064

The standard deviation of the test score for d = 3 is 0.004090617110027364

Number of non-zero alpha vector elements per class: [ 14 53 44 27 61 53 17 36 24 28 18 57 20 27 27 33 15 74

75 50 51 51 75 35 26 102 21 34 75 27 38 51 70 49 89 56

31 57 33 21 44 17 41 97 48]

Number of non-zero alpha vector elements per class: [ 16 62 45 32 69 51 25 47 21 29 22 53 28 29 24 41 20 68

77 55 49 47 75 33 23 102 17 36 84 34 47 51 60 49 79 49

32 75 29 21 46 19 47 96 49]

Number of non-zero alpha vector elements per class: [ 14 64 44 31 66 56 26 46 25 23 17 55 17 31 25 37 22 69

82 58 53 54 79 35 30 111 27 34 73 28 40 53 62 46 89 65

32 75 37 21 44 18 46 100 55]

Number of non-zero alpha vector elements per class: [ 17 56 37 35 59 51 18 46 23 28 18 60 22 29 26 26 17 65

64 66 49 51 73 30 27 106 18 31 76 26 52 47 61 45 88 63

26 76 31 15 40 17 54 113 49]

Number of non-zero alpha vector elements per class: [ 12 59 48 35 68 64 22 44 19 23 23 54 20 26 26 34 23 71

74 61 44 45 72 30 27 118 21 39 79 25 48 51 54 43 90 59

32 64 39 17 38 16 51 108 46]

Number of non-zero alpha vector elements per class: [ 12 54 47 31 58 52 23 44 20 25 17 49 21 28 19 29 14 70

73 59 50 55 69 30 27 102 24 32 78 27 43 38 66 53 85 62

30 68 36 18 40 19 46 101 49]

Number of non-zero alpha vector elements per class: [ 10 56 47 24 55 58 25 42 24 25 13 54 24 26 26 30 22 73

71 52 50 51 78 31 23 111 25 38 78 34 47 49 71 52 86 54

26 65 29 18 42 18 45 100 50]

Number of non-zero alpha vector elements per class: [ 15 64 40 40 67 52 21 43 21 27 16 48 21 27 19 27 18 66

76 48 52 40 76 43 25 110 23 28 87 36 48 47 58 52 93 57

30 75 25 12 40 18 47 115 47]

Number of non-zero alpha vector elements per class: [ 11 53 45 34 73 65 24 43 20 25 21 52 22 23 19 31 21 75

66 49 50 41 72 36 32 105 26 37 78 32 46 52 56 48 101 65

28 70 33 17 50 17 45 100 56]

Number of non-zero alpha vector elements per class: [ 17 48 37 35 59 60 27 42 25 22 13 53 22 27 22 36 21 76

67 53 61 45 77 41 23 102 20 35 74 22 50 50 57 49 84 51

22 71 36 14 32 16 37 103 47]

Number of non-zero alpha vector elements per class: [ 17 55 40 31 66 45 22 44 22 25 15 42 17 30 28 36 23 63

69 53 47 53 77 42 26 105 23 32 82 39 48 44 64 55 99 53

31 67 28 20 38 20 36 101 52]

Number of non-zero alpha vector elements per class: [ 16 49 42 32 67 62 21 48 25 19 14 58 23 27 16 36 14 70

64 55 52 46 70 35 26 102 25 26 90 23 52 45 49 51 97 68

25 71 29 15 49 15 41 96 50]

Number of non-zero alpha vector elements per class: [ 12 60 40 30 68 51 27 52 21 28 18 56 23 27 22 24 16 60

68 60 52 58 78 34 28 114 21 37 81 28 42 43 57 42 91 68

35 63 36 17 45 20 39 104 49]

Number of non-zero alpha vector elements per class: [ 16 51 46 36 60 56 22 38 21 24 23 52 20 30 29 35 19 70

72 53 45 55 73 32 30 109 30 34 75 20 40 49 68 46 91 63

35 65 28 20 45 15 45 106 46]

Number of non-zero alpha vector elements per class: [ 15 59 47 37 62 55 21 48 23 32 13 57 14 25 22 37 21 71

65 47 42 49 66 35 23 108 18 35 74 34 45 46 61 46 90 58

30 72 35 15 43 18 46 98 49]

Number of non-zero alpha vector elements per class: [ 19 49 45 24 58 61 21 38 15 23 17 49 20 16 22 21 20 67

65 58 52 52 70 32 28 115 21 38 76 27 45 45 53 49 85 59

29 68 34 17 45 15 44 91 49]

Number of non-zero alpha vector elements per class: [ 18 59 38 32 59 58 22 45 25 23 15 51 22 24 21 42 26 70

80 58 50 42 76 34 27 111 26 31 84 28 38 44 62 57 93 64

25 71 30 13 34 15 47 95 43]

Number of non-zero alpha vector elements per class: [ 21 52 48 32 66 62 24 46 22 36 21 63 24 26 27 40 20 75

76 63 48 59 78 28 23 111 19 38 84 27 54 42 66 54 90 66

33 82 30 14 45 14 46 106 42]

Number of non-zero alpha vector elements per class: [ 16 61 46 28 68 50 26 44 24 30 21 57 22 29 26 33 21 73

72 55 44 55 62 23 28 112 23 39 77 31 44 40 57 47 85 55

37 62 30 15 38 19 39 109 39]

Number of non-zero alpha vector elements per class: [ 19 64 43 36 74 55 29 38 21 28 17 50 20 30 22 38 25 67

71 65 47 55 69 31 29 112 28 35 67 35 53 47 63 48 85 54

30 72 27 18 42 16 43 102 47]

The average training score for d = 4 is 0.9148494218876042

The standard deviation of the training score for d = 4 is 0.002013206219399456

The average test score for d = 4 is 0.9672580645161292

The standard deviation of the test score for d = 4 is 0.003935762960901339

Number of non-zero alpha vector elements per class: [ 16 58 42 34 63 50 29 45 27 22 16 52 17 21 22 28 18 71

64 67 43 54 67 32 26 101 21 31 77 34 47 43 54 51 81 44

24 61 32 18 28 17 49 104 47]

Number of non-zero alpha vector elements per class: [ 18 61 55 31 52 55 26 36 24 26 10 54 20 19 21 31 16 75

75 58 44 50 70 32 18 108 21 22 76 30 49 40 64 49 92 59

31 70 30 17 47 11 49 102 50]

Number of non-zero alpha vector elements per class: [ 17 53 48 28 70 60 29 46 25 31 17 61 18 27 26 35 17 62

69 62 47 52 66 31 27 109 27 36 80 31 48 50 70 52 83 61

34 74 32 20 41 16 40 97 50]

Number of non-zero alpha vector elements per class: [ 19 59 43 28 62 60 21 47 25 26 16 48 25 28 19 34 16 69

73 51 49 34 58 34 21 96 24 36 73 30 54 45 51 45 88 52

28 72 34 18 45 19 39 105 48]

Number of non-zero alpha vector elements per class: [ 18 54 44 26 73 62 26 45 22 25 16 43 25 26 19 36 21 78

61 49 44 50 75 35 26 104 25 33 82 35 54 48 62 42 87 63

30 74 37 20 46 20 45 101 49]

Number of non-zero alpha vector elements per class: [ 15 54 45 35 64 51 17 45 24 28 19 57 23 24 23 26 24 71

77 48 49 50 61 43 26 110 26 34 84 25 47 41 62 44 92 59

22 66 28 20 37 18 41 91 51]

Number of non-zero alpha vector elements per class: [ 9 54 51 29 60 50 23 44 17 25 8 56 21 20 27 33 16 65

68 60 48 51 71 28 33 109 24 37 84 31 50 35 54 54 87 58

26 68 33 20 34 12 41 93 45]

Number of non-zero alpha vector elements per class: [ 16 54 46 24 55 52 22 41 17 27 18 45 21 29 25 41 21 84

55 60 55 45 73 33 28 108 22 26 72 25 47 48 63 42 94 62

29 78 29 18 42 17 44 104 41]

Number of non-zero alpha vector elements per class: [ 15 48 45 27 57 56 25 41 19 30 20 52 21 24 21 35 21 71

72 55 44 47 80 27 27 106 25 33 77 30 48 40 60 47 84 52

32 78 33 18 42 20 40 89 42]

Number of non-zero alpha vector elements per class: [ 15 57 43 31 53 52 19 48 19 25 14 56 26 22 17 30 21 69

54 57 54 43 73 35 28 109 23 35 85 30 45 44 56 38 93 54

29 64 28 12 48 15 42 102 38]

Number of non-zero alpha vector elements per class: [17 62 49 32 67 57 29 46 26 25 17 52 18 15 28 35 22 72 70 58 46 50 68 35

29 89 23 36 81 36 42 47 61 39 90 57 35 74 32 17 50 15 40 93 45]

Number of non-zero alpha vector elements per class: [ 14 57 47 34 67 55 23 42 26 25 14 45 20 19 19 32 18 58

70 56 39 47 66 36 24 110 26 32 80 32 48 39 58 47 88 59

28 67 37 20 41 17 42 94 45]

Number of non-zero alpha vector elements per class: [ 15 59 45 27 75 60 25 47 25 25 19 55 19 24 24 31 20 62

71 56 39 54 71 36 26 112 24 31 78 36 46 42 64 43 76 47

31 73 33 16 38 15 48 90 49]

Number of non-zero alpha vector elements per class: [ 15 59 53 34 51 62 26 45 20 31 14 48 18 21 21 40 18 73

61 55 43 46 68 30 29 112 20 33 83 34 40 40 60 44 84 55

25 67 30 20 42 15 43 92 42]

Number of non-zero alpha vector elements per class: [ 12 54 44 36 65 64 27 49 17 27 12 40 21 24 26 31 11 74

74 52 53 46 84 37 22 108 24 35 79 28 37 48 55 43 94 53

32 71 35 20 37 18 45 96 45]

Number of non-zero alpha vector elements per class: [ 14 66 52 24 62 59 24 37 24 16 19 48 11 21 18 31 22 66

72 56 41 54 60 40 28 105 25 34 86 28 37 42 61 48 76 61

29 63 28 17 47 20 42 96 47]

Number of non-zero alpha vector elements per class: [16 54 41 23 71 51 25 44 20 22 17 54 21 20 24 33 20 70 74 54 49 51 66 36

23 99 23 33 74 34 46 45 62 46 81 61 31 66 32 15 45 17 42 85 46]

Number of non-zero alpha vector elements per class: [ 17 55 40 28 60 55 19 34 17 32 21 41 22 24 27 32 19 69

63 63 52 54 71 38 29 105 26 28 80 33 50 42 64 46 83 62

29 58 32 19 41 18 42 87 42]

Number of non-zero alpha vector elements per class: [ 11 57 47 34 63 59 28 51 22 26 18 46 20 24 24 38 18 68

68 54 41 54 59 27 26 112 22 36 78 31 46 38 59 50 85 54

26 72 28 19 42 15 44 102 50]

Number of non-zero alpha vector elements per class: [ 14 56 51 29 72 63 20 47 22 32 18 58 20 27 22 35 19 75

73 55 49 59 71 28 21 106 24 29 82 27 52 51 59 33 89 68

30 63 40 17 42 18 47 92 33]

The average training score for d = 5 is 0.9149569776821727

The standard deviation of the training score for d = 5 is 0.0017752179808853074

The average test score for d = 5 is 0.9672311827956989

The standard deviation of the test score for d = 5 is 0.004486832136369269

Number of non-zero alpha vector elements per class: [ 15 55 52 33 63 65 26 44 23 29 11 47 16 20 20 20 16 66

70 59 41 49 80 32 29 104 20 39 83 30 49 46 61 43 78 63

33 78 34 19 45 16 45 95 37]

Number of non-zero alpha vector elements per class: [12 62 46 23 53 54 24 42 24 24 11 55 18 29 22 33 23 62 64 55 48 47 76 40

26 96 19 27 71 26 41 47 50 43 88 64 27 68 37 18 35 19 37 86 42]

Number of non-zero alpha vector elements per class: [ 17 50 44 25 68 64 24 46 23 26 18 49 18 23 23 26 25 72

67 48 42 50 71 32 25 112 23 28 78 31 43 45 65 48 78 49

29 64 34 15 41 21 44 92 50]

Number of non-zero alpha vector elements per class: [ 15 64 39 31 64 64 25 44 21 23 17 55 20 22 23 30 21 84

61 56 53 59 57 31 30 104 24 35 75 33 43 46 58 46 81 56

27 65 35 19 41 19 43 84 53]

Number of non-zero alpha vector elements per class: [ 13 54 51 27 59 60 25 44 19 24 16 44 24 22 19 27 15 68

68 51 54 52 76 35 24 114 23 34 71 29 43 45 56 43 87 60

31 80 29 23 35 21 50 94 41]

Number of non-zero alpha vector elements per class: [ 16 69 42 34 71 66 26 44 24 26 18 44 21 27 20 23 22 73

63 61 49 51 60 38 22 108 31 35 72 33 50 41 66 49 89 54

37 76 38 16 39 19 50 96 50]

Number of non-zero alpha vector elements per class: [16 55 50 21 61 54 16 44 17 27 15 53 20 25 24 23 20 67 68 56 46 48 67 38

27 99 20 38 74 28 41 48 49 49 90 46 38 76 36 19 33 14 36 76 45]

Number of non-zero alpha vector elements per class: [14 54 40 26 61 59 16 41 19 30 17 47 16 23 27 31 21 72 58 49 48 48 67 37

25 92 25 32 74 29 46 40 61 50 82 60 33 69 31 19 41 20 41 93 50]

Number of non-zero alpha vector elements per class: [16 53 44 34 62 72 27 33 23 26 18 60 22 22 22 32 20 81 63 59 52 53 78 36

21 99 32 32 72 35 40 49 63 45 80 54 33 67 32 20 39 15 51 92 42]

Number of non-zero alpha vector elements per class: [ 14 52 43 29 66 62 26 45 20 23 19 48 21 19 23 28 14 75

69 54 40 52 71 35 24 110 30 34 82 26 48 40 49 50 81 67

34 72 35 17 43 18 42 87 42]

Number of non-zero alpha vector elements per class: [ 16 58 48 31 63 63 28 49 18 26 8 51 19 20 21 29 15 70

74 54 48 45 78 24 25 106 17 29 84 25 41 45 56 40 94 56

32 68 36 22 39 19 35 87 42]

Number of non-zero alpha vector elements per class: [16 54 46 35 62 58 21 48 23 26 12 45 14 26 18 35 24 74 68 54 45 57 68 36

24 95 31 33 87 31 38 42 54 47 86 53 28 63 28 24 41 14 44 84 47]

Number of non-zero alpha vector elements per class: [16 62 42 32 58 66 24 42 26 28 20 45 18 25 18 30 23 70 69 57 42 41 65 40

18 95 20 33 80 30 36 34 49 53 85 53 22 68 29 16 45 19 42 96 46]

Number of non-zero alpha vector elements per class: [ 17 58 41 33 63 55 25 38 17 27 18 57 23 27 23 26 18 74

55 56 47 56 70 31 30 113 21 30 74 29 41 47 53 45 89 56

31 66 31 19 46 13 38 86 43]

Number of non-zero alpha vector elements per class: [ 17 54 41 30 62 52 19 48 19 23 16 49 21 22 19 34 20 78

60 53 49 47 82 36 20 106 21 32 76 28 38 47 61 49 77 54

25 63 27 21 50 15 44 93 43]

Number of non-zero alpha vector elements per class: [ 16 63 39 36 66 58 24 46 22 22 16 55 10 22 21 30 18 76

63 54 47 48 68 31 29 101 20 31 72 24 34 35 66 46 86 61

23 76 22 17 38 16 43 92 45]

Number of non-zero alpha vector elements per class: [ 14 62 48 26 60 66 21 45 23 25 26 57 19 28 23 30 25 84

74 50 49 55 63 39 27 109 19 38 74 27 39 44 62 44 91 65

29 58 31 14 38 21 46 105 52]

Number of non-zero alpha vector elements per class: [ 11 45 48 22 63 54 25 40 20 32 17 50 24 29 22 28 18 71

67 53 51 52 76 40 18 111 23 28 81 30 40 39 58 50 91 55

28 71 33 19 37 18 38 92 50]

Number of non-zero alpha vector elements per class: [ 12 57 47 32 71 67 26 50 24 20 17 57 15 18 26 29 20 78

67 46 55 55 68 38 36 108 31 41 70 35 48 47 60 47 76 65

28 78 29 16 34 18 45 107 50]

Number of non-zero alpha vector elements per class: [ 11 56 52 32 61 63 18 42 19 23 13 50 20 25 27 26 15 72

63 61 45 48 73 32 22 106 28 36 83 26 37 39 56 44 90 58

30 67 28 17 34 17 49 89 44]

The average training score for d = 6 is 0.9150510890024199

The standard deviation of the training score for d = 6 is 0.00323514254567706

The average test score for d = 6 is 0.9658602150537634

The standard deviation of the test score for d = 6 is 0.004961116001989938

Number of non-zero alpha vector elements per class: [ 20 58 50 41 55 63 20 45 20 21 17 49 21 21 22 29 17 71

60 47 44 54 67 32 31 103 20 34 72 29 40 43 57 42 84 50

25 58 27 17 43 17 42 89 43]

Number of non-zero alpha vector elements per class: [ 18 56 53 35 64 68 25 53 19 27 17 46 28 24 18 35 20 69

67 60 41 49 73 32 29 113 29 39 83 30 47 41 60 45 88 60

33 75 34 18 37 14 41 83 46]

Number of non-zero alpha vector elements per class: [ 16 62 53 39 65 58 27 50 24 25 18 55 16 26 23 30 18 62

67 54 41 57 69 27 31 110 22 36 85 30 45 43 59 50 80 63

33 70 36 16 45 16 44 85 41]

Number of non-zero alpha vector elements per class: [ 13 60 56 22 59 57 28 49 25 25 13 47 18 17 22 24 16 79

62 46 51 41 84 42 13 121 24 24 80 28 32 44 56 41 87 57

26 66 31 15 42 17 45 92 49]

Number of non-zero alpha vector elements per class: [ 14 53 45 23 64 61 22 39 15 28 16 53 23 24 21 28 17 70

61 62 50 51 72 33 25 108 24 29 75 28 41 47 48 51 81 58

28 65 37 18 44 21 37 90 48]

Number of non-zero alpha vector elements per class: [ 14 51 41 32 58 56 26 42 21 22 18 36 22 26 19 22 19 60

68 53 51 48 76 35 26 105 22 29 79 23 41 47 60 46 87 63

23 68 32 17 41 13 43 86 51]

Number of non-zero alpha vector elements per class: [ 18 60 54 33 67 56 25 47 21 29 11 51 23 28 18 34 17 61

62 60 44 54 76 38 27 106 23 37 74 33 50 44 51 56 84 58

32 66 35 16 48 18 41 88 56]

Number of non-zero alpha vector elements per class: [ 19 61 46 32 80 55 22 48 16 25 16 49 20 21 23 35 21 68

67 63 50 45 72 26 27 110 26 23 67 29 43 53 59 49 80 58

33 69 30 18 42 13 41 90 37]

Number of non-zero alpha vector elements per class: [13 70 52 35 65 59 19 48 23 25 22 49 24 24 19 31 22 67 74 61 49 55 72 37

24 98 27 36 76 31 42 44 52 50 73 57 27 71 37 16 44 16 41 91 38]

Number of non-zero alpha vector elements per class: [13 56 50 41 71 69 25 48 22 28 20 52 22 23 25 26 28 74 61 62 50 53 67 35

19 99 20 26 81 29 38 42 68 46 80 65 28 76 32 21 49 19 45 93 43]

Number of non-zero alpha vector elements per class: [ 14 52 40 34 44 47 16 44 27 28 18 55 22 23 21 25 15 69

59 60 45 52 67 33 26 107 26 39 88 31 42 46 58 44 83 59

29 73 27 20 43 15 46 85 51]

Number of non-zero alpha vector elements per class: [ 17 66 50 36 65 65 28 51 24 32 16 51 24 26 21 29 23 77

68 59 46 50 76 33 20 105 25 33 81 35 41 43 53 40 69 62

31 75 35 18 44 19 45 85 52]

Number of non-zero alpha vector elements per class: [ 16 62 40 32 65 61 26 50 21 21 16 45 18 23 17 30 18 65

67 55 45 57 73 38 20 103 18 30 82 31 49 40 49 53 79 65

38 85 31 18 40 15 44 92 56]

Number of non-zero alpha vector elements per class: [ 17 59 50 32 69 71 22 31 21 28 18 41 26 21 20 27 14 74

60 58 42 50 72 36 27 116 24 36 76 27 45 45 60 48 86 63

34 72 30 17 42 19 36 87 40]

Number of non-zero alpha vector elements per class: [ 20 57 51 33 65 65 22 48 22 25 17 60 22 22 20 32 16 73

64 56 49 48 75 38 26 106 20 30 81 33 48 36 56 44 83 56

30 73 27 15 35 21 42 82 44]

Number of non-zero alpha vector elements per class: [13 54 44 32 67 63 26 57 24 27 17 42 18 29 20 28 21 78 58 64 51 48 73 40

22 96 23 31 81 25 41 48 56 55 85 57 30 78 37 20 50 23 47 91 55]

Number of non-zero alpha vector elements per class: [ 10 63 46 31 68 65 21 45 20 25 14 48 15 22 19 31 16 73

59 60 45 52 66 39 22 105 24 34 87 36 45 43 56 48 96 51

34 57 30 22 43 18 41 80 44]

Number of non-zero alpha vector elements per class: [ 18 61 46 25 68 55 26 41 23 25 23 33 22 25 20 36 18 76

72 57 44 51 70 29 26 107 23 33 86 35 42 38 62 53 79 63

32 76 36 16 31 19 43 95 56]

Number of non-zero alpha vector elements per class: [ 16 50 51 33 70 63 22 54 24 26 13 52 17 26 27 31 21 76

69 56 51 57 73 40 22 105 29 32 81 27 40 49 62 43 85 61

31 68 31 21 38 17 47 79 50]

Number of non-zero alpha vector elements per class: [ 11 54 48 24 63 59 17 36 20 21 14 44 21 26 20 30 22 78

65 63 49 45 74 40 29 115 26 30 73 36 46 45 48 47 83 60

27 70 40 19 47 20 42 82 44]

The average training score for d = 7 is 0.9138074751277225

The standard deviation of the training score for d = 7 is 0.0025734493908495778

The average test score for d = 7 is 0.9655376344086022

The standard deviation of the test score for d = 7 is 0.00500000000000002

6.

One-vs-one trains the classifiers on each class where each class are grouped in pairs whereas one-vs-rest classifier trains each class. Both approaches use binary classification to categorise the data into 2 groups based on the labels e.g. (+1) and (-1).

Both algorithms have their limitations:

* Both uses different number of classifiers, one-vs-rest uses  classifiers whereas one-vs-one uses classifiers which meant that the one-vs-one classifier is a more time-consuming approach than one-vs-rest approach with a time complexity of compared to the one-vs-rests’ time complexity of .
* One-vs-one classifier trains on a larger dataset and has the potential of providing more detail than its one-vs-rest counterpart.
* One-vs-rest creates a discrepancy between the one and the rest’s data size whereas having the same dataset for one-vs-one approach creates a more balanced dataset.

