Results

Number of epoch = 1000

Map Radius = 7.5

Gaussian decay rate: 1000/7.5 = 133.33 and same for learning decay rate

Filename = L30fft16.out

Number of good motors in the file = 34

Number of bad motors in the file = 19

Chart: 1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gaussian Curve | Gaussian decay rate = 133.33 | Learning Rate = 0.9 | Learning Rate decay = 133.33 | T = 1000 | Any other parameters | Data file L30fft16 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 28 | 18 |  |  |  |  |  |  |
| 2 | 32 | 17 |  |  |  |  |  |  |
| 3 | 31 | 18 |  |  |  |  |  |  |
| 4 | 30 | 18 |  |  |  |  |  |  |
| 5 | 31 | 18 |  |  |  |  |  |  |
| 6 | 32 | 18 |  |  |  |  |  |  |
| 7 | 31 | 18 |  |  |  |  |  |  |
| 8 | 30 | 18 |  |  |  |  |  |  |
| 9 | 28 | 18 |  |  |  |  |  |  |
| 10 | 30 | 19 |  |  |  |  |  |  |
| averages | 30.3 /34 = 89% | 18/19 = 94% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 4 | 3 |  |  |  |  |  |  |
| 2 | 4 | 3 |  |  |  |  |  |  |
| 3 | 4 | 1 |  |  |  |  |  |  |
| 4 | 5 | 2 |  |  |  |  |  |  |
| 5 | 4 | 2 |  |  |  |  |  |  |

Chart: 2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gaussian Curve | Gaussian decay rate = 133.33 | Learning Rate = 3.4 | Learning Rate decay = 133.33 | T = 800 | Any other parameters | Data file L30fft16 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 32 | 19 |  |  |  |  |  |  |
| 2 | 31 | 18 |  |  |  |  |  |  |
| 3 | 31 | 18 |  |  |  |  |  |  |
| 4 | 33 | 19 |  |  |  |  |  |  |
| 5 | 33 | 18 |  |  |  |  |  |  |
| 6 | 31 | 18 |  |  |  |  |  |  |
| 7 | 31 | 19 |  |  |  |  |  |  |
| 8 | 31 | 19 |  |  |  |  |  |  |
| 9 | 32 | 19 |  |  |  |  |  |  |
| 10 | 31 | 19 |  |  |  |  |  |  |
| averages | 31/34 = 91% | 18/19= 98% |  |  |  |  |  |  |
| Method | ======== | ======= | Hold out | ===== | ======== | ======= | ===== | === |
| 1 | 4 | 2 |  |  |  |  |  |  |
| 2 | 6 | 1 |  |  |  |  |  |  |
| 3 | 4 | 1 |  |  |  |  |  |  |
| 4 | 3 | 2 |  |  |  |  |  |  |
| 5 | 6 | 0 |  |  |  |  |  |  |

Chart: 3

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mexican Hat Curve | Gaussian decay rate = 133.33 | Learning Rate = 3.4 | Learning Rate decay = 133.33 | T = 55 | Any other parameters | Data file L30fft16 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 3 | 1 |  |  |  |  |  |  |
| 2 | 3 | 0 |  |  |  |  |  |  |
| 3 | 2 | 1 |  |  |  |  |  |  |
| 4 | 5 | 2 |  |  |  |  |  |  |
| 5 | 4 | 2 |  |  |  |  |  |  |
| 6 | 4 | 2 |  |  |  |  |  |  |
| 7 | 2 | 0 |  |  |  |  |  |  |
| 8 | 4 | 0 |  |  |  |  |  |  |
| 9 | 1 | 2 |  |  |  |  |  |  |
| 10 | 3 | 1 |  |  |  |  |  |  |
| averages | 3.1/34 = 0.1% | 1.1/19 = 0.05% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ===== | ======== | ======= | ===== | === |
| 1 | 2 | 1 |  |  |  |  |  |  |
| 2 | 1 | 0 |  |  |  |  |  |  |
| 3 | 1 | 0 |  |  |  |  |  |  |

Filename = L30fft25.out

Number of good motors in the file = 34

Number of bad motors in the file = 19

Combination: 1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gaussian Curve | Gaussian decay rate = 133.33 | Learning Rate = 1.7 | Learning Rate decay = 133.33 | T = 1000 | Any other parameters | Data file L30fft25 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 31 | 18 |  |  |  |  |  |  |
| 2 | 32 | 17 |  |  |  |  |  |  |
| 3 | 31 | 18 |  |  |  |  |  |  |
| 4 | 33 | 16 |  |  |  |  |  |  |
| 5 | 31 | 18 |  |  |  |  |  |  |
| 6 | 32 | 17 |  |  |  |  |  |  |
| 7 | 33 | 16 |  |  |  |  |  |  |
| 8 | 32 | 17 |  |  |  |  |  |  |
| 9 | 31 | 17 |  |  |  |  |  |  |
| 10 | 30 | 19 |  |  |  |  |  |  |
| averages | 31.6/34 = 93% | 17.3/19=91% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 4 | 1 |  |  |  |  |  |  |
| 2 | 4 | 0 |  |  |  |  |  |  |
| 3 | 3 | 1 |  |  |  |  |  |  |
| 4 | 4 | 1 |  |  |  |  |  |  |
| 5 | 4 | 2 |  |  |  |  |  |  |

Combination: 2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gaussian Curve | Gaussian decay rate = 133.33 | Learning Rate = 2.5 | Learning Rate decay = 133.33 | T = 1000 | Any other parameters | Data file L30fft25 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 31 | 18 |  |  |  |  |  |  |
| 2 | 33 | 17 |  |  |  |  |  |  |
| 3 | 31 | 19 |  |  |  |  |  |  |
| 4 | 33 | 17 |  |  |  |  |  |  |
| 5 | 31 | 19 |  |  |  |  |  |  |
| 6 | 31 | 16 |  |  |  |  |  |  |
| 7 | 31 | 19 |  |  |  |  |  |  |
| 8 | 31 | 19 |  |  |  |  |  |  |
| 9 | 31 | 19 |  |  |  |  |  |  |
| 10 | 31 | 19 |  |  |  |  |  |  |
| averages | 31.4/34 = 92% | 18.2/19=95% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 4 | 2 |  |  |  |  |  |  |
| 2 | 4 | 1 |  |  |  |  |  |  |
| 3 | 4 | 2 |  |  |  |  |  |  |
| 4 | 6 | 0 |  |  |  |  |  |  |
| 5 | 5 | 1 |  |  |  |  |  |  |

Combination: 3

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mexican Hat Curve | Gaussian decay rate = 133.33 | Learning Rate = 3.5 | Learning Rate decay = 133.33 | T = 55 | Any other parameters | Data file L30fft25 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 2 | 1 |  |  |  |  |  |  |
| 2 | 1 | 1 |  |  |  |  |  |  |
| 3 | 4 | 1 |  |  |  |  |  |  |
| 4 | 2 | 1 |  |  |  |  |  |  |
| 5 | 2 | 2 |  |  |  |  |  |  |
| 6 | 1 | 2 |  |  |  |  |  |  |
| 7 | 3 | 2 |  |  |  |  |  |  |
| 8 | 1 | 2 |  |  |  |  |  |  |
| 9 | 3 | 2 |  |  |  |  |  |  |
| 10 | 0 | 4 |  |  |  |  |  |  |
| averages | 2/34=0.06% | 2/19=0.1% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 0 | 1 |  |  |  |  |  |  |
| 2 | 4 | 0 |  |  |  |  |  |  |
| 3 | 2 | 0 |  |  |  |  |  |  |

Filename = L30fft\_32.out

Number of good motors in the file = 34

Number of bad motors in the file = 19

Combination: 1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gaussian Curve | Gaussian decay rate = 133.33 | Learning Rate = 1.8 | Learning Rate decay = 133.33 | T = 1000 | Any other parameters | Data file L30fft\_32 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 32 | 14 |  |  |  |  |  |  |
| 2 | 32 | 14 |  |  |  |  |  |  |
| 3 | 32 | 14 |  |  |  |  |  |  |
| 4 | 33 | 14 |  |  |  |  |  |  |
| 5 | 31 | 16 |  |  |  |  |  |  |
| 6 | 29 | 19 |  |  |  |  |  |  |
| 7 | 32 | 15 |  |  |  |  |  |  |
| 8 | 31 | 16 |  |  |  |  |  |  |
| 9 | 31 | 16 |  |  |  |  |  |  |
| 10 | 29 | 19 |  |  |  |  |  |  |
| averages | 31.2/34 = 91% | 15.2/19=82% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 5 | 2 |  |  |  |  |  |  |
| 2 | 5 | 2 |  |  |  |  |  |  |
| 3 | 5 | 0 |  |  |  |  |  |  |
| 4 | 6 | 0 |  |  |  |  |  |  |
| 5 | 1 | 5 |  |  |  |  |  |  |

Combination: 2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gaussian Curve | Gaussian decay rate = 133.33 | Learning Rate = 3.6 | Learning Rate decay = 133.33 | T = 1000 | Any other parameters | Data file L30fft\_32 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 31 | 16 |  |  |  |  |  |  |
| 2 | 31 | 16 |  |  |  |  |  |  |
| 3 | 33 | 14 |  |  |  |  |  |  |
| 4 | 32 | 15 |  |  |  |  |  |  |
| 5 | 28 | 19 |  |  |  |  |  |  |
| 6 | 31 | 18 |  |  |  |  |  |  |
| 7 | 30 | 17 |  |  |  |  |  |  |
| 8 | 31 | 18 |  |  |  |  |  |  |
| 9 | 30 | 18 |  |  |  |  |  |  |
| 10 | 32 | 15 |  |  |  |  |  |  |
| averages | 30.9/34 = 90% | 16.6/19=87% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 2 | 5 |  |  |  |  |  |  |
| 2 | 5 | 1 |  |  |  |  |  |  |
| 3 | 3 | 2 |  |  |  |  |  |  |
| 4 | 5 | 1 |  |  |  |  |  |  |
| 5 | 5 | 2 |  |  |  |  |  |  |

Combination: 3

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mexican  Hat Curve | Gaussian decay rate = 133.33 | Learning Rate = 4.5 | Learning Rate decay = 133.33 | T = 55 | Any other parameters | Data file L30fft\_32 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 33 | 9 |  |  |  |  |  |  |
| 2 | 33 | 0 |  |  |  |  |  |  |
| 3 | 33 | 5 |  |  |  |  |  |  |
| 4 | 18 | 16 |  |  |  |  |  |  |
| 5 | 33 | 6 |  |  |  |  |  |  |
| 6 | 33 | 0 |  |  |  |  |  |  |
| 7 | 33 | 0 |  |  |  |  |  |  |
| 8 | 32 | 11 |  |  |  |  |  |  |
| 9 | 32 | 1 |  |  |  |  |  |  |
| 10 | 14 | 16 |  |  |  |  |  |  |
| averages | 29.9/34 = 86% | 6.4/19=33% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 4 | 0 |  |  |  |  |  |  |
| 2 | 3 | 0 |  |  |  |  |  |  |
| 3 | 2 | 1 |  |  |  |  |  |  |
| 4 | 5 | 0 |  |  |  |  |  |  |
| 5 | 1 | 1 |  |  |  |  |  |  |

Filename = L30fft\_64.out

Number of good motors in the file = 34

Number of bad motors in the file = 19

Combination: 1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gaussian Curve | Gaussian decay rate = 133.33 | Learning Rate = 1.2 | Learning Rate decay = 133.33 | T = 1000 | Any other parameters | Data file L30fft\_64 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 30 | 17 |  |  |  |  |  |  |
| 2 | 33 | 14 |  |  |  |  |  |  |
| 3 | 29 | 18 |  |  |  |  |  |  |
| 4 | 31 | 16 |  |  |  |  |  |  |
| 5 | 31 | 16 |  |  |  |  |  |  |
| 6 | 33 | 14 |  |  |  |  |  |  |
| 7 | 31 | 16 |  |  |  |  |  |  |
| 8 | 31 | 16 |  |  |  |  |  |  |
| 9 | 32 | 15 |  |  |  |  |  |  |
| 10 | 32 | 15 |  |  |  |  |  |  |
| averages | 31.3/34 = 92% | 15.7/19=82% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 4 | 3 |  |  |  |  |  |  |
| 2 | 4 | 1 |  |  |  |  |  |  |
| 3 | 4 | 0 |  |  |  |  |  |  |
| 4 | 1 | 3 |  |  |  |  |  |  |
| 5 | 1 | 2 |  |  |  |  |  |  |

Combination: 2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gaussian Curve | Gaussian decay rate = 133.33 | Learning Rate = 2.1 | Learning Rate decay = 133.33 | T = 1000 | Any other parameters | Data file L30fft\_64 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 33 | 14 |  |  |  |  |  |  |
| 2 | 30 | 17 |  |  |  |  |  |  |
| 3 | 32 | 15 |  |  |  |  |  |  |
| 4 | 30 | 17 |  |  |  |  |  |  |
| 5 | 31 | 16 |  |  |  |  |  |  |
| 6 | 30 | 17 |  |  |  |  |  |  |
| 7 | 32 | 15 |  |  |  |  |  |  |
| 8 | 31 | 16 |  |  |  |  |  |  |
| 9 | 32 | 15 |  |  |  |  |  |  |
| 10 | 28 | 19 |  |  |  |  |  |  |
| averages | 30.9/34 = 90% | 16.1/19=84% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 4 | 1 |  |  |  |  |  |  |
| 2 | 5 | 1 |  |  |  |  |  |  |
| 3 | 5 | 1 |  |  |  |  |  |  |
| 4 | 4 | 3 |  |  |  |  |  |  |
| 5 | 4 | 1 |  |  |  |  |  |  |

Combination: 3

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mexican Hat Curve | Gaussian decay rate = 133.33 | Learning Rate = 4.0 | Learning Rate decay = 133.33 | T = 55 | Any other parameters | Data file L30fft\_64 |  |  |
| Run # | Correctly identified as Good | Correctly identified as Bad |  |  |  |  |  |  |
| 1 | 33 | 0 |  |  |  |  |  |  |
| 2 | 31 | 11 |  |  |  |  |  |  |
| 3 | 19 | 10 |  |  |  |  |  |  |
| 4 | 33 | 0 |  |  |  |  |  |  |
| 5 | 33 | 2 |  |  |  |  |  |  |
| 6 | 32 | 6 |  |  |  |  |  |  |
| 7 | 23 | 14 |  |  |  |  |  |  |
| 8 | 32 | 7 |  |  |  |  |  |  |
| 9 | 16 | 16 |  |  |  |  |  |  |
| 10 | 32 | 3 |  |  |  |  |  |  |
| averages | 28.4/34 = 83% | 6.9/19=36% |  |  |  |  |  |  |
| Method | ========= | ======= | Hold-out | ==== | ====== | ======= | ==== | ==== |
| 1 | 6 | 0 |  |  |  |  |  |  |
| 2 | 2 | 3 |  |  |  |  |  |  |
| 3 | 0 | 2 |  |  |  |  |  |  |
| 4 | 3 | 2 |  |  |  |  |  |  |
| 5 | 4 | 0 |  |  |  |  |  |  |

Self-Organizing Maps Report

For each file, there are charts with two Gaussian Curves and one with Mexican Curve and with different combination of parameters, such as, learning rate and epoch. Chart 1, 2, (Gaussian Curves) 3 (Mexican hat Curve) are the results from file L30fft16, and so on. The charts also show the result for hold out method right underneath averages of runs. (without the hold out). There are 34 good motors and 19 bad motors. 0 classify as the good motor and 1 classify as the bad motor

From file L30fft16, Chart 1 with 0.9 learning rate and 1000 epoch (timestamp) shows average of 89% for good motors and 94% of bad motors. There is couple of good motors, which are not classified at all, that could be cause of more good motor samples then bad motor. In Chart 2, learning rate is 3.4 and 800 epochs and shows almost 91% motors being classified as good and 98% as bad motors. I see that bad motors have higher classifier rate, one reason could be there only 19 samples for bad motor and doesn’t have enough for generalization, compare to 34 good motor sample. The hold out method holds the 15% of the original data, so 8 randomly chosen samples. Those could all be good or bad or mix of two. The results from chart 1 and chart 2 for hold out method seem to be heavy towards good motors. The reason could be there are more samples of good motor than the bad motor and some of them could not be classified at all. There is huge difference between Gaussian Curve and Mexican Hat Curve, the results for Mexican hat are just really bad, almost 0.1% with 3.4 learning rate and 55 epoch. For some reason, for file L30fft\_32 and L30fft\_64 for Mexican hat curve, with 4.5 and 4.0 learning rate and 55 epoch for both, shows 86% and 83% for good motors and 33% and 36% for bad motors. Also, this could be cause by the sample higher sample size for good motors than bad motors. The same result could be seen for the hold out method of each of those files. If the epoch are increase to 1000 then accuracy of those motors alternatives between 33 good motors and 0 bad motors or 0 good motors and 19 motors. It only classifies one type of motor.

L30fft25 performed better than all the other files, learning rate is 1.7 and 1000 epoch for chart 1 and the accuracy is almost 93% for good motors and 91% for bad motors. Chart 2, learning rate of 2.5 and 1000 epoch gives the accuracy 92% for good motors and 95% for bad motors. But the Mexican hat results are just really bad, even the learning rate is 3.5 for 55 epochs. Even if the epochs are increased, the result just gets worse.