|  |  |
| --- | --- |
| 21.06.2019 | |
| cat\_latent\_size = 10  cont\_latent\_size = 10  epochs=30  batch\_size=256  learning\_rate=0.001 | |
| test\_aae | |
| ACC | 81.52% |
| test\_aae\_GR(Sequtial Learning, with GR) | |
| ACC\_Task 0 | [99.62%, 0, 0, 0, 0] |
| ACC\_Task 1 | [97.28%, 90.13%, 0, 0, 0] |
| ACC\_Task 2 | [93.03%,89.92%,91.74%,0,0] |
| ACC\_Task 3 | [75.11%, 73.69%,85.65%,82.93%,0] |
| ACC\_Task 4 | [87.92%,66.68%,76.05%,84.19%,75.29%] |
| test\_aae\_noGR(Sequial Learning,without GR) | |
| ACC\_Task 0 | [99.89%, 0, 0, 0, 0] |
| ACC\_Task 1 | [97.01%, 92.08%, 0, 0, 0] |
| ACC\_Task 2 | [90.01%, 84.30%, 96.63%, 0, 0] |
| ACC\_Task 3 | [92.31%, 81.23%, 87.71%, 96.80%, 0] |
| ACC\_Task 4 | [88.14%, 75.50%, 87.35%, 88.27%, 97.33%] |
|  |  |
| last time: the best(2019\_06\_04\_12\_36) | |
| cat\_latent\_size = 10  cont\_latent\_size = 10  batch\_size=256  learning\_rate=0.001  epoch = 100 | acc=89.16% |
| Once more to test the parameters of aae(from 13\_19) | |
| epoch | acc |
| 100 | 74.275%/70.05%/87.355%/80.72%/87.255%/  74.375% |
|  |  |
|  |  |

|  |  |  |
| --- | --- | --- |
| 20190627-20190628  **The change in code: Reinitialize optimizers for each task** | | |
| cat\_latent\_size = 10  cont\_latent\_size = 10  epochs=100  batch\_size=256  learning\_rate=0.001 | | |
| **test\_aae\_GR(Sequential Learning, with GR)** | | |
| duration：1h 20m for epoch=100 | | |
| 1  (10\_16) | ACC\_Task 0 | [99.89%] |
| ACC\_Task 1 | [89.11%,84.01%] |
| ACC\_Task 2 | [91.54%,88.40%,88.12%] |
| ACC\_Task 3 | [90.5%,70.84%,85.57%,89.87%] |
| ACC\_Task 4 | [93.29%,69%,92.37%,80.98%,90.84%] |
| 2  (13\_55) | ACC\_Task 0 | [99.94%] |
| ACC\_Task 1 | [96.28%,90.21%] |
| ACC\_Task 2 | [89.24%, 84.91%, 88.11%] |
| ACC\_Task 3 | [53.34%, 50.98%, 52.82%,52.71%] |
| ACC\_Task 4 | [62.69%, 50.74%, 51.86%, 53.36%, 50.93%] |
| 3  (15\_55) | ACC\_Task 0 | [99.88%] |
| ACC\_Task 1 | [96.11%,87.04%] |
| ACC\_Task 2 | [88.23%,83.49%,84.48%] |
| ACC\_Task 3 | [86.32%,77.24%,77.42%,74.28%] |
| ACC\_Task 4 | [88.78%,64.09%,79.50%,77.88%,75.26%] |
| 4  (10\_37) | ACC\_Task 0 | [98.85%] |
| ACC\_Task 1 | [87.56%,90.37%,] |
| ACC\_Task 2 | [81.57%,88.54%,74.01%] |
| ACC\_Task 3 | [79.28%,80.99%,86.06%,82.60%] |
| ACC\_Task 4 | [72.02%,53.11%,69.91%,56.43%,53.24%] |
| 5  (16\_29)  epoch=50 | ACC\_Task 0 | [99.50%] |
| ACC\_Task 1 | [95.19%,85.35%] |
| ACC\_Task 2 | [91.68%,85.26%,86.53%] |
| ACC\_Task 3 | [89.79%,73.95%,83.93%,80.43%] |
| ACC\_Task 4 | [86.48%,66.76%,90.36%,82.16%,88.54%] |
| Compared to training separate tasks without GR:   * The accuracies for the current task (corresponding to real data) are greatly influenced by the GR as the red font showed. * The accuracies for the previous tasks (corresponding to generated data) are also bad as without GR. | | |
| **test\_aae\_noGR(Sequential Learning, without GR)** | | |
| duration: 45m | | |
| 1  (11\_32) | ACC\_Task 0 | [98.76%] |
| ACC\_Task 1 | [81.94%,86.70%] |
| ACC\_Task 2 | [91.70%,80.24%,99.54%] |
| ACC\_Task 3 | [93.66%,68.55%,79.74%,99.83%] |
| ACC\_Task 4 | [84.84%,67.34%,87.11%,82.50%,92.39%] |
| 2  (13\_56)  batch\_size=512 | ACC\_Task 0 | [99.02%] |
| ACC\_Task 1 | [86.36%,96.55%] |
| ACC\_Task 2 | [86.73%,85.12%,99.81%] |
| ACC\_Task 3 | [87.46%,70.39%,77.46%,99.94%] |
| ACC\_Task 4 | [87.65%,70,62%,86.41%,97.85%,91.16%] |
| 3  (16\_04)  epoch = 50 | ACC\_Task 0 | [99.77%] |
| ACC\_Task 1 | [96.02%,90.05%] |
| ACC\_Task 2 | [93.50%,81.19%,95.89%] |
| ACC\_Task 3 | [87.83%,70.93%,85.35%,98.93%] |
| ACC\_Task 4 | [83.71%,74.22%,88.25%,89.09%,94.88%] |
| * The last accuracy (corresponding to the current task) is true as expected, basically higher than 90% as red font showed. * But the previous accuracies in each task (corresponding to previous tasks) is not gradually decreased, the abnormal data is as blue font showed. * The accuracy for [2, 3] is always lower than other tasks. | | |

* z\_cont and z\_cat are similar in each task, because they are from the same distribution(cont\_prior, cat\_prior), therefore the generated label and style are similar.
* The label and style for the generative replay decoder are randomly selected from categorical distribution (cat\_prior) and normal distribution (cont\_prior). Is there such a possible case, the digits are not uniformly generated, namely some digit due to only a little generated date for training, so that the results for the previous tasks are not stable?

Summary with Felix(20190702):

1. plot the mean and variance value for each task

reference:

<https://jakevdp.github.io/PythonDataScienceHandbook/04.03-errorbars.html>

1. compare: train all data vs. sequential learning
2. use different datasets: MNIST vs. Fashion\_MNIST

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 2019.07.02-2019.07.04 | | | | |
| Dataset: MNIST | | | | |
| Folder: Compare\_0627-0704 | | | | |
| cat\_latent\_size = 10  cont\_latent\_size = 10  epochs=100  batch\_size=256  learning\_rate=0.001 | | | | |
| **test\_aae\_GR(Sequential Learning, with GR)** | | | | |
| duration：1h 20m for epoch=100 | | | | |
| 1  (06\_27\_10\_16) | ACC\_Task 0 | | [99.89%] | |
| ACC\_Task 1 | | [89.11%,84.01%] | |
| ACC\_Task 2 | | [91.54%,88.40%,88.12%] | |
| ACC\_Task 3 | | [90.5%,70.84%,85.57%,89.87%] | |
| ACC\_Task 4 | | [93.29%,69%,92.37%,80.98%,90.84%] | |
| 2  (06\_27\_13\_55) | ACC\_Task 0 | | [99.94%] | |
| ACC\_Task 1 | | [96.28%,90.21%] | |
| ACC\_Task 2 | | [89.24%, 84.91%, 88.11%] | |
| ACC\_Task 3 | | [53.34%, 50.98%, 52.82%,52.71%] | |
| ACC\_Task 4 | | [62.69%, 50.74%, 51.86%, 53.36%, 50.93%] | |
| 3  (06\_27\_15\_55) | ACC\_Task 0 | | [99.88%] | |
| ACC\_Task 1 | | [96.11%,87.04%] | |
| ACC\_Task 2 | | [88.23%,83.49%,84.48%] | |
| ACC\_Task 3 | | [86.32%,77.24%,77.42%,74.28%] | |
| ACC\_Task 4 | | [88.78%,64.09%,79.50%,77.88%,75.26%] | |
| 4  (06\_28\_10\_37) | ACC\_Task 0 | | [98.85%] | |
| ACC\_Task 1 | | [87.56%,90.37%,] | |
| ACC\_Task 2 | | [81.57%,88.54%,74.01%] | |
| ACC\_Task 3 | | [79.28%,80.99%,86.06%,82.60%] | |
| ACC\_Task 4 | | [72.02%,53.11%,69.91%,56.43%,53.24%] | |
| 5  (07\_02\_14\_44) | ACC\_Task 0 | | [99.84%] | |
| ACC\_Task 1 | | [96.32%,82.00%] | |
| ACC\_Task 2 | | [83.26%,85.04%,83.78%] | |
| ACC\_Task 3 | | [88.05%,79.99%,77.05%,69.34%] | |
| ACC\_Task 4 | | [88.29%,70.40%,82.02%,72.13%,70.05%] | |
| 6  (07\_02\_16\_20) | ACC\_Task 0 | | [98.48%] | |
| ACC\_Task 1 | | [93.95%,86.59%] | |
| ACC\_Task 2 | | [88.44%,74.23%,82.67%] | |
| ACC\_Task 3 | | [91.84%，77.35%，74.91%，71.78%] | |
| ACC\_Task 4 | | [86.75%,77.29%,78.14%,89.69%,87.38%] | |
| 7  (07\_03\_13\_12) | ACC\_Task 0 | | [99.91%] | |
| ACC\_Task 1 | | [95.94%,86.78%] | |
| ACC\_Task 2 | | [83.39%,77.87%,75.59%] | |
| ACC\_Task 3 | | [93.05%,89.41%,84.40%,91.44%] | |
| ACC\_Task 4 | | [53.26%,50.72%,52.06%,51.42%,50.47%] | |
| 8  (07\_03\_14\_16) | ACC\_Task 0 | | [99.90%] | |
| ACC\_Task 1 | | [89.87%,82.93%] | |
| ACC\_Task 2 | | [53.25%,50.98%,51.86%] | |
| ACC\_Task 3 | | [53.23%,50.72%,51.87%,51.42%] | |
| ACC\_Task 4 | | [53.23%,50.72%,51.87%,51.42%,50.42%] | |
| 9  (07\_03\_15\_17) | ACC\_Task 0 | | [99.26%] | |
| ACC\_Task 1 | | [98.75%,82.72%] | |
| ACC\_Task 2 | | [91.11%,84.91%,75.11%] | |
| ACC\_Task 3 | | [93.68%,79.26%,73.95%,70.02%] | |
| ACC\_Task 4 | | [94.29%,69.71%,69.7%,85.36%,77.83%] | |
| 10  (07\_03\_16\_16) | ACC\_Task 0 | | [98.74%] | |
| ACC\_Task 1 | | [96.65%,] | |
| ACC\_Task 2 | | [94.62%,87.57%,79.05%] | |
| ACC\_Task 3 | | [87.39%,69.35%,82.43%,74.88%] | |
| ACC\_Task 4 | | [87.44%,66.20%,79.83%,79.04%,80.53%] | |
| Mean: [0.76952222,0.61753333,0.69714444,0.68741111,0.674]  Variance: [0.02536359,0.00974339 ,0.0197819,0.02164468,0.02408742] | | | | |
| **test\_aae\_noGR(Sequential Learning, without GR)** | | | | |
| duration: 30m | | | | |
| 1  (06\_27\_11\_32) | ACC\_Task 0 | | [98.76%] | |
| ACC\_Task 1 | | [81.94%,86.70%] | |
| ACC\_Task 2 | | [91.70%,80.24%,99.54%] | |
| ACC\_Task 3 | | [93.66%,68.55%,79.74%,99.83%] | |
| ACC\_Task 4 | | [84.84%,67.34%,87.11%,82.50%,92.39%] | |
| 2  (07\_02\_15\_30) | ACC\_Task 0 | | [98.85%] | |
| ACC\_Task 1 | | [84.87%,91.45%] | |
| ACC\_Task 2 | | [92.30%,83.63%,99.66%,] | |
| ACC\_Task 3 | | [96.39%,73.37%,83.61%,99.93%] | |
| ACC\_Task 4 | | [89.37%,72.75%,,88.02%,80.48%,98.33%] | |
| 3  (07\_02\_15\_47) | ACC\_Task 0 | | [99.92%] | |
| ACC\_Task 1 | | [94.28%,84.00%] | |
| ACC\_Task 2 | | [87.69%,81.01%,99.34%] | |
| ACC\_Task 3 | | [92.09%,72.71%,82.55%,99.95%] | |
| ACC\_Task 4 | | [85.66%,69.55%,90.34%,91.13%,97.73%] | |
| 4  (07\_02\_16\_05) | ACC\_Task 0 | | [98.63%] | |
| ACC\_Task 1 | | [92.72%,89.13%] | |
| ACC\_Task 2 | | [94.97%,78.94%,97.14%] | |
| ACC\_Task 3 | | [89.94%,78.30%,80.28%,99.91%] | |
| ACC\_Task 4 | | [87.99%,62.53%,88.26%,88.04%,98.16%] | |
| 5  (07\_02\_17\_02) | ACC\_Task 0 | | [98.89%] | |
| ACC\_Task 1 | | [89.03%,99.22%] | |
| ACC\_Task 2 | | [93.47%,84.20%,99.70%] | |
| ACC\_Task 3 | | [83.17%,70.80%,81.84%,99.82%] | |
| ACC\_Task 4 | | [87.33%,75.60%,85.44%,89.76%,97.69%] | |
| 6  (07\_02\_17\_32) | ACC\_Task 0 | | [99.04%] | |
| ACC\_Task 1 | | [90.28%,93.01%] | |
| ACC\_Task 2 | | [92.56%,81.16%,99.55%] | |
| ACC\_Task 3 | | [96.24%,70.77%,81.89%,99.89%] | |
| ACC\_Task 4 | | [86.90%,77.87%,88.59%,88.82%,98.19%] | |
| 7  (07\_02\_17\_50) | ACC\_Task 0 | | [99.95%] | |
| ACC\_Task 1 | | [92.80%,96.05%] | |
| ACC\_Task 2 | | [94.08%,80.80%,99.56%] | |
| ACC\_Task 3 | | [79.23%,75.59%,74.21%,99.88%] | |
| ACC\_Task 4 | | [89.30%,69.70%,86.43%,89.44%,96.78%] | |
| 8  (07\_03\_11\_16) | ACC\_Task 0 | | [98.83%] | |
| ACC\_Task 1 | | [94.21%,91.53%] | |
| ACC\_Task 2 | | [85.33%,84.63%,99.67%] | |
| ACC\_Task 3 | | [99.36%,71.93%,75.75%,99.89%] | |
| ACC\_Task 4 | | [91.63%,79.34%,90.45%，85.93%，98.5%] | |
| 9  (07\_03\_11\_38) | ACC\_Task 0 | | [99.94%] | |
| ACC\_Task 1 | | [90.86%,98.99%] | |
| ACC\_Task 2 | | [87.49%,84.43%,99.67%] | |
| ACC\_Task 3 | | [97.02%,75.97%,81.98%,99.91%] | |
| ACC\_Task 4 | | [92.89%,69.71%,88.05%,85.14%,98.31%] | |
| 10  (07\_03\_12\_51) | ACC\_Task 0 | | [99.91%] | |
| ACC\_Task 1 | | [84.86%,91.2%] | |
| ACC\_Task 2 | | [94.62%,83.53%,96.55%] | |
| ACC\_Task 3 | | [88.96%,69.85%,85.12%,99.93%] | |
| ACC\_Task 4 | | [90.58%,72.76%,90.01%,91.62%,97.48%] | |
| Mean: [0.88649, 0.71715, 0.8827, 0.87286,0.97326]  Variance: [0.0006022,0.00229553,0.00025018,0.00122913,0.00030196] | | | | |
| Plot: Figure 1 | | | | |
| **test\_aae(all Data)** | | | | |
| **2019.07.04** | | | | |
| **Folder:MNIST\_all\_0704** | | | | |
| Nr. | | Acc | | Mean:  78.48%  Variance:  0.0008744 |
| 1. (10\_08) | | 87.28% | |
| 2. (10\_23) | | 79.93% | |
| 3. (11\_02) | | 80.75% | |
| 4. (11\_19) | | 71.585% | |
| 5. (11\_35) | | 71.91% | |
| 6. (11\_48) | | 72.14% | |
| 7. (11\_50) | | 78.06% | |
| 8. (12\_02) | | 71.13% | |
| 9. (12\_06) | | 87.39% | |
| 10. (12\_16) | | 78.27% | |
| 11.(12\_23) | | 88.6% | |
| 12.(13\_22) | | 86.495% | |
| 13.(13\_25) | | 63.405% | |
| 14. (13\_46) | | 53.38% | |
| 15. (13\_42) | | 80.18% | |
| 16. (13\_52) | | 73.8% | |
| 17. (14\_13) | | 87.74% | |
| 18. (13\_58) | | 83.68% | |
| 19. (14\_19) | | 84.82% | |
| 20. (14\_35) | | 88.99% | |
| **Dataset: Fashion\_MNIST** | | | | |
| **20190709** | | | | |
| **The same parameters as MNIST:**  cat\_latent\_size = 10  cont\_latent\_size = 10  epochs=100  batch\_size=256  learning\_rate=0.001 | | | | |
| **test\_aae(all Data)** | | | | |
| **Folder:Fashion\_MNIST1\_0709** | | | | |
| Nr. | | Acc | | Mean:  61.27%  Var:  0.001612 |
| 1(10\_03) | | 62.16% | |
| 2(10\_05) | | 61.41% | |
| 3(10\_06) | | 55.8% | |
| 4(10\_08) | | 70.365% | |
| 5(10\_12) | | 58.96% | |
| 6(10\_25) | | 58.74% | |
| 7(10\_38) | | 63.19% | |
| 8(10\_43) | | 60.81% | |
| 9(10\_45) | | 63.37% | |
| 10(10\_47) | | 57.86% | |
| **Find the best parameters** | | | | |
| **Folder:Fashion\_MNIST2\_0709** | | | | |
| **[1]: epoch**  cat\_latent\_size = 10  cont\_latent\_size = 10  batch\_size=256  learning\_rate=0.001 | | | | |
| epoch | | Acc | |  |
| 80 | | 61.88% | | 11\_47 |
| 100 | | As aboved | | |
| 120 | | 62.66%/63.94% | | 11\_08/11\_27 |
| 140 | | 61.22% | | 11\_09 |
| 160 | | 61.815% | | 11\_10 |
| 180 | | 61.34% | | 11\_15 |
| 200 | | 60.195% | | 11\_18 |
| 300 | | 61.72% | | 11\_59 |
| 400 | | 10.005%/61.17% | | 12\_01/13\_48 |
| 500 | | 72.995%/61.725% | | 12\_17/13\_50 |
| 600 | | 71.62% | | 13\_37 |
| **[2]:batch\_size**  cat\_latent\_size = 10  cont\_latent\_size = 10  epoch=100  learning\_rate=0.001 | | | | |
| batch\_size | | Acc | |  |
| 64 | | 62.88% | |  |
| 128 | | 62.31% | | 13\_04 |
| 256 | | As aboved | | |
| 512 | | 62.65% | | 13\_09 |
| 1024 | | 61.18% | | 13\_33 |

Summary with Felix(20170709)：

* The Startpoint of Fashion\_MNIST is about 60%, That is no problem.
* Change them: The number of clusters：16 The number of style: 5

Reason: corresponding to paper

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* The above makes no sense\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2019.07.15** | | | | | | | | | | | | | |
| cat\_latent\_size = 16  cont\_latent\_size = 5  epochs=100  batch\_size=256  learning\_rate=0.001 | | | | | | | | | | | | | |
| **Dataset: MNIST** | | | | | | | | | | | | | |
| **test\_aae(all Data)** | | | | | | | | | | | | | |
| **Folder：MNIST\_all\_0715** | | | | | | | | | | | | | |
| Nr. | Acc | |  | | | | | | | | | | |
| **Date:20170719** | | |  | | | | | | | | | | |
| 1(10\_39) | 0.8072 | |  | | | | | | | | | | |
| 2(10\_41) | 0.8721 | |  | | | | | | | | | | |
| 3(10\_46) | 0.8114 | |  | | | | | | | | | | |
| 4(10\_48) | 0.8585 | |  | | | | | | | | | | |
| 5(10\_49) | 0.7931 | |  | | | | | | | | | | |
| 6(10\_54) | 0.855 | |  | | | | | | | | | | |
| 7(10\_58) | 0.77715 | |  | | | | | | | | | | |
| 8(11\_05) | 0.8300 | |  | | | | | | | | | | |
| 9(11\_07) | 0.7881 | |  | | | | | | | | | | |
| 10(11\_10) | 0.8739 | |  | | | | | | | | | | |
| **Date:20190719** | | |  | | | | | | | | | | |
| 11(16\_10) | 0.74 | |  | | | | | | | | | | |
| 12(16\_13) | 0.78 | |  | | | | | | | | | | |
| 13(16\_14) | 0.7643 | |  | | | | | | | | | | |
| 14(16\_16) | 0.8163 | |  | | | | | | | | | | |
| 15(16\_17) | 0.7498 | |  | | | | | | | | | | |
| 16(16\_33) | 0.7864 | |  | | | | | | | | | | |
| 17(16\_36) | 0.87065 | |  | | | | | | | | | | |
| 18(16\_37) | 0.7991 | |  | | | | | | | | | | |
| 19(16\_38) | 0.77675 | |  | | | | | | | | | | |
| 20(16\_40) | 0.7640 | |  | | | | | | | | | | |
| Mean | 0.805688 | |  | | | | | | | | | | |
| Variance | 0.001754 | |  | | | | | | | | | | |
| **test\_all\_noGR(Sequential Learning, without GR)** | | | | | | | | | | | | | |
| **Folder: MNIST\_noGR\_0716** | | | | | | | | | | | | | |
| **Date:20190716** | | | | | | | | | | | | | |
| 1  (15\_51) | ACC\_Task 0 | | 0.9846 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8234 | | 0.8781 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8208 | | 0.7828 | | | 0.9497 | |  | | |  |
| ACC\_Task 3 | | 0.7306 | | 0.8358 | | | 0.8034 | | 0.9980 | | |  |
| ACC\_Task 4 | | 0.7423 | | 0.7470 | | | 0.8284 | | 0.8602 | | | 0.9082 |
| 2  (15\_56) | ACC\_Task 0 | | 0.9991 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8952 | | 0.9418 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9390 | | 0.8543 | | | 0.9830 | |  | | |  |
| ACC\_Task 3 | | 0.8998 | | 0.7713 | | | 0.8874 | | 0.9784 | | |  |
| ACC\_Task 4 | | 0.8791 | | 0.7585 | | | 0.8539 | | 0.8604 | | | 0.9158 |
| 3  (15\_59) | ACC\_Task 0 | | 0.9988 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.5687 | | 0.5072 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5486 | | 0.5599 | | | 0.5293 | |  | | |  |
| ACC\_Task 3 | | 0.9247 | | 0.7599 | | | 0.7393 | | 0.8760 | | |  |
| ACC\_Task 4 | | 0.5882 | | 0.5198 | | | 0.5418 | | 0.5571 | | | 0.5169 |
| 4  (16\_02) | ACC\_Task 0 | | 0.9942 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8606 | | 0.9200 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8495 | | 0.8068 | | | 0.9809 | |  | | |  |
| ACC\_Task 3 | | 0.8981 | | 0.7389 | | | 0.7499 | | 0.9985 | | |  |
| ACC\_Task 4 | | 0.8184 | | 0.7997 | | | 0.9025 | | 0.8474 | | | 0.9656 |
| 5  (16\_03) | ACC\_Task 0 | | 0.9977 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9092 | | 0.8392 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8272 | | 0.7878 | | | 0.9936 | |  | | |  |
| ACC\_Task 3 | | 0.8050 | | 0.7747 | | | 0.7613 | | 0.9977 | | |  |
| ACC\_Task 4 | | 0.6235 | | 0.5495 | | | 0.5450 | | 0.6078 | | | 0.5181 |
| 6  (16\_21) | ACC\_Task 0 | | 0.9957 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9088 | | 0.9830 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9006 | | 0.8334 | | | 0.9969 | |  | | |  |
| ACC\_Task 3 | | 0.6709 | | 0.5612 | | | 0.5625 | | 0.5142 | | |  |
| ACC\_Task 4 | | 0.5479 | | 0.5072 | | | 0.5324 | | 0.5160 | | | 0.5102 |
| 7  (16\_23) | ACC\_Task 0 | | 0.9976 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9272 | | 0.8310 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8932 | | 0.7652 | | | 0.9951 | |  | | |  |
| ACC\_Task 3 | | 0.9062 | | 0.7545 | | | 0.8333 | | 0.9929 | | |  |
| ACC\_Task 4 | | 0.7523 | | 0.8667 | | | 0.9109 | | 0.9381 | | | 0.9846 |
| 8  (16\_26) | ACC\_Task 0 | | 0.9989 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9606 | | 0.8725 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9229 | | 0.7753 | | | 0.9923 | |  | | |  |
| ACC\_Task 3 | | 0.7950 | | 0.7811 | | | 0.6790 | | 0.9987 | | |  |
| ACC\_Task 4 | | 0.5334 | | 0.5153 | | | 0.5290 | | 0.5348 | | | 0.5041 |
| 9  (16\_30) | ACC\_Task 0 | | 0.9986 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9175 | | 0.8045 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8584 | | 0.7449 | | | 0.9953 | |  | | |  |
| ACC\_Task 3 | | 0.6152 | | 0.5524 | | | 0.5877 | | 0.5277 | | |  |
| ACC\_Task 4 | | 0.8323 | | 0.6006 | | | 0.6061 | | 0.6231 | | | 0.5403 |
| 10  (16\_32) | ACC\_Task 0 | | 0.9972 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9294 | | 0.9531 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9527 | | 0.8171 | | | 0.9944 | |  | | |  |
| ACC\_Task 3 | | 0.8643 | | 0.8019 | | | 0.8600 | | 0.9976 | | |  |
| ACC\_Task 4 | | 0.8616 | | 0.7919 | | | 0.8422 | | 0.9269 | | | 0.8935 |
| **Date:20190722** | | | | | | | | | | | | | |
| 11  (16\_05) | ACC\_Task 0 | | 0.9994 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9226 | | 0.9005 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9101 | | 0.8720 | | | 0.9943 | |  | | |  |
| ACC\_Task 3 | | 0.8582 | | 0.7318 | | | 0.7283 | | 0.9994 | | |  |
| ACC\_Task 4 | | 0.5522 | | 0.5487 | | | 0.5322 | | 0.5189 | | | 0.5124 |
| 12  (16\_07) | ACC\_Task 0 | | 0.9986 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8148 | | 0.6151 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8844 | | 0.7458 | | | 0.9499 | |  | | |  |
| ACC\_Task 3 | | 0.8463 | | 0.7350 | | | 0.8534 | | 0.9928 | | |  |
| ACC\_Task 4 | | 0.9518 | | 0.8126 | | | 0.8530 | | 0.9190 | | | 0.9001 |
| 13  (16\_11) | ACC\_Task 0 | | 0.9988 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9427 | | 0.8488 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9486 | | 0.7689 | | | 0.9954 | |  | | |  |
| ACC\_Task 3 | | 0.8637 | | 0.7557 | | | 0.7293 | | 0.9993 | | |  |
| ACC\_Task 4 | | 0.7273 | | 0.7598 | | | 0.8876 | | 0.9426 | | | 0.9669 |
| 14  (16\_21) | ACC\_Task 0 | | 0.9945 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9003 | | 0.9077 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8542 | | 0.7535 | | | 0.8654 | |  | | |  |
| ACC\_Task 3 | | 0.6921 | | 0.5843 | | | 0.7006 | | 0.5149 | | |  |
| ACC\_Task 4 | | 0.7247 | | 0.7297 | | | 0.7690 | | 0.9399 | | | 0.8322 |
| 15  (16\_25) | ACC\_Task 0 | | 0.9694 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.5354 | | 0.5077 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5356 | | 0.5112 | | | 0.5340 | |  | | |  |
| ACC\_Task 3 | | 0.9582 | | 0.8046 | | | 0.8340 | | 0.9958 | | |  |
| ACC\_Task 4 | | 0.8174 | | 0.7848 | | | 0.8795 | | 0.9099 | | | 0.9183 |
| 16  (16\_28) | ACC\_Task 0 | | 0.9979 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9154 | | 0.6849 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9083 | | 0.8574 | | | 0.9221 | |  | | |  |
| ACC\_Task 3 | | 0.8954 | | 0.8276 | | | 0.7663 | | 0.9990 | | |  |
| ACC\_Task 4 | | 0.8814 | | 0.7347 | | | 0.7512 | | 0.8938 | | | 0.8577 |
| 17  (16\_29) | ACC\_Task 0 | | 0.9982 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8869 | | 0.9413 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9068 | | 0.8329 | | | 0.9726 | |  | | |  |
| ACC\_Task 3 | | 0.8219 | | 0.7063 | | | 0.7853 | | 0.9982 | | |  |
| ACC\_Task 4 | | 0.5968 | | 0.5283 | | | 0.5206 | | 0.5400 | | | 0.5197 |
| 18  (16\_42) | ACC\_Task 0 | | 0.9991 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8294 | | 0.9173 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9120 | | 0.8463 | | | 0.9874 | |  | | |  |
| ACC\_Task 3 | | 0.9048 | | 0.7904 | | | 0.8364 | | 0.9983 | | |  |
| ACC\_Task 4 | | 0.9127 | | 0.7964 | | | 0.9085 | | 0.9439 | | | 0.9706 |
| 19  (16\_53) | ACC\_Task 0 | | 0.9315 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8921 | | 0.9478 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9315 | | 0.8314 | | | 0.9623 | |  | | |  |
| ACC\_Task 3 | | 0.9074 | | 0.8102 | | | 0.8590 | | 0.9976 | | |  |
| ACC\_Task 4 | | 0.7869 | | 0.7894 | | | 0.8902 | | 0.8845 | | | 0.9581 |
| 20  (16\_56) | ACC\_Task 0 | | 0.9992 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8858 | | 0.9266 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5825 | | 0.5678 | | | 0.5204 | |  | | |  |
| ACC\_Task 3 | | 0.6486 | | 0.5304 | | | 0.5331 | | 0.5204 | | |  |
| ACC\_Task 4 | | 0.5770 | | 0.5227 | | | 0.5238 | | 0.5474 | | | 0.5098 |
| Mean | 0.99245 |  | |  | |  | | | | |  | | |
| 0.8613 | 0.836405 | |  | |  | | | | |  | | |
| 0.844345 | 0.765735 | | 0.905715 | |  | | | | |  | | |
| 0.82532 | 0.7304 | | 0.754475 | | 0.89477 | | | | |  | | |
| 0.73536 | 0.683165 | | 0.73039 | | 0.765585 | | | | | 0.760155 | | |
| Var | 0.000255 |  | |  | |  | | | | |  | | |
| 0.012694 | 0.020689 | |  | |  | | | | |  | | |
| 0.016942 | 0.010524 | | 0.027547 | |  | | | | |  | | |
| 0.010247 | 0.009041 | | 0.010323 | | 0.037839 | | | | |  | | |
| 0.01962 | 0.016266 | | 0.026939 | | 0.032234 | | | | | 0.043055 | | |
| Abnormal: 10/20  Normal: 10/20 | | | | | | | | | | | | | |
| **test\_aae\_GR(Sequential Learning, with GR)** | | | | | | | | | | | | | |
| **Folder：MNIST\_GR\_0719** | | | | | | | | | | | | | |
| 1  (10\_12) | ACC\_Task 0 | | 0.9879 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9062 | | 0.8045 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9146 | | 0.7247 | | | 0.8218 | |  | | |  |
| ACC\_Task 3 | | 0.8991 | | 0.6955 | | | 0.9037 | | 0.7944 | | |  |
| ACC\_Task 4 | | 0.9381 | | 0.7646 | | | 0.8043 | | 0.8860 | | | 0.8765 |
| 2  (10\_13) | ACC\_Task 0 | | 0.9972 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9740 | | 0.9285 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9309 | | 0.8619 | | | 0.8833 | |  | | |  |
| ACC\_Task 3 | | 0.9590 | | 0.7424 | | | 0.8081 | | 0.8481 | | |  |
| ACC\_Task 4 | | 0.8925 | | 0.7657 | | | 0.8545 | | 0.8442 | | | 0.8729 |
| 3  (10\_14) | ACC\_Task 0 | | 0.9994 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.5371 | | 0.5332 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8863 | | 0.8334 | | | 0.8561 | |  | | |  |
| ACC\_Task 3 | | 0.8719 | | 0.7825 | | | 0.8448 | | 0.9662 | | |  |
| ACC\_Task 4 | | 0.9359 | | 0.8108 | | | 0.8512 | | 0.9701 | | | 0.9172 |
| 4  (10\_15) | ACC\_Task 0 | | 0.9989 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9861 | | 0.7899 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8443 | | 0.8057 | | | 0.7279 | |  | | |  |
| ACC\_Task 3 | | 0.9099 | | 0.6757 | | | 0.7590 | | 0.9164 | | |  |
| ACC\_Task 4 | | 0.8846 | | 0.6893 | | | 0.8044 | | 0.8914 | | | 0.8441 |
| 5  (10\_17) | ACC\_Task 0 | | 0.9980 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9709 | | 0.8741 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9678 | | 0.7970 | | | 0.9241 | |  | | |  |
| ACC\_Task 3 | | 0.9350 | | 0.7498 | | | 0.8579 | | 0.9168 | | |  |
| ACC\_Task 4 | | 0.9477 | | 0.7575 | | | 0.8629 | | 0.8862 | | | 0.7870 |
| 6  (10\_54) | ACC\_Task 0 | | 0.9853 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9429 | | 0.7108 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8931 | | 0.7020 | | | 0.8046 | |  | | |  |
| ACC\_Task 3 | | 0.9379 | | 0.6809 | | | 0.9062 | | 0.9358 | | |  |
| ACC\_Task 4 | | 0.8391 | | 0.7242 | | | 0.8686 | | 0.9583 | | | 0.9261 |
| 7  (10\_57) | ACC\_Task 0 | | 0.9921 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.7043 | | 0.5999 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9058 | | 0.8006 | | | 0.7829 | |  | | |  |
| ACC\_Task 3 | | 0.9156 | | 0.6544 | | | 0.7893 | | 0.9590 | | |  |
| ACC\_Task 4 | | 0.9222 | | 0.7387 | | | 0.7785 | | 0.8816 | | | 0.8448 |
| 8  (11\_04) | ACC\_Task 0 | | 0.9981 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9740 | | 0.8752 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9857 | | 0.7618 | | | 0.7404 | |  | | |  |
| ACC\_Task 3 | | 0.9769 | | 0.7513 | | | 0.8184 | | 0.8251 | | |  |
| ACC\_Task 4 | | 0.9467 | | 0.7107 | | | 0.7607 | | 0.7945 | | | 0.8326 |
| 9  (11\_06) | ACC\_Task 0 | | 0.9991 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9930 | | 0.8878 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9743 | | 0.8555 | | | 0.8944 | |  | | |  |
| ACC\_Task 3 | | 0.9522 | | 0.7657 | | | 0.6928 | | 0.8391 | | |  |
| ACC\_Task 4 | | 0.5372 | | 0.5084 | | | 0.5190 | | 0.5147 | | | 0.5105 |
| 10  (11\_11) | ACC\_Task 0 | | 0.9990 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9556 | | 0.9362 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9603 | | 0.8832 | | | 0.9546 | |  | | |  |
| ACC\_Task 3 | | 0.9575 | | 0.8178 | | | 0.8801 | | 0.9396 | | |  |
| ACC\_Task 4 | | 0.9703 | | 0.7771 | | | 0.9411 | | 0.8911 | | | 0.9181 |
| 11  (13\_33) | ACC\_Task 0 | | 0.9989 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9812 | | 0.8504 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9716 | | 0.7542 | | | 0.9482 | |  | | |  |
| ACC\_Task 3 | | 0.9790 | | 0.7291 | | | 0.8169 | | 0.9387 | | |  |
| ACC\_Task 4 | | 0.9409 | | 0.7424 | | | 0.8144 | | 0.8930 | | | 0.8179 |
| 12  (13\_37) | ACC\_Task 0 | | 0.9862 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9453 | | 0.8902 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8861 | | 0.8127 | | | 0.7906 | |  | | |  |
| ACC\_Task 3 | | 0.9383 | | 0.7942 | | | 0.7532 | | 0.9839 | | |  |
| ACC\_Task 4 | | 0.8677 | | 0.8005 | | | 0.7818 | | 0.9590 | | | 0.9022 |
| 13  (13\_39) | ACC\_Task 0 | | 0.9941 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.5346 | | 0.5618 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8753 | | 0.7858 | | | 0.7866 | |  | | |  |
| ACC\_Task 3 | | 0.8211 | | 0.7400 | | | 0.8999 | | 0.9054 | | |  |
| ACC\_Task 4 | | 0.8832 | | 0.7500 | | | 0.8836 | | 0.9165 | | | 0.9060 |
| 14  (13\_40) | ACC\_Task 0 | | 0.9993 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9665 | | 0.9337 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9741 | | 0.8697 | | | 0.9125 | |  | | |  |
| ACC\_Task 3 | | 0.9832 | | 0.7279 | | | 0.8298 | | 0.8951 | | |  |
| ACC\_Task 4 | | 0.9390 | | 0.7830 | | | 0.8944 | | 0.7831 | | | 0.9137 |
| 15  (13\_41) | ACC\_Task 0 | | 0.9976 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9465 | | 0.8991 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9542 | | 0.7753 | | | 0.9080 | |  | | |  |
| ACC\_Task 3 | | 0.5977 | | 0.5223 | | | 0.5498 | | 0.5495 | | |  |
| ACC\_Task 4 | | 0.5338 | | 0.5083 | | | 0.5201 | | 0.5158 | | | 0.5091 |
| 16  (14\_32) | ACC\_Task 0 | | 0.9854 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9608 | | 0.7246 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9287 | | 0.7262 | | | 0.9129 | |  | | |  |
| ACC\_Task 3 | | 0.9502 | | 0.7537 | | | 0.9142 | | 0.9443 | | |  |
| ACC\_Task 4 | | 0.9470 | | 0.7657 | | | 0.8851 | | 0.8633 | | | 0.9103 |
| 17  (14\_39) | ACC\_Task 0 | | 0.5431 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.5324 | | 0.5408 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9349 | | 0.6693 | | | 0.9365 | |  | | |  |
| ACC\_Task 3 | | 0.9611 | | 0.6629 | | | 0.8942 | | 0.8780 | | |  |
| ACC\_Task 4 | | 0.8942 | | 0.6512 | | | 0.8737 | | 0.8560 | | | 0.9367 |
| 18  (14\_40) | ACC\_Task 0 | | 0.9971 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9462 | | 0.8409 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9398 | | 0.7650 | | | 0.8400 | |  | | |  |
| ACC\_Task 3 | | 0.9270 | | 0.7039 | | | 0.7630 | | 0.7996 | | |  |
| ACC\_Task 4 | | 0.9356 | | 0.7454 | | | 0.7282 | | 0.8509 | | | 0.8275 |
| 19  (14\_44) | ACC\_Task 0 | | 0.9983 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9851 | | 0.8791 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9689 | | 0.8641 | | | 0.9064 | |  | | |  |
| ACC\_Task 3 | | 0.9240 | | 0.8238 | | | 0.8155 | | 0.8326 | | |  |
| ACC\_Task 4 | | 0.9381 | | 0.7877 | | | 0.7805 | | 0.8434 | | | 0.8503 |
| 20  (14\_49) | ACC\_Task 0 | | 0.9870 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9772 | | 0.8141 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.9290 | | 0.8142 | | | 0.9034 | |  | | |  |
| ACC\_Task 3 | | 0.8926 | | 0.8156 | | | 0.8749 | | 0.9325 | | |  |
| ACC\_Task 4 | | 0.8842 | | 0.8243 | | | 0.8047 | | 0.8367 | | | 0.8198 |
| Mean | 0.9721 |  | |  | |  | | | | |  | | |
| 0.885995 | 0.79374 | |  | |  | | | | |  | | |
| 0.931285 | 0.793115 | | 0.86176 | |  | | | | |  | | |
| 0.91446 | 0.72947 | | 0.818585 | | 0.880005 | | | | |  | | |
| 0.8789 | 0.730275 | | 0.800585 | | 0.84179 | | | | | 0.836165 | | |
| Var | 0.010224 |  | |  | |  | | | | |  | | |
| 0.026631 | 0.018344 | |  | |  | | | | |  | | |
| 0.00156 | 0.003514 | | 0.0049 | |  | | | | |  | | |
| 0.0071 | 0.00496 | | 0.007667 | | 0.009263 | | | | |  | | |
| 0.015554 | 0.007402 | | 0.012009 | | 0.014848 | | | | | 0.014298 | | |
| Abnormal: 4/20  Normal: 16/20 | | | | | | | | | | | | | |
| **Dataset: Fashion\_MNIST** | | | | | | | | | | | | | |
| **test\_aae(all Data)** | | | | | | | | | | | | | |
| **Folder：Fashion\_MNIST\_all\_0715** | | | | | | | | | | | | | |
| Nr. | Acc | |  | | | | | | | | | | |
| **Date：20190715** | | |  | | | | | | | | | | |
| 1(11\_30) | 0.1067 | |  | | | | | | | | | | |
| 2(11\_34) | 0.6819 | |  | | | | | | | | | | |
| 3(11\_38) | 0.1089 | |  | | | | | | | | | | |
| 4(11\_39) | 0.6313 | |  | | | | | | | | | | |
| 5(11\_42) | 0.5251 | |  | | | | | | | | | | |
| 6(11\_44) | 0.44345 | |  | | | | | | | | | | |
| 7(11\_48) | 0.6484 | |  | | | | | | | | | | |
| 8(11\_54) | 0.1045 | |  | | | | | | | | | | |
| 9(11\_56) | 0.65565 | |  | | | | | | | | | | |
| 10(11\_58) | 0.1035 | |  | | | | | | | | | | |
| 11(13\_08) | 0.6060 | |  | | | | | | | | | | |
| 12(13\_10) | 0.6524 | |  | | | | | | | | | | |
| 13(13\_13) | 0.4178 | |  | | | | | | | | | | |
| 14(13\_18) | 0.6498 | |  | | | | | | | | | | |
| 15(13\_20) | 0.6574 | |  | | | | | | | | | | |
| **Date：20190719** | | |  | | | | | | | | | | |
| 16(17\_05) | 0.6630 | |  | | | | | | | | | | |
| 17(17\_07) | 0.6609 | |  | | | | | | | | | | |
| 18(17\_10) | 0.6944 | |  | | | | | | | | | | |
| 19(17\_12) | 0.1053 | |  | | | | | | | | | | |
| 20(17\_35) | 0.6606 | |  | | | | | | | | | | |
| Mean | 0.48885 | |  | | | | | | | | | | |
| Variance | 0.056814 | |  | | | | | | | | | | |
| Acc = 10%: 5/20  20%< Acc < 60% : 3/20  Acc>60%: 12/20 | | | | | | | | | | | | | |
| **test\_aae\_noGR(Sequential Learning, without GR)** | | | | | | | | | | | | | |
| **Folder：Fashion\_MNIST\_noGR\_0715** | | | | | | | | | | | | | |
| 1  (13\_50) | ACC\_Task 0 | | 0.9640 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8785 | | 0.9244 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8933 | | 0.8379 | | | 0.9976 | |  | | |  |
| ACC\_Task 3 | | 0.9093 | | 0.9027 | | | 0.9598 | | 0.9993 | | |  |
| ACC\_Task 4 | | 0.8128 | | 0.8603 | | | 0.9198 | | 0.9438 | | | 0.9952 |
| 2  (13\_51) | ACC\_Task 0 | | 0.9513 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.5026 | | 0.5101 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5040 | | 0.5066 | | | 0.5086 | |  | | |  |
| ACC\_Task 3 | | 0.7048 | | 0.6557 | | | 0.9681 | | 0.9834 | | |  |
| ACC\_Task 4 | | 0.5214 | | 0.5048 | | | 0.5147 | | 0.5349 | | | 0.5058 |
| 3  (13\_54) | ACC\_Task 0 | | 0.9814 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9130 | | 0.9592 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8208 | | 0.8294 | | | 0.9563 | |  | | |  |
| ACC\_Task 3 | | 0.8643 | | 0.9126 | | | 0.9486 | | 0.9983 | | |  |
| ACC\_Task 4 | | 0.8743 | | 0.7800 | | | 0.9306 | | 0.9883 | | | 0.9677 |
| 4  (13\_56) | ACC\_Task 0 | | 0.9790 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8817 | | 0.9610 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8195 | | 0.9295 | | | 0.9878 | |  | | |  |
| ACC\_Task 3 | | 0.8868 | | 0.9033 | | | 0.9546 | | 0.9992 | | |  |
| ACC\_Task 4 | | 0.9015 | | 0.8790 | | | 0.9429 | | 0.9601 | | | 0.9758 |
| 5  (13\_57)  ? | ACC\_Task 0 | | 0.9754 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9013 | | 0.9640 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5736 | | 0.5483 | | | 0.5083 | |  | | |  |
| ACC\_Task 3 | | 0.5449 | | 0.5288 | | | 0.5009 | | 0.5096 | | |  |
| ACC\_Task 4 | | 0.8457 | | 0.8497 | | | 0.9478 | | 0.9773 | | | 0.9777 |
| 6  (14\_42) | ACC\_Task 0 | | 0.9780 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.5259 | | 0.5079 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5390 | | 0.5905 | | | 0.5215 | |  | | |  |
| ACC\_Task 3 | | 0.5078 | | 0.5433 | | | 0.5419 | | 0.5112 | | |  |
| ACC\_Task 4 | | 0.5018 | | 0.5331 | | | 0.5005 | | 0.5090 | | | 0.5081 |
| 7  (14\_44) | ACC\_Task 0 | | 0.8409 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8767 | | 0.9600 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8156 | | 0.8509 | | | 0.9297 | |  | | |  |
| ACC\_Task 3 | | 0.8793 | | 0.7812 | | | 0.9910 | | 0.9999 | | |  |
| ACC\_Task 4 | | 0.5000 | | 0.5000 | | | 0.5000 | | 0.5000 | | | 0.5002 |
| 8  (14\_48) | ACC\_Task 0 | | 0.9606 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8925 | | 0.9563 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.7820 | | 0.7439 | | | 0.9966 | |  | | |  |
| ACC\_Task 3 | | 0.5072 | | 0.5500 | | | 0.5150 | | 0.5039 | | |  |
| ACC\_Task 4 | | 0.5018 | | 0.5135 | | | 0.5001 | | 0.5000 | | | 0.5000 |
| 9  (14\_50) | ACC\_Task 0 | | 0.9662 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8184 | | 0.9212 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8638 | | 0.8745 | | | 0.9954 | |  | | |  |
| ACC\_Task 3 | | 0.8369 | | 0.9177 | | | 0.9533 | | 0.9990 | | |  |
| ACC\_Task 4 | | 0.9148 | | 0.7975 | | | 0.9421 | | 0.9393 | | | 0.9971 |
| 10  (14\_53) | ACC\_Task 0 | | 0.9499 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9236 | | 0.9533 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8325 | | 0.8664 | | | 0.9732 | |  | | |  |
| ACC\_Task 3 | | 0.7925 | | 0.6434 | | | 0.9833 | | 0.9943 | | |  |
| ACC\_Task 4 | | 0.5021 | | 0.5003 | | | 0.5039 | | 0.5038 | | | 0.5079 |
| 11  (15\_16) | ACC\_Task 0 | | 0.9771 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8775 | | 0.9542 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8562 | | 0.9399 | | | 0.9699 | |  | | |  |
| ACC\_Task 3 | | 0.8080 | | 0.8881 | | | 0.9473 | | 0.9978 | | |  |
| ACC\_Task 4 | | 0.8363 | | 0.8188 | | | 0.8895 | | 0.9662 | | | 0.9818 |
| 12  (15\_19) | ACC\_Task 0 | | 0.9754 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8603 | | 0.9604 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5426 | | 0.5457 | | | 0.5129 | |  | | |  |
| ACC\_Task 3 | | 0.5249 | | 0.5036 | | | 0.6218 | | 0.5093 | | |  |
| ACC\_Task 4 | | 0.7699 | | 0.6873 | | | 0.9286 | | 0.9645 | | | 0.7338 |
| 13  (15\_27) | ACC\_Task 0 | | 0.9851 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8707 | | 0.9229 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5130 | | 0.5455 | | | 0.5016 | |  | | |  |
| ACC\_Task 3 | | 0.9033 | | 0.8576 | | | 0.9918 | | 0.9973 | | |  |
| ACC\_Task 4 | | 0.5625 | | 0.6760 | | | 0.5183 | | 0.5530 | | | 0.5176 |
| 14  (15\_30) | ACC\_Task 0 | | 0.9748 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8978 | | 0.9489 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.6990 | | 0.6179 | | | 0.9984 | |  | | |  |
| ACC\_Task 3 | | 0.7701 | | 0.6504 | | | 0.9940 | | 0.9993 | | |  |
| ACC\_Task 4 | | 0.7684 | | 0.7861 | | | 0.9864 | | 0.9931 | | | 0.9943 |
| 15  (15\_34) | ACC\_Task 0 | | 0.9528 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.5331 | | 0.5078 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5073 | | 0.5073 | | | 0.5051 | |  | | |  |
| ACC\_Task 3 | | 0.6114 | | 0.5477 | | | 0.5483 | | 0.5122 | | |  |
| ACC\_Task 4 | | 0.5000 | | 0.5000 | | | 0.5000 | | 0.5000 | | | 0.5000 |
| **Date:20190723** | | |  | |  | | |  | |  | | |  |
| 16  (11\_23) | ACC\_Task 0 | | 0.9697 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9164 | | 0.9703 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8673 | | 0.9243 | | | 0.9930 | |  | | |  |
| ACC\_Task 3 | | 0.8430 | | 0.7201 | | | 0.9768 | | 0.9973 | | |  |
| ACC\_Task 4 | | 0.8108 | | 0.8353 | | | 0.9008 | | 0.9727 | | | 0.5705 |
| 17  (11\_35) | ACC\_Task 0 | | 0.9688 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8418 | | 0.9256 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8478 | | 0.7670 | | | 0.9982 | |  | | |  |
| ACC\_Task 3 | | 0.8172 | | 0.7247 | | | 0.9948 | | 0.9993 | | |  |
| ACC\_Task 4 | | 0.5195 | | 0.5654 | | | 0.5094 | | 0.5097 | | | 0.5088 |
| 18  (11\_36) | ACC\_Task 0 | | 0.9495 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.8944 | | 0.9303 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8754 | | 0.9228 | | | 0.9770 | |  | | |  |
| ACC\_Task 3 | | 0.7603 | | 0.6884 | | | 0.9839 | | 0.9983 | | |  |
| ACC\_Task 4 | | 0.8014 | | 0.8248 | | | 0.9123 | | 0.9364 | | | 0.8636 |
| 19  (11\_38) | ACC\_Task 0 | | 0.9768 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.5044 | | 0.5033 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.5055 | | 0.5024 | | | 0.5113 | |  | | |  |
| ACC\_Task 3 | | 0.6230 | | 0.5100 | | | 0.9772 | | 0.9983 | | |  |
| ACC\_Task 4 | | 0.5026 | | 0.5002 | | | 0.5000 | | 0.5000 | | | 0.5000 |
| 20  (11\_39) | ACC\_Task 0 | | 0.9493 | |  | | |  | |  | | |  |
| ACC\_Task 1 | | 0.9070 | | 0.9395 | | |  | |  | | |  |
| ACC\_Task 2 | | 0.8344 | | 0.9205 | | | 0.9775 | |  | | |  |
| ACC\_Task 3 | | 0.8316 | | 0.9315 | | | 0.9692 | | 0.9955 | | |  |
| ACC\_Task 4 | | 0.8584 | | 0.8269 | | | 0.9225 | | 0.9527 | | | 0.9963 |
| Mean | 0.9613 |  | |  | |  | | | | |  | | |
| 0.81088 | 0.85903 | |  | |  | | | | |  | | |
| 0.72463 | 0.73856 | | 0.815995 | |  | | | | |  | | |
| 0.74633 | 0.71804 | | 0.86608 | | 0.875135 | | | | |  | | |
| 0.6903 | 0.68695 | | 0.73851 | | 0.76024 | | | | | 0.73011 | | |
| Var | 0.000941 |  | |  | |  | | | | |  | | |
| 0.023453 | 0.032786 | |  | |  | | | | |  | | |
| 0.024035 | 0.029218 | | 0.05338 | |  | | | | |  | | |
| 0.019889 | 0.024838 | | 0.036716 | | 0.04699 | | | | |  | | |
| 0.032806 | 0.023345 | | 0.047254 | | 0.053299 | | | | | 0.053779 | | |
| Abnormal: 11/20  Normal: 9/20 | | | | | | | | | | | | | |
| **test\_aae\_GR(Sequential Learning, with GR)** | | | | | | | | | | | | | |
| **Folder: Fashion\_MNIST\_GR\_0715** | | | | | | | | | | | | | |
| 1  (15\_58) | ACC\_Task 0 | | 0.9719 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9293 | | 0.9012 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.8813 | | 0.9322 | | 0.9360 | |  | | |  | |
| ACC\_Task 3 | | 0.9043 | | 0.9327 | | 0.8977 | | 0.9596 | | |  | |
| ACC\_Task 4 | | 0.8819 | | 0.9070 | | 0.9060 | | 0.9698 | | | 0.9723 | |
| 2  (16\_01) | ACC\_Task 0 | | 0.9752 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9275 | | 0.9331 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5000 | | 0.5004 | | 0.5000 | |  | | |  | |
| ACC\_Task 3 | | 0.5000 | | 0.5000 | | 0.5000 | | 0.5000 | | |  | |
| ACC\_Task 4 | | 0.5993 | | 0.5852 | | 0.6872 | | 0.6960 | | | 0.5507 | |
| 3  (16\_04) | ACC\_Task 0 | | 0.9719 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.5039 | | 0.5297 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5000 | | 0.5000 | | 0.5000 | |  | | |  | |
| ACC\_Task 3 | | 0.5112 | | 0.5015 | | 0.5449 | | 0.5017 | | |  | |
| ACC\_Task 4 | | 0.5029 | | 0.5006 | | 0.5033 | | 0.5051 | | | 0.5131 | |
| 4  (16\_05) | ACC\_Task 0 | | 0.9768 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9658 | | 0.9436 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5018 | | 0.5070 | | 0.5010 | |  | | |  | |
| ACC\_Task 3 | | 0.5004 | | 0.5055 | | 0.5048 | | 0.5279 | | |  | |
| ACC\_Task 4 | | 0.5006 | | 0.5091 | | 0.5048 | | 0.5039 | | | 0.5502 | |
| 5  (16\_06) | ACC\_Task 0 | | 0.9773 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.5024 | | 0.5147 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.7509 | | 0.6572 | | 0.9888 | |  | | |  | |
| ACC\_Task 3 | | 0.5199 | | 0.5091 | | 0.5068 | | 0.5246 | | |  | |
| ACC\_Task 4 | | 0.5352 | | 0.5010 | | 0.5000 | | 0.5002 | | | 0.5054 | |
| 6  (16\_46) | ACC\_Task 0 | | 0.9442 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9152 | | 0.8755 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.9291 | | 0.9175 | | 0.9436 | |  | | |  | |
| ACC\_Task 3 | | 0.9329 | | 0.9213 | | 0.9794 | | 0.9824 | | |  | |
| ACC\_Task 4 | | 0.5000 | | 0.5000 | | 0.5000 | | 0.5000 | | | 0.5000 | |
| 7  (16\_51) | ACC\_Task 0 | | 0.9747 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.5311 | | 0.6224 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.8728 | | 0.9416 | | 0.8383 | |  | | |  | |
| ACC\_Task 3 | | 0.8447 | | 0.9182 | | 0.9193 | | 0.9678 | | |  | |
| ACC\_Task 4 | | 0.8678 | | 0.9163 | | 0.8053 | | 0.9556 | | | 0.9270 | |
| 8  (16\_55) | ACC\_Task 0 | | 0.9814 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9613 | | 0.9551 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.9359 | | 0.9420 | | 0.8468 | |  | | |  | |
| ACC\_Task 3 | | 0.9356 | | 0.9373 | | 0.9455 | | 0.9598 | | |  | |
| ACC\_Task 4 | | 0.9218 | | 0.9166 | | 0.9478 | | 0.9777 | | | 0.9746 | |
| 9  (17\_03) | ACC\_Task 0 | | 0.9721 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9129 | | 0.8987 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5000 | | 0.5000 | | 0.5000 | |  | | |  | |
| ACC\_Task 3 | | 0.5021 | | 0.5057 | | 0.5263 | | 0.5256 | | |  | |
| ACC\_Task 4 | | 0.5031 | | 0.5060 | | 0.5003 | | 0.5012 | | | 0.5012 | |
| 10  (17\_06) | ACC\_Task 0 | | 0.9705 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9156 | | 0.9039 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5000 | | 0.5000 | | 0.5000 | |  | | |  | |
| ACC\_Task 3 | | 0.5139 | | 0.5003 | | 0.5002 | | 0.5061 | | |  | |
| ACC\_Task 4 | | 0.5000 | | 0.5000 | | 0.5000 | | 0.5000 | | | 0.5000 | |
| **Date:20190723** | | |  | |  | |  | |  | | |  | |
| 11  (12\_00) | ACC\_Task 0 | | 0.9719 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.5864 | | 0.6609 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5008 | | 0.5177 | | 0.5124 | |  | | |  | |
| ACC\_Task 3 | | 0.5150 | | 0.5027 | | 0.5026 | | 0.5073 | | |  | |
| ACC\_Task 4 | | 0.5202 | | 0.5118 | | 0.5028 | | 0.5002 | | | 0.5020 | |
| 12  (12\_01) | ACC\_Task 0 | | 0.9559 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9175 | | 0.8888 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5096 | | 0.5256 | | 0.5033 | |  | | |  | |
| ACC\_Task 3 | | 0.5048 | | 0.5215 | | 0.5044 | | 0.5078 | | |  | |
| ACC\_Task 4 | | 0.5024 | | 0.5009 | | 0.5031 | | 0.5046 | | | 0.5442 | |
| 13  (12\_02) | ACC\_Task 0 | | 0.5063 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9586 | | 0.9155 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.9143 | | 0.8780 | | 0.9018 | |  | | |  | |
| ACC\_Task 3 | | 0.7919 | | 0.7788 | | 0.9421 | | 0.9044 | | |  | |
| ACC\_Task 4 | | 0.5000 | | 0.5000 | | 0.5000 | | 0.5000 | | | 0.5000 | |
| 14  (12\_03) | ACC\_Task 0 | | 0.9755 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9339 | | 0.9297 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.9315 | | 0.8838 | | 0.8993 | |  | | |  | |
| ACC\_Task 3 | | 0.8534 | | 0.8973 | | 0.9597 | | 0.9673 | | |  | |
| ACC\_Task 4 | | 0.9078 | | 0.9294 | | 0.9633 | | 0.9664 | | | 0.9640 | |
| 15  (12\_04) | ACC\_Task 0 | | 0.9786 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.5074 | | 0.5072 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5322 | | 0.5080 | | 0.6390 | |  | | |  | |
| ACC\_Task 3 | | 0.5233 | | 0.5115 | | 0.5025 | | 0.5057 | | |  | |
| ACC\_Task 4 | | 0.8657 | | 0.9153 | | 0.9593 | | 0.9678 | | | 0.8903 | |
| 16  (13\_16) | ACC\_Task 0 | | 0.9433 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9479 | | 0.9055 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5056 | | 0.5001 | | 0.5281 | |  | | |  | |
| ACC\_Task 3 | | 0.5000 | | 0.5000 | | 0.5000 | | 0.5000 | | |  | |
| ACC\_Task 4 | | 0.5209 | | 0.5288 | | 0.5143 | | 0.5183 | | | 0.5633 | |
| 17  (13\_18) | ACC\_Task 0 | | 0.9758 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9458 | | 0.9403 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5381 | | 0.5328 | | 0.5114 | |  | | |  | |
| ACC\_Task 3 | | 0.9291 | | 0.8921 | | 0.9515 | | 0.9605 | | |  | |
| ACC\_Task 4 | | 0.8980 | | 0.9112 | | 0.8883 | | 0.9338 | | | 0.9347 | |
| 18  (13\_19) | ACC\_Task 0 | | 0.9788 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9083 | | 0.9453 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5290 | | 0.5096 | | 0.5073 | |  | | |  | |
| ACC\_Task 3 | | 0.9149 | | 0.9349 | | 0.9333 | | 0.9650 | | |  | |
| ACC\_Task 4 | | 0.8481 | | 0.8937 | | 0.9394 | | 0.9134 | | | 0.9291 | |
| 19  (13\_24) | ACC\_Task 0 | | 0.9760 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9461 | | 0.9180 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.8472 | | 0.9034 | | 0.9492 | |  | | |  | |
| ACC\_Task 3 | | 0.8958 | | 0.9041 | | 0.9438 | | 0.9932 | | |  | |
| ACC\_Task 4 | | 0.8769 | | 0.7311 | | 0.9636 | | 0.9863 | | | 0.9227 | |
| 20  (13\_27) | ACC\_Task 0 | | 0.9788 | |  | |  | |  | | |  | |
| ACC\_Task 1 | | 0.9308 | | 0.9431 | |  | |  | | |  | |
| ACC\_Task 2 | | 0.5054 | | 0.5021 | | 0.5017 | |  | | |  | |
| ACC\_Task 3 | | 0.5203 | | 0.5058 | | 0.5085 | | 0.5077 | | |  | |
| ACC\_Task 4 | | 0.5007 | | 0.5008 | | 0.5000 | | 0.5002 | | | 0.5566 | |
| Mean | 0.947845 |  | |  | |  | | | | |  | | |
| 0.832385 | 0.83161 | |  | |  | | | | |  | | |
| 0.659275 | 0.65795 | | 0.6754 | |  | | | | |  | | |
| 0.680675 | 0.684015 | | 0.703665 | | 0.71372 | | | | |  | | |
| 0.662665 | 0.66324 | | 0.67944 | | 0.695025 | | | | | 0.69007 | | |
| Var | 0.010916 |  | |  | |  | | | | |  | | |
| 0.033415 | 0.026018 | |  | |  | | | | |  | | |
| 0.036629 | 0.038547 | | 0.041492 | |  | | | | |  | | |
| 0.0385 | 0.041903 | | 0.048995 | | 0.053494 | | | | |  | | |
| 0.034855 | 0.038014 | | 0.043909 | | 0.05087 | | | | | 0.044314 | | |
| Normal : 5/20  Abnormal Data: 15/20 | | | | | | | | | | | | | |

Summary:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dataset:MNIST | | | | | | | | | | | |
| File:mean\_var\_20190723 | | | | | | | | | | | |
| All Data | | | | | | | | | | | |
| Mean | | 0.805688 | | | | | | | | | |
| Var | | 0.001754 | | | | | | | | | |
| * Stable, no suddenly drop | | | | | | | | | | | |
| Continual Learning(no GR) | | | | | | | | | | | |
| Including abnormal data | | | | | | | | | | | |
| Mean | | | 0.99245 | |  | |  | |  | |  |
| 0.8613 | | 0.836405 | |  | |  | |  |
| 0.844345 | | 0.765735 | | 0.905715 | |  | |  |
| 0.82532 | | 0.7304 | | 0.754475 | | 0.89477 | |  |
| 0.73536 | | 0.683165 | | 0.73039 | | 0.765585 | | 0.760155 |
| Var | | | 0.000255 | |  | |  | |  | |  |
| 0.012694 | | 0.020689 | |  | |  | |  |
| 0.016942 | | 0.010524 | | 0.027547 | |  | |  |
| 0.010247 | | 0.009041 | | 0.010323 | | 0.037839 | |  |
| 0.01962 | | 0.016266 | | 0.026939 | | 0.032234 | | 0.043055 |
| Normal: 10/20  Abnormal: 10/20 | | | | | | | | | | | |
| Including only normal data | | | | | | | | | | | |
| 1,2,4,7,10,12,13,16,18,19 | | | | | | | | | | | |
| Mean | 0.98986 | | |  | |  | |  | |  | |
| 0.88302 | | | 0.85379 | |  | |  | |  | |
| 0.904 | | | 0.8076 | | 0.97202 | |  | |  | |
| 0.87166 | | | 0.78213 | | 0.81784 | | 0.99524 | |  | |
| 0.83138 | | | 0.78567 | | 0.86284 | | 0.90168 | | 0.93211 | |
| Var | 0.00044 | | |  | |  | |  | |  | |
| 0.002281 | | | 0.013499 | |  | |  | |  | |
| 0.001869 | | | 0.001616 | | 0.000621 | |  | |  | |
| 0.00292 | | | 0.001318 | | 0.002831 | | 4.05E-05 | |  | |
| 0.005997 | | | 0.001462 | | 0.002398 | | 0.001383 | | 0.001793 | |
| Continual Learning(with GR) | | | | | | | | | | | |
| Including abnormal data | | | | | | | | | | | |
| Mean | | | 0.9721 | |  | |  | |  | |  |
| 0.885995 | | 0.79374 | |  | |  | |  |
| 0.931285 | | 0.793115 | | 0.86176 | |  | |  |
| 0.91446 | | 0.72947 | | 0.818585 | | 0.880005 | |  |
| 0.8789 | | 0.730275 | | 0.800585 | | 0.84179 | | 0.836165 |
| Var | | | 0.010224 | |  | |  | |  | |  |
| 0.026631 | | 0.018344 | |  | |  | |  |
| 0.00156 | | 0.003514 | | 0.0049 | |  | |  |
| 0.0071 | | 0.00496 | | 0.007667 | | 0.009263 | |  |
| 0.015554 | | 0.007402 | | 0.012009 | | 0.014848 | | 0.014298 |
| Normal: 16/20  Abnormal: 4/20 | | | | | | | | | | | |
| Including only normal data | | | | | | | | | | | |
| 1-8,10,11,12,14,16,18,19,20 | | | | | | | | | | | |
| Mean | 0.994256 | | |  | |  | |  | |  | |
| 0.919588 | | | 0.811581 | |  | |  | |  | |
| 0.930438 | | | 0.798525 | | 0.856856 | |  | |  | |
| 0.934819 | | | 0.743656 | | 0.833438 | | 0.901756 | |  | |
| 0.9206 | | | 0.761725 | | 0.825956 | | 0.87705 | | 0.866313 | |
| Var | 3.34E-05 | | |  | |  | |  | |  | |
| 0.014955 | | | 0.013715 | |  | |  | |  | |
| 0.001607 | | | 0.003114 | | 0.005218 | |  | |  | |
| 0.00104 | | | 0.002816 | | 0.002783 | | 0.003792 | |  | |
| 0.001532 | | | 0.001312 | | 0.003179 | | 0.002878 | | 0.001941 | |
| When use generative replay, the data are more stable(variance with generative replay is smaller than without generative replay). The Acc are only improved about 2% - 3%. | | | | | | | | | | | |
| Dataset:Fashion\_MNIST | | | | | | | | | | | |
| **All Data** | | | | | | | | | | | |
| Mean | | | 0.48885 | | | | | | | | |
| Variance | | | 0.056814 | | | | | | | | |
| * Abnormal: 5/20 (close to 10%) | | | | | | | | | | | |
| **Continual Learning(no GR)** | | | | | | | | | | | |
| Including abnormal data | | | | | | | | | | | |
| Mean | | | 0.9613 | |  | |  | |  | |  |
| 0.81088 | | 0.85903 | |  | |  | |  |
| 0.72463 | | 0.73856 | | 0.815995 | |  | |  |
| 0.74633 | | 0.71804 | | 0.86608 | | 0.875135 | |  |
| 0.6903 | | 0.68695 | | 0.73851 | | 0.76024 | | 0.73011 |
| Var | | | 0.000941 | |  | |  | |  | |  |
| 0.023453 | | 0.032786 | |  | |  | |  |
| 0.024035 | | 0.029218 | | 0.05338 | |  | |  |
| 0.019889 | | 0.024838 | | 0.036716 | | 0.04699 | |  |
| 0.032806 | | 0.023345 | | 0.047254 | | 0.053299 | | 0.053779 |
| Normal: 9/20  Abnormal: 11/20 | | | | | | | | | | | |
| Including only normal data | | | | | | | | | | | |
| 1,3,4,9,11,14,16,18,20 | | | | | | | | | | | |
| Mean | 0.967889 | | |  | |  | |  | |  | |
| 0.887189 | | | 0.945444 | |  | |  | |  | |
| 0.836633 | | | 0.8663 | | 0.983656 | |  | |  | |
| 0.834478 | | | 0.834978 | | 0.965278 | | 0.998222 | |  | |
| 0.842078 | | | 0.823189 | | 0.927433 | | 0.9614 | | 0.926922 | |
| Variance | 0.000143 | | |  | |  | |  | |  | |
| 0.000876 | | | 0.000304 | |  | |  | |  | |
| 0.003283 | | | 0.010355 | | 0.000209 | |  | |  | |
| 0.002458 | | | 0.012876 | | 0.000276 | | 1.54E-06 | |  | |
| 0.002385 | | | 0.001072 | | 0.0008 | | 0.000422 | | 0.019631 | |
| **Continual Learning(with GR)** | | | | | | | | | | | |
| Including abnormal data | | | | | | | | | | | |
| Mean | | | 0.947845 | |  | |  | |  | |  |
| 0.832385 | | 0.83161 | |  | |  | |  |
| 0.659275 | | 0.65795 | | 0.6754 | |  | |  |
| 0.680675 | | 0.684015 | | 0.703665 | | 0.71372 | |  |
| 0.662665 | | 0.66324 | | 0.67944 | | 0.695025 | | 0.69007 |
| Var | | | 0.010916 | |  | |  | |  | |  |
| 0.033415 | | 0.026018 | |  | |  | |  |
| 0.036629 | | 0.038547 | | 0.041492 | |  | |  |
| 0.0385 | | 0.041903 | | 0.048995 | | 0.053494 | |  |
| 0.034855 | | 0.038014 | | 0.043909 | | 0.05087 | | 0.044314 |
| Normal : 5/20  Abnormal Data: 15/20 | | | | | | | | | | | |
| Including only normal data | | | | | | | | | | | |
| 1,7,8,14, 19 | | | | | | | | | | | |
| Mean | 0.9759 | | |  | |  | |  | |  | |
| 0.86034 | | | 0.86528 | |  | |  | |  | |
| 0.89374 | | | 0.9206 | | 0.89392 | |  | |  | |
| 0.88676 | | | 0.91792 | | 0.9332 | | 0.96954 | |  | |
| 0.89124 | | | 0.88008 | | 0.9172 | | 0.97116 | | 0.95212 | |
| Variance | 1.2E-05 | | |  | |  | |  | |  | |
| 0.034028 | | | 0.018819 | |  | |  | |  | |
| 0.001491 | | | 0.000671 | | 0.002542 | |  | |  | |
| 0.001414 | | | 0.000303 | | 0.000605 | | 0.00019 | |  | |
| 0.000513 | | | 0.006999 | | 0.004465 | | 0.000135 | | 0.000638 | |

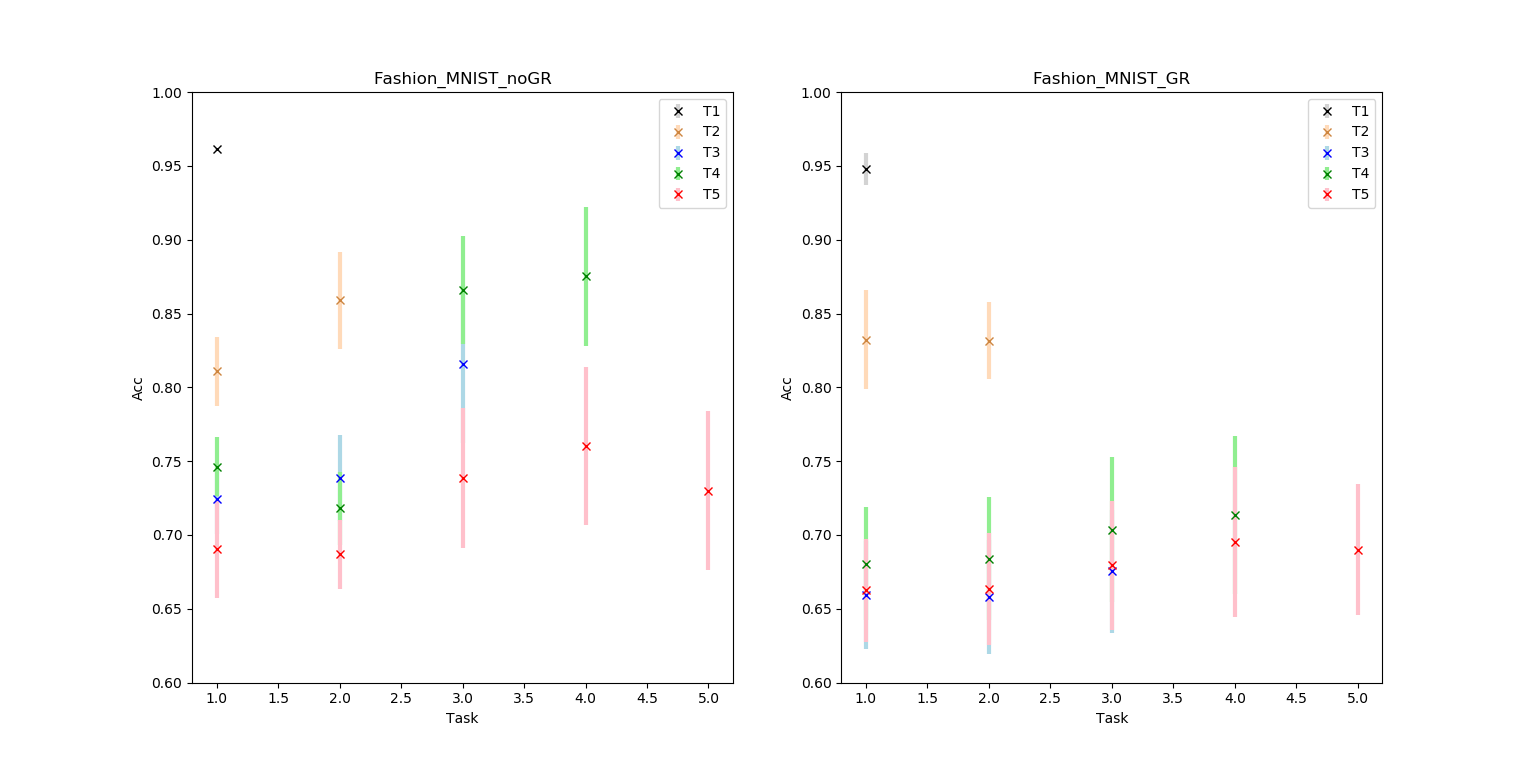
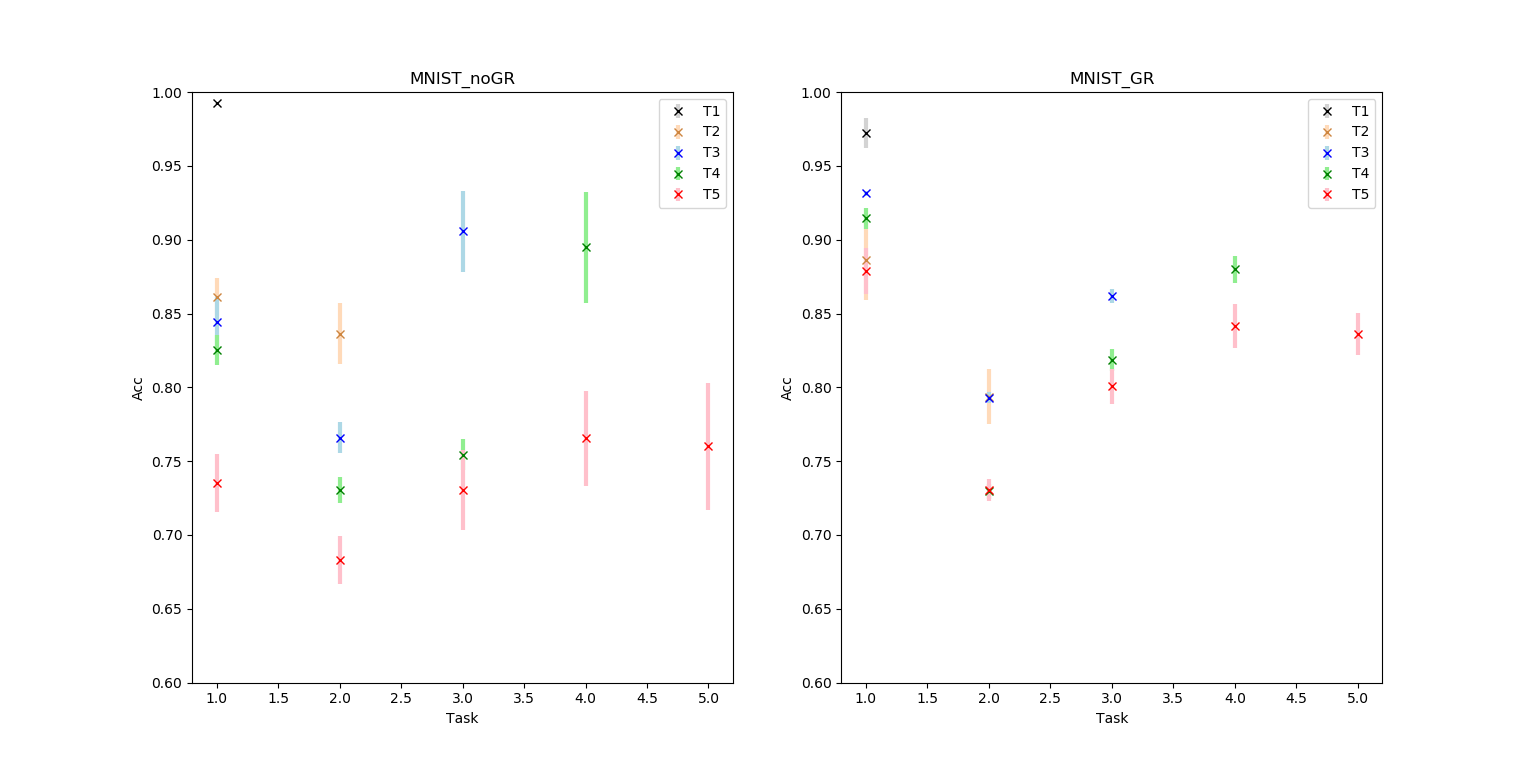
Excel：results\_2019

Py: visualization\_acc1 (Folder: Code\_20190625\_final)

Image\_folder: Code\_20190625\_final -> Visualization

Explanation：

* Use all data(abnormal&normal)
* Figure\_1: MNIST
* Figure\_2: Fashion\_MNIST



Discussion with Felix (0716):

* Change the evaluation method: after each task use the all trained data. For example after task1 use digits[0,1,2,3] for evaluating, Then for each task we get one value of ACC.
* We can use another method to verify if there also exists no catastrophe forgetting, for example normal autoencoder + k\_means. (sklearn).
* Based on continual learning, the number of clusters = 16 maybe too large for binary task. We can decrease the number of clusters to compare the results between with GR and without GR.

Discussion with Felix(0723):

Suggestion for the thesis:

[1]Discussed in different situations: all data and only normal data. Because abnormal data exist not only the situation without generative replay but also the situation with generative replay. What we need pay more attention is whether generative replay in continual learning works.

[2]from September I should start to write thesis

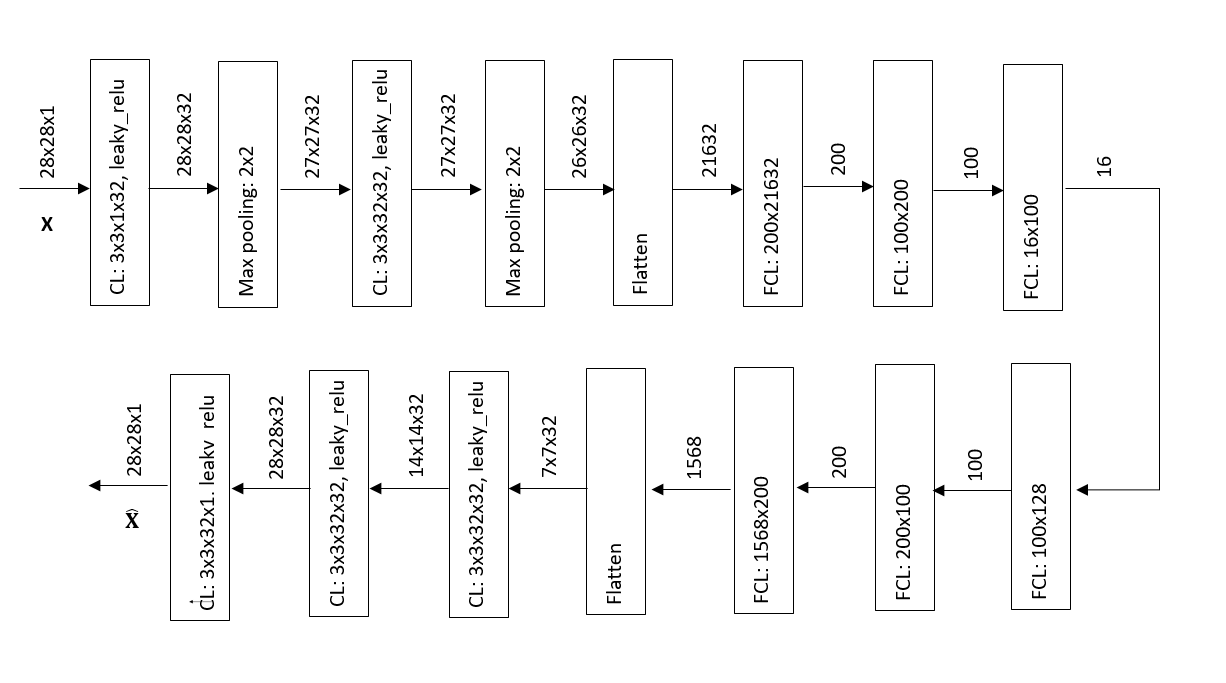
Experiments:

[1]Next I should do experiments with normal autoencoder.

[2]I don’t know whether the evaluation method should be changed. This should be discussed with Felix in next time.

**AE model**

|  |  |  |  |
| --- | --- | --- | --- |
| **Input: [?,28,28,1]** | | | |
| **Encoder: enc\_filters=[32,32], enc\_neurons = [200, 100], cont\_latent\_size = 16** | | | |
| Layer | Output\_size | Parameters | |
| Conv2D  ?\*3\*3\*1\*32 | [?,28,28,32] | * filters=32 * kernel\_size=3 * stride=1 * activation=leaky\_relu * padding="SAME"   "same"表示不够卷积核大小的块就补0 | |
| MaxPooling | [?,27,27,32] | pool\_size=2  strides=1 | |
| Conv2D  ?\*3\*3\*32\*32 | [?,27,27,32] | The same as Layer1 | |
| MaxPooling | [?,26,26,32] | The same as Layer2 | |
| Faltten | [?,21632] |  | |
| FCL(Dense) | [?,200] | * units=200 * activation= enc\_activation =leaky\_relu | |
| FCL(Dense) | [?,100] | * units=200 * activation= enc\_activation =leaky\_relu | |
| Output | [?,16] | * units=cont\_latent\_size=16 * activation=None(linear) | |
| **Decoder: dec\_neurons = [100, 200, 7\*7\*32], dec\_im\_shape = [7, 7, 32],**  **dec\_filters = [32, 32, 1]** | | | |
| FCL(Dense) | [?,100] | | * units=100 * activation=dec\_activation=leaky\_relu |
| FCL(Dense) | [?,200] | | The same as previous |
| FCL(Dense) | [?,7\*7\*32]=[?,1568] | | The same as previous |
| Flatten | [?,7,7,32] | |  |
| Conv2DTranspose  ?\*3\*3\*32\*32 | [?,14,14,32] | | * filters=32 * kernel\_size=3 * stride=2 * activation=leaky\_relu * padding="SAME" |
| Conv2DTranspose  ?\*3\*3\*32\*32 | [?,28,28,32] | | The same as previous |
| Conv2DTranspose  ?\*3\*3\*32\*1 | [?,28,28,1] | | * filters=32 * kernel\_size=3 * stride=1 * activation= tf.nn.sigmoid * padding="SAME" |
| Faltten | [?,784] | |  |
| **Loss function: l2 loss**  loss\_recon = tf.reduce\_mean(tf.square(tf.subtract(self.input, self.dec\_out))) | | | |
| **Optimizer: RMSProp**  opt\_recon = tf.train.RMSPropOptimizer(self.learning\_rate) | | | |



Reference:

[1]Calculate the output\_size after convolutional layer?

<https://blog.csdn.net/HelloZEX/article/details/81109136>

[2]Slide 9-8 Autoencoder model from Professor Yang

Question:

[1]Why use the activation=sigmoid in the Conv2DTranspose? In the model from slide also use the activation function as leaky\_relu.

**First Step：find the best hyperparameters for the model**

<https://blog.csdn.net/sinat_34611224/article/details/84072205>

[1] determine enc\_neurons and dec\_neurons

Input:(?,21632)-> (?,output1) ->(?,output2)

|  |  |  |  |
| --- | --- | --- | --- |
| **[1]Change enc\_neurons** | | | |
| **Folder:Enc\_neuron\_20190724** | | | |
| cont\_latent\_size = 16  img\_size = [28, 28, 1]  n\_clusters = 16  num\_classes = 10  epochs = 20  batch\_size = 256  learning\_rate = 0.001 | | | |
| Enc\_neurons | Acc | Mean |  |
| **Date:20190724** | | | |
| [200,100] | 0.7132/0.7507/0.7406 | 0.7348 | 17\_34/17\_37/17\_38 |
| [300,200] | 0.7357/0.7446/0.74125 | 0.7405 | 17\_46/17\_48/17\_50 |
| [300,100] | 0.7386/0.7294/0.7324 | 0.7335 | 17\_43/17\_47/17\_52 |
| **Date:20190725** | | | |
| [400,300] | 0.7323/0.7539/0.7414 | 0.7425 | 13\_56/13\_58/14\_01 |
| [400,200] | 0.7446/0.7516/0.73875 | 0.7450 | 13\_55/13\_57/14\_00 |
| [400,100] | 0.7408/0.7313/0.7078 |  | 14\_02/14\_06/14\_08 |
| [500,400] | 0.75055/0.73035/0.7333 |  | 14\_04/14\_07/14\_09 |
| [500,300] | 0.7338/0.7302/0.74735 |  | 14\_17/14\_20/14\_23 |
| [500,200] | 0.7448/0.7141/0.7281 |  | 14\_18/14\_21/14\_23 |
| [500,100] | 0.7475 |  | 14\_27 |
| [600,500] | 0.7311 |  | 14\_36 |
| [600,400] | 0.74925 |  | 14\_37 |
| [600,300] | 0.75745 |  | 14\_39 |
| [600,200] | 0.7537 |  | 14\_48 |
| [600,100] | 0.7403 |  | 14\_49 |
| [700,600] | 0.7267 |  | 14\_51 |
| [700,500] | 0.7348 |  | 14\_53 |
| [700,400] | 0.7492 |  | 14\_54 |
| [700,300] | 0.73405 |  | 14\_57 |
| [700,200] | 0.7270 |  | 14\_58 |
| [700,100] | 0.7369 |  | 15\_03 |
| * Change enc\_neurons brings a little influence on Acc * So determine the enc\_neurons=[200,100] as previous | | | |
|  | | | |
| Picture: Enc\_neuron\_20190730 | | | |

[2]Change mini-batch

|  |  |  |
| --- | --- | --- |
| **[2]Change batch\_size** | | |
| **Folder: Batch\_size\_20190724** | | |
| cont\_latent\_size = 16  img\_size = [28, 28, 1]  n\_clusters = 16  num\_classes = 10  epochs = 20  learning\_rate = 0.001  enc\_neurons = [200,100]  dex\_neurons = [100,200,7\*7\*32] | | |
| Batch\_size | Acc |  |
| 32 | 0.74115/0.7489/0.7346 | 15\_21/15\_43/15\_45 |
| 64 | 0.76698/0.7255/0.7529 | 15\_22/15\_35/15\_36 |
| 128 | 0.72175/0.7328/0.7222 | 15\_29/15\_51/15\_54 |
| 256 | 0.72752/0.7150/0.7308 | 15\_30/15\_56/16\_00 |
| 512 | 0.7133/0.6853/0.7118 | 15\_33/15\_59/16\_02 |
| * batch\_size = 64 | | |
|  | | |
| Picture: Batch\_size\_20190730 | | |
| Problem: Epochs is too small for batch\_size=64,128,256,512,need to test once more | | |

[3]Change Learning-rate

|  |  |  |
| --- | --- | --- |
| **[2]Change Learning-rate** | | |
| **Folder: Learning\_rate\_20190724** | | |
| cont\_latent\_size = 16  img\_size = [28, 28, 1]  n\_clusters = 16  num\_classes = 10  epochs = 20  batch\_size=64  enc\_neurons = [200,100]  dex\_neurons = [100,200,7\*7\*32] | | |
| Learning\_rate | Acc |  |
| 0.001 | 0.76698/0.7255/0.7529  (from last table) |  |
| 0.01 | 0.7070/0.7459/0.72005 | 16\_10/16\_14 |
| 0.1 | 0.7741/0.7505/0.7994 | 16\_11/16\_23 |
| 1 | 0.46685/0.3671 | 16\_24/16\_28 |
| * Learning rate = 0.1 | | |
| Error: when learning\_rate = 0.1, the loss function has a large flutuation | | |
|  | | |
| Picture: Learning\_rate\_20190730 | | |

-------------------------------------------------------Wrong Start---------------------------------------------------------

Reason：Because of the neglect of the development of loss function, the following data are based on learning\_rate=0.1, which has a large fluctuation.

[4] Change epochs

|  |  |  |
| --- | --- | --- |
| **[4] Change Epochs** | | |
| **Folder:Epochs\_20190726** | | |
| cont\_latent\_size = 16  img\_size = [28, 28, 1]  n\_clusters = 16  num\_classes = 10  batch\_size=64  enc\_neurons = [200,100]  dex\_neurons = [100,200,7\*7\*32]  learning rate = 0.1 | | |
| Epochs | Acc |  |
| 20 | 0.7741/0.7505/0.7994  (from last table) |  |
| 30 | 0.8168/0.7767/0.7852 | 09\_59/10\_06/10\_16 |
| 40 | 0.77305 | 09\_51 |
| 50 | 0.7699 | 10\_02 |
| 60 | 0.8177/0.7798/0.78065 | 10\_23/10\_29/10\_36 |
| 70 | 0.7627/0.7856 | 10\_56/10\_58 |
| 80 | 0.7925 | 12\_26 |
| 90 | 0.7791 | 11\_13 |
| 100 | 0.79005 | 11\_14 |

When batch\_size=64, it takes long time to train the model, so I try to make the batch\_size larger and keep the acc not descreased.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Randomly select** | | | | |
| **Folder: random\_20190726** | | | | |
| Epoch | Batch\_size | Learning\_rate | Acc |  |
| 40 | 128 | 0.1 | 0.7442 | 12\_54 |
| 60 | 128 | 0.1 | 0.7751 | 12\_59 |
| 70 | 128 | 0.1 | 0.7838 | 13\_06 |
| 80 | 128 | 0.1 | 0.75655 | 13\_16 |
| 100 | 256 | 0.1 | 0.7635 | 13\_25 |
| 100 | 256 | 0.01 | 0.7457 | 13\_36 |
| 100 | 256 | 0.001 | 0.75005 | 13\_37 |
| 80 | 256 | 0.1 | 0.7641 | 13\_52 |
| 60 | 256 | 0.1 | 0.75685 | 13\_55 |

[5]Change cont\_latent\_size

|  |  |  |
| --- | --- | --- |
| **[4] Change cont\_latent\_size** | | |
| **Folder:Cont\_20190726** | | |
| img\_size = [28, 28, 1]  n\_clusters = 16  num\_classes = 10  enc\_neurons = [200,100]  dex\_neurons = [100,200,7\*7\*32]  batch\_size=64  learning rate = 0.1  epochs = 30 | | |
| Cont\_latent\_size | Acc |  |
| 1 |  |  |
| 2 |  |  |
| 3 | 0.319 | 17\_24 |
| 4 | 0.2990/0.2875 | 17\_13/17\_23 |
| 5 | 0.83875/0.8545 | 15\_31/15\_40 |
| 6 | 0.8476/0.8327/0.7682  0.79375 | 15\_54/16\_59/17\_07  17\_16 |
| 7 | 0.86045/0.47075/0.7933  0.8261/0.8061 | 15\_55/16\_06/16\_14  16\_35/16\_48 |
| 8 | 0.3268/0.3075/0.81585  0.8351/0.8386 | 15\_58/16\_10/16\_23  16\_37/16\_49 |
| 9 | 0.2899/0.7986/0.7942  0.8099 | 16\_17/16\_34/16\_42  16\_50 |
| 10 | 0.8239/0.8212 | 15\_34/15\_43 |
| 15 | 0.7633 | 15\_42 |
| * **Cont\_latent\_size = 5** | | |

---------------------------------------------------Wrong End--------------------------------------------------------------

[2] Change mini-batch

|  |  |  |
| --- | --- | --- |
| **[2]Change batch\_size** | | |
| **Folder: Batch\_size\_20190730** | | |
| cont\_latent\_size = 16  img\_size = [28, 28, 1]  n\_clusters = 16  num\_classes = 10  epochs = 50  learning\_rate = 0.001  enc\_neurons = [200,100]  dex\_neurons = [100,200,7\*7\*32] | | |
| Batch\_size | Acc |  |
| 32 | 0.7383 | 14\_24/14\_33/14\_34 |
| 64 | 0.7365 | 14\_08/ |
| 128 | 0.7702/0.7663/0.7583 | 14\_09/14\_17/14\_25 |
| 256 | 0.7508/0.7572/0.74625 | 14\_10/14\_20/14\_26 |
| 512 | 0.7399/0.7490/0.7438 | 14\_12/14\_21/14\_27 |

**Suggestion from the FA from Yufei Wang:**

* **Clustering and Unsupervised Anomaly Detection with L2 Normalized Deep Auto-Encoder Representations**
* **Use t-SNE on latent space(the output of encoder)**

**【20190731】 AE model with l2 normalization**

|  |  |  |  |
| --- | --- | --- | --- |
| **Input: [?,28,28,1]** | | | |
| **Encoder: enc\_filters=[ ], enc\_neurons = [500, 500,2000], cont\_latent\_size = 16** | | | |
| Layer | Output\_size | Parameters | |
| Faltten | [?,784] |  | |
| FCL | [?,500] | Activation = leaky\_relu | |
| FCL | [?,500] |  | |
| FCL | [?,2000] |  | |
| FCL | [?,16] |  | |
| L2\_normalization | [?,16] |  | |
| **Decoder: dec\_neurons = [2000, 500, 500,784], dec\_im\_shape = [784],**  **dec\_filters = [ ]** | | | |
| FCL | [?,2000] | | Activation = leaky\_relu |
| FCL | [?,500] | |  |
| FCL | [?,500] | |  |
| FCL | [?,784] | |  |
| **Loss function: l2 loss**  loss\_recon = tf.reduce\_mean(tf.square(tf.subtract(self.input, self.dec\_out))) | | | |
| **Optimizer: RMSProp**  opt\_recon = tf.train.RMSPropOptimizer(self.learning\_rate) | | | |
| **Summary:**  **Enc\_neurons=[500,500,2000]**  **Enc\_filters=[]**  **Dec\_neurons=[2000,500,500,784]**  **Dec\_im\_shape = [784]**  **Dec\_filters = []** | | | |

Dataset:MNIST

[1]Change n\_clusters

|  |  |  |  |
| --- | --- | --- | --- |
| **Dataset:MNIST** | | | |
| **[1]Change n\_clusters** | | | |
| **Folder: N\_clusters\_20190801** | | | |
| cont\_latent\_size = 10  img\_size = [28, 28, 1]  num\_classes = 10  epochs = 100  Batch\_size=256  Learning\_rate=0.001 | | | |
| n\_clusters | Train\_Acc | Test\_Acc |  |
| 10 | 0.72985 | 0.7415 | 16\_45 |
| 12 | 0.8077 | 0.8199 | 17\_03 |
| 14 | 0.8191 | 0.8252 | 17\_08 |
| 16 | 0.8438/0.8607 | 0.8644/0.8645 | 16\_54/17\_34 |
| 18 | 0.89185 | 0.8543 | 17\_29 |
| 20 | 0.8764 | 0.9012 | 17\_37 |
| 22 | 0.9139/0.8942 | 0.8869/0.906 | 17\_41/17\_46 |
| 24 | 0.9082 | 0.9139 | 17\_48 |
| 26 | 0.9155 | 0.9129 | 17\_50 |
| 28 | 0.9205 | 0.9259 | 17\_54 |
| 30 | 0.9258 | 0.9266 | 17\_56 |
| 32 | 0.9162 | 0.9229 | 18\_03 |
| 34 | 0.9224 | 0.9194 | 18\_04 |
| 36 | 0.9234 | 0.9241 | 18\_08 |
| 38 | 0.9291 | 0.9339 | 18\_09 |
| 40 | 0.9293 | 0.9283 | 18\_13 |
| * N\_clusters=30 | | | |
| Picture: | | | |

[2] Change cont\_latent\_size

|  |  |  |  |
| --- | --- | --- | --- |
| **[2]Change cont\_latent\_size** | | | |
| **Folder: Cont\_latent\_20190801** | | | |
| n\_clusters = 30  img\_size = [28, 28, 1]  num\_classes = 10  epochs = 100  Batch\_size=256  Learning\_rate=0.001 | | | |
| Cont\_latent\_size | Train\_Acc | Test\_Acc |  |
| 6 | 0.92315/0.9364 | 0.9242/0.9294 | 18\_36 |
| 8 | 0.9141 | 0.9097 | 18\_35 |
| 10 | 0.9258 | 0.9266 | 17\_56(last table) |
| 12 | 0.8995 | 0.9066 | 18\_19 |
| 14 | 0.8910 | 0.9149 | 18\_23 |
| 16 | 0.8800 | 0.8834 | 18\_25 |
| 18 | 0.88684 | 0.8756 | 18\_28 |
| 20 | 0.8630 | 0.8656 | 18\_30 |
|  | | | |
| Picture: | | | |

[3]Change batch\_size

|  |  |  |  |
| --- | --- | --- | --- |
| **[3]Change batch\_size** | | | |
| **Date:20190802** | | | |
| **Folder: batch\_size\_20190802** | | | |
| n\_clusters = 30  cont\_alatent\_size=10  img\_size = [28, 28, 1]  num\_classes = 10  epochs = 100  Learning\_rate=0.001 | | | |
| batch\_size | Train\_Acc | Test\_Acc |  |
| 128 | 0.9196/0.9254 | 0.9252/0.9331 | 10\_17 |
| 256 | 0.9258/0.9185 | 0.9266/0.9193 | 17\_56(last\_label)/10\_36 |
| 512 | 0.91135/0.8932 | 0.9056/0.9013 | 10\_09/10\_19 |
| * Batch\_size=256 | | | |

[4]Change learning rate

|  |  |  |  |
| --- | --- | --- | --- |
| **[4]Change learning\_rate** | | | |
| **Date:20190802** | | | |
| **Folder: Learning\_rate\_20190802** | | | |
| n\_clusters = 30  cont\_alatent\_size=10  img\_size = [28, 28, 1]  num\_classes = 10  epochs = 100  Learning\_rate=0.001 | | | |
| Learning\_rate | Train\_Acc | Test\_Acc |  |
| 0.001 | 0.9258/0.9185 | 0.9266/0.9193 | last\_label |
| 0.01 | 0.9122/0.9099 | 0.9224/0.91 | 10\_42/10\_51 |
| 0.1 | 0.9185/0.9110 | 0.9057/0.9046 | 10\_53/10\_57 |
| * Learning\_rate = 0.001 | | | |

Summary:

* n\_clusters = 30
* cont\_alatent\_size=10
* epochs = 100
* Learning\_rate=0.001
* Batch\_size=256

|  |  |  |  |
| --- | --- | --- | --- |
| **Input: [?,28,28,1]** | | | |
| **Encoder: enc\_filters=[32,64,128], enc\_neurons = [], cont\_latent\_size = 10** | | | |
| Layer | Output\_size | Parameters | |
| Reshape | [?,28,28,1] |  | |
| CL | [?,14,14,32] | Activation = leaky\_relu  Kernel\_size: 5x5  Stride: 2  Padding: SAME | |
| CL | [?,7,7,64] | Activation = leaky\_relu  Kernel\_size: 5x5  Stride: 2  Padding: SAME | |
| CL | [?,3,3,128] | Activation = leaky\_relu  Kernel\_size: 3x3  Stride: 2  Padding: VALID | |
| Flatten | [?,1152] |  | |
| FCL | [?,10] |  | |
| L2\_Normalization | [?,10] |  | |
| **Decoder: dec\_neurons = [], dec\_im\_shape = [3,3,128],**  **dec\_filters = [64,32,1]** | | | |
| FCL | [?,1152] | |  |
| Reshape | [?,3,3,128] | |  |
| CL | [?,7,7,64] | | Activation = leaky\_relu  Kernel\_size: 3x3  Stride: 2  Padding: VALID |
| CL | [?,14,14,32] | | Activation = leaky\_relu  Kernel\_size: 5x5  Stride: 2  Padding: SAME |
| CL | [?,28,28,1] | | Activation = sigmoid  Kernel\_size: 5x5  Stride: 2  Padding: SAME |
| Faltten | [?,784] | |  |
| **Loss function: l2 loss**  loss\_recon = tf.reduce\_mean(tf.square(tf.subtract(self.input, self.dec\_out))) | | | |
| **Optimizer: RMSProp**  opt\_recon = tf.train.RMSPropOptimizer(self.learning\_rate) | | | |

**【20190801】Model:CAE-l2-k-means**

|  |  |  |  |
| --- | --- | --- | --- |
| **Dataset:MNIST** | | | |
| **[1]Change n\_clusters** | | | |
| **Folder: N\_clusters\_20190802** | | | |
| cont\_latent\_size = 10  num\_classes = 10  epochs = 200  Batch\_size=256  Learning\_rate=0.001 | | | |
| n\_clusters | Train\_Acc | Test\_Acc |  |
| 10 | 0.80205 | 0.8837 | 11\_58 |
| 20 | 0.9118 | 0.918 | 10\_05 |
| 22 | 0.8894 | 0.8899 | 11\_55 |
| 24 | 0.9076 | 0.9117 | 11\_53 |
| 26 | 0.90495 | 0.928 | 11\_38 |
| 28 | 0.9182 | 0.9179 | 11\_33 |
| 30 | 0.9241 | 0.9303 | 10\_20 |
| 32 | 0.9339 | 0.937 | 11\_16 |
| 34 | 0.9166 | 0.9286 | 11\_15 |
| 36 | 0.93795 | 0.9367 | 11\_20 |
| 38 | 0.93405 | 0.9315 | 11\_32 |
| 40 | 0.9402 | 0.9394 | 10\_44 |
| 50 | 0.9405 | 0.94 | 10\_56 |
| * N\_clusters=40 | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **[2]Change cont\_latent\_size** | | | |
| **Folder: cont\_latent\_20190802** | | | |
| N\_clusters = 40  num\_classes = 10  epochs = 200  Batch\_size=256  Learning\_rate=0.001 | | | |
| Cont\_latent\_size | Train\_Acc | Test\_Acc |  |
| 10 | 0.9458 | 0.946 | 12\_44 |
| 12 | 0.93475 | 0.928 | 12\_49 |
| 14 | 0.9296 | 0.933 | 12\_55 |
| 16 | 0.9154 | 0.9165 | 12\_58 |
| 18 | 0.9063 | 0.9114 | 13\_15 |
| 20 | 0.9020 | 0.9132 | 13\_18 |
| * Cont\_latent\_size=10 | | | |

Summary:

* n\_clusters = 40
* cont\_alatent\_size=10
* epochs = 200
* Learning\_rate=0.001
* Batch\_size=256

Suggestion with Felix(20190802):

* N\_clusters = 16 the same as AAE, because the more clusters are, the better accuracy is
* Now we do the AE without GR at first, then besed on the results to determine if we use GR.

|  |  |  |  |
| --- | --- | --- | --- |
| * n\_clusters = 16 * cont\_alatent\_size=10 * epochs = 100 * Learning\_rate=0.001 * Batch\_size=256 | | | |
| AE | 0.87495 | 0.8747 | 08\_02\_14\_27 |
| * n\_clusters = 16 * cont\_alatent\_size=10 * epochs = 200 * Learning\_rate=0.001 * Batch\_size=256 | | | |
| CAE | 0.88425 | 0.8872 | 08\_02\_14\_30 |

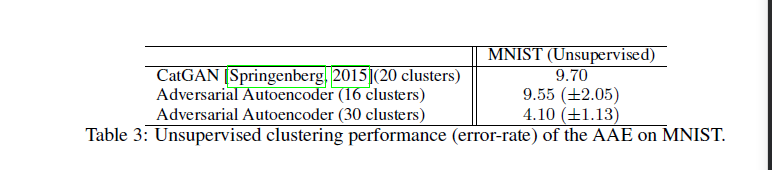
|  |  |  |  |
| --- | --- | --- | --- |
| **Folder:AEl2\_20190812** | | | |
| **Dataset: MNIST /Folder:MNIST\_20190812** | | | |
| n\_clusters = 16  cont\_latent\_size=10  epochs = 100  Learning\_rate=0.001  Batch\_size=256 | | | |
| **Test\_ael2(all data)** | | | |
| **Date:20190812** | | | |
| **Folder:AEl2\_all\_20190812** | | | |
| Nr. | Acc\_Train | Acc\_Test |  |
| 1(15\_31) | 0.88035 | 0.8624 |  |
| 2(15\_37) | 0.8304 | 0.8309 |  |
| 3(15\_48) | 0.83314 | 0.8459 |  |
| 4(15\_54) | 0.8462 | 0.8882 |  |
| 5(16\_02) | 0.8367 | 0.8553 |  |
| **Test\_ael2\_noGR** | | | |
| **Folder:AEl2\_noGR\_20190803** | | | |
| **Date:20190802-20190804** | | | |
| **Dataset:MNIST** | | | |
| Nr. |  | Acc | Acc\_curr |
| 1  (08\_03\_00\_03) | Task\_0 | 0.9979 |  |
| Task\_1 | 0.9560 |  |
| Task\_2 | 0.8224 |  |
| Task\_3 | 0.7505 |  |
| Task\_4 | 0.6066 |  |
| 2  ()08\_03\_09\_53 | Task\_0 | 0.9993 |  |
| Task\_1 | 0.9514 |  |
| Task\_2 | 0.8208 |  |
| Task\_3 | 0.7676 |  |
| Task\_4 | 0.6115 |  |
| 3  08\_04\_20\_20 | Task\_0 | 0.9982 |  |
| Task\_1 | 0.9506 |  |
| Task\_2 | 0.8308 |  |
| Task\_3 | 0.7622 |  |
| Task\_4 | 0.6497 |  |
| 4  (08\_04\_21\_18) | Task\_0 | 0.9972 |  |
| Task\_1 | 0.9558 |  |
| Task\_2 | 0.8248 |  |
| Task\_3 | 0.7839 |  |
| Task\_4 | 0.5983 |  |
| 5  (08\_04\_22\_24) | Task\_0 | 0.9977 | 0.9977 |
| Task\_1 | 0.9541 | 0.9827 |
| Task\_2 | 0.7967 | 0.9973 |
| Task\_3 | 0.7642 | 0.9993 |
| Task\_4 | 0.6288 | 0.9810 |
| Calculate Mean and Variance | | | |
|  | Mean | Variance |  |
| Task\_0 | 0.99806 | 6.13E-07 |  |
| Task\_1 | 0.95358 | 6.17E-06 |  |
| Task\_2 | 0.8191 | 0.000171 |  |
| Task\_3 | 0.76568 | 0.000145 |  |
| Task\_4 | 0.61898 | 0.000419 |  |
| **Test\_ael2\_GR** | | | |
| **Folder: AEl2\_GR\_20190808** | | | |
| **Date:20190808 – 20190812** | | | |
| **Dataset:MNIST** | | | |
| 1  （08\_08\_22\_23） | Task\_0 | 0.9975 | 0.9978 |
| Task\_1 | 0.9732 | 0.9742 |
| Task\_2 | 0.9124 | 0.9860 |
| Task\_3 | 0.8952 | 0.9987 |
| Task\_4 | 0.7488 | 0.9617 |
| 2  (08\_08\_23\_57) | Task\_0 | 0.9970 | 0.9972 |
| Task\_1 | 0.9694 | 0.9635 |
| Task\_2 | 0.9217 | 0.9853 |
| Task\_3 | 0.9102 | 0.9992 |
| Task\_4 | 0.76895 | 0.9568 |
| 3  (08\_09\_09\_15) | Task\_0 | 0.9982 | 0.9961 |
| Task\_1 | 0.9680 | 0.9600 |
| Task\_2 | 0.9047 | 0.9930 |
| Task\_3 | 0.8919 | 0.9996 |
| Task\_4 | 0.7658 | 0.9572 |
| 4  (08\_09\_14\_48) | Task\_0 | 0.9970 | 0.9974 |
| Task\_1 | 0.9716 | 0.9677 |
| Task\_2 | 0.9180 | 0.9878 |
| Task\_3 | 0.8916 | 0.9987 |
| Task\_4 | 0.7604 | 0.9707 |
| 5  (08\_11\_22\_22) | Task\_0 | 0.9973 | 0.9972 |
| Task\_1 | 0.9681 | 0.9763 |
| Task\_2 | 0.9039 | 0.9799 |
| Task\_3 | 0.8836 | 0.9991 |
| Task\_4 | 0.7624 | 0.9677 |
| Calculate Mean and Variance | | | |
|  | Mean | Variance |  |
| Task\_0 | 0.9974 | 2.45E-07 |  |
| Task\_1 | 0.97006 | 5.19E-06 |  |
| Task\_2 | 0.91214 | 6.23E-05 |  |
| Task\_3 | 0.8945 | 9.52E-05 |  |
| Task\_4 | 0.76127 | 5.93E-05 |  |

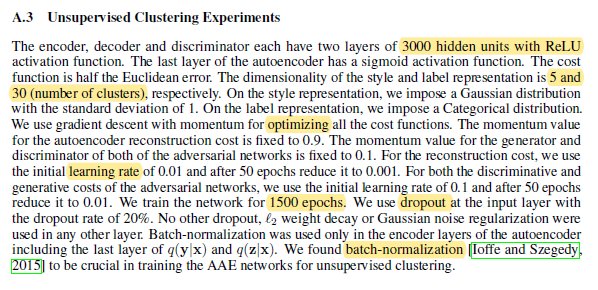
|  |  |  |  |
| --- | --- | --- | --- |
| **Dataset: Fashion\_MNIST** | | | |
| n\_clusters = 16  cont\_alatent\_size=10  epochs = 100  Learning\_rate=0.001  Batch\_size=256 | | | |
| **Date:20190812** | | | |
| **Test\_ael2(all data)** | | | |
| **Folder: AEl2\_all\_FM\_20190812** | | | |
|  | Acc\_Train | Acc\_Test |  |
| 1(15\_56) | 0.7074 | 0.6992 |  |
| 2(16\_36) | 0.7029 | 0.6964 |  |
| 3(16\_40) | 0.7011 | 0.69 |  |
| 4(16\_45) | 0.7001 | 0.6926 |  |
| 5() | 0.7023 | 0.6933 |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Dataset:MNIST | | | |
| Ael2\_noGR | | | |
|  | Mean | Variance |  |
| Task\_0 | 0.99806 | 6.13E-07 |  |
| Task\_1 | 0.95358 | 6.17E-06 |  |
| Task\_2 | 0.8191 | 0.000171 |  |
| Task\_3 | 0.76568 | 0.000145 |  |
| Task\_4 | 0.61898 | 0.000419 |  |
| Ael2\_GR | | | |
|  | Mean | Variance |  |
| Task\_0 | 0.9974 | 2.45E-07 |  |
| Task\_1 | 0.97006 | 5.19E-06 |  |
| Task\_2 | 0.91214 | 6.23E-05 |  |
| Task\_3 | 0.8945 | 9.52E-05 |  |
| Task\_4 | 0.76127 | 5.93E-05 |  |
|  | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| AAE\_noGR | | | |
| Date:08.08.2019 | | | |
| Folder:AAE\_noGR\_20190808 | | | |
|  |  | ACC\_previous | ACC\_current |
| 1  (14\_52) | Task\_0 | 0.9789 | 0.9882 |
| Task\_1 | 0.7495 | 0.9758 |
| Task\_2 | 0.2061 | 0.5195 |
| Task\_3 | 0.1418 | 0.5142 |
| Task\_4 | 0.124 | 0.5107 |
| 2  (15\_16) | Task\_0 | 0.9882 | 0.9888 |
| Task\_1 | 0.7156 | 0.9057 |
| Task\_2 | 0.1963 | 0.5240 |
| Task\_3 | 0.1623 | 0.5142 |
| Task\_4 | 0.3829 | 0.9468 |
| 3  (15\_31) | Task\_0 | 0.9993 | 0.9993 |
| Task\_1 | 0.6431 | 0.8528 |
| Task\_2 | 0.1975 | 0.5190 |
| Task\_3 | 0.3918 | 0.9727 |
| Task\_4 | 0.4110 | 0.9597 |
| 4  (15\_46) | Task\_0 | 0.9864 | 0.9867 |
| Task\_1 | 0.6927 | 0.8733 |
| Task\_2 | 0.5165 | 0.9784 |
| Task\_3 | 0.4865 | 0.9873 |
| Task\_4 | 0.4166 | 0.9423 |

In paper AAE, the ACC ist about 90%. How to improve the stability and accuracy of out implemented model?

The structure in paper:



|  |  |  |
| --- | --- | --- |
|  | Model in paper | Our model |
| optimizer | SGD+momentum | RMSProp |
| Learning rate | Actually change  Before 50 epochs:0.01  After 50 epochs: 0.001 | Fixed:0.001 |
| epochs | 1500 | 100 |
| Drop out | Input layer | Input layer: no  Discriminator: yes |
| Latent layer | Continual: 5  Clusters:30 | Continual:5  Clusters:16 |
| Acc | 90% (similar with AE\_l2) | 80%  from 15.07(page 10) |

Discussion with Felix(20190806):

* AE has catastrophy forgetting. We have implemented the model AE with GR. I should debug it. (finish)
* Based on the AE model I should think about how to improve AAE.

20190808：

* Debug test\_ael2\_GR, then it works (finish)
* The loss function of the AAE model is changed, from two discriminators to one discriminator. It maybe work.(finish)

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Some Results Wrong\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**AAE1\_all应该是对的**

**noGR和GR测的model=AAE**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**[20190812]AAE with one discriminator**

|  |  |  |  |
| --- | --- | --- | --- |
| **AAE1\_all** | | | |
| **Model：AAE1**  **Change two discriminators into one** | | | |
| Folder:AAE1\_all\_20190812 | | | |
| Date:12.08.2019 | | | |
| Nr. | Acc |  |  |
| 1(17\_44) | 0.82535 |  |  |
| 2(17\_45) | 0.7853 |  |  |
| 3(17\_46) | 0.8435 |  |  |
| 4(18\_03) | 0.8105 |  |  |
| 5(18\_08) | 0.8148 |  |  |
| 6(18\_09) | 0.73995 |  |  |
| 7(18\_18) | 0.7212 |  |  |
| 8(18\_25) | 0.7258 |  |  |
| 9(18\_27) | 0.7715 |  |  |
| 10(18\_34) | 0.7708 |  |  |
| Date:13.08.2019 | | | |
| 11(10\_43) | 0.7795 |  |  |
| 12(10\_44) | 0.7535 |  |  |
| 13(10\_46) | 0.7003 |  |  |
| 14(10\_56) | 0.7857 |  |  |
| 15(10\_59) | 0.7964 |  |  |
| 16(11\_00) | 0.8018 |  |  |
| 17(11\_15) | 0.8054 |  |  |
| 18(13\_13) | 0.84205 |  |  |
| 19(13\_31) | 0.7445 |  |  |
| 20(13\_55) | 0.6801 |  |  |
| Mean:0.774898  Var:0.002077 | | | |
| **AAE1\_noGR** | | | |
| **Folder:AAE1\_noGR\_20190813** | | | |
| Nr. |  | Acc\_pre | Acc\_curr |
| 1  (12\_58) | Task\_0 | 0.9885 | 0.9885 |
| Task\_1 | 0.7069 | 0.9145 |
| Task\_2 | 0.5330 | 0.9143 |
| Task\_3 | 0.4113 | 0.9762 |
| Task\_4 | 0.3885 | 0.8695 |
| 2  (12\_59) | Task\_0 | 0.9995 | 0.9995 |
| Task\_1 | 0.7022 | 0.8994 |
| Task\_2 | 0.4661 | 0.8134 |
| Task\_3 | 0.1513 | 0.5177 |
| Task\_4 | 0.11385 | 0.5041 |
| 3  (13\_00) | Task\_0 | 0.9991 | 0.9991 |
| Task\_1 | 0.2753 | 0.5072 |
| Task\_2 | 0.1887 | 0.5224 |
| Task\_3 | 0.3856 | 0.9991 |
| Task\_4 | 0.3567 | 0.9481 |
| 4  (13\_03) | Task\_0 | 0.9905 | 0.9908 |
| Task\_1 | 0.6601 | 0.9706 |
| Task\_2 | 0.5048 | 0.9974 |
| Task\_3 | 0.4029 | 0.9921 |
| Task\_4 | 0.3357 | 0.9673 |
| 5  (13\_05) | Task\_0 | 0.9978 | 0.9977 |
| Task\_1 | 0.7216 | 0.9094 |
| Task\_2 | 0.5084 | 0.9415 |
| Task\_3 | 0.4298 | 0.9998 |
| Task\_4 | 0.34005 | 0.8758 |
| 6  (13\_18) | Task\_0 | 0.9986 | 0.9988 |
| Task\_1 | 0.6607 | 0.9579 |
| Task\_2 | 0.5248 | 0.9758 |
| Task\_3 | 0.3847 | 0.9899 |
| Task\_4 | 0.3565 | 0.9847 |
| 7  (13\_20) | Task\_0 | 0.9991 | 0.9991 |
| Task\_1 | 0.7150 | 0.9040 |
| Task\_2 | 0.5374 | 0.9648 |
| Task\_3 | 0.3981 | 0.9993 |
| Task\_4 | 0.3638 | 0.9548 |
| 8  (13\_22) | Task\_0 | 0.9989 | 0.9989 |
| Task\_1 | 0.6494 | 0.9245 |
| Task\_2 | 0.5775 | 0.9943 |
| Task\_3 | 0.4132 | 0.9974 |
| Task\_4 | 0.3695 | 0.8883 |
| 9  (13\_24) | Task\_0 | 0.9992 | 0.9994 |
| Task\_1 | 0.2825 | 0.5134 |
| Task\_2 | 0.4995 | 0.9367 |
| Task\_3 | 0.4210 | 0.9881 |
| Task\_4 | 0.4032 | 0.9075 |
| 10  (13\_34) | Task\_0 | 0.9881 | 0.9883 |
| Task\_1 | 0.6606 | 0.8792 |
| Task\_2 | 0.5006 | 0.9955 |
| Task\_3 | 0.4199 | 0.9524 |
| Task\_4 | 0.3801 | 0.9559 |
| 11  (13\_28) | Task\_0 | 0.9896 | 0.9896 |
| Task\_1 | 0.5917 | 0.9089 |
| Task\_2 | 0.4937 | 0.9419 |
| Task\_3 | 0.3801 | 0.9471 |
| Task\_4 | 0.3706 | 0.9358 |
| 12  (13\_42) | Task\_0 | 0.9871 | 0.9868 |
| Task\_1 | 0.6791 | 0.9046 |
| Task\_2 | 0.5304 | 0.9576 |
| Task\_3 | 0.4331 | 0.9613 |
| Task\_4 | 0.3577 | 0.8846 |
| 13  (13\_48) | Task\_0 | 0.9912 | 0.9916 |
| Task\_1 | 0.7454 | 0.9659 |
| Task\_2 | 0.1894 | 0.5187 |
| Task\_3 | 0.4228 | 0.9988 |
| Task\_4 | 0.3896 | 0.9476 |
| 14  (13\_47) | Task\_0 | 0.9933 | 0.9935 |
| Task\_1 | 0.6424 | 0.8841 |
| Task\_2 | 0.4608 | 0.9438 |
| Task\_3 | 0.3821 | 0.9819 |
| Task\_4 | 0.3722 | 0.9168 |
| 15  (13\_50) | Task\_0 | 0.9790 | 0.9791 |
| Task\_1 | 0.6718 | 0.9118 |
| Task\_2 | 0.4915 | 0.8341 |
| Task\_3 | 0.1450 | 0.5142 |
| Task\_4 | 0.3481 | 0.8847 |
| 16  (13\_52) | Task\_0 | 0.9994 | 0.9993 |
| Task\_1 | 0.7480 | 0.9434 |
| Task\_2 | 0.5113 | 0.8992 |
| Task\_3 | 0.4679 | 0.9945 |
| Task\_4 | 0.36275 | 0.8836 |
| 17  (14\_04) | Task\_0 | 0.9997 | 0.9995 |
| Task\_1 | 0.6951 | 0.9572 |
| Task\_2 | 0.5851 | 0.9624 |
| Task\_3 | 0.4468 | 0.9918 |
| Task\_4 | 0.3558 | 0.8479 |
| 18  (14\_02) | Task\_0 | 0.9959 | 0.9959 |
| Task\_1 | 0.6685 | 0.9048 |
| Task\_2 | 0.5369 | 0.9608 |
| Task\_3 | 0.4153 | 0.9718 |
| Task\_4 | 0.368 | 0.8905 |
| 19  (14\_07) | Task\_0 | 0.9994 | 0.9992 |
| Task\_1 | 0.6734 | 0.9234 |
| Task\_2 | 0.5238 | 0.9980 |
| Task\_3 | 0.4269 | 0.9563 |
| Task\_4 | 0.39965 | 0.9205 |
| 20  (14\_10) | Task\_0 | 0.9978 | 0.9979 |
| Task\_1 | 0.6568 | 0.9013 |
| Task\_2 | 0.5225 | 0.9568 |
| Task\_3 | 0.4143 | 0.9501 |
| Task\_4 | 0.3453 | 0.9336 |
|  |  | Mean | |
|  | Task\_0 | 0.994585 | 0.994625 |
|  | Task\_1 | 0.640325 | 0.879275 |
|  | Task\_2 | 0.48431 | 0.90147 |
|  | Task\_3 | 0.387605 | 0.93399 |
|  | Task\_4 | 0.35388 | 0.89508 |
|  |  | Var | |
|  | Task\_0 | 3.41E-05 | 3.37241E-05 |
|  | Task\_1 | 0.016615 | 0.016600444 |
|  | Task\_2 | 0.011115 | 0.019363237 |
|  | Task\_3 | 0.007188 | 0.020764865 |
|  | Task\_4 | 0.003537 | 0.009843699 |
| **AAE1\_GR** | | | |
| **Folder:AAE1\_GR\_20190813** | | | |
| 1  (14\_15) | Task\_0 | 0.9987 | 0.9987 |
| Task\_1 | 0.8224 | 0.8581 |
| Task\_2 | 0.6831 | 0.8938 |
| Task\_3 | 0.5356 | 0.9203 |
| Task\_4 | 0.4610 | 0.7864 |
| 2  (14\_24) | Task\_0 | 0.9990 | 0.9989 |
| Task\_1 | 0.9031 | 0.9607 |
| Task\_2 | 0.7248 | 0.9797 |
| Task\_3 | 0.5654 | 0.9652 |
| Task\_4 | 0.4485 | 0.8961 |
| 3  (14\_25) | Task\_0 | 0.9881 | 0.9885 |
| Task\_1 | 0.8887 | 0.8727 |
| Task\_2 | 0.7193 | 0.9550 |
| Task\_3 | 0.5613 | 0.9637 |
| Task\_4 | 0.4440 | 0.8939 |
| 4  (14\_54) | Task\_0 | 0.9965 | 0.9966 |
| Task\_1 | 0.8839 | 0.8403 |
| Task\_2 | 0.7057 | 0.9241 |
| Task\_3 | 0.5131 | 0.8401 |
| Task\_4 | 0.4004 | 0.8171 |
| 5  (15\_03) | Task\_0 | 0.9987 | 0.9985 |
| Task\_1 | 0.9005 | 0.8769 |
| Task\_2 | 0.6948 | 0.9237 |
| Task\_3 | 0.5485 | 0.9558 |
| Task\_4 | 0.4224 | 0.9034 |
| 6  (14\_29) | Task\_0 | 0.9941 | 0.9940 |
| Task\_1 | 0.7283 | 0.8505 |
| Task\_2 | 0.7918 | 0.8680 |
| Task\_3 | 0.5630 | 0.9442 |
| Task\_4 | 0.49675 | 0.885 |
| 7  (14\_31) | Task\_0 | 0.9991 | 0.9991 |
| Task\_1 | 0.9314 | 0.9246 |
| Task\_2 | 0.6588 | 0.9314 |
| Task\_3 | 0.5489 | 0.8860 |
| Task\_4 | 0.4447 | 0.8868 |
| 8  (15\_12) | Task\_0 | 0.9981 | 0.9981 |
| Task\_1 | 0.8801 | 0.9342 |
| Task\_2 | 0.6009 | 0.8637 |
| Task\_3 | 0.4704 | 0.9056 |
| Task\_4 | 0.3577 | 0.7719 |
| Date:16082019 | | | |
| 9  (10\_36) | Task\_0 | 0.9901 | 0.9902 |
| Task\_1 | 0.8113 | 0.8502 |
| Task\_2 | 0.6571 | 0.9373 |
| Task\_3 | 0.5142 | 0.8967 |
| Task\_4 | 0.4104 | 0.9125 |
| 10  (12\_38) | Task\_0 | 0.9683 | 0.9683 |
| Task\_1 | 0.7112 | 0.8347 |
| Task\_2 | 0.4885 | 0.7597 |
| Task\_3 | 0.5186 | 0.7441 |
| Task\_4 | 0.4565 | 0.7979 |
| 11  (12\_23) | Task\_0 | 0.9967 | 0.9967 |
| Task\_1 | 0.7743 | 0.7803 |
| Task\_2 | 0.6012 | 0.9125 |
| Task\_3 | 0.4439 | 0.8671 |
| Task\_4 | 0.3487 | 0.8280 |
| 12  (10\_34) | Task\_0 | 0.9987 | 0.9987 |
| Task\_1 | 0.7438 | 0.7291 |
| Task\_2 | 0.7558 | 0.7825 |
| Task\_3 | 0.5916 | 0.7672 |
| Task\_4 | 0.5205 | 0.8406 |
| 13  (10\_32) | Task\_0 | 0.9997 | 0.9996 |
| Task\_1 | 0.8598 | 0.9550 |
| Task\_2 | 0.6429 | 0.9558 |
| Task\_3 | 0.5861 | 0.8606 |
| Task\_4 | 0.47445 | 0.8919 |
| 14  (12\_12) | Task\_0 | 0.9961 | 0.9961 |
| Task\_1 | 0.8135 | 0.8115 |
| Task\_2 | 0.5758 | 0.9415 |
| Task\_3 | 0.5208 | 0.9102 |
| Task\_4 | 0.4287 | 0.8342 |
| 15  (12\_14) | Task\_0 | 0.9995 | 0.9993 |
| Task\_1 | 0.9158 | 0.8767 |
| Task\_2 | 0.6205 | 0.9799 |
| Task\_3 | 0.5253 | 0.9217 |
| Task\_4 | 0.4159 | 0.8208 |
| 16  (13\_32) | Task\_0 | 0.9990 | 0.9991 |
| Task\_1 | 0.8396 | 0.8909 |
| Task\_2 | 0.5950 | 0.9203 |
| Task\_3 | 0.5294 | 0.8493 |
| Task\_4 | 0.3929 | 0.8442 |
| 17  (13\_30) | Task\_0 | 0.9932 | 0.9932 |
| Task\_1 | 0.8898 | 0.8238 |
| Task\_2 | 0.6268 | 0.9202 |
| Task\_3 | 0.4530 | 0.8928 |
| Task\_4 | 0.3842 | 0.8091 |
| 18  (13\_43) | Task\_0 | 0.9912 | 0.9912 |
| Task\_1 | 0.8260 | 0.9079 |
| Task\_2 | 0.4699 | 0.7274 |
| Task\_3 | 0.1418 | 0.5144 |
| Task\_4 | 0.3723 | 0.7270 |
| 19  (13\_51) | Task\_0 | 0.9916 | 0.9913 |
| Task\_1 | 0.2724 | 0.5209 |
| Task\_2 | 0.7207 | 0.7818 |
| Task\_3 | 0.5456 | 0.9688 |
| Task\_4 | 0.4253 | 0.9488 |
| 20  (15\_03) | Task\_0 | 0.9993 | 0.9993 |
| Task\_1 | 0.8768 | 0.9149 |
| Task\_2 | 0.6631 | 0.8967 |
| Task\_3 | 0.4766 | 0.8673 |
| Task\_4 | 0.3943 | 0.8358 |
|  |  | Mean | |
|  | Task\_0 | 0.994785 | 0.99477 |
|  | Task\_1 | 0.813635 | 0.850695 |
|  | Task\_2 | 0.649825 | 0.89275 |
|  | Task\_3 | 0.507655 | 0.872055 |
|  | Task\_4 | 0.42498 | 0.84657 |
|  |  | Var | |
|  | Task\_0 | 5.1595E-05 | 5.11769E-05 |
|  | Task\_1 | 0.020253227 | 0.009339902 |
|  | Task\_2 | 0.006657944 | 0.005457117 |
|  | Task\_3 | 0.009077331 | 0.010750456 |
|  | Task\_4 | 0.001999509 | 0.003017071 |

Summary

|  |  |  |
| --- | --- | --- |
|  | Mean | Var |
| **AAE1\_all data** | | |
|  | 0.774898 | 0.002077 |
| **AAE1\_noGR** | | |
| Task\_0 | 0.994585 | 3.41E-05 |
| Task\_1 | 0.640325 | 0.016615 |
| Task\_2 | 0.48431 | 0.011115 |
| Task\_3 | 0.387605 | 0.007188 |
| Task\_4 | 0.35388 | 0.003537 |
| **AAE1\_GR** | | |
| Task\_0 | 0.994785 | 5.1595E-05 |
| Task\_1 | 0.813635 | 0.020253227 |
| Task\_2 | 0.649825 | 0.006657944 |
| Task\_3 | 0.507655 | 0.009077331 |
| Task\_4 | 0.42498 | 0.001999509 |
|  | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Wrong End\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

[20190830]AAE with two discriminators

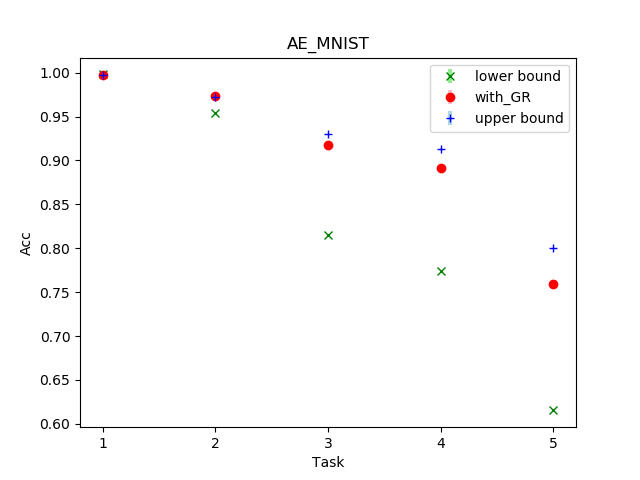
|  |  |  |  |
| --- | --- | --- | --- |
| **AAE\_all** | | | |
| **Model：AAE with two discriminators** | | | |
| Folder:AAE\_all\_20190830 | | | |
| Date:30.08.2019 | | | |
| Nr. | Acc\_Train | Acc\_Test |  |
| 1(14\_02) | 0.84645 | 0.8435 |  |
| 2(14\_09) | 0.8801 | 0.893 |  |
| 3(14\_33) | 0.7902 | 0.7964 |  |
| 4(14\_36) | 0.8379 | 0.8458 |  |
| 5(14\_47) | 0.8588 | 0.8579 |  |
| 6(15\_15) | 0.7663 | 0.7735 |  |
| 7(15\_17) | 0.8029 | 0.8018 |  |
| 8(15\_22) | 0.7939 | 0.7958 |  |
| 9(15\_49) | 0.7968 | 0.8008 |  |
| 10(15\_55) | 0.8545 | 0.8686 |  |
| 11(15\_54) | 0.8300 | 0.8323 |  |
| 12(16\_15) | 0.8637 | 0.8557 |  |
| 13(16\_23) | 0.8196 | 0.827 |  |
| 14(16\_32) | 0.7714 | 0.769 |  |
| 15(16\_33) | 0.8343 | 0.8403 |  |
| 16(16\_30) | 0.7308 | 0.7297 |  |
| 17(16\_43) | 0.8021 | 0.8035 |  |
| 18(16\_51) | 0.8299 | 0.8319 |  |
| 19(16\_54) | 0.8712 | 0.8812 |  |
| 20(16\_58) | 0.7919 | 0.8031 |  |
| Mean | 0.818638 | 0.82254 |  |
| Var | 0.001523 | 0.001648 |  |
| **AAE\_noGR** | | | |
| **Folder:AAE\_noGR\_20190910** | | | |
| Nr. |  | Acc\_pre | Acc\_curr |
| 1  (10\_56) | Task\_0 | 0.9987 | 0.9987 |
| Task\_1 | 0.7263 | 0.8962 |
| Task\_2 | 0.5587 | 0.9938 |
| Task\_3 | 0.4829 | 0.9988 |
| Task\_4 | 0.1546 | 0.5098 |
| 2  (10\_57) | Task\_0 | 0.9570 | 0.9574 |
| Task\_1 | 0.7058 | 0.8857 |
| Task\_2 | 0.5382 | 0.9708 |
| Task\_3 | 0.4909 | 0.9971 |
| Task\_4 | 0.3609 | 0.9743 |
| 3  (11\_00) | Task\_0 | 0.9992 | 0.9991 |
| Task\_1 | 0.7416 | 0.9097 |
| Task\_2 | 0.5520 | 0.9954 |
| Task\_3 | 0.4674 | 0.9978 |
| Task\_4 | 0.1194 | 0.5095 |
| 4  (11\_03) | Task\_0 | 0.9987 | 0.9987 |
| Task\_1 | 0.6165 | 0.9082 |
| Task\_2 | 0.5131 | 0.9471 |
| Task\_3 | 0.5354 | 0.9977 |
| Task\_4 | 0.3526 | 0.8687 |
| 5  (11\_05) | Task\_0 | 0.9863 | 0.9867 |
| Task\_1 | 0.6569 | 0.8719 |
| Task\_2 | 0.2026 | 0.5210 |
| Task\_3 | 0.1399 | 0.5142 |
| Task\_4 | 0.1667 | 0.5321 |
| 6  (11\_40) | Task\_0 | 0.9881 | 0.9876 |
| Task\_1 | 0.6457 | 0.8861 |
| Task\_2 | 0.4880 | 0.9671 |
| Task\_3 | 0.4162 | 0.9956 |
| Task\_4 | 0.4165 | 0.9652 |
| 7  (11\_35) | Task\_0 | 0.9843 | 0.9840 |
| Task\_1 | 0.7242 | 0.8523 |
| Task\_2 | 0.5476 | 0.9719 |
| Task\_3 | 0.4287 | 0.9984 |
| Task\_4 | 0.3680 | 0.9653 |
| 8  (11\_42) | Task\_0 | 0.9947 | 0.9949 |
| Task\_1 | 0.3507 | 0.5152 |
| Task\_2 | 0.5749 | 0.9916 |
| Task\_3 | 0.4393 | 0.9796 |
| Task\_4 | 0.3165 | 0.9821 |
| 9  (11\_43) | Task\_0 | 0.9994 | 0.9994 |
| Task\_1 | 0.5363 | 0.7235 |
| Task\_2 | 0.5067 | 0.9178 |
| Task\_3 | 0.4630 | 0.9729 |
| Task\_4 | 0.37935 | 0.8998 |
| 10  (11\_45) | Task\_0 | 0.9966 | 0.9961 |
| Task\_1 | 0.2907 | 0.5092 |
| Task\_2 | 0.1916 | 0.5208 |
| Task\_3 | 0.4828 | 0.9747 |
| Task\_4 | 0.3815 | 0.8962 |
| 11  (12\_03) | Task\_0 | 0.9992 | 0.9992 |
| Task\_1 | 0.5904 | 0.8678 |
| Task\_2 | 0.2564 | 0.5189 |
| Task\_3 | 0.1719 | 0.5230 |
| Task\_4 | 0.1257 | 0.5113 |
| 12  (12\_12) | Task\_0 | 0.9990 | 0.9991 |
| Task\_1 | 0.6570 | 0.8528 |
| Task\_2 | 0.5849 | 0.9606 |
| Task\_3 | 0.4142 | 0.9975 |
| Task\_4 | 0.3395 | 0.9779 |
| 13  (12\_20) | Task\_0 | 0.9983 | 0.9983 |
| Task\_1 | 0.6232 | 0.8425 |
| Task\_2 | 0.1906 | 0.5229 |
| Task\_3 | 0.4595 | 0.9801 |
| Task\_4 | 0.4107 | 0.9725 |
| 14  (12\_24) | Task\_0 | 0.9994 | 0.9993 |
| Task\_1 | 0.7025 | 0.7644 |
| Task\_2 | 0.3798 | 0.7249 |
| Task\_3 | 0.2816 | 0.7672 |
| Task\_4 | 0.4440 | 0.8992 |
| 15  (12\_25) | Task\_0 | 0.9884 | 0.9885 |
| Task\_1 | 0.6319 | 0.9093 |
| Task\_2 | 0.2122 | 0.5284 |
| Task\_3 | 0.4038 | 0.9576 |
| Task\_4 | 0.3218 | 0.8728 |
| 16  (12\_27) | Task\_0 | 0.9995 | 0.9994 |
| Task\_1 | 0.2817 | 0.5123 |
| Task\_2 | 0.5539 | 0.9973 |
| Task\_3 | 0.4192 | 0.9983 |
| Task\_4 | 0.3776 | 0.9286 |
| 17  (13\_15) | Task\_0 | 0.9905 | 0.9989 |
| Task\_1 | 0.5844 | 0.8102 |
| Task\_2 | 0.5565 | 0.9130 |
| Task\_3 | 0.4090 | 0.9973 |
| Task\_4 | 0.2907 | 0.7980 |
| 18  (13\_16) | Task\_0 | 0.9858 | 0.9860 |
| Task\_1 | 0.7385 | 0.8717 |
| Task\_2 | 0.5088 | 0.9686 |
| Task\_3 | 0.1490 | 0.5188 |
| Task\_4 | 0.1167 | 0.5041 |
| 19  (13\_18) | Task\_0 | 0.9510 | 0.9510 |
| Task\_1 | 0.7028 | 0.8330 |
| Task\_2 | 0.5263 | 0.9571 |
| Task\_3 | 0.4387 | 0.9533 |
| Task\_4 | 0.3882 | 0.9647 |
| 20  (13\_22) | Task\_0 | 0.9981 | 0.9983 |
| Task\_1 | 0.6859 | 0.8925 |
| Task\_2 | 0.2438 | 0.5263 |
| Task\_3 | 0.5128 | 0.9906 |
| Task\_4 | 0.12655 | 0.5066 |
| 21  (13\_25) | Task\_0 | 0.9989 | 0.9992 |
| Task\_1 | 0.7781 | 0.9596 |
| Task\_2 | 0.4771 | 0.9917 |
| Task\_3 | 0.4202 | 0.9980 |
| Task\_4 | 0.3924 | 0.9735 |
| Abnormal: 14/20  Normal: 6/20 | | | |

**20190910：AEl2**

|  |  |  |  |
| --- | --- | --- | --- |
| **AEl2\_all** | | | |
|  | | | |
| Folder:AE\_all\_20190910 | | | |
| Date: 10.09.2019 | | | |
| Nr. | Acc\_Train | Acc\_Test |  |
| 1(10\_48) | 0.8718 | 0.8754 |  |
| 2(11\_00) | 0.84225 | 0.8588 |  |
| 3(11\_18) | 0.8381 | 0.832 |  |
| 4(11\_26) | 0.8704 | 0.8456 |  |
| 5(11\_31) | 0.8753 | 0.8643 |  |
| 6(11\_43) | 0.8278 | 0.8646 |  |
| 7(11\_58) | 0.8536 | 0.8649 |  |
| 8(12\_15) | 0.8282 | 0.8451 |  |
| 9(12\_22) | 0.8280 | 0.8422 |  |
| 10(12\_33) | 0.83045 | 0.8564 |  |
| 11(12\_43) | 0.8587 | 0.874 |  |
| 12(12\_50) | 0.8762 | 0.8762 |  |
| 13(12\_58) | 0.8663 | 0.8738 |  |
| 14(13\_05) | 0.85235 | 0.8673 |  |
| 15(13\_12) | 0.8535 | 0.8686 |  |
| 16(13\_23) | 0.8271 | 0.8442 |  |
| 17(13\_32) | 0.86525 | 0.8646 |  |
| 18(13\_40) | 0.8288 | 0.8466 |  |
| 19(13\_46) | 0.8713 | 0.8672 |  |
| 20(13\_56) | 0.8657 | 0.8657 |  |
| Mean | 0.851555 |  |  |
| Var | 0.000341 |  |  |
| **AEl2\_noGR** | | | |
| **Folder:AEl2\_noGR\_20190910** | | | |
| Nr. |  | Acc\_pre | Acc\_curr |
| 1  (11\_22) | Task\_0 | 0.9982 | 0.9982 |
| Task\_1 | 0.9514 | 0.9827 |
| Task\_2 | 0.8023 | 0.9972 |
| Task\_3 | 0.7684 | 0.9995 |
| Task\_4 | 0.62175 | 0.9797 |
| 2  (11\_44) | Task\_0 | 0.9983 | 0.9982 |
| Task\_1 | 0.9559 | 0.9802 |
| Task\_2 | 0.8236 | 0.9967 |
| Task\_3 | 0.7619 | 0.9988 |
| Task\_4 | 0.6186 | 0.9817 |
| 3  (11\_53) | Task\_0 | 0.9982 | 0.9978 |
| Task\_1 | 0.9522 | 0.9811 |
| Task\_2 | 0.8041 | 0.9973 |
| Task\_3 | 0.7686 | 0.9997 |
| Task\_4 | 0.6080 | 0.9786 |
| 4  (12\_03) | Task\_0 | 0.9986 | 0.9990 |
| Task\_1 | 0.9538 | 0.9803 |
| Task\_2 | 0.8137 | 0.9975 |
| Task\_3 | 0.7817 | 0.9993 |
| Task\_4 | 0.6026 | 0.9802 |
| 5  (12\_10) | Task\_0 | 0.9983 | 0.9979 |
| Task\_1 | 0.9567 | 0.9848 |
| Task\_2 | 0.8219 | 0.9973 |
| Task\_3 | 0.7759 | 0..9995 |
| Task\_4 | 0.5957 | 0.9803 |
| 6  (12\_20) | Task\_0 | 0.9976 | 0.9805 |
| Task\_1 | 0.9574 | 0.9993 |
| Task\_2 | 0.8309 | 0.9961 |
| Task\_3 | 0.7775 | 0.9835 |
| Task\_4 | 0.6151 | 0.9975 |
| 7  (12\_31) | Task\_0 | 0.9985 | 0.9981 |
| Task\_1 | 0.9550 | 0.9827 |
| Task\_2 | 0.8390 | 0.9965 |
| Task\_3 | 0.7780 | 0.9996 |
| Task\_4 | 0.59825 | 0.9826 |
| 8  (12\_44) | Task\_0 | 0.9979 | 0.9980 |
| Task\_1 | 0.9559 | 0.9830 |
| Task\_2 | 0.7963 | 0.9967 |
| Task\_3 | 0.7998 | 0.9998 |
| Task\_4 | 0.6275 | 0.9799 |
| 9  (12\_52) | Task\_0 | 0.9974 | 0.9976 |
| Task\_1 | 0.9500 | 0.9796 |
| Task\_2 | 0.8299 | 0.9971 |
| Task\_3 | 0.7880 | 0.9988 |
| Task\_4 | 0.63625 | 0.9792 |
| 10  (13\_00) | Task\_0 | 0.9979 | 0.9983 |
| Task\_1 | 0.9508 | 0.9810 |
| Task\_2 | 0.8132 | 0.9971 |
| Task\_3 | 0.7680 | 0.9994 |
| Task\_4 | 0.6174 | 0.9807 |
| 11  (13\_08) | Task\_0 | 0.9981 | 0.9976 |
| Task\_1 | 0.9601 | 0.9862 |
| Task\_2 | 0.8329 | 0.9974 |
| Task\_3 | 0.7464 | 0.9997 |
| Task\_4 | 0.6055 | 0.9820 |
| 12  (13\_15) | Task\_0 | 0.9975 | 0.9984 |
| Task\_1 | 0.9555 | 0.9827 |
| Task\_2 | 0.8066 | 0.9965 |
| Task\_3 | 0.7717 | 0.9993 |
| Task\_4 | 0.6132 | 0.9813 |
| 13  (13\_25) | Task\_0 | 0.9971 | 0.9977 |
| Task\_1 | 0.9578 | 0.9830 |
| Task\_2 | 0.8025 | 0.9978 |
| Task\_3 | 0.7789 | 0.9996 |
| Task\_4 | 0.5999 | 0.9786 |
| 14  (13\_36) | Task\_0 | 0.9981 | 0.9985 |
| Task\_1 | 0.9552 | 0.9820 |
| Task\_2 | 0.8238 | 0.9967 |
| Task\_3 | 0.7911 | 0.9993 |
| Task\_4 | 0.6282 | 0.9796 |
| 15  (13\_45) | Task\_0 | 0.9981 | 0.9983 |
| Task\_1 | 0.9532 | 0.9801 |
| Task\_2 | 0.8229 | 0.9975 |
| Task\_3 | 0.7611 | 0.9992 |
| Task\_4 | 0.6103 | 0.9808 |
| 16  (13\_54) | Task\_0 | 0.9982 | 0.9982 |
| Task\_1 | 0.9509 | 0.9789 |
| Task\_2 | 0.8092 | 0.9964 |
| Task\_3 | 0.7694 | 0.9989 |
| Task\_4 | 0.6276 | 0.9814 |
| 17  (14\_04) | Task\_0 | 0.9979 | 0.9803 |
| Task\_1 | 0.9536 | 0.9998 |
| Task\_2 | 0.8018 | 0.9972 |
| Task\_3 | 0.7810 | 0.9849 |
| Task\_4 | 0.6154 | 0.9981 |
| 18  (14\_09) | Task\_0 | 0.9976 | 0.9974 |
| Task\_1 | 0.9593 | 0.9799 |
| Task\_2 | 0.8322 | 0.9958 |
| Task\_3 | 0.7768 | 0.9993 |
| Task\_4 | 0.6155 | 0.9830 |
| 19  (14\_13) | Task\_0 | 0.9980 | 0.9984 |
| Task\_1 | 0.9510 | 0.9845 |
| Task\_2 | 0.8295 | 0.9963 |
| Task\_3 | 0.7977 | 0.9993 |
| Task\_4 | 0.6229 | 0.9806 |
| 20  (14\_17) | Task\_0 | 0.9973 | 0.9979 |
| Task\_1 | 0.9511 | 0.9773 |
| Task\_2 | 0.7707 | 0.9972 |
| Task\_3 | 0.7462 | 0.9996 |
| Task\_4 | 0.6296 | 0.9757 |
|  |  | Mean | |
|  | Task\_0 | 0.99794 | 0.996315 |
|  | Task\_1 | 0.95434 | 0.983455 |
|  | Task\_2 | 0.81535 | 0.996915 |
|  | Task\_3 | 0.774405 | 0.997763 |
|  | Task\_4 | 0.615463 | 0.982075 |
|  |  | Var | |
|  | Task\_0 | 1.64632E-07 | 2.97613E-05 |
|  | Task\_1 | 9.06779E-06 | 3.48637E-05 |
|  | Task\_2 | 0.00027201 | 2.81342E-07 |
|  | Task\_3 | 0.000202887 | 2.29825E-05 |
|  | Task\_4 | 0.000130327 | 3.15251E-05 |
| **AEl2\_GR** | | | |
| 1  (11\_27) | Task\_0 | 0.9976 | 0.9977 |
| Task\_1 | 0.9732 | 0.9616 |
| Task\_2 | 0.9385 | 0.9873 |
| Task\_3 | 0.8931 | 0.9988 |
| Task\_4 | 0.7571 | 0.9681 |
| 2  (11\_42) | Task\_0 | 0.9982 | 0.9979 |
| Task\_1 | 0.9749 | 0.9639 |
| Task\_2 | 0.9060 | 0.9875 |
| Task\_3 | 0.8870 | 0.9996 |
| Task\_4 | 0.7672 | 0.9680 |
| 3  (11\_54) | Task\_0 | 0.9982 | 0.9987 |
| Task\_1 | 0.9757 | 0.9663 |
| Task\_2 | 0.8985 | 0.9907 |
| Task\_3 | 0.8904 | 0.9986 |
| Task\_4 | 0.7524 | 0.9588 |
| 4  (12\_13) | Task\_0 | 0.9972 | 0.9978 |
| Task\_1 | 0.9700 | 0.9731 |
| Task\_2 | 0.9188 | 0.9899 |
| Task\_3 | 0.9048 | 0.9995 |
| Task\_4 | 0.8023 | 0.9672 |
| 5  (12\_24) | Task\_0 | 0.9968 | 0.9965 |
| Task\_1 | 0.9757 | 0.9594 |
| Task\_2 | 0.9181 | 0.9892 |
| Task\_3 | 0.8879 | 0.9989 |
| Task\_4 | 0.75735 | 0.9667 |
| 6  (12\_34) | Task\_0 | 0.9971 | 0.9972 |
| Task\_1 | 0.9727 | 0.9696 |
| Task\_2 | 0.9260 | 0.9904 |
| Task\_3 | 0.8972 | 0.9994 |
| Task\_4 | 0.7660 | 0.9719 |
| 7  (12\_45) | Task\_0 | 0.9978 | 0.9976 |
| Task\_1 | 0.9711 | 0.9667 |
| Task\_2 | 0.9262 | 0.9856 |
| Task\_3 | 0.8948 | 0.9979 |
| Task\_4 | 0.7476 | 0.9678 |
| 8  (12\_54) | Task\_0 | 0.9967 | 0.9971 |
| Task\_1 | 0.9750 | 0.9720 |
| Task\_2 | 0.9095 | 0.9926 |
| Task\_3 | 0.8862 | 0.9994 |
| Task\_4 | 0.7507 | 0.9642 |
| 9  (13\_02) | Task\_0 | 0.9981 | 0.9979 |
| Task\_1 | 0.9733 | 0.9663 |
| Task\_2 | 0.9117 | 0.9901 |
| Task\_3 | 0.8893 | 0.9993 |
| Task\_4 | 0.7484 | 0.9721 |
| 10  (13\_13) | Task\_0 | 0.9981 | 0.9983 |
| Task\_1 | 0.9745 | 0.9653 |
| Task\_2 | 0.9211 | 0.9909 |
| Task\_3 | 0.8993 | 0.9993 |
| Task\_4 | 0.75455 | 0.9712 |
| 11  (13\_22) | Task\_0 | 0.9978 | 0.9979 |
| Task\_1 | 0.9723 | 0.9703 |
| Task\_2 | 0.9223 | 0.9914 |
| Task\_3 | 0.8869 | 0.9997 |
| Task\_4 | 0.7390 | 0.9716 |
| 12  (13\_35) | Task\_0 | 0.9978 | 0.9979 |
| Task\_1 | 0.9762 | 0.9725 |
| Task\_2 | 0.9152 | 0.9933 |
| Task\_3 | 0.8872 | 0.9993 |
| Task\_4 | 0.7693 | 0.9759 |
| 13  (14\_07) | Task\_0 | 0.9991 | 0.9987 |
| Task\_1 | 0.9710 | 0.9715 |
| Task\_2 | 0.9231 | 0.9684 |
| Task\_3 | 0.8958 | 0.9992 |
| Task\_4 | 0.7559 | 0.975 |
| 14  (14\_22) | Task\_0 | 0.9973 | 0.9979 |
| Task\_1 | 0.9706 | 0.9634 |
| Task\_2 | 0.9210 | 0.9869 |
| Task\_3 | 0.9090 | 0.9993 |
| Task\_4 | 0.7767 | 0.9658 |
| 15  (14\_25) | Task\_0 | 0.9974 | 0.9974 |
| Task\_1 | 0.9695 | 0.9708 |
| Task\_2 | 0.9121 | 0.9917 |
| Task\_3 | 0.8821 | 0.9991 |
| Task\_4 | 0.7433 | 0.9707 |
| 16  (14\_35) | Task\_0 | 0.9971 | 0.9969 |
| Task\_1 | 0.9735 | 0.9660 |
| Task\_2 | 0.9093 | 0.9880 |
| Task\_3 | 0.8729 | 0.9989 |
| Task\_4 | 0.7483 | 0.9623 |
| 17  (14\_38) | Task\_0 | 0.9978 | 0.9978 |
| Task\_1 | 0.9745 | 0.9631 |
| Task\_2 | 0.9224 | 0.9889 |
| Task\_3 | 0.9028 | 0.9990 |
| Task\_4 | 0.7538 | 0.9508 |
| 18  (14\_39) | Task\_0 | 0.9987 | 0.9987 |
| Task\_1 | 0.9741 | 0.9664 |
| Task\_2 | 0.9125 | 0.9901 |
| Task\_3 | 0.8735 | 0.9994 |
| Task\_4 | 0.7674 | 0.9728 |
| 19  (14\_46) | Task\_0 | 0.9978 | 0.9975 |
| Task\_1 | 0.9762 | 0.9638 |
| Task\_2 | 0.9270 | 0.9902 |
| Task\_3 | 0.8976 | 0.9995 |
| Task\_4 | 0.7695 | 0.9670 |
| 20  (14\_48) | Task\_0 | 0.9977 | 0.9979 |
| Task\_1 | 0.9717 | 0.9725 |
| Task\_2 | 0.9106 | 0.9845 |
| Task\_3 | 0.8869 | 0.9998 |
| Task\_4 | 0.7689 | 0.9731 |
|  |  | Mean | |
|  | Task\_0 | 0.997715 | 0.997765 |
|  | Task\_1 | 0.973285 | 0.967225 |
|  | Task\_2 | 0.917495 | 0.98838 |
|  | Task\_3 | 0.891235 | 0.999195 |
|  | Task\_4 | 0.759785 | 0.96805 |
|  |  | Var | |
|  | Task\_0 | 3.61342E-07 | 3.35026E-07 |
|  | Task\_1 | 4.42239E-06 | 1.6542E-05 |
|  | Task\_2 | 8.15816E-05 | 2.71954E-05 |
|  | Task\_3 | 8.72834E-05 | 1.86816E-07 |
|  | Task\_4 | 0.000202923 | 3.46605E-05 |
| **AE\_upp** | | | |
| 1  (11\_29) | Task\_0 | 0.9975 |  |
| Task\_1 | 0.9737 |  |
| Task\_2 | 0.9362 |  |
| Task\_3 | 0.9099 |  |
| Task\_4 | 0.8151 |  |
| 2  (11\_46) | Task\_0 | 0.9968 |  |
| Task\_1 | 0.9705 |  |
| Task\_2 | 0.9363 |  |
| Task\_3 | 0.9154 |  |
| Task\_4 | 0.80465 |  |
| 3  (12\_09) | Task\_0 | 0.9967 |  |
| Task\_1 | 0.9751 |  |
| Task\_2 | 0.9253 |  |
| Task\_3 | 0.9061 |  |
| Task\_4 | 0.8121 |  |
| 4  (12\_29) | Task\_0 | 0.9974 |  |
| Task\_1 | 0.9720 |  |
| Task\_2 | 0.9318 |  |
| Task\_3 | 0.9172 |  |
| Task\_4 | 0.7940 |  |
| 5  (12\_49) | Task\_0 | 0.9986 |  |
| Task\_1 | 0.9758 |  |
| Task\_2 | 0.9388 |  |
| Task\_3 | 0.9185 |  |
| Task\_4 | 0.7939 |  |
| 6  (13\_10) | Task\_0 | 0.9985 |  |
| Task\_1 | 0.9720 |  |
| Task\_2 | 0.9152 |  |
| Task\_3 | 0.9006 |  |
| Task\_4 | 0.8052 |  |
| 7  (13\_30) | Task\_0 | 0.9974 |  |
| Task\_1 | 0.9710 |  |
| Task\_2 | 0.9185 |  |
| Task\_3 | 0.9118 |  |
| Task\_4 | 0.7837 |  |
| 8  (14\_12) | Task\_0 | 0.9975 |  |
| Task\_1 | 0.9728 |  |
| Task\_2 | 0.9322 |  |
| Task\_3 | 0.9219 |  |
| Task\_4 | 0.7946 |  |
| 9  (14\_45) | Task\_0 | 0.9961 |  |
| Task\_1 | 0.9717 |  |
| Task\_2 | 0.9175 |  |
| Task\_3 | 0.9062 |  |
| Task\_4 | 0.79135 |  |
| 10  (14\_51) | Task\_0 | 0.9966 |  |
| Task\_1 | 0.9750 |  |
| Task\_2 | 0.9259 |  |
| Task\_3 | 0.9111 |  |
| Task\_4 | 0.82075 |  |
| 11  (14\_57) | Task\_0 | 0.9981 |  |
| Task\_1 | 0.9738 |  |
| Task\_2 | 0.9352 |  |
| Task\_3 | 0.9255 |  |
| Task\_4 | 0.7873 |  |
| 12  (14\_59) | Task\_0 | 0.9980 |  |
| Task\_1 | 0.9691 |  |
| Task\_2 | 0.9244 |  |
| Task\_3 | 0.9255 |  |
| Task\_4 | 0.7878 |  |
| 13  (15\_09) | Task\_0 | 0.9974 |  |
| Task\_1 | 0.9719 |  |
| Task\_2 | 0.9261 |  |
| Task\_3 | 0.9105 |  |
| Task\_4 | 0.8007 |  |
| 14  (15\_15) | Task\_0 | 0.9977 |  |
| Task\_1 | 0.9678 |  |
| Task\_2 | 0.9253 |  |
| Task\_3 | 0.9076 |  |
| Task\_4 | 0.7876 |  |
| 15  (15\_16) | Task\_0 | 0.9977 |  |
| Task\_1 | 0.9642 |  |
| Task\_2 | 0.9311 |  |
| Task\_3 | 0.9015 |  |
| Task\_4 | 0.81355 |  |
| 16  (15\_24) | Task\_0 | 0.9964 |  |
| Task\_1 | 0.9701 |  |
| Task\_2 | 0.9333 |  |
| Task\_3 | 0.8992 |  |
| Task\_4 | 0.7928 |  |
| 17  (15\_34) | Task\_0 | 0.9973 |  |
| Task\_1 | 0.9703 |  |
| Task\_2 | 0.9274 |  |
| Task\_3 | 0.9126 |  |
| Task\_4 | 0.7997 |  |
| 18  (15\_47) | Task\_0 | 0.9974 |  |
| Task\_1 | 0.9711 |  |
| Task\_2 | 0.9381 |  |
| Task\_3 | 0.9131 |  |
| Task\_4 | 0.8169 |  |
| 19  (15\_53) | Task\_0 | 0.9972 |  |
| Task\_1 | 0.9710 |  |
| Task\_2 | 0.9406 |  |
| Task\_3 | 0.9207 |  |
| Task\_4 | 0.7842 |  |
| 20  (15\_54) | Task\_0 | 0.9975 |  |
| Task\_1 | 0.9750 |  |
| Task\_2 | 0.9354 |  |
| Task\_3 | 0.9285 |  |
| Task\_4 | 0.8163 |  |
|  |  | Mean | Var |
|  | Task\_0 | 0.99739 | 4.17789E-07 |
|  | Task\_1 | 0.971695 | 7.65839E-06 |
|  | Task\_2 | 0.92973 | 5.42275E-05 |
|  | Task\_3 | 0.91317 | 7.18348E-05 |
|  | Task\_4 | 0.80011 | 0.000147218 |

Summary(normale AE):

|  |  |  |  |
| --- | --- | --- | --- |
| All data | No GR(lower bound) | Mit GR | Upper bound |
| Mean | | | |
| 0.851555 | 0.99794 | 0.997715 | 0.99739 |
| 0.95434 | 0.973285 | 0.971695 |
| 0.81535 | 0.917495 | 0.92973 |
| 0.774405 | 0.891235 | 0.91317 |
| 0.615463 | 0.759785 | 0.80011 |
| Variance | | | |
| 0.000341 | 1.64632E-07 | 3.61342E-07 | 4.17789E-07 |
| 9.06779E-06 | 4.42239E-06 | 7.65839E-06 |
| 0.00027201 | 8.15816E-05 | 5.42275E-05 |
| 0.000202887 | 8.72834E-05 | 7.18348E-05 |
| 0.000130327 | 0.000202923 | 0.000147218 |



【20190924】

测试AEl2，针对于Fashion-MNIST

|  |  |  |
| --- | --- | --- |
| Epoch | Acc\_Train | Acc\_Test |
| 100 | 0.6983/0.7002 | 0.6665/0.6961 |
| 200 | 0.708/0.7014 | 0.69970.6606 |
| 300 | 0.7114/0.7225 | 0.7032/0.7146 |
| 400 | 0.7215/0.7158 | 0.7/0.7118 |
| 500 | 0.7082/0.7083 | 0.6965/0.6965 |
| 600 | 0.71895/0.7184 | 0.7096/0.7093 |
| 700 | 0.7147/0.7277 | 0.7081/0.716 |
| 800 | 0.7186/0.71675 | 0.713/0.6968 |
| 900 | 0.6792/0.7208 | 0.7097/0.7142 |
| 1000 | 0.7150/0.7150 | 0.7034/0.7034 |

测试AEl2,针对于MNIST

|  |  |  |
| --- | --- | --- |
| Epoch | Acc\_Train | Acc\_Test |
| 100 | 0.8761 | 0.8818 |
| 200 | 0.8821 | 0.8771 |
| 300 | 0.8828 | 0.8776 |
| 400 |  |  |
| 500 | 0.8481 | 0.8829 |
| 600 |  |  |
| 700 | 0.8865 | 0.8772 |
| 800 |  |  |
| 900 | 0.8609 | 0.8401 |
| 1000 | 0.88125 | 0.853 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| noGR | 0.99 | 0.74 | 0.54 | 0.42 | 0.42 |
| GR | 0.96 | 0.91 | 0.68 | 0.57 | 0.45 |
| upp | 0.99 | 0.92 | 0.77 | 0.72 | 0.68 |