Neural Network Implementation: Autoencoder (AE)

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Question 2

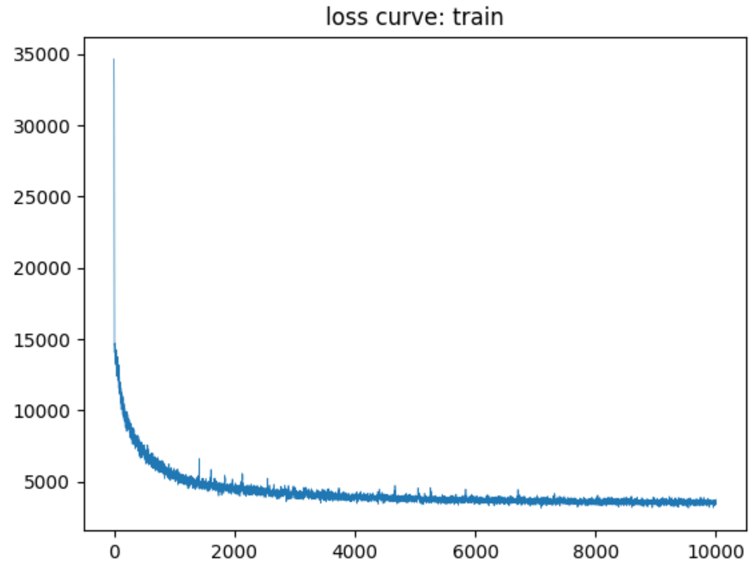
Development environment:

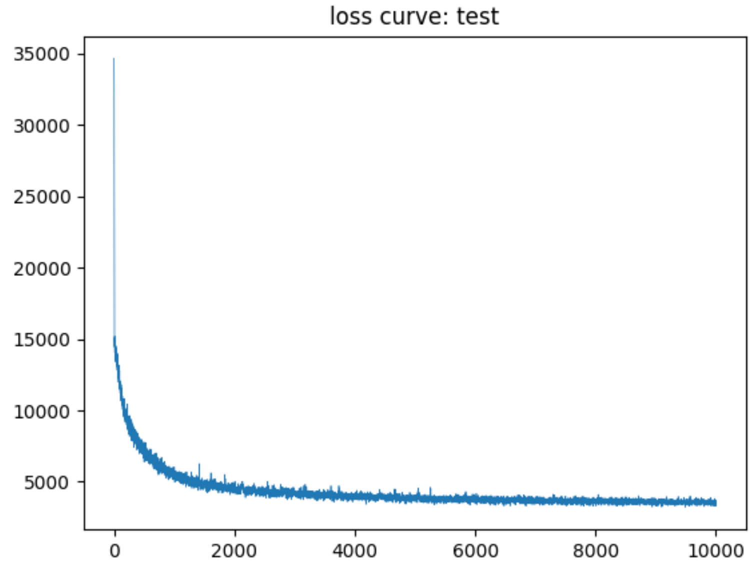
```
kernel version: #39-Ubuntu SMP
Processor type: x86_64
Memory size: 31GiB System memorylsh

CPUs: 12
CPU model name: Intel(R) Core(TM) i7-8700 CPU @ 3.20GHz
L1d cache:           32K
L1i cache:           32K
L2 cache:            256K
L3 cache:            12288K

network: Ethernet interface
```

Parameters:

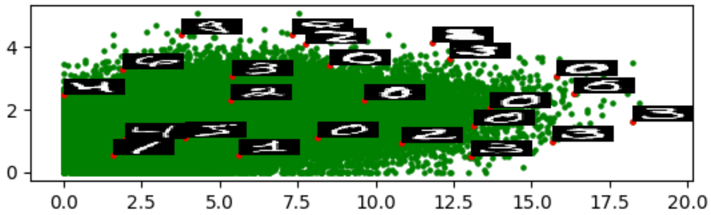
iteration times: 10000
batch size : 64
learning rate : 0.01

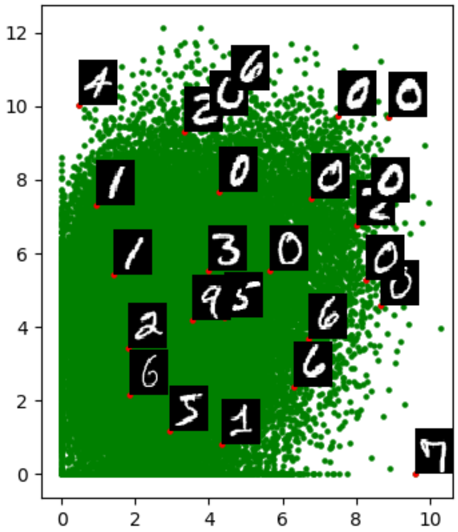
Result images:





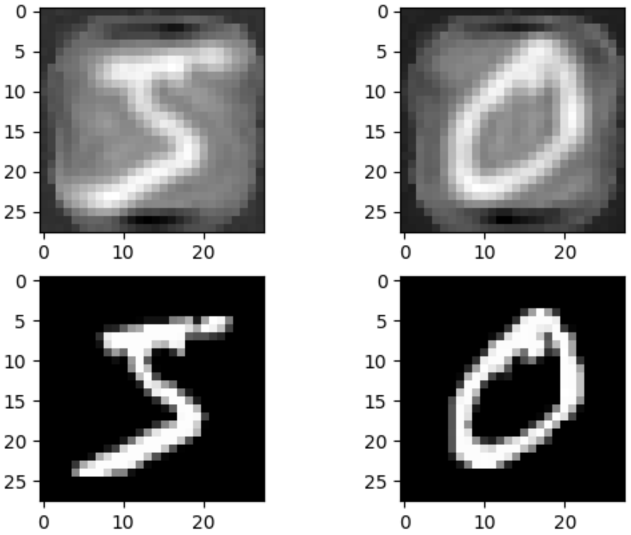
Dimension reduction:

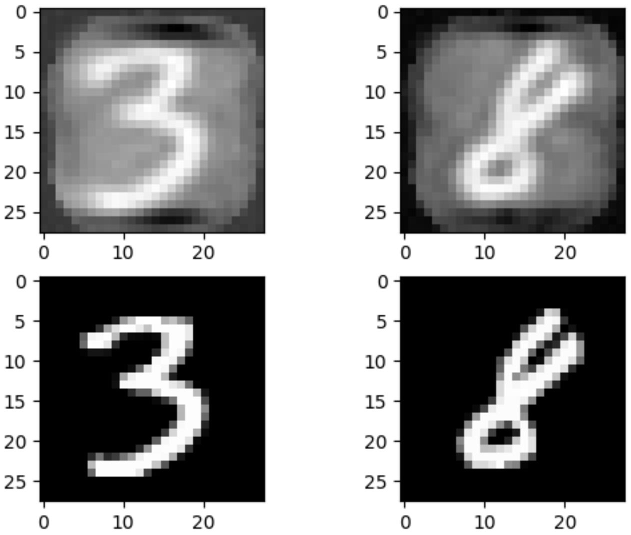


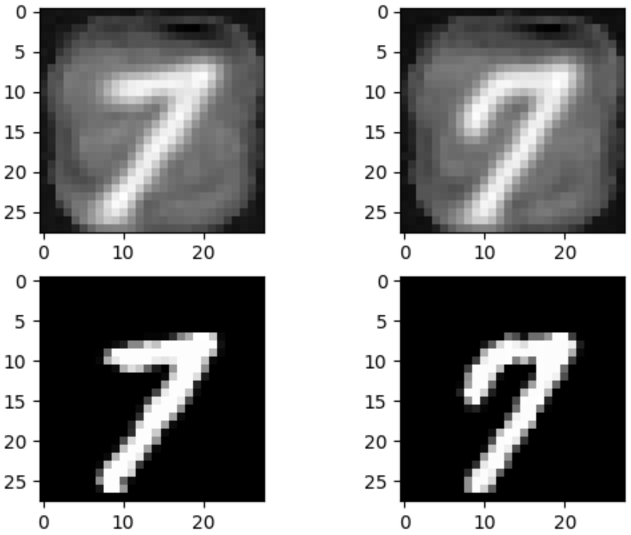


Reconstruction results:

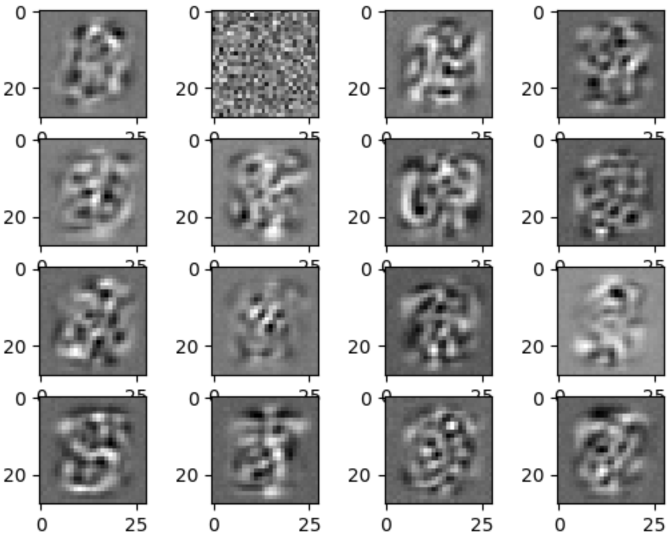
Reconstruction results on the top, the originals on the bottom







Filters:



Observations:

1. As this question is meant to compare the training results to the original images, there will be no such thing as accuracy, but only the loss curve.
2. The result of the dimension reduction is similar to that of the previous homework: with larger x value, the image is somewhat more oblique; however, with different y values, there is no explicit distinction.
3. The reconstruction results are somewhat weird, as they do show the shape of original numbers quite clearly, which is a good sign saying that the reconstruction is successful, but they don’t generate the right color of the backgroud. (p.s. the images are gray-scaled)
4. The filters are still the same problem as those of the previous homework: one cannot understand the meaning of these filters.
5. The parametres mentioned above are tried and considered to be leading to better results; however, as many learners of AI concern, I don’t really understand why ends in this conclusion and this set of optimal parametres. I tried to print out some processes of this training, but didn’t yet find out any useful information.

Clarification:

The code of this report is constructed according to the book “Deep Learning：用Python進行深度學習的基礎理論實作”. Therefore, the structure and some part of my code looks similar to the code provided in the book.

tags: `Machine Learning` `Neural Network` `Autoencoder` `AE` `Reconstruction` `Filters` `Relu` `Sigmoid` `Cross entropy error` `Mnist dataset`