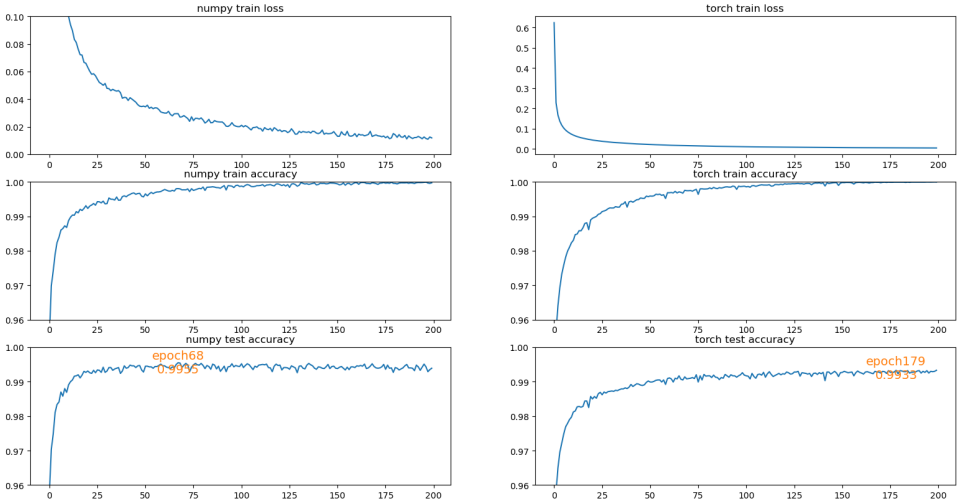
ResNet9 numpy mnist

performance

测试集准确率99.55%

Loss curve



Dependency

cupy & numpy

`pip install cupy-cuda12x`

to draw these figs,

`torch, matplotlib` are used

Implementation

`Convblock, Resblock, Maxpooling, Avgpooling, Dropout, softmax, relu, cross_entropy_loss`, all these `forward` and its corresponding `backward`.

Experiments

Mnist, 60000 for train, 10000 for test.

Hyperparameter:

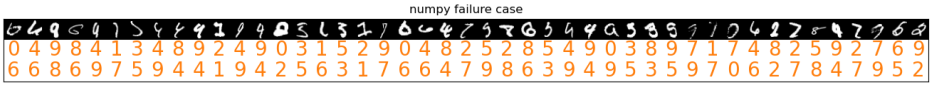
Batchsize: 64, so every epoch has 938 iterations

learning rate: 1e-4

dropout rate: 0.9

epochs_max: 200

Failure case



The first row is the input images, second row is combination of wrong predictions, third row is combination of labels

Try the code

After installing all dependencies(site-packages), run

`python mnist_maxpool_weightdecay.py`

Parameters, log files, backups will be saved at `../save/20241019`, you can modify variable `tag` for diffenent folders.

The pytorch version, run

`cd torch_version`

`python resnet9_torch.py`

And to show the results (just like this report) , after training, run

`python plot_figs.py`

Other statements

In our implementation of `MaxPooling2D`, a mask that records the position of max indices of forward process is used, then passed into backward process. It is possible that, a sub block has 2 values, they all equal to the max value, a conservative choise is to randomly choose one, but we make the mask of all these positions into 1——for simplification.

The dropout rate is an interesting parameter, we found even 99% droprate can achieve >99% accuracy, but more easy to collapse. And in our experiment, we tried 0.5, 0.6, 0.7, 0.8, 0.9, 0.95, 0.99 droprate, 0.9 can achieve the highest test accuracy (99.55%)