Lab-1 Report

Original Labs: AI-Systems

Experimental Enviroments

Hardware	CPU（# vCPU)	2
	GPU	/
Software	OS Version	macOS Mojave
	Package	PyTorch-1.9.0
	CUDA Version	/

Experimental Results

Visualizing Models and Results

Note: use `tensorboard --logdir=logs`

Network Data Trend

output

64×10

Net

64×1×28×28

input +

Net

94
95
96

Linear[fc2]

Dropout2d[drop...

input.15

Linear[fc1]

85
86
input.11

Dropout2d[drop...

72
73
76
79
80
input.9

input.7

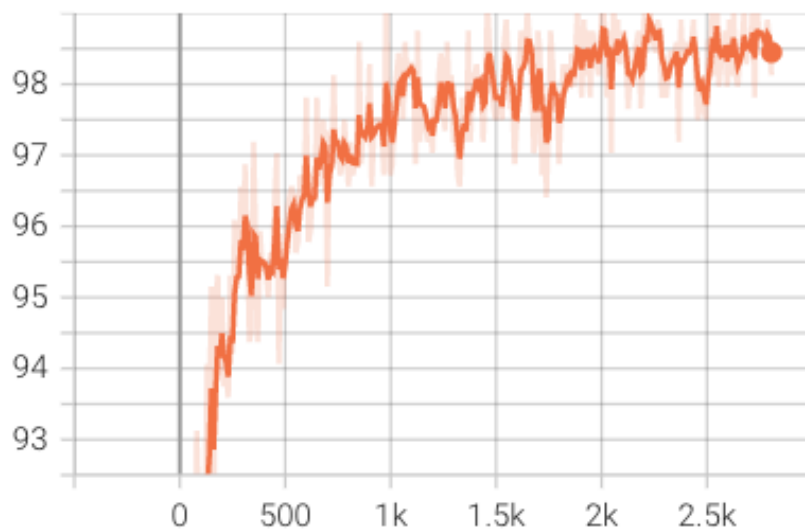Conv2d[con...

input.3

Conv2d[con...
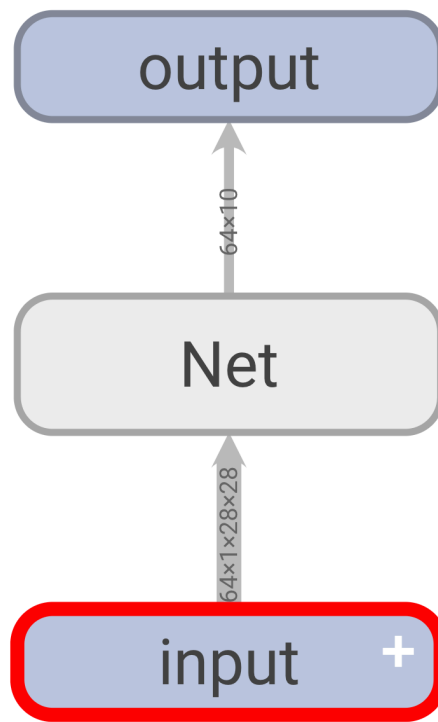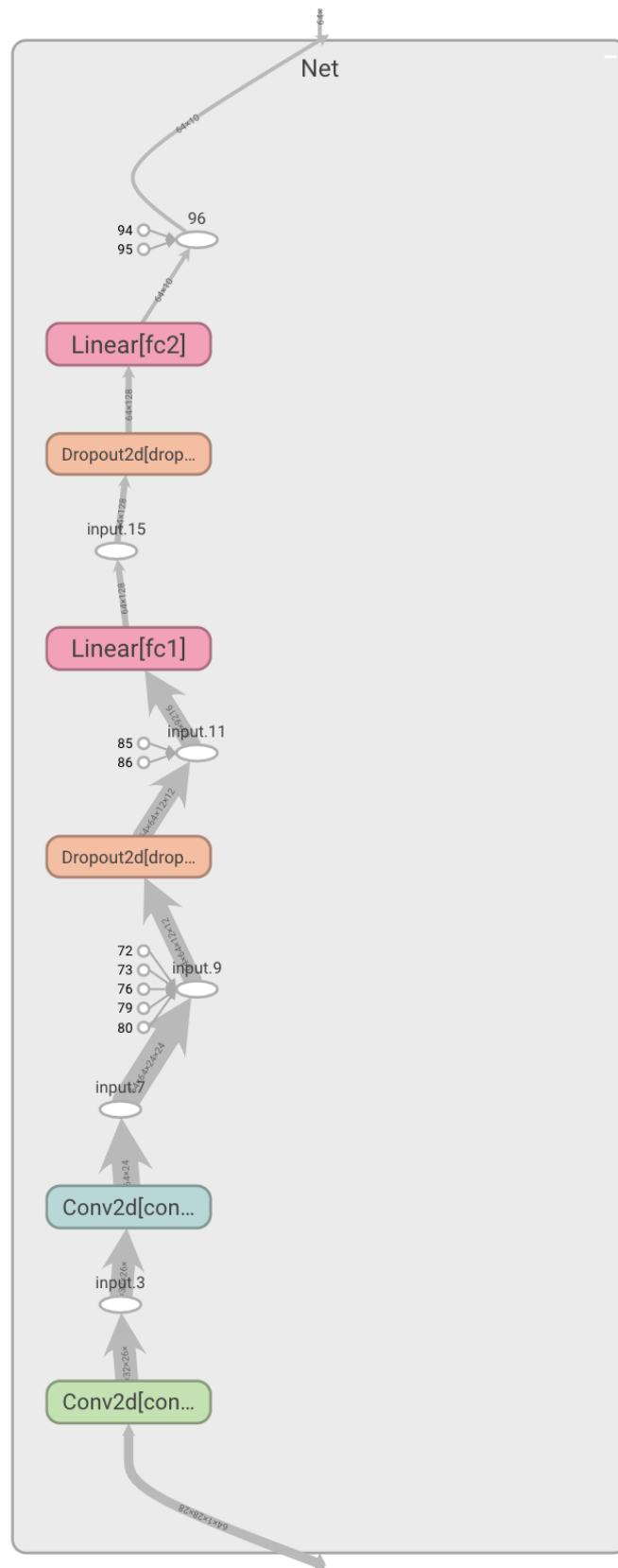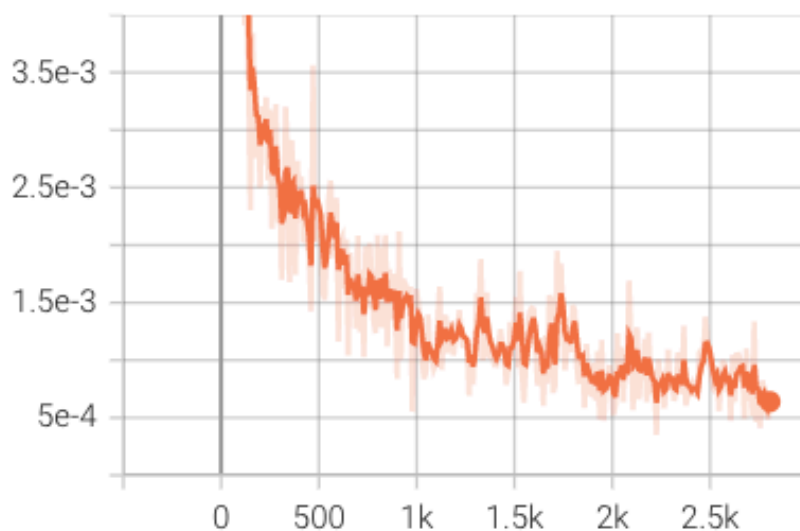
Loss and Accuracy Trend

Accuracy

Accuracy/train
tag: Accuracy/train

Loss

Loss/train
tag: Loss/train

Operations

from profile results:

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                          Name     Self CPU %     Self CPU   CPU total %      CPU
total   CPU time avg    # of Calls
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                   aten::conv2d        0.71%     903.317us        32.73%
41.396ms        41.396ms             1
               aten::convolution        0.01%      17.259us        32.02%
40.492ms        40.492ms             1
              aten::_convolution        0.61%     775.225us        32.01%
40.475ms        40.475ms             1
        aten::mkldnn_convolution       31.36%      39.654ms        31.39%
39.700ms        39.700ms             1
                    aten::empty        0.02%      25.299us         0.02%
25.299us        25.299us             1
               aten::as_strided_        0.02%      20.716us         0.02%
20.716us        20.716us             1
                     aten::relu        0.47%     597.455us         1.53%
1.940ms         1.940ms             1
                aten::clamp_min        0.02%      27.279us         1.06%
1.343ms         1.343ms             1
                    aten::empty        0.00%       5.226us         0.00%
5.226us         5.226us             1
                aten::clamp_min        1.04%       1.310ms         1.04%
1.310ms         1.310ms             1
                   aten::conv2d        0.00%       4.681us        35.13%
44.421ms        44.421ms             1
               aten::convolution        0.00%       4.980us        35.12%
44.416ms        44.416ms             1
              aten::_convolution        0.01%      14.663us        35.12%
44.411ms        44.411ms             1
        aten::mkldnn_convolution       35.09%      44.379ms        35.11%
44.397ms        44.397ms             1
                    aten::empty        0.01%      14.540us         0.01%
14.540us        14.540us             1
               aten::as_strided_        0.00%       3.650us         0.00%
3.650us         3.650us             1
                     aten::relu        0.01%      15.720us         0.94%
1.183ms         1.183ms             1
                aten::clamp_min        0.00%       5.479us         0.92%
1.167ms         1.167ms             1
                    aten::empty        0.00%       2.878us         0.00%
2.878us         2.878us             1
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Name	Self CPU %	Self CPU	CPU total %	CPU total	CPU time avg	# of Calls
aten::clamp_min	0.92%	1.159ms	0.92%	1.159ms	1.159ms	1
aten::max_pool2d	1.00%	1.266ms	10.86%	13.731ms	13.731ms	1
aten::max_pool2d_with_indices	9.86%	12.466ms	9.86%	12.466ms	12.466ms	1
aten::feature_dropout	0.42%	533.460us	4.71%	5.959ms	5.959ms	1
aten::empty	0.01%	9.312us	0.01%	9.312us	9.312us	1
aten::bernoulli_	2.31%	2.918ms	2.34%	2.959ms	2.959ms	1
aten::empty	0.03%	40.485us	0.03%	40.485us	40.485us	1
aten::div_	0.04%	54.159us	0.56%	704.197us	704.197us	1
aten::to	0.48%	603.033us	0.51%	650.038us	650.038us	1
aten::empty_strided	0.00%	3.819us	0.00%	3.819us	3.819us	1
aten::copy_	0.03%	43.186us	0.03%	43.186us	43.186us	1
aten::mul	1.39%	1.753ms	1.39%	1.753ms	1.753ms	1
aten::flatten	0.02%	19.643us	0.03%	41.842us	41.842us	1
aten::view	0.02%	22.199us	0.02%	22.199us	22.199us	1
aten::linear	2.11%	2.665ms	9.68%	12.240ms	12.240ms	1
aten::t	0.48%	609.637us	0.60%	757.760us	757.760us	1
aten::transpose	0.11%	140.705us	0.12%	148.123us	148.123us	1
aten::as_strided	0.01%	7.418us	0.01%	7.418us	7.418us	1
aten::addmm	6.93%	8.767ms	6.97%	8.817ms	8.817ms	1
aten::expand	0.02%	24.723us	0.02%	29.151us	29.151us	1
aten::as_strided	0.00%	4.428us	0.00%	4.428us	4.428us	1
aten::copy_	0.02%	21.343us	0.02%	21.343us	21.343us	1
aten::relu	0.01%	12.372us	0.04%	46.287us	46.287us	1
aten::clamp_min	0.01%	14.627us	0.03%	33.915us	33.915us	1

Name	Self CPU %	Self CPU	CPU total %	CPU total	CPU time avg	# of Calls
aten::empty	0.00%	4.259us	0.00%	4.259us	4.259us	1
aten::clamp_min	0.01%	15.029us	0.01%	15.029us	15.029us	1
aten::feature_dropout	0.01%	16.409us	0.18%	225.300us	225.300us	1
aten::empty	0.00%	2.341us	0.00%	2.341us	2.341us	1
aten::bernoulli_	0.09%	116.905us	0.09%	118.090us	118.090us	1
aten::empty	0.00%	1.185us	0.00%	1.185us	1.185us	1
aten::div_	0.02%	22.843us	0.03%	35.798us	35.798us	1
aten::to	0.00%	4.860us	0.01%	12.955us	12.955us	1
aten::empty_strided	0.00%	2.912us	0.00%	2.912us	2.912us	1
aten::copy_	0.00%	5.183us	0.00%	5.183us	5.183us	1
aten::mul	0.04%	52.662us	0.04%	52.662us	52.662us	1
aten::linear	0.00%	5.098us	0.08%	96.324us	96.324us	1
aten::t	0.01%	9.217us	0.01%	17.823us	17.823us	1
aten::transpose	0.00%	5.864us	0.01%	8.606us	8.606us	1
aten::as_strided	0.00%	2.742us	0.00%	2.742us	2.742us	1
aten::addmm	0.05%	62.877us	0.06%	73.403us	73.403us	1
aten::expand	0.00%	2.922us	0.00%	3.957us	3.957us	1
aten::as_strided	0.00%	1.035us	0.00%	1.035us	1.035us	1
aten::copy_	0.01%	6.569us	0.01%	6.569us	6.569us	1
aten::log_softmax	0.51%	642.944us	4.10%	5.185ms	5.185ms	1
aten::_log_softmax	3.58%	4.531ms	3.59%	4.542ms	4.542ms	1
aten::empty	0.01%	10.993us	0.01%	10.993us	10.993us	1
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Self CPU time total: 126.464ms

Compare Different Batch Size

Training 1 epochs:

Batch Size	Comparison
1	Self CPU time total: 51.256ms (51.256 ms/batch) Test set: Average loss: 0.1159, Accuracy: 9749/10000 (97%)
16	52.227ms (3.2641875ms/batch) Test set: Average loss: 0.0586, Accuracy: 9829/10000 (98%)
64	CPU time total: 126.464ms (1.976 ms/batch) Test set: Average loss: 0.0677, Accuracy: 9782/10000 (98%)