

实验报告

<https://github.com/2horse9sun/coursework/blob/main/AI-System/Labs/BasicLabs/Lab1/lab1-report.md>

(图片存储在github仓库中, 若因网络原因无法显示, 请查看pdf文件)

1. 实验环境

1.1 硬件环境

CPU(vCPU数目): Intel® Core™ i7-9750H CPU @ 2.60GHz × 12

GPU(型号, 数目): GeForce RTX 2080 with Max-Q Design/PCIe/SSE2 × 1

1.2 软件环境

OS版本: Ubuntu 18.04.5 LTS

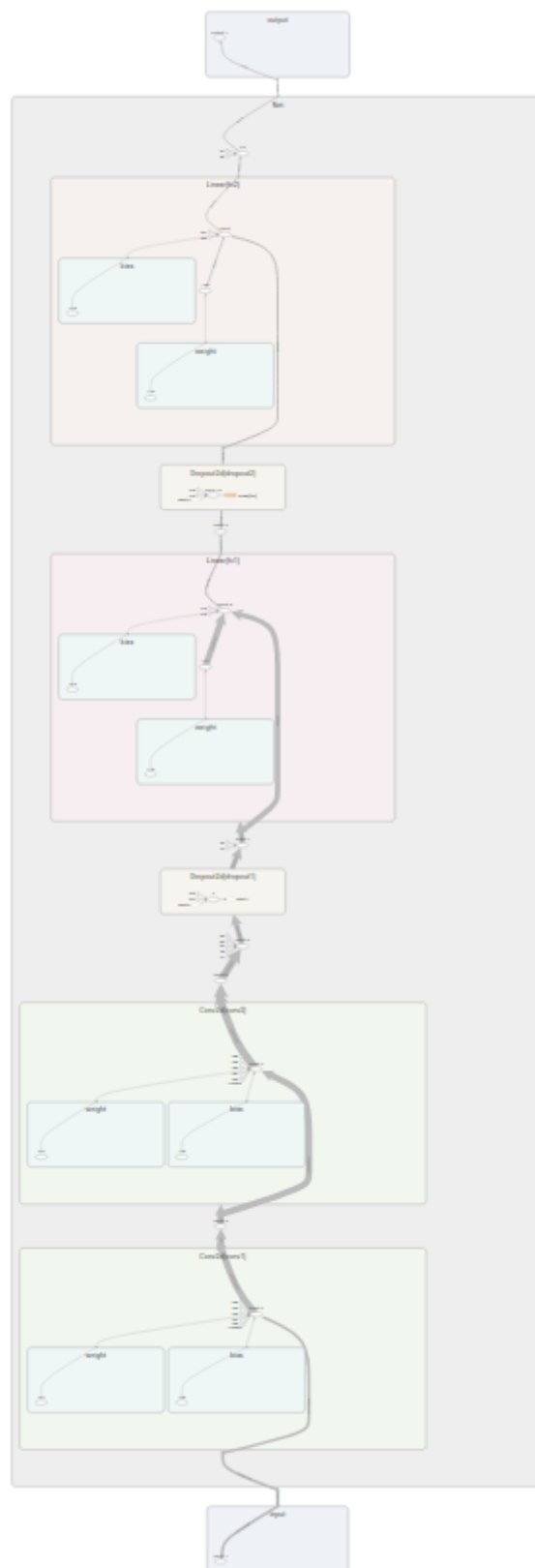
深度学习框架, python包名称及版本: Pytorch 1.5, Tensorflow 1.15.0

CUDA版本: 11.0

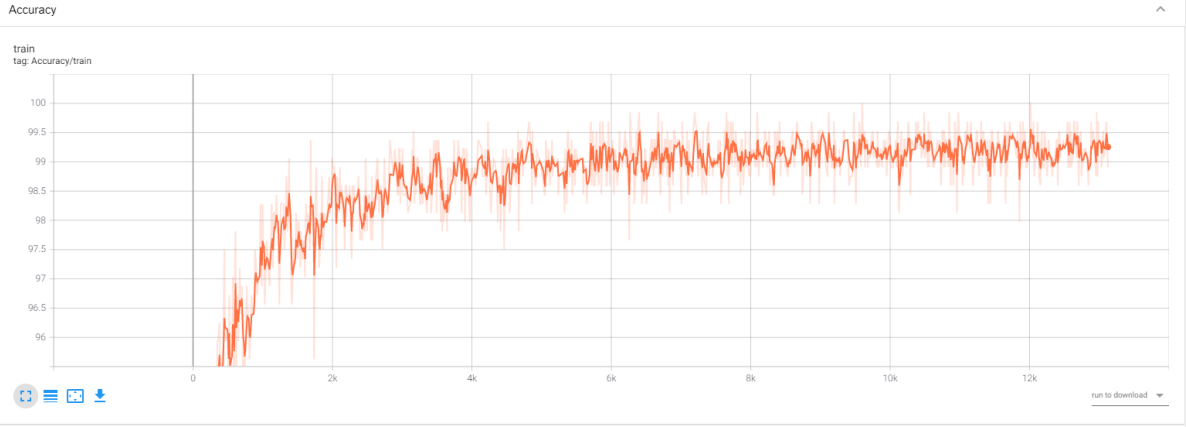
2. 实验结果

2.1 模型可视化结果截图

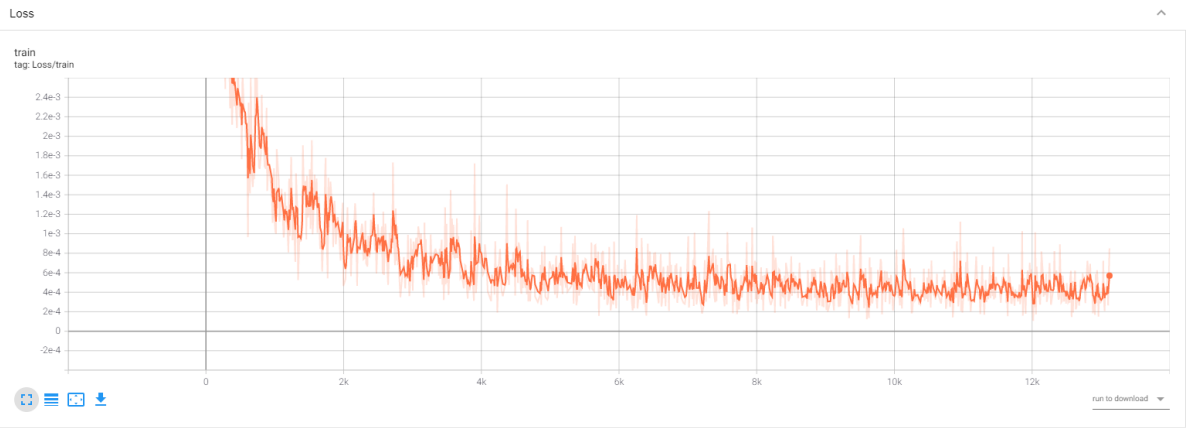
神经网络数据流图:



正确率趋势图:



损失趋势图:



网络分析，使用率前十名的操作(不使用CUDA):

Name	Self CPU total %	Self CPU total	CPU total %	CPU total	CPU time avg	Number of Calls
conv2d	0.30%	6.001us	55.92%	1.135ms	567.731us	2
convolution	0.15%	3.137us	55.62%	1.129ms	564.731us	2
_convolution	2.30%	46.608us	55.47%	1.126ms	563.163us	2
mkldnn_convolution	53.08%	1.078ms	53.08%	1.078ms	538.894us	2
addmm	17.26%	350.570us	17.26%	350.570us	175.285us	2
feature_dropout	1.15%	23.341us	9.92%	201.433us	100.717us	2
max_pool2d	0.26%	5.205us	7.39%	150.119us	150.119us	1
max_pool2d_with_indices	7.14%	144.914us	7.14%	144.914us	144.914us	1
bernoulli_	4.67%	94.758us	4.67%	94.758us	47.379us	2
relu	3.79%	76.894us	3.79%	76.894us	25.631us	3
Self CPU time total: 2.031ms						

网络分析，使用率前十名的操作(使用CUDA):

Name	Self CPU total %	Self CPU total	CPU total %	CPU total	CPU time avg	CUDA total %	CUDA total	CUDA time avg	Number of Calls
conv2d	0.01%	14.061us	94.79%	163.393ms	81.697ms	24.60%	163.392ms	81.696ms	2
convolution	0.01%	12.630us	94.78%	163.379ms	81.696ms	24.65%	163.377ms	81.696ms	2
_convolution	0.03%	54.797us	94.77%	163.366ms	81.683ms	24.65%	163.368ms	81.684ms	2
cuda_convolution	94.67%	163.197ms	94.67%	163.197ms	81.599ms	24.63%	163.211ms	81.606ms	2
pin_memory	3.46%	5.962ms	4.72%	8.133ms	2.033ms	0.88%	5.857ms	1.464ms	4
empty	1.22%	2.100ms	1.22%	2.100ms	349.992us	0.34%	2.239ms	373.172us	6
addmm	0.19%	323.341us	0.19%	323.341us	161.670us	0.05%	330.312us	169.156us	2
feature_dropout	0.03%	52.848us	0.10%	177.576us	88.780us	0.03%	174.766us	87.383us	2
relu	0.04%	76.737us	0.04%	76.737us	25.579us	0.01%	72.234us	24.078us	3
set_	0.04%	71.361us	0.04%	71.361us	8.920us	0.01%	66.174us	8.272us	8
Self CPU time total: 172.381ms CUDA time total: 662.713ms									

通过分析可以看出，卷积操作占用了大多数CPU时间，因此对卷积进行重点优化可以提升性能。

2.2 网络分析，不同批大小结果比较

不使用CUDA:

batch_size= 1:

