实验2报告

https://github.com/2horse9sun/coursework/blob/main/AI-System/Labs/BasicLabs/Lab2/lab2-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 PyTorch原有张量运算

```
-------------------------  ------------  ------------  ------------  ------------  ------------  ------------
Name                       Self CPU total %  Self CPU total   CPU total %      CPU total        CPU time avg     Number of Calls
-------------------------  ------------  ------------  ------------  ------------  ------------  ------------
conv2d                     0.01%            8.613us          90.85%           155.767ms        77.883ms         2
convolution                0.00%            4.910us          90.85%           155.758ms        77.879ms         2
_convolution               0.02%            31.675us         90.84%           155.753ms        77.877ms         2
cudnn_convolution          90.77%           155.622ms        90.77%           155.622ms        77.811ms         2
addmm                      5.31%            9.107ms          5.31%            9.107ms          4.553ms          2
pin_memory                 3.55%            6.089ms          3.59%            6.154ms          1.539ms          4
feature_dropout            0.01%            17.785us         0.10%            169.148us        84.574us         2
relu                       0.06%            98.812us         0.06%            98.812us         32.937us         3
add                        0.04%            66.528us         0.04%            66.528us         33.264us         2
mul                        0.03%            56.228us         0.03%            56.228us         28.114us         2
-------------------------  ------------  ------------  ------------  ------------  ------------  ------------
Self CPU time total: 171.453ms
```

2.2 基于Python API的定制化张量运算

```
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Name                       Self CPU total %  Self CPU total   CPU total %      CPU total        CPU time avg     Number of Calls
-------------------------  ------------  ------------  ------------  ------------  ------------  ------------
conv2d                     0.00%            4.162us          98.55%           157.117ms        78.559ms         2
convolution                0.00%            4.272us          98.55%           157.113ms        78.557ms         2
_convolution               0.02%            39.155us         98.55%           157.109ms        78.554ms         2
cudnn_convolution          98.46%           156.970ms        98.46%           156.970ms        78.485ms         2
pin_memory                 0.91%            1.444ms          1.03%            1.647ms          411.833us        4
myLinearFunction           0.05%            85.136us         0.22%            343.629us        171.814us        2
mm                         0.15%            246.859us        0.15%            246.859us        123.429us        2
is_pinned                  0.12%            187.976us        0.12%            187.976us        46.994us         4
feature_dropout            0.01%            19.128us         0.08%            132.737us        66.369us         2
add                        0.04%            69.086us         0.04%            69.086us         34.543us         2
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Self CPU time total: 159.423ms
```

2.3 基于C++的定制化张量运算

Name	Self CPU total %	Self CPU total	CPU total %	CPU total	CPU time avg	Number of Calls
conv2d	0.01%	8.866us	95.74%	165.587ms	82.793ms	2
convolution	0.00%	4.299us	95.73%	165.578ms	82.789ms	2
_convolution	0.02%	35.213us	95.73%	165.574ms	82.787ms	2
cudnn_convolution	95.65%	165.444ms	95.65%	165.444ms	82.722ms	2
pin_memory	3.84%	6.641ms	3.86%	6.685ms	1.671ms	4
myLinearFunction	0.05%	88.010us	0.20%	349.527us	174.764us	2
mm	0.15%	251.521us	0.15%	251.521us	125.761us	2
feature_dropout	0.01%	21.848us	0.08%	143.615us	71.807us	2
relu	0.04%	71.429us	0.04%	71.429us	23.810us	3
add	0.04%	62.966us	0.04%	62.966us	31.483us	2

Self CPU time total: 172.962ms