

Practice #4

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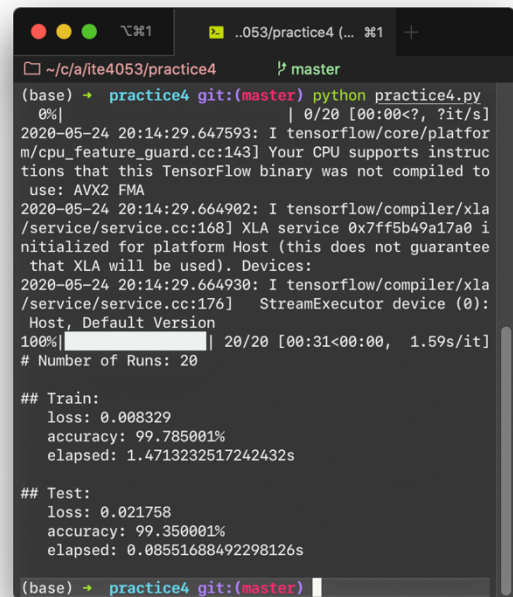
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Development Environment

OS	MacOS 10.15.4 (19E287)
Machine	MacBook Pro (13-inch, 2017) 3.5 GHz Dual-Core Intel Core i7 16 GB 2133 MHz LPDDR3
Language	Python 3.6.8 Anaconda, Inc.
Libraries	NumPy 1.18.4 TensorFlow 2.2.0 Keras 2.3.0-tf tqdm 4.36.1

Run

```
$ cd /path/to/repo/practice4  
$ python practice4.py
```



```
~/c/a/ite4053/practice4  master  
(base) → practice4 git:(master) python practice4.py  
0% | 0/20 [00:00<?, ?it/s]  
2020-05-24 20:14:29.647593: I tensorflow/core/platform/cpu_feature_guard.cc:143] Your CPU supports instructions that this TensorFlow binary was not compiled to use: AVX2 FMA  
2020-05-24 20:14:29.664902: I tensorflow/compiler/xla/service/service.cc:168] XLA service 0x7ff5b49a17a0 initialized for platform Host (this does not guarantee that XLA will be used). Devices:  
2020-05-24 20:14:29.664930: I tensorflow/compiler/xla/service/service.cc:176] StreamExecutor device (0): Host, Default Version  
100% | 20/20 [00:31<00:00, 1.59s/it]  
# Number of Runs: 20  
  
## Train:  
loss: 0.008329  
accuracy: 99.785001%  
elapsed: 1.4713232517242432s  
  
## Test:  
loss: 0.021758  
accuracy: 99.350001%  
elapsed: 0.08551688492298126s  
  
(base) → practice4 git:(master)
```

Experimental Setup

Used Adam with `learning_rate=0.5` as optimizer for TensorFlow-implemented version.

Results

		NumPy (Practice 3, Model 3)	TensorFlow (Local, CPU)	TensorFlow (Colab, CPU)	TensorFlow (Colab, GPU)
Accuracy	Train	99.24%	99.78%	99.76%	99.78%
	Test	99.00%	99.35%	99.30%	99.25%
Loss	Train	0.02	0.008329	0.008506	0.008517
	Test	0.02	0.021758	0.021491	0.023119
Elapsed Time	Train	124.59ms	1.47s	1.88s	3.05s
	Test	0.08ms	85ms	111ms	92ms

Results above are average value of 20 runs per model. Models implemented with TensorFlow performed slightly better than NumPy-implemented models but showed much poor speed. It seems that this difference is mainly because of different optimizer (Adam versus GD).

It is weird that TensorFlow with GPU version were much slower than others, which doesn't make sense. After some googling, I found that its' because data transfer time is larger than the time gain from doing GPU computation instead of CPU.