Pytorch Lab1 Report

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Introduction:

此次作業目的在於熟悉 pytorch 相關 API 的使用，以此訓練 CNN 模型，並學習如何計算 MACs,FLOPs 等指標

Experiment setup:

在 anaconda 新建一個環境:

conda create -n pytorch python=3.6
activate pytorch

安裝 pytorch

conda install pytorch torchvision cudatoolkit=9.2 -c pytorch -c defaults -c numba/label/dev

Result:

Lab1-1:

```
Test set: Top1 Accuracy: 2969/3347 (88 %) , Top3 Accuracy: 3264/3347 (97 %)
class 0 : 328/368 89 %
class 1 : 117/148 79 %
class 10 : 199/231 86 %
class 2 : 416/500 83 %
class 3 : 285/335 85 %
class 4 : 251/287 87 %
class 5 : 378/432 87 %
class 6 : 143/147 97 %
class 7 : 95/96 98 %
class 8 : 278/303 91 %
class 9 : 479/500 95 %
```

Lab1-2:

```
Lab 1-2:

resnet50:
Total params: 25.56M
Total MACs: 4113.56M

mobilenet_v2:
Total params: 3.50M
Total MACs: 315.41M
```

Lab1-3:

```
resnet50:

op_type | input_shape | output_shape | params | MACs | FLOPs
--------|-------------|--------------|--------|------|------
Conv2d [1, 3, 224, 224] [1, 64, 112, 112] 9408 118013952 950534144
Conv2d [1, 64, 56, 56] [1, 64, 56, 56] 4096 12845056 26091520
Conv2d [1, 64, 56, 56] [1, 64, 56, 56] 36864 115605504 231612416
Conv2d [1, 64, 56, 56] [1, 256, 56, 56] 16384 51380224 104366080
Conv2d [1, 64, 56, 56] [1, 256, 56, 56] 16384 51380224 104366080
Conv2d [1, 256, 56, 56] [1, 64, 56, 56] 16384 51380224 103161856
Conv2d [1, 64, 56, 56] [1, 64, 56, 56] 36864 115605504 231612416
Conv2d [1, 64, 56, 56] [1, 256, 56, 56] 16384 51380224 104366080
Conv2d [1, 256, 56, 56] [1, 64, 56, 56] 16384 51380224 103161856
Conv2d [1, 64, 56, 56] [1, 64, 56, 56] 36864 115605504 231612416
Conv2d [1, 64, 56, 56] [1, 256, 56, 56] 16384 51380224 104366080
Conv2d [1, 256, 56, 56] [1, 128, 56, 56] 32768 102760448 206323712
Conv2d [1, 128, 56, 56] [1, 128, 28, 28] 147456 115605504 925646848
Conv2d [1, 128, 28, 28] [1, 512, 28, 28] 65536 51380224 103563264
Conv2d [1, 256, 56, 56] [1, 512, 28, 28] 131072 102760448 825294848
Conv2d [1, 512, 28, 28] [1, 128, 28, 28] 65536 51380224 102961152
Conv2d [1, 128, 28, 28] [1, 128, 28, 28] 147456 115605504 231411712
Conv2d [1, 128, 28, 28] [1, 512, 28, 28] 65536 51380224 103563264
Conv2d [1, 512, 28, 28] [1, 128, 28, 28] 65536 51380224 102961152
Conv2d [1, 128, 28, 28] [1, 128, 28, 28] 147456 115605504 231411712
Conv2d [1, 128, 28, 28] [1, 512, 28, 28] 65536 51380224 103563264
Conv2d [1, 512, 28, 28] [1, 128, 28, 28] 65536 51380224 102961152
Conv2d [1, 128, 28, 28] [1, 128, 28, 28] 147456 115605504 231411712
Conv2d [1, 128, 28, 28] [1, 512, 28, 28] 65536 51380224 103563264
Conv2d [1, 512, 28, 28] [1, 256, 28, 28] 131072 102760448 205922304
Conv2d [1, 256, 28, 28] [1, 256, 14, 14] 589824 115605504 925245440
Conv2d [1, 256, 14, 14] [1, 1024, 14, 14] 262144 51380224 103161856
Conv2d [1, 512, 28, 28] [1, 1024, 14, 14] 524288 102760448 823689216
Conv2d [1, 1024, 14, 14] [1, 256, 14, 14] 262144 51380224 102860800
Conv2d [1, 256, 14, 14] [1, 256, 14, 14] 589824 115605504 231311360
Conv2d [1, 256, 14, 14] [1, 1024, 14, 14] 262144 51380224 103161856
Conv2d [1, 1024, 14, 14] [1, 256, 14, 14] 262144 51380224 102860800
Conv2d [1, 256, 14, 14] [1, 256, 14, 14] 589824 115605504 231311360
Conv2d [1, 256, 14, 14] [1, 1024, 14, 14] 262144 51380224 103161856
Conv2d [1, 1024, 14, 14] [1, 256, 14, 14] 262144 51380224 102860800
Conv2d [1, 256, 14, 14] [1, 256, 14, 14] 589824 115605504 231311360
Conv2d [1, 256, 14, 14] [1, 1024, 14, 14] 262144 51380224 103161856
Conv2d [1, 1024, 14, 14] [1, 256, 14, 14] 262144 51380224 102860800
Conv2d [1, 256, 14, 14] [1, 256, 14, 14] 589824 115605504 231311360
Conv2d [1, 256, 14, 14] [1, 1024, 14, 14] 262144 51380224 103161856
Conv2d [1, 1024, 14, 14] [1, 256, 14, 14] 262144 51380224 102860800
Conv2d [1, 256, 14, 14] [1, 256, 14, 14] 589824 115605504 231311360
Conv2d [1, 256, 14, 14] [1, 1024, 14, 14] 262144 51380224 103161856
Conv2d [1, 1024, 14, 14] [1, 512, 14, 14] 524288 102760448 205721600
Conv2d [1, 512, 14, 14] [1, 512, 7, 7] 2359296 115605504 925044736
Conv2d [1, 512, 7, 7] [1, 2048, 7, 7] 1048576 51380224 102961152
Conv2d [1, 1024, 14, 14] [1, 2048, 7, 7] 2097152 102760448 822886400
Conv2d [1, 2048, 7, 7] [1, 512, 7, 7] 1048576 51380224 102810624
Conv2d [1, 512, 7, 7] [1, 512, 7, 7] 2359296 115605504 231261184
Conv2d [1, 512, 7, 7] [1, 2048, 7, 7] 1048576 51380224 102961152
Conv2d [1, 2048, 7, 7] [1, 512, 7, 7] 1048576 51380224 102810624
Conv2d [1, 512, 7, 7] [1, 512, 7, 7] 2359296 115605504 231261184
Conv2d [1, 512, 7, 7] [1, 2048, 7, 7] 1048576 51380224 102961152
Linear [1, 2048] [1, 1000] 2049000 2048000 4095000

Total_params: 25.50M
Total_MACs: 4.09G
Total_FLOPs: 12.85G
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mobilenet_v2:

op_type | input_shape | output_shape | params | MACs | FLOPs
--------|-------------|--------------|--------|------|------
Conv2d [1, 3, 224, 224] [1, 32, 112, 112] 864 10838016 89915392
Conv2d [1, 32, 112, 112] [1, 32, 112, 112] 288 115605504 232013824
Conv2d [1, 32, 112, 112] [1, 16, 112, 112] 512 6422528 13246464
Conv2d [1, 16, 112, 112] [1, 96, 112, 112] 1536 19267584 40943616
Conv2d [1, 96, 112, 112] [1, 96, 56, 56] 864 260112384 2083307520
Conv2d [1, 96, 56, 56] [1, 24, 56, 56] 2304 7225344 14601216
Conv2d [1, 24, 56, 56] [1, 144, 56, 56] 3456 10838016 22579200
Conv2d [1, 144, 56, 56] [1, 144, 56, 56] 1296 585252864 1171408896
Conv2d [1, 144, 56, 56] [1, 24, 56, 56] 3456 10838016 21826560
Conv2d [1, 24, 56, 56] [1, 144, 56, 56] 3456 10838016 22579200
Conv2d [1, 144, 56, 56] [1, 144, 28, 28] 1296 146313216 1171408896
Conv2d [1, 144, 28, 28] [1, 32, 28, 28] 4608 3612672 7275520
Conv2d [1, 32, 28, 28] [1, 192, 28, 28] 6144 4816896 9934848
Conv2d [1, 192, 28, 28] [1, 192, 28, 28] 1728 260112384 520525824
Conv2d [1, 192, 28, 28] [1, 32, 28, 28] 6144 4816896 9683968
Conv2d [1, 32, 28, 28] [1, 192, 28, 28] 6144 4816896 9934848
Conv2d [1, 192, 28, 28] [1, 192, 28, 28] 1728 260112384 520525824
Conv2d [1, 192, 28, 28] [1, 32, 28, 28] 6144 4816896 9683968
Conv2d [1, 32, 28, 28] [1, 192, 28, 28] 6144 4816896 9934848
Conv2d [1, 192, 28, 28] [1, 192, 14, 14] 1728 65028096 520525824
Conv2d [1, 192, 14, 14] [1, 64, 14, 14] 12288 2408448 4841984
Conv2d [1, 64, 14, 14] [1, 384, 14, 14] 24576 4816896 9784320
Conv2d [1, 384, 14, 14] [1, 384, 14, 14] 3456 260112384 520375296
Conv2d [1, 384, 14, 14] [1, 64, 14, 14] 24576 4816896 9658880
Conv2d [1, 64, 14, 14] [1, 384, 14, 14] 24576 4816896 9784320
Conv2d [1, 384, 14, 14] [1, 384, 14, 14] 3456 260112384 520375296
Conv2d [1, 384, 14, 14] [1, 64, 14, 14] 24576 4816896 9658880
Conv2d [1, 64, 14, 14] [1, 384, 14, 14] 24576 4816896 9784320
Conv2d [1, 384, 14, 14] [1, 384, 14, 14] 3456 260112384 520375296
Conv2d [1, 384, 14, 14] [1, 64, 14, 14] 24576 4816896 9658880
Conv2d [1, 64, 14, 14] [1, 384, 14, 14] 24576 4816896 9784320
Conv2d [1, 384, 14, 14] [1, 384, 14, 14] 3456 260112384 520375296
Conv2d [1, 384, 14, 14] [1, 96, 14, 14] 36864 7225344 14488320
Conv2d [1, 96, 14, 14] [1, 576, 14, 14] 55296 10838016 21901824
Conv2d [1, 576, 14, 14] [1, 576, 14, 14] 5184 585252864 1170731520
Conv2d [1, 576, 14, 14] [1, 96, 14, 14] 55296 10838016 21713664
Conv2d [1, 96, 14, 14] [1, 576, 14, 14] 55296 10838016 21901824
Conv2d [1, 576, 14, 14] [1, 576, 14, 14] 5184 585252864 1170731520
Conv2d [1, 576, 14, 14] [1, 96, 14, 14] 55296 10838016 21713664
Conv2d [1, 96, 14, 14] [1, 576, 14, 14] 55296 10838016 21901824
Conv2d [1, 576, 14, 14] [1, 576, 7, 7] 5184 146313216 1170731520
Conv2d [1, 576, 7, 7] [1, 160, 7, 7] 92160 4515840 9047360
Conv2d [1, 160, 7, 7] [1, 960, 7, 7] 153600 7526400 15146880
Conv2d [1, 960, 7, 7] [1, 960, 7, 7] 8640 406425600 812945280
Conv2d [1, 960, 7, 7] [1, 160, 7, 7] 153600 7526400 15068480
Conv2d [1, 160, 7, 7] [1, 960, 7, 7] 153600 7526400 15146880
Conv2d [1, 960, 7, 7] [1, 960, 7, 7] 8640 406425600 812945280
Conv2d [1, 960, 7, 7] [1, 160, 7, 7] 153600 7526400 15068480
Conv2d [1, 160, 7, 7] [1, 960, 7, 7] 153600 7526400 15146880
Conv2d [1, 960, 7, 7] [1, 960, 7, 7] 8640 406425600 812945280
Conv2d [1, 960, 7, 7] [1, 320, 7, 7] 307200 15052800 30136960
Conv2d [1, 320, 7, 7] [1, 1280, 7, 7] 409600 20070400 40266240
Linear [1, 1280] [1, 1000] 1281000 1280000 2559000

Total_params: 3.47M
Total_MACs: 5.55G
Total_FLOPs: 14.89G
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