(3) ResNet18 CNN Classify (framework: PyTorch)

甲、摘要

搭建 ResNet18 網路拿去 Inference 於 CIFAR-10 dataset 上。

Layer (type)	Output Shape	Param #
Conv2d-1	[-1, 64, 32, 32]	1,728
BatchNorm2d-2	[-1, 64, 32, 32]	128
ReLU-3	[-1, 64, 32, 32]	0
Conv2d-4	[-1, 64, 32, 32]	36,864
BatchNorm2d-5	[-1, 64, 32, 32]	128
ReLU-6	[-1, 64, 32, 32]	0
Conv2d-7	[-1, 64, 32, 32]	36,864
BatchNorm2d-8	[-1, 64, 32, 32]	128
ResBlock-9	[-1, 64, 32, 32]	0
Conv2d-10	[-1, 64, 32, 32]	36,864
BatchNorm2d-11	[-1, 64, 32, 32]	128
ReLU-12	[-1, 64, 32, 32]	0
Conv2d-13	[-1, 64, 32, 32]	36,864
BatchNorm2d-14	[-1, 64, 32, 32]	128
ResBlock-15	[-1, 64, 32, 32]	0
Conv2d-16	[-1, 128, 16, 16]	73,728
BatchNorm2d-17	[-1, 128, 16, 16]	256
ReLU-18	[-1, 128, 16, 16]	0
Conv2d-19	[-1, 128, 16, 16]	147,456
BatchNorm2d-20	[-1, 128, 16, 16]	256
Conv2d-21	[-1, 128, 16, 16]	8,192
BatchNorm2d-22	[-1, 128, 16, 16]	256
ResBlock-23	[-1, 128, 16, 16]	0
Conv2d-24	[-1, 128, 16, 16]	147,456
BatchNorm2d-25	[-1, 128, 16, 16]	256
ReLU-26	[-1, 128, 16, 16]	0
Conv2d-27	[-1, 128, 16, 16]	147,456
BatchNorm2d-28	[-1, 128, 16, 16]	256
ResBlock-29	[-1, 128, 16, 16]	0
Conv2d-30	[-1, 256, 8, 8]	294,912
BatchNorm2d-31	[-1, 256, 8, 8]	512
ReLU-32	[-1, 256, 8, 8]	0
Conv2d-33	[-1, 256, 8, 8]	589,824
BatchNorm2d-34	[-1, 256, 8, 8]	512
Conv2d-35	[-1, 256, 8, 8]	32,768
BatchNorm2d-36	[-1, 256, 8, 8]	512
ResBlock-37	[-1, 256, 8, 8]	0
Conv2d-38	[-1, 256, 8, 8]	589,824
BatchNorm2d-39	[-1, 256, 8, 8]	512
ReLU-40	[-1, 256, 8, 8]	0
Conv2d-41	[-1, 256, 8, 8]	589,824
BatchNorm2d-42	[-1, 256, 8, 8]	512
ResBlock-43	[-1, 256, 8, 8]	0
Conv2d-44	[-1, 512, 4, 4]	1,179,648
BatchNorm2d-45	[-1, 512, 4, 4]	1,024
ReLU-46	[-1, 512, 4, 4]	0
Conv2d-47	[-1, 512, 4, 4]	2,359,296
BatchNorm2d-48	[-1, 512, 4, 4]	1,024
Conv2d-49	[-1, 512, 4, 4]	131,072
BatchNorm2d-50	[-1, 512, 4, 4]	1,024
ResBlock-51	[-1, 512, 4, 4]	0
Conv2d-52	[-1, 512, 4, 4]	2,359,296
BatchNorm2d-53	[-1, 512, 4, 4]	1,024
ReLU-54	[-1, 512, 4, 4]	0
Conv2d-55	[-1, 512, 4, 4]	2,359,296
BatchNorm2d-56	[-1, 512, 4, 4]	1,024
ResBlock-57	[-1, 512, 4, 4]	0
Linear-58	[-1, 10]	5,130

Total params: 11,173,962
Trainable params: 11,173,962
Non-trainable params: 0

Input size (MB): 0.01
Forward/backward pass size (MB): 13.63
Params size (MB): 42.63
Estimated Total Size (MB): 56.26

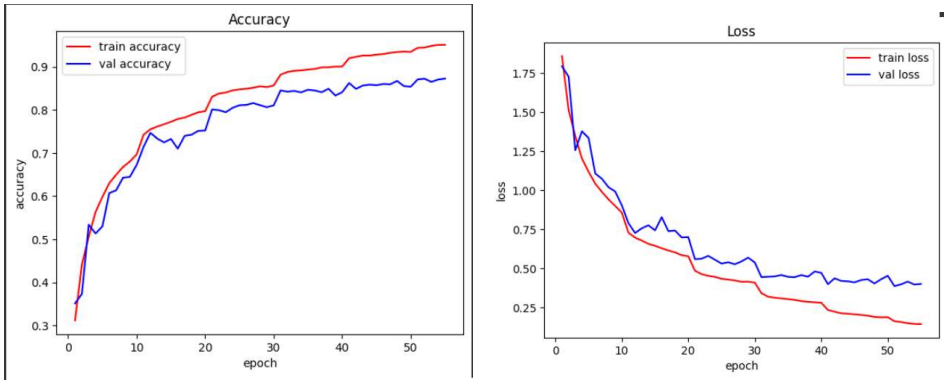
圖一二、Model summary

乙、想法

首先是搭建 block 網路，其內部由兩個 Convolution 和兩個 batch normalization 和一個 ReLU 層所組成，最後一層要與 input 做 shortcuut 的動作再 ReLU 輸出。接著利用先前搭建的 block 網路來建 ResNet18，透過 make_layer 來串接所建立的子 layer，由於每大層都要有兩個 block，因此 num_blocks=2，而剩下的參數就對照 ResNet18 各自填入對應的值，最後再利用這五大層加上頭尾的 convolution 和 fully-connected 就建立完成。

其中 turning 有做 Image Standardization, Data augmentation 來使準確率有更好的結果。

丙、結果



圖三四、Dynamic learning rate 使原本快飽和的模型又提高準度

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Test loss: 0.317 | Test acc: 0.903
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圖五、test accuracy