Deep Learning Final Report

109511085 洪鈺翔
109511054 王宏銘

Brief introduction to SR task and dataset we use

- SR Task
  - Upsample low resolution images to high resolution images.
  - CNN models are mainly used in this task.
- Dataset
  - DIV2K - Bicubic downsample X4

Our training and evaluation method

- Due to the bottleneck of VRAM, we crop the images into smaller size.
  - Training dataset：
    - HR　100 x 100
    - LR　25 x 25
  - Validation dataset：
    - HR　800 x 800
    - LR　200 x 200
- Remove pure color
  - If the MSE of HR image and LR image after upsample is smaller than 1e-8,
  - we remove the image from the cropped dataset.
- Evaluation method：PSNR
  - PSNR = -10 * log(MSE)　　***note***　MSE on Y channel

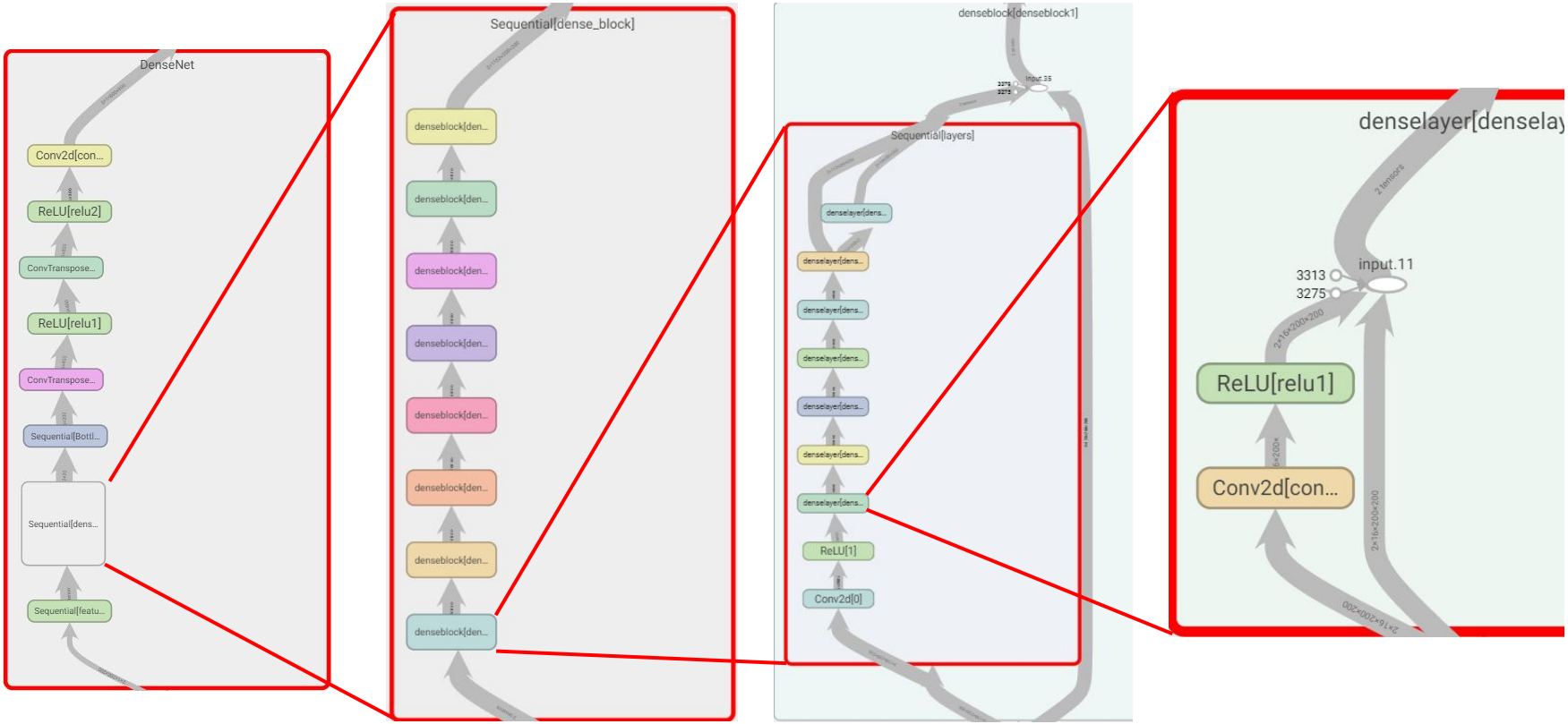
Training Details

- Number of Epochs
  - 10
- Optimizer
  - AdamW with weight decay
- Learning rate scheduler
  - CosineAnnealingLR
- Loss function
  - L1 loss
- Batch size
  - Training : 32
  - Validation : 2

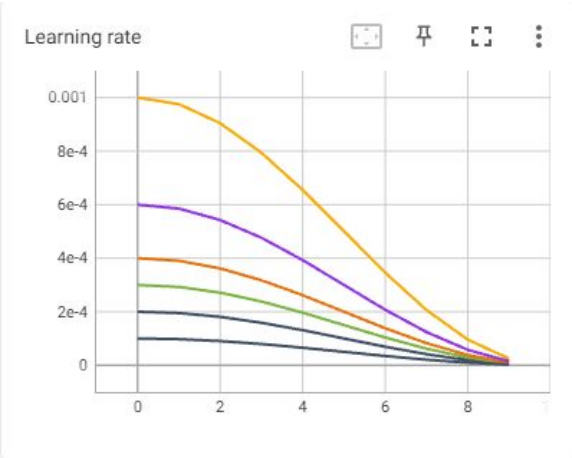
Baseline

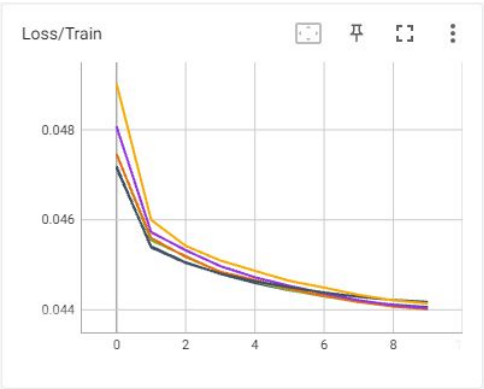
- Bicubic upsample
  - PSNR = 27.22 dB

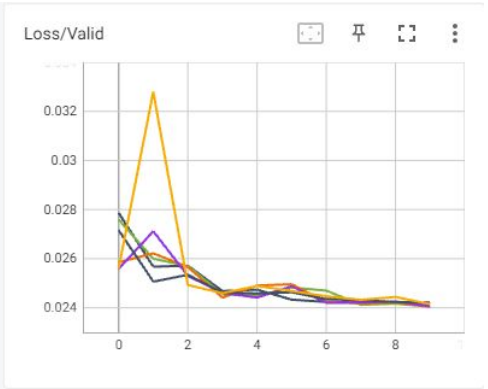
SRDenseNet Model Architecture

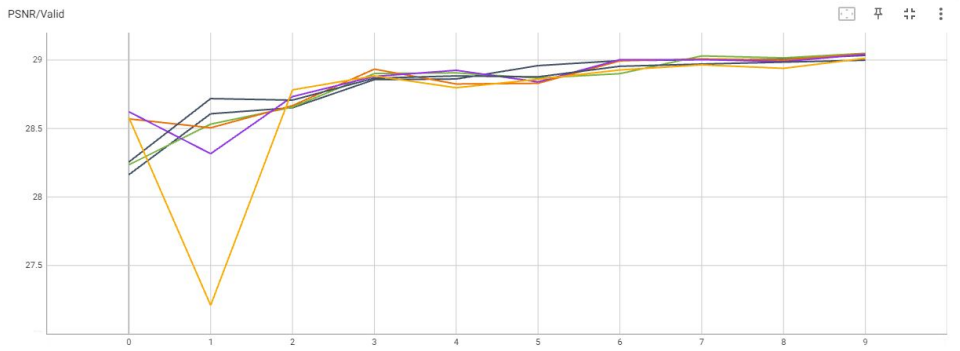


SRDenseNet Training









Best : lr = 3e-4

SRDenseNet Result

```
[Epoch 9]
Train
100%|██████████| 6548/6548 [08:24<00:00, 12.97it/s]
avg_loss = 4.401334e-02 learning_rate = 0.000010
Valid
100%|██████████| 105/105 [00:08<00:00, 11.76it/s]
avg_loss = 2.403544e-02
PSNR     = 29.05 dB
```

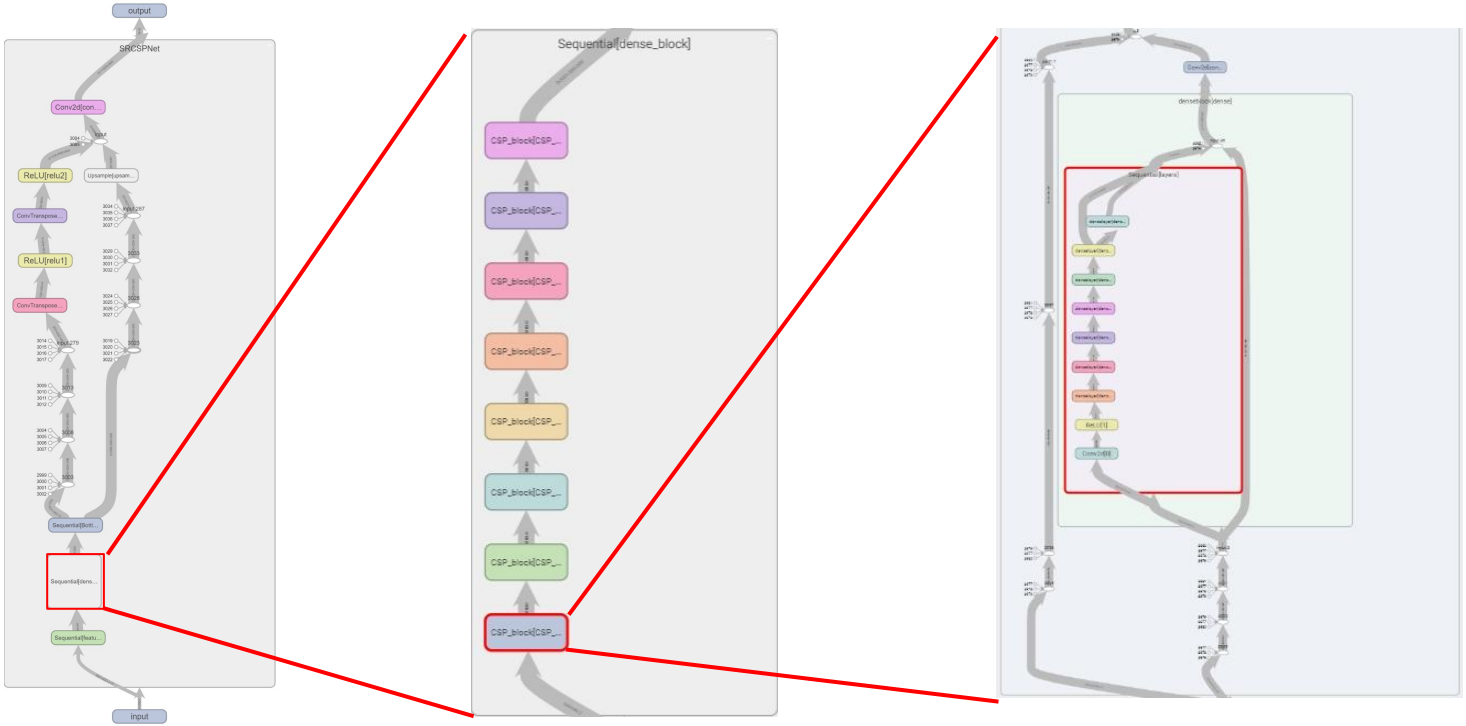
@ input size = [1,1,256,256]

FLOPs : 872.22 G

Params : 2.66M

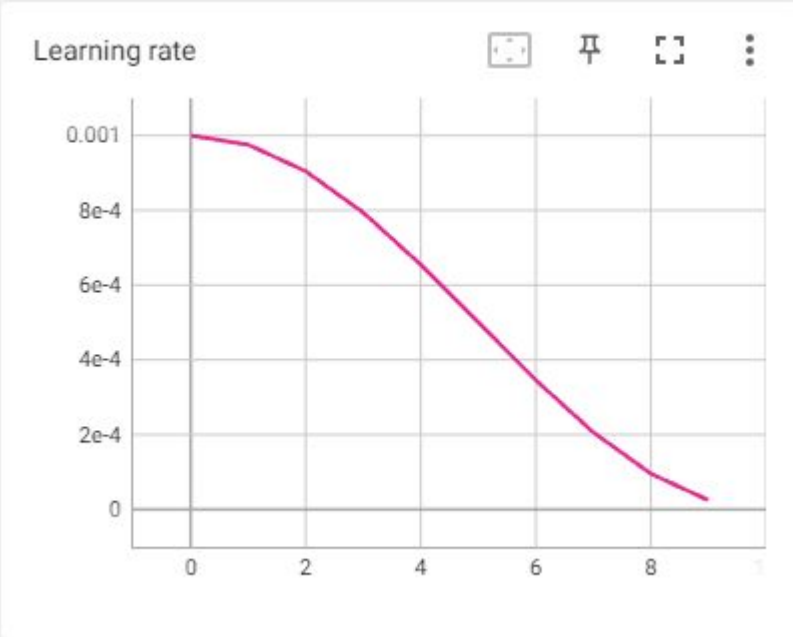
PSNR : 29.05 dB

CSPNet model



SRCSPNet training condition

learning rate scheduler:cosine linear



FLOPS & parameter:

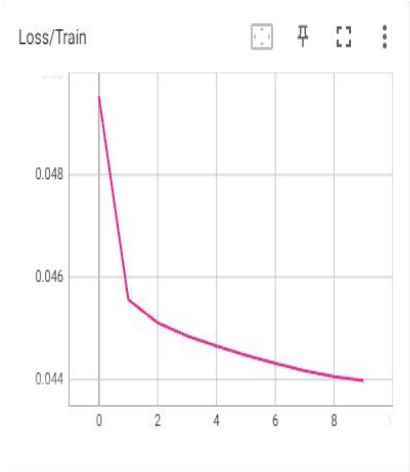
```
FLOPs = 275.0690754560
Params = 1.509991M
```

input size(1,1,256,256)

SRCSPNet result 1

valid PSNR:

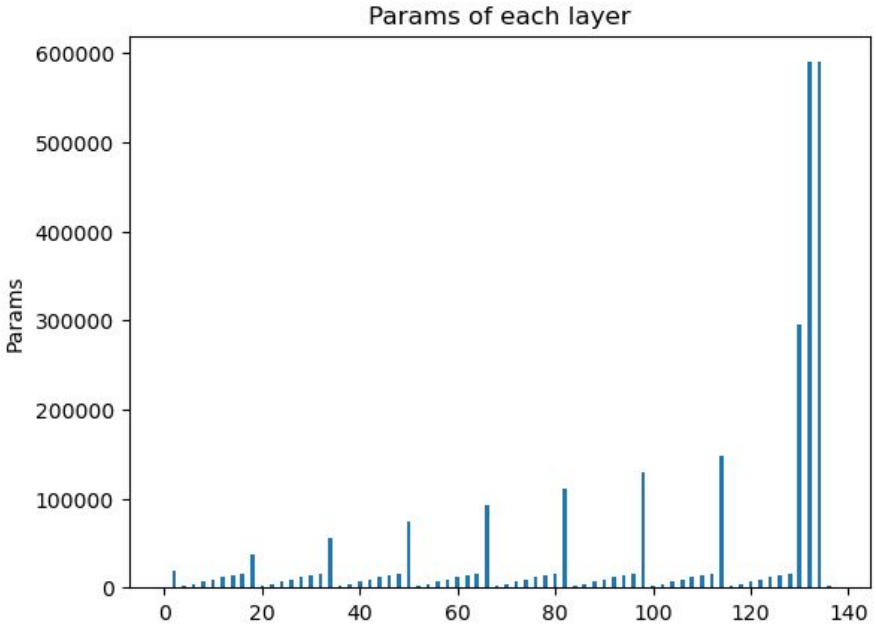
loss:



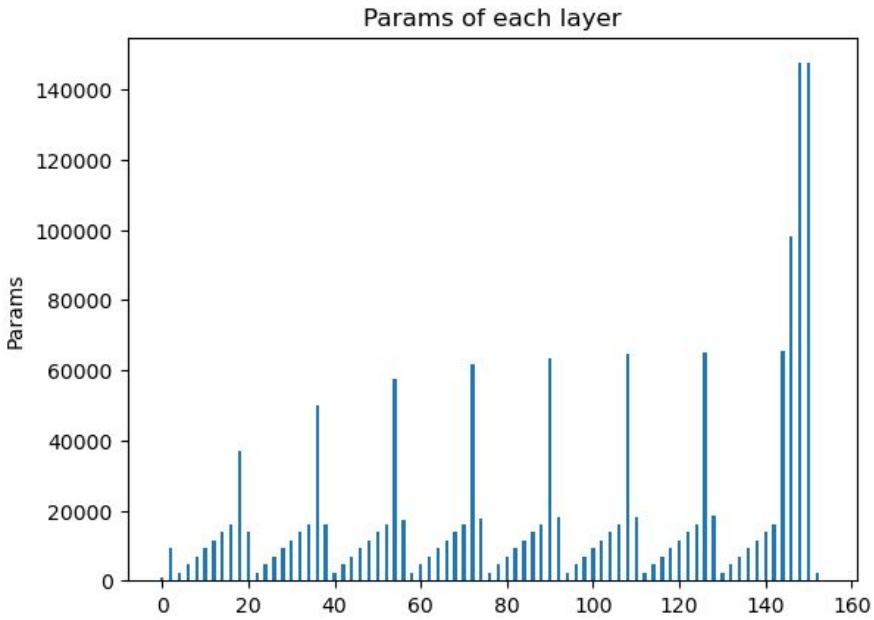
SRCSPNet & upsample inference result compare

Comparison

SRDenseNet



SRCSPNet



Comparison

SRDenseNet

SRCSPNet

Compare 2

total paramter: 872.22 G >> 275.069 G reduce by **68.46%**

FLOPS: 2.66M >> 1.51 M reduce by **43.233%**

training time: 9.5min >> 5.5min

performance: 29.05 dB >> 29.06dB

reference

CSPNet :
https://github.com/HarleysZhang/cv_note/blob/master/7-model_compression/%E8%BD%BB%E9%87%8F%E7%BA%A7%E7%BD%91%E7%BB%9C%E8%AE%BA%E6%96%87%E8%A7%A3%E6%9E%90/CSPNet%E8%AE%BA%E6%96%87%E8%AF%A6%E8%A7%A3.md

SRDenseNet:

https://towardsdatascience.com/review-srdensenet-densenet-for-sr-super-resolution-cbee599de7e8

https://github.com/yjn870/SRDenseNet-pytorch/blob/master/models.py

Dataset & PSNR count:

https://data.vision.ee.ethz.ch/cvl/DIV2K/

分工概況

王宏銘:

題目訂定, 模型除錯, 資料前處理(切割、換坐標系、刪除單色圖片)

環境架設, 訓練函數、PSNR函數實作, SRDenseNet結果紀錄, 製作簡報

洪鈺翔:

模型實作, SRDenseNet結果紀錄, CSPNet結果紀錄, 製作簡報