AgeClassification - 얼굴 이미지를 입력으로 나이를 예측하는 모델

Dataset - https://www.kaggle.com/datasets/ayushkumar0801/utkface-uncropped-dataset

Version
- pytorch: 1.10.0+cu111
- python: 3.7.13

Environment
- gpu: Tesla T4 15gb
- memory: 25gb
- cpu: Intel(R) Xeon(R) CPU @ 2.20GHz

First try

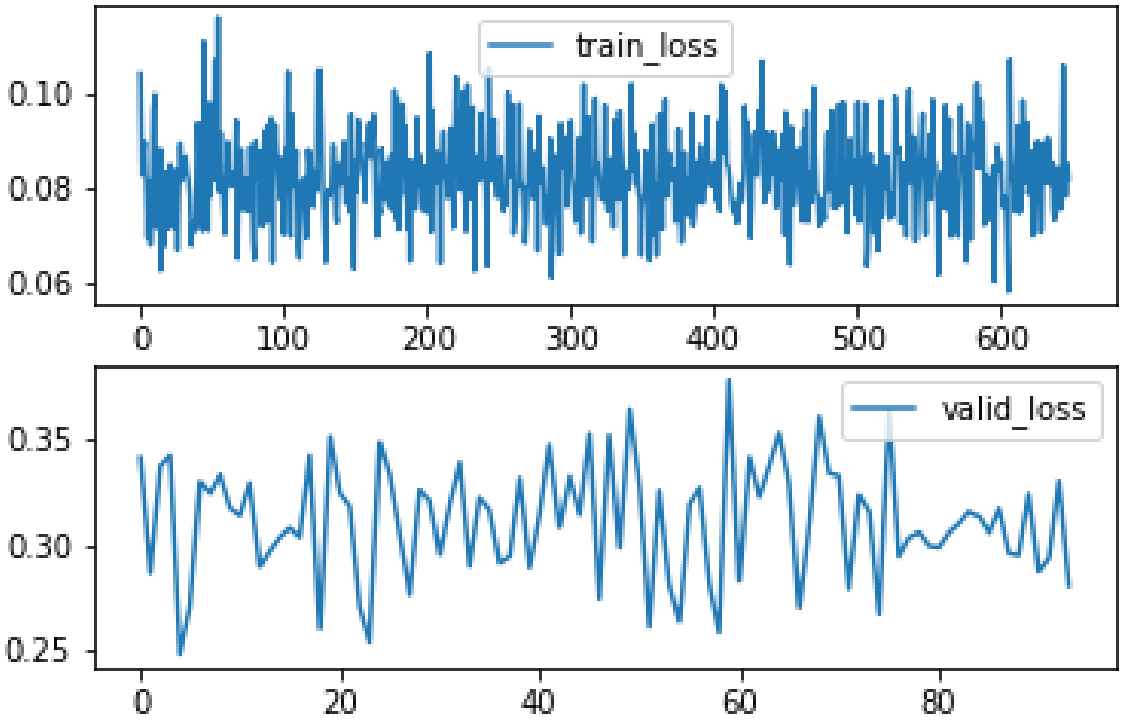
Structure

Input : (3, 128, 128)

ConvBlock (
    Conv2d(3, 16, kernel_size=3, stride=1, padding=1),
    BatchNorm(16),
    LeakyReLU(0.2),
    MaxPool2d(kernel_size=2, stride=2)
) : (16, 64, 64),

ConvBlock(16, 32) : (32, 32, 32),
ConvBlock(32, 64) : (64, 16, 16),
ConvBlock(64, 128) : (128, 8, 8),
ConvBlock(128, 256) : (256, 4, 4),
Flatten() : (256*4*4),
Linear(256*4*4, 256*4),
ReLU(),
Linear(256*4, 256),
ReLU(),
Linear(256, 1),
Sigmoid()

Loss History



Conclusion

같은 환경으로 여러 번 학습시키다가 우연히 한번 괜찮은 수렴율을 보여주어 모델의 가중치 초기화가 원인이라고 판단하였다.

Second try

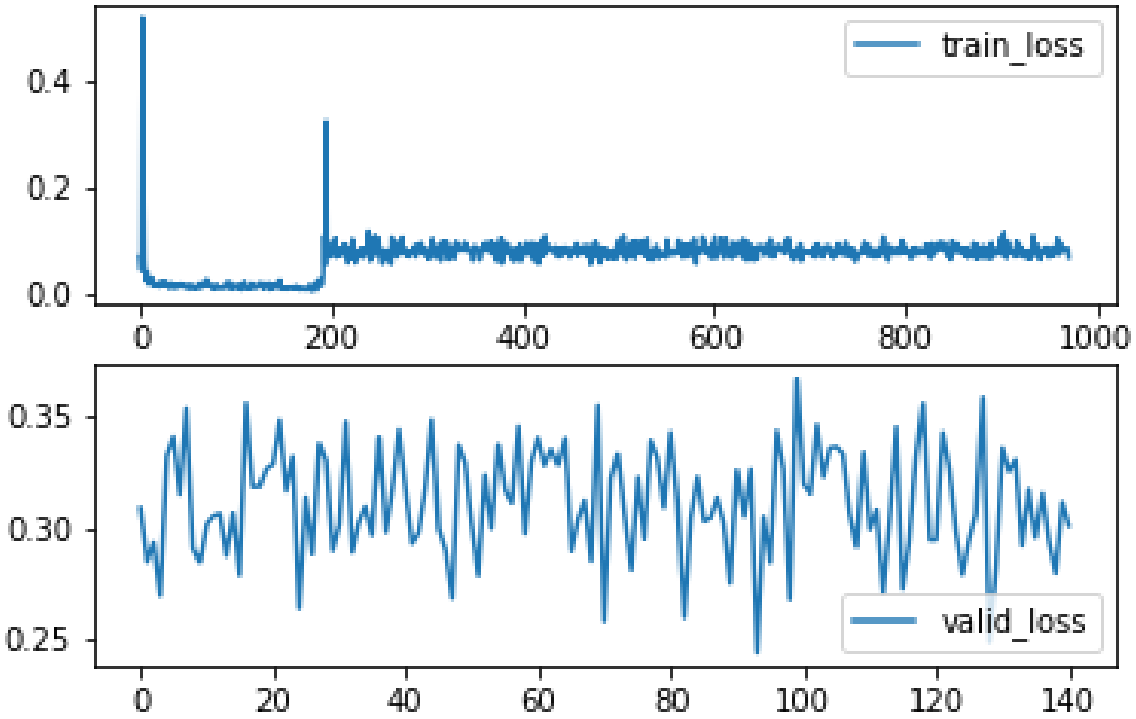
Structure

Input : (3, 128, 128)

ConvBlock (
    Conv2d(3, 16, kernel_size=3, stride=1, padding=1),
    BatchNorm(16),
    LeakyReLU(0.2),
    MaxPool2d(kernel_size=2, stride=2)
) : (16, 64, 64),

ConvBlock(16, 32) : (32, 32, 32),
ConvBlock(32, 64) : (64, 16, 16),
ConvBlock(64, 128) : (128, 8, 8),
ConvBlock(128, 256) : (256, 4, 4),
Flatten() : (256*4*4),
Linear(256*4*4, 256*4),
ReLU(),
Linear(256*4, 256),
ReLU(),
Linear(256, 1),
Sigmoid()

Loss History



Conclusion

모델 구조는 같게 하고 모델 가중치 초기화만 바꿔주었을 때 학습 초반에 모델이 좋게 수렴하는 것을 확인할 수 있다. 하지만 중간에 팍 튀었다가 갇힌 것 같다.

ConvBlock을 많이 쌓고, Linear층을 줄여서 모델 파라미터를 줄임으로써 모델 복잡도를 줄여봐야하겠다고 판단하였다.

Third try

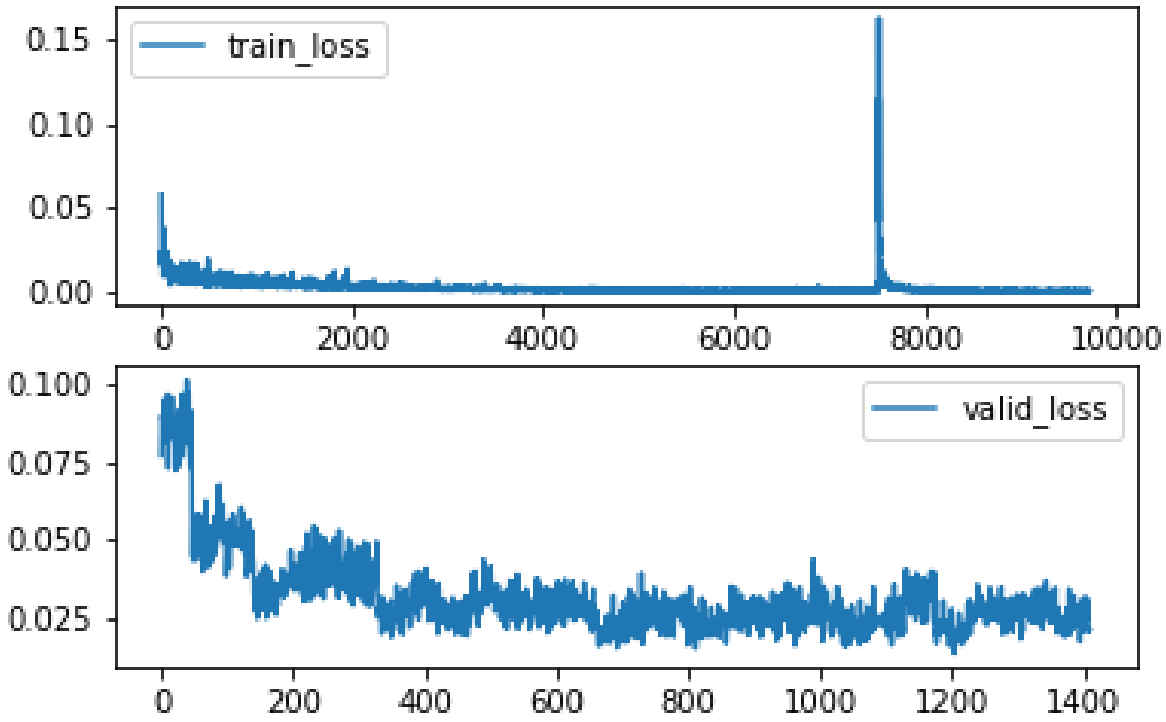
Structure

Input : (3, 128, 128)

ConvBlock (
    Conv2d(3, 16, kernel_size=3, stride=1, padding=1),
    BatchNorm(16),
    LeakyReLU(0.2),
    MaxPool2d(kernel_size=2, stride=2)
) : (16, 64, 64),

ConvBlock(16, 64) : (64, 32, 32),
ConvBlock(64, 128) : (128, 16, 16),
ConvBlock(128, 256) : (256, 8, 8),
ConvBlock(256, 512) : (512, 4, 4),
Conv2d(512, 1024, kernel_size=4, stride=1, padding=0), : (1024, 1, 1)
BatchNorm(1024),
LeakyReLU(0.2),
Flatten() : (1024),
Linear(1024, 100),
LeakyReLU(0.2),
Linear(100, 1),
Sigmoid()

Loss History



Conclusion

Train history 후반부에 잠깐 연산처리 실수가 원인으로 예상되는 튐이 있지만 훌륭한 수렴율을 보이고 있는 것으로 확인된다.