Prediction of Age using CNN

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In this report, I used Convolutional Neural Networks (CNNs) based regression model to predict age from photo of face images (from a given .zip file)

Experiment 1

At first, I chose seed value based on my admission year 2021.

Experiment 1:

Seed value: 2021

Device: cpu

Experiment 2

Next, I used conventional values for the batch size, overall dataset size, training dataset size, validation dataset size and testing dataset size.

Experiment 2:

Overall dataset size: 9778

Training dataset size: 6844

Validation dataset size: 1467

Testing dataset size: 1467

Experiment 3

Similarly, I also used conventional values for the number of convolutional kernels, their sizes, strides, padding, number of neurons in the fully connected layers.

Experiment 3:

Model architecture:

CNNRegression(

(conv1): Conv2d(3, 16, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))

```
        (conv2): Conv2d(16, 32, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
        (fc1): Linear(in_features=2048, out_features=128, bias=True)
        (fc2): Linear(in_features=128, out_features=64, bias=True)
        (fc3): Linear(in_features=64, out_features=1, bias=True)
)
```

Regularization, loss function, optimizer and learning rate used in this model are stated below

Loss function: Mean Squared Error

Optimizer: Adam

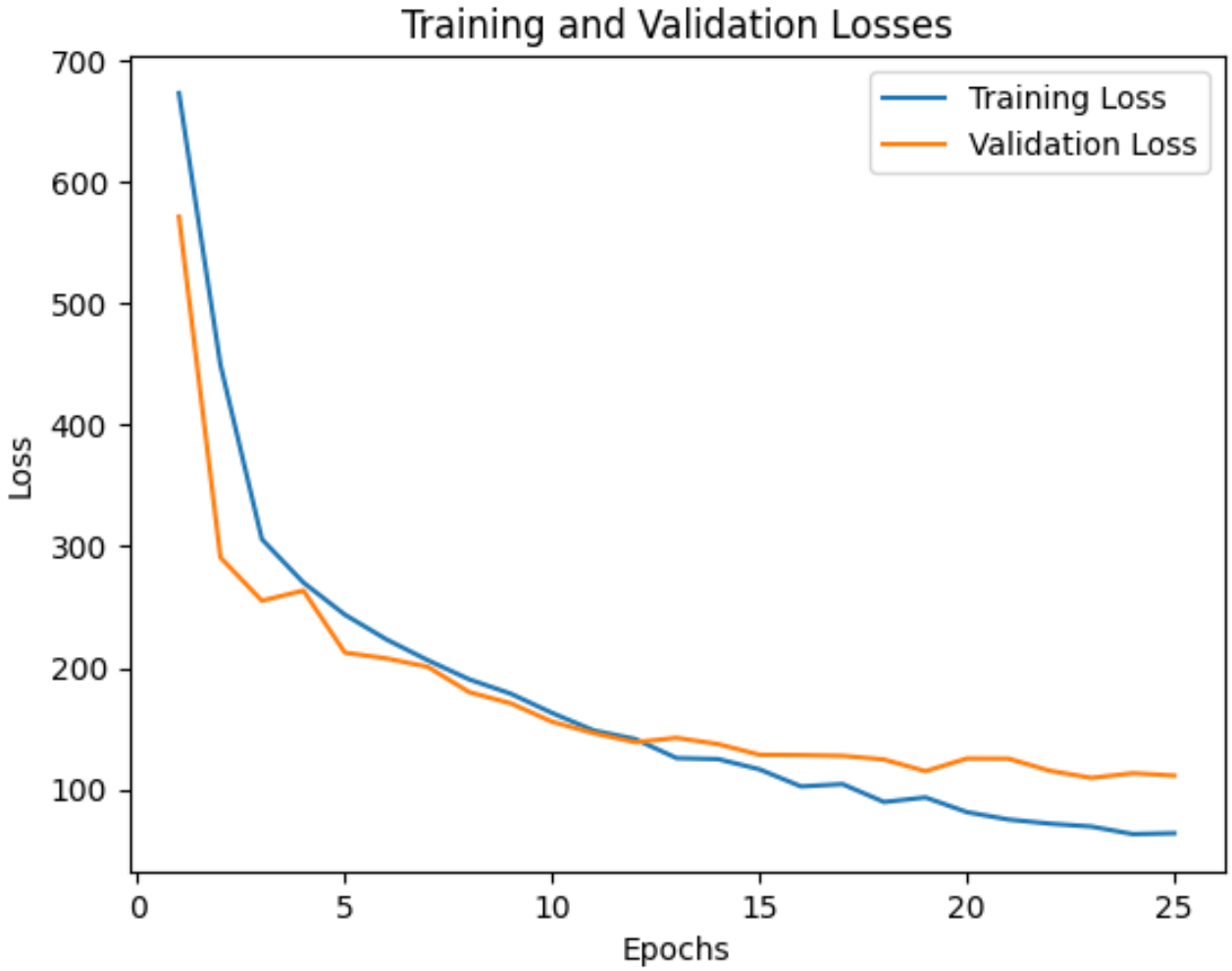
Learning rate: 0.001

Experiment 4

Training the CNN Model

```
Epoch 1/25, Training Loss: 673.2315430186911, Validation Loss: 571.5314032535774
Epoch 2/25, Training Loss: 449.5344676960288, Validation Loss: 290.94569988809803
Epoch 3/25, Training Loss: 305.9452217409724, Validation Loss: 255.28991817794207
Epoch 4/25, Training Loss: 270.2580793103163, Validation Loss: 263.651256589883
Epoch 5/25, Training Loss: 243.82588953835304, Validation Loss: 212.57143892523538
Epoch 6/25, Training Loss: 223.49389528935586, Validation Loss: 207.83732848372196
Epoch 7/25, Training Loss: 206.29454906470312, Validation Loss: 200.85022803724584
Epoch 8/25, Training Loss: 190.53570364010676, Validation Loss: 179.98050315768523
Epoch 9/25, Training Loss: 178.75171907069318, Validation Loss: 170.8085357208356
Epoch 10/25, Training Loss: 162.85750094245986, Validation Loss: 155.61327288730988
Epoch 11/25, Training Loss: 148.470796960756, Validation Loss: 146.2483990181037
Epoch 12/25, Training Loss: 141.40548286460285, Validation Loss: 138.7956825833623
Epoch 13/25, Training Loss: 125.70644777744991, Validation Loss: 142.41161433286868
Epoch 14/25, Training Loss: 124.91043026610329, Validation Loss: 137.2398315486895
Epoch 15/25, Training Loss: 116.43630470440863, Validation Loss: 128.43622959139563
Epoch 16/25, Training Loss: 102.3966012505465, Validation Loss: 128.1623957165261
Epoch 17/25, Training Loss: 104.30522998963652, Validation Loss: 127.59129996322497
Epoch 18/25, Training Loss: 89.57665493695936, Validation Loss: 124.55799452528794
Epoch 19/25, Training Loss: 93.33453125677772, Validation Loss: 114.96211885479575
Epoch 20/25, Training Loss: 81.22968790755503, Validation Loss: 125.38104526803212
Epoch 21/25, Training Loss: 75.16842027326413, Validation Loss: 125.27972677343949
Epoch 22/25, Training Loss: 71.76569130126667, Validation Loss: 115.29200618772501
Epoch 23/25, Training Loss: 69.35350958524846, Validation Loss: 109.404043812612
Epoch 24/25, Training Loss: 63.15679207940606, Validation Loss: 113.26051551465201
Epoch 25/25, Training Loss: 63.85752464887484, Validation Loss: 111.31922083999645
```

Plotting Training Loss vs Validation Loss



Experiment 5

Testing the CNN Model

```
Experiment 5:

Test MSE Loss: 135.60601513842457
```

Scatter Plot for predicted labels vs. ground truth labels of ages.