MLNS deep learning assignment part1 report

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Problem statement

Given Images having four digits written on them, calculate the sum of digits for the whole dataset using CNN model.

Basic approach

→ Combined the three data files to form a dataset

→ Break down into training and validation set in 4:1 ratio

→ Used inbuilt CNN model from pytorch

→ Loaded the dataset into the model

→ Decided the layers for CNN

→ 2 convolutional layers and 2 pooling layers (Maxpooling)

→ USed the Adam optimizer for fast training and batch size of 32 for better accuracy and decreased loss.

→ Trained the model in 20 EPOCHS (no access to ADA till date)

→ Found Training and validation loss and plot for loss with EPOCHS.

→ Saved the model in PyTorch for reusability

→ while finding accuracy found three ranges [+-0.5,+-1.+-2], for better understanding.

→ Plot the predicted vs actual values for better visualization.

→ Found other error stats like mean absolute error, median and standard deviation
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Results
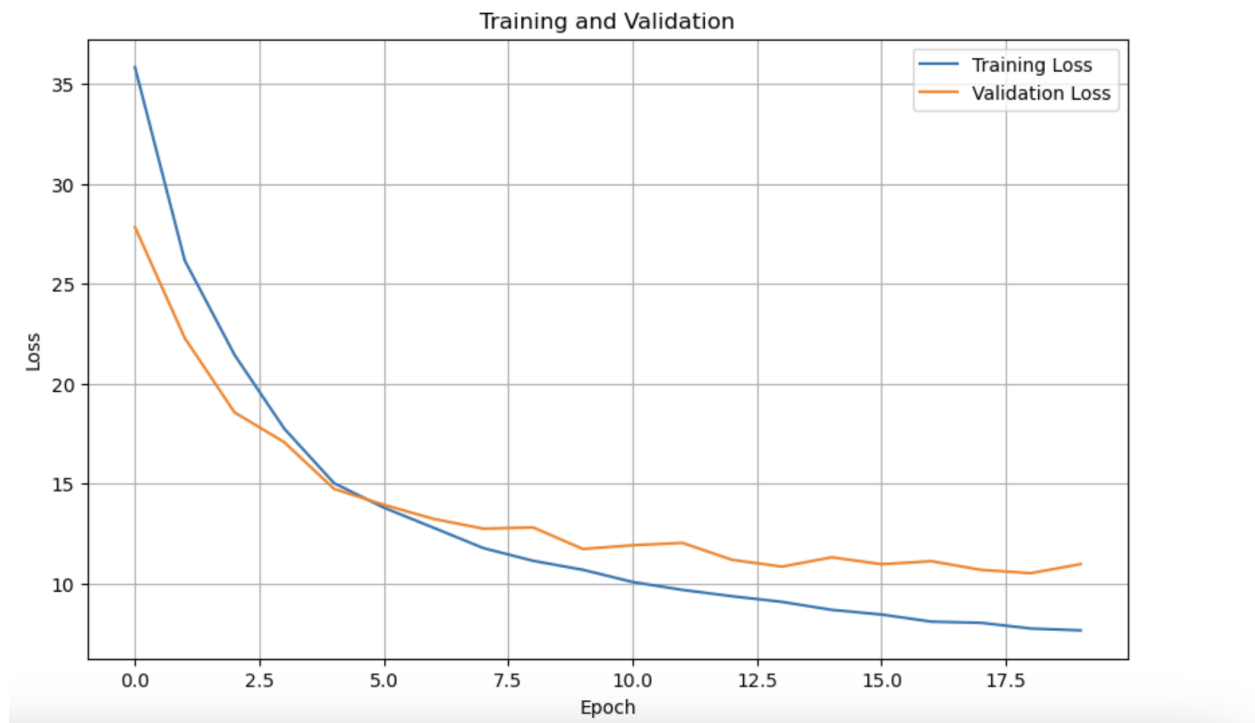

```
Training Loss: 7.635465885480245
Validation Loss: 10.953494952080097
```

```
Dataset 0
Mean Squared Error: 7.7993
Root Mean Squared Error: 2.7927
R² Score: 0.7668

Dataset 0 Accuracy Metrics
Accuracy (±0.5): 14.02%
Accuracy (±1.0): 27.89%
Accuracy (±2.0): 53.30%

Accuracy (±2.0) Error Statistics
Mean Absolute Error: 2.2166
Median Absolute Error: 1.8471
Standard Deviation of Error: 1.6988

Dataset 1
Mean Squared Error: 8.0552
Root Mean Squared Error: 2.8382
R² Score: 0.7590

Dataset 1 Accuracy Metrics
Accuracy (±0.5): 14.57%
Accuracy (±1.0): 28.25%
Accuracy (±2.0): 52.60%

Accuracy (±2.0) Error Statistics
Mean Absolute Error: 2.2416
Median Absolute Error: 1.8859
Standard Deviation of Error: 1.7408

Dataset 2
Mean Squared Error: 7.9647
Root Mean Squared Error: 2.8222
R² Score: 0.7585

Dataset 2 Accuracy Metrics
Accuracy (±0.5): 14.85%
Accuracy (±1.0): 28.84%
Accuracy (±2.0): 53.61%

Accuracy (±2.0) Error Statistics
Mean Absolute Error: 2.2176
Median Absolute Error: 1.8455
Standard Deviation of Error: 1.7455
```
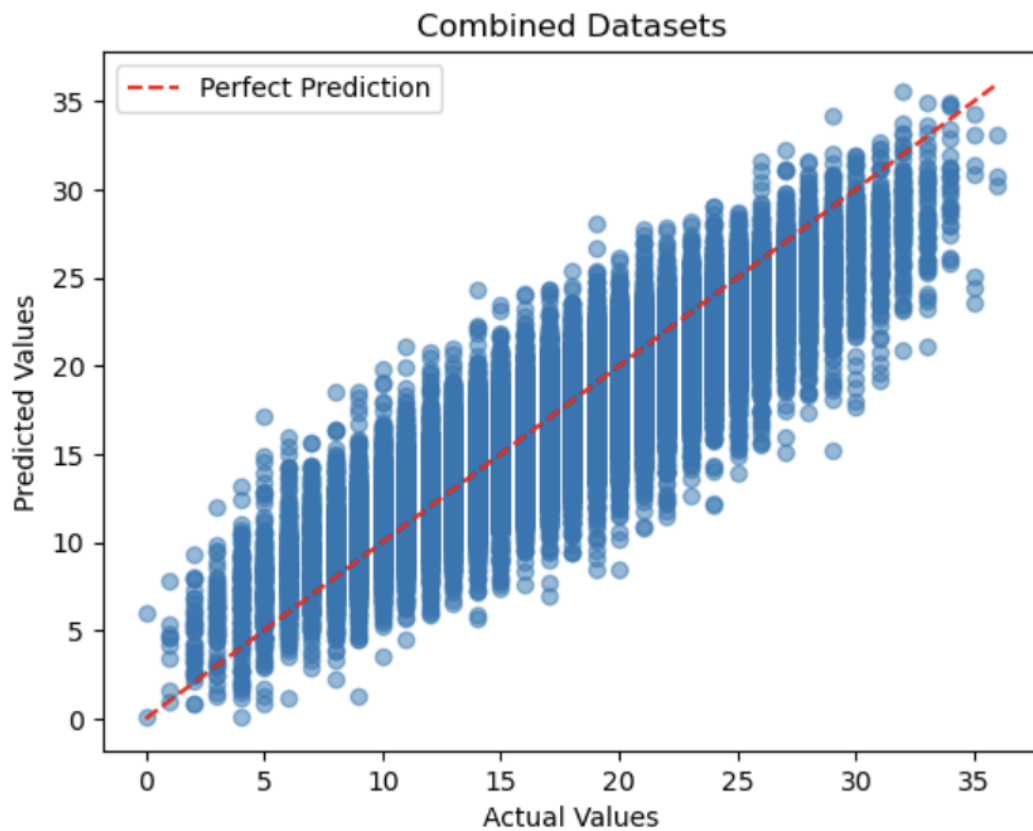
Combined Datasets

Dataset 0
Pred: 20.2
True: 17.0
Error: 3.17

Dataset 0
Pred: 15.9
True: 18.0
Error: 2.07

Dataset 0
Pred: 14.5
True: 16.0
Error: 1.47

Dataset 1
Pred: 19.6
True: 17.0
Error: 2.58

Dataset 1
Pred: 15.8
True: 18.0
Error: 2.20

Dataset 1
Pred: 18.1
True: 21.0
Error: 2.93

Dataset 2
Pred: 12.3
True: 13.0
Error: 0.70

Dataset 2
Pred: 19.4
True: 23.0
Error: 3.55

Dataset 2
Pred: 15.0
True: 17.0
Error: 2.00