Lab 5 - A little Linear Regression

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Introduction

CNN to predict the best fit line of a given image of a scatter plot is implemented. Three different models are created and their performance are analysed.

1 An initial attempt

1.1 A simple CNN baseline

The First model we implement is a simple CNN with a single convoluton layer. The loss function used is Mean Squared Error(MSE). This model performs really well on the training set, this is due to the large number of training parameters (9.8M). But it's performance on test and validation set is not as good because the large number of trainable parameters causes the model to overfit.

Table 1: Training and Test loss (After 100 epochs).

Parameters	Training loss	Test loss	Validation loss
9.8 M	0.2042	10.1638	10.3833

Figure 1: Training and validation Loss plot

2 A second attempt

2.1 A simple CNN with global pooling

Now we implement a model with 2 convolutional layer and a global max pooling layer. This helps reduce the dimensionality and makes the model less complex. The trainable parameters are now much smaller (27.8K). This model performs worse than the previous model. But due to redcution in complexity the training is much faster(5 mins).

Table 2: Training and Test loss (After 100 epochs).

Parameters	Training loss	Test loss	Validation loss
27.8K	12.6945	14.9378	11.8149

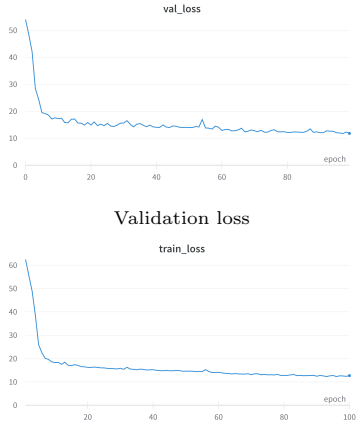

Figure 2: Training and validation Loss plot

3 Something that actually works?

3.1 Let's regress

The third model implemented uses the same structure as the above model but it does some data preprocessing before giving input to the feedforward network. Two intrleaved channels, with one being the transpose of other is added. This process provides data augmentation and helps model to learn better. We can observe from table 3 and figure 3 that this model performs better than the other two.

Table 3: Training and Test loss (After 100 epochs).

Parameters	Training loss	Test loss	Validation loss
28.7K	1.6405	1.8763	1.7137

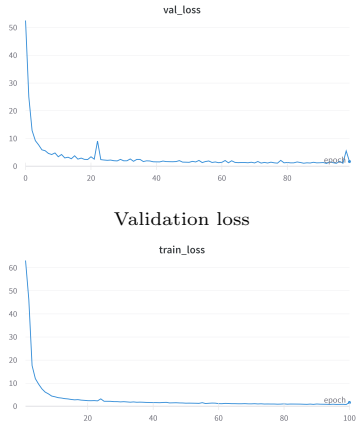

Figure 3: Training and validation Loss plot