

Lineare Algebra, Datenanalyse und maschinelles Lernen 2

3. Exercise Sheet

Exercise 41

Take the data from exercise 40 and perform linear regression with one variable using tensorflow with keras. Build a sequential model with a single neuron and define the input shape according to your data. Compile the model using

```
model.compile(optimizer=tf.optimizers.Adam(learning_rate=0.1),  
              loss='mean_absolute_error')
```

Fit the model to the data using 20% of the data for validation. Plot the training and validation loss. Scatter the data and plot the predicted linear curve of the data points. Compare with your solution from exercise 40.

Exercise 42

Take the data from exercise 40 and perform regression using a neural network. Modify the model from the previous exercise such that you add a dense layer with 64 neurons between the input layer and the output layer. Observe the error after training and adjust the learning rate of the Adams optimizer if necessary.

Try to overfit the model by adding more, large dense layers, using more epochs for training and removing the validation split in the model's definition.

Exercise 43

Use a neural network to learn $\sin(x)$ and $\det(A)$, $A \in \mathbb{R}^{2 \times 2}$.