CM2003 Course: Teodor Pstrusinski & Lasse Stahnke

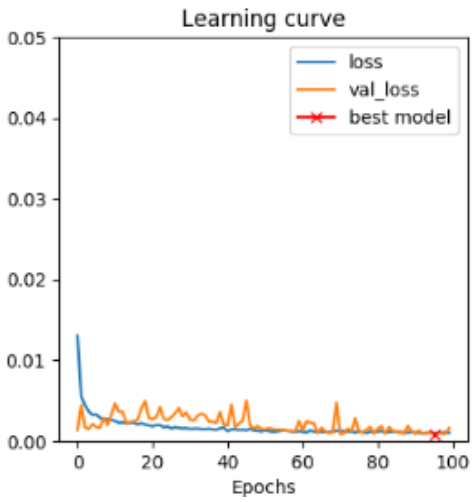
Lab 6

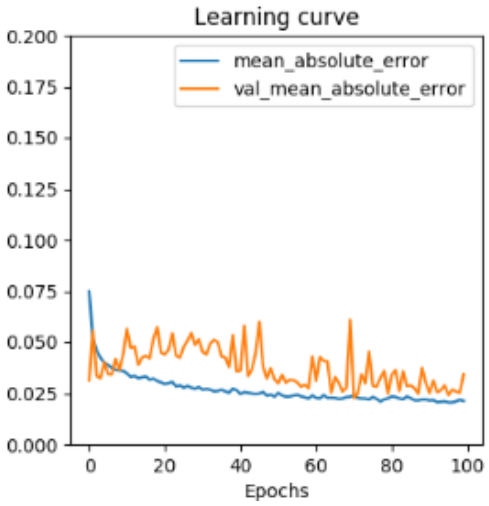
Task 1: Regression problem – prediction of stock prices

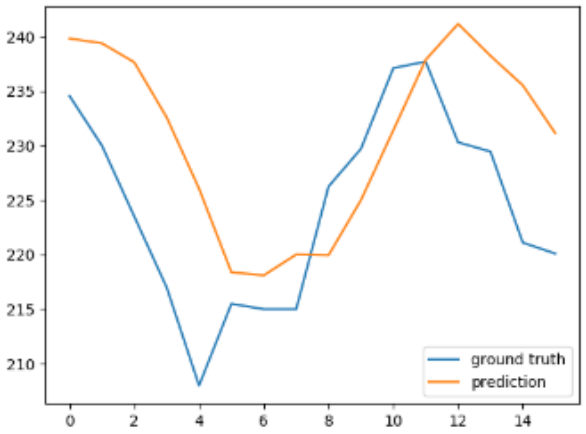
```
batch_size = 16
dropout_rate = 0.2
learning_rate = 0.001
timesteps = 60
n_units = 20
```

Results:

	Loss	Mean Absolute Error
Train	0.0010	0.0213
Validation	0.0016	0.0343

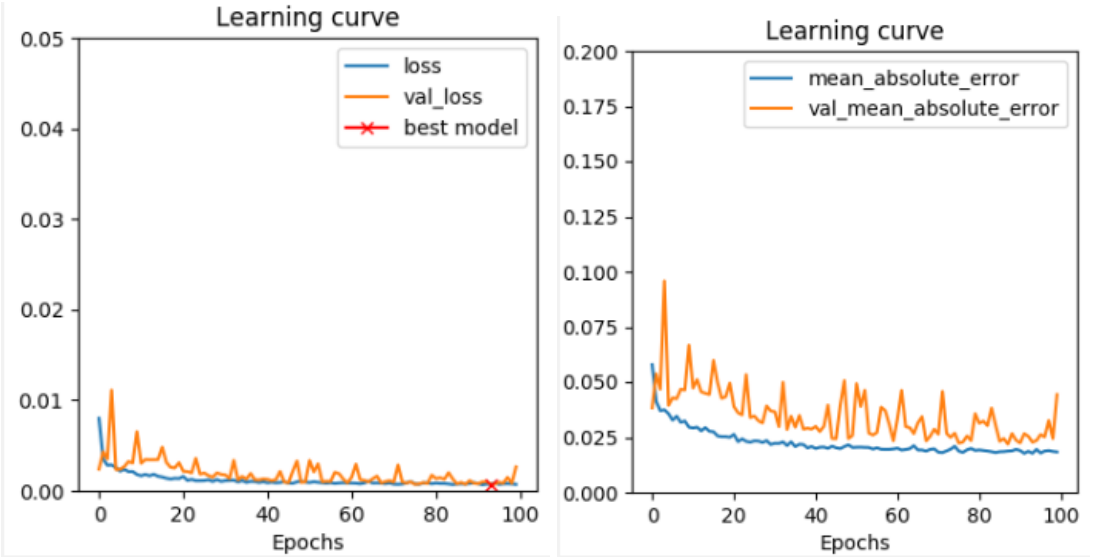


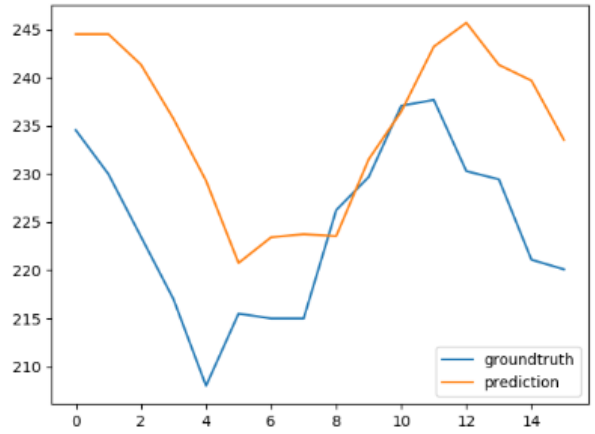




Increasing the number of output units to 40:

	Loss	Mean Absolute Error
Train	0.0007	0.0183
Validation	0.0026	0.0443





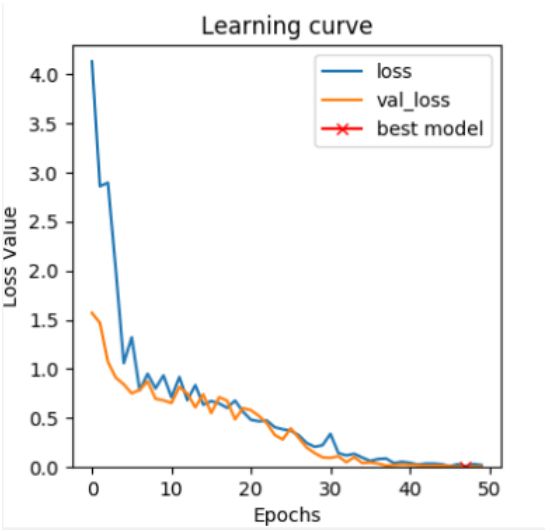
How good is your model? Can you observe any difference in performance if you increase (e.g. double) the number of output units of the LSTM layers?

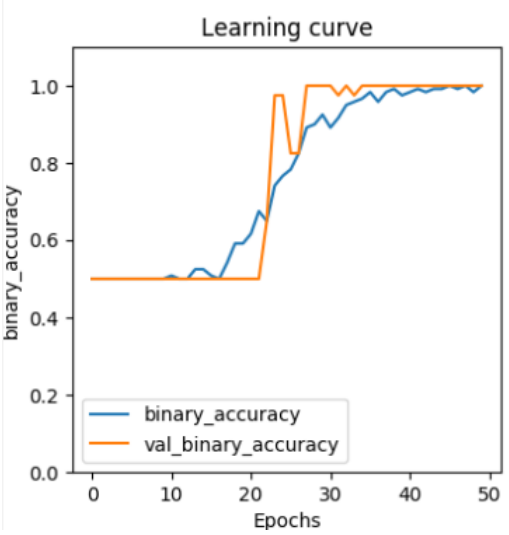
By looking at the predictions vs. the ground truth curves, it can be seen that the shape of the curve is closer to the ground truth. However, the mean absolute error doesn't change substantially. It should be noted, however, that the mean absolute error is already 3.4 percent when using 20 output units. To summarise, the model performs quite well on the dataset.

Task 2

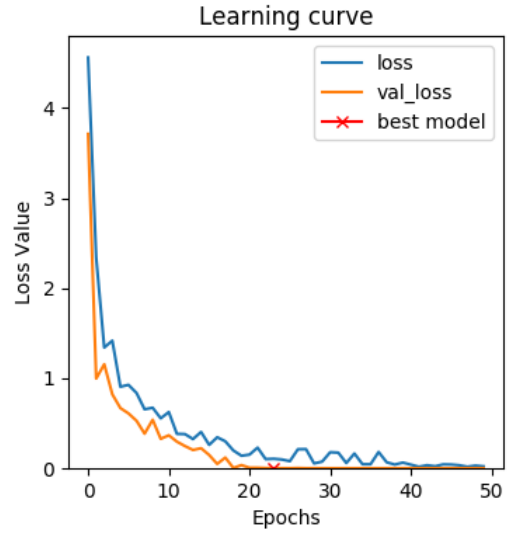
For this task the learning rate has been modified(0.0001) to gain more insight into the learning process. With the default higher learning rate of 0.001 the model trained perfectly after just a few epochs.

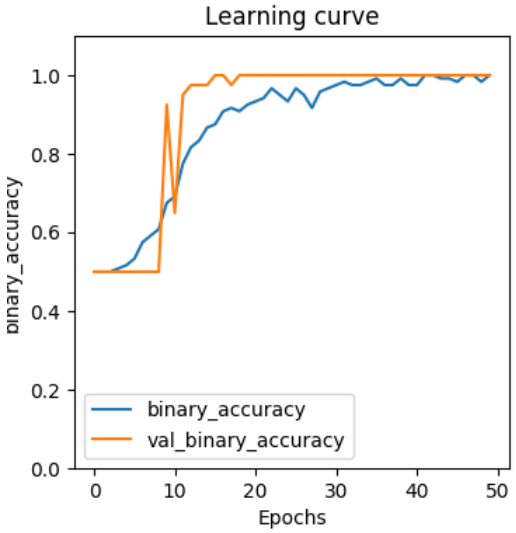
Number of units: 10





Number of units: 5





How good is your model? Does the performance change if you further reduce the number of units?

The model can predict the respective cerebrospinal tract perfectly in both cases. However, when using 5, instead of 10 units, the model converges faster. With an increased learning rate, the models converge even faster. Thus, the model is capable of classifying to which bundle the tracts belong to.

Task 3

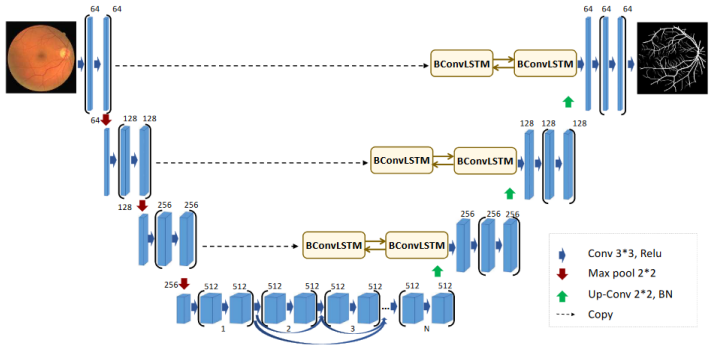
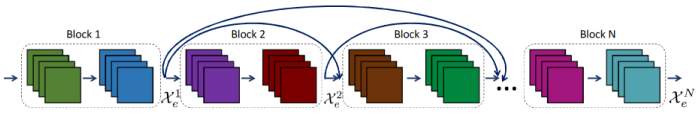
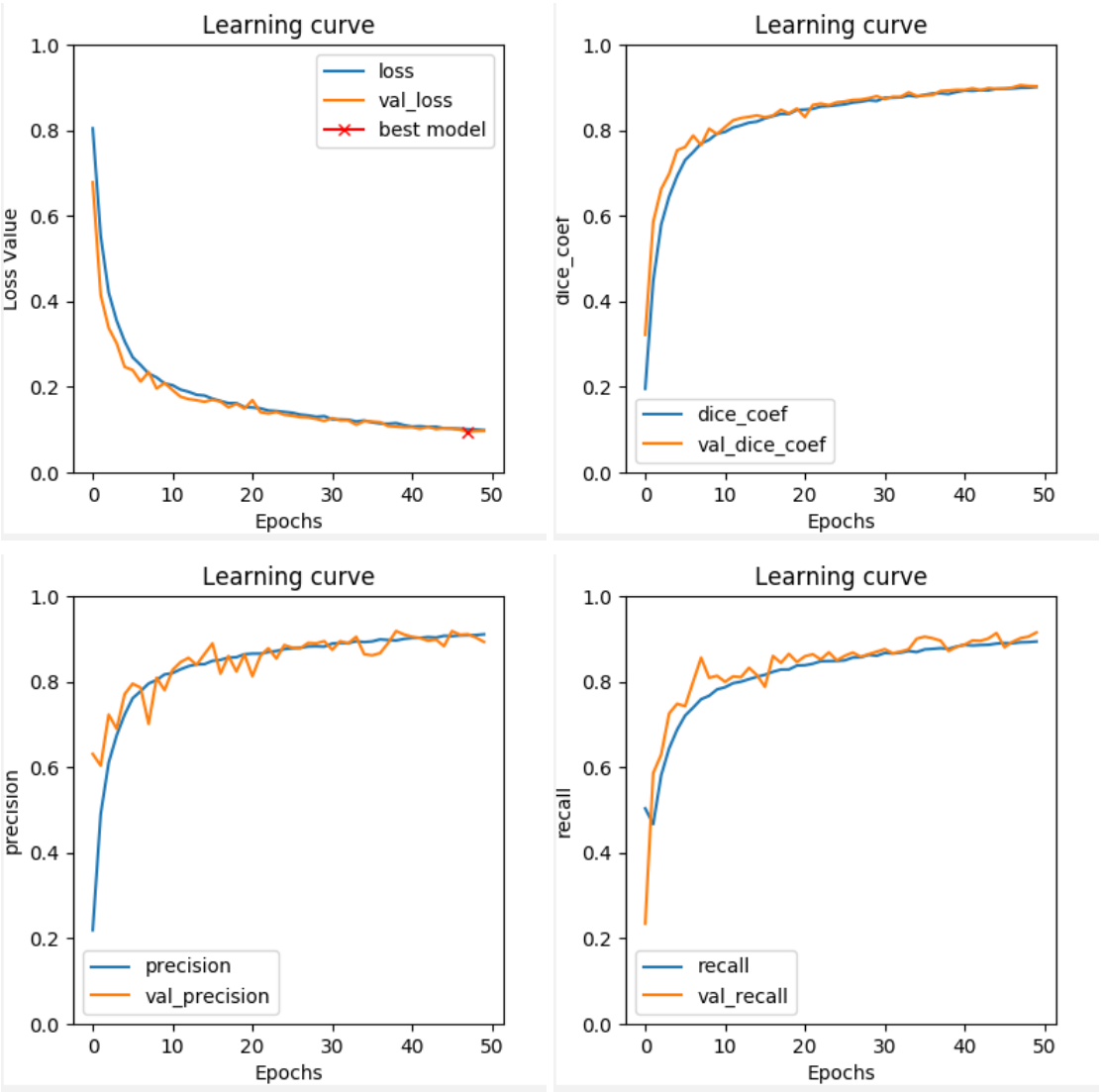


Figure 1. BCDU-Net with bi-directional ConvLSTM in the skip connections and densely connected convolution.



	DSC	precision	recall
Training	0.901	0.911	0.89
Validation	0.903	0.893	0.925



Compared to the Model that was trained in Lab 5 without the weighted loss, the model performed similarly. The validation recall increased slightly, while the precision decreased slightly. Thus, this model is likely to be preferred. However, since no statistical analysis was performed, it is unclear if the performance is actually statistically significantly different. To conclusively say that, one would need to run more experiments and make sure that the data is distributed the same in both models. Compared to the U-Net without LSTM layers, the model with LSTM layers has a steeper learning curve for the DSC after 50 epochs, which indicates that the model might not have converged completely. Thus, the model's performance might increase further with an increase in epochs.