Today in this tutorial we will continue our introduction into TensorFlow. Please download the files in “tutorial9” from the github http://github.com/dgromann/SemanticComputing/.

Exercise 1

`tutorial9_1.py: MNIST classification as regression task in tensorflow`
Please first read the exercise and look at the code before you run it.

a) Create the output variable Y to be used during training. Which variables do you need to use to define the shape of this tensor?

b) Choose and specify an optimizer with a predefined learning rate. Which optimizer did you choose and how did it perform?

c) Experiment with the learning rate. Which one gives you the best accuracy on the validation set?

d) Add a second layer to the network. Keep in mind that you need to connect it correctly to layer 1 and the output layer. Does a second layer improve the accuracy of your model?

Exercise 2

`tutorial9_2.py: MNIST classification as GRU implementation in tensorflow`
Please first read the exercise and look at the code before you run it.

a) Compare the two implementations as regression task from tutorial9_1 and here as LSTM implementation.
   - What is the main difference?
   - Which model performs faster?
   - Which model performs better on the test set?

b) Change the implementation from the GRU to an LSTM using `BasicLSTMCell` and specify a `forget_bias = 0.8` as a parameter of the cell initialization. Which one performs better?

c) Experiment with the forget bias of the LSTM. Remember 1.0 means nothing is 'forgotten' - no dropout. Which forget bias provides the best solution?