

**ΥΣ19 Artificial Intelligence II (Deep Learning for
Natural Language Processing)
Fall Semester 2020
Homework 3
20% of the course mark
Announced: November 25, 2020 Due: December 24,
2020 at 23:59**

1. Develop a sentiment classifier using a bidirectional stacked RNN with LSTM/GRU cells for the Twitter sentiment analysis dataset of the previous assignment [available here](#). For the development of the models, you can experiment with the number of stacked RNNs, the number of hidden layers, type of cells, skip connections, gradient clipping and dropout probability. Document the performance of different configurations on your final report. Use the Adam optimizer and the binary cross-entropy loss function. Remember to transform the predicted logits to probabilities using a sigmoid function. You should also utilize pre-trained word embeddings ([GloVe](#)) as the initial embeddings to input on your models. For the best model you found:

- Compute precision, recall and F1 for each class.
- Plot the loss vs. epochs curve and the [ROC curve](#) and explain what you see.
- Compare with your best model from Homework 2.

Your solution should be implemented in PyTorch and we expect your report to be well documented.

(10/10 marks)

2. Add attention to the best model you developed in the previous question. Evaluate the improvements that you might have from its introduction.

(2 bonus marks)

3. Add contextual word embeddings using ELMo to the model of the previous question. Evaluate the improvements that you might have from its introduction. To do this question, you should first read the papers on TagLM and ELMo discussed in the “Contextual word embeddings” lecture, and check out the data and code on the Web site of ELMo (<https://allennlp.org/elmo>).

(3 bonus marks)