

Modeling dynamic temporal behavior using Recurrent Neural Networks

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1 Overview and Goal

Many processes exhibit dynamic temporal behavior. For example, writing a text. Every new letter that we write actually depends on the word we want to write, and the word depends on the context. Another example is the stock market exchange. The new price of the stock today depends on all the hidden and observed factors that were included in the process so far. We can assume that all these processes that exhibit dynamic temporal behavior maintain some internal states that evolve over the time and the outputs are functions of these internal states at each moment.

In this project you will be modeling the dynamic temporal behavior present in the time series data using Recurrent Neural Networks (RNNs). RNNs are popular models that have shown great promise in many NLP tasks. There are different RNN architectures. One of them is Long short-term memory (LSTM). Unlike traditional RNNs, an LSTM network is well-suited to learn from experience to classify, process and predict time series when there are very long time lags of unknown size between important events. In the project you will learn how the RNNs work and how you can apply them on real data using powerful machine learning libraries such as tensorflow. More concretely, you should apply the model on two types of data: tweets data and stock market prices data. For the first application you should build a TwitterBot that will generate tweets based on a data obtained from a set of users. For the second application you should build a system that will be able to predict the stock price in the next moment given the history of the prices and the information on the factors that affected the price.

2 Project Steps

- Learn how RNNs work
- Collect tweets
- Apply RNN on twitter data

- Apply RNN on stock market prices data
- Analyze the results

3 Required Skills

The student should have knowledge in Machine learning. The student should know how to work with Python.

References

- [1] “Tensorflow: Language modelling using recurrent neural networks,” accessed: 3 October 2016. [Online]. Available: <https://www.tensorflow.org/versions/r0.11/tutorials/recurrent/index.html#recurrent-neural-networks>
- [2] “Understanding lstm networks,” accessed: 3 October 2016. [Online]. Available: <http://colah.github.io/posts/2015-08-Understanding-LSTMs/>
- [3] “The unreasonable effectiveness of recurrent neural networks,” accessed: 3 October 2016. [Online]. Available: <http://karpathy.github.io/2015/05/21/rnn-effectiveness/>
- [4] H. Jia, “Investigation into the effectiveness of long short term memory networks for stock price prediction,” *arXiv preprint arXiv:1603.07893*, 2016.