

# Deep Learning for Sentiment Analysis

## Term Project Report

Chunxu Tang  
ctang02@syr.edu

Zhi Xing  
zxing01@syr.edu

## 1 Introduction

Due to the “world of mouth” phenomenon, mining the social media has become one of the most important tasks in Data Mining. Particularly, Sentiment Analysis on social media is useful for various practical purposes such as brand monitoring, stock prediction, etc. Sentiment Analysis is inherently difficult because of things like negation, sarcasm, etc. in texts, but Machine Learning techniques are able to produce accuracy above 90% for multi-class classification in regular texts such as movie reviews, arguably better than human. Unfortunately, the irregularities of social-media texts, such as misspelling, informal acronyms, emoticons, etc., make social-media-oriented Sentiment Analysis, or Text Mining in general, extremely difficult.

The buzzing Deep Learning is dominating pattern recognition in computer vision and voice recognition. As it turned out, it may be good at text classification as well. Various deep neural nets achieve state-of-art sentiment-polarity classification on Twitter data (about 87%) [2, 3, 5]. One of the advantages of Deep Learning is its ability to automatically learn features from data, and this ability leads to lots of interesting designs [1, 2, 3, 4, 5].

The goal of our term project is to get a good understanding of Deep Learning techniques and apply it to social-media sentiment classification. We’ll first *study* the literature and online articles/tutorials to understand different types of deep neural nets, then apply one or two of them on two-class sentiment classification of Twitter data. We envision the following *programming* tasks:

- Data collection (Chunxu)
- Logistic Regression with Word Embeddings (Chunxu)
- Recurrent Neural Network with Word Embeddings (Chunxu) \*
- Convolutional Neural Network with Word Embeddings (Zhi)
- Dynamic Convolutional Neural Network with Word Embeddings (Zhi) \*

---

\*These will be done if time permits.

## 2 Background

## 3 Convolutional Neural Network

## 4 Experiment

## References

- [1] Cícero Nogueira dos Santos and Maira Gatti. Deep convolutional neural networks for sentiment analysis of short texts. In *COLING*, pages 69–78, 2014.
- [2] Nal Kalchbrenner, Edward Grefenstette, and Phil Blunsom. A convolutional neural network for modelling sentences. *arXiv preprint arXiv:1404.2188*, 2014.
- [3] Yoon Kim. Convolutional neural networks for sentence classification. *arXiv preprint arXiv:1408.5882*, 2014.
- [4] Richard Socher, Alex Perelygin, Jean Y Wu, Jason Chuang, Christopher D Manning, Andrew Y Ng, and Christopher Potts. Recursive deep models for semantic compositionality over a sentiment treebank. In *Proceedings of the conference on empirical methods in natural language processing (EMNLP)*, volume 1631, page 1642. Citeseer, 2013.
- [5] Xin Wang, Yuanchao Liu, Chengjie Sun, Baoxun Wang, and Xiaolong Wang. Predicting polarities of tweets by composing word embeddings with long short-term memory. In *Proceedings of the 53rd Annual Meeting of the Association for Computational Linguistics and the 7th International Joint Conference on Natural Language Processing*, volume 1, pages 1343–1353, 2015.