

Implementation of Common NLP Algorithms

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Abstract

In this paper I detail my implementation of recurrent neural networks, attention, and convolutional neural networks for the purpose of sentiment classification on the IMDB dataset.

1 Introduction

Sentiment analysis is a classic Natural Language Processing task where a model is trained to predict whether the contents of a sentence are positive or negative. Using the IMDB dataset, I compared the performance of a baseline fully connected network, recurrent network variants (RNN, LSTM, GRU, etc.), convolutional networks, and attention-based networks for the task of sentiment analysis. Each model utilized Word2Vec embeddings. I found that the bidirectional LSTM network performed the best on this task, largely due to the serious overfitting of the recurrent neural networks.

2 Results

After preprocessing the data into 200 length sequences of indexes to a dictionary of roughly fifty thousand words, a variety of models were trained on the data. All models benefited from transfer learning using Word2Vec embeddings at the beginning of each network.

The results of the experiment are as follows.

Model	Parameters	Accuracy
Baseline	NA	0.7199
RNN	1 Layer	0.4399
LSTM	2 Layer	0.5600
BiLSTM	2 Layer	0.7199
GRU	2 Layer	0.5799

Conv	NA	0.6599
Attention	NA	0.5199

3 Conclusions

I found that implementing these models with PyTorch was quite the challenge. The implementation of attention was especially confusing. However, the practice of designing and training neural language models is a very rewarding endeavor.

References

- Tomas Mikolov. 2013. *Distributed Representations of Words and Phrases and their Compositionality*
- Ashish Vaswani. 2017. *Attention is All You Need*, NIPS