

Chapter 14

Deep Learning Approaches for Textual Sentiment Analysis

Tamanna Sharma

Department of Computer Science and Technology, Guru Jambheshwar University of Science and Technology, Hisar, India

Anu Bajaj

 <https://orcid.org/0000-0001-8563-6611>

Department of Computer Science and Engineering, Guru Jambheshwar University of Science and Technology, Hisar, India

Om Prakash Sangwan

Department of Computer Science and Technology, Guru Jambheshwar University of Science and Technology, Hisar, India

ABSTRACT

Sentiment analysis is computational measurement of attitude, opinions, and emotions (like positive/negative) with the help of text mining and natural language processing of words and phrases. Incorporation of machine learning techniques with natural language processing helps in analysing and predicting the sentiments in more precise manner. But sometimes, machine learning techniques are incapable in predicting sentiments due to unavailability of labelled data. To overcome this problem, an advanced computational technique called deep learning comes into play. This chapter highlights latest studies regarding use of deep learning techniques like convolutional neural network, recurrent neural network, etc. in sentiment analysis.

INTRODUCTION

Sentiment analysis is a subset of natural language processing used in association with text mining techniques for the extraction of subjective information from social media sources. Collection of documents, reviews, blog posts, data from microblogging sites like tweets from twitter, status and news articles. Basically sentiments are analysed for certain product, domain, people and try to quantify the polarity of

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that particular information. In other words, Sentiment analysis means mining of text for finding out the actual meaning/essence/attitude behind the text. It is also called as opinion mining. It is both science and art because of its complex context. Correct identification of hidden polarity behind the text is the key of success for any sentiment analysis task. Some of the reasons which make sentiment analysis a tough job in text are:

- Understanding the context of language for human is easy but teaching the same thing to machine is a complicated task.
- Vast variety of languages and grammar usage of every language is different.
- Usage of unstructured text like slangs, abbreviated form of text and grammar nuances make it more difficult to analyse.

Figure 1 shows the general framework of sentiment analysis. With the advent of web and social media lots of information is present for opinion mining like blog posts, data from microblogging sites, news posts etc. Most of this data is in textual form and for computation we need to transform it in to vector form. Natural language processing come up with loads of models like bag of words vector, vector space models, word embedding etc. Mining technique is chosen after that according to application for example if we want to analyse movie reviews we have rating and text as our dataset etc. Correct feature extraction is necessary for the training and testing accuracy of any machine learning model.

Now a days, deep learning models do not required hand coded features but they are data hungry techniques and need loads of data for training. Training is accomplished with the help of labelled data. After that trend or pattern is analysed by machine learning technique called knowledge. At last this knowledge with some mathematical function will be used for predictions of unlabelled data.

Sentiment analysis plays a greater role in gaining the overview of wider public opinion and social media interactive dataset is the best source for it. Gaining deeper insights from dataset make it more useful for forecasting applications like stock market in which correct sentiment identification make it more predictable for investors. Market research for maintaining the quality of product can be accomplished with the help of sentiment analysis. Opinion mining of customer review helps in knowing the current status of our product and its competitors.

Natural language processing (NLP) is one of the promising domain which makes our day to day life easier like keyboard auto completion, speech recognition, dictionary prediction etc. Amalgamation of machine learning with NLP brings awesome results in various applications and sentiment analysis is one of them. Sentiment analysis become talk of the town day by day because of its deep business insights which help in taking further decisions. Sentiment information is taken from customer reviews, posts from microblogging sites like twitter, reddit etc. and computational intelligence based techniques are applied for mining, analysing and forecasting of trend information.

Major limitation in sentiment analysis is the strict classification of polarity in to three buckets called positive, negative and neutral. While human emotions are not so quantifiable every time sometime it is ambiguous and chaotic in nature. While in future researchers are trying to move from one dimensional monotonous scaling of positive to negative to multidimensional scaling. Involvement of deep learning techniques opens a new line of research in sentiment analysis which is described in last part of this chapter. In next section we presented a simple case study of sentiment classifier using Naïve Bayes machine learning algorithm for understanding the general flow of model.

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