

An Approach to Detect Sentence Level Sarcasm Using Deep Learning Techniques

Amruta K. Chimote¹, S.R. Tandan² and Rohit Miri³

¹Research Scholar, Department of Computer Science & Engineering,
Dr. C.V. Raman University, Bilaspur (CG), India

^{2,3}Associate Professor, Department of computer science & Engineering,
Dr. C.V. Raman University, Bilaspur (CG), India

ABSTRACT

Today is the era of customer self-service, where people use conversation agents (chatbots) to get their query solved in minimum time and cost. Use of conversation Agent gives real time experience to user/customer to get answers very fast. To make this experience more genuine it needs understanding of human emotions and which is the most complex task to perform as facial expression and verbal details are unavailable. Most of data over the internet is in textual format which needs to process to get required answers that is why one of the most popular area in natural language processing is Sentiment analysis which focuses on solving this issue. Sarcasm is critical sentiment which is very difficult to recognize by machines. User express sarcasm to show their anger, disagreement using positive words over internet forums, social media and over shopping sites for reviews about product, services, situation, workplace etc. This paper gives a combined approach by extracting pragmatic features like emoticons, use of hyperbole, punctuations and special words used in sentence to detect sentence level sarcasm using deep learning techniques such as LSTM which will help machine for better understanding of natural language.

KEY WORDS: SARCASM, SENTIMENT ANALYSIS, CONVERSATION AGENT, LSTM, NATURAL LANGUAGE UNDERSTANDING.

INTRODUCTION

Sarcasm is one of the sentiments belongs to anger or disagreement representing something positive with negative intent. Sarcasm is defined by so many people with different approach. Some of definitions are:

a. (Mondher etl.,2016) elaborated Sarcasm as form of irony, majorly used on internet platform such as social media and blogging sites.

b. Cambridge Dictionary explains sarcasm as remark used to state opposite of what is said, this is to hurt or to criticize in humorous manner. (Cambridge Dictionary, n.d.)

c. Sarcasm is the lowest form of wit, but the highest form of intelligence stated by Oscar Wilde.

d. According to wheel of sentiment Sarcasm is critical expression of anger.

Sentiment analysis specially inclined towards opinion mining is one of the most favoured topics in natural language processing which leads to understand sentiment behind textual data provided by user such as reviews about place, product, person and even situation. Detection of sentiment from text/speech data leads to correct decision making for company. Available methodologies for sentiment analysis find it difficult to process complex sentiments such as sarcasm, rhetorical questions which can affect ability to reach correct decision.

ARTICLE INFORMATION

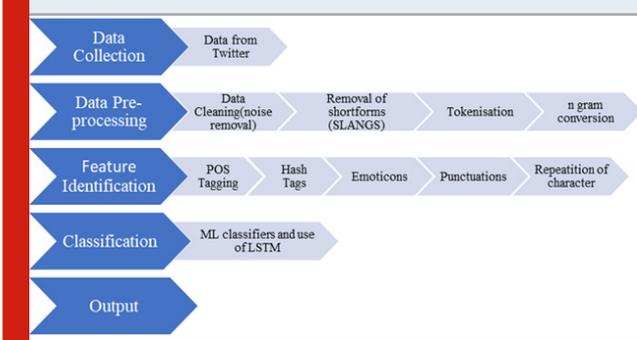
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Figure 2: Methodology for sarcasm detectio



Long Short-Term Memory is dedicated form of artificial recurrent neural network commonly known as RNN. It has capacity to learn order dependence where prediction is needed. This made it eligible to solve complex domain problem like machine translation, speech recognition etc. Its main focus is to remove problem like vanishing gradient which was present in other versions. LSTM is able to deal with issues like noise, distributed representations and time lags. In LSTM, it's not mandatory to have finite states beforehand. Without fine adjustments LSTM can work with more parameters like rate of learning, handling biases of input and output. LSTM success is reduced complexity up to $O(1)$. (aditiano, n.d.)

```

embed_dim = 128
lstm_out = 196

model = Sequential()
model.add(Embedding(max_fatures, embed_dim, input_length = X.shape
[1]))
model.add(SpatialDropout1D(0.4))
model.add(LSTM(lstm_out, dropout=0.2, recurrent_dropout=0.2))
model.add(Dense(2, activation='softmax'))
model.compile(loss = 'categorical_crossentropy', optimizer='adam', m
etrics = ['accuracy'])

if np.argmax(Y_validate[x]) == 0:
    neg_cnt += 1
else:
    pos_cnt += 1

print("Sarcasm_acc", pos_correct/pos_cnt*100, "%")
print("Non-Sarcasm_acc", neg_correct/neg_cnt*100, "%")

Sarcasm_acc 80.8446455505279 %
Non-Sarcasm_acc 83.75149342891278 %
  
```

RESULTS

Partial prototyping model after applying LSTM over political headlines and tweets generated following output. Proposed model correctly classified sarcastic and non-sarcastic sentences with accuracy 80.84% and 83.75 % respectively.

CONCLUSION

With the reviewed papers, articles, and applications it is observed that detection of sarcasm is complex. As sarcasm is critical expression of anger one needs to identify the context of sentence before classification. Pragmatic features help to detect sarcasm correctly and

use of LSTM increase the accuracy when used with n grams. Scope of this can be extended to identify the incongruity of numbers and autosuggestions before entering sarcastic sentence which will ease the work of machine to respond.

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