

# Sarcasm Detection

CSE/LIN467/567 Project

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## Abstract

The purpose of the project is to understand the linguistic nature of sarcasm and do a comparative analysis of difference machine learning models that are used to detect sarcasm and propose a new model that is at par or better than the existing models. Sarcasm manifests with a contrasting theme, between positive and negative sentiments or literal and figurative meanings. The proposed model captures both the incongruity and the contrast of sarcasm text.

**Key words** Sarcasm Detection, Sentiment Analysis,Bidirectional LSTM with Attention, Attention Model

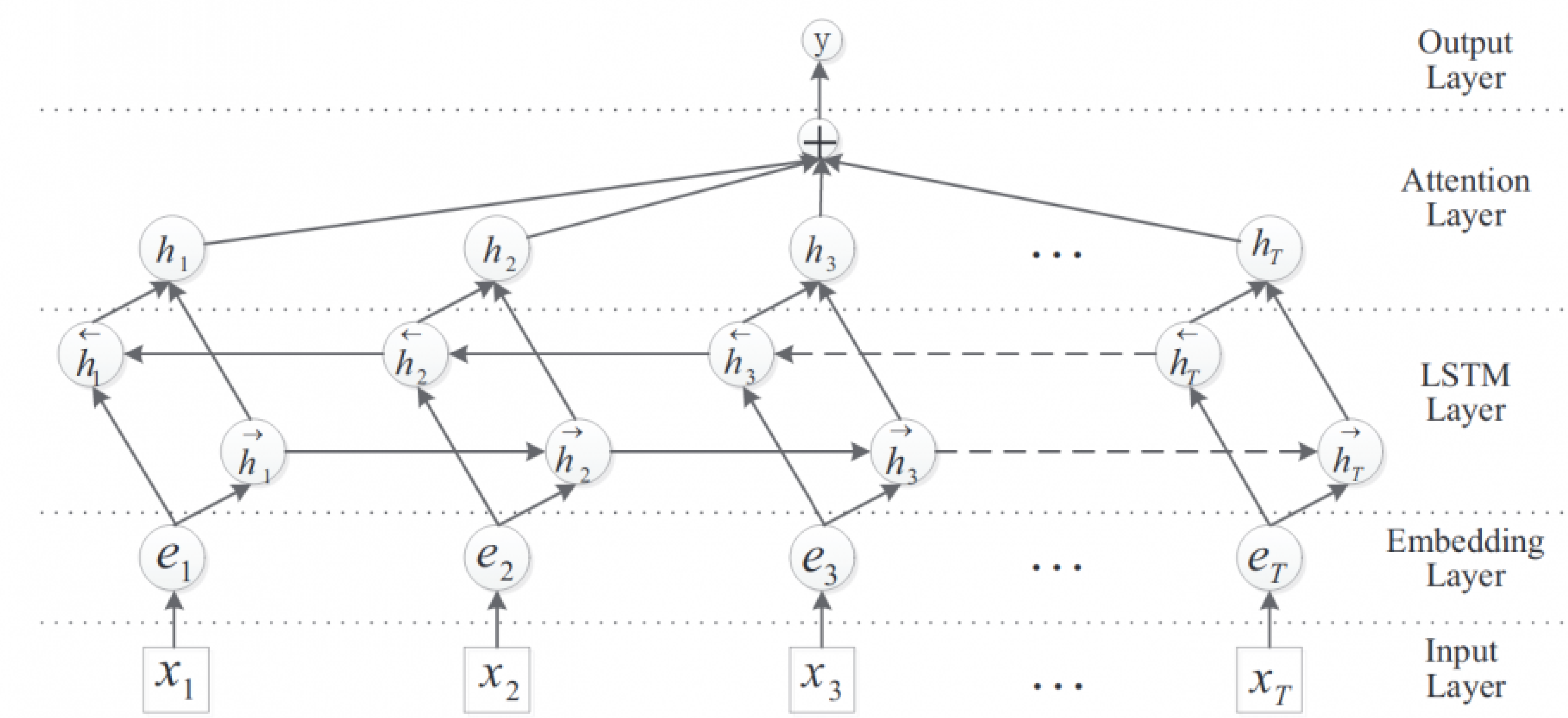
Data and codes are available at <https://github.com/Nhrkr/Sarcasm-Detection>

## Proposed Methods

In this project, the new proposed method is to use a bi-directional lstm model with attention stacked with a convolution layer with max pooling to classify if a text is sarcastic or not. This model is then compared with other machine learning models (existing) for the same data set.

This project implements two bidirectional LSTM with attention models, with CNN with max pooling and without CNN. A bidirectional LSTM layer is initiated with outputs being averaged together. There are 128 hidden units for this layer and the weights for words are picked from the preloaded embeddings. Two attention layers with activations tanh and softmax were added.The hidden states were multiplied with the attention coefficients to find the weighted average. This weighted vector was passed to single layer dense network with relu as the activation for classification.

For another model, a convolution layer was added before the lstm layer. The filter width is 3 and number of filters f = 100.



## Embedding

The models we ran with two different embedding, Glove for common crawl and Fasttext. The dimensions for both the embedding is d=300. The Fasttext embedding have embedding for approximately 1Million words, whereas the embedding used from glove have 2 millions words. It was observed that the models gave better results with golve embeddings.

## Results

### Dataset

The Sarcasm Corpus V2 is a subset of the Internet Argument Corpus (IAC), including response text from quote-response pairs annotated for sarcasm. It contains data representing three categories of sarcasm: general sarcasm, hyperbole, and rhetorical questions.The data is in form of 'quote-response' pairs, where quote is a dialogic parent to the response. The sarcasm annotations are related only to response, but quote acts as a context. The subset of the data used for sarcasm detection has 3260 quote-response pairs with 1630 sarcastic examples.

Avg number of words in an instance	31 words
Avg length of sarcastic sentences	231 chars
Number of positive examples	1630
Number of negative examples	1630

### Compared Models

The proposed model was compared with the following algorithms.

1. NBOW is a simple neural bag-of-words baseline that sums all the word embeddings and passes the summed vector into a simple logistic regression layer.
2. LSTM is a vanilla Long Short-Term Memory Network. The size of the LSTM cell is set to d = 100
3. ATT-LSTM (Attention-based LSTM) is a LSTM model with a neural attention mechanism applied to all the LSTM hidden outputs.
4. CNN-LSTM-DNN (Convolutional LSTM + Deep Neural Network), proposed by (Ghosh and Veale, 2016), is the state-of-the art model for sarcasm detection. This model is a combination of a CNN, LSTM and Deep Neural Network via stacking. It stacks two layers of 1D convolution with 2 LSTM layers.The output passes through a deep neural network (DNN) for prediction

Model	Accuracy
NBOW	66.09
Vanilla LSTM	62.22
Attention LSTM	69.96
CNN-LSTM-DNN (Ghosh and Veale)	64.38
Bidirectional LSTM	70.18%
<b>Bidirectional LSTM with Attention</b>	<b>70.34%</b>
<b>CNN Bidirectional LSTM with Attention</b>	<b>71.17%</b>