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USING DEEP LEARNING FOR SENTIMENT ANALYSIS OF FINANCIAL NEWS

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ABSTRACT

Sentiment analysis is a machine learning tool that analyzes texts for polarity, from positive to negative. By training the machine learning models with examples of emotions in text, machines automatically learn to detect sentiment without human input. Machine learning allows computers to learn new tasks without being expressly programmed to perform them. Sentiment analysis models may be trained to read beyond mere definitions, to grasp things like, context, sarcasm, and misapplied words. This paper proposes a Deep Learning based approach mixed with Transfer Learning to avoid wasting resources. We also compare different Machine Learning Models for accuracy and iterations. We achieved an F1 score of 0.6 with LSTM, 0.5 with SVM and 0.7 with Vader. So, we conclude that using transfer learning is way more resource-efficient than training a model from scratch.

KEYWORDS: ***Deep Learning, Transfer Learning, Sentiment Analysis, Financial News***

I. INTRODUCTION

Traders use powerful computers to speedread news reports, editorials, company internet sites, blog posts and even Twitter messages then letting the machines decide what it all means for the markets. The last word goal is to create an automatic trading system which looks for market opportunity and trades there on. Markets often move supported human emotion, so sentiment may provide a useful signal for trading. We seek to check whether sentiment is also gleaned from news articles describing the market. The work described during this project are often a module in a very larger trading system. This module would extract sentiment from tongue and supply it as an input thereto larger system. This project describes the deep learning methods and SVM for sentiment analysis of financial news. The results of both approaches are reported, and therefore the efficacy of using sentiment to predict profitable trading opportunities is discussed. Machine learning is a branch of AI which allows machines to spot patterns and make decisions with minimal human intervention.

II. REVIEW OF LITERATURE

BERT, which is applied [1] in online financial text mining and public sentiment analysis in social media. By using pre-trained models and ensemble learning to enhance the performance of the proposed approach. Experimental results show that the performance of this approach is mostly higher than SVM, LR, NBM, and BERT for two financial sentiment analysis and key entity detection datasets.

The initial idea of this project was to use online information using net crawler. There are several papers written on sentiment analysis for social network media. The paper of Alec Go, Lei Huang and Richa Bhayani (2009) [1] discusses issues relevant to the algorithm, classification and query of Twitter messages as positive or negative terms. They assumed sentiment classification in Twitter messages is obtained using machine learning techniques. The authors mentioned the general goal of sentiment analysis for market research, product / service or market opinion collection. It was concluded that machine learning performs well for classifying sentiment in tweets.

The recursive neural network (RNN) [2] lies in supervised learning. It contains a tree structure which is settled before training and the nodes can have different matrices. There is no need for reconstruction of input in RNN.

The research work [3] builds a Treebank for Chinese sentiments of social data to beat the deficiency of labeled and enormous corpus in existing models. To predict the labels at the sentence level i.e positive or negative, the Recursive Neural Deep Model (RNDM) was proposed and achieved higher performance than SVM, Naive Bayes and Maximum Entropy. 2270

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movie reviews were collected from different website and Chinese word segmentation tool ICTCLAS used to segment these reviews.

Hussein [4] did studied the relationship between sentences and the sentiment structure, as well as their impact on the accuracy of these results. This work can be used to verify that accuracy is a matter of high caution among the latest studies on sentiment analysis and thus proves that it is affected by some of these challenges, such as addressing negation or domain dependence.

A deep neural network [5] is a neural network with more than two layers, some of which are hidden layers. Deep neural networks use sophisticated mathematical modeling to process data in many ways. A neural network is an adjustable model of outputs as functions of inputs, which consists of several layers: an input layer, including input data; hidden layers, including processing nodes called neurons; and an output layer, including one or several neurons, whose outputs are the network output.

III. METHODOLOGY

2.1 Deep Learning

Identifying and classification of text sentences have been carried out by many companies and services using natural language processing and different methods. These methods use different words as features to perform classification. Excessive time for computation is required for feature extraction which also becomes a major problem when they are associated with these classical methods. Nowadays all traditional methods are replaced by machine learning techniques. Deep learning is a class of machine learning which requires a computational model that learns to perform classification tasks directly from text sentences. Higher accuracy means ability to handle huge volume of data increases, also inbuilt ability to use GPUs for parallel computation and availability of inbuilt pre-trained Neural Networks constitute towards the popularity of deep learning.

2.2 Transfer Learning

It is a machine learning method which involves a model being developed for a particular task that is reused which in turn becomes the starting point for a model on a second task. Highly popular approach in deep-learning where pre-trained models are being used as a starting point rather than starting from scratch.

This technique is useful when people have insufficient data for a totally new area that needs to be handled by a neural network and there are big pre-existing data pools that can be transferred to your problem.

In this method the basic utilization method is used from previously learnt abilities of a pre-trained model like word correlation, degree of word,etc which can be reused in other applications. But the output layer of a pre-trained model is removed, and new output layers are added in front of it.

2.3 Data Set

The dataset contains the sentiments for financial news headlines from the perspective of a retail investor. Further details about the dataset can be found in: Malo, P., Sinha, A., Takala, P., Korhonen, P. and Wallenius, J. (2014): "Good debt or bad debt: Detecting semantic orientations in economic texts." Journal of the American Society for Information Science and Technology. Each news headline is marked with the corresponding sentiment ("Neutral", "positive" , "Negative"). There is a total of 4837 unique headlines.

2.4 LSTM

LSTM is recurrent neural network (RNN) architecture that remembers values over arbitrary intervals. LSTM is well-suited to classify, process and predict statistic given time lags of unknown duration.

The structure of RNN is incredibly kind of like the hidden Markov model. However, the major difference is with how parameters are calculated and constructed. Among the benefits with LSTM is insensitivity to gap length. RNN and HMM depend upon the hidden state before emission / sequence. If we wish to predict the sequence after 1,000 intervals rather than 10, the model forgot the place to begin by then. LSTM REMEMBERS

2.5 SVM

SVM are especially effective at classification, numeral prediction, and pattern recognition tasks. SVMs find a line (or hyperplane in dimensions greater than 2) in between different classes to specify the gap on either side of that line or the hyperplane to the next-closest data point. In other words, support vector machines calculate a maximum-margin boundary that results in a homogeneous partition of all data points. This classifies an SVM as a maximum margin classifier.

2.6 Vader

VADER (Valence Aware Dictionary and Sentiment Reasoner) is a lexicon and rule-based sentiment analysis tool that's specifically attuned to sentiments expressed in social media. VADER uses a mixture of A sentiment lexicon could be a list of lexical features (e.g., words) which are generally labelled in line with their semantic orientation as either positive or negative. VADER has been found to be quite successful when coping with social media texts, NY Times editorials, movie reviews, and products reviews. this is often because VADER not only tells about the Positivity and Negativity score

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but also tells us about how positive or negative a sentiment is

IV. RESULT AND CONCLUSION

Here we observe that our custom-made LSTM model has an F1 score of 0.6 which is considerably good as it has been trained on less data. SVM gives 0.5 F1 score and on the other hand Vader gives 0.7.

But for a real-world scenario where news may consist of positive, neural and negative news all together Vader's full power usage may be helpful.

Result Table	
MODEL	**F1 Score**
LSTM	0.6
SVM	0.5
Vader	0.7

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