

# Deep Stock Prediction using Visual Interpretation: DeepClue

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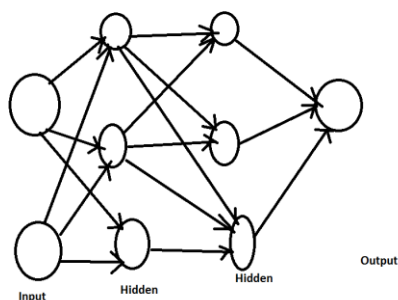
**Abstract**— This proposed paper builds Deep Clue system that links text related models, final users using visual interpretation. We try to implement following modules in this paper. 1.Designing an architecture for a 'deep neural network' used for interpretation and we apply algorithms to give similar relevant factors. 2.By exploring different levels of predictive(relevant) factors and visualizing them that can be interacted by the end users at different factor-levels. Interpretation method differentiates the predicted and unpredicted values of stock price. 3.We examine visualization integrated systems using some real-world scenarios like tweeter data, financial news data and obtained stock price values by predictions. The effective working of Deep Clue helps for proper investment in stocks and to analyses tasks.

**Keywords:** Deep Clue, stck market, Text Based Visualization, Neural Network

## 1. INTRODUCTION

Deep-Learning comes under the machine learning technique. There are many applications that run through this technique. Now-a-days cars can be driven without human innervations, applications are able to recognize the images, speech that are spoken, etc. This is possible by trying the applications with various datasets. In this paper we collect data which is in the form of text from various new of finance and tweeter data which are related to stock market and tries to predict the price movements of stock. Model developed in this paper will be useful for the end users who want to invest in stocks. By deep clue it will be clear to the user whether the price for particular is high or low according to that they can invest.

For example, 'Oil prices in India are setting very high records' the word high represents big. In stock high refers to increase but the statement gives a bad impact for the end users since many can't afford for lot of oil. Analyzing these words and helping the investors either to invest in a product or not.



We consider stock traders - who manage stock trading

operations. Everyday job of traders is to make trading decisions either to buy/sell stock such decision is based on multiple sources of info known as trading signals...i.e., when u buy/sell the stock at which particular time to improve the trader's job there should be a method to help traders to detect signals from prediction model, so they can be able to combine with their traditional source of inf. to finalize the decision. At times using the prediction model and getting 60-70% accuracy may lead to heavy losses so there should be deep understanding of failure cases of prediction model and stock market analysts-who provide prediction model for traders.

In this we create visualization where final users can understand the stock results and invest accordingly. Designing a such a visualization system for final users can be challenging.1.The patterns that are discovered from the extracted data are represented in different channels and are displayed in the same view but in this the data extracted will be at high level.2.Not just considering a single coordinate view ,here we have to consider in many coordinate view so that the relationship among model, data ,interpretation can be illustrated.

3.With text information not all stock prices and their movements can be neither predicted nor unpredicted. Perception is required to differentiate between them. The existing literature analysed that there are many interpretation models for recognition of images, for detecting objects, etc this is the first model to interpret the links which are hidden between the stock prices and text data using deep learning.

**The following are modules which we implement:**

The algorithm used for interpretation is "pixel based --layer wise -relevance" propagation to obtain the text data which is relevant to prediction values. Obtained factors will be classified as three layers namely titles, bigrams, titles. These factors are analysed and are made to form a hierarchy named as factor hierarchy which will be useful for the end users to interpret the results.

In this we will be designing a visual integrated system named as DeepClue. DeepClue model is applied to scenarios like prediction of stock prices which will visually interpret the textual data with that particular time stock prices.

## 2. WORK

Deep Neural-Networks visualization and interpretation: Previously many interpretations were done on data sets containing images. Bach came up with few algorithms namely layer wise and relevance propagation which divides

**Revised Manuscript Received on February 22, 2019.**

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neural network into different layers and gives score for each layer. The scores will be calculated for specified inputs and thus with the scores pixels are contributed. In order to understand architecture of deep learning Google designed few online tools for visualization. But mostly literature says the visualization mainly focused on recognition of images. In contrast, to existing models DeepClue is designed tries to combine text data and stock price data, builds a time series for it.

#### Text related stock visualization and prediction:

The text data is collected from various resources like data from social media, news data. The sentiment texts that are obtained from social media data content plays a vital effect on stock market. The visualization of data related to stock market mainly focuses on times series of stock price.

#### Text based-Prediction :

We collect data from many articles of news, we consider stocks and their previous stock prices. Each news article contains a title and the text data. The keywords from them is collected and stored. The tweets which are related to stocks are also collected.

#### Architecture: Deep-neural networks:

The proposed architecture is deep regression-model which is organized in the form of hierarchical structure of neural networks. This is classified into four blocks namely bigram block, word block, title block and feed-forward block. The word block takes the titles of all data from news as an input, takes every word present in title and converts them into real-valued word.

#### Word Block:

Distributed method is used here. If suppose two words have meaning which are close to one and another in higher dimensional region then they will have close semantic-meanings. Consider an example, the semantic meanings of rise and increase are very close than the words 'rise' and 'decrease'.

#### Bigram Block:

Using bigram we collect info of phrases which contains series of two consecutive words in sentence for example high scores, less rains, etc.

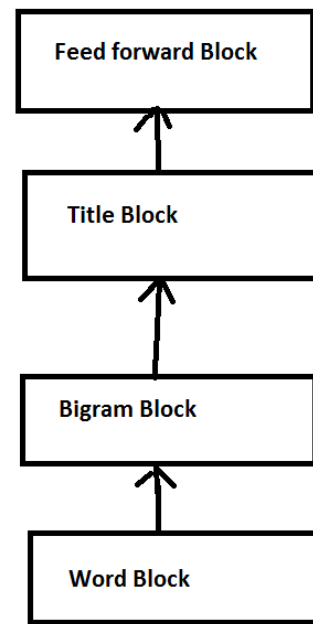
#### Title Block:

In title block collects titles from news and maps into vector and then combine all vectors to a one representation and gets summary of each day. The sum pooling will be efficient to give all features of specified sentence which helps in predicting stock prices.

At times sum pooling will lead to increase in the size since we need to sum them all instead we can use average pooling.

#### Feed-forward block:

The tangent function  $-\tanh$  is used in regression -model.



Architecture for proposed neural n/w

#### Model used for training:

For implementing DeepClue a software library of neural networks is used called Dynet.

#### Importance of visualization:

Visualization interface has to help the users to understand the prediction and analysis of stock prices. By the visualization users can understand stock related data like what the prices currently and about news related to trades. Thus users can understand when the stock prices can rise and also fall and can also understand predictions.

### 3. CONCLUSION

We present a model named DeepClue which takes text related data and predicts the movements of stock prices. It contains four blocks namely word block, bigram block, title block and feed-forward block. DeepClue system takes input data from news and tweeter.

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