Predicting Stocks Trends Based on News

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Abstract

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1 Background

Stocks market has been known to be volatile and sentitive to facctors, including news and statistics. Speculation on stocks movement requires complicated techniques and models, still the result is not satisfactory.

1.1 Indicators

Nothing here for now

2 Dataset

Some text for second section

3 Naïve Bayes

Describe the result from Naïve Bayes approach

4 Logistic Regression

Describe the result from logictic regression

5 Sentiment Analysis

6 Recurrent Neural Network

In order to capture the objective of accurate prediction, Recurrent Neural Network (RNN) is introduced because its ability to exhibit internal state (memory). Specifically, Long short-term memory (LSTM), a special kind of RNN, is used for implementation as LSTM can deal with vanishing gradient problems and is capable of learning long-term dependencies.

Before begin training the model, the dataset, 100 samples in this case, must be preprocesed introduced boolean vector through $TfidfVectorizer$ from $sklearn.feature\_extraction.text$. The $max_features$, which is also the size of the boolean vector is specified to be 10. Each sample (now a boolean vector) is paired up with the stock (AMZN in this case) movement, 1 for going up and 0 otherwise. In one epoch, we use $KFold$ from $sklearn.model_selection$ to split the dataset

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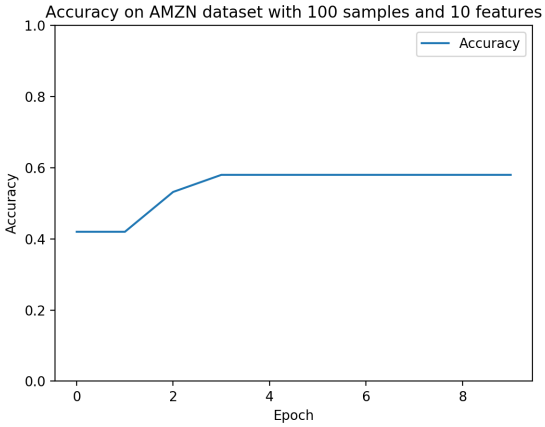
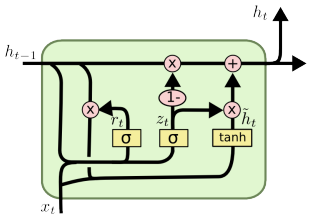


Figure 1: Accuracy of the model



$$z_t = \sigma\left(W_z \cdot [h_{t-1}, x_t]\right)$$
$$r_t = \sigma\left(W_r \cdot [h_{t-1}, x_t]\right)$$
$$\tilde{h}_t = \tanh\left(W \cdot [r_t * h_{t-1}, x_t]\right)$$
$$h_t = (1 - z_t) * h_{t-1} + z_t * \tilde{h}_t$$

Figure 2: LSTM structure

into 2 groups, one for training and one for testing.

Regarding network structure, the LSTM network has 10 input nodes, which corresponds to the size of the boolean vector. It has 4 hidden nodes between the input layer and the LSTM and use sigmoid as an activation function. After LSTM module, the output layer consisting of 2 nodes uses softmax as an activation function in order to represent output as a probability of classification.

During the training period of the network, the parameters (learning rate, $max_feature$, and number of sample) have to be adjusted to some specific configuration in order to show the improvement of training as shown in Figure 1. Greater or lesser the value of parameters will result in stationary accuracy since the first epoch, which is not useful for parameter tuning process and training process.

Currently, the only indicator that was taken into account is news headlines as a boolean vector through $TfidfVectorizer$. However, there are more factors that can be used as indicators for prediction, for instance, the unemployment rate, volume, social network, interest rate, etc. Those indicators should be fed into the network as well, but they need to be processed/weighted appropiately proportional to the importance of each indicator. As described, there are lots of rooms for improvement for this network and also for integrating other techniques to improve the accuracy of prediction.

References

if needed