STOCK PRICE PREDICTION USING MULTIPLE LSTM MODELS AND ATTENTION NETWORK

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ABSTRACT

In stock market, there is always a inter-dependency between the price change of similar companies. Stock prices of such companies grow or fall together with some time difference. Based on this observation we propose a model which predicts the stock price of a particular company using price series of other companies and attention network. We implement attention network in two ways (i) simple FNN, and (ii) LSTM and show that LSTM-based attention gives improvement over FNN based attention network in terms of generalization error.

Index Terms— Stock price prediction, LSTM, Attention Network

1. INTRODUCTION

Stock price prediction is considered to be a difficult problem in time series forecasting as compared to time series problems in NLP domain because the stock price series have the effect of many non-technical external factors. The existing models ([1], [2], [3]) based on Regression, ARIMA, RNN and LSTM consider the single price series input and therefore highly over-fit the data and cannot predict the future values well.

In this paper, we propose a model which takes as input the price series of multiple companies (called secondary input) and predict the stock price of one particular company (called primary input) using attention network. Since the dependence of these price series evolve with time, it is intuitive to use LSTM-based attention than the simple FNN-based attention. In this work we implement these two models and show the results in term of generalization error.

2. TECHNICAL DETAILS

The main model involves three layers of LSTM followed by a Dense layer (Fig. 1). Outputs of dense layer are passed through attention network to predict the next value of primary series.

In pre-processing step, we removed from the input the outliers (like stock splits) and scaled all input series to same range.
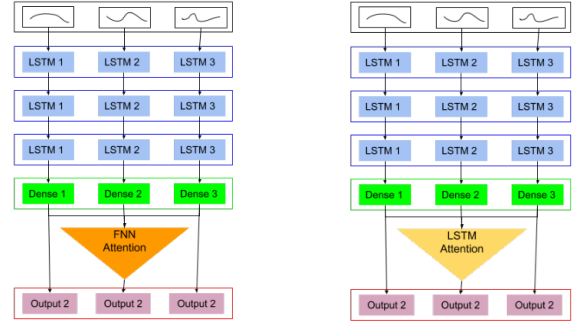

Fig. 1. Model architecture.

FNN-based attention is simple two layer FNN with softmax at the end. LSTM based attention contains three LSTM layer followed by a dense and softmax. We didn't refer any available code in our implementation except the standard Pytorch documentation.

3. RESULTS

As per our results, the test error of the model with attention network was less than the single input LSTM model. Also the test error of LSTM based attention is better than that of FNN based attention with small margin.

Attention	Test error for primary input series
FNN based	0.0383
LSTM based	0.0322

4. CONTRIBUTIONS

The use of LSTM-based attention network and the way the attention network is used in model is novel idea to the best of our knowledge.

5. RESOURCES

https://pytorch.org/docs/stable/index.html
https://www.kaggle.com/rohanrao/nifty50-stock-market-data
Blog: Understanding Stock Splits

6. REFERENCES

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