

# Trading Binary Options with Deep Learning Models

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# Introduction to Binary Options trading

- A binary option is a financial instrument where traders 'bet' on a binary outcome - whether the value of a stock/commodity rises above a set 'strike price' within the expiry time of the option.
- At the time of expiry, the price of the underlying asset must be on the correct side of the strike price (above or below based on the trade taken) for the trader to make a profit.
- The risk in the trade is always the amount bet on the binary option, while the profit is always a fixed amount.



# What is our project about?

- We are trying to create a deep learning model which can predict whether the closing price of a stock, commodity or other financial instrument would be above or below a particular 'strike price' in a given time period.
- Given all the parameters mentioned above, the model classifies whether the closing price would be above/below the strike price before the expiry of our time period allowing us to purchase the appropriate binary option, thus beating the market and turning a profit.
- After we get all predictions we perform a back test to see whether the model is viable in real market conditions, we simulate trading with the generated orders and make a report with various performance metrics to evaluate the model.



# Literature Survey 1 - Empirical Case Study of Binary Options Trading

<https://www.researchgate.net/publication/236872916> Empirical Case Study of Binary Options Trading  
[An Interdisciplinary Application of Telecommunications Methodology to Financial Economics](#)

In finance, a binary option is a type of option where the payoff is either some fixed amount of some asset or nothing at all.

The case study consists of a preliminary example of trading stocks with a simple algorithm for binary options, which includes one buy / sell order for week of a fixed amount of cash (or exchange equivalent) to limit the maximum risk of the investment to that fixed amount.



## Literature Survey 2 - Binary options trading: candlestick prediction using SVM


<https://iopscience.iop.org/article/10.1088/1757-899X/1088/1/012107/pdf>

This paper specifies indicators that will help us in our model. Some popular indicators are Moving Average (MA), Moving Average Convergence Divergence (MACD), and The Relative Strength Index (RSI). Each of the indicators provides different information to help traders choosing High or Low.

One of the most popular asset price chart displays is Candlesticks (CS), which uses to read price movements in financial markets. Most BO traders use the CS pattern technique to determine what CS will be formed next. Some of these patterns are Spinning Top, Marubozu, Doji, Hammer, etc.

Predicting the next CS pattern is discussed in this paper. They use machine learning to classify CS based on the Open and Close Value, Volume, High and Low Value, and CS Color features.

The prediction results are not very good because only 56% are correct. The paper concludes by saying machine learning is to be mainly used for forecasting and not classification for Binary options trading.



# Literature Survey 3 -Stock Market's Price Movement Prediction With LSTM Neural Networks

[https://www.researchgate.net/publication/318329563\\_Stock\\_market%27s\\_price\\_movement\\_prediction\\_w  
ith\\_LSTM\\_neural\\_networks](https://www.researchgate.net/publication/318329563_Stock_market%27s_price_movement_prediction_with_LSTM_neural_networks)

This article studies the usage of LSTM networks to predict future trends of stock prices based on the price history, alongside with technical analysis indicators.

A prediction model was built, and a series of experiments were executed and their results analyzed against a number of metrics to assess if this type of algorithm presents and improvements when compared to other Machine Learning methods and investment strategies.

The results that were obtained are promising, getting up to an average of 55.9% of accuracy when predicting if the price of a particular stock is going to group or not in the near future

With a input dimension that is very large, the algorithm has demonstrated acceptable capability to learn from it without the need of any dimension reduction technique. Hence we can conclude that the LSTM based model offers less risks when compared to the other strategies.



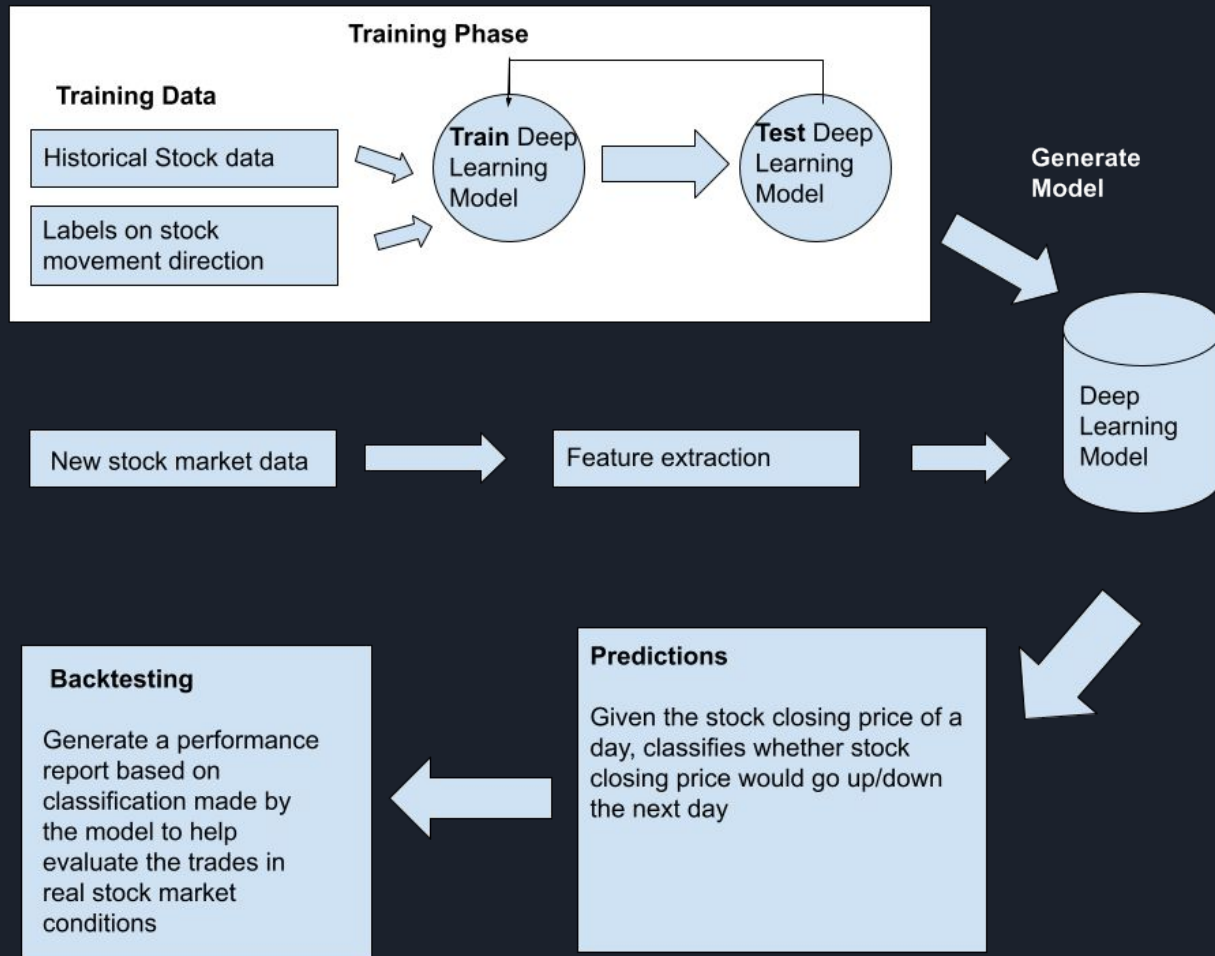
# Literature Survey 4 - Stock price prediction using LSTM, RNN and CNN-sliding window model

<https://ieeexplore.ieee.org/document/8126078>

S. Selvin, R. Vinayakumar, E. A. Gopalakrishnan, V. K. Menon and K. P. Soman, "" 2017 International Conference on Advances in Computing, Communications and Informatics (ICACCI), Udupi, India, 2017, pp. 1643-1647, doi: 10.1109/ICACCI.2017.8126078.

- This paper compares the performance of RNNs, LSTMs and CNNs in short-term stock price prediction using an overlapping sliding-window approach.
- This paper has a special focus on short term forecasting of prices and uses minute scale data of Infosys, TCS and Cipla. It makes predictions of the stock price 10 minutes in the future.
- All models were trained for 1000 epochs (with varying layer sizes) and using RMSE for error calculation.
- The data was normalized to account for differing scale of stock prices.
- The paper shows that CNNs outperform LSTMs and RNNs in short term price forecasting.
- The authors suggest that CNNs are better at identifying changes in trends in the short term while LSTMs and RNNs are better at long term predictions.
- This is applicable to our project as we intend to build models for the volatile binary options market.

# Architecture







# Software Requirements

- Jupyter Notebook
- Spyder IDE
- Python libraries
  - Numpy
  - Pandas
  - Tensorflow
  - Keras
  - Matplotlib
  - Seaborn
  - scikit-learn



# Hardware requirements

- OS : Windows 10 / Ubuntu 18.04 LTS
- CPU: Intel processor with 64-bit support
- Disk Storage: At least 8GB of free disk space.
- At least 8GB of RAM
- Graphics card: gtx 750 or better



# Final Deliverables

- Deep Learning Model to classify binary options trades.
- Back testing the model and final report on performance of model on historical and recent market data.
- Determine direction in which a stock is going to move (up/down), allowing a trader to make the appropriate binary option trade.

THANK YOU

