Automated Algorithmic Stock Trading System using Machine Learning

Group 8

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Abstract

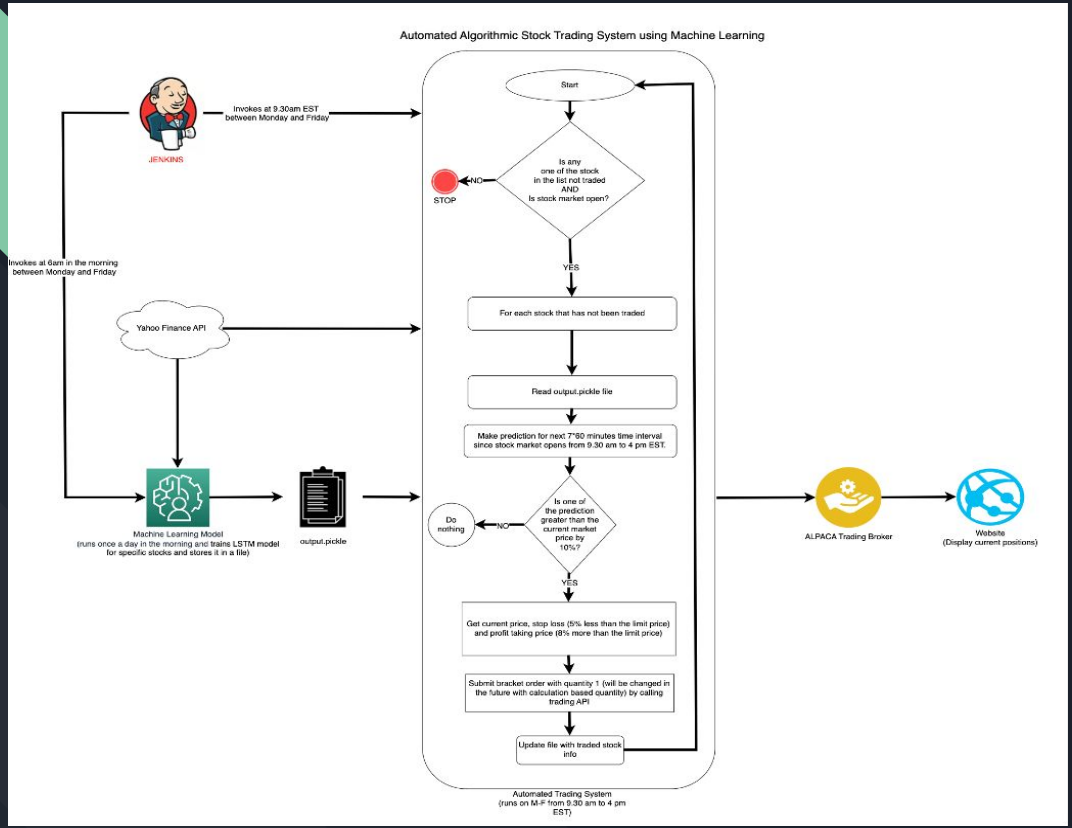
Why ?

- Stock Market is dynamic and volatile
- For short-term trading, need to spend lot of time during technical analysis
- Automated Algorithmic Trading System will perform technical analysis and buy/sell stock automatically without human effort

How ?

- Use historical stock price data
- Build Machine Learning model to make predictions
- Build Trading System to use those predictions and buy/sell stock automatically

Design and Workflow



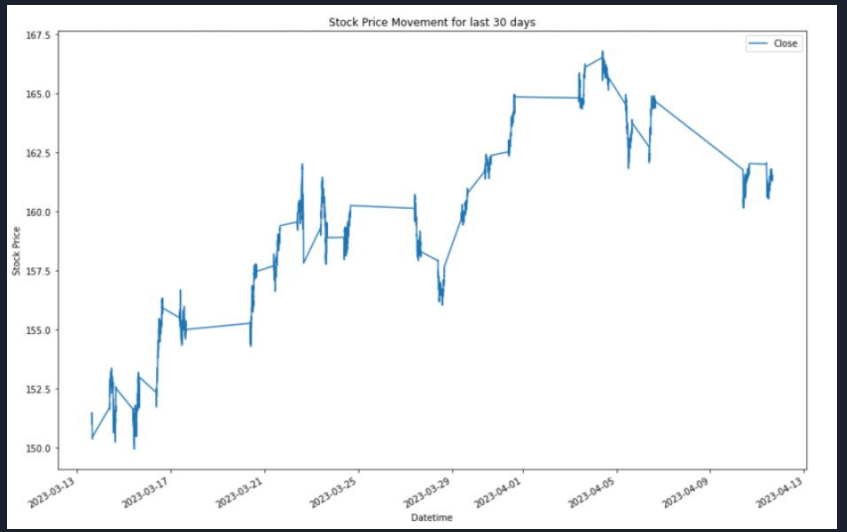
Dataset Used

- Used the data provided by Yahoo Finance API
- Interested in short term trading, so we extracted the data in minute range
- Used last 30 days of stock price data, as Yahoo Finance API do not provide data for more than 30 days in minute range
- Thus, the size of dataset is 7786 which contains 6 columns

Datetime	Open	High	Low	Close	Adj Close	Volume
2023-03-13 15:30:00-04:00	151.050003	151.300003	151.009995	151.145004	151.145004	0
2023-03-13 15:31:00-04:00	151.139999	151.179993	151.020004	151.160904	151.160904	129968
2023-03-13 15:32:00-04:00	151.160004	151.255005	151.000000	151.009995	151.009995	191684
2023-03-13 15:33:00-04:00	151.000000	151.350006	150.980103	151.279999	151.279999	192353
2023-03-13 15:34:00-04:00	151.279999	151.360001	151.210007	151.250000	151.250000	124118

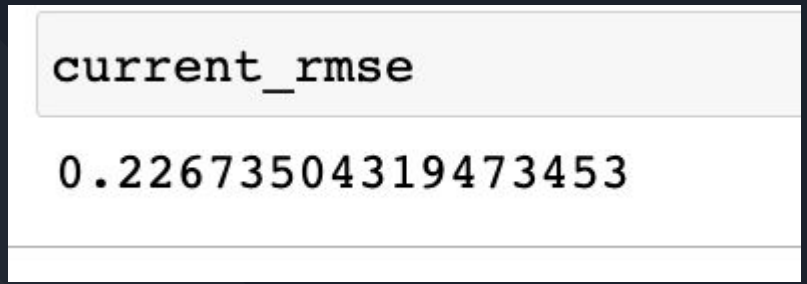
Exploratory Data Analysis

- Exploratory data analysis has been carried out to learn more about the data
- Plotted the stock price of Apple in minute range against time for last 30 days
- From this plot, we see the stock price is moving in an upward trend which means there is a high probability for this this stock price to increase during short term trading



Machine Learning Model

- Used LSTM model as it can store previous prices in memory during learning
- Used 70% of dataset for training and 30% for testing
- Calculated root mean squared error
- Output the trained model into output.pickle file



Trading System (1)

- Reads the output.pickle file generated by the machine learning model and makes predictions
- If one of the predictions price is more than the threshold price, then bracket order is executed by trading system

```
***** Starting Automated Algorithmic Trading System. Iteration Number: [1] *****
Started the process to trade [AAPL] stock
[*********************100%**********************]  1 of 1 completed
Current Price: [160.8], Threshold Signal Price: [159.19], Take Profit Signal Price: [173.66], Stop Loss Price: [152.76]
Predicting stock prices for [AAPL] for next [420] intervals
Predicted stock prices for [AAPL] are [161.46068, 161.53914, 161.65282, 161.77887, 161.90794, 162.03561, 162.15909, 162.2766, 162.38753, 162.49207, 162.59113, 162.686, 162.77818, 162.86916, 162.96016, 163.0522, 1
Executing bracket order for [AAPL] with quantity [1]
Started the process to trade [TSLA] stock
[*********************100%**********************]  1 of 1 completed
Current Price: [186.8], Threshold Signal Price: [184.93], Take Profit Signal Price: [201.74], Stop Loss Price: [177.46]
Predicting stock prices for [TSLA] for next [420] intervals
Predicted stock prices for [TSLA] are [185.15997, 185.13911, 185.11224, 185.08348, 185.05368, 185.0232, 184.99278, 184.96306, 184.93416, 184.90628, 184.87949, 184.85396, 184.82948, 184.80586, 184.78302, 184.76062
Executing bracket order for [TSLA] with quantity [1]


***** Starting Automated Algorithmic Trading System. Iteration Number: [2] *****
All the stocks have been traded for today
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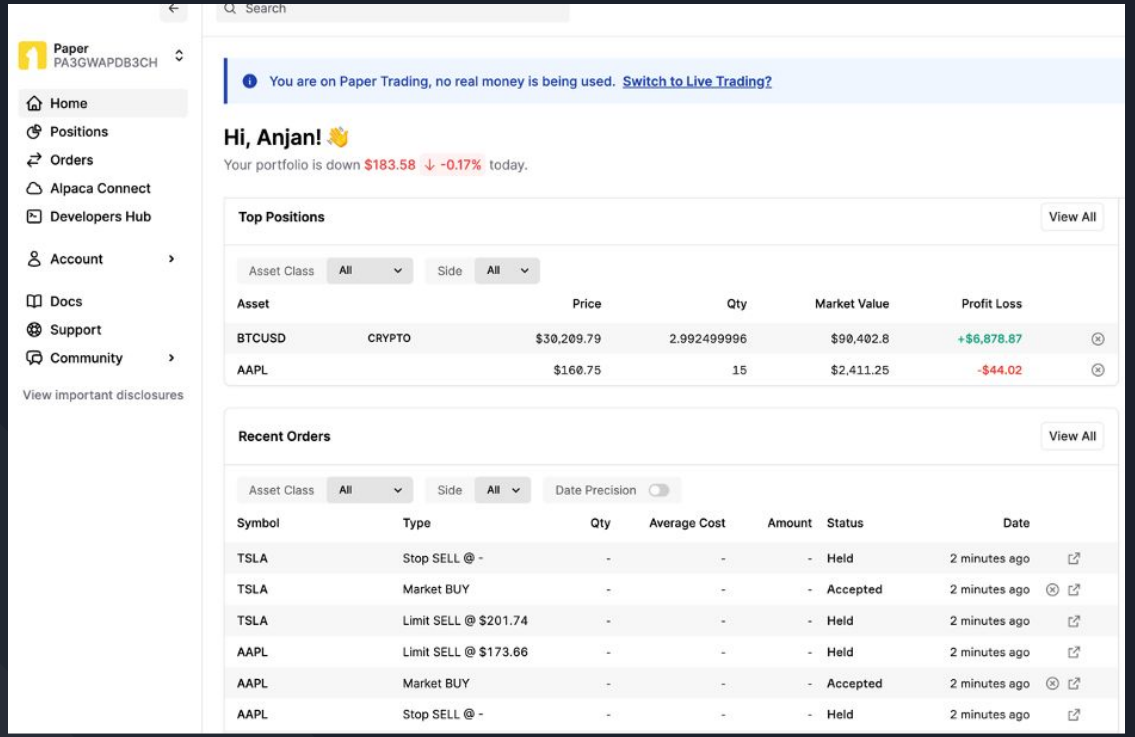
Trading System (2)

- Trading System is integrated with Alpaca Broker API
- After bracket order is placed, we can verify it in the Alpaca UI



Future Improvement

- Train the model with larger dataset
- Build a website that shows the bracket order executed by trading system (Project 3)
- Deploy it to cloud (Project 3)

Live Demo