

The background of the slide features a complex, abstract pattern of blue lines and arrows. Some lines are solid, while others are dashed. The arrows point in various directions, creating a sense of movement and flow. The pattern is dense and occupies the right half of the slide, partially overlapping the text area.

CSE 546: REINFORCEMENT LEARNING

Stock Market Prediction Using Deep RL

FINAL PROJECT

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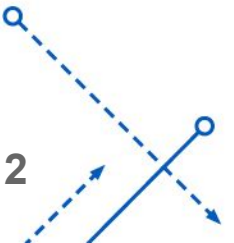
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Declaration

Academic Integrity Policy

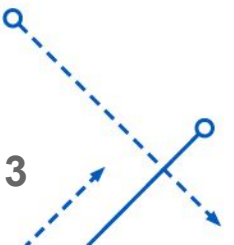
I certify that the code and data in this assignment were generated independently using only the tools and resources defined in the course and that i did not receive any external help coaching or contributions during the production of this work.

Date : - 05/10/2022



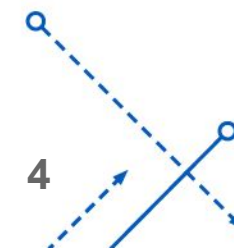
PROBLEM STATEMENT

Identify the pattern in a price of a stock and then perform trading actions like sell, buy and hold to gain profit on a certain amount, invested over certain days.

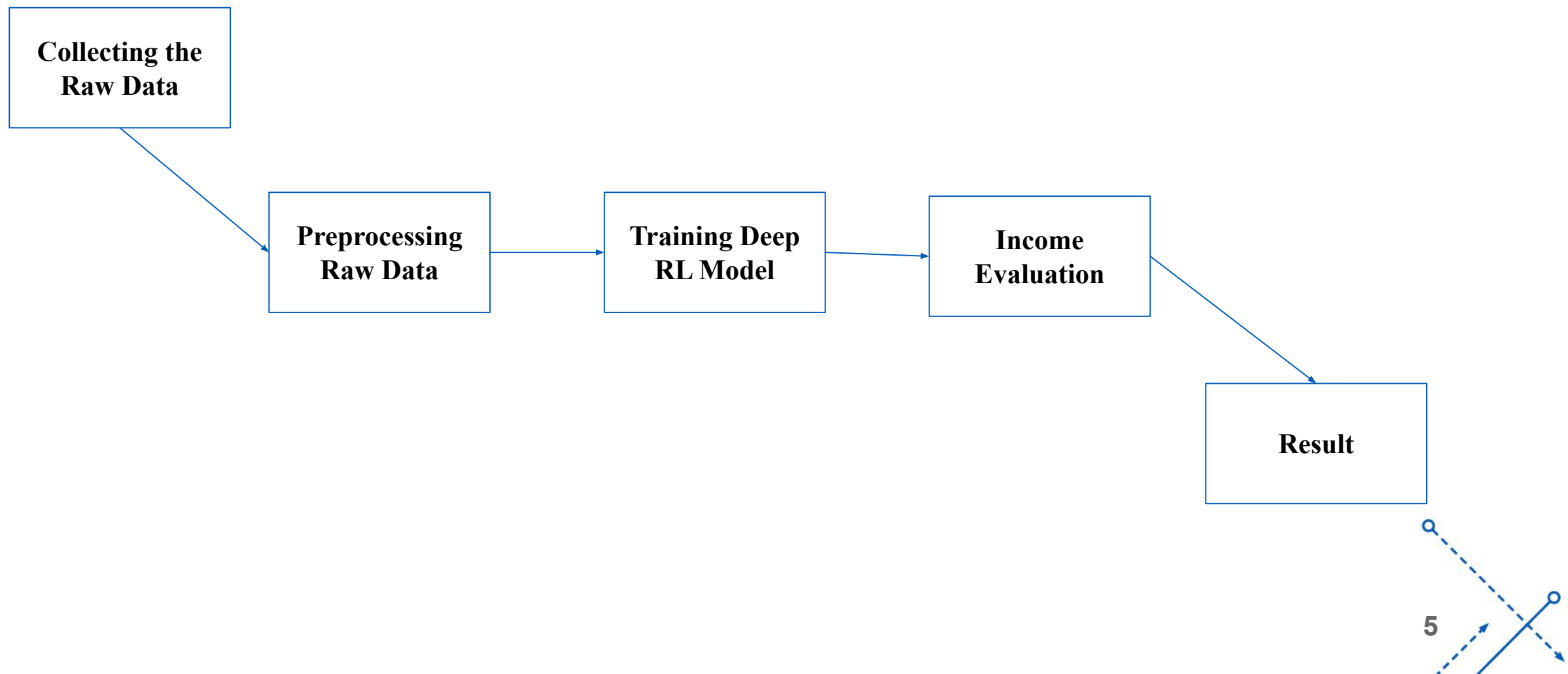


BACKGROUND

- Stock market has intricate details to be considered while make wise set of decisions. Thus RL agent fits well to learn the **stock market environment**.
- Previous works in this field include:
 - LSTM based RNN model to predict the stock price considering a period of historical data.
 - MDP model solved using TD(0) algorithm to predict the stock market behaviour.
 - Real time stock price prediction using a POMDP model solved using Q learning.

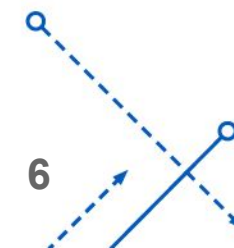


FLOW DIAGRAM



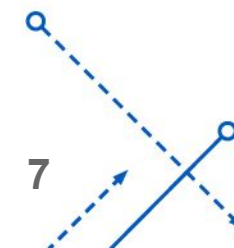
IMPLEMENTATION

- We implemented Actor-Critic method to built a model which can predict the stock price.
- One of key to our model success was data. So we collected multiple companies stock price data.
- To train and test our model we've collected historical stock price data of Microsoft, Inc. (MSFT) since it's listing on stock exchange. Apart from this to train/test our model we've collected last 5 years stock price data of Apple, Inc. (APPL), Tesla, Inc. (TSLA)
- Once data is collected, we pre-processed the data. We came up with four parameters which will derive our model: close - open; high - low; low - close; (open) - (open+1 day)
- Once we've those 4 factors, we normalized the data.



IMPLEMENTATION - contd...

- Now we built our main Actor Critic model class.
- Our actor model has 1 hidden layer of 32 neurons, working on ReLU activation function and having 3 neurons in output layer with SoftMax activation function.
- Our critic model has 1 hidden layer of 32 neurons, working on ReLU activation function and having 1 neurons in output layer with ReLU activation function.
- Our policy model has 1 hidden layer of 32 neurons, working on ReLU activation function and having 3 neurons in output layer with ReLU activation function.
- We defined income evaluation function, to evaluate the income based on the actions.



Network Architectures

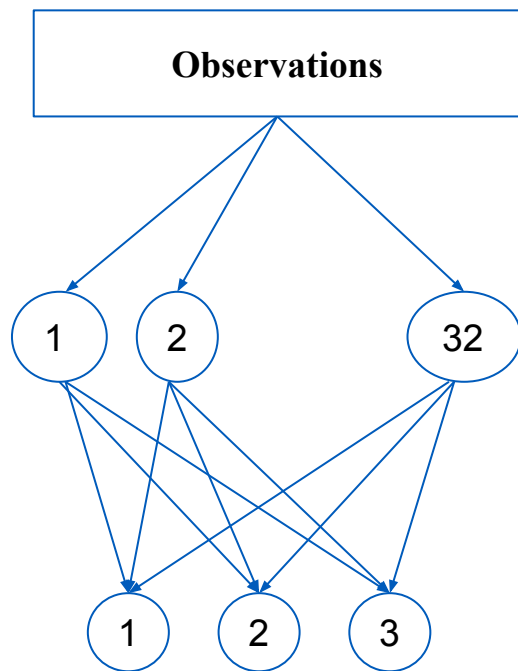


Figure: - Policy Network

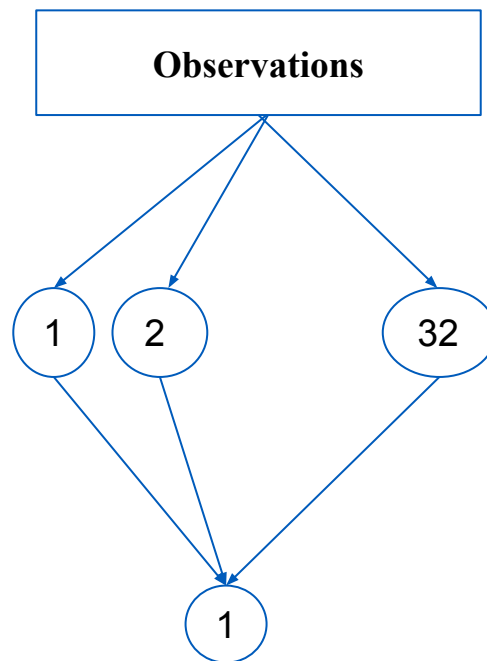


Figure: - Critic Network

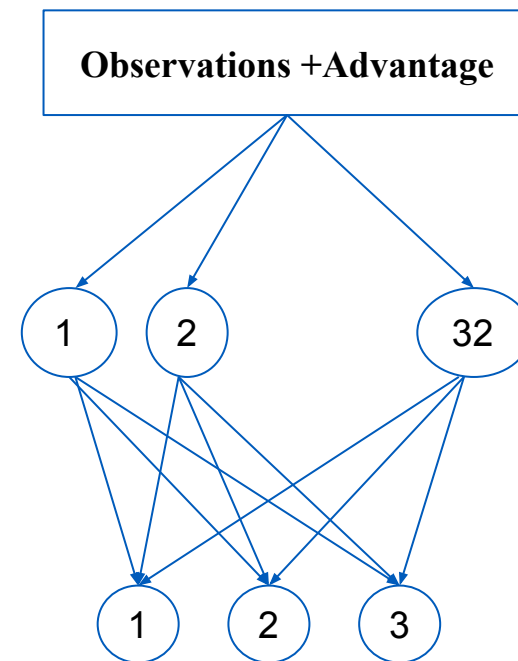
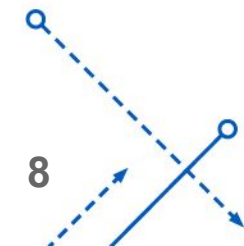
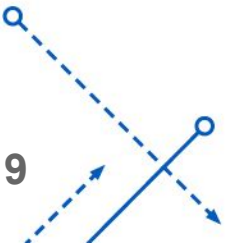


Figure: - Actor Network

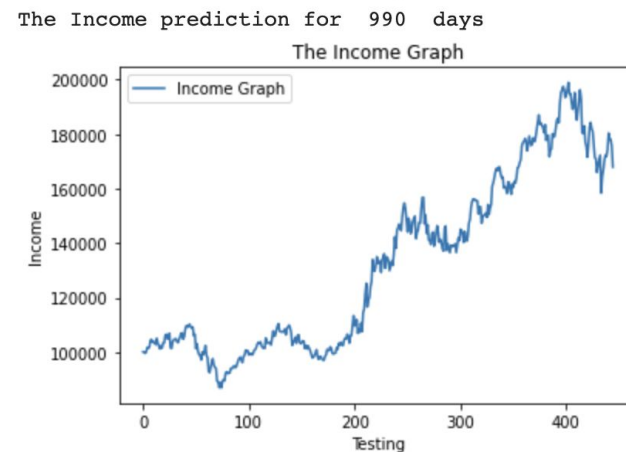
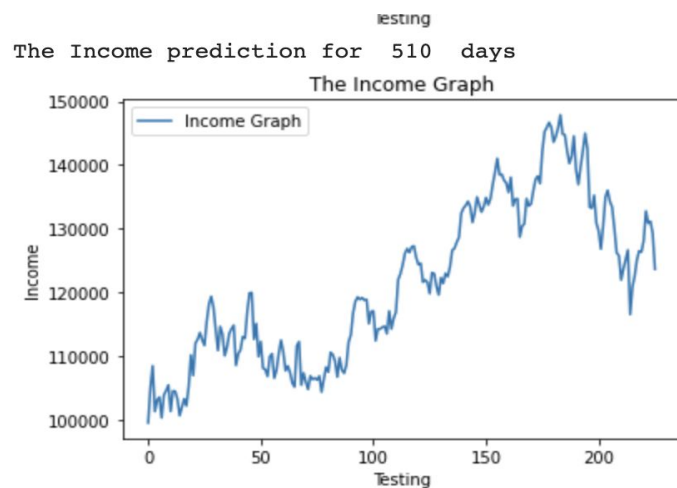
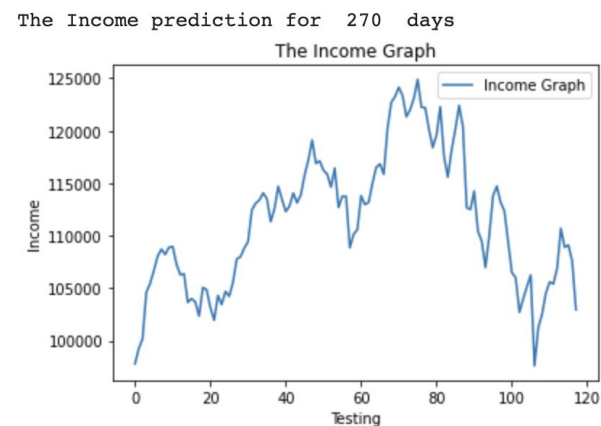
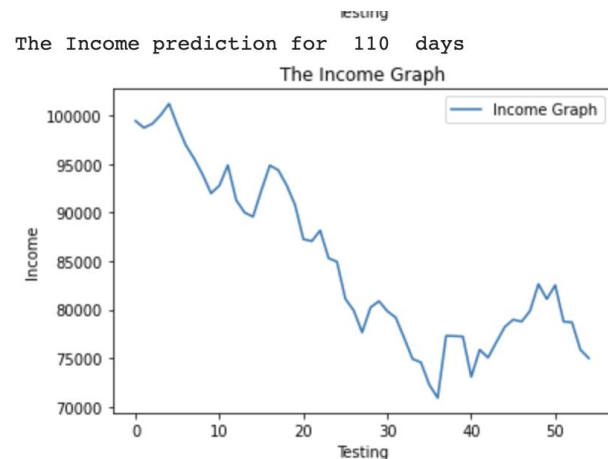


RESULTS

- We test our model for by giving certain parameters as input like the amount of money invested, the no of days for which it was invested.
- In the end our model should give us the profit and tell us to actions we need to take.

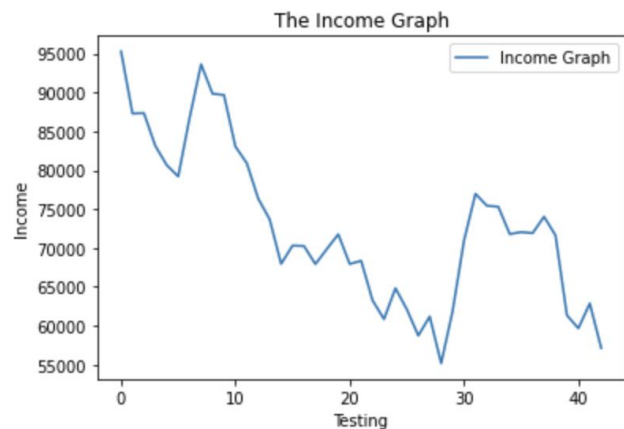


Results on Microsoft Data

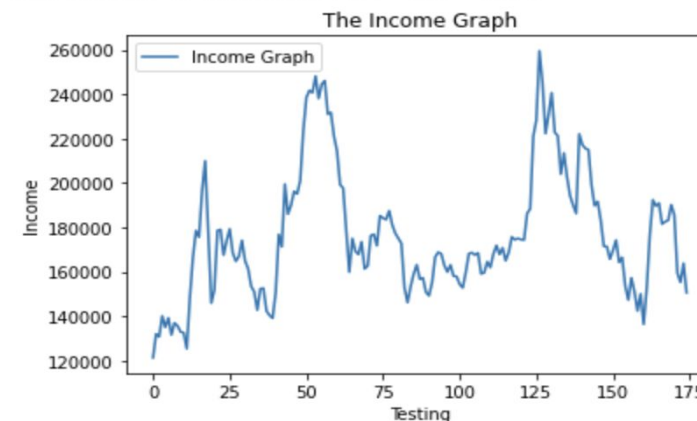


Results on Tesla Stocks

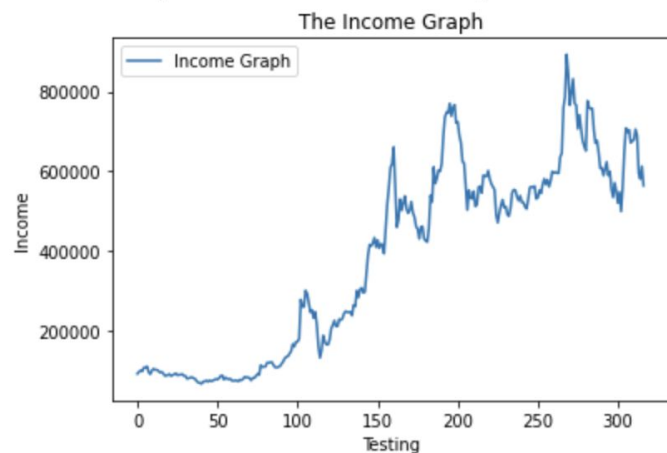
The Income prediction for 110 days



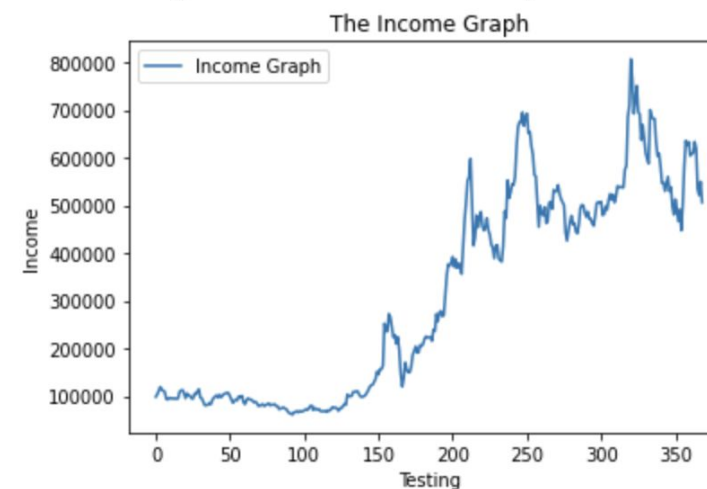
The Income prediction for 470 days



The Income prediction for 850 days



The Income prediction for 990 days



Key Observations:

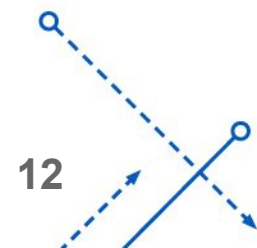
There are Mainly four columns a customer thinks of while doing stock purchase.

=> Open, Close, High, Low prices

So we came up with four observations with these column values,

1. Observation 1 = Close Price - Open Price
2. Observation 2 = High Price - Low Price
3. Observation 3 = Low Price - Close Price
4. Observation 4 = Open Price - Open Price (Open - Open = 0 How?)

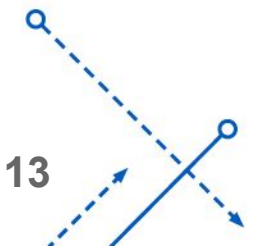
Here Observation 4 took as the difference of present open price with previous open price.



Contributions

Name	Contributions
Sruthikeerthi Nandita	33.33%
Sarveshwar Singhal	33.33%
SaiKrishna Dirisala	33.33%

We discussed together, brainstormed, discussed, and then reached to the final code.



Why to choose this project?



Thank You