Stock Prediction using Reinforcement Learning Algorithms

Project Update Report

SAN JOSÉ STATE UNIVERSITY

By

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1 INTRODUCTION

The Primary purpose of the project is to create a Stock prediction model using multiple Reinforcement Learning Algorithms. We will be using DQN (Deep Q Network) as a baseline model for stock prediction which will be followed up by Actor-Critic, TRPO (Trust Region Policy Optimization), and PPO (Proximal Policy Optimization).

2 PROJECT TEAM

Entire project is managed through Trello Board (Access Link to Trello Board). Following are the team members for the project:

a. Gulnara Timokhina (Lead)
b. Mirsaeid Abolghasemi
c. Poornapragna Vadiraj
d. Varun Bhaseen

3 PROJECT PLAN SNAPSHOT FROM TRELLO

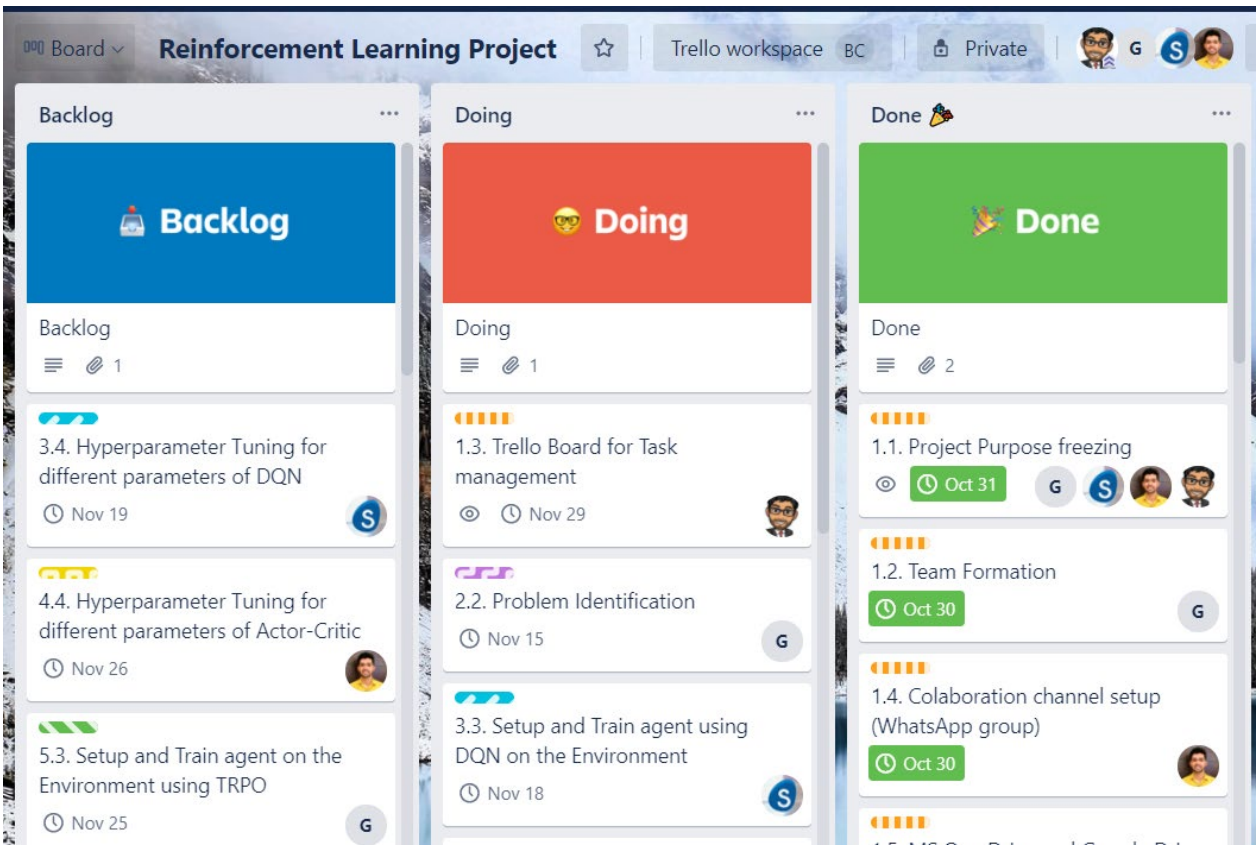

Figure 1: Trello Board List View (Source: Trello Board for Reinforcement Learning Project)

4 PROJECT PLAN AND PROGRESS STATUS

Milestone Description	Assigned To	Start	Status
1. Handshake and Collaboration Setup		10/24/2020	
1.1. Project Purpose freezing	Team	10/30/2020	Done
1.2. Team Formation	Gulnara Timokhina	10/24/2020	Done
1.3. Trello Board for Task management	Varun Bhaseen	10/27/2020	Doing
1.4. Colaboration channel setup (WhatsApp group)	Poornapragna Vadiraj	10/27/2020	Done
1.5. MS One Drive and Google Drive setup	Mirsaeid Abolghasemi	11/2/2020	Done
2. Project Kick-off		10/27/2020	
2.1. Literature Research	Mirsaeid Abolghasemi	11/5/2020	Done
2.2. Problem Identification	Gulnara Timokhina	11/1/2020	Doing
2.3. Project Scoping	Poornapragna Vadiraj	11/2/2020	Done
2.4. Abstract Draft	Varun Bhaseen	10/27/2020	Done
2.5. Abstract Submission	Team	10/30/2020	Done
3. DQN Baseline for Stock Prediction		11/5/2020	
3.1. Setup the Development and Testing Environment Locally for DQN	Mirsaeid Abolghasemi	11/7/2020	Done
3.1.1. Setup Anaconda environment with all required libraries for Deep Learning (PyTorch, Tensorboard)	Mirsaeid Abolghasemi	11/5/2020	Done
3.1.2. Install the Open AI Gym and all dependencies	Mirsaeid Abolghasemi	11/7/2020	Done
3.2. Identify the Target Label in the Open AI Gym environment (StockTradingENV: GOOGL) for DQN	Mirsaeid Abolghasemi	11/12/2020	Done
3.3. Setup and Train agent using DQN on the Environment	Mirsaeid Abolghasemi	11/13/2020	Doing
3.4. Hyperparameter Tuning for different parameters of DQN	Mirsaeid Abolghasemi	11/14/2020	Backlog
3.5. Record DQN results in Tensorboardx and publish link to teammates with logs	Mirsaeid Abolghasemi	11/13/2020	Doing
4. Using Actor-Critic for Stock Prediction		11/7/2020	
4.1. Setup the Development and Testing Environment Locally fro Actor Critic	Poornapragna Vadiraj	11/7/2020	Done
4.1.1. Setup Anaconda environment with all required libraries for Deep Learning (PyTorch, Tensorboard)	Poornapragna Vadiraj	11/15/2020	Done
4.1.2. Install the Open AI Gym and all dependencies	Poornapragna Vadiraj	11/13/2020	Done
4.2. Identify the Target Label in the environment (StockTradingENV: GOOGL) for Actor Critic	Poornapragna Vadiraj	11/15/2020	Done
4.3. Setup and Train agent on the Environment using Actor-Critic	Poornapragna Vadiraj	11/20/2020	Doing

Milestone Description	Assigned To	Start	Status
4.4. Hyperparameter Tuning for different parameters of Actor Critic	Poornapragna Vadiraj	11/21/2020	Backlog
4.5. Record results of Actor Critic in Tensorboardx and publish link to teammates with logs	Poornapragna Vadiraj	11/22/2020	Doing
5. Using TRPO (Trust Region Policy Optimization) for Stock Prediction		11/21/2020	
5.1. Setup the Development and Testing Environment Locally for TRPO	Gulnara Timokhina	11/7/2020	Done
5.1.1. Setup Anaconda environment with all required libraries for Deep Learning (PyTorch, Tensorboard)	Gulnara Timokhina	11/15/2020	Done
5.1.2. Install the Open AI Gym and all dependencies	Gulnara Timokhina	11/13/2020	Done
5.2. Identify the Target Label in the environment (StockTradingENV: GOOGL) for TRPO	Gulnara Timokhina	11/15/2020	Done
5.3. Setup and Train agent on the Environment using TRPO	Gulnara Timokhina	11/20/2020	Backlog
5.4. Hyperparameter Tuning for different parameters of TRPO	Gulnara Timokhina	11/21/2020	Backlog
5.5. Record results of TRPO in Tensorboardx and publish link to teammates with logs	Gulnara Timokhina	11/22/2020	Backlog
6. Using PPO (Proximal Policy Optimization) for Stock Prediction			
6.1. Setup the Development and Testing Environment Locally for PPO	Varun Bhaseen	11/7/2020	Done
6.1.1. Setup Anaconda environment with all required libraries for Deep Learning (PyTorch, Tensorboard)	Varun Bhaseen	11/15/2020	Done
6.1.2. Install the Open AI Gym and all dependencies	Varun Bhaseen	11/13/2020	Done
6.2. Identify the Target Label in the environment (StockTradingENV: GOOGL) for PPO	Varun Bhaseen	11/15/2020	Doing
6.3. Setup and Train agent on the Environment using PPO	Varun Bhaseen	11/20/2020	Backlog
6.4. Hyperparameter Tuning for different parameters of PPO	Varun Bhaseen	11/21/2020	Backlog
6.5. Record results of PPO in Tensorboardx and publish link to teammates with logs	Varun Bhaseen	11/22/2020	Backlog
7. Performance Comparision of Agents			
7.1. Compare the accuracy of each technique for the trained agents	Team	11/27/2020	Backlog
7.2. Time to convergence to most optimal prediction by each agent for each technique	Team	12/2/2020	Backlog
7.3. Performance Evaluation for each Hypertuning instance for all agents	Team	12/2/2020	Backlog

Milestone Description	Assigned To	Start	Status
7.4. Develop and publish interactive visualization for each results and draw conculsions	Team	12/7/2020	Backlog
8. Project presentation and closure	Team	12/7/2020	Backlog

5 Effort Distribution Across Resources

Project Implementation Plan	Effort
Gulnara Timokhina	**36**
1.2. Team Formation	6
2.2. Problem Identification	4
5.1. Setup the Development and Testing Environment Locally for TRPO	2
5.1.1. Setup Anaconda environment with all required libraries for Deep Learning (PyTorch, Tensorboard)	3
5.1.2. Install the Open AI Gym and all dependencies	2
5.2. Identify the Target Label in the environment (StockTradingENV: GOOGL) for TRPO	2
5.3. Setup and Train agent on the Environment using TRPO	5
5.4. Hyperparameter Tuning for different parameters of TRPO	5
5.5. Record results of TRPO in Tensorboardx and publish link to teammates with logs	7
Mirsaeid Abolghasemi	**33**
1.5. MS One Drive and Google Drive setup	1
2.1. Literature Research	6
3.1. Setup the Development and Testing Environment Locally for DQN	2
3.1.1. Setup Anaconda environment with all required libraries for Deep Learning (PyTorch, Tensorboard)	3
3.1.2. Install the Open AI Gym and all dependencies	2
3.2. Identify the Target Label in the Open AI Gym environment (StockTradingENV: GOOGL) for DQN	2
3.3. Setup and Train agent using DQN on the Environment	5
3.4. Hyperparameter Tuning for different parameters of DQN	5
3.5. Record DQN results in Tensorboardx and publish link to teammates with logs	7
Poornapragna Vadiraj	**32**
1.4. Colaboration channel setup (WhatsApp group)	3
2.3. Project Scoping	3
4.1. Setup the Development and Testing Environment Locally fro Actor Critic	2
4.1.1. Setup Anaconda environment with all required libraries for Deep Learning (PyTorch, Tensorboard)	3
4.1.2. Install the Open AI Gym and all dependencies	2
4.2. Identify the Target Label in the environment (StockTradingENV: GOOGL) for Actor Critic	2
4.3. Setup and Train agent on the Environment using Actor-Critic	5
4.4. Hyperparameter Tuning for different parameters of Actor Critic	5
4.5. Record results of Actor Critic in Tensorboardx and publish link to teammates with logs	7
Team	**20**

Project Implementation Plan	Effort
1.1. Project Purpose freezing	2
2.5. Abstract Submission	1
7.1. Compare the accuracy of each technique for the trained agents	2
7.2. Time to convergence to most optimal prediction by each agent for each technique	5
7.3. Performance Evaluation for each Hypertuning instance for all agents	6
7.4. Develop and publish interactive visualization for each results and draw conculsions	2
8. Project presentation and closure	2
Varun Bhaseen	**32**
1.3. Trello Board for Task management	2
2.4. Abstract Draft	4
6.1. Setup the Development and Testing Environment Locally for PPO	2
6.1.1. Setup Anaconda environment with all required libraries for Deep Learning (PyTorch, Tensorboard)	3
6.1.2. Install the Open AI Gym and all dependencies	2
6.2. Identify the Target Label in the environment (StockTradingENV: GOOGL) for PPO	2
6.3. Setup and Train agent on the Environment using PPO	5
6.4. Hyperparameter Tuning for different parameters of PPO	5
6.5. Record results of PPO in Tensorboardx and publish link to teammates with logs	7

6 PROJECT TIMELINE

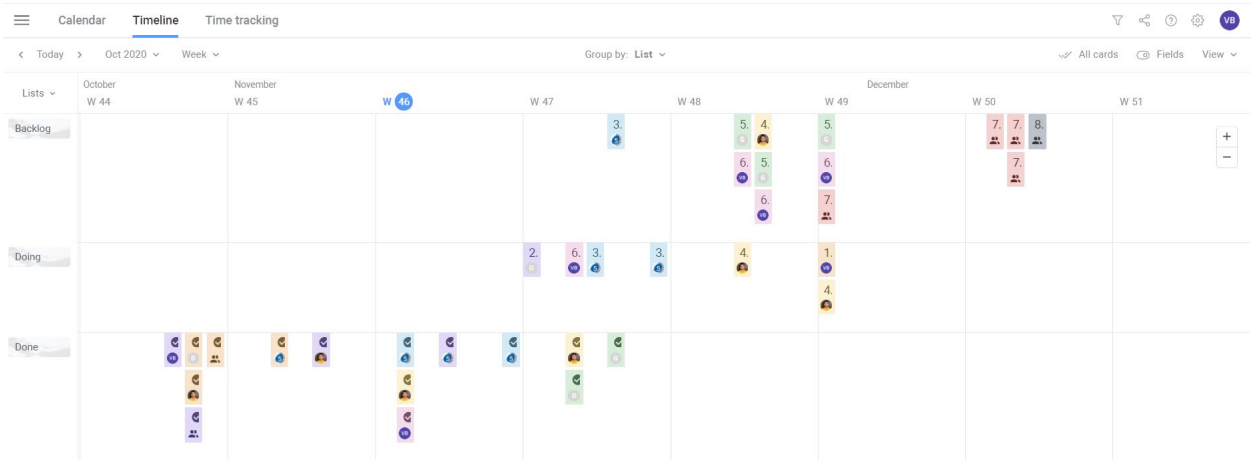

Figure 2: Trello Project Timeline Report (Source: Trello board for Reinforcement Learning Project)

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