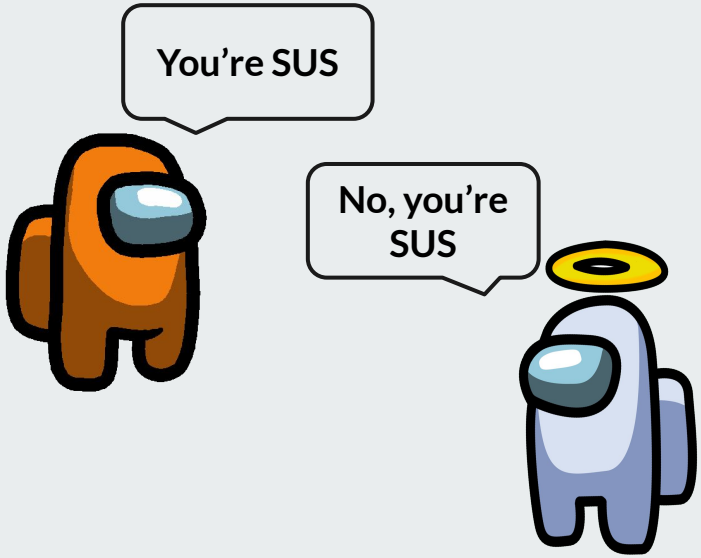
Among Us Meets RL

By John Henry Rudden and Dmytro Vremenko



What makes this problem interesting?

- Multi-agent dynamics
- Competing objectives
- Team work
- Memory
- Partial Observability ?

Agent Objectives

Crew Members

- Complete all tasks
- Vote out imposter

Imposters

- Sabotage Tasks
- Kill crew members

Environment

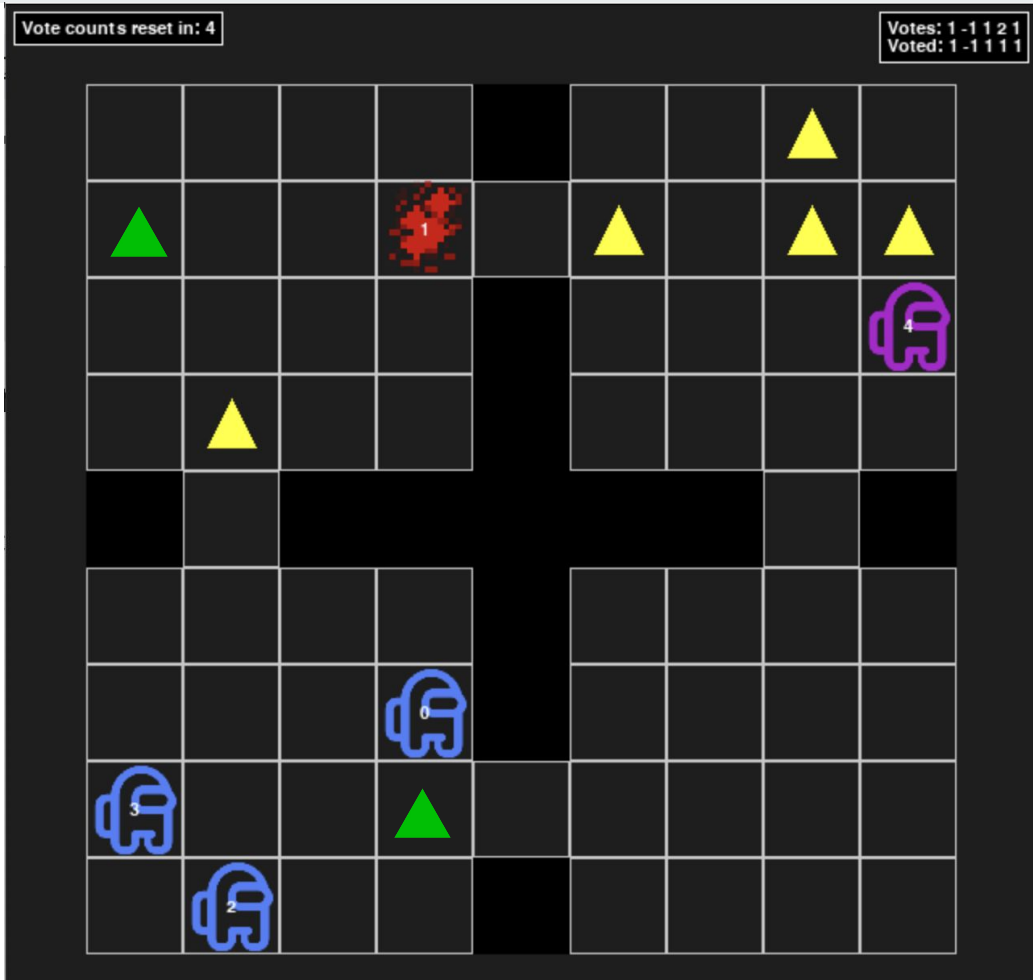
Crew Member

Imposter

Diseased Agent

Incomplete Task

Complete Task



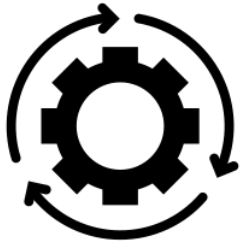
State Space

- Agent positions
- Which agents are alive
- Which agents have voted
- Timesteps until vote count reset
- Positions of complete and incomplete tasks

Actions Space

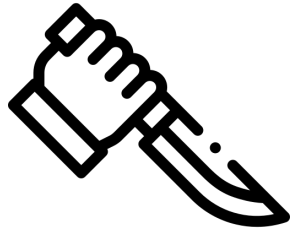
Move

Vote



Do Task

Sabotage Task



Kill

All Agents

Crew Only

Imposter Only

Rewards

Team Based

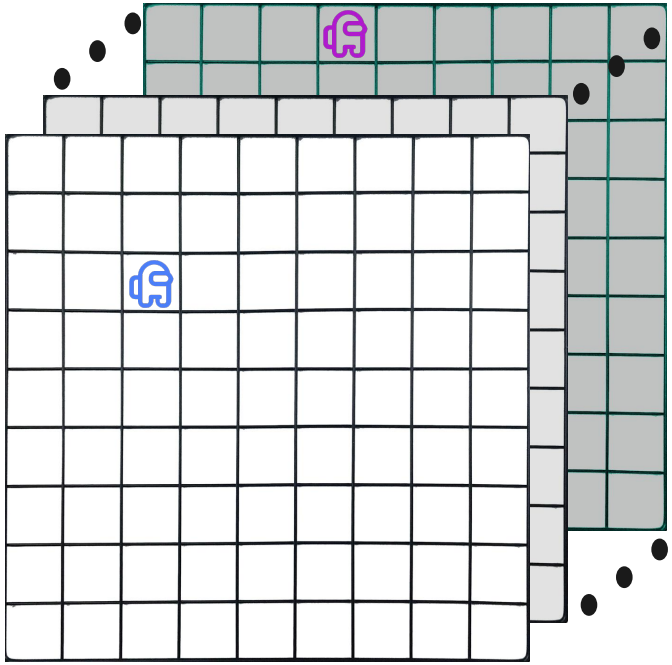
- Vote out imposter (+3 for crew, -3 for imposters)
- Vote out crew (-3 for crew, +3 for imposters)
- Game end (+10 for winning team, -10 for losing team)

Agent Based

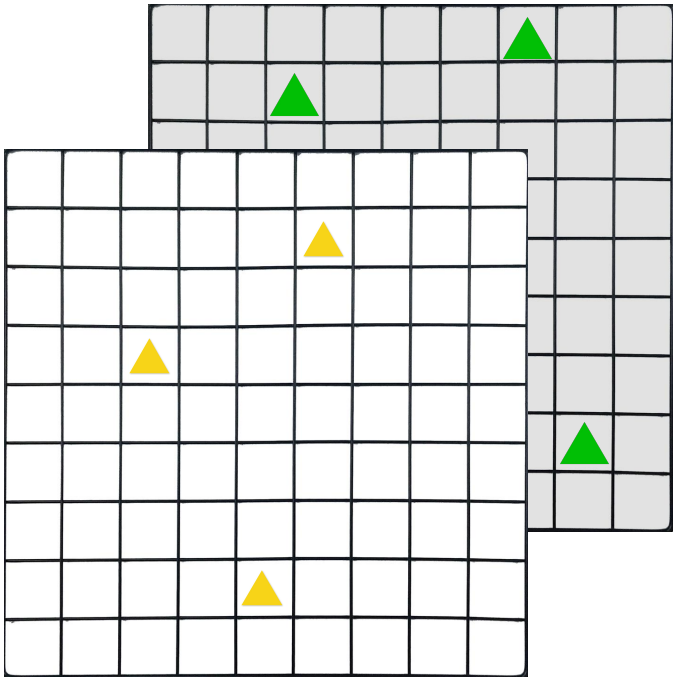
- Complete Task +1 (crew)
- Sabotage Task +1 (imposter)
- Kill +3 (imposter)
- Death (-3)

Action Processing

Spatial Feature Extraction

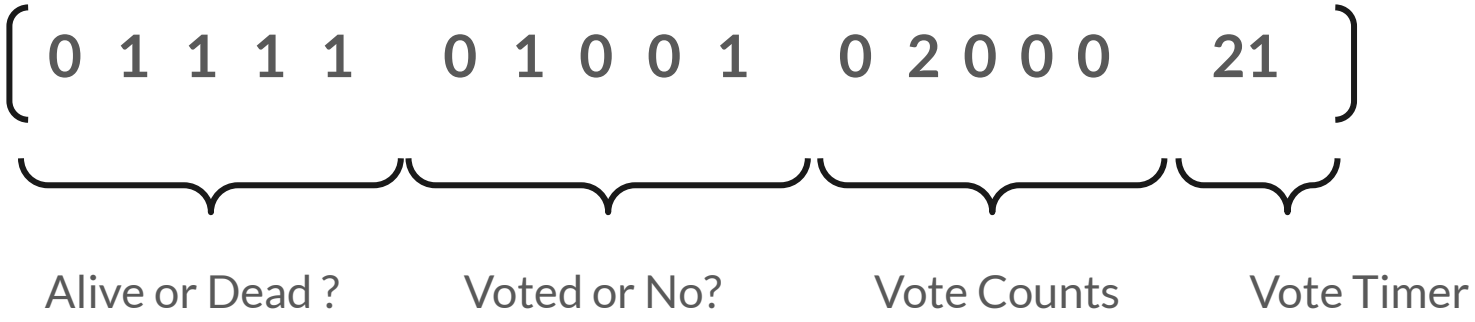


Agent Position Masks (1 channel per agent)

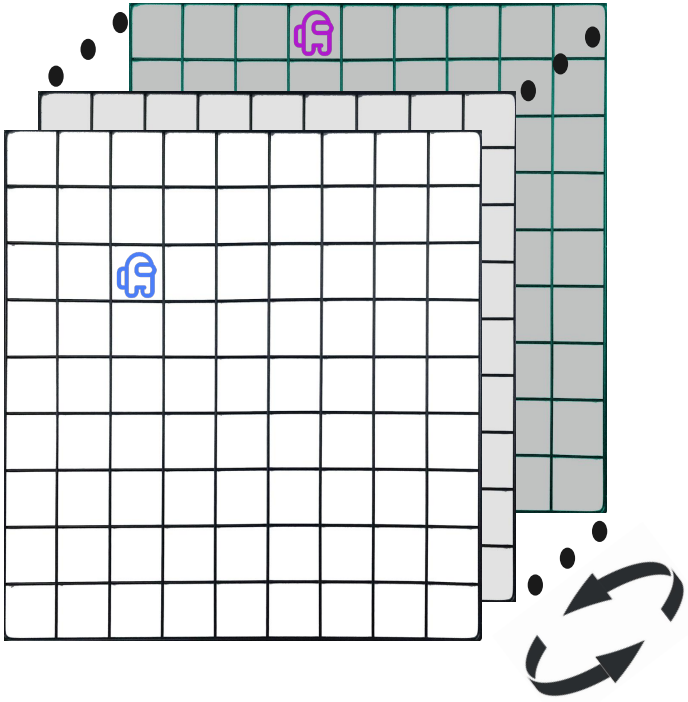


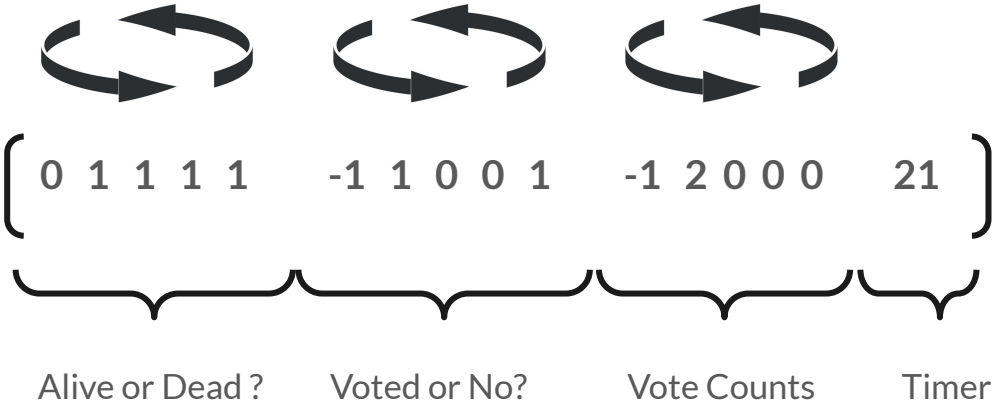
Complete/Incomplete Task Channel Masks

Other Features



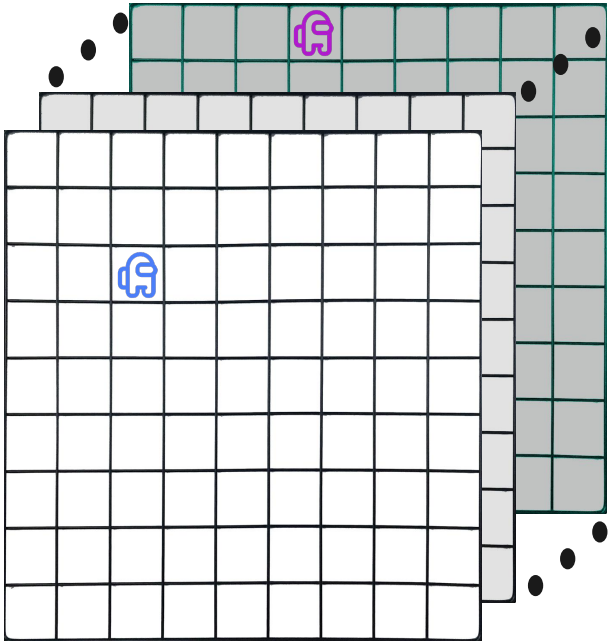
Feature Preprocessing: Perspective View





Bring the current agent's view to front

Feature Preprocessing: Global View



0 1 1 1 1 -1 1 0 0 1 -1 2 0 0 0 21

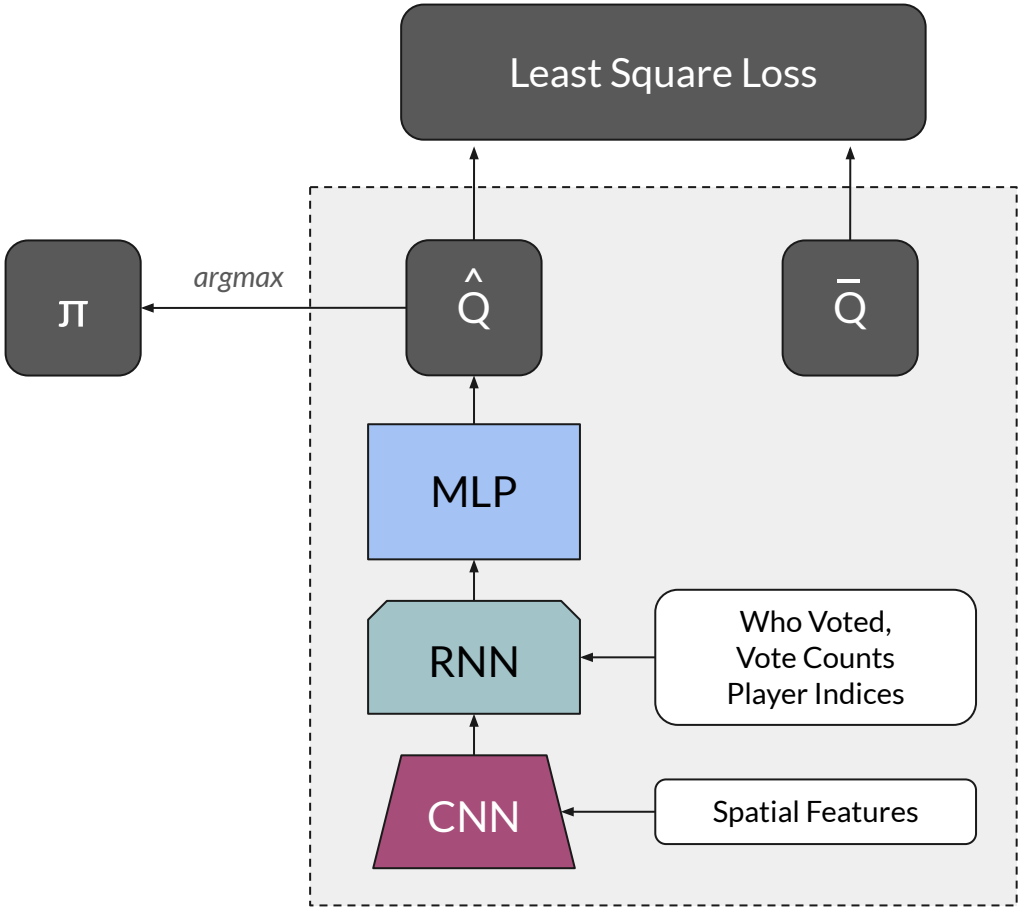
Alive or Dead ? Voted or No? Vote Counts Timer

0 1 0 0 0

One-Hot Encoding of Current Agent

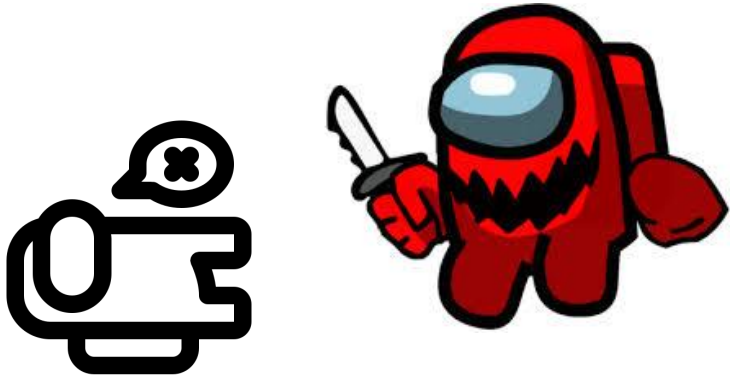
Q Estimator

Hybrid
Network



Initial Roadmap

1) Train imposter against random crew:
    - Should get good at killing!

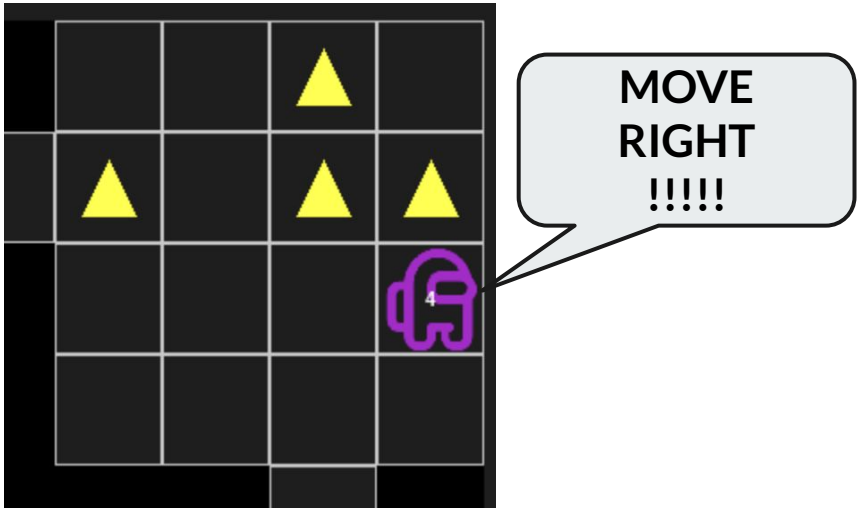


2) Train crew against the imposter:
    - Should learn to vote him out!

Did This Work....? Not really .... :(

Challenges

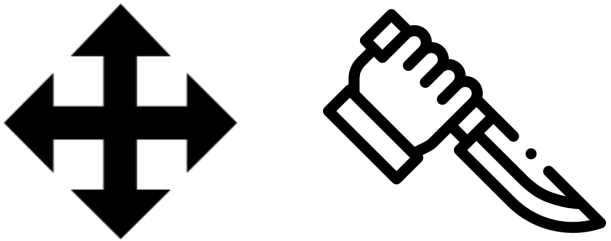
- Very sparse spatial features
- Small image sizes
- Random reward from voting



Simplifying the Problem:

Can the Imposter learn to hunt down crew members?

Actions:



Move

Kill

All Agents

Imposter Only

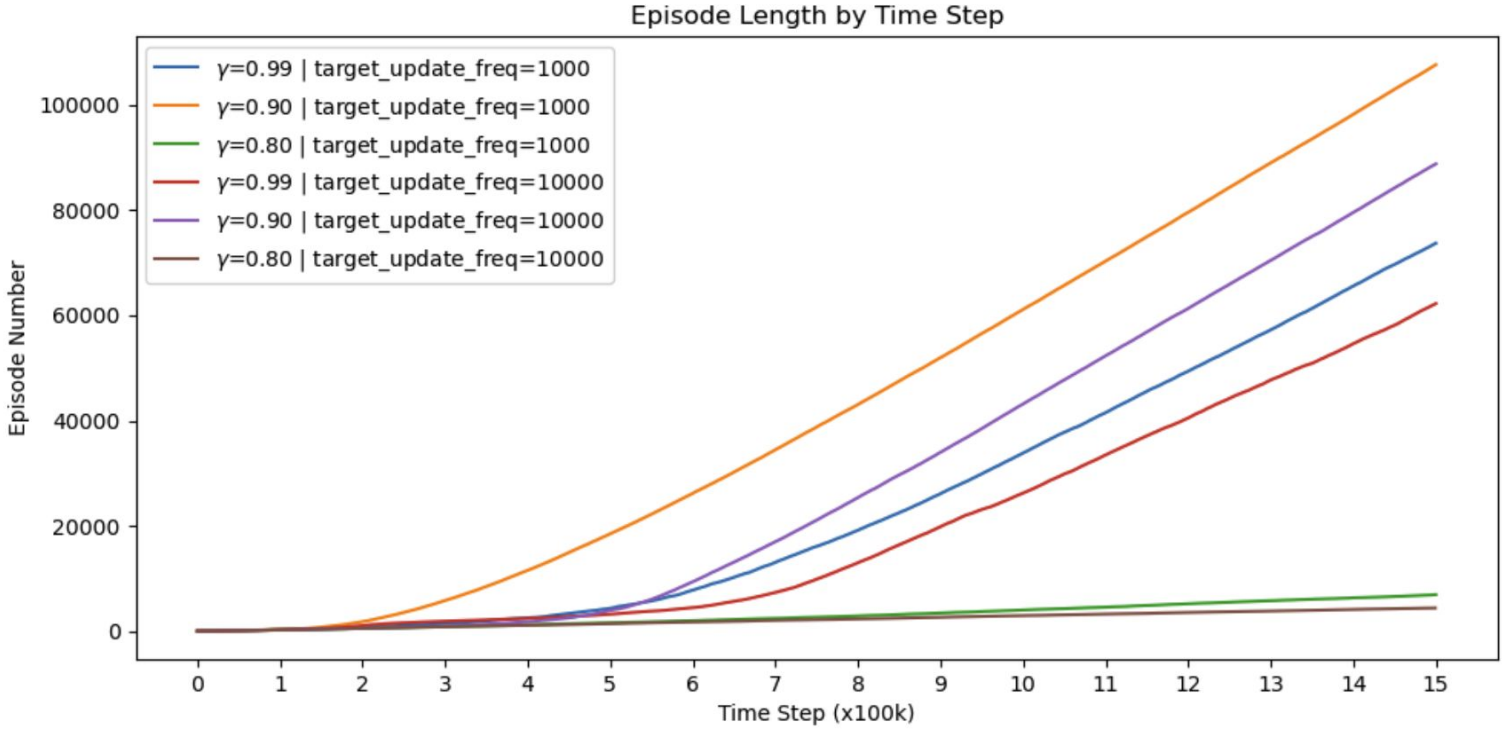
Features:

- Alive / Dead
- Raw (x, y) positions
- One-hot-encoded x and y positions
- Closest agent boolean

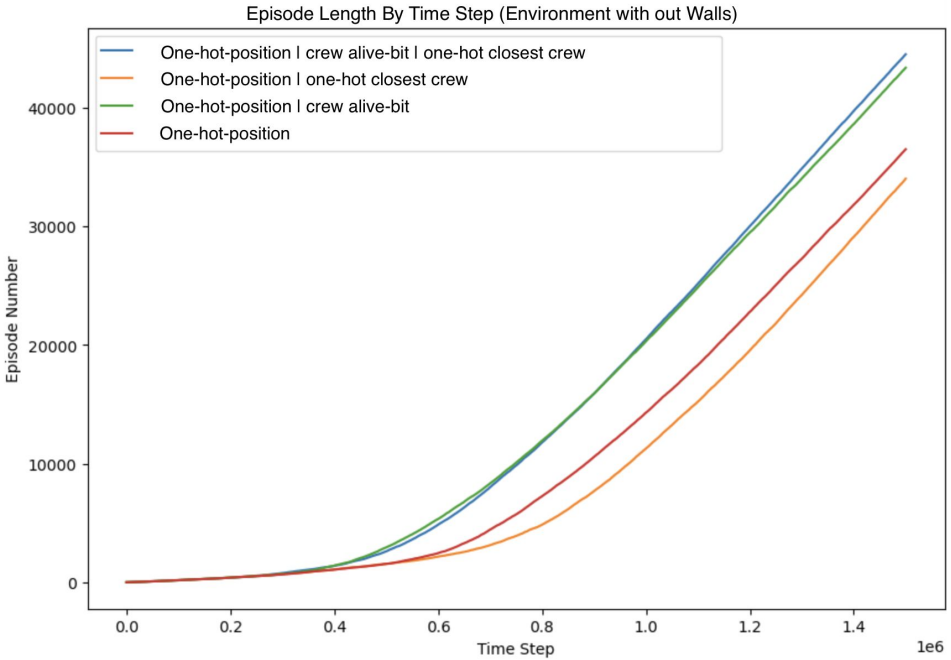
Model:

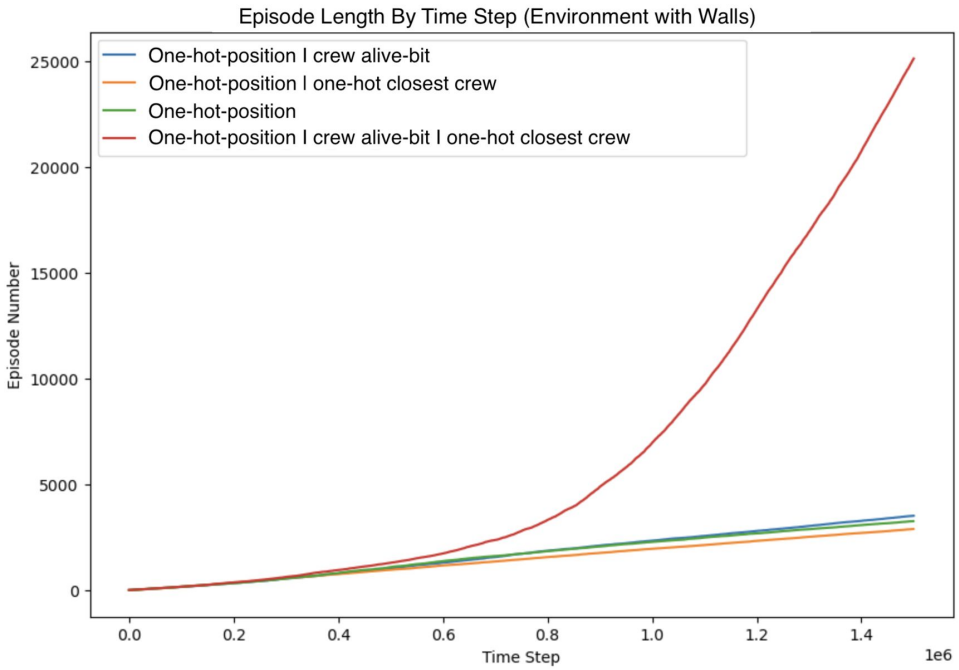
- MLP:
  [input_features, 256, 128, 64, 16, actions]

One Imposter -vs- One Crew Member



One Imposter -vs- Two Crew Members





Finally Learning Something !!!