

# Lent Update: Week 5

Alex Darch

*Supervisor:* Dr Glenn Vinnicombe

February 20, 2019

- 1 Neural Network Adaptations**
- 2 Motion History Images**
- 3 Results**

### 3.1 Iteration 0 MCTS vs Policy Comparison

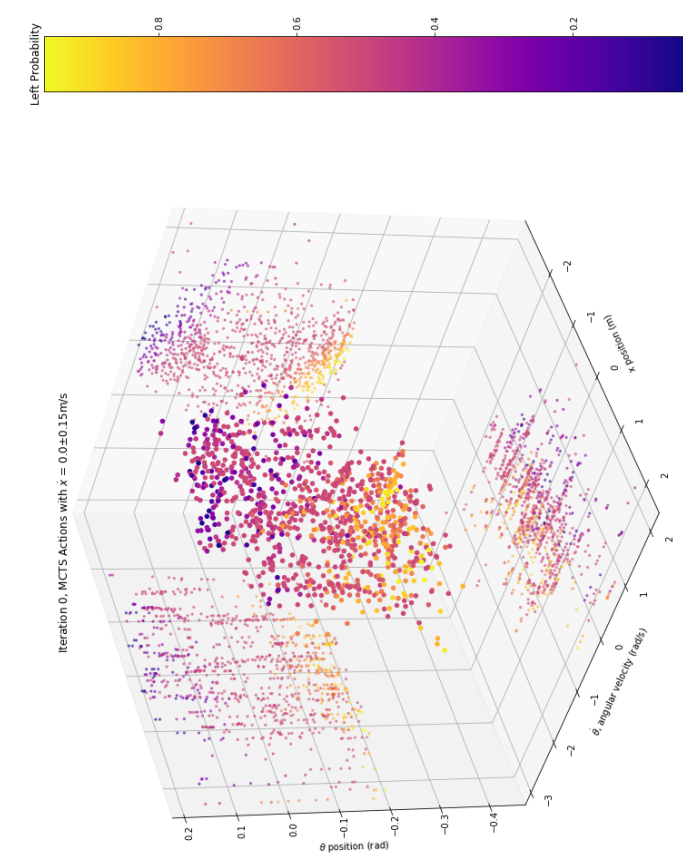
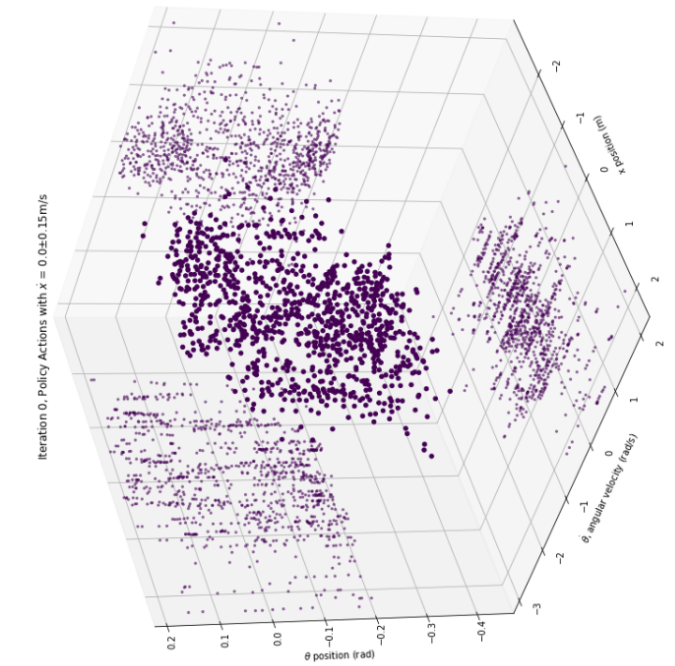


Figure 1: A 3D slice of the state space with colour intensity representing the probability of taking a left action.

The neural network starts off at about  $p=0.5$  for all inputs and the MCTS Improves these to the range  $p=(0.1, 0.9)$ .

Figure 2: The MCTS Predictions with no training.

### 3.2 Iteration 1 MCTS vs Policy Comparison

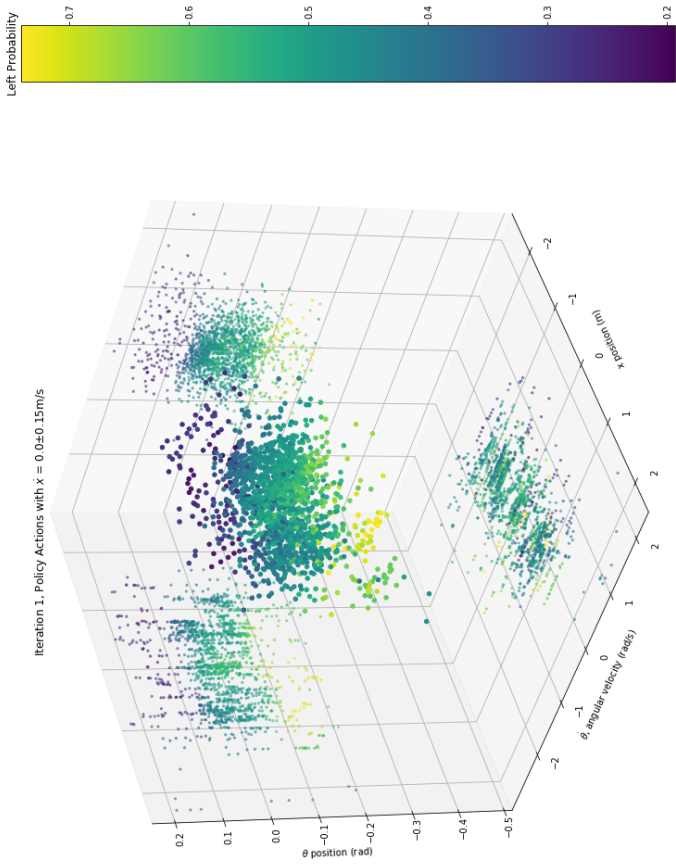


Figure 3: The Neural Network Predicted actions after training once.

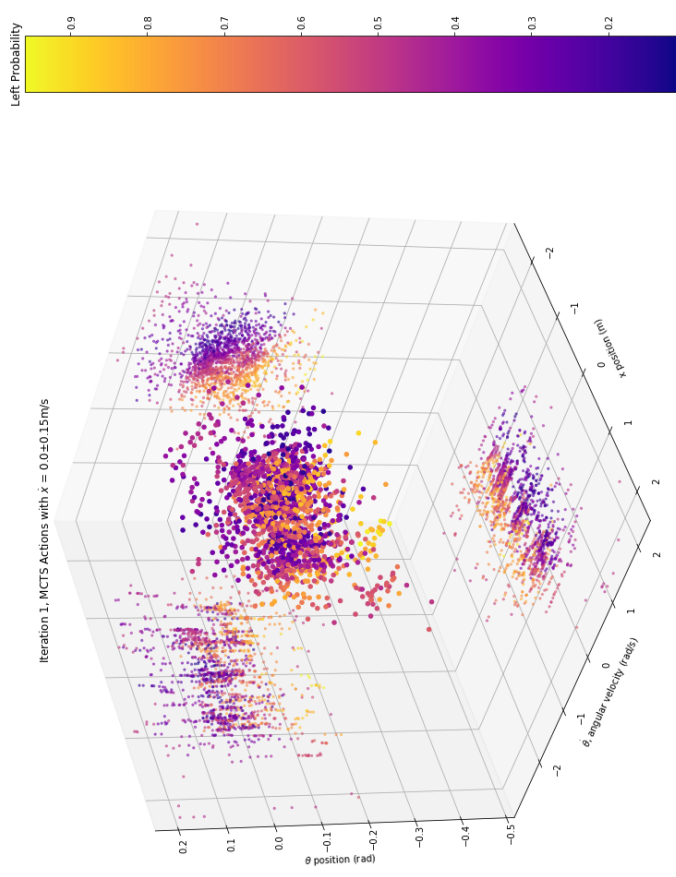


Figure 4: The MCTS Improved actions after training once.

With one train of the neural network the data is far more centrally clustered towards  $(0, 0, 0)$  as expected. Furthermore the neural network is predicting actions that agree with the areas that the MCTS actions suggested last iteration. These also have high probabilities.

### 3.3 Iteration 1 MCTS Comparison between varying $\dot{x}$

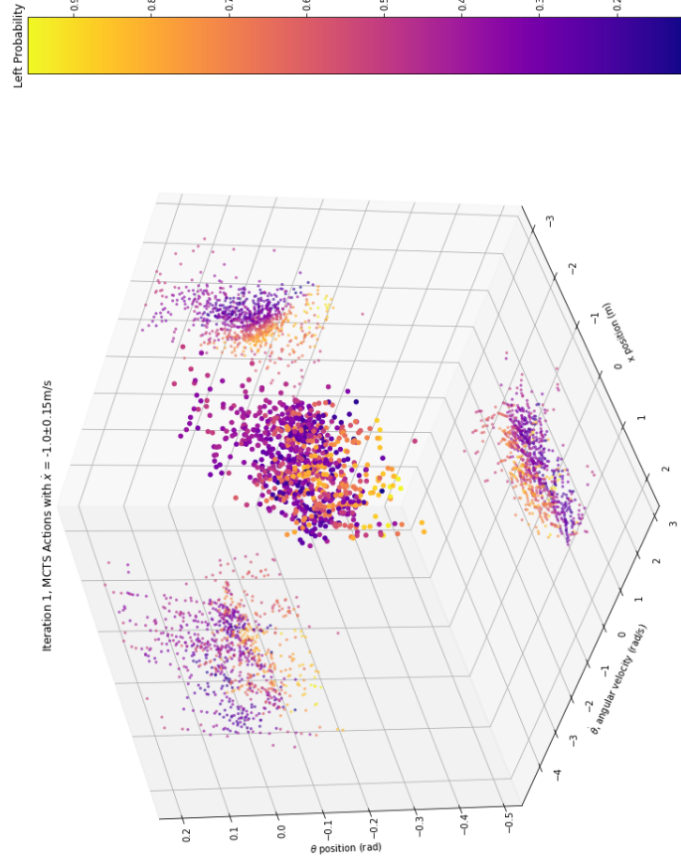


Figure 5: MCTS Improved actions with  $\dot{x} = -1$ .

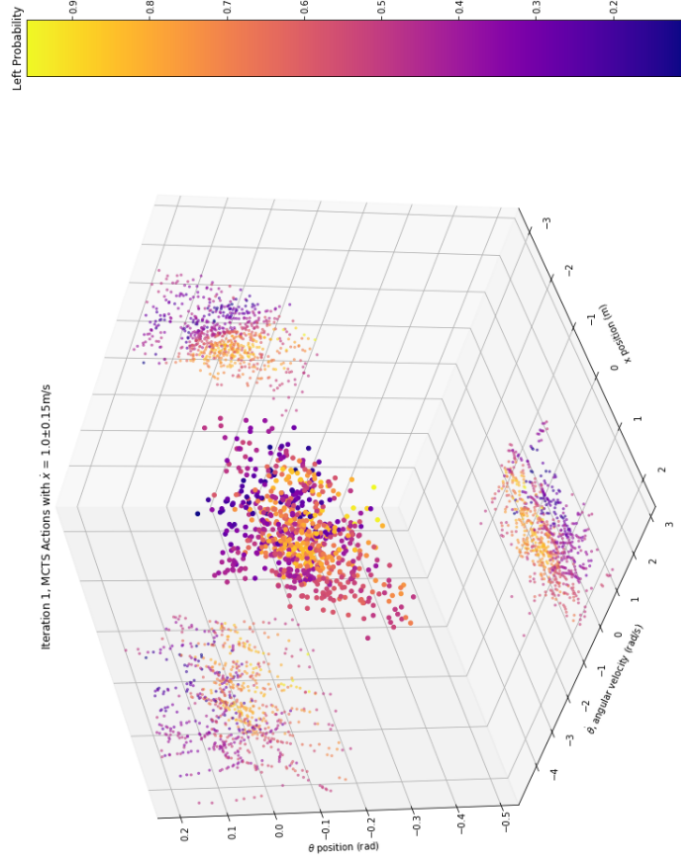


Figure 6: MCTS Improved actions with  $\dot{x} = +1$ .

### 3.4 Iteration 1 Policy Comparison between varying $\dot{x}$

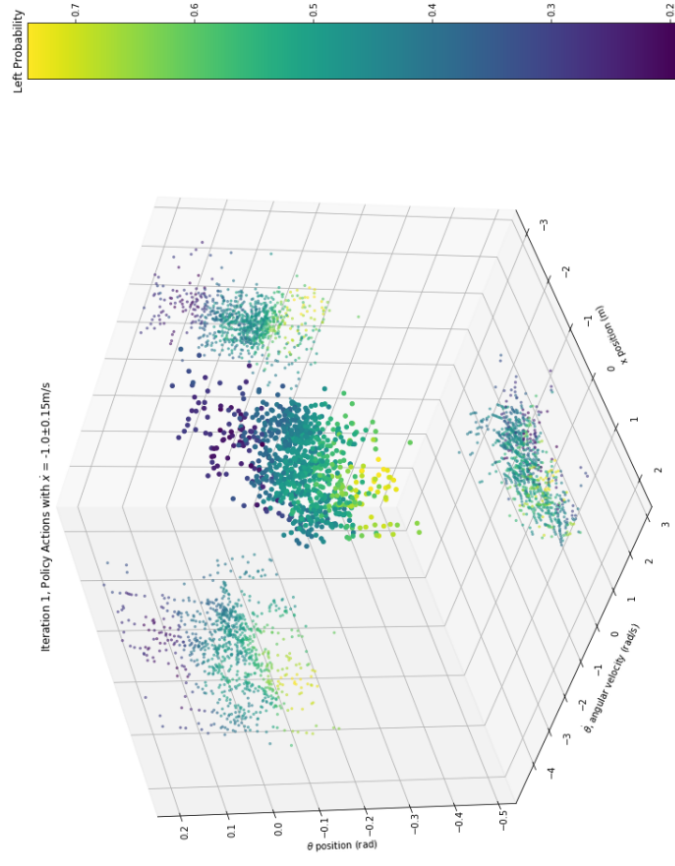


Figure 7: Policy Actions with  $\dot{x} = -1$ .

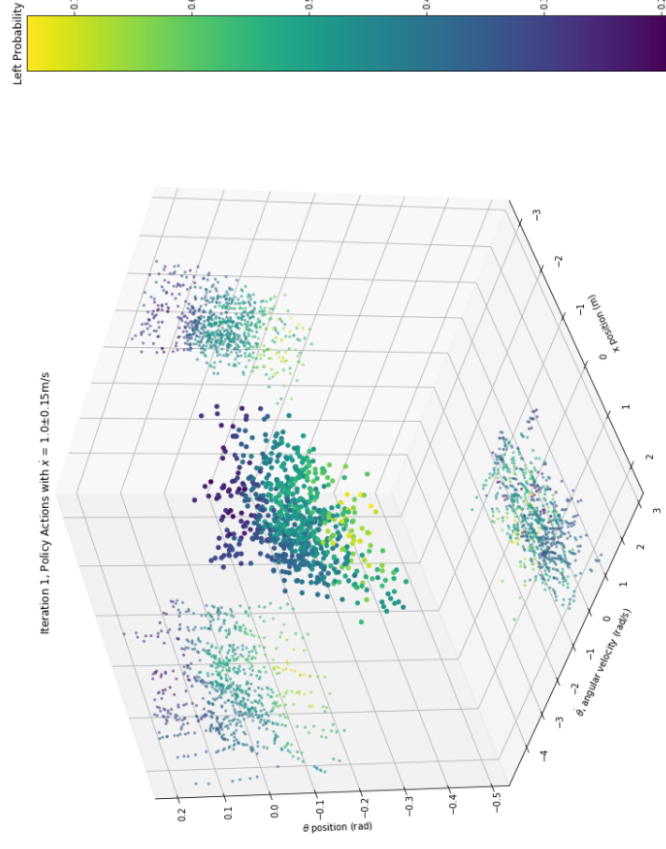


Figure 8: Policy Actions with  $\dot{x} = +1$ .

### 3.5 Iteration 1 Comparison between Policy and MCTS when $\dot{\theta}$ is fixed at zero instead.

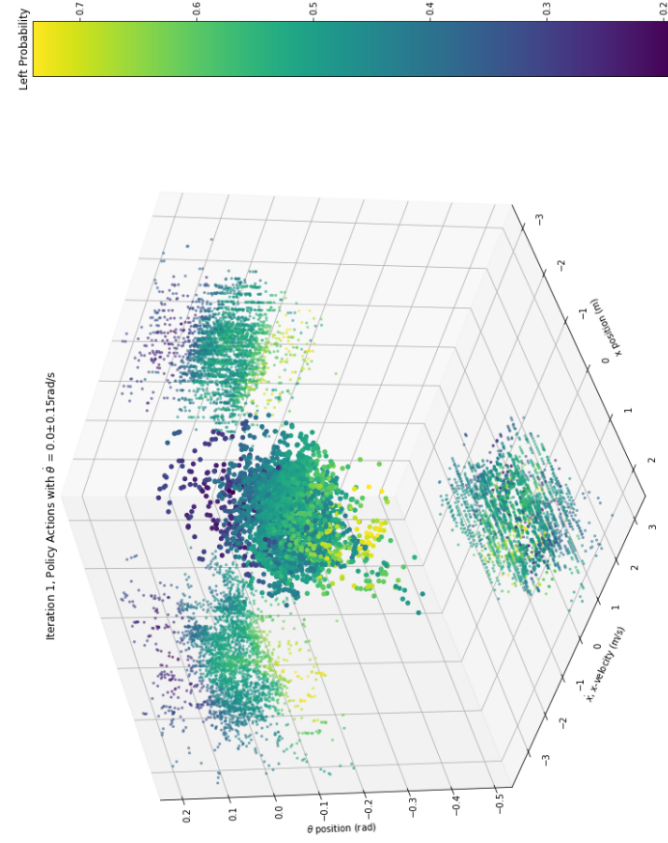


Figure 9: The Policy Actions with  $\dot{\theta} = 0$ .

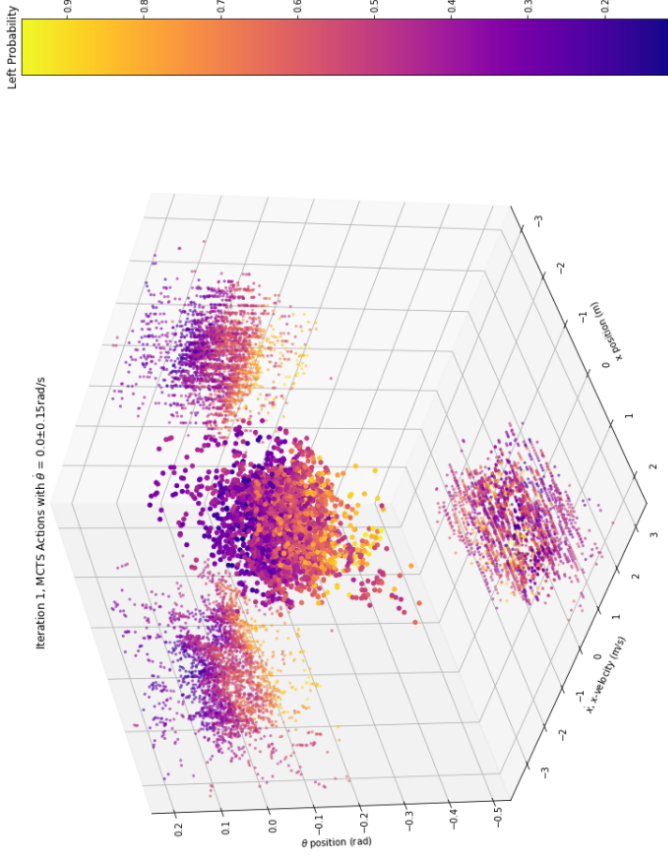


Figure 10: The MCTS Actions with  $\dot{\theta} = 0$ .

Noticably  $x$  vs  $\dot{x}$  is not linearly seperable for both the Policy predicted actions and the MCTS improved actions.

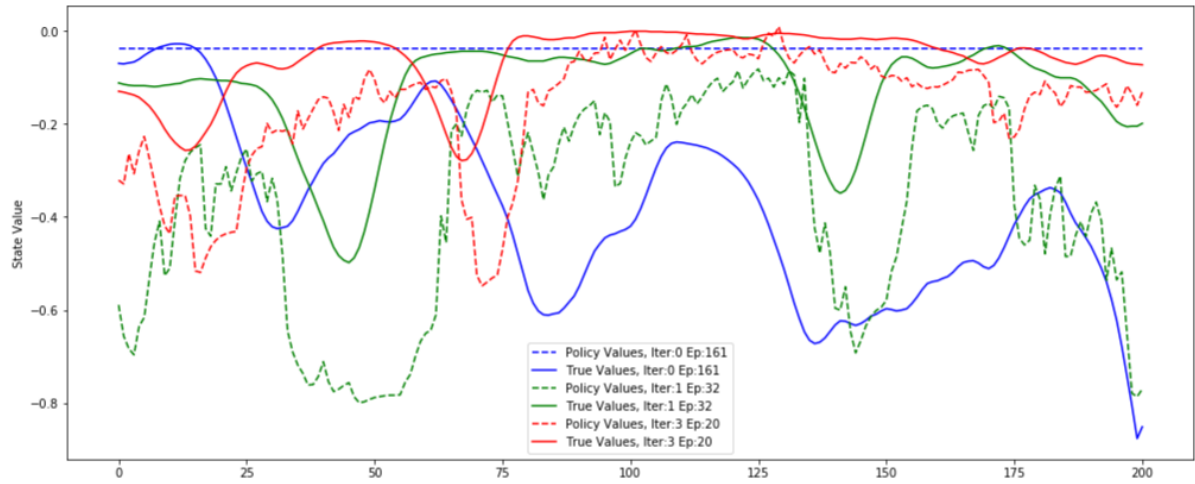


Figure 11: ?

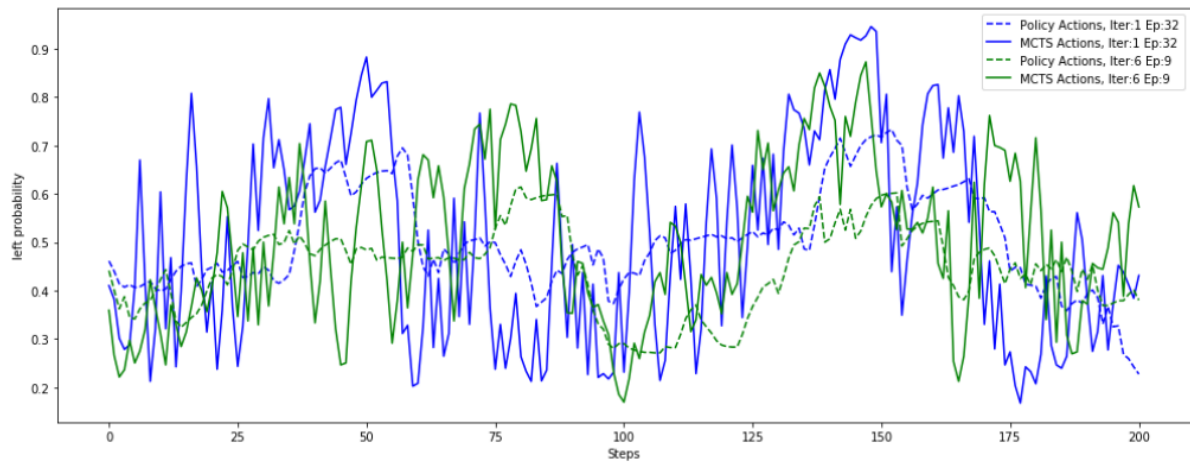


Figure 12: ?

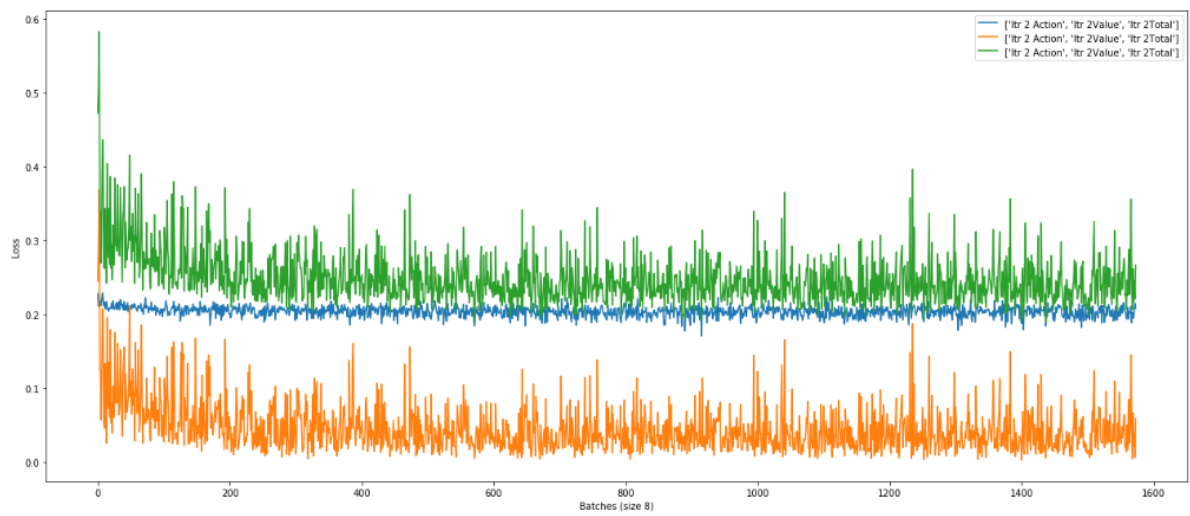


Figure 13: ?