

# Reinforcement Learning, Looking for New Backgammon Strategies

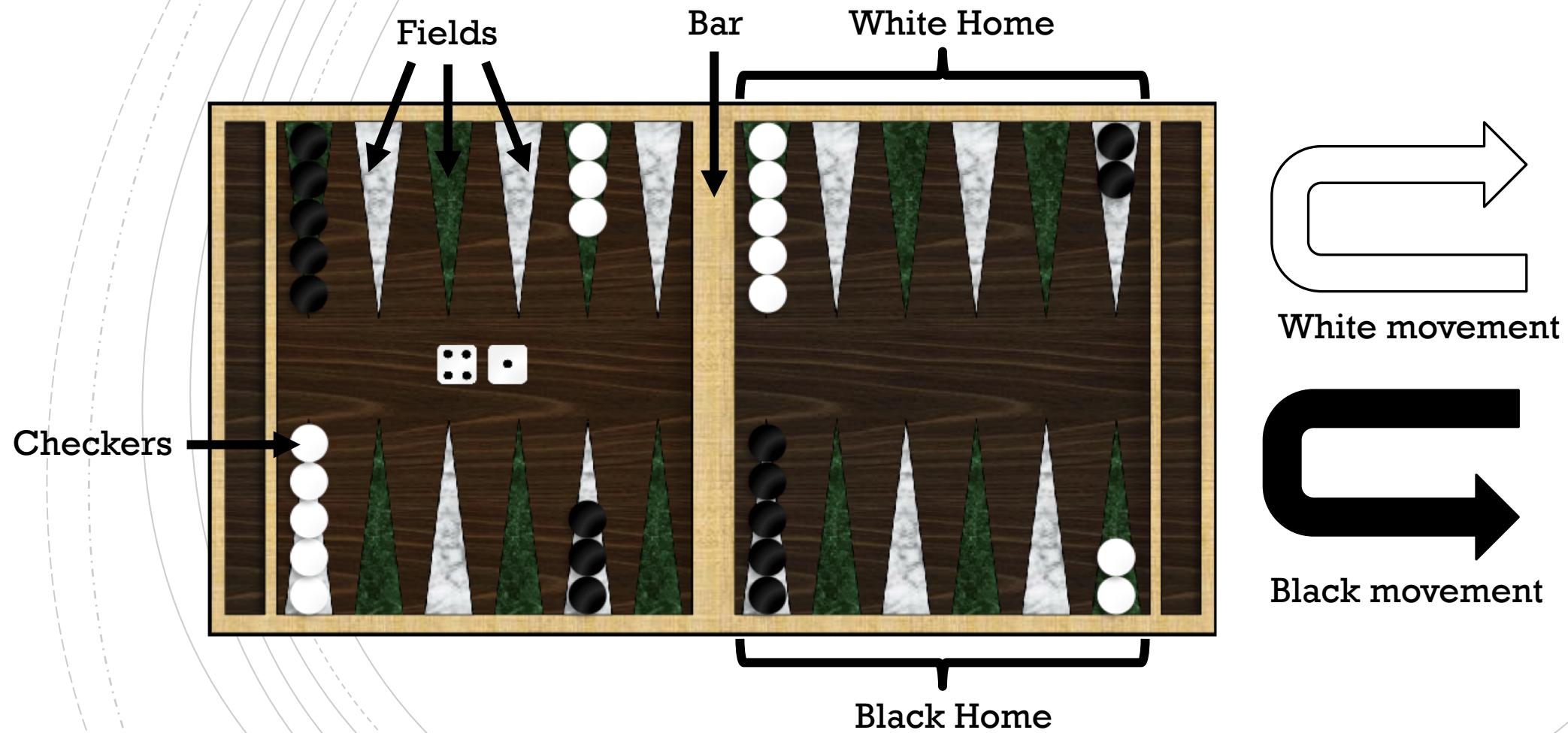
Student Name: Fatema Alkhanaizi

Supervisor Name: Rob Powell

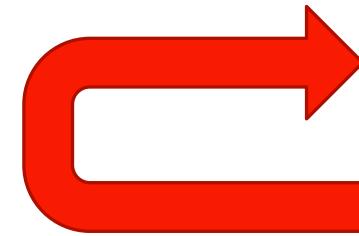
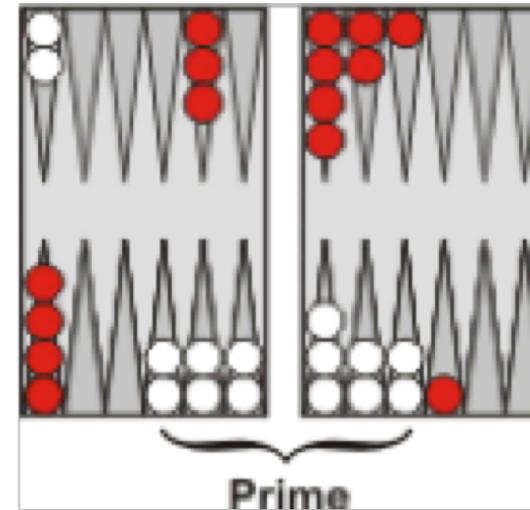
## Project Aim

- Is to find a new strategy for backgammon using reinforcement learning techniques; a hybrid of known strategies will be used as the basis for the new strategy.

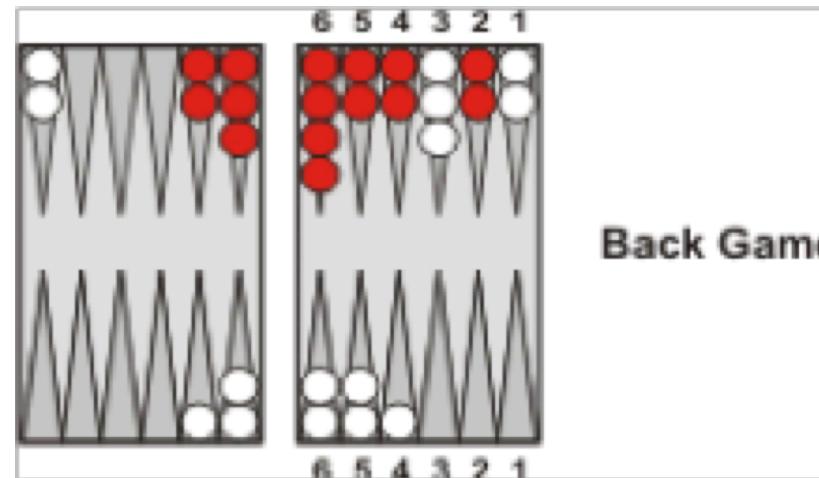
# Backgammon



# Backgammon Strategies



Red movement



Back Game

# Concepts

- **Reinforcement learning**
- **Temporal difference (TD) learning**
- **TD( $\lambda$ ) algorithms**

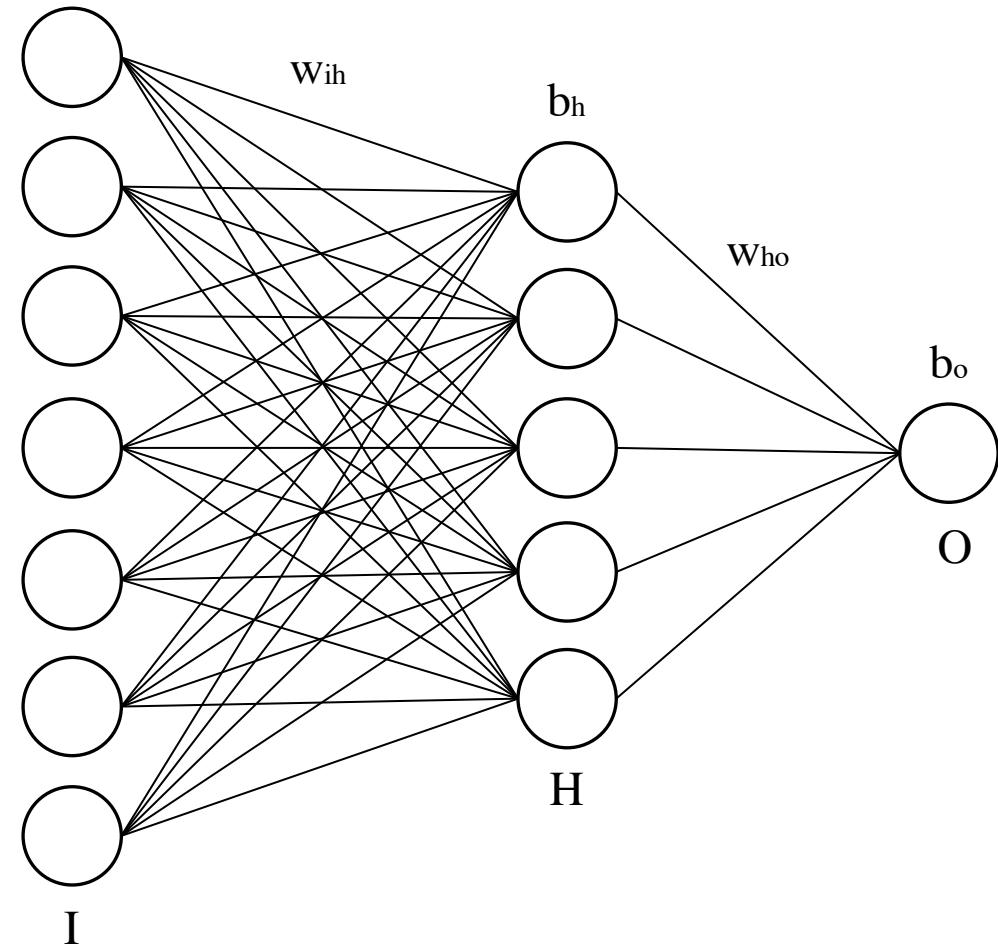
## Early Works

- **TD-Gammon of Tesauro**
- **Boyan's modular neural network**
- **GNU-Backgammon**

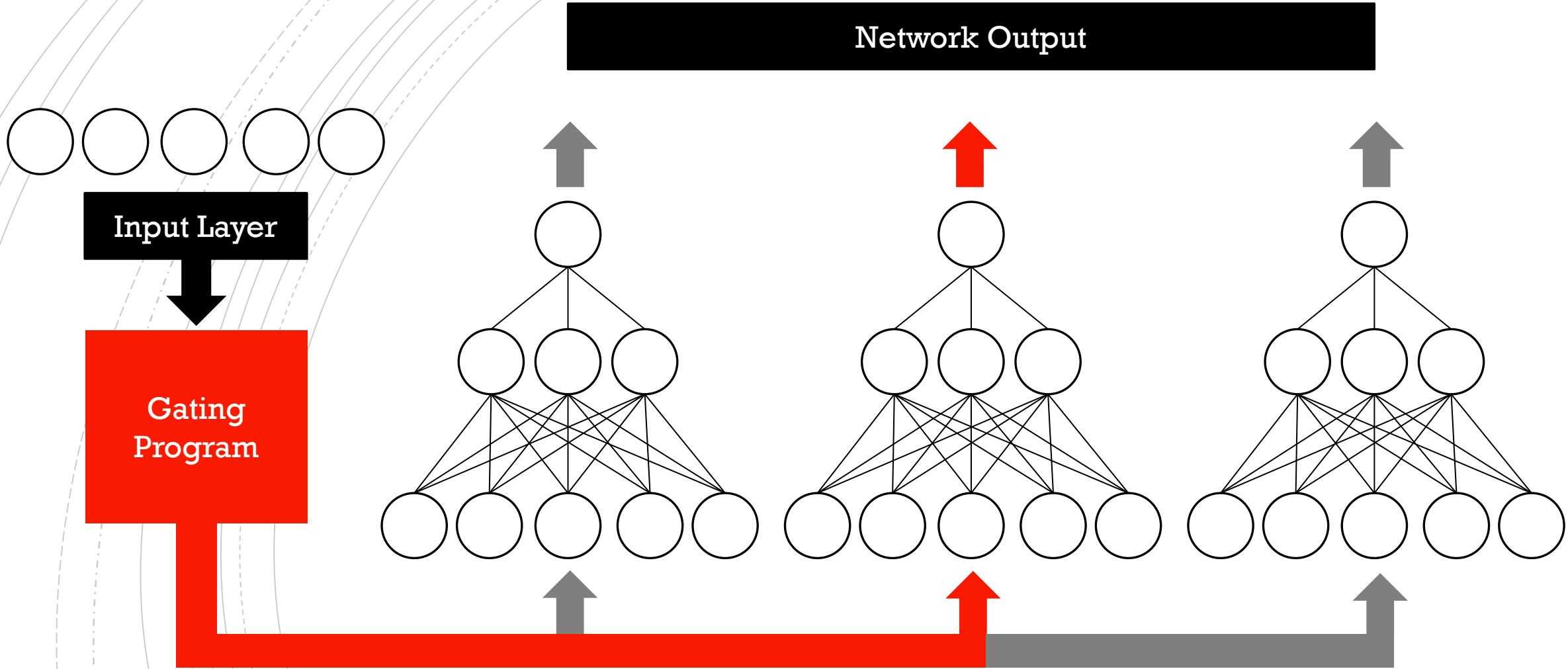
## Deliverables

- 3 Trained neural networks
- AI agent
- User interface and human agent
- Testing suit
- Project Report

# Monolithic Neural Network



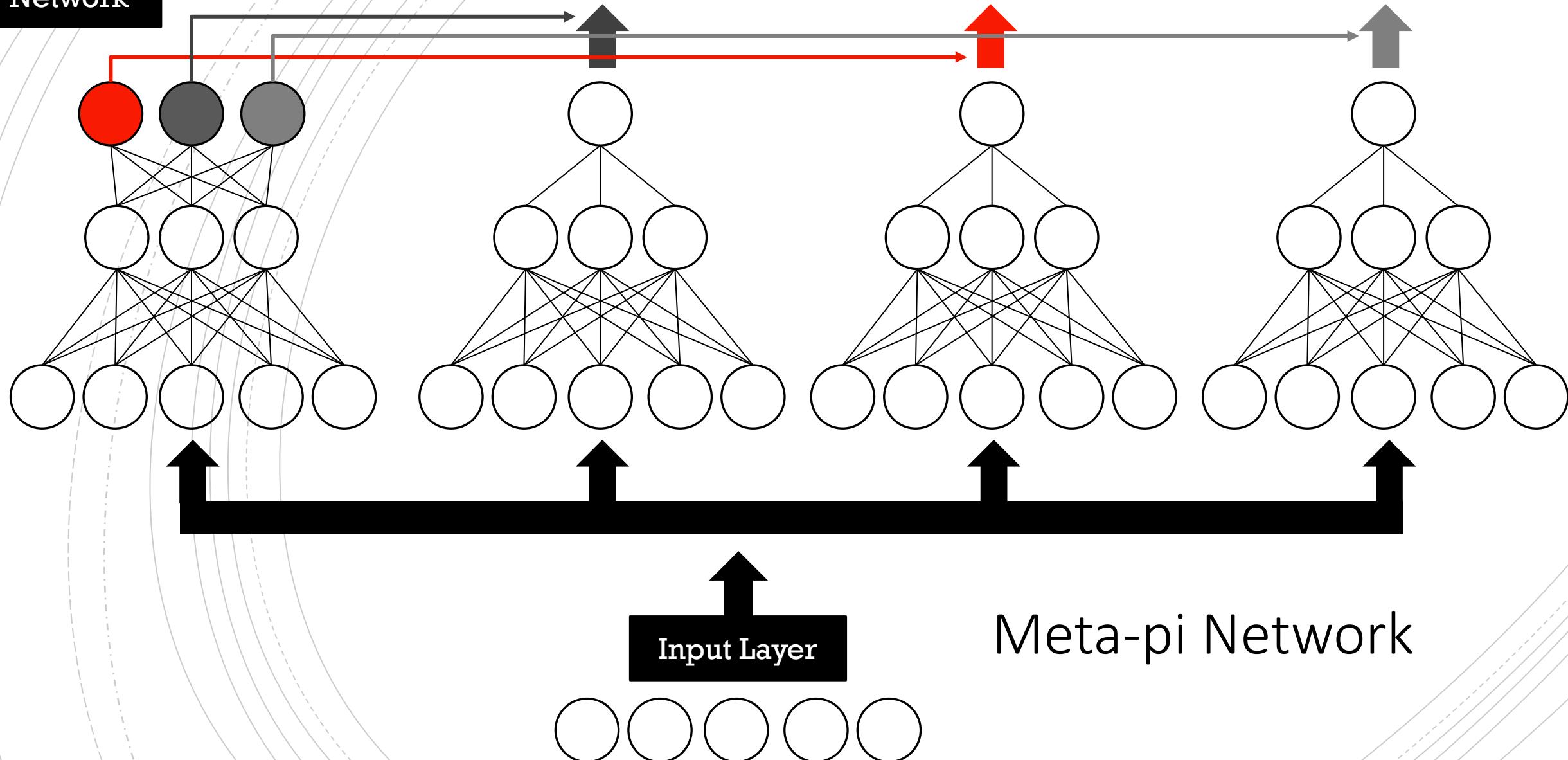
# Modular Neural Network



Designer Domain Decomposition  
Network (DDD)

Trainable  
Gating  
Network

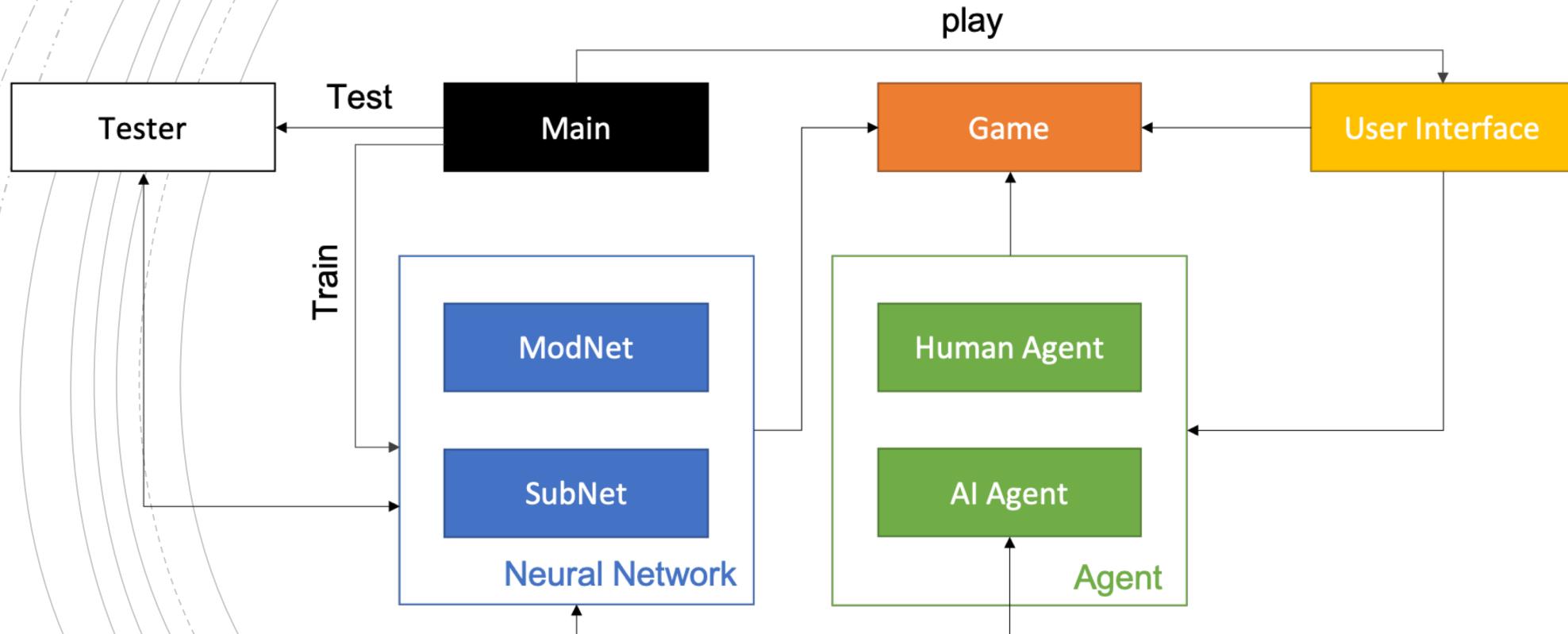
Network Output

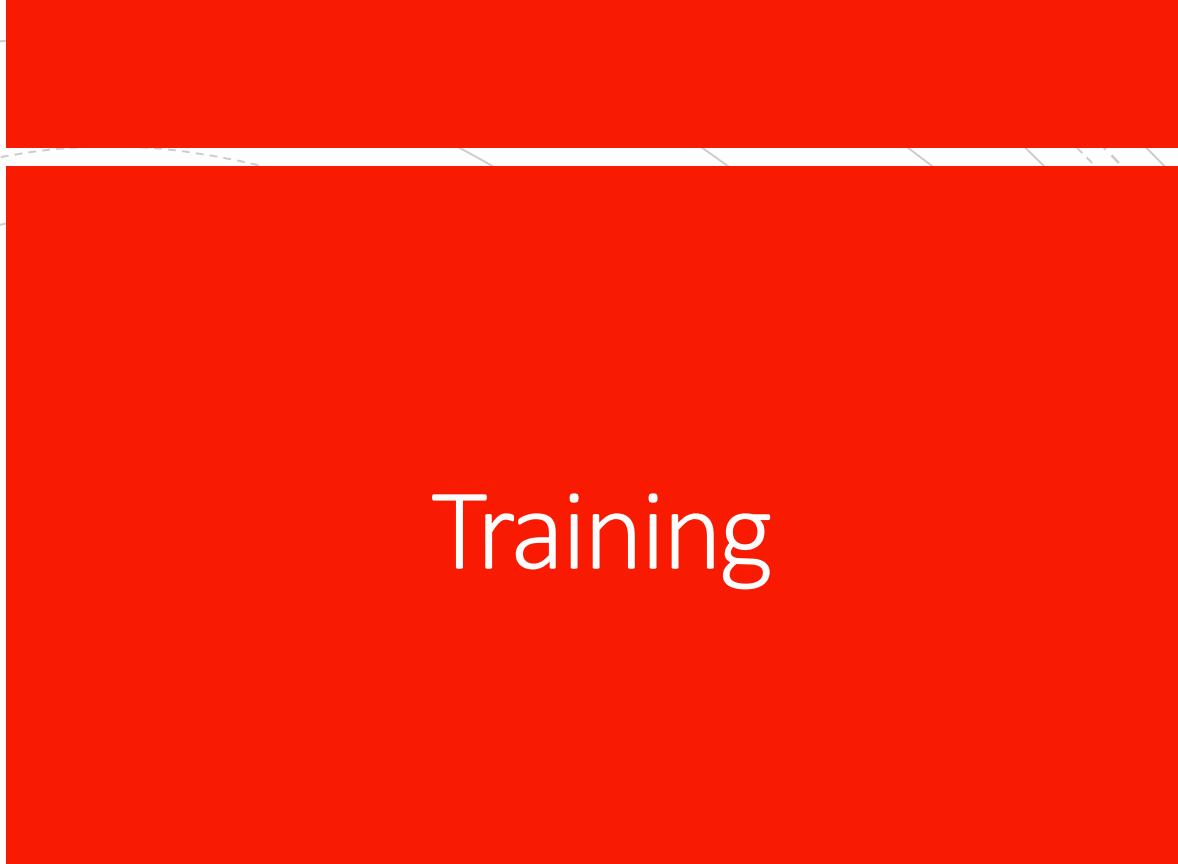


Input Layer

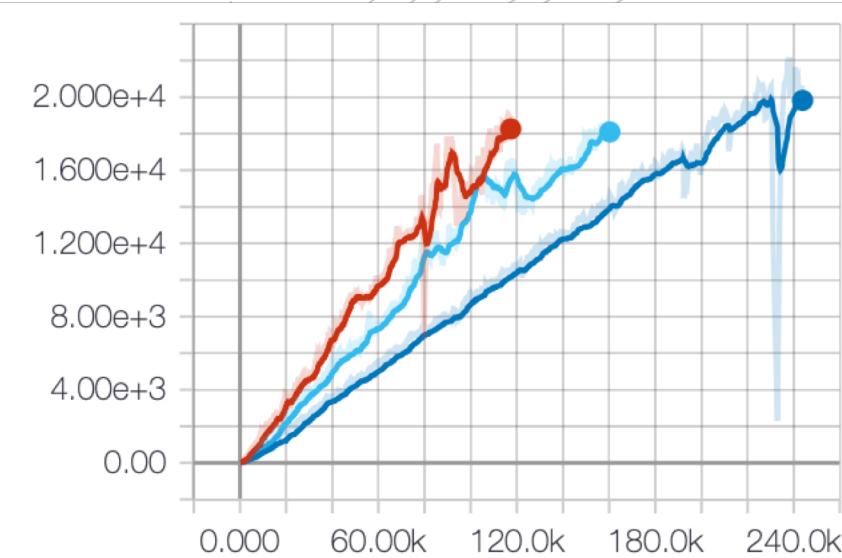
Meta-pi Network

# System Components

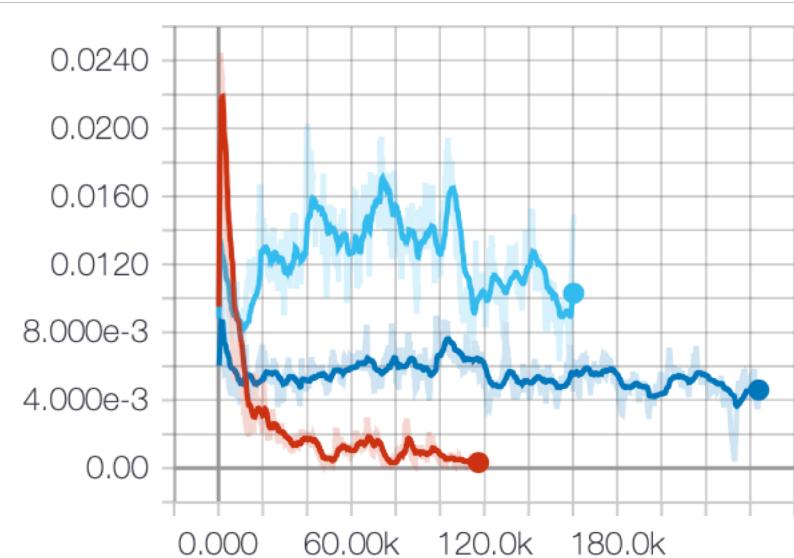




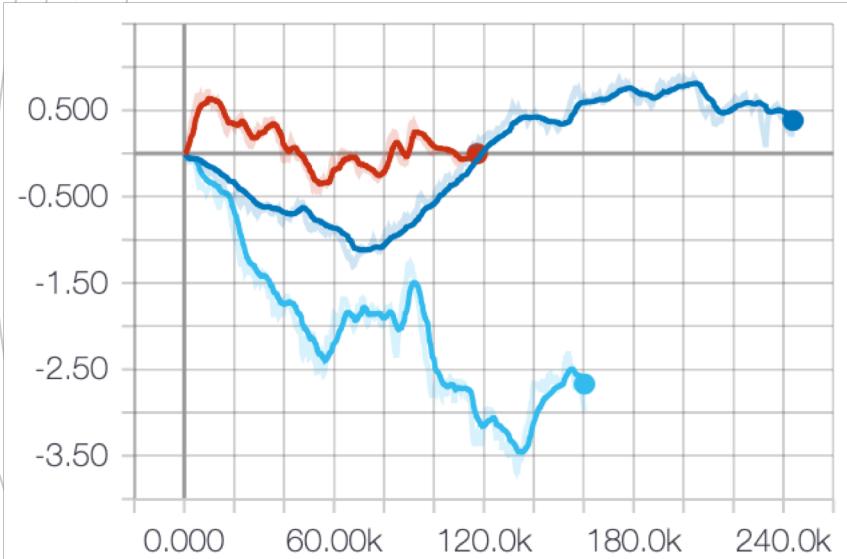
Training



Average Accuracy



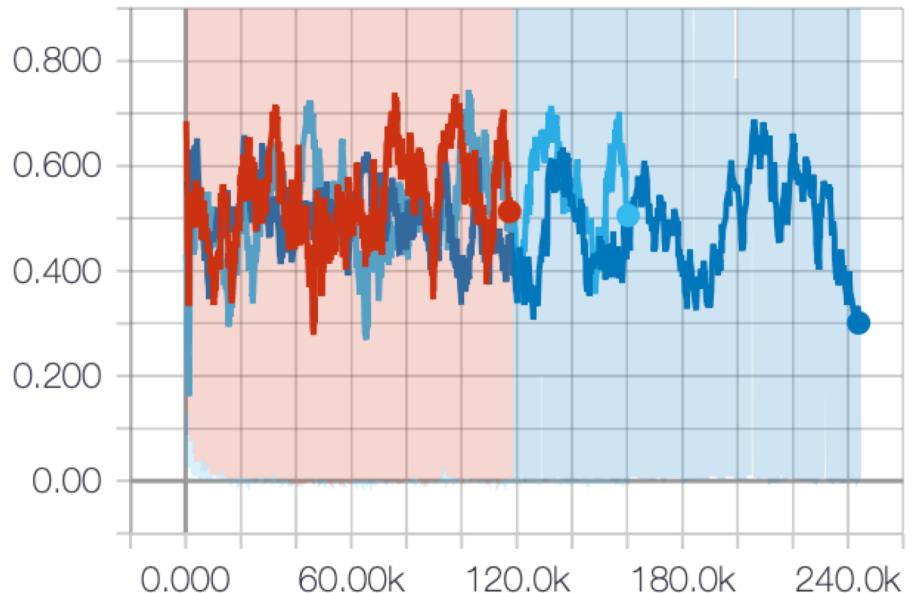
Average Loss



Average Delta

- Monolithic Network
- Racing Game – Modular Network
- Default – Modular Network

V



Name	Smoothed	Value	Step	Time	Relative
v_next_default/1547573096	0.5132	9.9221e-3	117.3k	Tue Jan 15, 19:37:32	2h 12m 24s
mono/1547564423	0.3012	7.1303e-3	243.8k	Tue Jan 15, 16:32:16	1h 31m 46s
v_next_racing/1547573097	0.5056	2.1029e-4	160.3k	Tue Jan 15, 19:37:32	2h 12m 24s



Questions