

Game Playing Teachable Agent using Deep Reinforcement Learning

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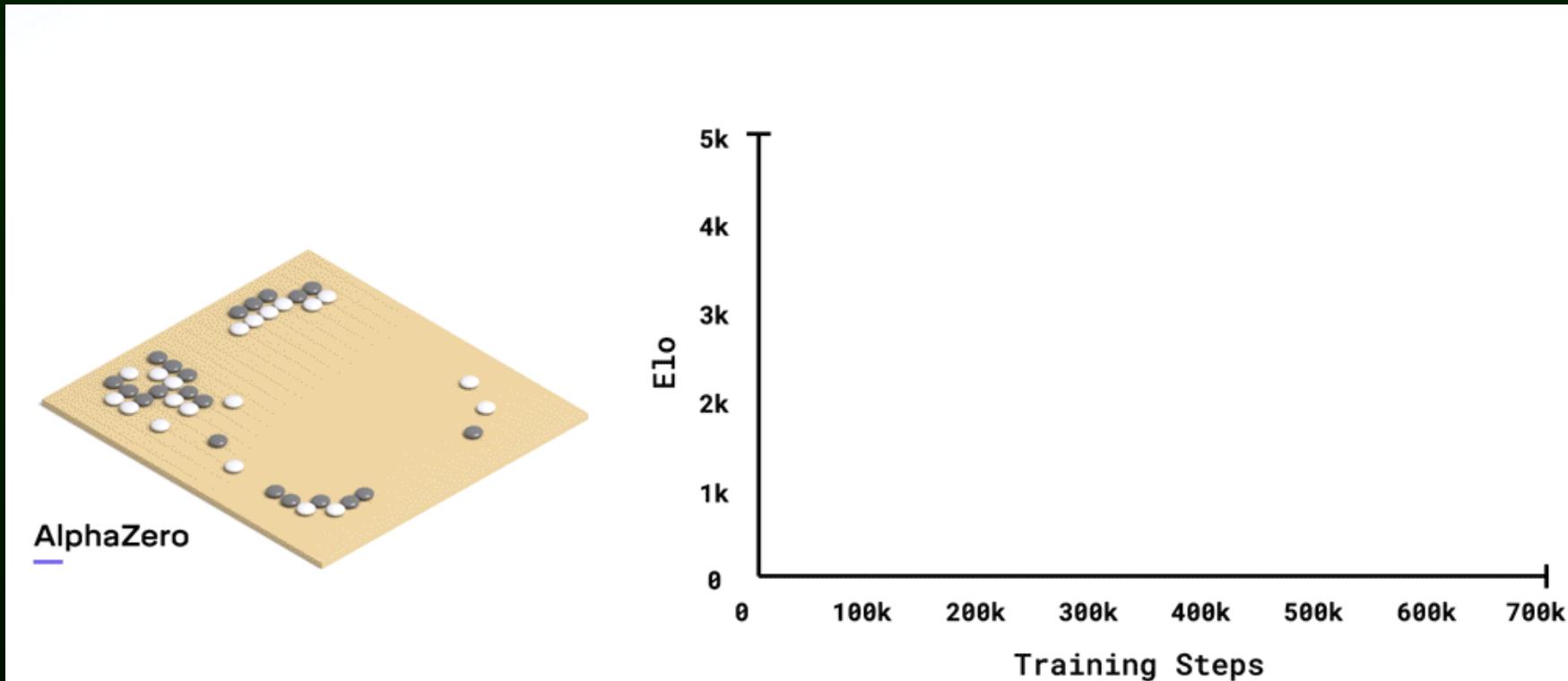
Director, Human Intelligence and Language Technologies Lab



Alpha Zero

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In late 2017 AlphaZero, a single system that taught itself from scratch how to master the games of Chess, Shogi (Japanese chess), and Go, beating a world-champion program in each case.

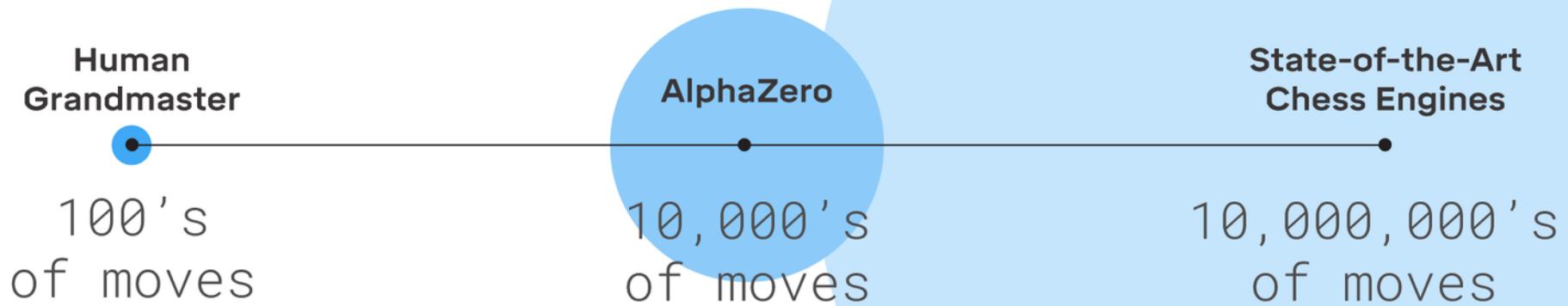




Alpha Zero

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Amount of Search per Decision





OpenAI Five

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2018 - Defeat the world's top Dota 2 professionals at 1v1.

OpenAI Five plays 180 years worth of games against itself every day, learning via self-play. It uses 256 GPUs and 128,000 CPU cores to train.

Scene 1: Attacking Mid

ACTIONS OBSERVATIONS

Action: Move

Move X

-400	-300	-200	-100	0	100	200	300	400

Move Y

-400	-300	-200	-100	0	100	200	300	400

Act in 1 frame





Deep Reinforcement Learning

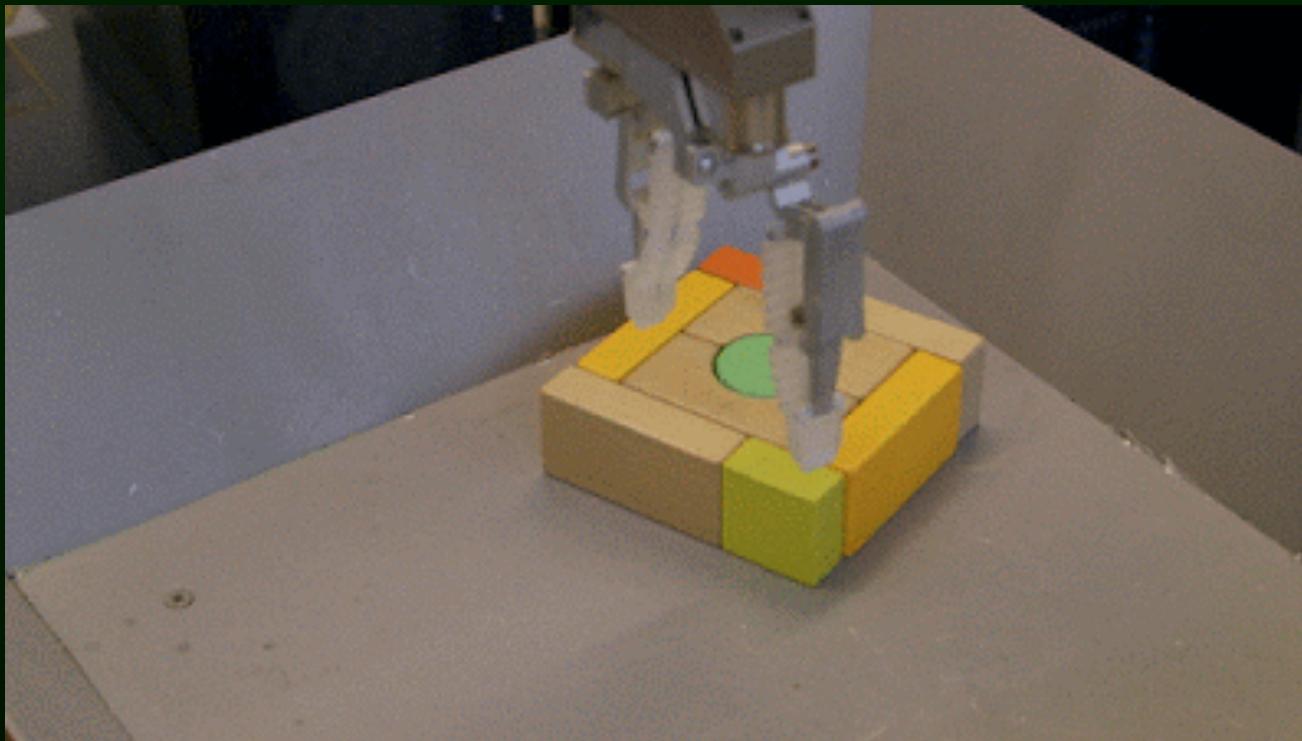
The Learning Robots Project by [GoogleX](#) has published [QT-Opt: Scalable Deep Reinforcement Learning for Vision-Based Robotic Manipulation](#) that tries to master the simple task of picking and grasping different shaped objects. Aiming to replicate some common human activities.





Deep Reinforcement Learning

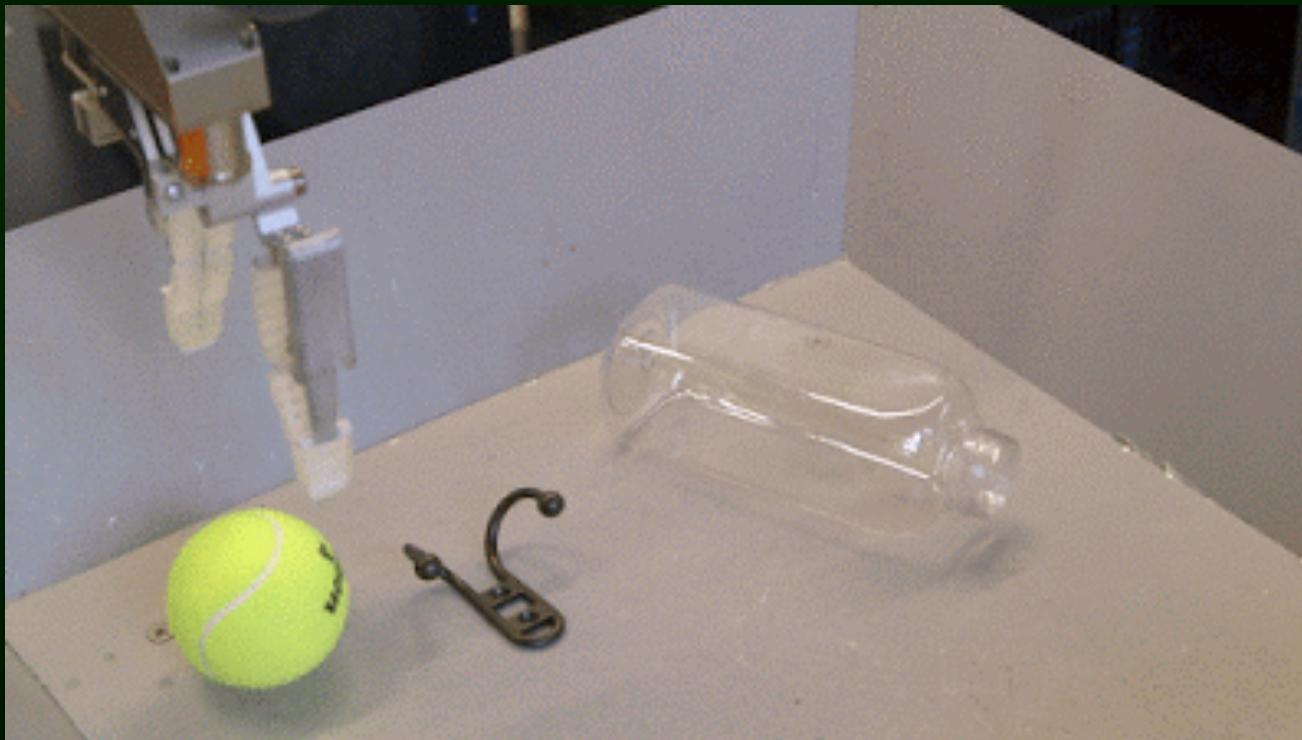
The model learned that when blocks are too close to each other and there is no space for the gripper, policy separates the blocks from the rest before picking it up.





Deep Reinforcement Learning

Swatting objects from gripper were not the part of dataset but it automatically repositions the gripper for another attempt.





Our Research

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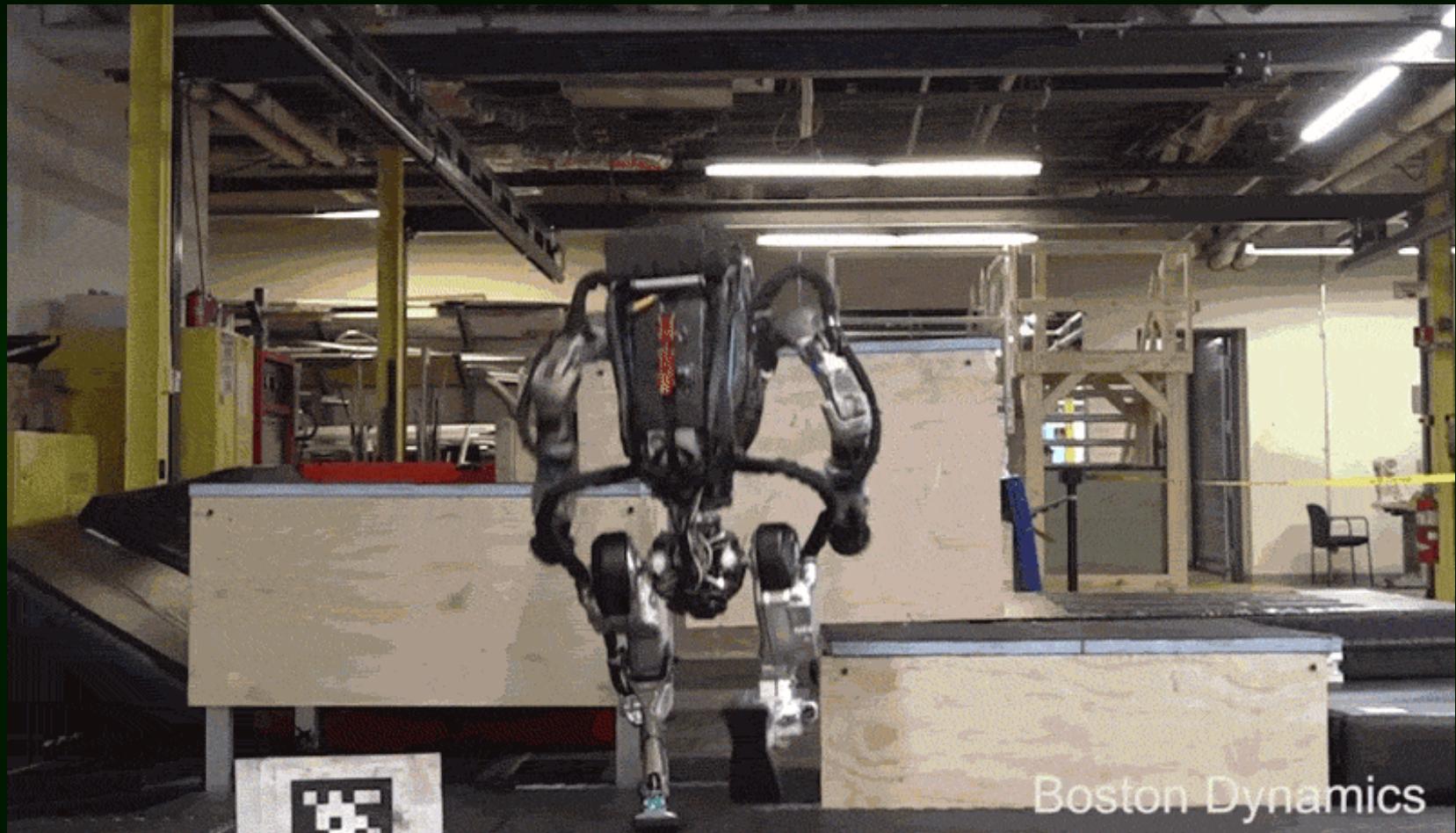


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Our Research

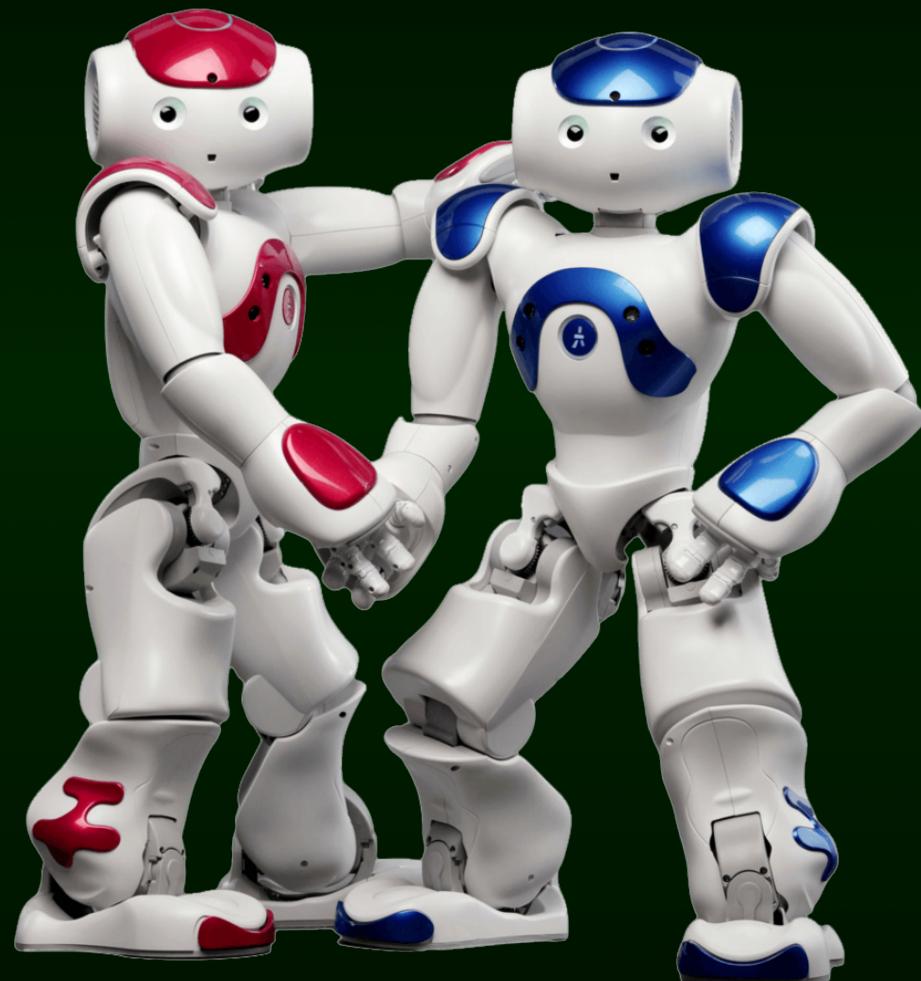
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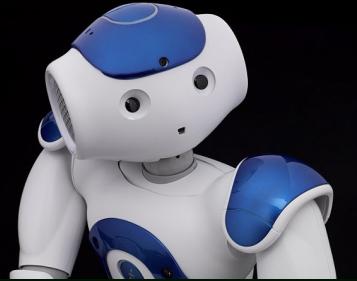


Our Research

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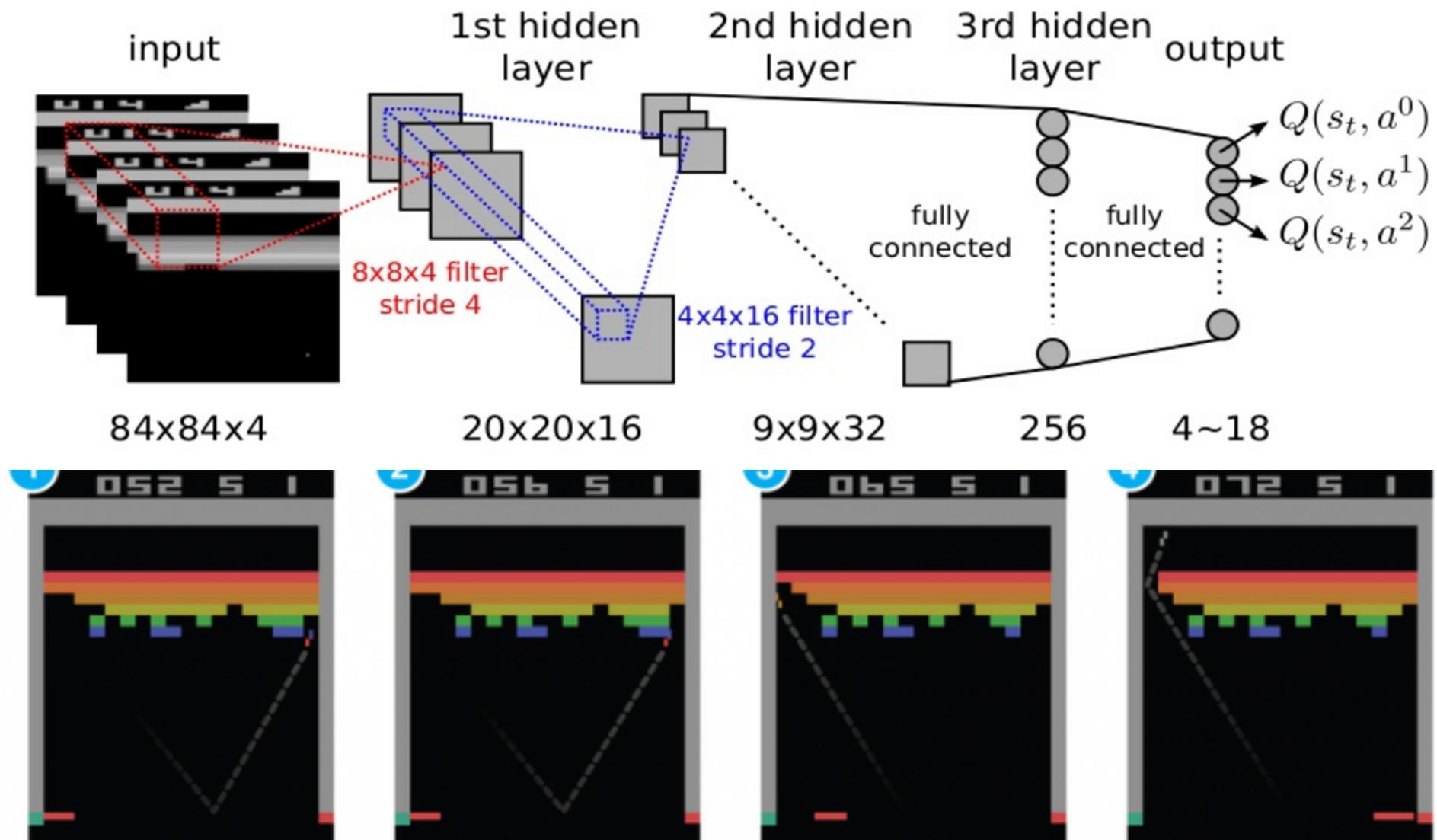
Game Playing Agent

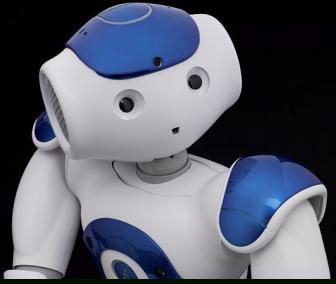
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- Playing game of Dominos with a Nao robot from human instructions.
- Current Task: Use Deep Reinforcement Learning to help with object grasping.
- Kinematics, Language, Game Playing, and Human Interaction



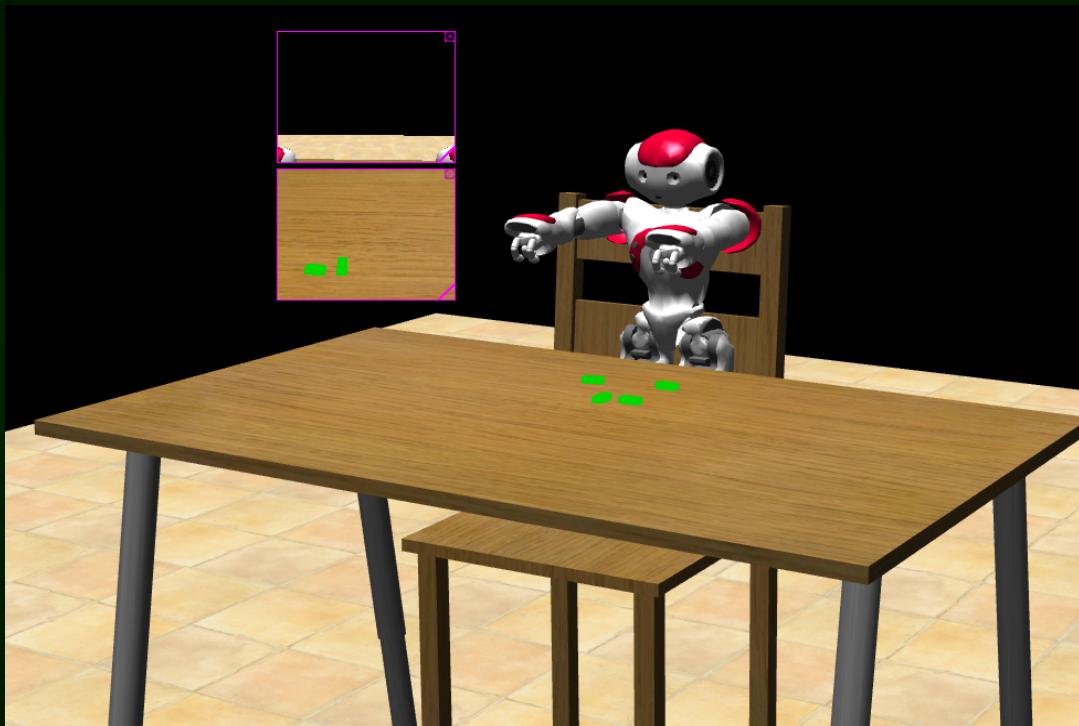
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Game Playing Agent

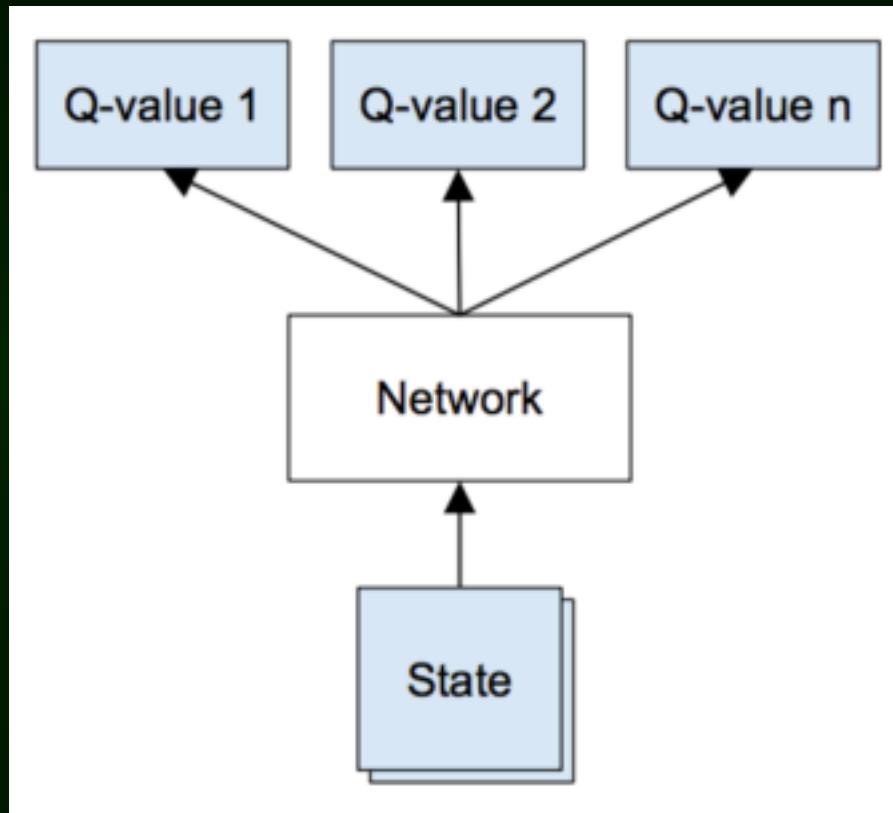
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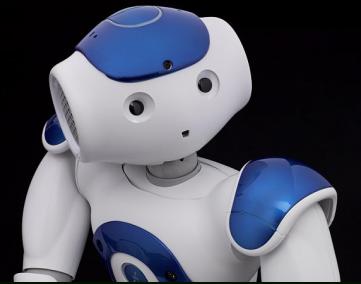


Deep Reinforcement Learning **UNT**

- Continuous State Space:

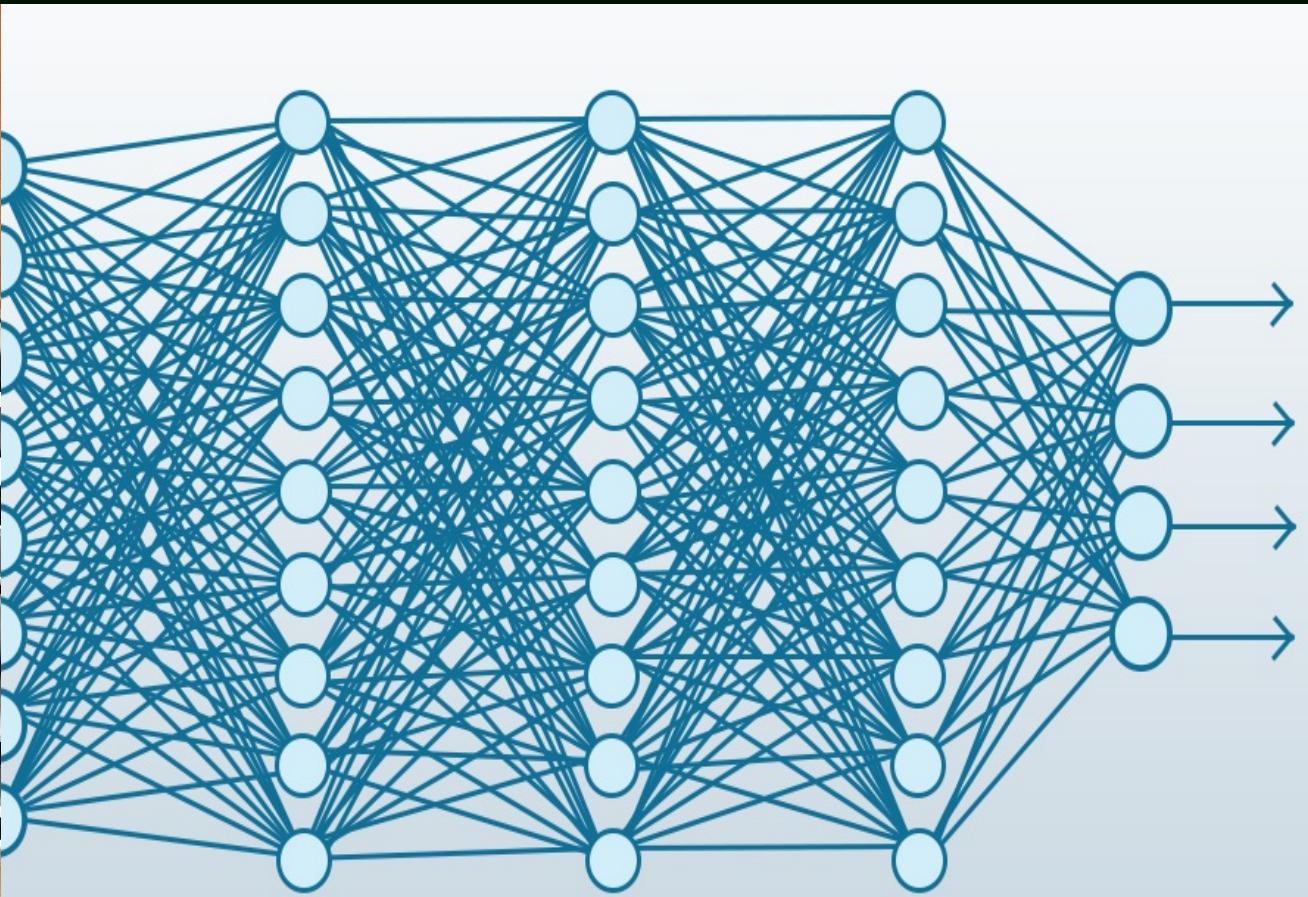
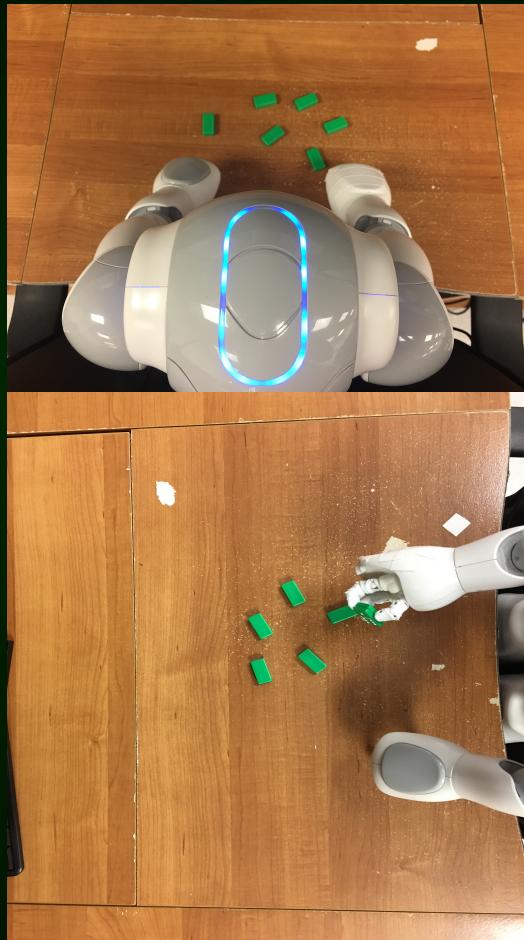


$$Q_{(S,a)} \leftarrow Q_{(S,a)} + \alpha(R_{(S)} + \gamma \max_{a'} Q_{(S',a')} - Q_{(S,a)})$$



Game Playing Agent

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Questions

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