



Unite Seoul 2019

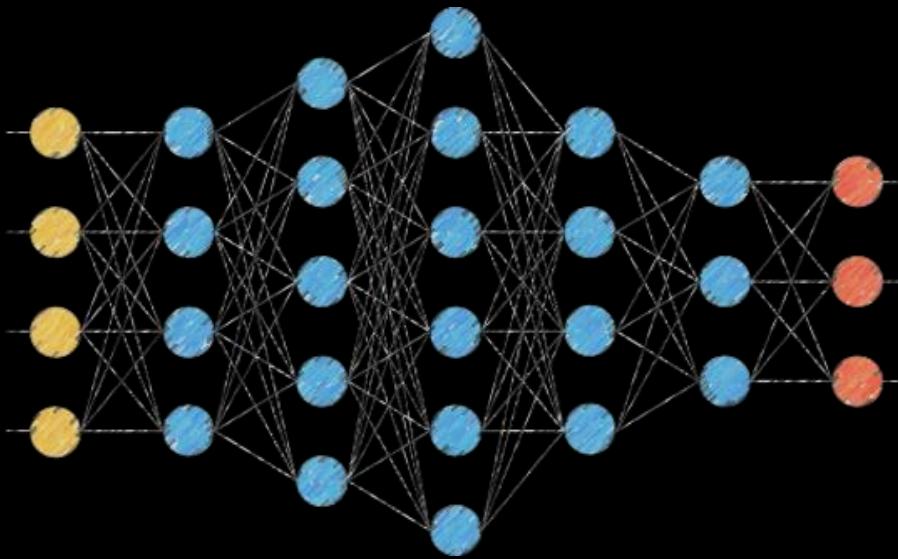


Artificial Intelligence & Deep Learning



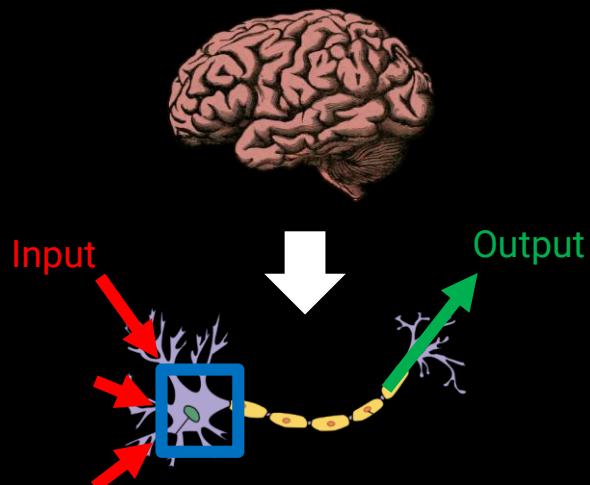
Artificial Intelligence

- Classification
 - Regression
 - Natural Language Processing
 - Object Detection
 - Generative Model
 - Reinforcement Learning
- ⋮

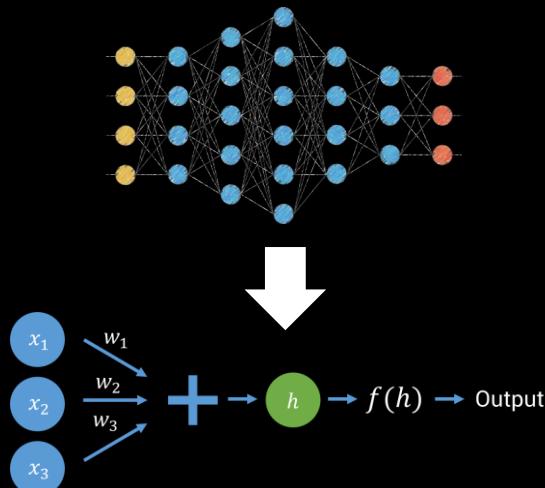


Deep Learning

Deep Learning

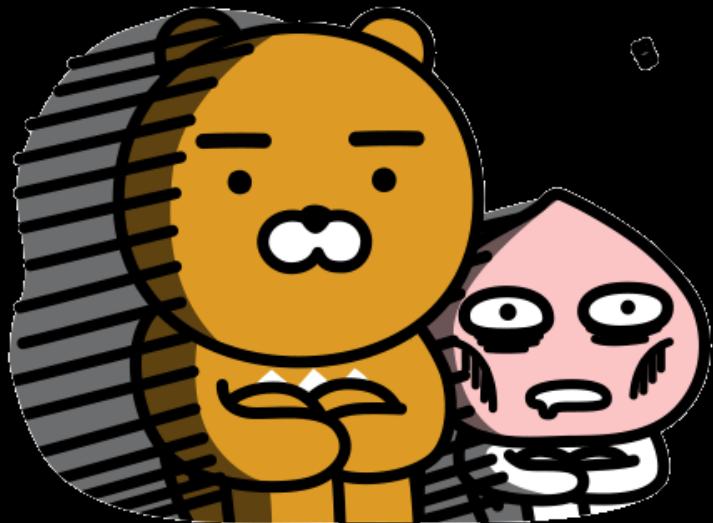


Processing unit of Brain



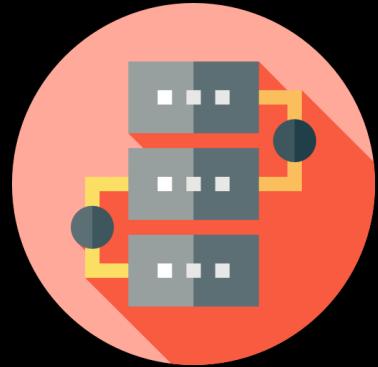
Processing unit of Neural Network

Deep Learning

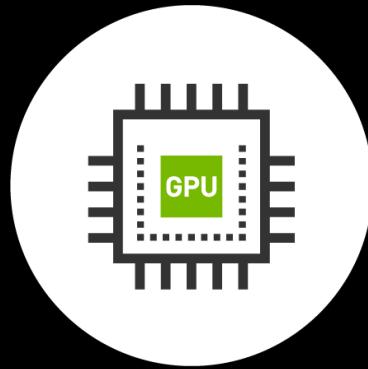


~ 2010

Deep Learning



Algorithms



GPU



Big Data

Deep Learning

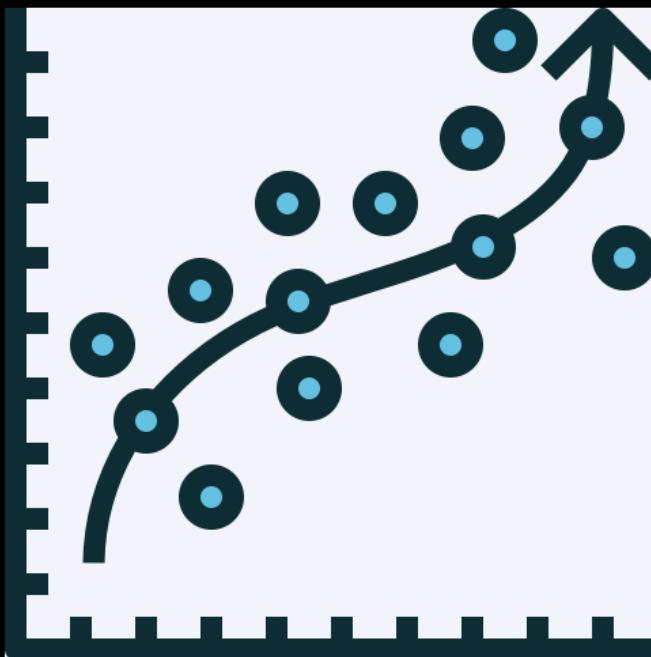


2010~

Classification



Regression



Natural Language Processing

- OpenAI's GPT-2

SYSTEM PROMPT
(HUMAN-WRITTEN)

In a shocking finding, scientist discovered a herd of unicorns living in a remote, previously unexplored valley, in the Andes Mountains. Even more surprising to the researchers was the fact that the unicorns spoke perfect English.

MODEL
COMPLETION
(MACHINE-
WRITTEN, 10 TRIES)

The scientist named the population, after their distinctive horn, Ovid's Unicorn. These four-horned, silver-white unicorns were previously unknown to science.

Now, after almost two centuries, the mystery of what sparked this odd phenomenon is finally solved.

Dr. Jorge Pérez, an evolutionary biologist from the University of La Paz, and several companions, were exploring the Andes Mountains when they found a small valley, with no other animals or humans. Pérez noticed that the valley had what appeared to be a natural fountain, surrounded by two peaks of rock and silver snow.

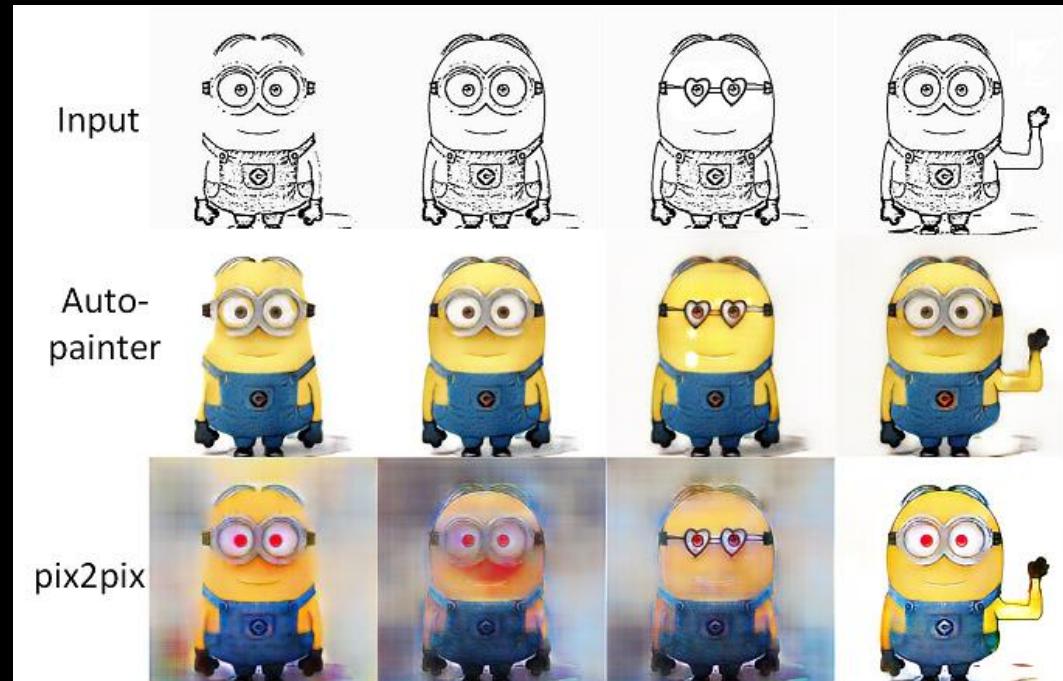
Pérez and the others then ventured further into the valley. “By the time we reached the top of one peak, the water looked blue, with some crystals on top,” said Pérez.

Pérez and his friends were astonished to see the unicorn herd. These creatures could be seen from the air without having to move too much to see them – they were so close they could touch their horns.

Object Detection



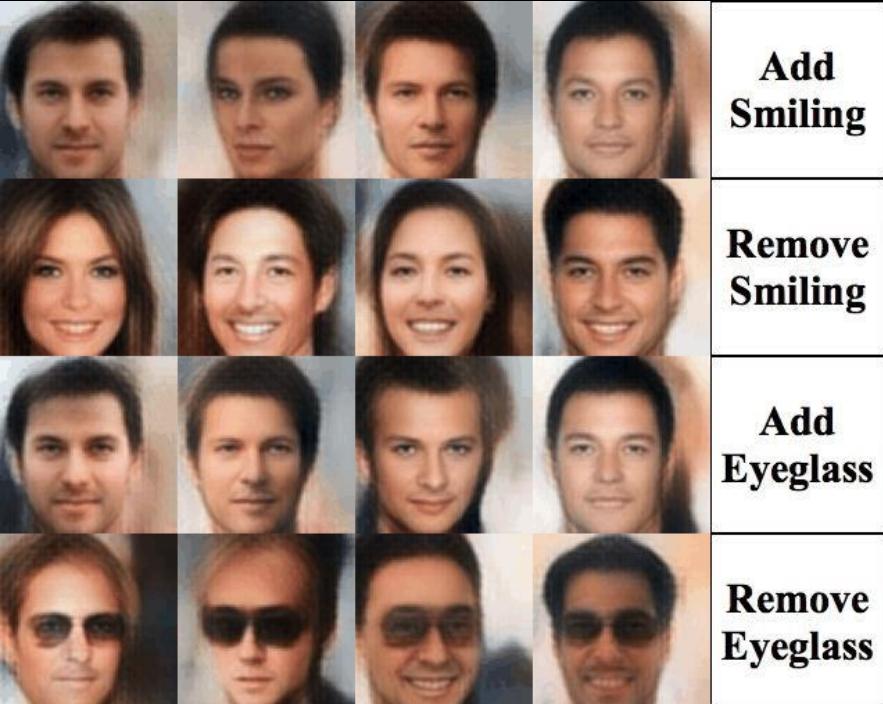
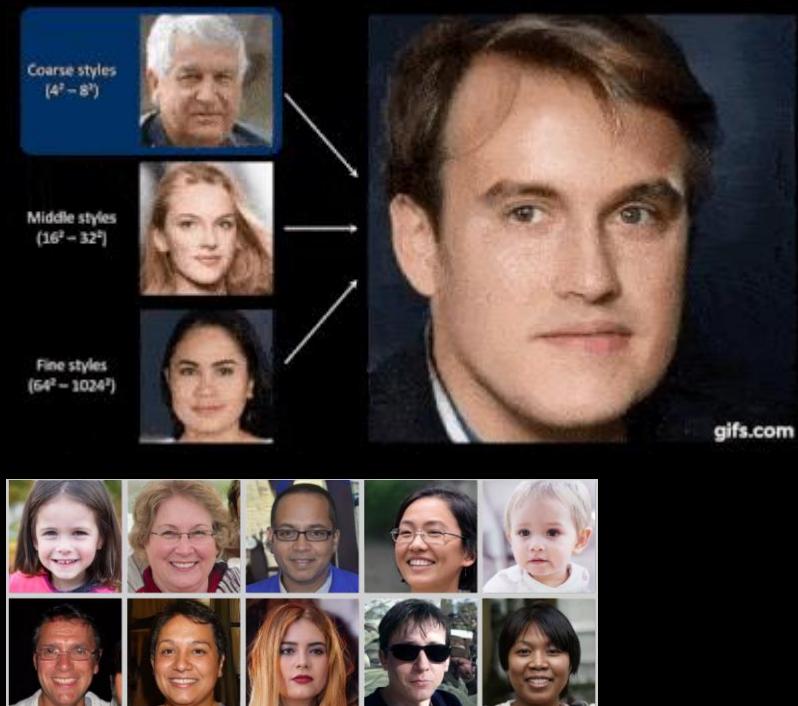
Generative Model



Generative Model



Generative Model



Reinforcement Learning



Deep Learning in Games



unity

Unite
Seoul
2019

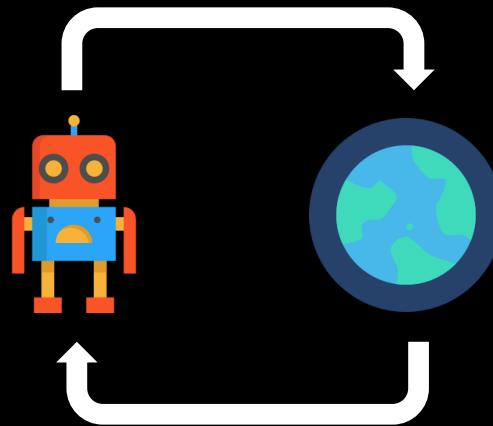
Deep Learning in Games



VS

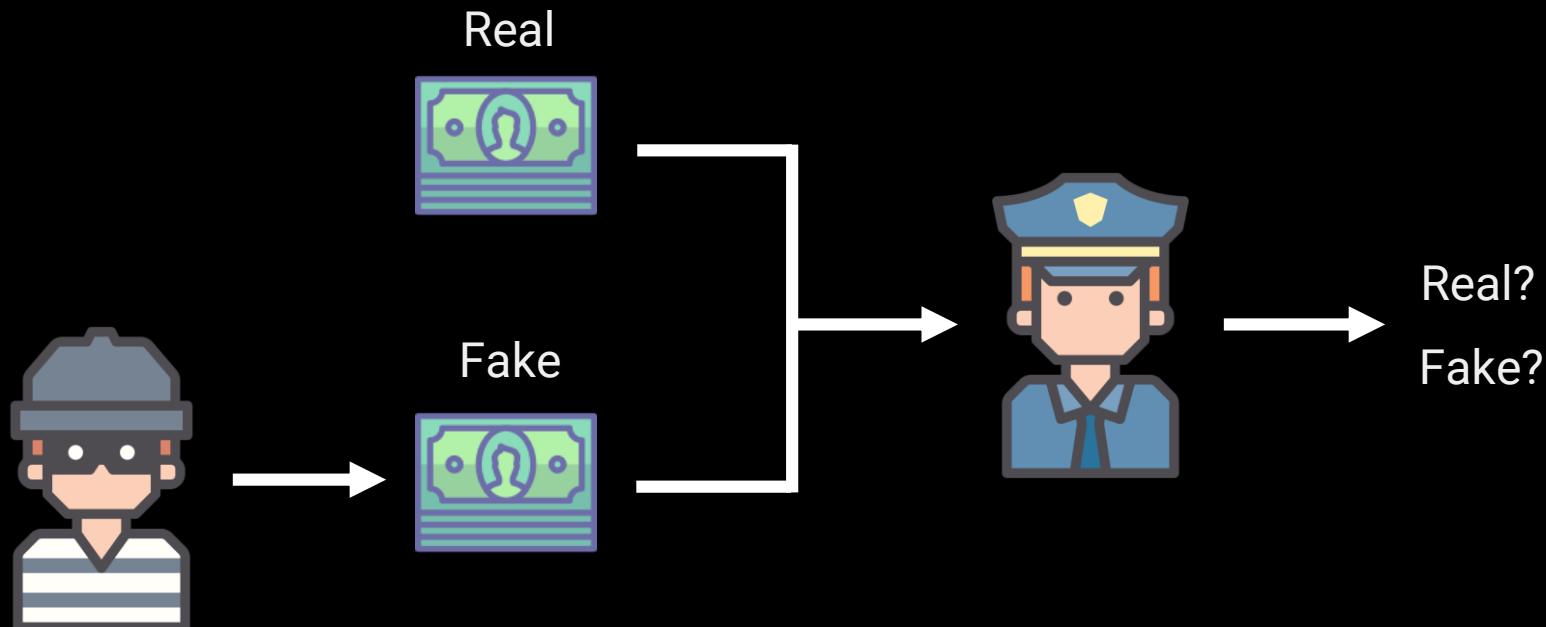


Generative Adversarial Networks (GAN)

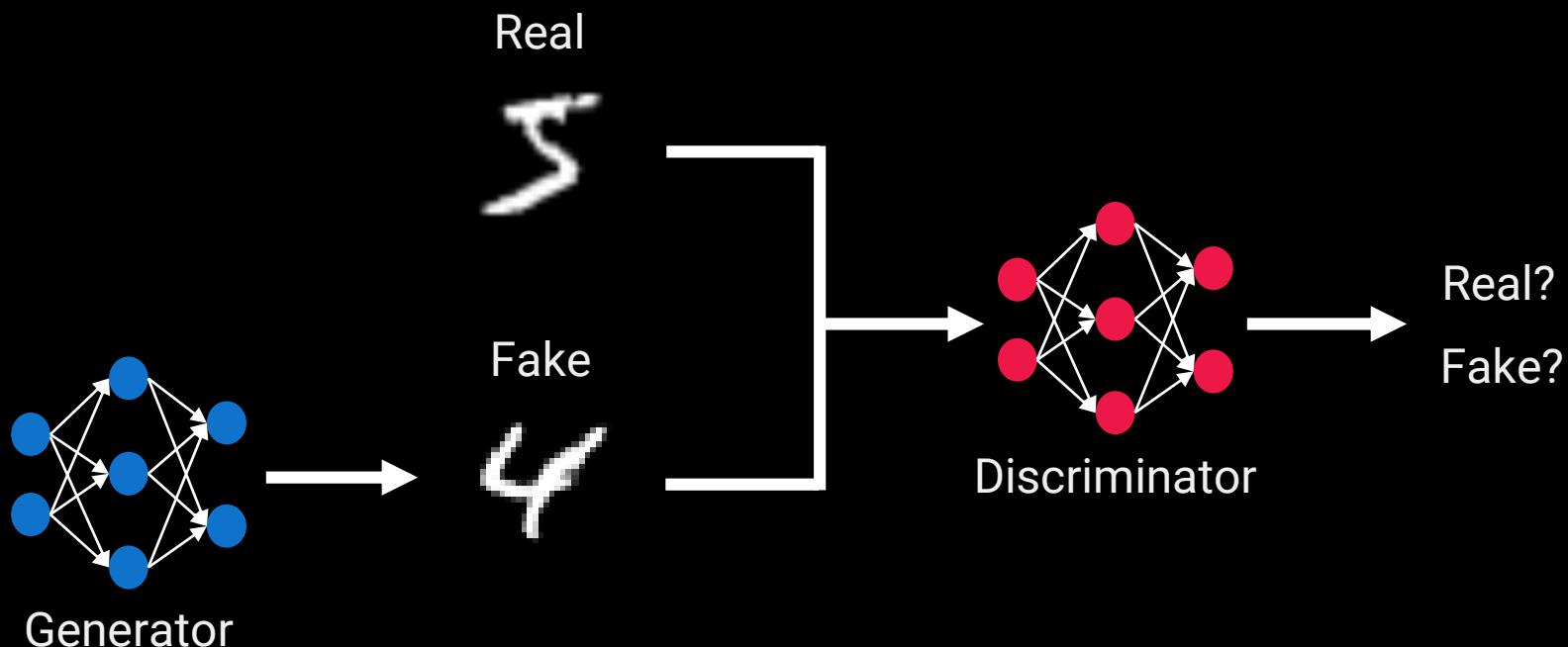


Reinforcement Learning (RL)

GAN

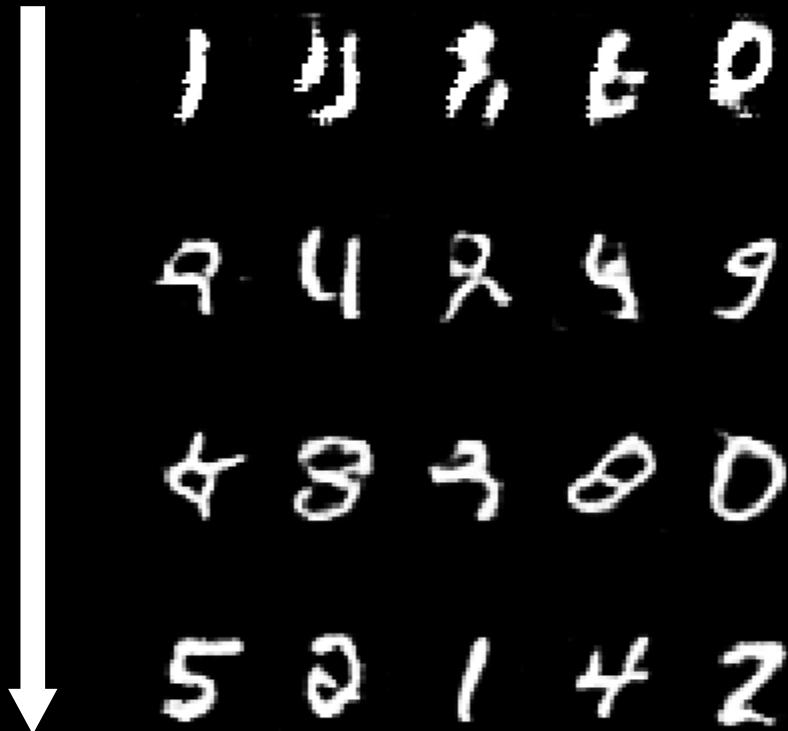


GAN

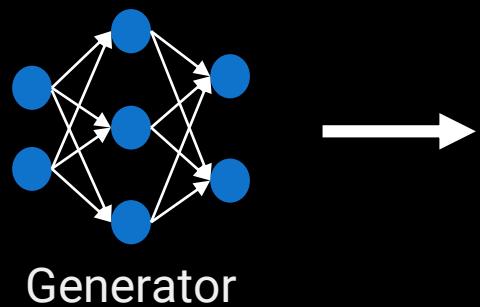


GAN

Training



GAN



4 0 0 9 9 5 2 0 5 2
4 6 0 0 2 1 0 1 8 5
7 1 9 1 2 3 5 5 7 9
2 5 3 8 5 1 8 2 2 1
5 1 0 7 2 1 9 8 0 0
8 4 5 0 0 5 4 3 1 5
6 3 5 9 7 0 8 6 4 7
8 6 5 3 7 9 5 2 3 7
9 8 6 1 0 5 3 6 6 7
7 7 8 7 3 0 5 6 1 3

Game Level Generation Using GAN



Unite Seoul 2018

세상을 바꾸는 리얼타임 3D 플랫폼

신경망을 사용한 게임 레벨 생성 (Game Level Generation Using Neural Networks)

#1



신승백

매버릭 게임즈 / 판타지 레이더스 / Senior Programmer

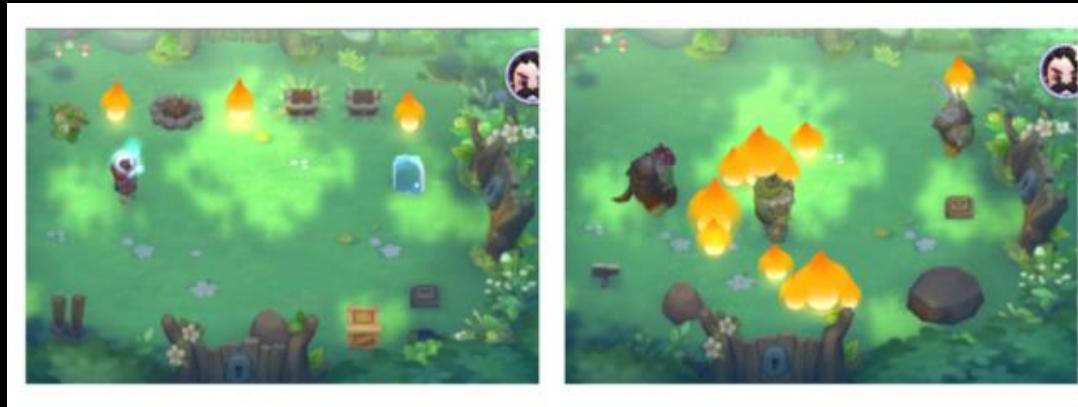
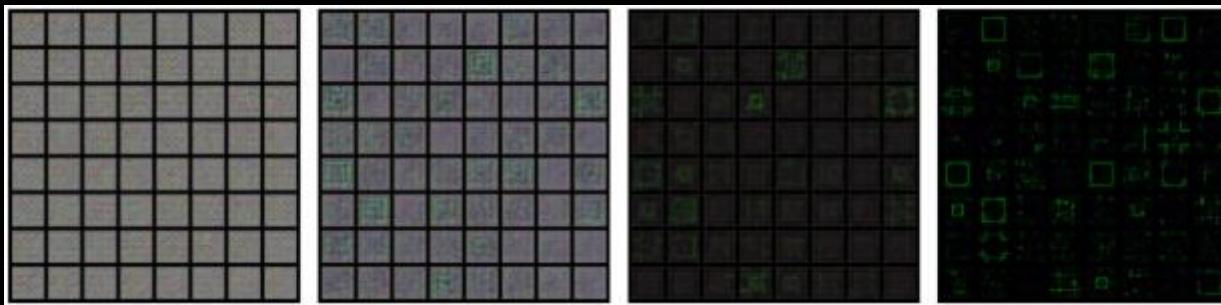
■ Biography

프로그래머. 현재 매버릭 게임즈에서 기계 학습을 사용한 게임 콘텐츠 생성을 연구 개발중. 그전에는 엔씨소프트와 바닐라브리즈등에서 3D 게임 엔진과 크로스 플랫폼 모바일 게임 엔진을 개발.

■ Session Introduction

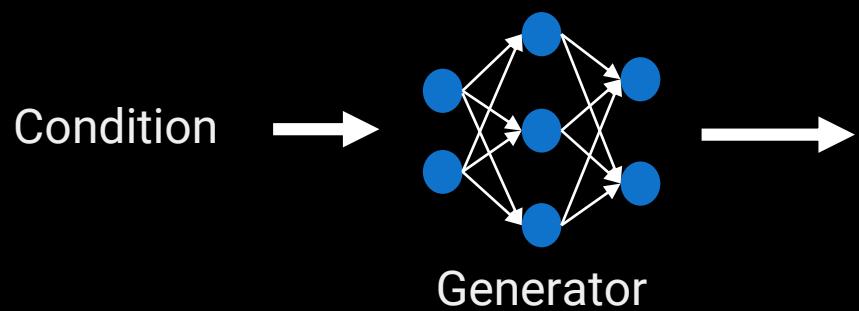
딥 러닝 기반의 기계 학습으로 게임 레벨을 자동 생성하는 방법을 소개합니다. 이론적인 내용보다는 현재 유니티를 사용해서 개발 중인 모바일 RPG인 판타지 레이더스에서 실험하고 적용한 내용을 바탕으로 합니다. 데이터 수집 및 가공부터 학습하여 적용한 전체 과정을 간략히 소개합니다. 최종적으로 게임 디자이너가 기계 학습 모델을 사용할 수 있도록 웰과 유니티를 통해서 어떻게 제공했는지도 이야기합니다.

Game Level Generation Using GAN



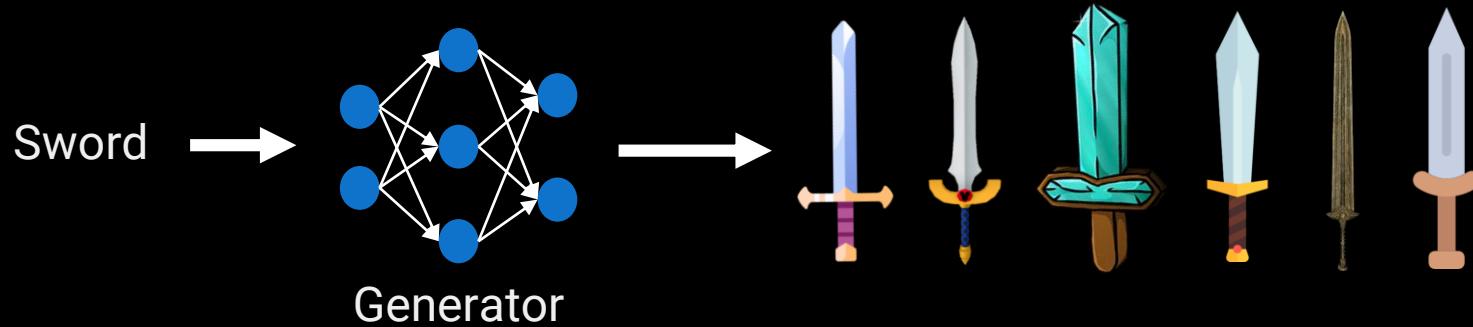
Game Level Generation Using GAN

Design Using GAN



0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9

Design Using GAN



Reinforcement Learning



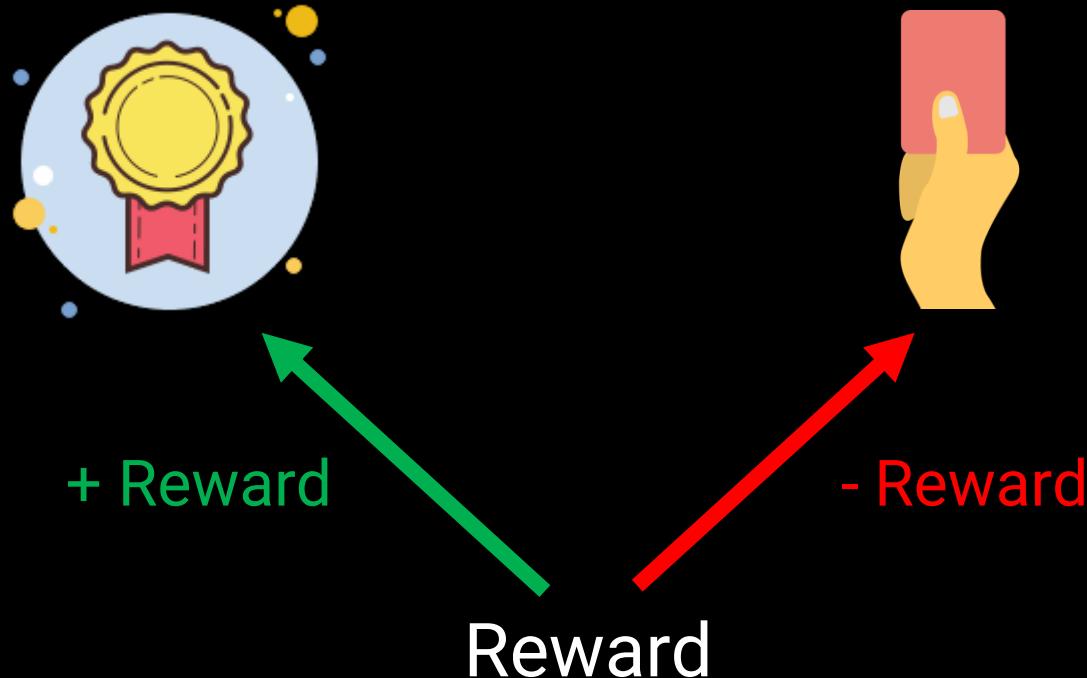
+ Reward

- Reward

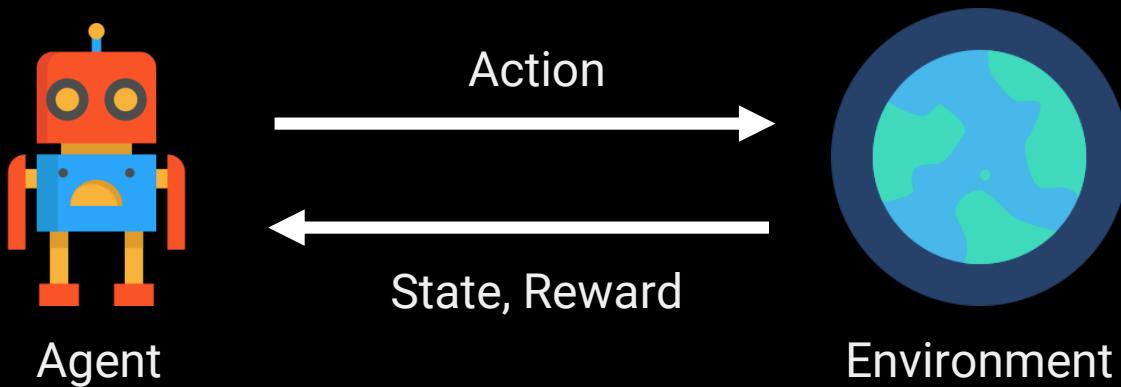
Reward



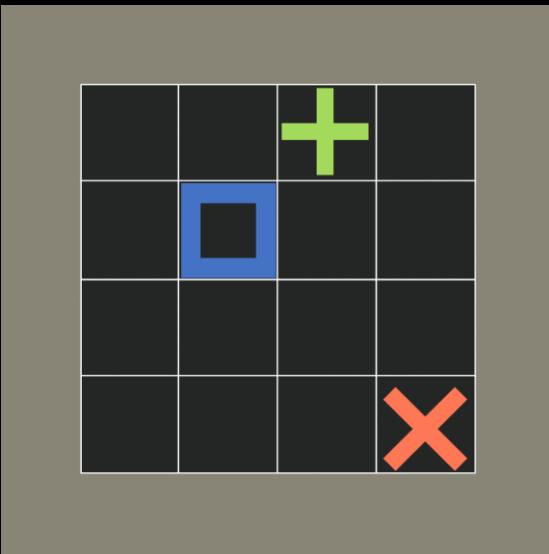
Reinforcement Learning



Reinforcement Learning



Reinforcement Learning

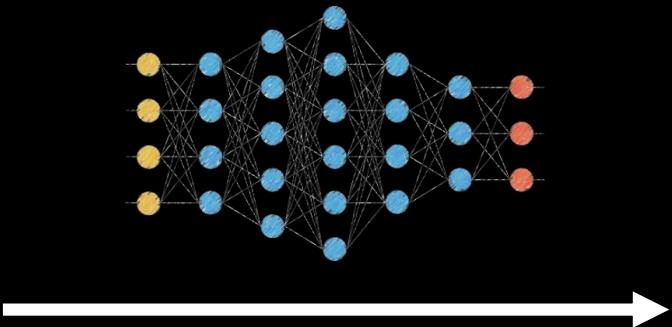
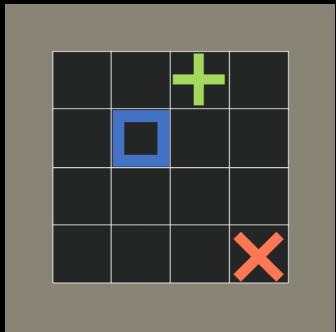


GridWorld



Starcraft2

Reinforcement Learning

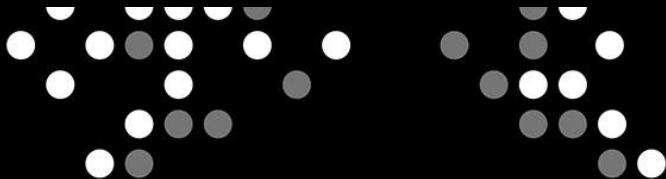


Reinforcement Learning

Reinforcement Learning



Reinforcement Learning



ALPHAGO



Reinforcement Learning



Reinforcement Learning

AlphaOmok Team



Kyushik Min



Jungdae Kim



Taeyoung Kim



Woongwon Lee



https://github.com/reinforcement-learning-kr/alpha_omok

Reinforcement Learning

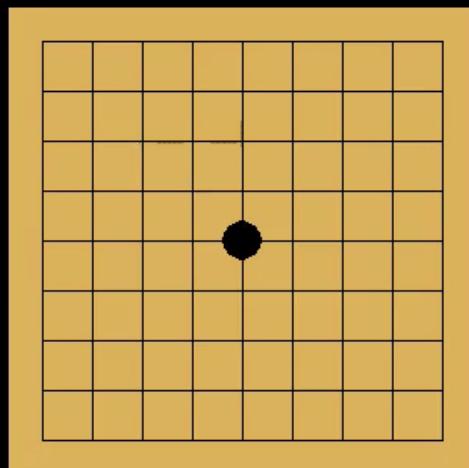


Mini Omok

Win: Stones has to be 5 in a row
(horizontal, vertical, diagonal)

Score: Black = 0 vs White = 1 vs Draw = 0

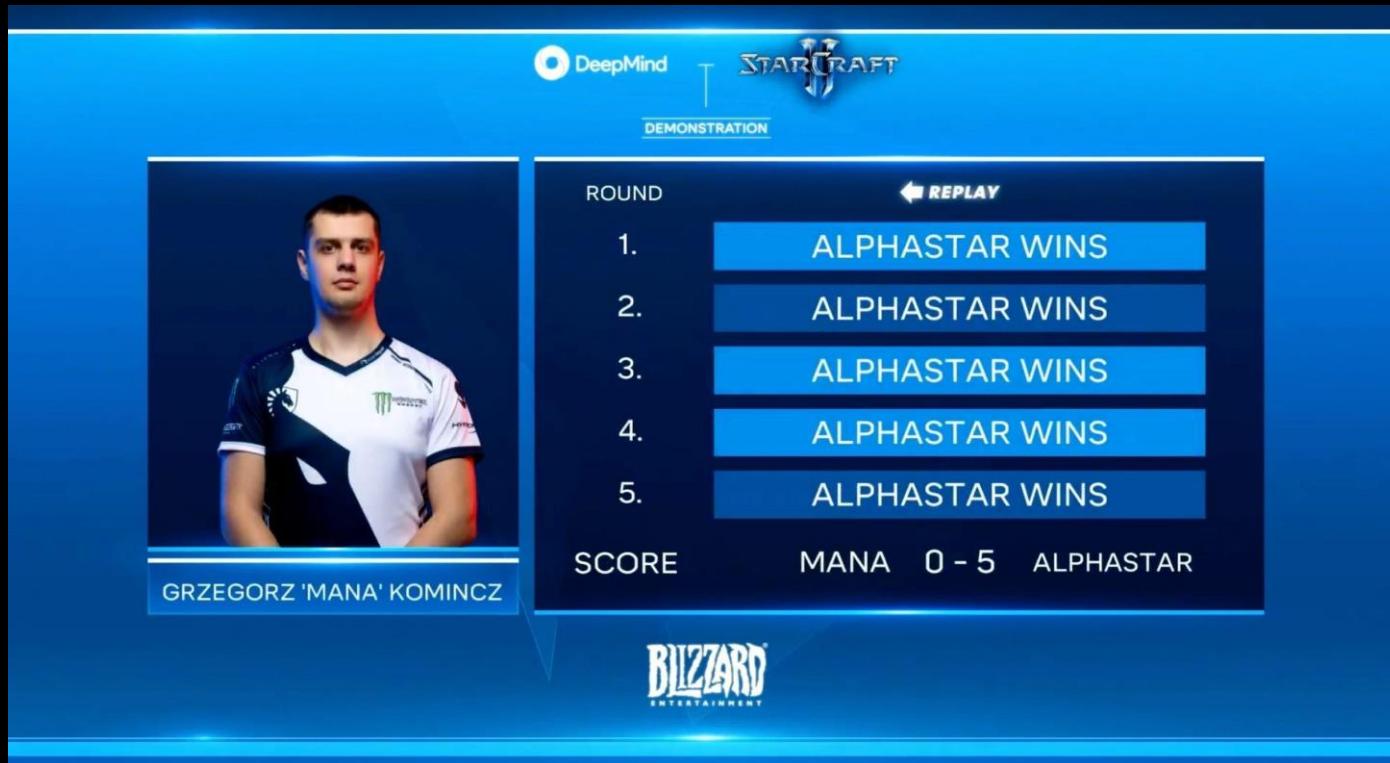
White's Turn!



Reinforcement Learning



Reinforcement Learning



Reinforcement Learning

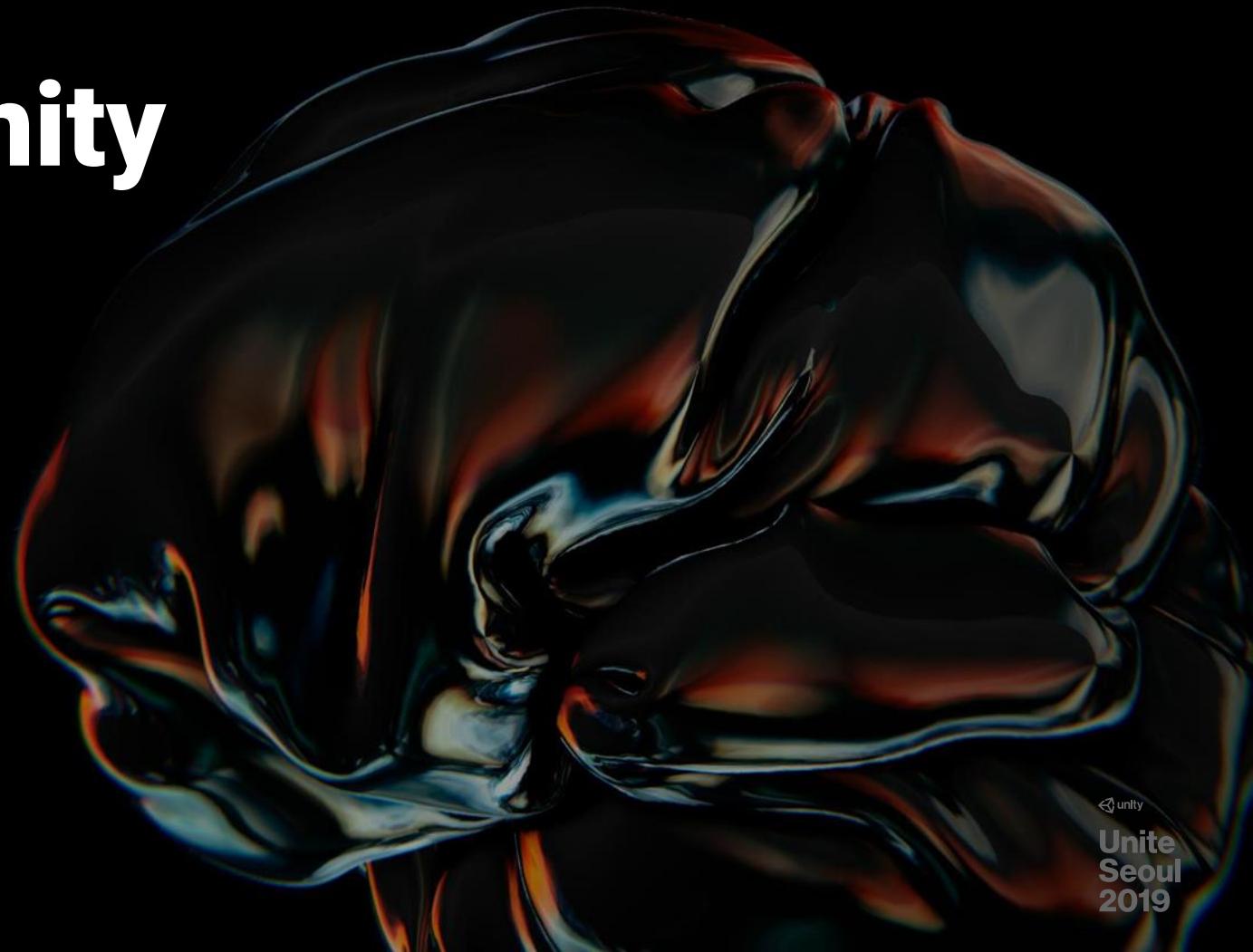
- Multi-agents RL
- Meta RL
- Exploration
 - Curiosity
 - Noise in parameter
- Model-based RL
- Sim2Real
 -
 -
 -

Reinforcement Learning



<https://www.facebook.com/groups/ReinforcementLearningKR/>

AI in Unity



unity

Unite
Seoul
2019

AI in Unity



**Obstacle
Tower Challenge**

Challenges



Machine Learning Agents

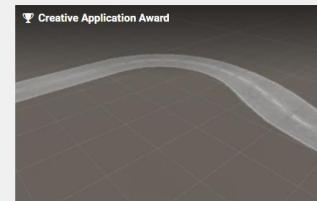
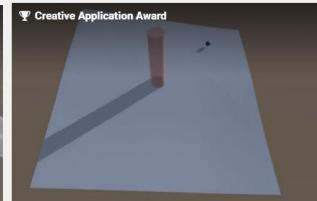
ML-agents Challenge



Machine Learning

Getting started with ML Agents

ML-agents Challenge

 <p>1st Prize Pass the Butter // Pancake bot</p> <p>Christine Barron Los Angeles, United States</p> <p>14581 ▲ 79 ▷ 12 ● 일년 전</p>	 <p>2nd Prize Metal Warfare - Real Time Strategy game</p> <p>Chau Chi Thien Dubai, United Arab Emirates</p> <p>6413 ▲ 21 ▷ 7 ● 일년 전</p>	 <p>3rd Prize Hide / Escape - Avoidance of Pursuing Enemies</p> <p>David Busch Austin, United States</p> <p>10186 ▲ 41 ▷ 9 ● 일년 전</p>	 <p>Community Choice Award Unity3d 跳一跳 AI</p> <p>洪流学堂 洪流学堂</p> <p>Jump(跳一跳) with ML-Agents</p> <p>郑洪晋 技术探路者/创业者/效率达人/终身学习者 Beijing, China</p> <p>8425 ▲ 145 ▷ 16 ● 일년 전</p>	 <p>Community Choice Award</p> <p>STABILIZE</p> <p>Emil Leszczynski CTO/Lead Programmer/Game Designer - SimFabric Warsaw, Poland</p> <p>4061 ▲ 263 ▷ 6 ● 일년 전</p>
 <p>Creative Application Award SpaceY</p> <p>Mikhail Bykhovskiy</p> <p>3319 ▲ 14 ▷ 0 ● 일년 전</p>	 <p>Creative Application Award Vehicle Environment Static Environment</p> <p>Kyushik Min South Korea</p> <p>5552 ▲ 9 ▷ 2 ● 일년 전</p>	 <p>Creative Application Award Autonomous car</p> <p>kwea koi</p> <p>5647 ▲ 17 ▷ 1 ● 일년 전</p>	 <p>Creative Application Award Fun Waves...</p> <p>Kuz Zhukovskiy, Russia</p> <p>2926 ▲ 7 ▷ 0 ● 일년 전</p>	

ML-agents Challenge



Obstacle Tower Challenge



Obstacle Tower Challenge

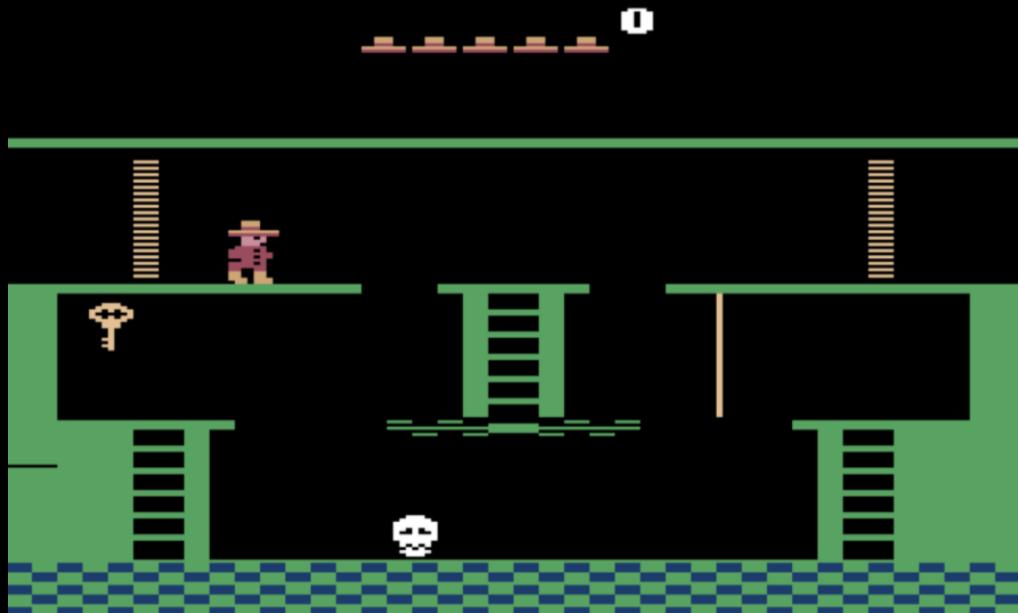
- Montezuma's Revenge

- Challenges

- Sparse reward
- Hard exploration
- Requires planning
- Multi Task

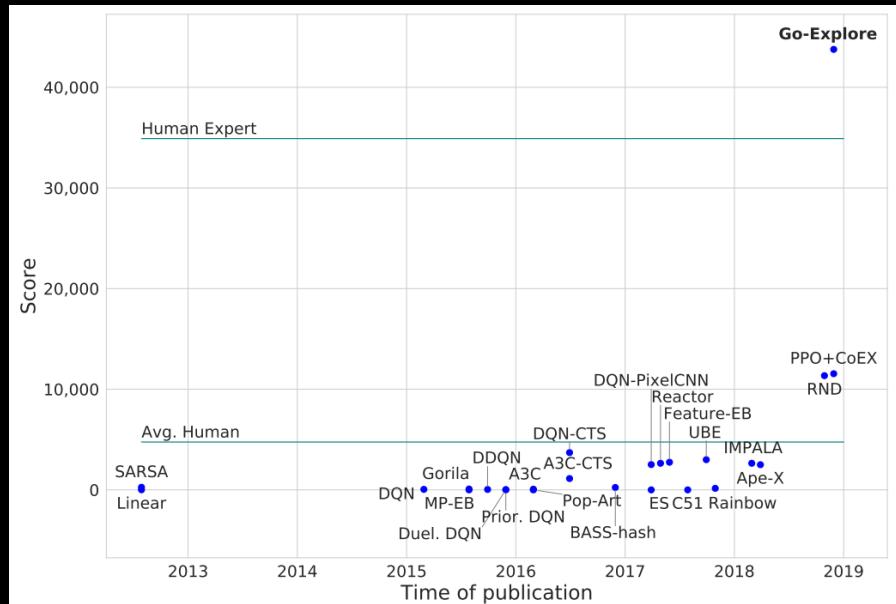


Hard to Solve!!



Obstacle Tower Challenge

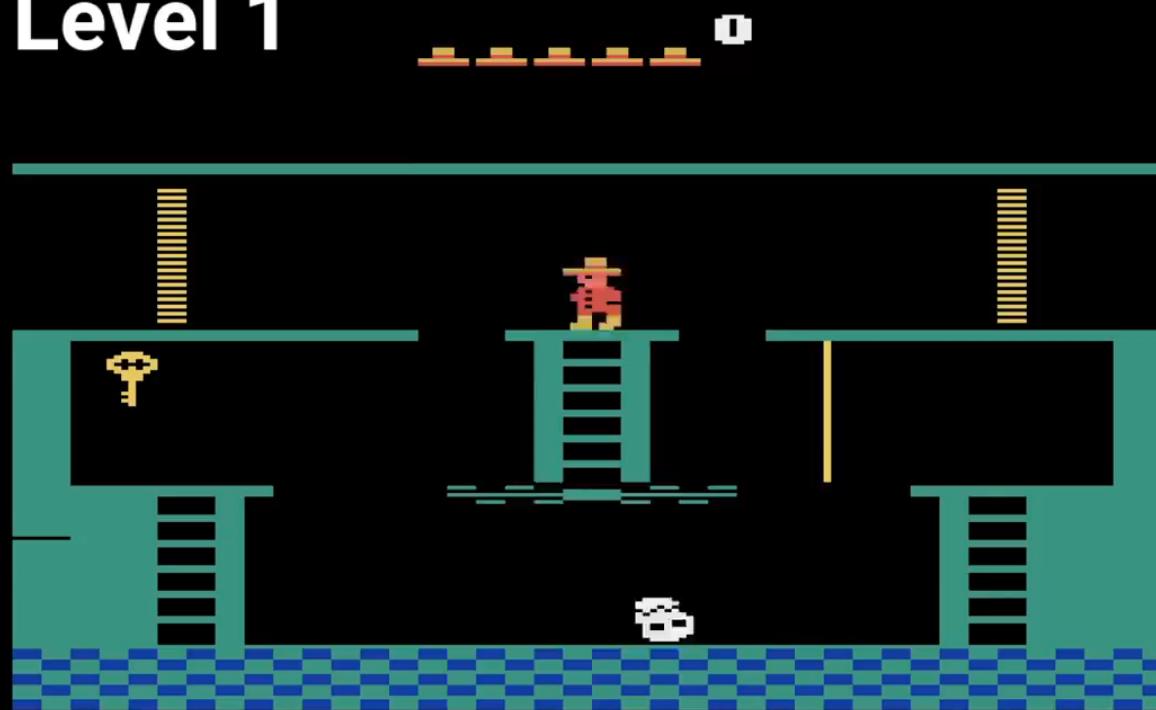
- Montezuma’s Revenge is Solved!
- Demonstration
 - Aytar et al. 2018
- Curiosity
 - Pathak er al. 2017
 - Burda et al. 2018
- Go-Explore
 - Ecoffet et al. 2018



Go-Explore: a New Approach for Hard-Exploration Problems (Ecoffet et al.)

Obstacle Tower Challenge

Level 1

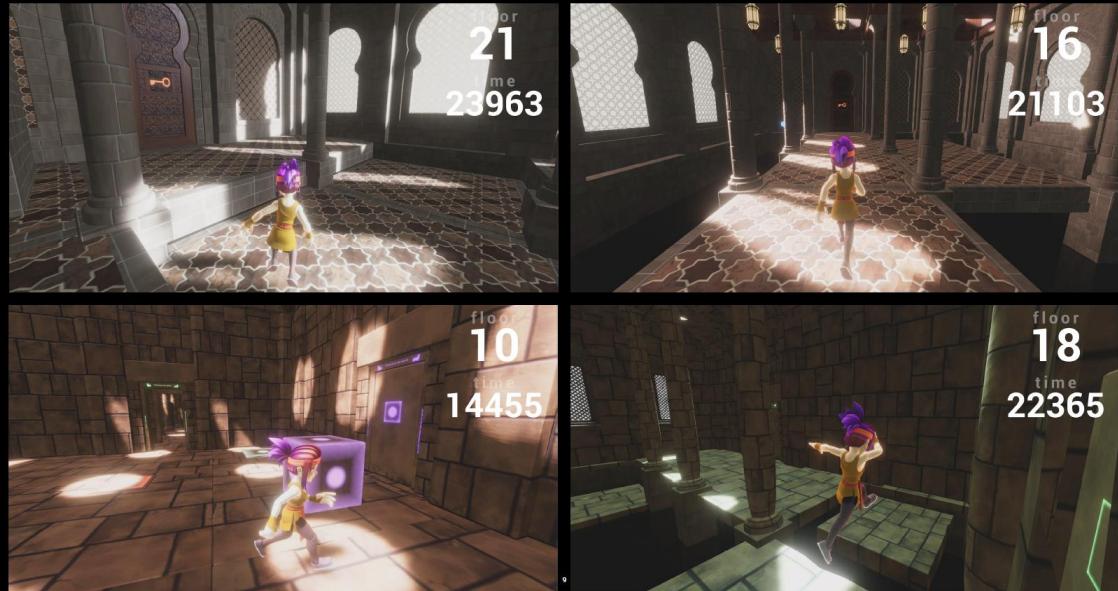


Obstacle Tower Challenge

ML researchers

Obstacle Tower Challenge

- 3D Visual Observation
- Complex floor layout
- Generalization
 - Floor, Room, Wall
 - Every 10 floors
- Multi Task
 - Key
 - Sokoban
 - Pit



Obstacle Tower Challenge

- ModuLabs CTRL Team
 - Kyushik Min
 - Jay Jung
 - Suhyuk Park
 - Hyojeong Jeon
- Round 1 is finished! ☺
- Curiosity based algorithm
- Average 6~7th floor



Obstacle Tower Challenge



Unity ML-agents



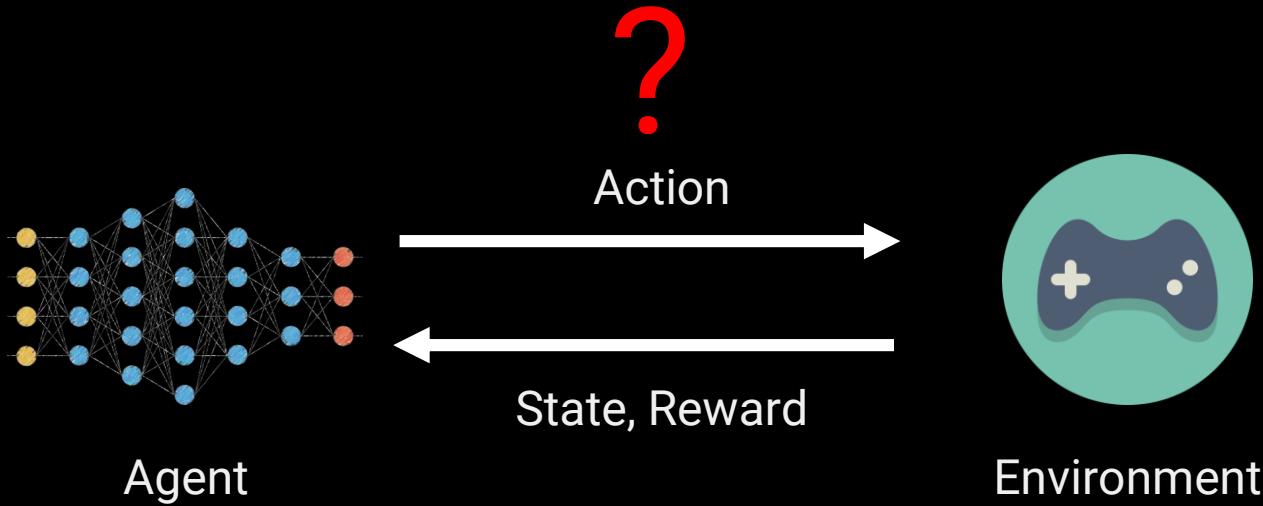
Unity ML-agents

- Reinforcement Learning



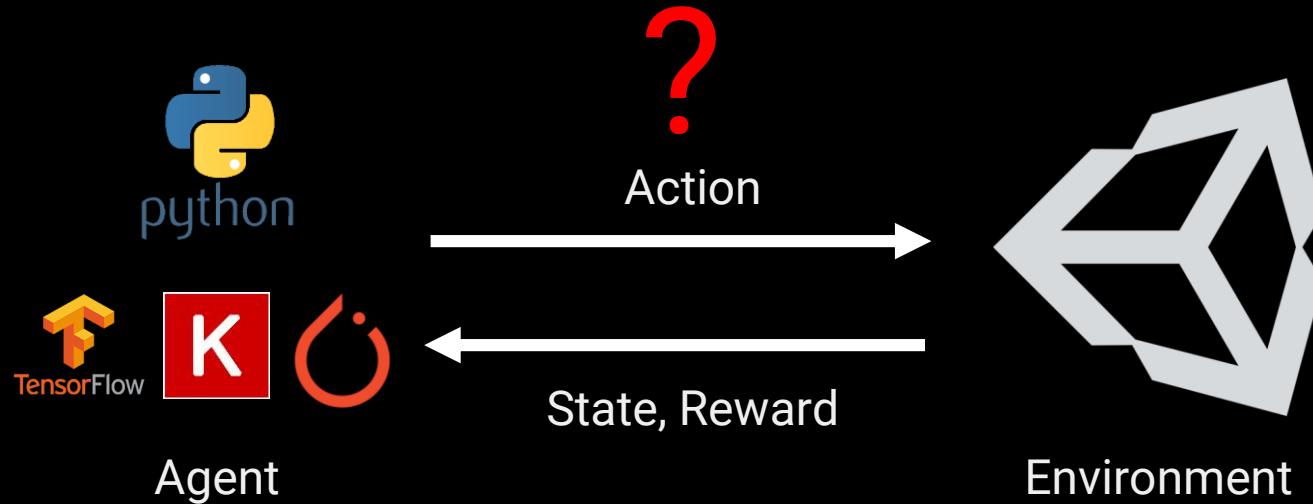
Unity ML-agents

- Deep Reinforcement Learning



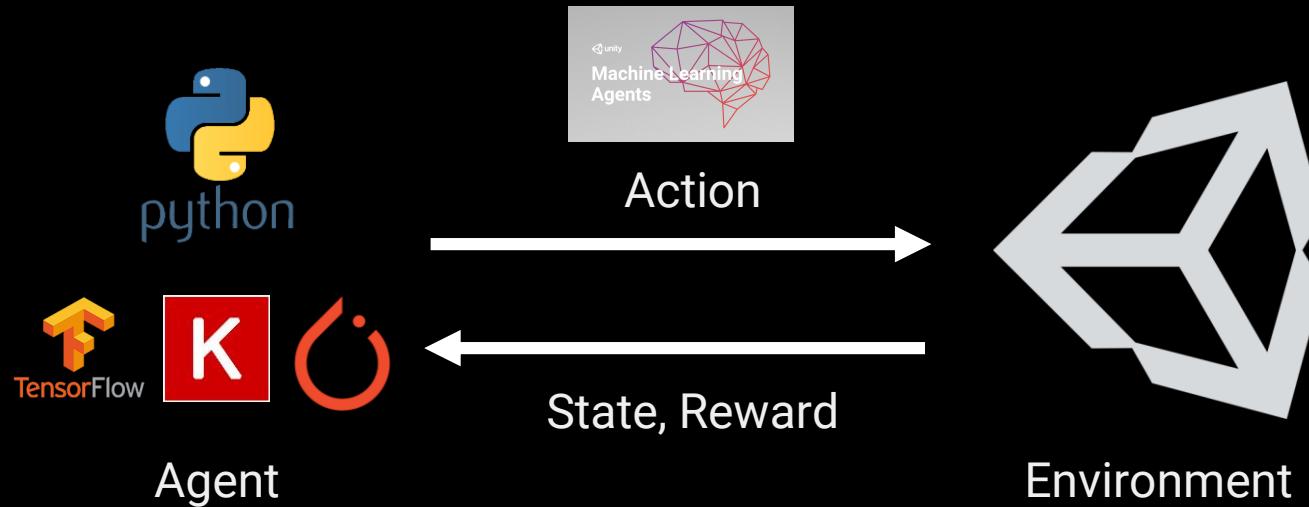
Unity ML-agents

- Deep Reinforcement Learning

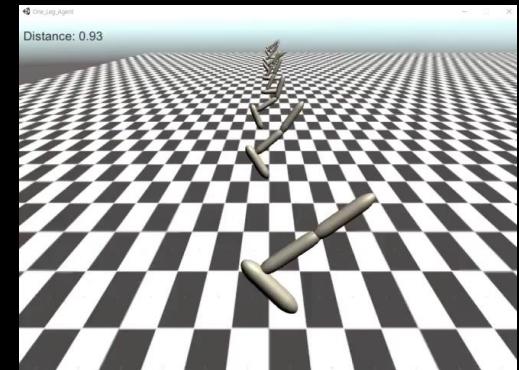
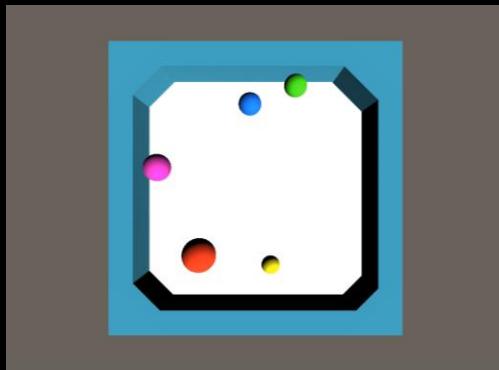
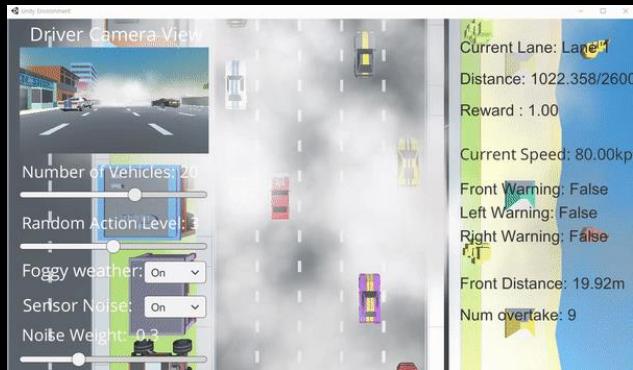
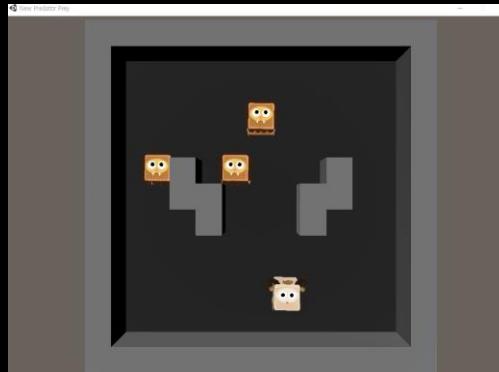


Unity ML-agents

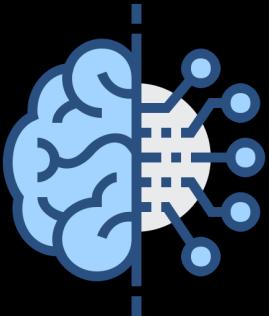
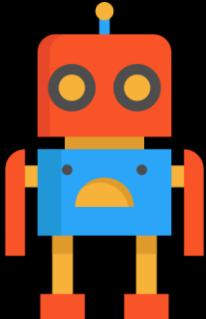
- Deep Reinforcement Learning



Unity ML-agents



Unity ML-agents



Agent

- Script for Agent
- Control Setting
- Reward, done setting

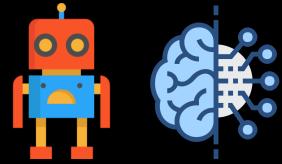
Brain

- Observation setting
- Action setting

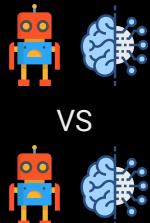
Academy

- Managing brains
- Configuration setting

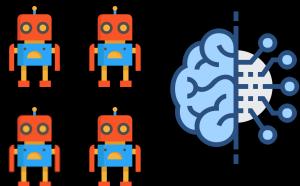
Unity ML-agents



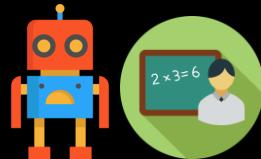
: Single Agent



: Adversarial Agents

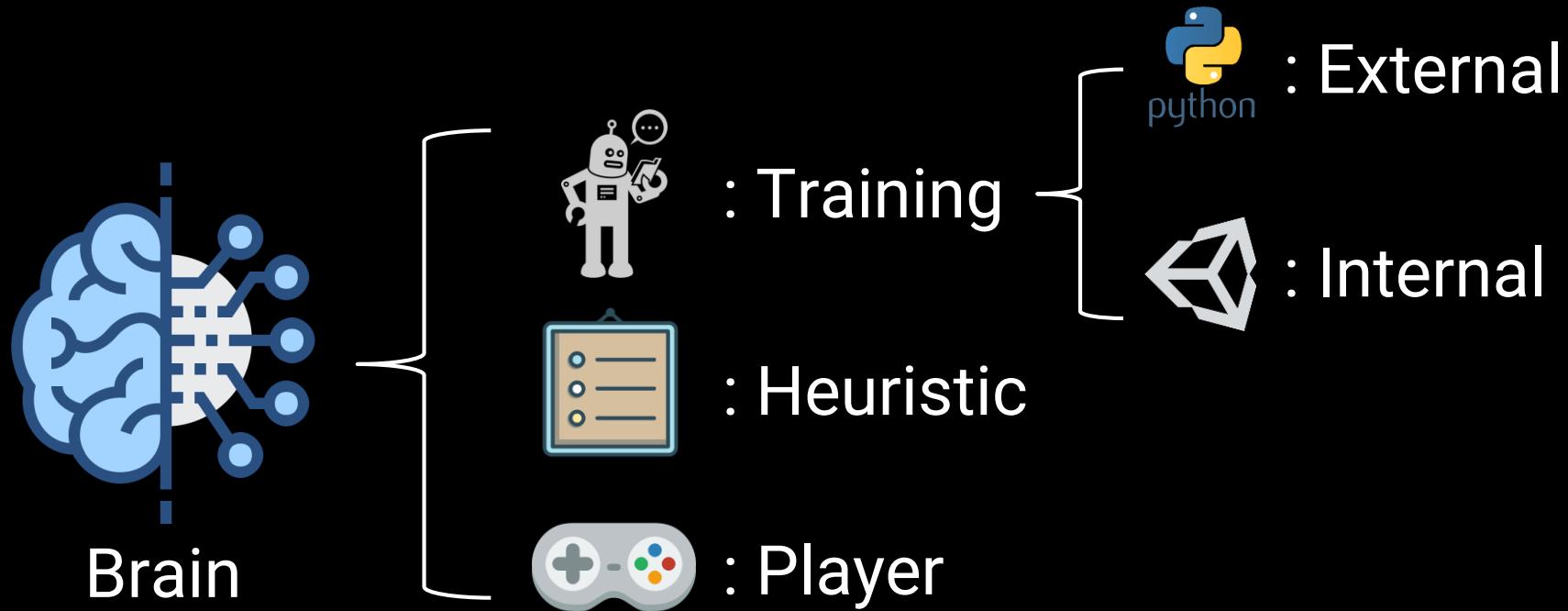


: Multi-Agent

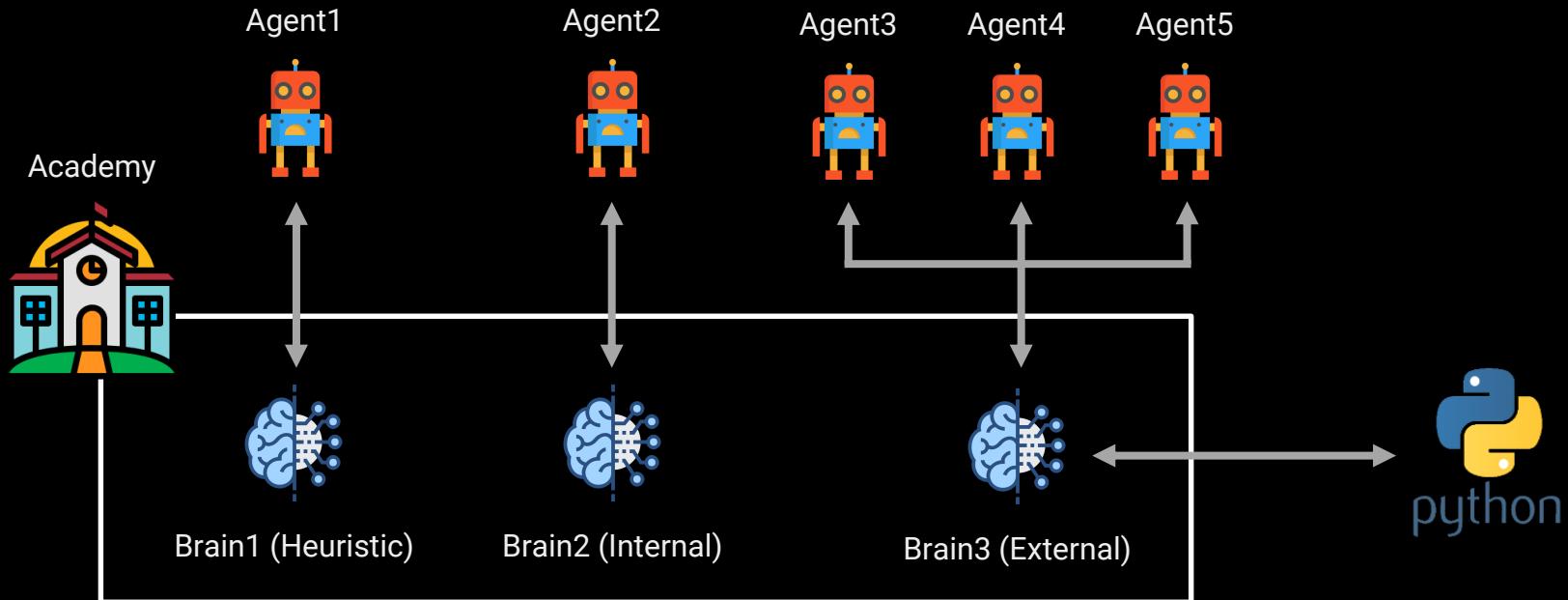


: Imitation Learning

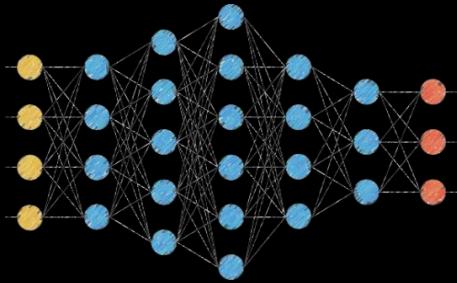
Unity ML-agents



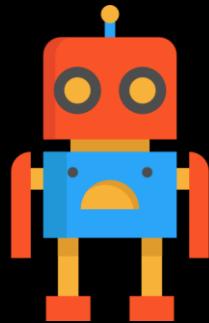
Unity ML-agents



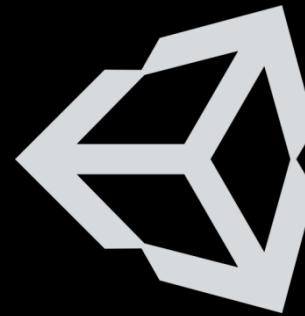
Unity ML-agents



Deep Learning



Reinforcement Learning



Unity

Unity ML-agents Tutorial



RL Korea Unity ML-agents Tutorial Team



https://github.com/reinforcement-learning-kr/Unity_ML_Agents

Unity ML-agents Tutorial



Sokoban

- Discrete Action
- Deep Q-Network (DQN)



Drone

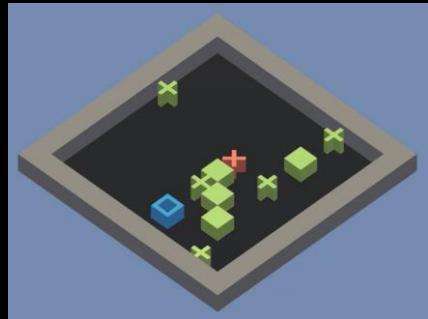
- Continuous Action
- Deep Deterministic Policy Gradient (DDPG)



Pong

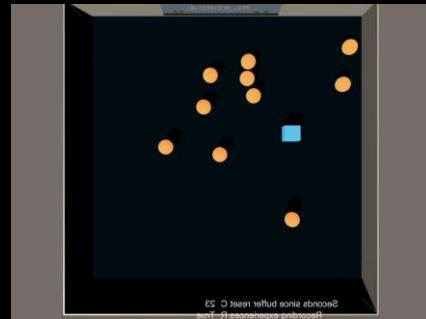
- Adversarial Environment
- Discrete Action
- DQN

Unity ML-agents Tutorial



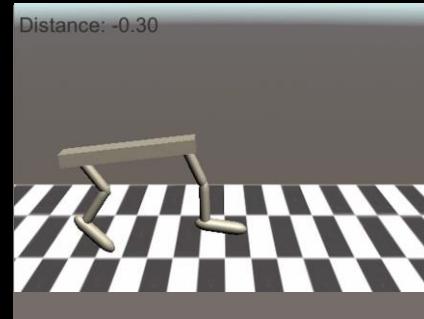
Sokoban (Curriculum)

- Curriculum Learning
- Discrete Action
- DQN



Dodge

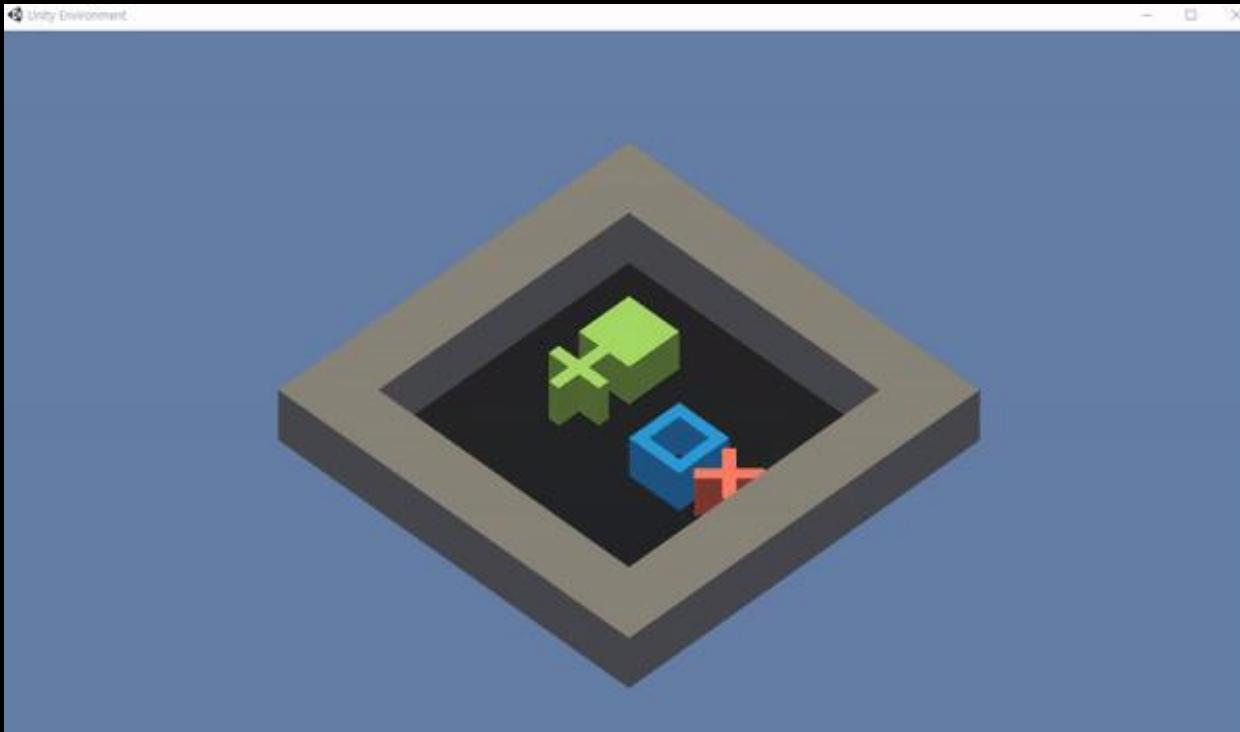
- Imitation Learning
- Discrete Action
- Behavioral Cloning



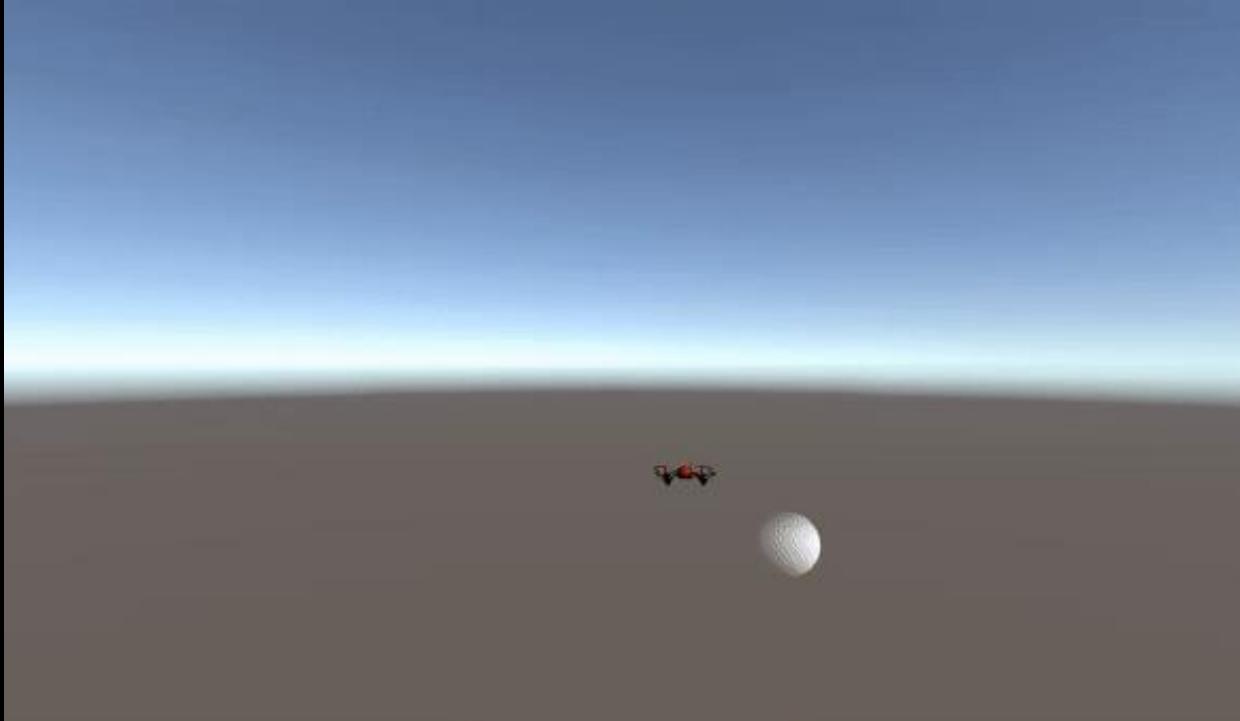
TwoLeg Walker

- Multi-agents
- Continuous Action
- MADDPG

Unity ML-agents Tutorial



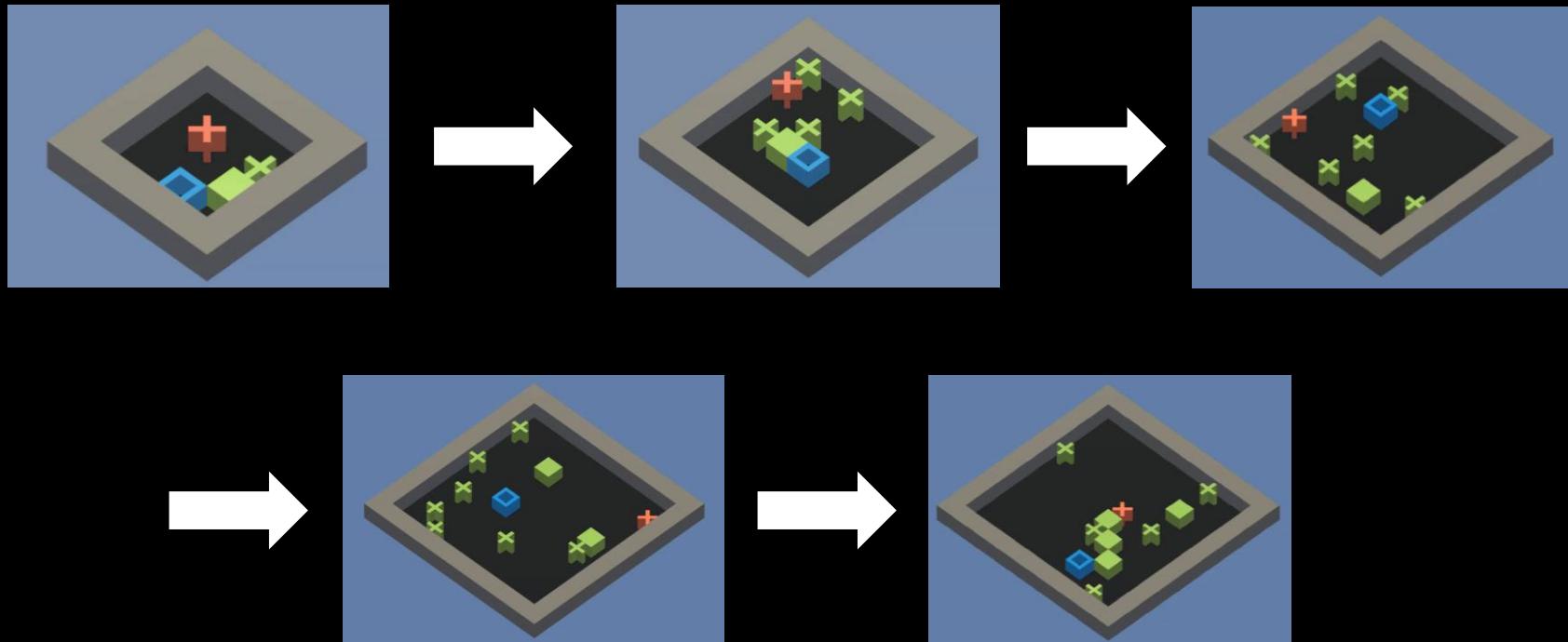
Unity ML-agents Tutorial



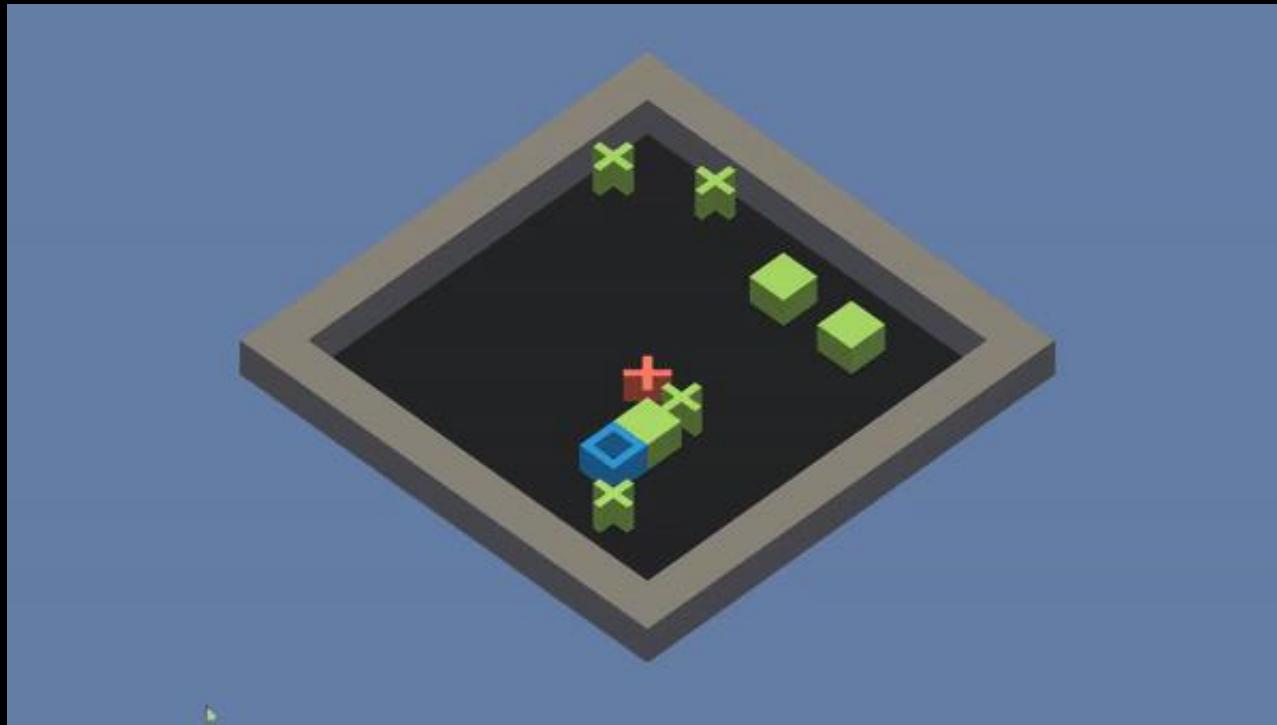
Unity ML-agents Tutorial



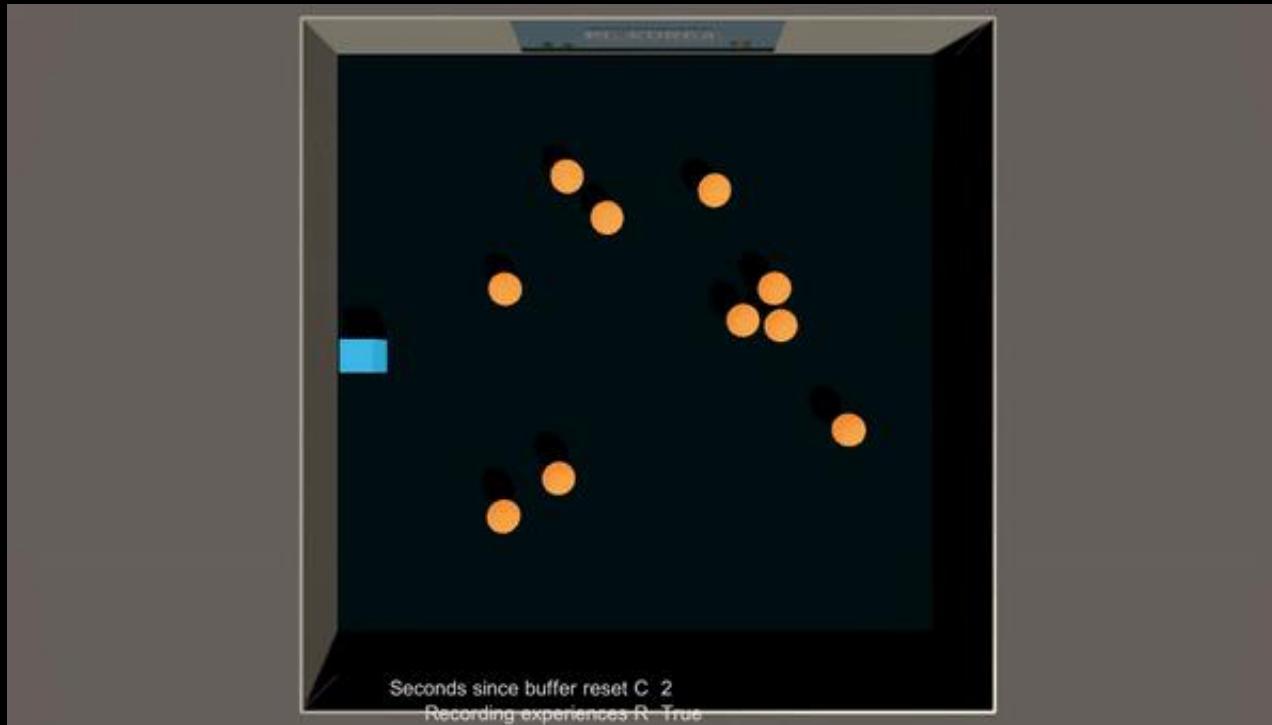
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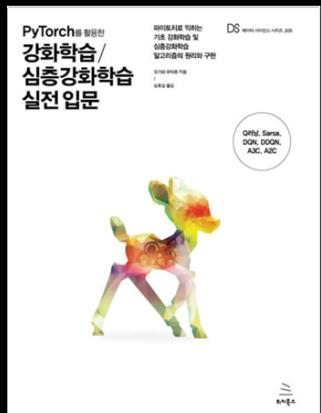


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Thank you



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