



PUBLIC SECTOR
SUMMIT ONLINE

RACE 1

Get Started with AWS DeepRacer

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Agenda

AWS DeepRacer

Introduction to Reinforcement Learning

AWS DeepRacer Console Walkthrough

AWS DeepRacer League Presented by Accenture

DEEPRACER VIDEO

Introducing AWS DeepRacer

Introducing AWS DeepRacer Evo



How can we put reinforcement learning in the hands of all developers? Literally.

AWS DeepRacer



AWS DeepRacer Evo



3D racing simulator



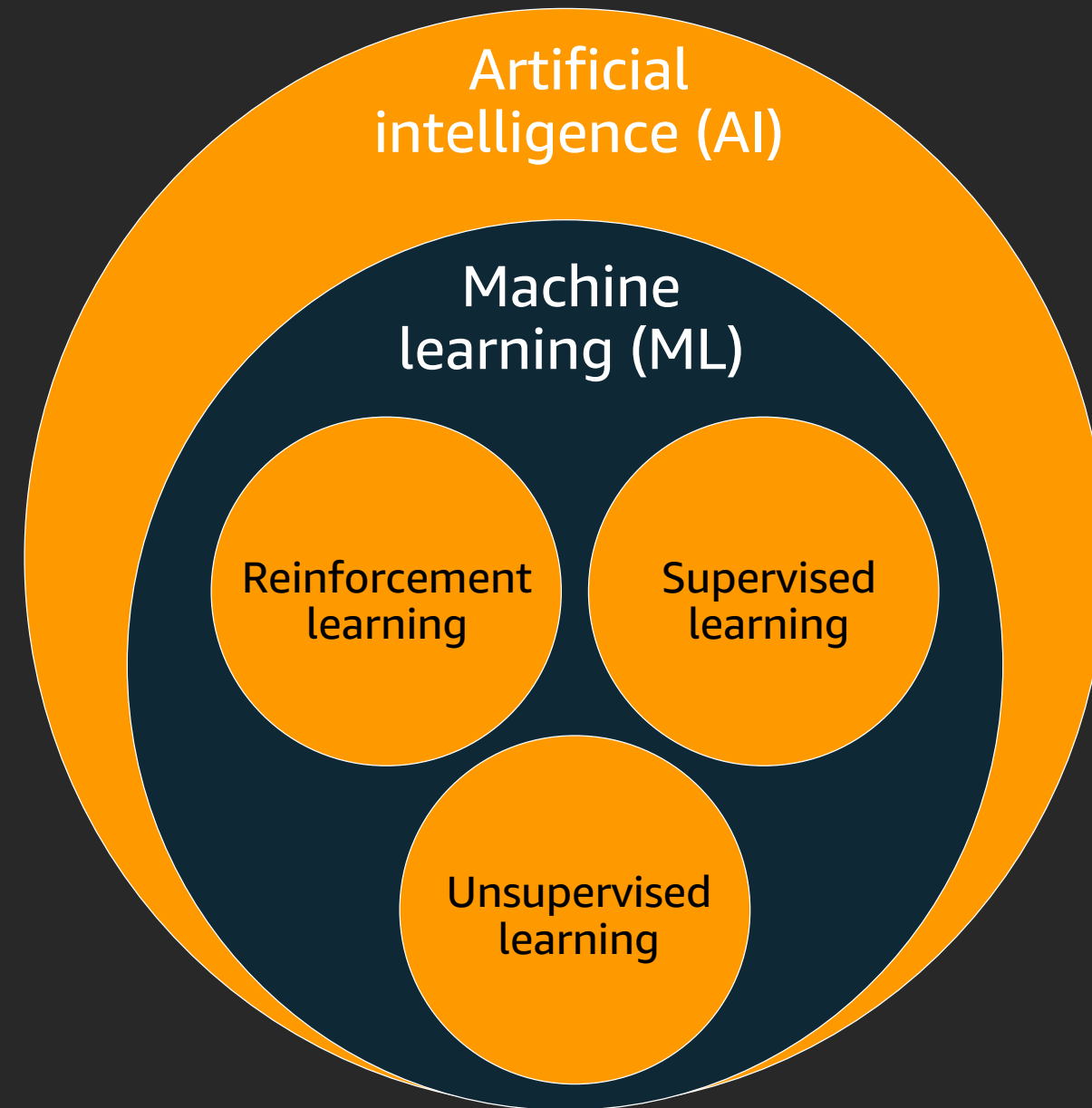
AWS DeepRacer
League Presented
by Accenture



Community Races

Reinforcement learning for the Sunday driver

Reinforcement learning in the broader AI context

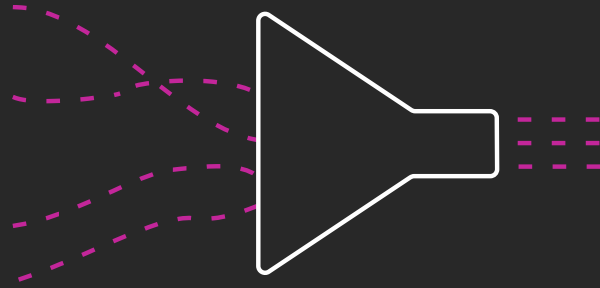


ML overview



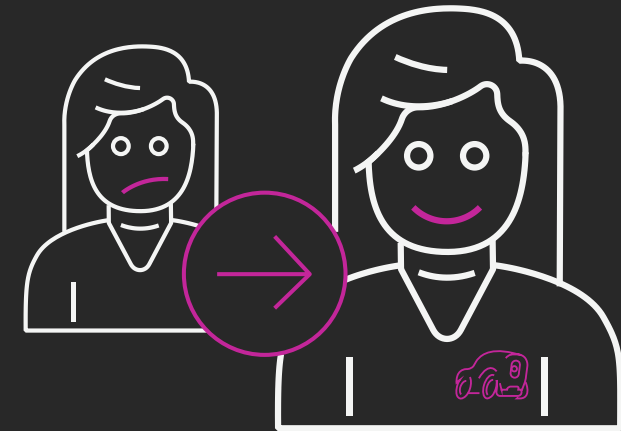
Supervised

Example-driven training; every datum has a corresponding label



Unsupervised

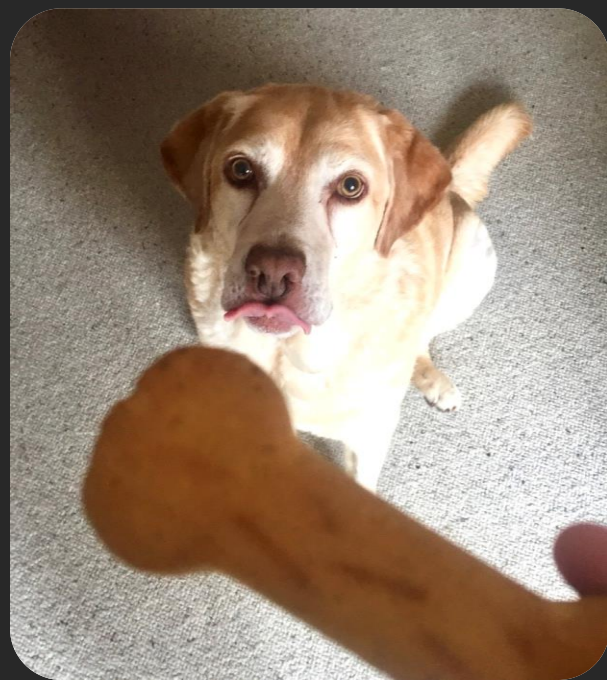
No labels for training data



Reinforcement

Learns through consequences of actions in a specific environment

RL in the real world



Reward positive behavior

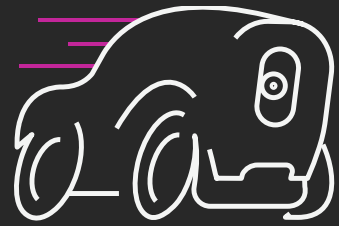


Don't reward negative behavior

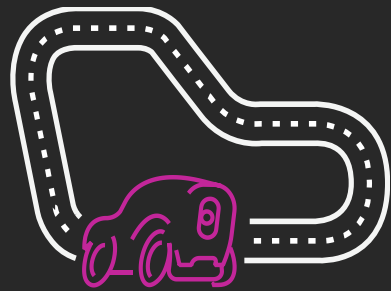


The result!

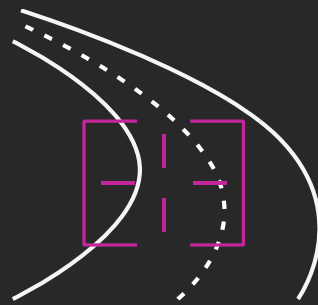
Reinforcement learning terms



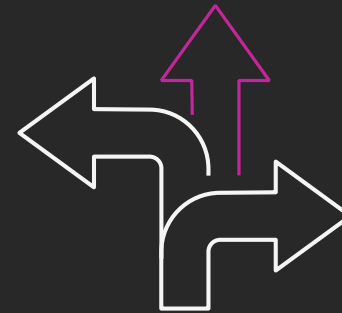
Agent



Environment



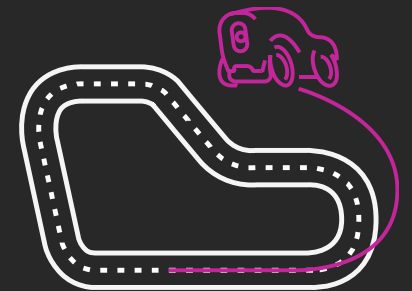
State



Action



Reward



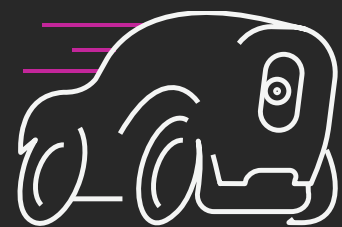
Episode

The reward function

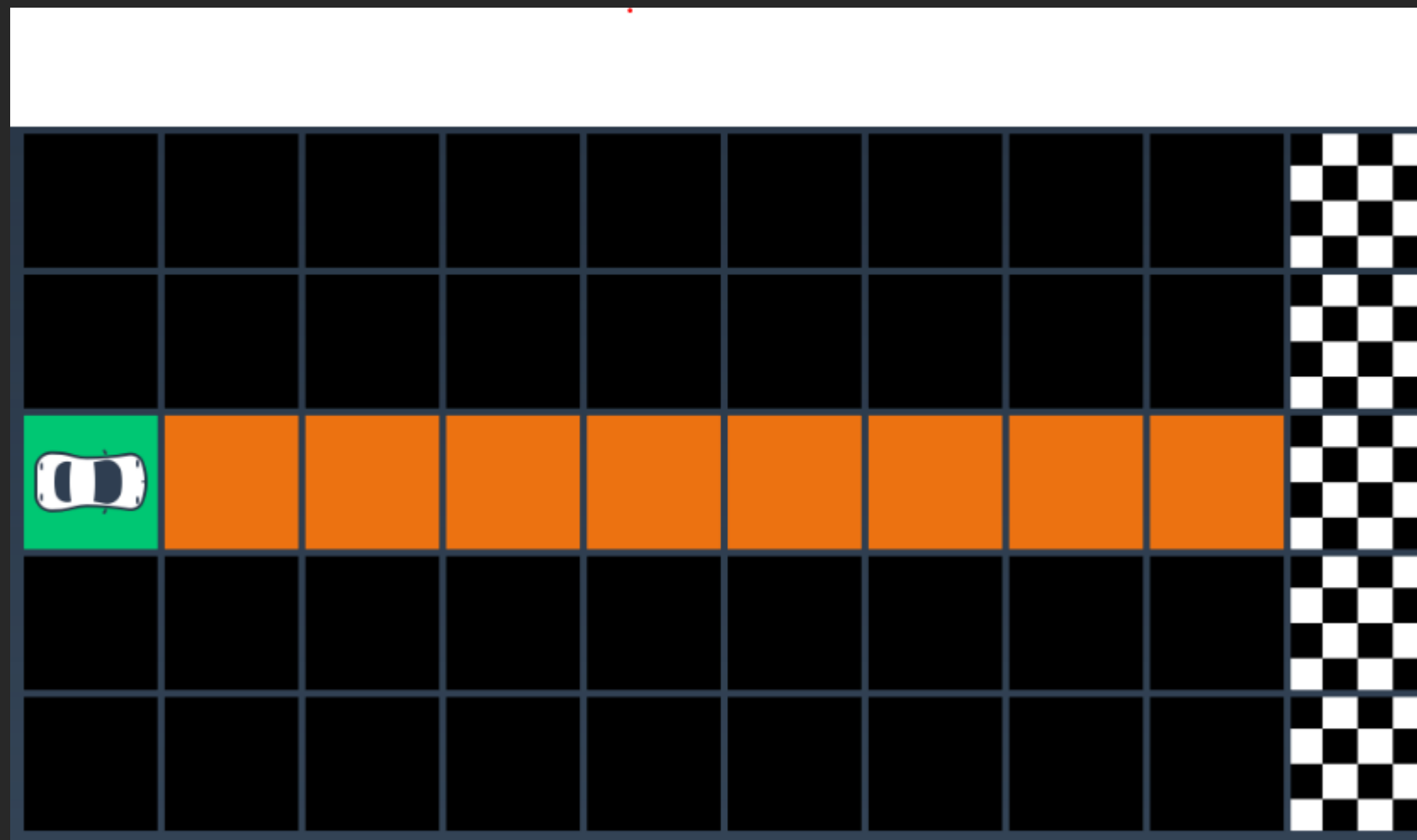


The reward function incentivizes particular behaviors and is at the core of reinforcement learning

The reward function in a grid race









Agent

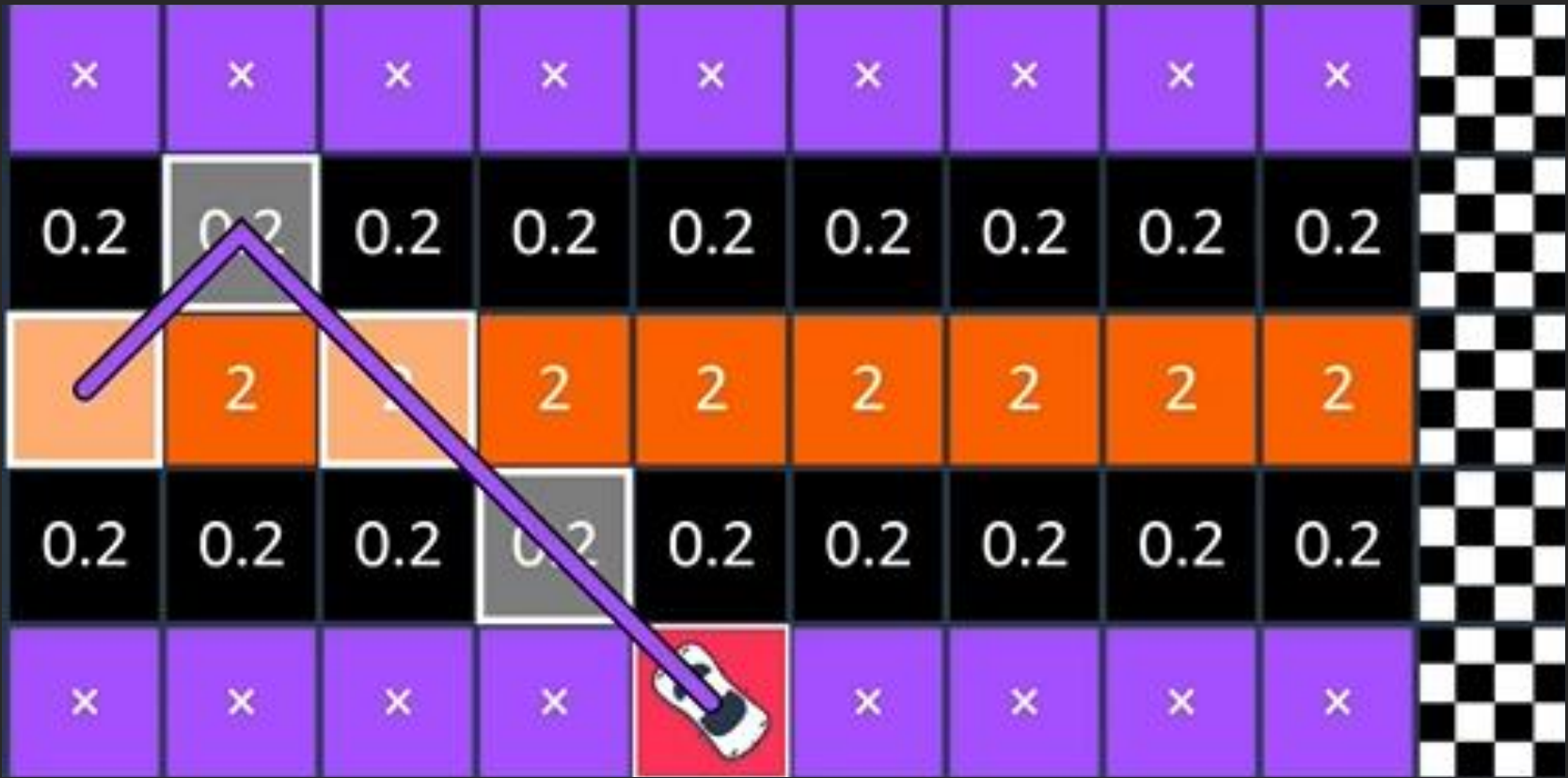


Goal

Rewards that incentivize center line driving

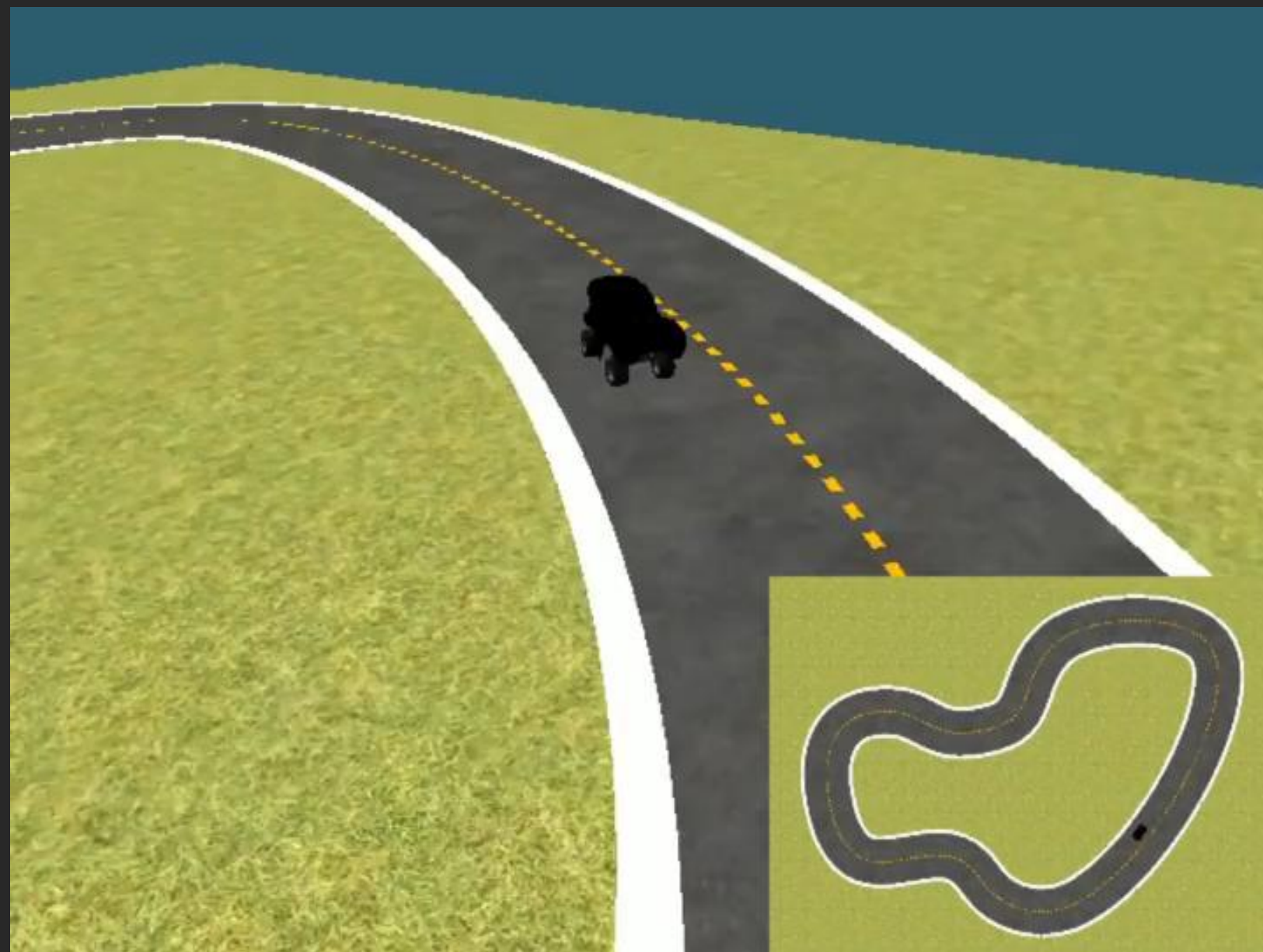
x	x	x	x	x	x	x	x	x	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	2	2	2	2	2	2	2	2	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
x	x	x	x	x	x	x	x	x	

Iteration and convergence



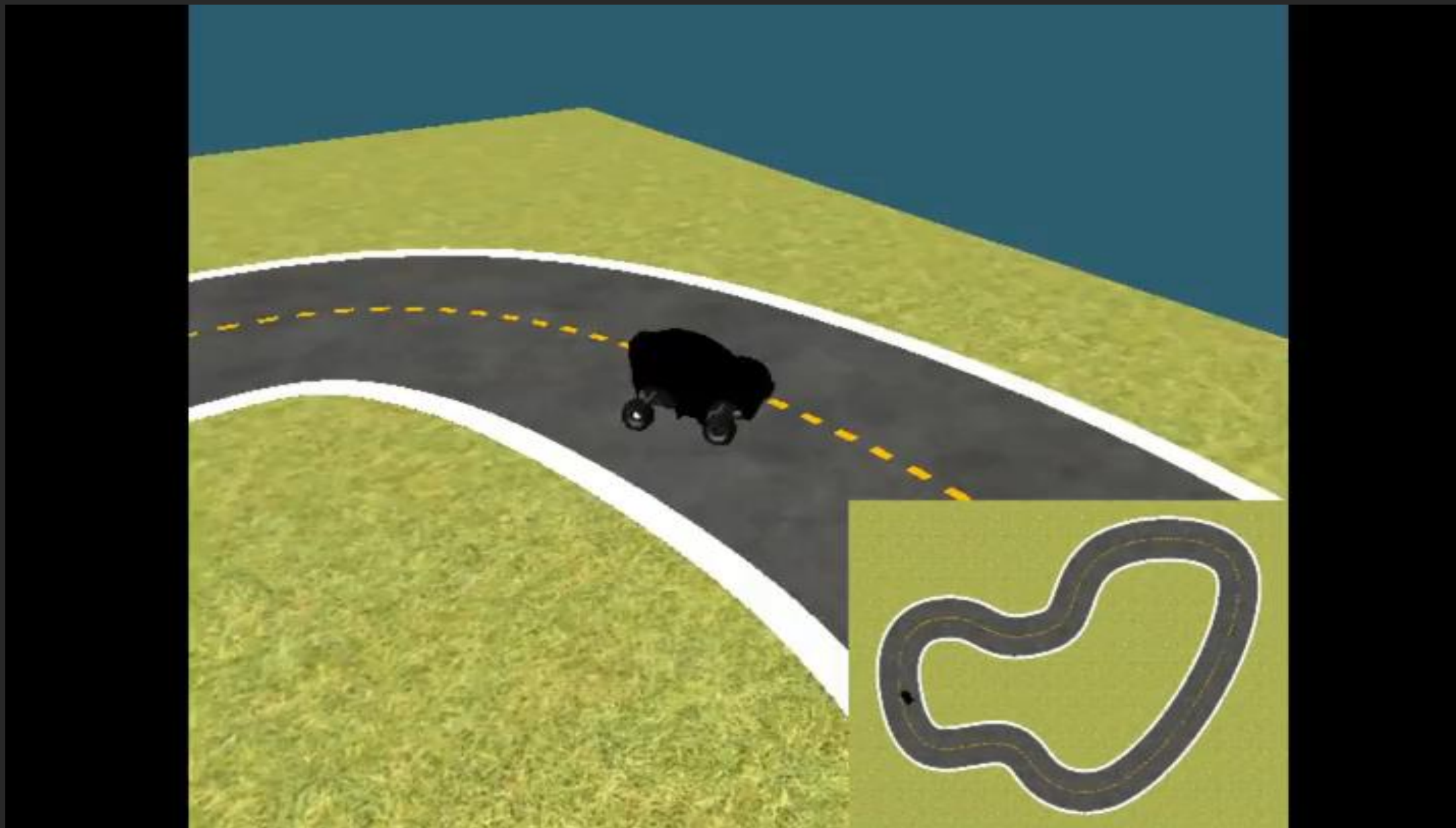
Exploration versus exploitation

Exploration









Exploration versus exploitation

Exploitation



Rewards that incentivize center line driving

x	x	x	x	x	x	x	x	x	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	2	2	2	2	2	2	2	2	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
x	x	x	x	x	x	x	x	x	

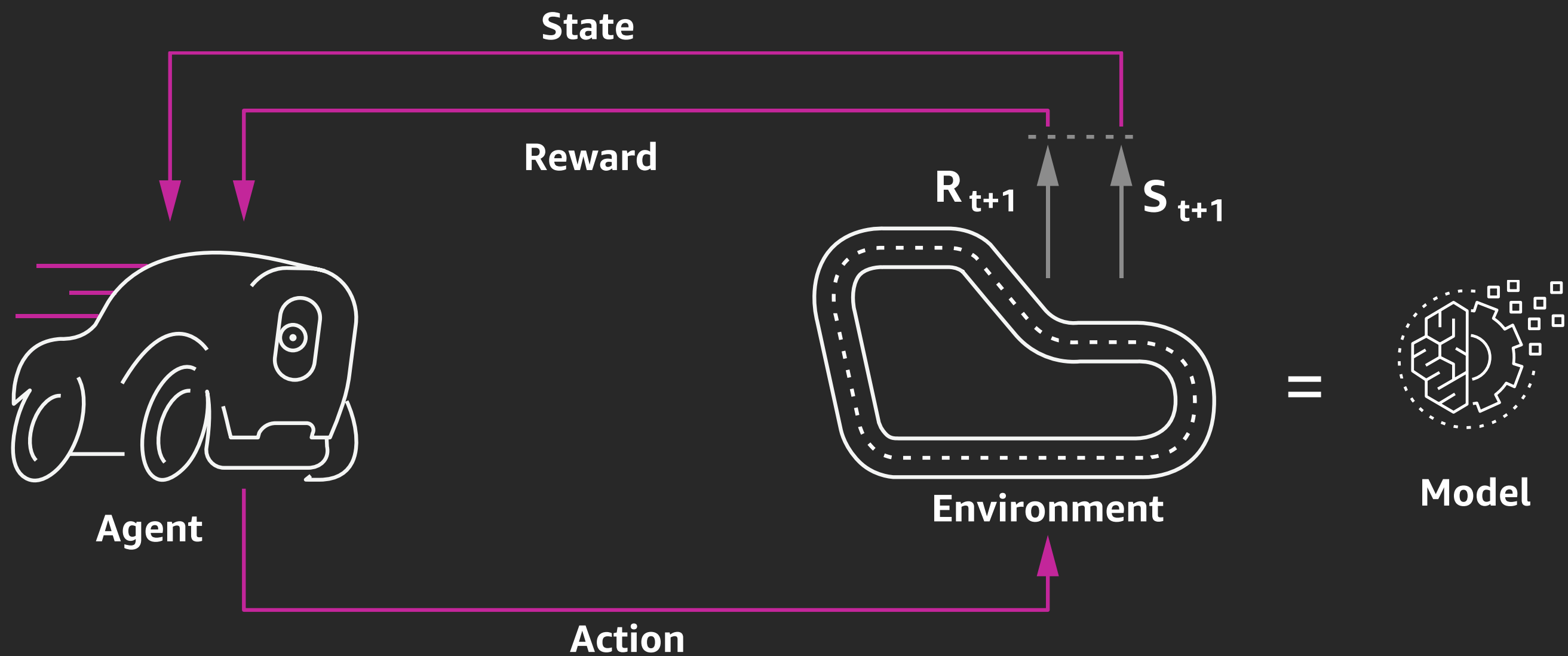
Recap before we continue

Reinforcement
learning

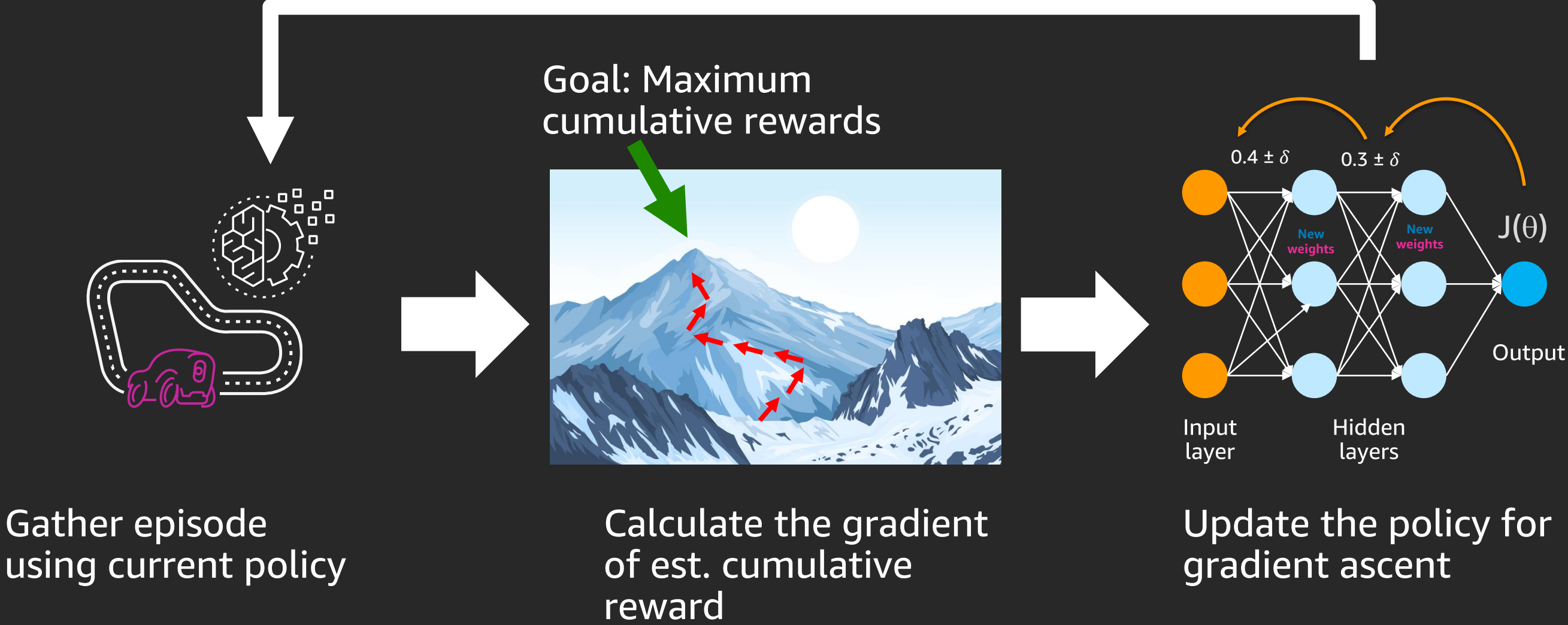


x	x	x	x	x
0.2	0.2	0.2	0.2	0.2
 2	2	2	2	2
0.2	0.2	0.2	0.2	0.2
x	x	x	x	x

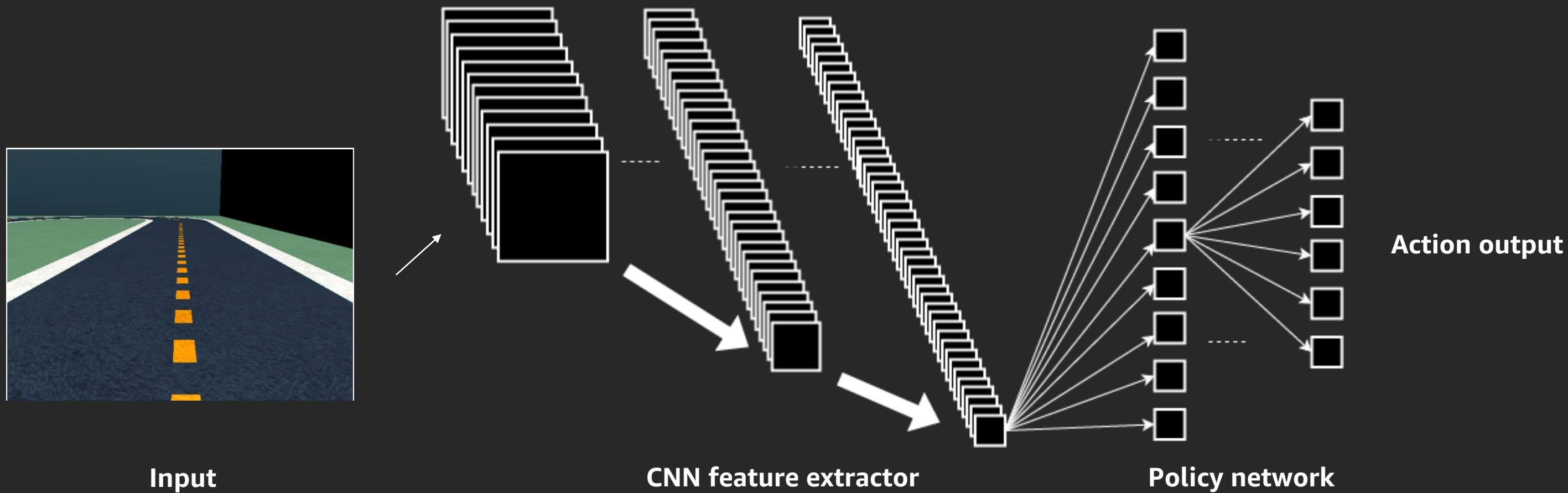
How does learning happen?



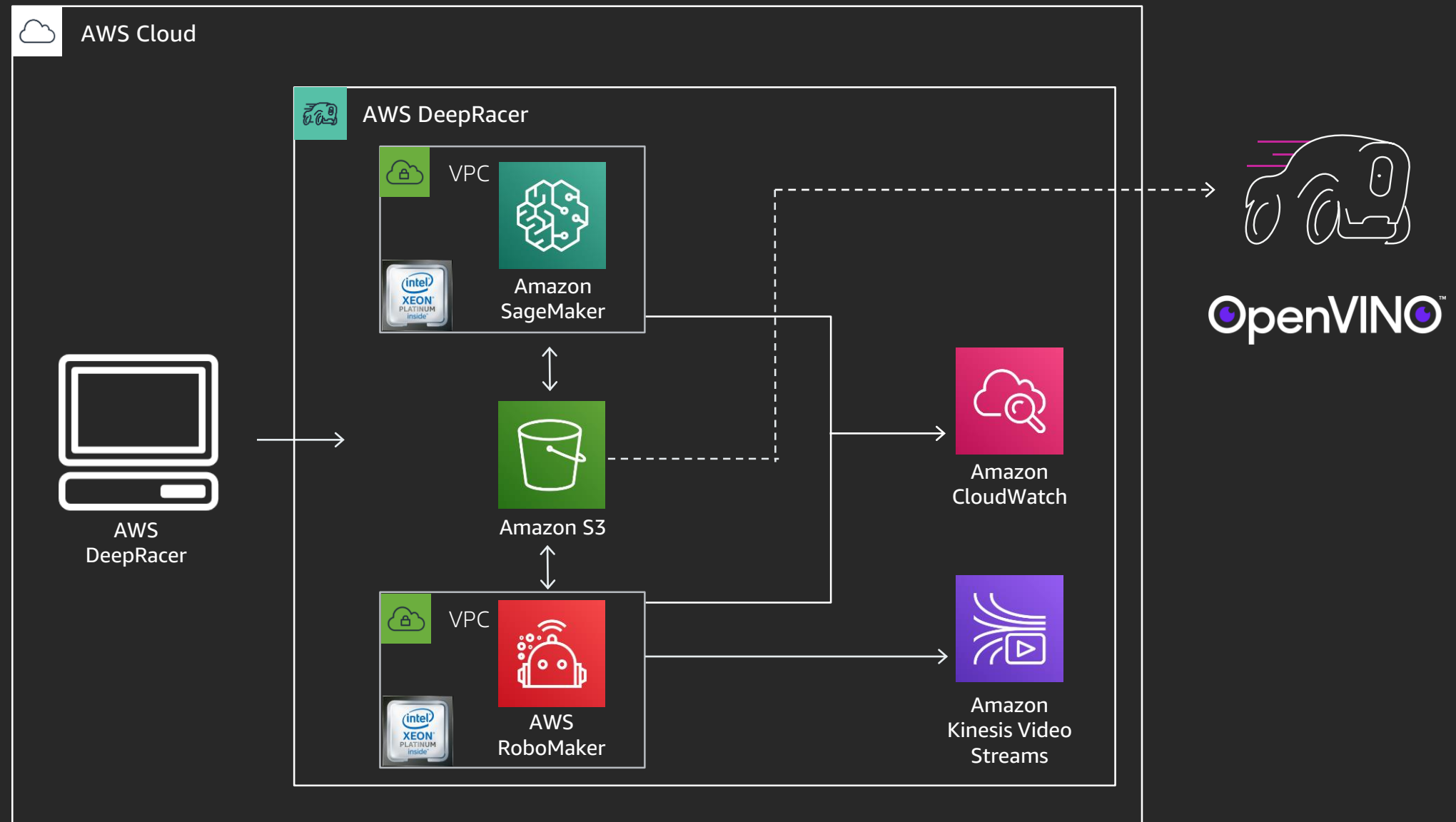
RL algorithms: Vanilla policy gradient



AWS DeepRacer neural network architecture



AWS DeepRacer simulator architecture



Under the hood

- 1:18 4WD scale car
- Intel Atom processor
- Intel distribution of OpenVINO toolkit
- Stereo Camera (4MP)
- 360 Degree 12 Meters Scanning Radius LIDAR Sensor
- System memory: 4 GB RAM
- 802.11ac Wi-Fi
- Ubuntu 16.04.3 LTS
- ROS Kinetic

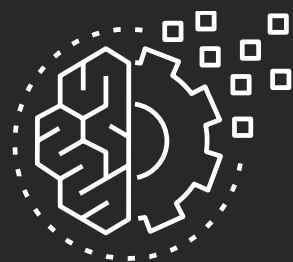


 OpenVINO™

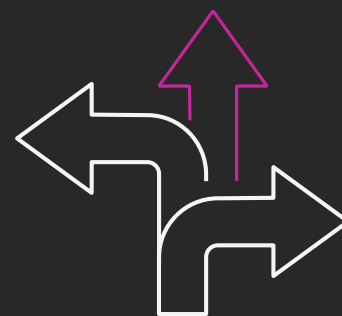
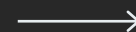
Optimizing and inferencing with OpenVINO™



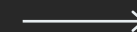
Input data



OpenVINO™
optimized
model



OpenVINO™
inference
results



Racing



Free Download ▶ software.intel.com/openvino-toolkit
Open Source version ▶ 01.org/openvinotoolkit

Demo — Console Walkthrough

1. Get Started
2. Garage + Action Space
3. Creating your first model
4. Reward Function
5. Printing log to CW — parameters discussion
6. Building model
7. Evaluation
8. Hyperparameters

AWS DeepRacer League presented by
Accenture

AWS DeepRacer League in 2020!



2 ways to race

Online Virtual
Circuit

Summit Circuit

3 race formats

Time trial

Object
Avoidance

Head-to-head

Prizes!

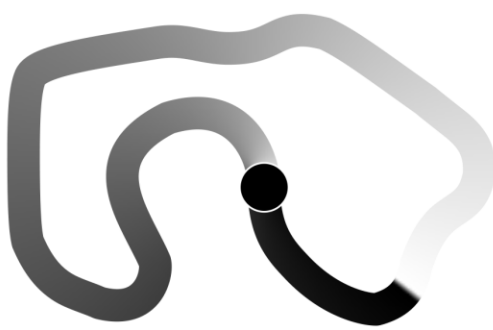
Paid trip to
re:Invent!

Win DeepRacer
cars

www.deepracerleague.com

AWS DeepRacer League 2020: Virtual Circuit

Time trials



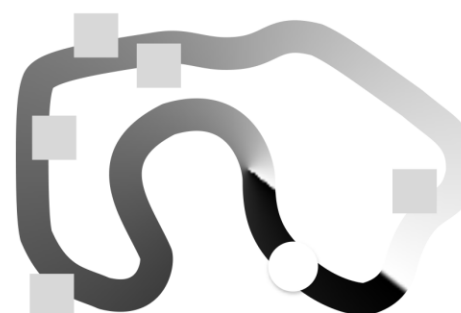
Overall rank
--/
1,308

Top racer
Fumiaki

Best time
01:36:283

Leaderboard Enter race

Object avoidance




Overall rank
-- /
401

Top racer
MasterRL007

Best time
01:36:283

Leaderboard Enter race

Head-to-head race



Overall rank
-- /100

Leaderboard Enter race

8 months of virtual racing, 3 race divisions, 24 chances to win

Unleash the Power of AI and ML with Accenture

Accenture is a global professional services company, with a deep history of helping customers around the world build artificial intelligence (AI) and machine learning (ML) powered solutions with AWS services.

Together, Accenture and AWS bring the best of both worlds to accelerate innovation in the cloud.



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partner
network

machine learning
competency



Deep Experience with AWS DeepRacer

In 2019, Accenture launched the world's largest private DeepRacer league to date, featuring physical and virtual races in over 30 global locations.

The Accenture league champion was a top 16 finalist at the AWS DeepRacer Championship Cup at AWS re:Invent.



Connect with Accenture at www.accenture.com/AI



Additional resources

- **DeepRacer Slack Community:** <http://join.deepracing.io/>
- **GitHub:** <https://github.com/aws-samples/aws-deepracer-workshops/>
- **Free video course:** <https://www.aws.training/Details/eLearning?id=32143>
- **Tips:** <https://aws.amazon.com/deepracer/racing-tips/>
- **Forum:** <https://forums.aws.amazon.com/forum.jspa?forumID=318>
- **Intel® Distribution of OpenVINO™ toolkit:**
<https://software.intel.com/en-us/openvino-toolkit>

Thank you!

Donnie Prakoso

Thank you for attending PS Summit Online

We hope you found it interesting! A kind reminder to **complete the survey**.

Let us know what you thought of today's event and how we can improve the event experience for you in the future.

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