

Amazon Robot Crews and AI Technology

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Amazon robots

<https://www.agvnetwork.com/robots-amazon>



RoboStow



Amazon new robots

<https://www.youtube.com/watch?v=4za8UK5cUsM>





**Realizing the full value of robotics automation requires
optimization from a single view**



Business drivers for automated operations



Scale



Customer experience



Standardization



Cost improvement

Companies rely on robots for automated operations

2023

when mobile autonomous robots will be the standard for logistics and fulfillment processes¹

>175

Amazon robotic fulfillment centers open around the world²

70%

of all mobile material handling equipment will be autonomous by 2030 (compared to 2% today)¹

>350k

robotic drive units used by Amazon around the world²

¹ IDTechEx | ²Amazon



What makes robotics development hard?

Build

- Multi-domain expertise is required to build robots
 - Iterative development is required to get it right
-

Test

- There is limited robot hardware and restricted access to physical environments
 - Scaling to create multiple scenarios in the physical world is hard
-

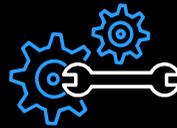
Deploy and manage

- Deployment and updates need to be managed
- Setting up a secure communication layer between the robot and external systems is difficult

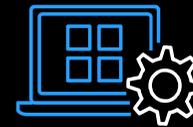
Robotics application development and testing is **time consuming, complicated** and **resource intensive**



Multi-domain expertise required to build robots



Iterative development to get it right



Configuration management is hard



Limited robot hardware available for testing



Deployment and updates need to be managed

Robotics development cycle



New application release and update

Robotics industry trends



Open-source
software and
hardware



Intelligent
robotics through
AI/ML



Connected
products



Robot-as-a-service
(RaaS)



Cloud is
an enabler

The Amazon ML stack: AI Services

Vision

Forecasting

Recommendation



REKOGNITION
IMAGE



REKOGNITION
VIDEO



TEXTRACT



FORECAST



PERSONALIZE

Speech



POLLY



TRANSCRIBE

Language



TRANSLATE



COMPREHEND



LEX

Search



KENDRA

Fraud



FRAUD DETECTOR

ML SERVICES



AMAZON
SAGEMAKER

ML FRAMEWORKS & INFRASTRUCTURE



Amazon Rekognition

기계 학습을 통해 이미지 및 비디오 분석을 자동화

What you will build today

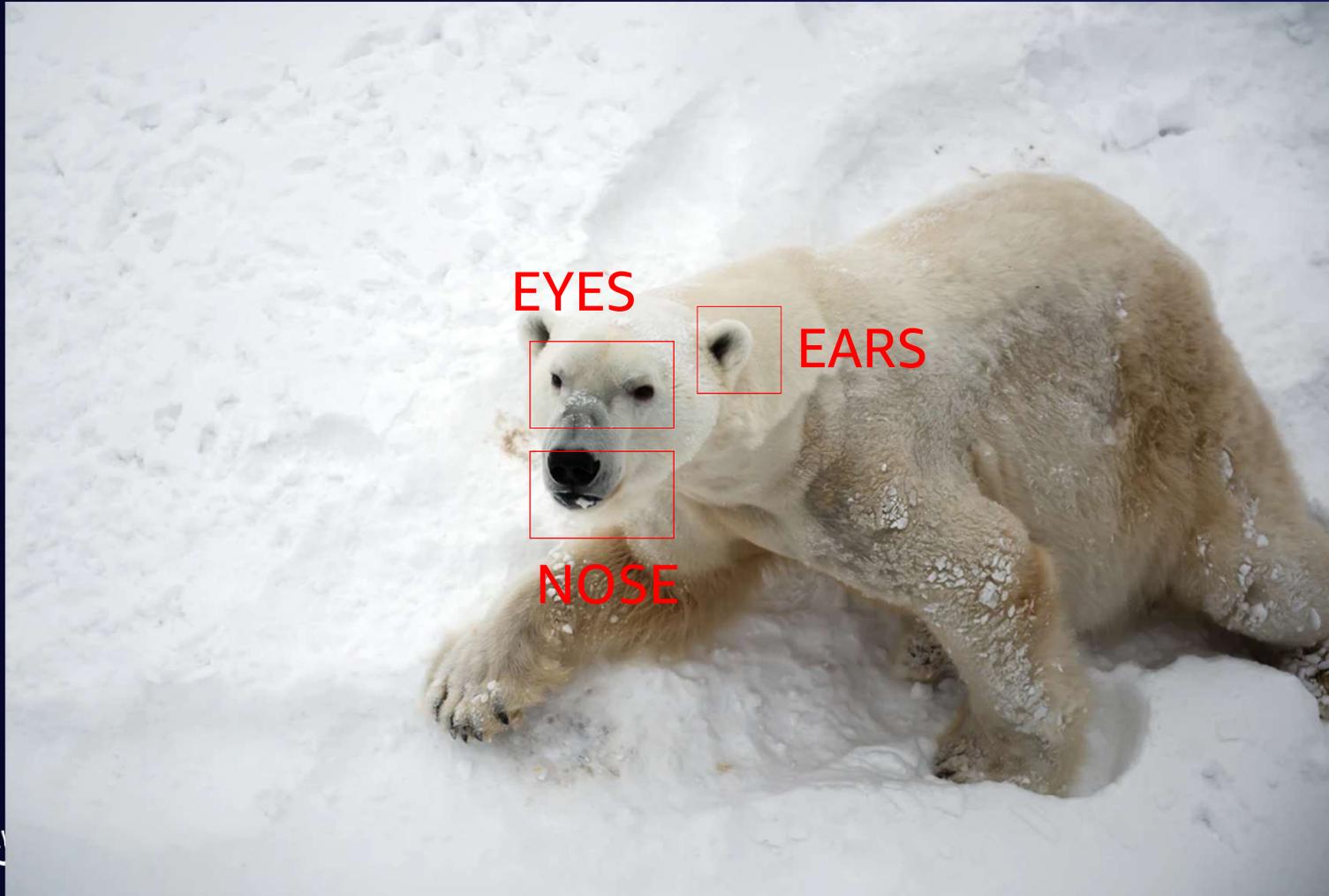
- In search of food, polar bears are wandering further into human towns every year. Encounters between humans and bears can be deadly for both.
-
- Our mission is to create an early bear detection system that sends an SMS message to a nearby ranger as soon as a bear is spotted.

Bear: 99.9%, Cuteness*: 70.2%



*Cuteness not a reliable prediction by machine learning

How would you identify a polar bear?

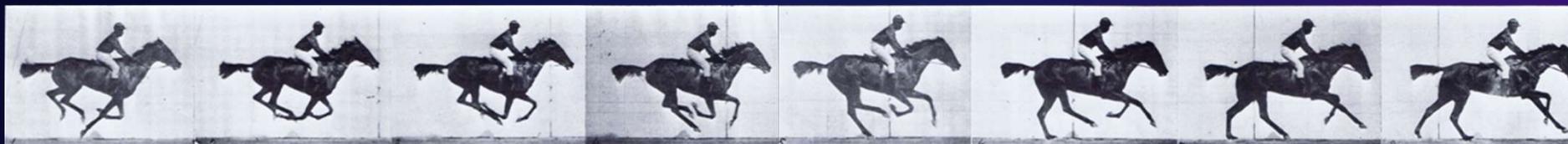


Amazon Rekognition은 이미지 및 비디오를 통해 정보를 추출하기 위해 머신러닝을 적용

Images



Video



Amazon Rekognition Image: 딥러닝 기반 이미지 분석 서비스



객체/장면 인식



표정 분석



얼굴 비교



얼굴 인식



유명인 인식



이미지 필터링

Amazon Rekognition Video

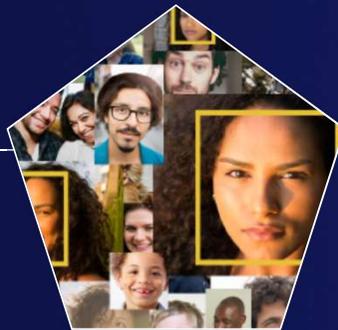
Video Analysis



객체 및 **행동** 탐지



사람 추적



얼굴 인식



실시간 라이브 스트림



안전하지 않은 비디오 탐지



유명인 인식

Demo: Public Safety – Video Analysis



LIVE STREAMING ●
Front Door Camera 1



Amazon Rekognition Demos - 유명 인사 인식



결과

	Park Myeong-su 자세히 알아보기
매칭 신뢰도	100 %
	Jeong Jun-ha 자세히 알아보기
매칭 신뢰도	100 %
	Haha 자세히 알아보기
매칭 신뢰도	99 %
	Jo Se-ho
매칭 신뢰도	99 %
	Yang Se-hyeong
매칭 신뢰도	100 %
	Yoo Jae Suk 자세히 알아보기
매칭 신뢰도	96 %

Amazon Rekognition Demos - 얼굴 비교

Reference face



Comparison faces



Done with the demo?
[Learn more](#)

▼ Results



Similarity 94 %



► Request

Amazon Rekognition API – 얼굴 분석

Demographic Data

Male
97.4%

Sentiment Expressed

Facial Landmarks

Happy
96.0%

Eyes are open
100%

Image Quality

Smiling
96.3%

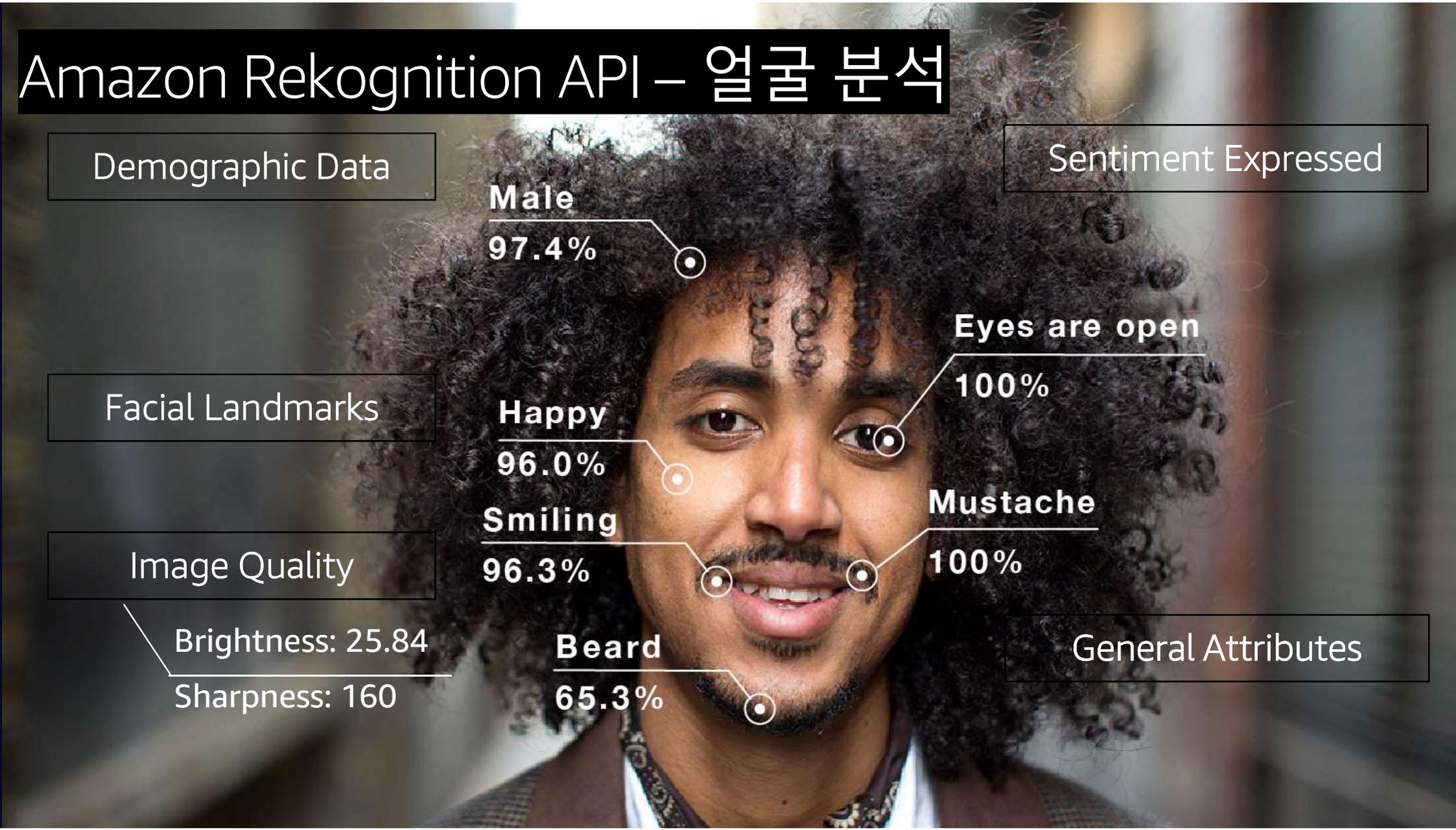
Mustache
100%

Brightness: 25.84

Sharpness: 160

Beard
65.3%

General Attributes



Amazon Rekognition Custom Labels

일반적인 식별



Machine: 96.9%
Wheel: 95.5%
Bracket: 80.3%

특화된 식별



Prop shaft mid bearing



Clutch pressure plate



Plant: 99.2%
Corn: 95.3%
Food: 95.3%
Vegetable: 95.3%



Sweet Corn



Field Corn

DeepRacer & DeepLens



최신 AWS 서비스 Amazon DeepLens

세계 최초로 딥 러닝이 지원되는 개발자용 비디오카메라



개체 탐지



새 분류



행동 인식



얼굴 탐지

내부 살펴보기

- 1:18 4WD 축소 모형차
- 인텔 아톰 프로세서
- OpenVINO 툴킷의 인텔 배포
- 스테레오 카메라 (4백만화소)
- 360 도 12 미터 탐색 반경 LIDAR 센서
- 시스템 메모리: 4 GB RAM
- 802.11ac Wi-Fi
- Ubuntu 16.04.3 LTS
- ROS Kinetic



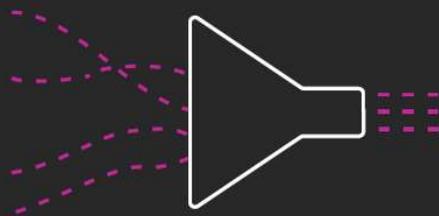
OpenVINO™

ML 개요



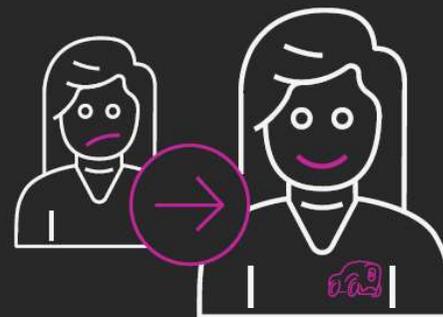
지도학습

예제 기반 학습; 모든 데이터는 상응하는 레이블을 갖습니다



비지도학습

학습 데이터에 대해 레이블이 없습니다



강화학습

특정 환경에서 연속적인 행위를 통해 학습합니다

실제 세계에서 의 강화학습



긍정적 행동에
대해 보상합니다



부정적 행동에
대해 보상하지
않습니다



결과!

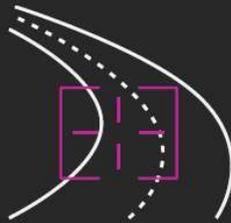
강화학습 용어



에이전트



환경



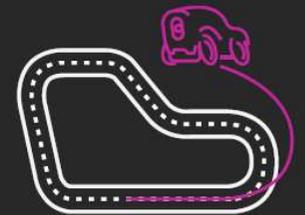
상태



행동



보상



에피소드

보상 함수

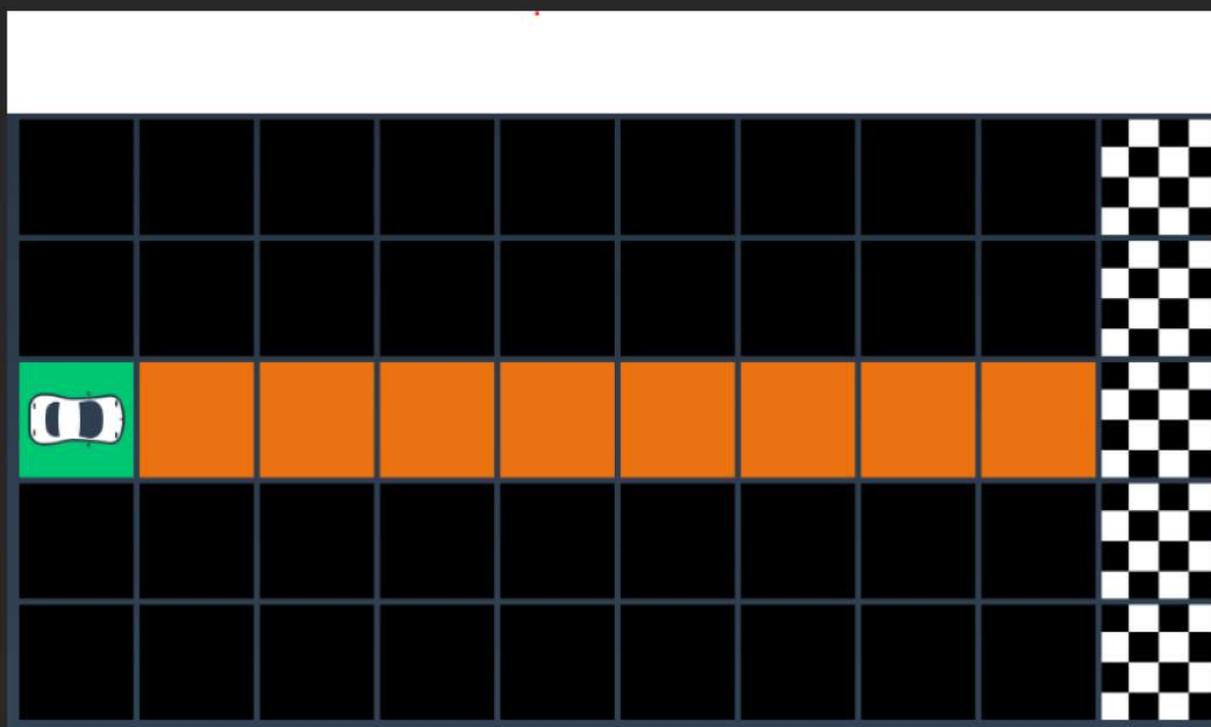


보상 함수는 특정 행동을 유도하고,
강화학습의 핵심입니다

그리드 경주에서의 보상 함수

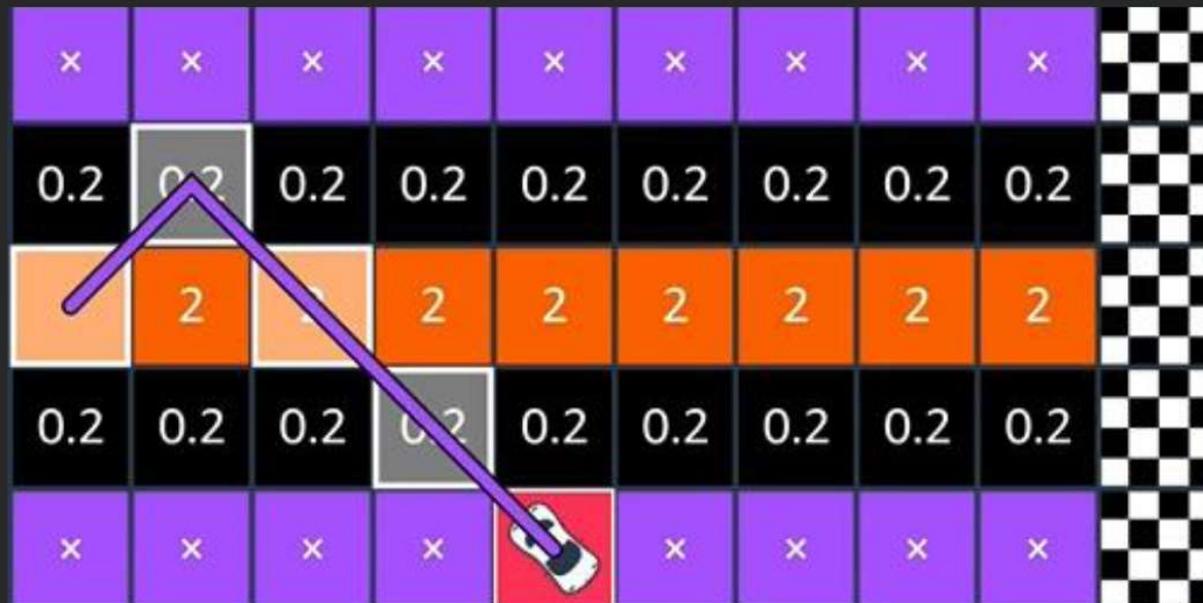


에이전트

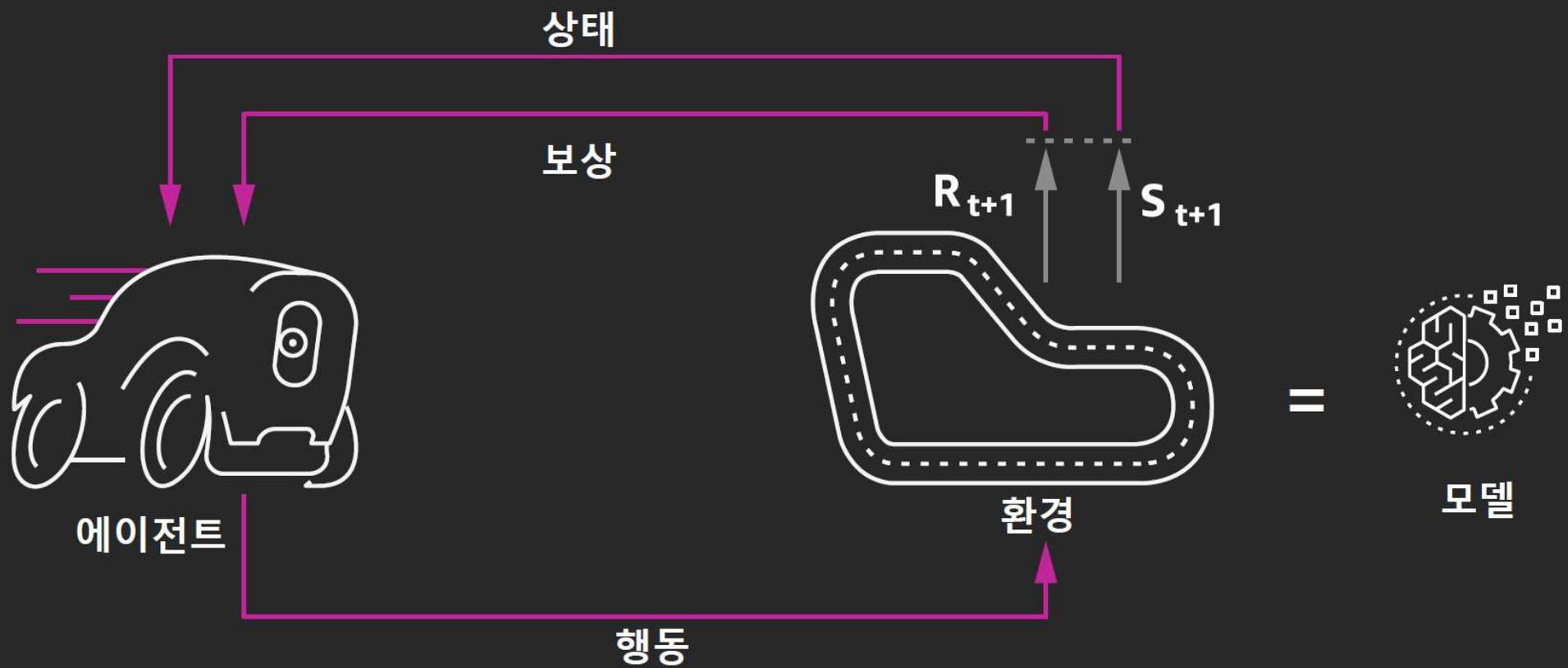


목표

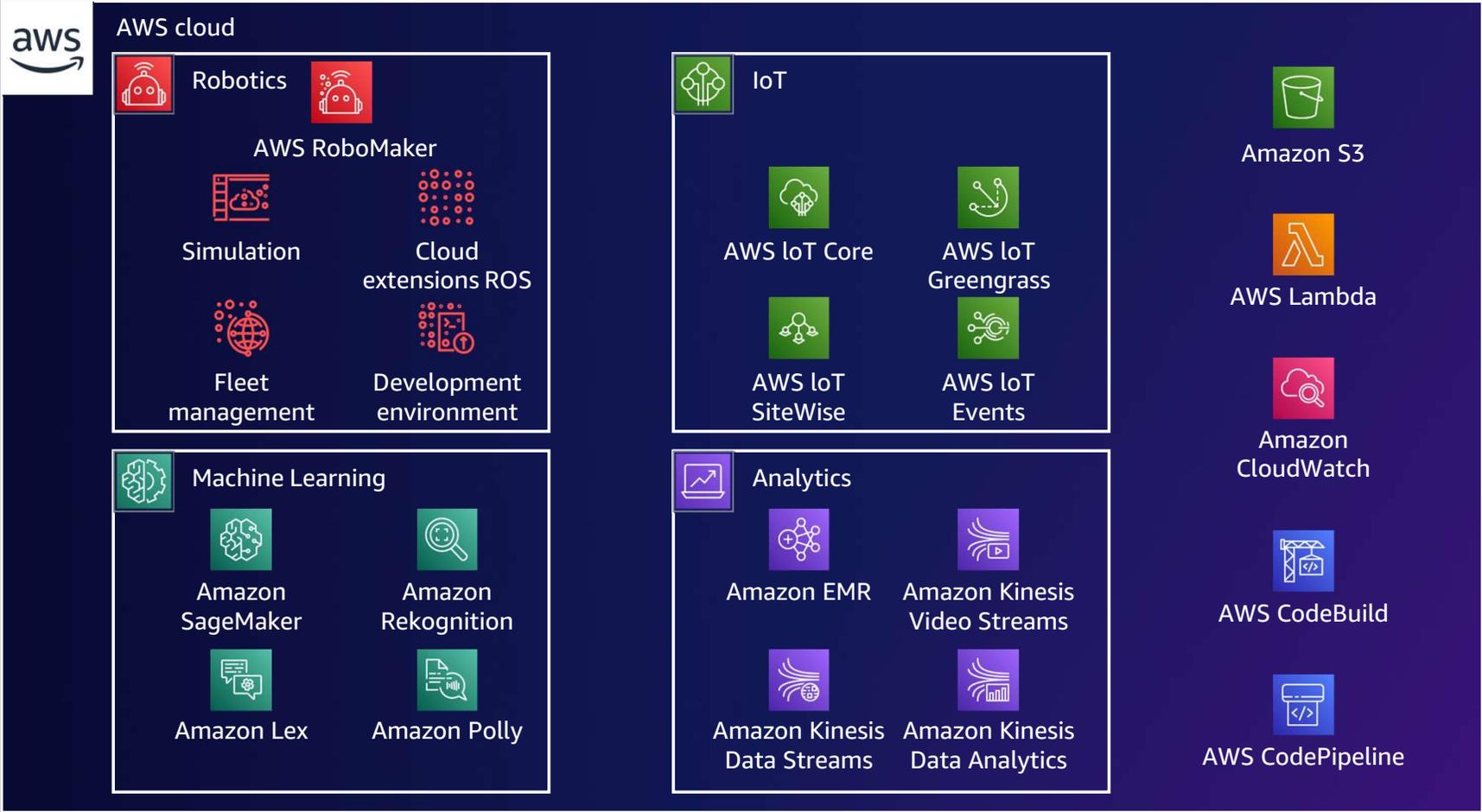
반복과 수렴



어떻게 학습할까요?



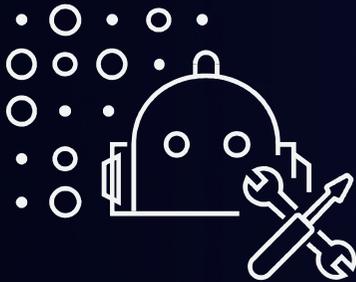
AWS cloud services for robotics



Role of the cloud

AWS ROBOTICS MAKES IT EASY TO BUILD, TEST, AND MANAGE ROBOTICS APPLICATIONS

Build



Cloud extensions
for robots

Test



Simulation

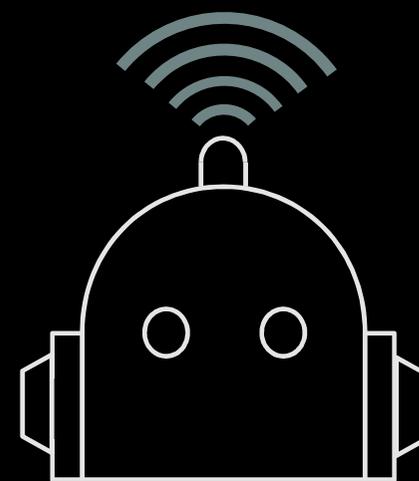
Manage



Fleet management

Introducing AWS RoboMaker

Cloud-based simulation service that enables robotics developers to run, scale, and automate simulation without managing any infrastructure



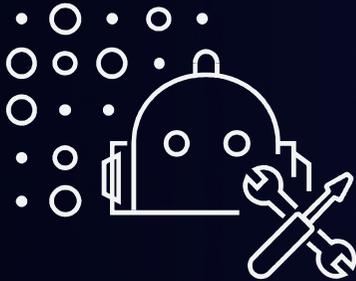
AWS RoboMaker cloud extensions

- Integration with Kinesis Video Streams
 - Native ROS packages for Amazon S3 for secure, scalable storage – rosbag logging and upload to Amazon S3
 - Integration with Amazon CloudWatch for easy logging and metrics collection
 - Bundle your own GUI-enabled tools as part of robot and simulation applications

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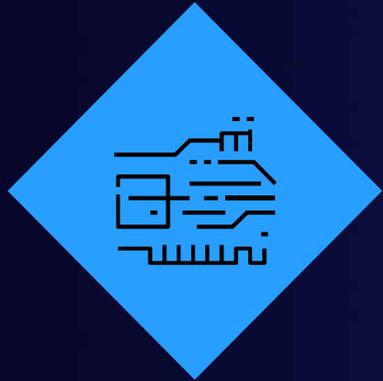
Manage



Fleet management



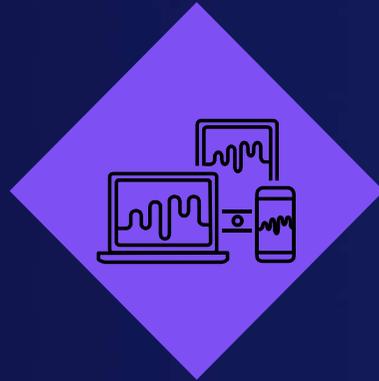
Common blockers to using simulation



Infrastructure required to run simulations



Integrating application management and control systems



Consistency across development teams



Difficulty setting up automation



Creation of 3D model assets – worlds and robot definitions (Universal Robot Description Format – URDF)

Thank you!



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