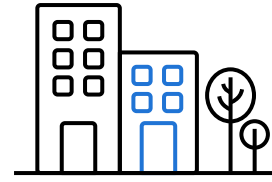# The reach of ML is growing

INCREASED SPENDING

By 2026, global spending on artificial intelligence will reach $300 billion growing 4.2 faster than average IT spend

IDC

"IDC Press Release, Worldwide Spending on AI-Centric Systems Will Pass $300 Billion by 2026, According to IDC, September 2022," https://www.idc.com/getdoc.jsp?containerId=prUS49670322
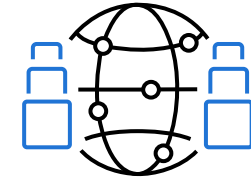
AI ACROSS SEVERAL BUSINESS UNITS

Gartner survey reveals 80% of executives think automation can be applied to any business decision

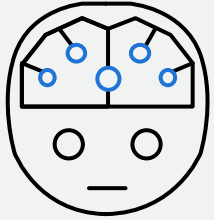**Gartner**

Gartner, Press Release   https://bit.ly/3is16a2

AI IS CRITICAL TO SUCCESS

94% of business leaders surveyed say AI is critical to their success

Deloitte

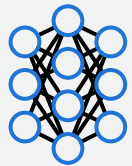Deloitte, "State of AI in the Enterprise," https://bit.ly/3XiNOLR

What is it?

Artificial intelligence (AI)

Any technique that enables computers to mimic human intelligence using logic, if-then statements, and machine learning

Machine learning (ML)

A subset of AI that uses machines to search for patterns in data to build logic models automatically

Deep learning (DL)

A subset of ML composed of deeply multi-layered neural networks that perform tasks like speech and image recognition

Reinforcement learning (RL)

Reinforcement learning trains models by using a reward function of a desired outcome

Amazon machine learning innovation at scale
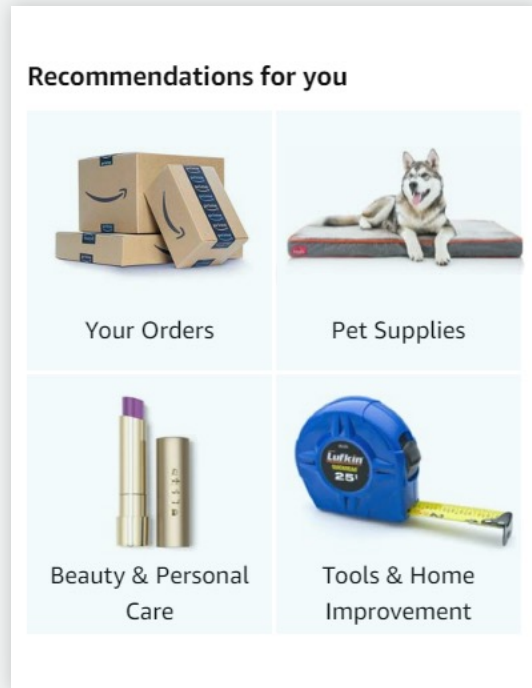
4,000 products per minute sold on Amazon.com

1.6 million packages every day

Billions of Alexa interactions each week

First Prime Air delivery on **December 7, 2016**

| Enhance customer experience | Better and faster decision-making | Improve business operations | New products and services |

Contact center intelligence

Chatbots and virtual assistants

Personalization

Identity verification

Fraud prevention
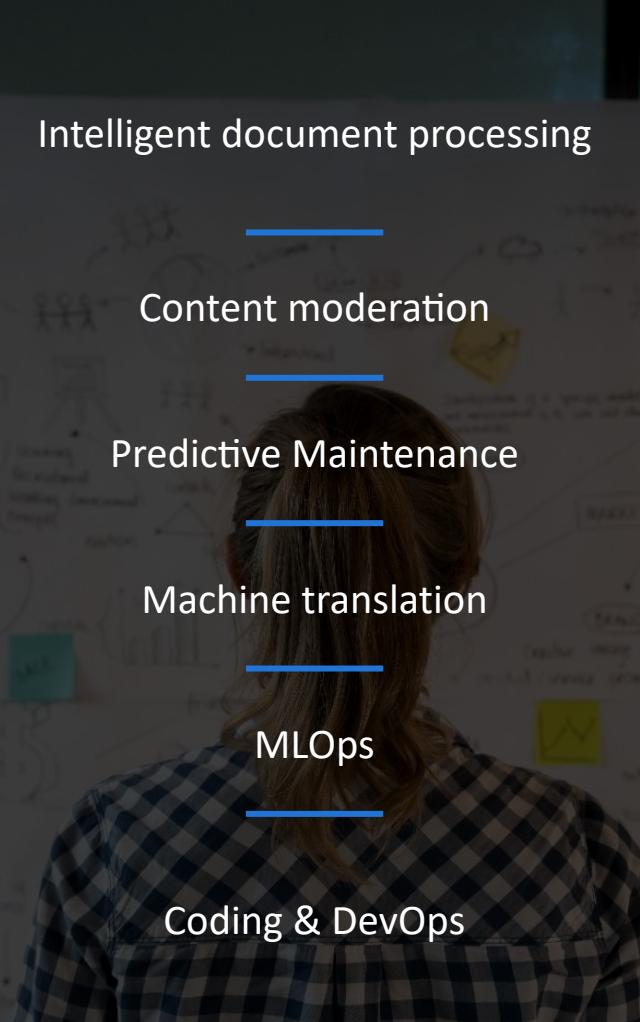
Intelligent search

Forecasting

Lead scoring

Churn prediction

Intelligent document processing

Content moderation

Predictive Maintenance

Machine translation

MLOps

Coding & DevOps

New use cases

Enhance customer experience

Better and faster decision-making

Improve business operations

New products and services

Healthcare & life sciences
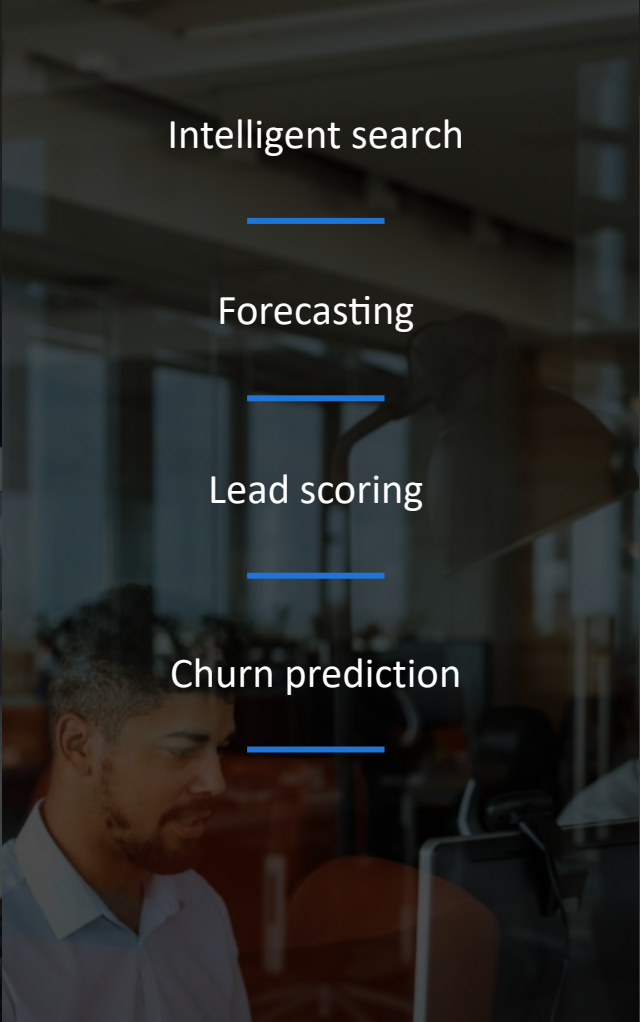
Reduce costs, improve patient outcomes, and enable the discovery and manufacturing of new drugs

Industrial & manufacturing

Implement predictive maintenance, improve workplace safety, automate visual inspection, and optimize supply chains

Financial services

Detect fraud, process documents faster, personalize recommendations, and perform credit decisioning

Retail

Personalize product recommendations, forecast demand, and predict fraud

Media & entertainment

Accelerate content creation and curation, increase customer engagement, and improve monetization

100,000+ customers
use AWS for machine learning

The AWS AI/ML stack

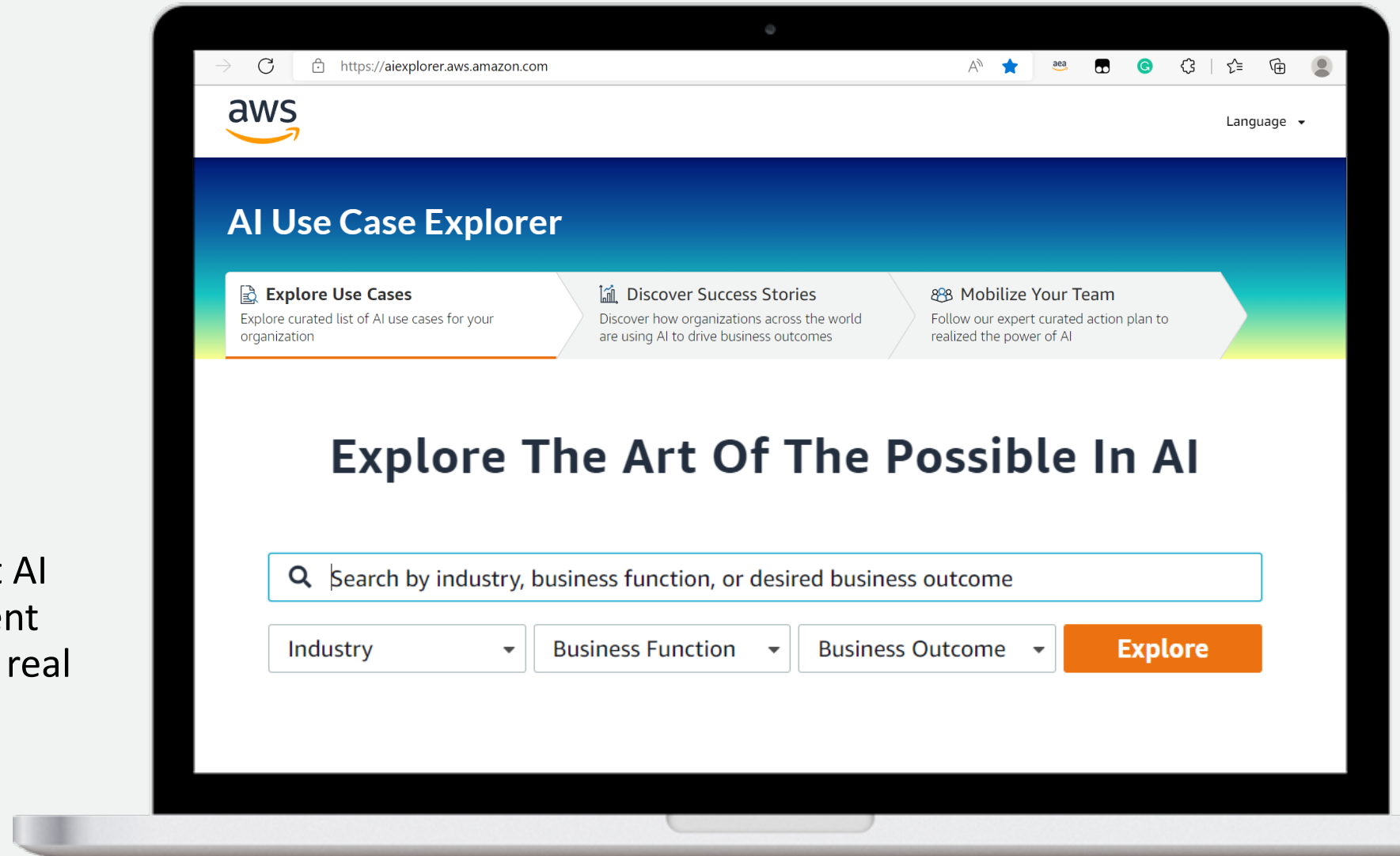**BROADEST AND MOST COMPLETE SET OF MACHINE LEARNING CAPABILITIES**

AI SERVICES

SPECIALIZED

BUSINESS PROCESSES
Amazon Personalize
Amazon Forecast
Amazon Fraud Detector
Amazon Lookout for Metrics

SEARCH
Amazon Kendra

CONVERSATION
Amazon Lex
Amazon Transcribe Call Analytics
Contact Lens
Voice ID

CODE + DEVOPS
Amazon CodeGuru
Amazon CodeWhisperer
Amazon DevOps Guru

INDUSTRIAL
Amazon Monitron
Amazon Lookout for Equipment
Amazon Lookout for Vision

HEALTH
Amazon HealthLake
Amazon Comprehend Medical
Amazon Transcribe Medical
Amazon Omics

CORE

TEXT
Amazon Translate   Amazon Comprehend

SPEECH
Amazon Polly   Amazon Transcribe

VISION
Amazon Textract   Amazon Rekognition   AWS Panorama

AMAZON SAGEMAKER

CANVAS
No-code ML for business analysts

STUDIO LAB
Learn ML

GROUND TRUTH
Label data

STUDIO IDE

Prepare data

Geospatial ML

Build with notebooks

Train models

Deploy in production

Store features

Tune parameters

Manage and monitor

EDGE MANAGER
Manage edge devices

CI/CD | GOVERNANCE | RESPONSIBLE ML

ML FRAMEWORKS & INFRASTRUCTURE

PyTorch, Apache MXNet, TensorFlow | Amazon EC2 | CPUs | GPUs | AWS Inferentia | AWS Trainium | Habana Gaudi | FPGA
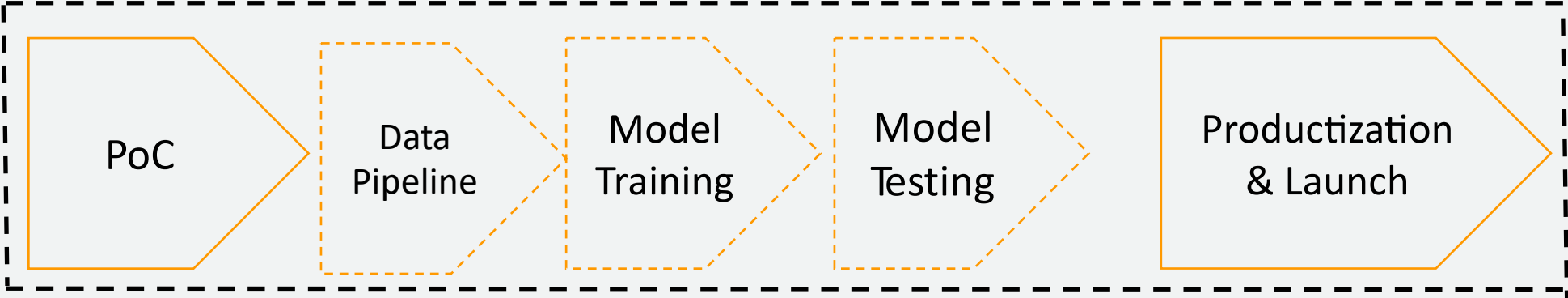
Common ML use cases for some verticals

- Retail: Supply chain and demand forecasting

- Financial services: Credit default prediction for customer behavior

- Manufacturing: Real-time predictions for industrial IoT

- Advertising: Predict click-through rate for targeted ads

- Automotive innovation: Self-driving vehicles and simulation

- Health and wellness: Track disease progression

The machine learning process

Problem Use Case KPI → PoC → Data Pipeline → Model Training → Model Testing → Productization & Launch

Measure & Feedback Loop

The machine learning process

```
PoC  →  Data Pipeline  →  Model Training  →  Model Testing  →  Productization & Launch
```
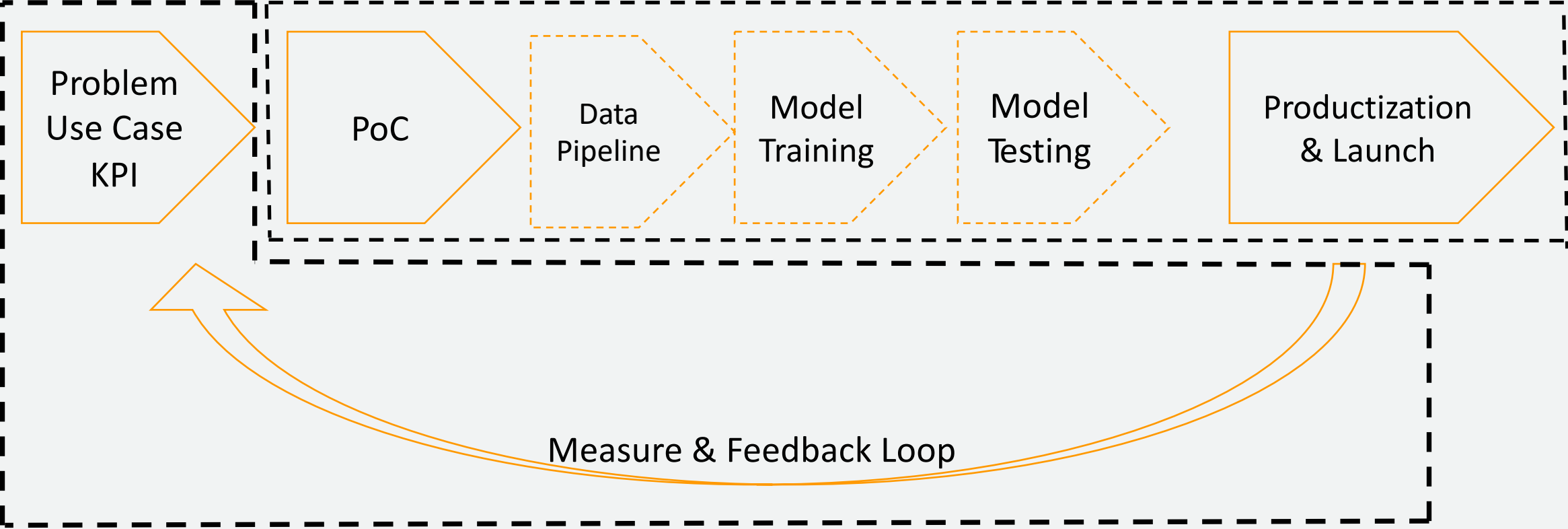
SageMaker Studio

SageMaker Pipelines

SageMaker Training

SageMaker Endpoints

The machine learning process

Problem
Use Case
KPI

SageMaker
Model Monitor

AWS
CodePipeline

Measure & Feedback Loop
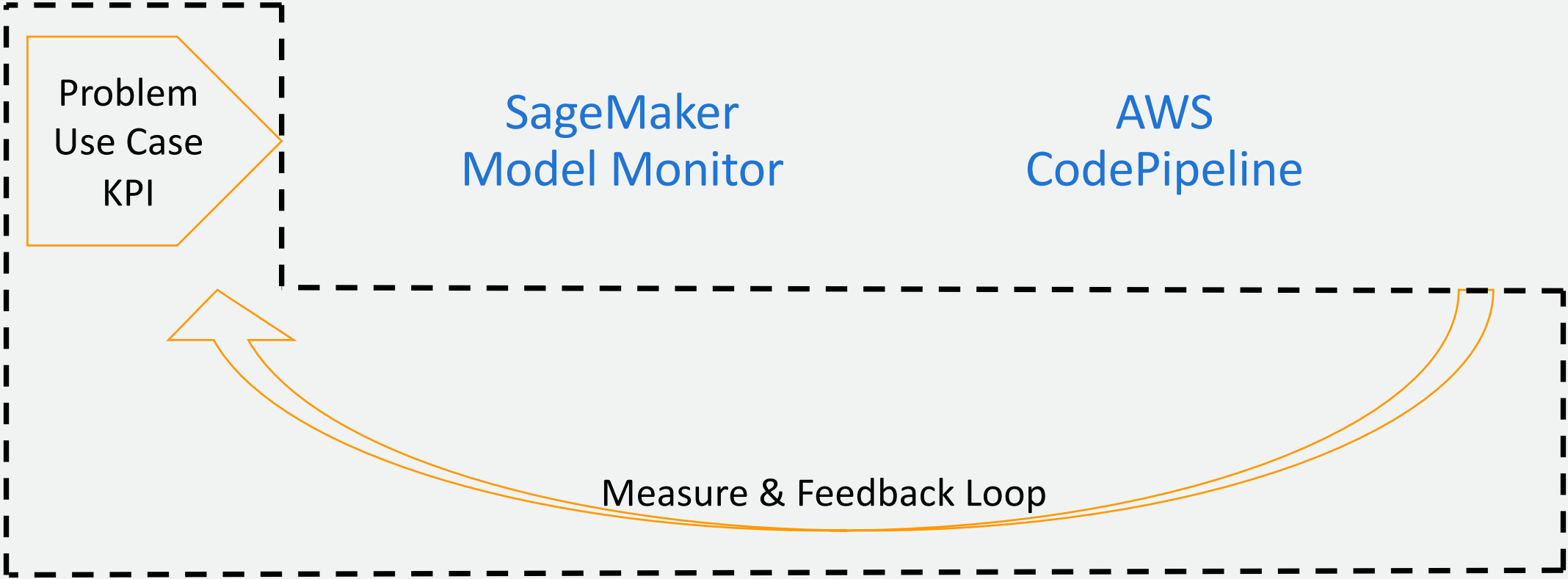
Fraud Detection Deep Dive

Fraud detection card fraud

(left-hand scale: total value of fraud (EUR millions); right-hand scale: value of fraud as a share of value of transactions (percentages))

Legend: POS, ATM, CNP, Fraud share

	2014	2015	2016	2017	2018
Fraud share	0.038%	0.042%	0.041%	0.035%	0.037%
ATM	12%	9%	8%	8%	6%
CNP	69%	71%	73%	76%	79%
POS	19%	20%	19%	16%	15%

Fig. 1. Evolution of total value of card fraud using cards issued within SEPA. Card-not-present frauds account for the majority of reported frauds.

- Class imbalance
- Concept drift
- Near real-time
- Sequential modeling
- Lack of public datasets

source: https://www.ecb.europa.eu/

Fraud detection complete system
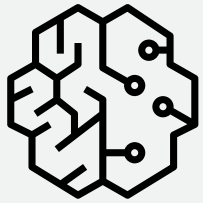
source: DAL POZOLLO et al.
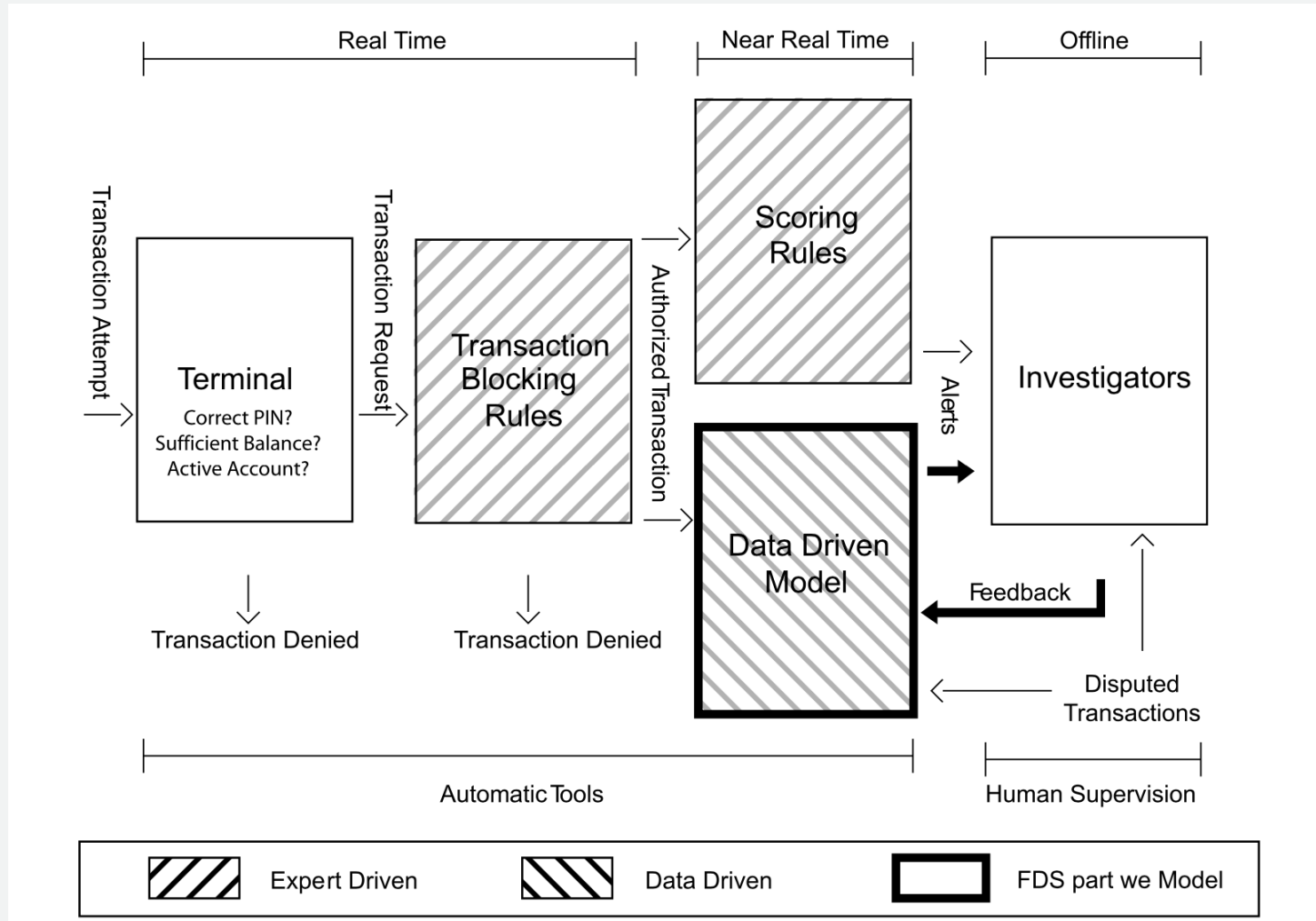
Fraud detection solution

Fraud detection solution

https://aws.amazon.com/solutions/implementations/fraud-detection-using-machine-learning/
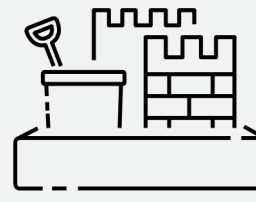
or
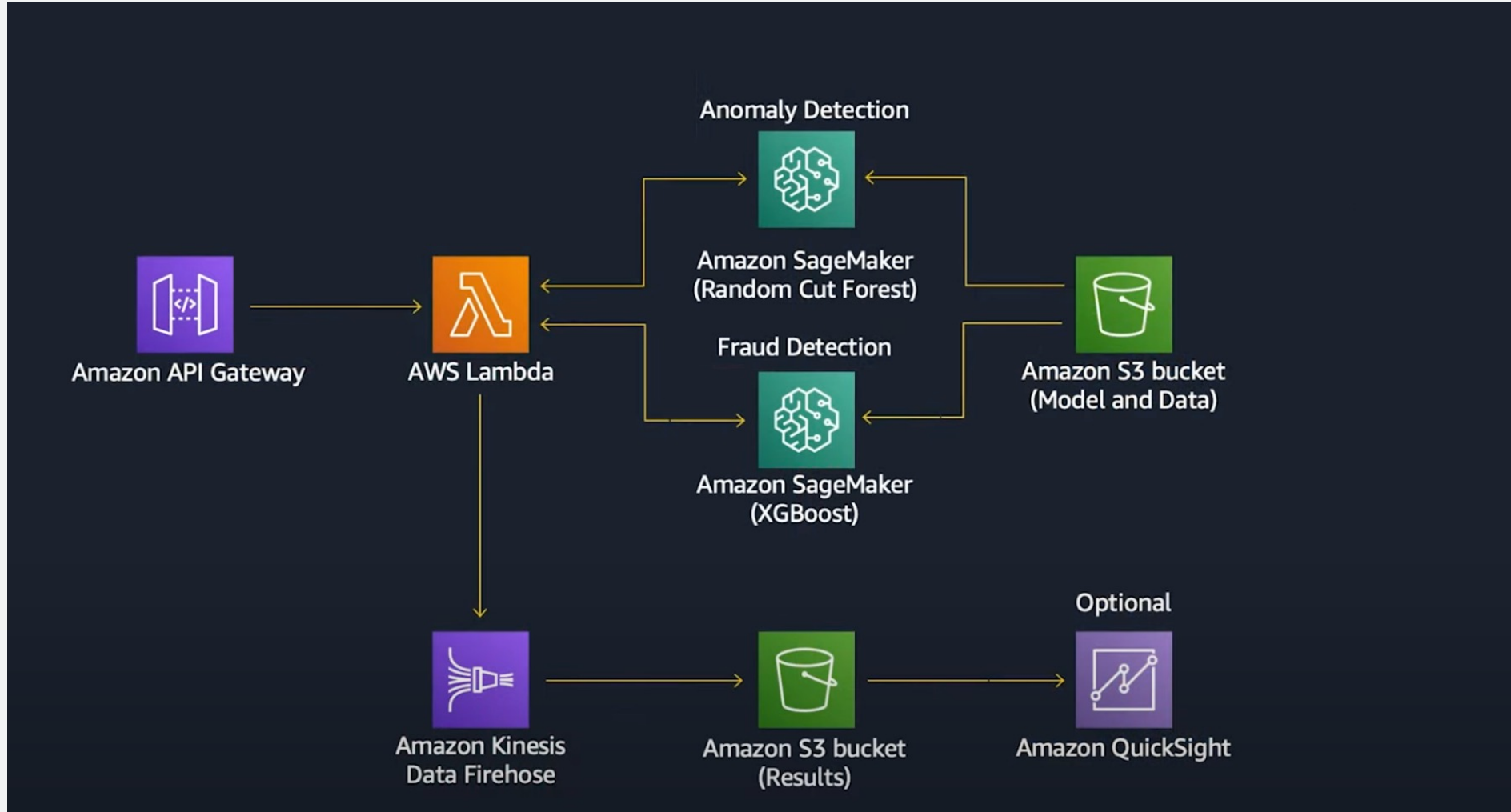
Amazon Fraud Detector

https://aws.amazon.com/fraud-detector/

AMAZON

SageMaker

Build, train, and deploy ML models for any use case with fully managed infrastructure, tools, and workflows

BUILD

TRAIN

DEPLOY

BUSINESS NEED

Wanted to speed up all stages of research and development, particularly the review of tissue samples

Labeling data was time-consuming and tedious

SOLUTION

Partnered with the Amazon ML Solutions Lab to integrate Amazon SageMaker Ground Truth to automate tedious portions of work

Helps annotate, collect and classify ML model training data quickly

IMPACT

Reduces time humans spend cataloging samples by at least 50%

Accelerates the drug research process and the introduction of medicines to the market

Increases the pace of research by freeing up scientists

AstraZeneca

It's the start of a broad change in our business—using all of this imaging and molecular data along with AI to develop a holistic approach, one that lets our scientists interact and interpret the data in ways that have never been possible.

Richard Goodwin

Director for Molecular Imaging

AstraZeneca

MORE INFO: ARTICLE | CASE STUDY

Personalization

GENERATE PERSONALIZED RECOMMENDATIONS TO INCREASE CUSTOMER ENGAGEMENT

Use case categories

- Deliver unique homepage experiences
- Help customers discover products faster
- Target customers more accurately
- Highlight new products, content, and promotion offerings

Benefits

- Implement a personalization engine in days, not months—no ML expertise required
- Adapt recommendations in real time
- Increase engagement and revenue through relevancy

Customer references

Calm · WARNER BROS. DISCOVERY · LOTTE Mart · freshworks · BUNDESLIGA · Marc O'Polo EST. IN STOCKHOLM

SUBWAY · Pomelo. · HYATT · FOX · chewy · Pulselive

EQUINOX · StockX · zalando · Zappos.com · coursera · ZOLA

AI services

Amazon Personalize

Solution

Maintaining Personalized Experiences with Machine Learning

ML Services

Amazon SageMaker

Solution

Personalized recommendations

Amazon Personalize

How it works

User events/interactions
(views, signups, conversions, etc.)

Item metadata
(details of articles, products, videos, etc.)

User metadata
(age, location, etc.)

Inspect data → Identify features → Select hyper-parameters → Train models → Optimize models → Host models → Real-time feature store → Customized personalization API

Fully managed by Amazon Personalize

BUSINESS NEED

Pomelo Fashion had been displaying items in the same web format since its founding. The setup had grown stale, and the algorithm for displaying products relied on old data streams with limited inputs and spotty accuracy

SOLUTION

Pomelo Fashion used Amazon Personalize to build a recommendation engine to personalize the shopping experience to each customer. It now reflects user preferences on product pages in minutes, driving sales

IMPACT

Boosted click-through rate from category to product pages by up to 18%

Increased gross revenue from category pages by up to 15%

Increased return on investment by 400% within 1 month

Pomelo.

When you think of e-commerce, you think of AWS.

New services are always coming out on AWS, and support is very good.

Shane Leese

Business Intelligence Director

Pomelo Fashion

MORE INFO: CASE STUDY | VIDEO

Predictive maintenance

Benefits

- Detect abnormal conditions in industrial equipment, and prevent problems before they occur

- Improve uptime of industrial equipment

- Reduce costs of unplanned downtime

- Allow reliability and maintenance engineers to make more informed decisions

- No ML experience required

Partners

CloudRAIL   Seeq   RADIX

TensorIoT   RoVISYS
Automation & Information Solutions

Customer references

KOCH
AG & ENERGY SOLUTIONS   GE Power

CEPSA   Fender

GP Georgia-Pacific

Underlying AI services

Amazon
Monitron   Amazon
Lookout for Equipment

Solution

Predictive Maintenance Using
Machine Learning

Forecasting

Use case category

- Retail inventory forecasting
- Supply chain demand planning
- Revenue and financial metrics forecasting
- Workforce planning and staffing

Benefits

- Grow retail sales through fewer stockouts
- Lower costs by reducing wasted inventory
- Increase profitability through improved product allocation
- Optimize workforce productivity & staffing

Customer references

AI Services

Amazon Forecast

ML Services

Amazon SageMaker

SageMaker Canvas

Guidance

Improving Forecast Accuracy with ML

Solution

Demand Forecasting

Identity verification

ENABLE SECURE AND COMPLIANT DIGITAL EXPERIENCES

Use case category

- Customer onboarding & verification
- Online proctoring
- Gig economy verification
- Event & airport check-ins
- Use challenges

Benefits

- Reduce onboarding friction
- Reduce fraud
- Lower costs and overheads

Customer references

Underlying AI services

Amazon Rekognition

Amazon Textract

Guidance

AWS Solution Guidance

Content moderation

CREATE SAFE ONLINE ENVIRONMENTS, PROTECT YOUR BRAND, AND MINIMIZE MODERATION COSTS

Use case category

- Gaming
- Social media
- E-commerce
- Advertising

Benefits

- Improve safety for users and brands
- Streamline content moderation operations
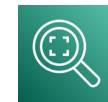- Increase reliability and lower costs

Customer references

:DeNA

DREAM11

FLIPBOARD

CoStar™

Underlying AI services

| Amazon Augmented AI | Amazon Rekognition | Amazon Transcribe | Amazon Comprehend | Amazon Translate |

Guidance

AWS Solution Guidance

Innovate faster with the most comprehensive set of AI/ML services

AWS ADVANTAGE

| AI powered use cases	Hundreds of pre-built algorithms, models, and solutions for common use cases and industries Faster time to value with 23 pre-trained AI Services
Democratize access to ML	Empower any business analyst to make predictions without writing code with Amazon SageMaker AI Services to easily add AI capabilities to your applications, no ML skills required
Scale ML	Build, train, and deploy ML models for any use case with Amazon SageMaker Harness the exponential growth of ML models with foundation models on AWS
Grow ML skills	Learn more with AWS Training, AWS DeepRacer, AI & ML Scholarship Program, and AWS Machine Learning University Accelerate your journey with AWS ML Embark Program or Amazon ML Solutions Lab

Next steps

TRAINING

In-person, online and certification programs
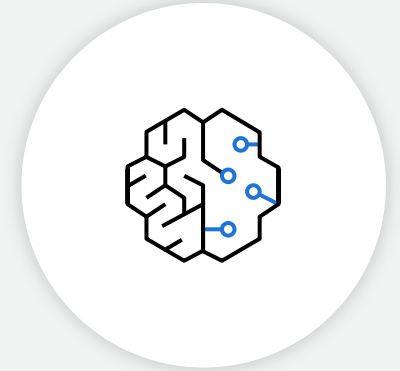
AWS deep devices

IDEATION AND PROOF OF CONCEPT

ML Solutions Lab

AWS ML Embark Program
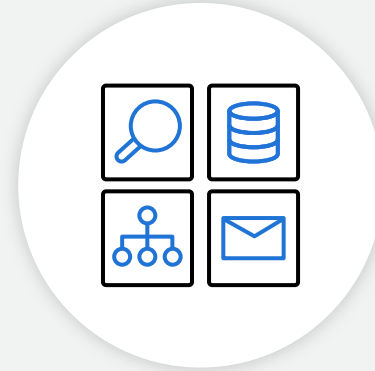
AI SERVICES, NO ML SKILLS REQUIRED

Leverage our AI services to add AI capabilities to your business applications

BUILD YOUR OWN MODEL

Build your own model using SageMaker or SageMaker Canvas

Thank you!

If you would like to follow up, our colleagues from Kreuzwerker are available to talk.

We can be found at the tables at the back of the room.