Reinventing industrial operations with AI and ML

Simon Johnston
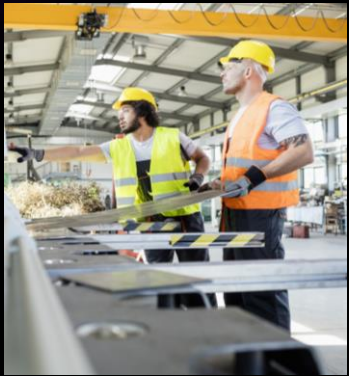
AI/ML Principal Specialist
AWS

What is the cost of downtime?

Agenda

1. How industrial leaders are leveraging AIML

2. AWS technology approach

3. How to get started

aws

How industrial leaders are leveraging AIML

Digital transformation increasing across asset-heavy industries

Discrete and process manufacturing

Transportation and logistics

Agriculture

Power utilities, and renewables

Energy (oil and gas)

Mining

aws

Adoption by leaders

Industrial challenges

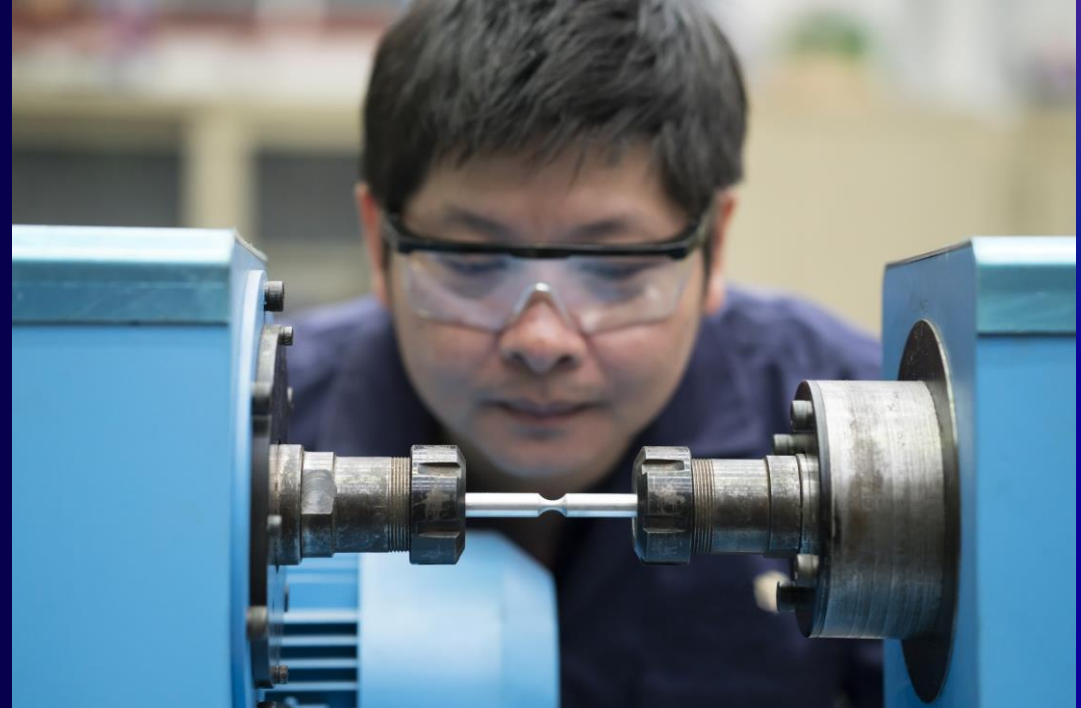Data access

Data management

Security

Real-time decision making

Scale

Key customer needs across common industrial workloads

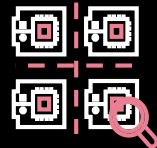**Engineering and design**

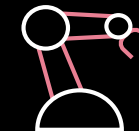**Production and asset optimization**

Supply chain management

Worker safety and productivity

Quality management

Smart products and machines

Data silos & insights

How Volkswagen Connects 124 Factories to the Cloud Using AWS | Volkswagen Group

The Volkswagen Group manufactures about 11 million cars per year and brings 200 million parts per day into its factories—a massive scale at which to operate an effective global supply chain. Volkswagen is working with AWS to move its 124 factory sites to a single architecture: the Volkswagen Industrial Cloud. As a next step, the Group will integrate Volkswagen's global network of more than 1,500 suppliers into the Industrial Cloud. The company uses AWS machine learning services—running algorithms using information gathered from sensors on the shop floor—and AWS Outposts.

https://aws.amazon.com/solutions/case-studies/volkswagen-group/

Machine learning in real time, at the edge

"We are using AWS data-analysis technologies to predict ... precisely how fast converting lines should run to avoid tearing. By reducing paper tears, we have increased profits by millions of dollars for one production line."

Steve Bakalar, Vice President of IT/Digital Transformation, Georgia-Pacific
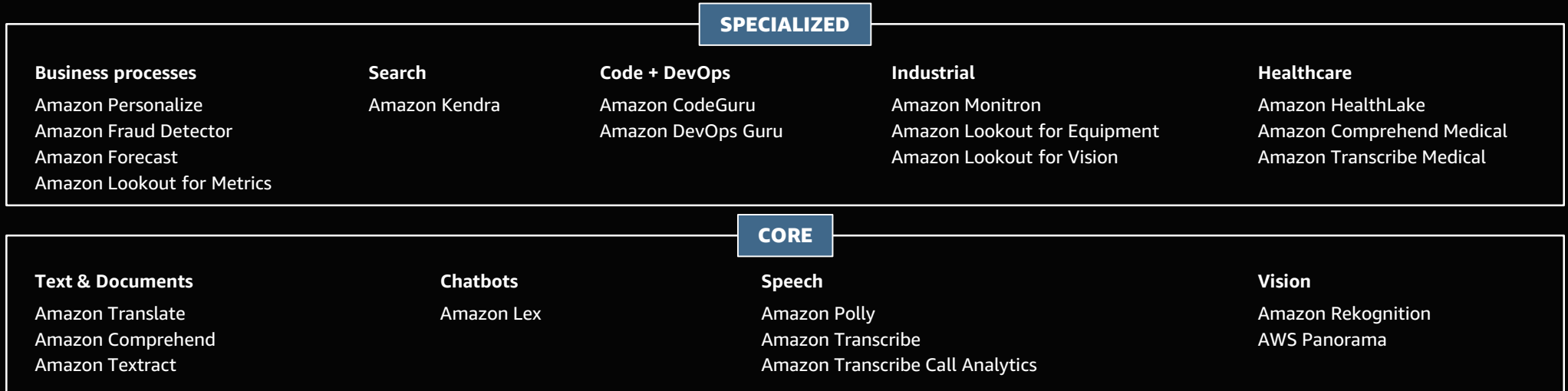
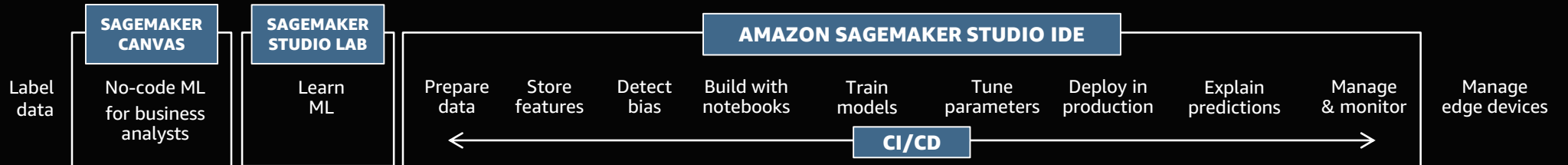https://aws.amazon.com/solutions/case-studies/georgia-pacific/

AWS technology approach

The AWS ML Stack

BROADEST AND MOST COMPLETE SET OF MACHINE LEARNING CAPABILITIES

AI SERVICES

SPECIALIZED

Business processes	**Search**	**Code + DevOps**	**Industrial**	**Healthcare**
Amazon Personalize	Amazon Kendra	Amazon CodeGuru	Amazon Monitron	Amazon HealthLake
Amazon Fraud Detector		Amazon DevOps Guru	Amazon Lookout for Equipment	Amazon Comprehend Medical
Amazon Forecast			Amazon Lookout for Vision	Amazon Transcribe Medical
Amazon Lookout for Metrics				

CORE

Text & Documents	**Chatbots**	**Speech**	**Vision**
Amazon Translate	Amazon Lex	Amazon Polly	Amazon Rekognition
Amazon Comprehend		Amazon Transcribe	AWS Panorama
Amazon Textract		Amazon Transcribe Call Analytics	

ML SERVICES

SAGEMAKER CANVAS

SAGEMAKER STUDIO LAB

AMAZON SAGEMAKER STUDIO IDE

Label data	No-code ML for business analysts	Learn ML	Prepare data	Store features	Detect bias	Build with notebooks	Train models	Tune parameters	Deploy in production	Explain predictions	Manage & monitor	Manage edge devices

CI/CD

ML FRAMEWORKS & INFRASTRUCTURE

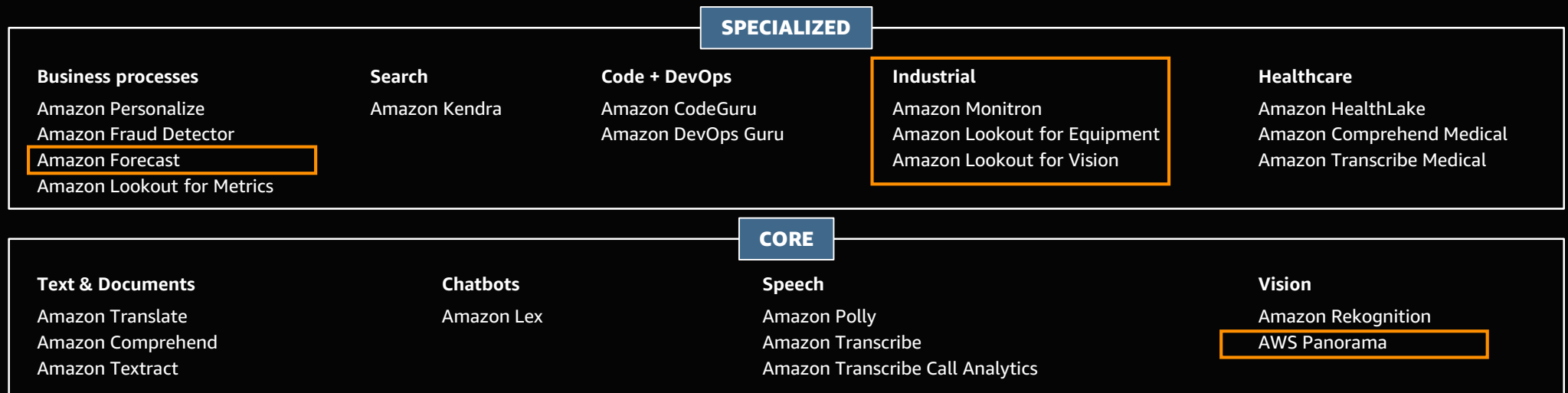| PyTorch, Apache MXNet, TensorFlow	Amazon Elastic Compute Cloud (Amazon EC2)	CPUs	GPUs	AWS Inferentia	AWS Trainium	Habana Gaudi	FPGA	Elastic inference

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The AWS ML Stack

SPECIALIZED

AI SERVICES

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Amazon Fraud Detector		Amazon DevOps Guru	Amazon Lookout for Equipment	Amazon Comprehend Medical
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CORE

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https://aws.amazon.com/industrial/machine-learning/

AI use cases for industrial customers
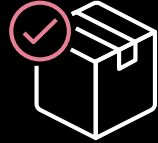
**Improve operational
efficiency at the edge**

**Automate visual
quality inspection**

**Improve asset performance
by reducing unplanned downtime**
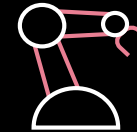
**Forecast demand and
manage inventory**

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AWS Industrial AI services

AWS Panorama – Improve your operations with computer vision at the edge
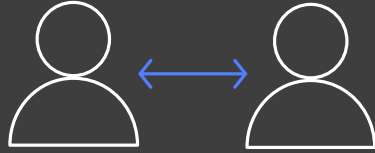aws.amazon.com/panorama

Amazon Lookout for Vision – Spot defects and anomalies in industrial products using computer vision
aws.amazon.com/lookout-for-vision

aws

Computer vision enables new capabilities across industries

Improve the performance and productivity of industrial processes

Monitor social distancing and crowd density for public health

Gather data on retail analytics, people counting, and line length monitoring

Enhance worker safety in the warehouse, the office, and on the factory floor
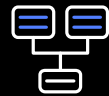
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AWS Panorama Appliance

POWERFUL CV APPLIANCE FOR INDUSTRIAL ENVIRONMENTS

Set up in minutes

Automatically detects IP cameras

Runs custom models or production-ready CV apps at the edge

IP62-rated ruggedized device

Nvidia Xavier AGX GPU

Multiple camera streams in parallel

Multiple models per stream

AWS and Deloitte help Port of Vancouver improve supply chain visibility with computer vision-based container tracking

"By adopting computer vision at the edge, Port of Vancouver is increasing its competiveness while preserving privacy."
- Greg Rogge, Director, Land Operations and Security, Port of Vancouver

"Computer vision can enable the proper assignment of cost and continue to identify efficiency improvement opportunities in the existing process."
**- Don MacPherson, Partner, Deloitte**

https://aws.amazon.com/partners/success/port-of-vancouver-deloitte/

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Amazon Lookout for Vision

Spot defects and anomalies using CV

- Improved defect detection speed, consistency, and accuracy compared to manual inspection

- Lower cost of quality control inspection compared to machine vision systems

- Start building a model with as few as 30 images

- No ML experience required

https://aws.amazon.com/lookout-for-vision/
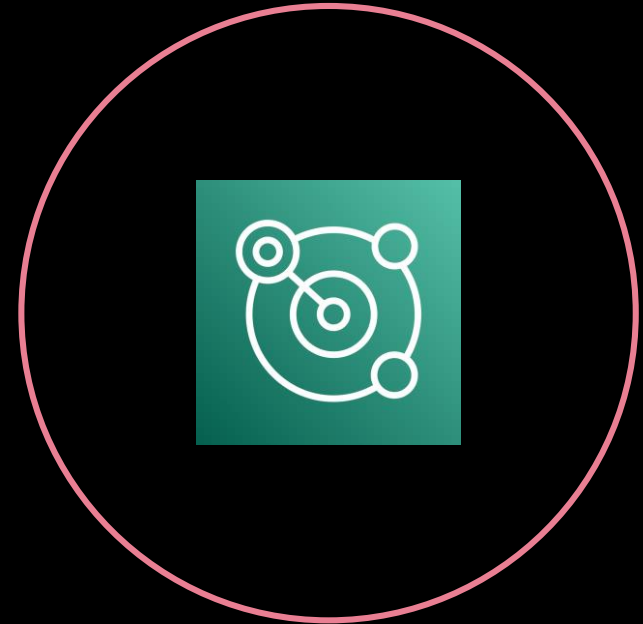
Dafgårds automates and scales inspection

Dafgards is a household name in Sweden, manufacturing 15 different types of frozen pizzas at over 100 pizzas per minute.
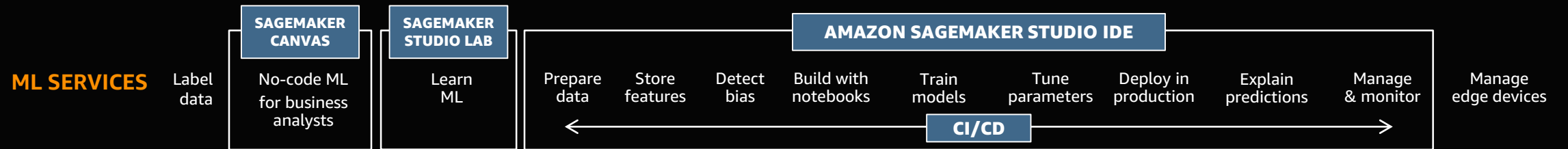
"To uphold our brand and deliver the freshest and tastiest customer experience, we want to ensure that all our pizzas are adequately covered in cheese and with the correct toppings. Early in our production process we installed a machine vision system to detect proper coverage of cheese across a pizza's surface. While this system served well for our original inspection requirement, the system is unable to detect defects on new product types that include multiple toppings. Amazon Lookout for Vision automates and scales inspection of diverse product types such as a cheese pizza with vegetables using the same machine vision system. We successfully expanded our quality assurance for new product types with minimal impact to operations."

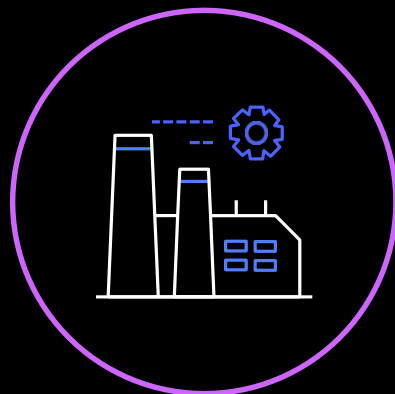**Fredrik Dafgård, Head of Operational Excellence & Industrial IoT**

https://aws.amazon.com/lookout-for-vision/customers/

The AWS ML Stack

SAGEMAKER

ML SERVICES | Label data

SAGEMAKER CANVAS
No-code ML for business analysts

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Learn ML

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Prepare data | Store features | Detect bias | Build with notebooks | Train models | Tune parameters | Deploy in production | Explain predictions | Manage & monitor

CI/CD

Manage edge devices

https://aws.amazon.com/sagemaker/

Amazon SageMaker

Computer vision

Healthcare,
pharma, manufacturing

Predictive maintenance

Manufacturing,
automotive, IoT

Demand forecasting

Retail, consumer
goods, manufacturing

Autonomous driving

Automotive, transportation

https://aws.amazon.com/sagemaker/

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How to get started

Help from experts

DISCOVER
Design your future with ML

DELIVER
Bringing your ML project to life

SCALE
Evolve with AWS

IDEATION SESSION
Understand the art of the possible, diagnose immediate business challenges and identify high priority use case(s)

OUTPUT:
Problem statement(s)

START HERE

DISCOVERY WORKSHOP
An engagement where business and technology stakeholders work backwards from 1 to 2 ML business opportunities

Input:
Problem statement & use cases

OUTPUT:
ML Blueprint

MINIMAL VIABLE PRODUCT (MVP)
A 2-Pizza team* delivers a production-ready solution to pilot

Input:
Successful POV

OUTPUT:
AWS Public Reference

AI-POWERED ORGANISATION
A program aimed at assisting customers to become self-sufficient, efficient and to realise the value with ML moving to multiple use cases and ML workloads

LEVEL UP!

READINESS ASSESSMENT
A tool to understand the organisational readiness to embrace ML across the dimensions of data, people, operations, strategy and governance.

OUTPUT:
Current and target state

PROOF OF VALUE (POV)
Involves a data health-check and the building of a basic solution to prove the approach and Return on Investment (ROI)

Input:
Statement Of Work (SOW) as formulated in the ML Blueprint

OUTPUT:
POV show case & ROI validation

POST PRODUCTION
Review solution adoption, change management and lifecycle requirements

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Visit the AI & Machine Learning resource hub for more resources

Dive deeper into these resources, get inspired and learn how you can use AI and machine learning to accelerate your business outcomes.

- The machine learning journey e-book
- 7 leading machine learning use cases e-book
- A strategic playbook for data, analytics, and machine learning e-book
  Accelerate machine learning innovation with the right cloud services & infrastructure e-book
- Choosing the right compute infrastructure for machine learning e-book
- Improving service and reducing costs in contact centers e-book
- Why ML is essential in your fight against online fraud e-book
- … and more!

https://bit.ly/3mwi59V

Visit resource hub

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AWS Machine Learning (ML) Training and Certification

AWS is how you build machine learning skills

Courses built on the curriculum leveraged by Amazon's own teams. Learn from the experts at AWS.

aws.training/machinelearning

Flexibility to learn your way

Learn online with on-demand digital courses or live with virtual instructor-led training, plus hands-on labs and opportunities for practical application.

explore.skillbuilder.aws/learn

Validate your expertise

Demonstrate expertise in building, training, tuning, and deploying machine learning models with an industry-recognized credential.

aws.amazon.com/certification

Thank you for attending AWS Innovate – AI/ML Edition

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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slideshare.net/AmazonWebServices

twitch.tv/aws

Thank you!

Simon Johnston

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