
AWS
re:Invent
NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

AIM217-L

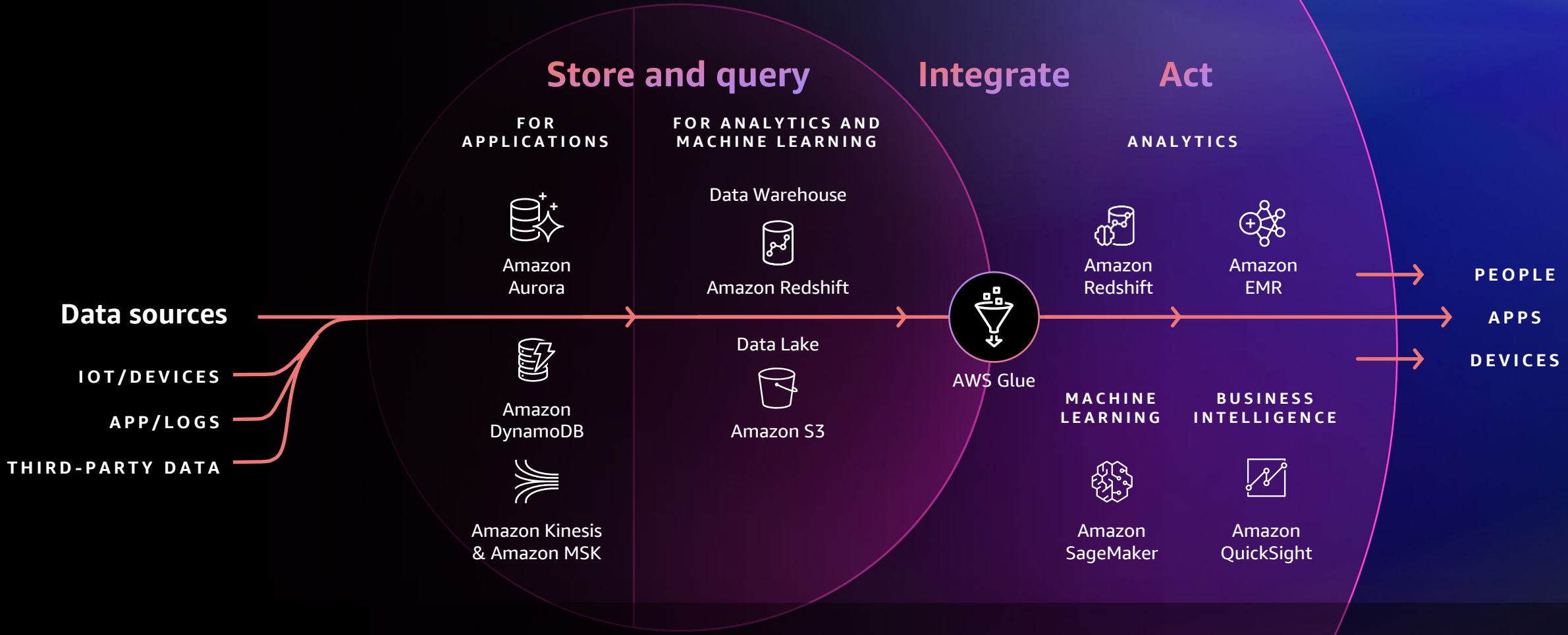
Innovate with AI/ML to transform your business

Dr. Bratin Saha (he/him)

Vice President of Artificial Intelligence and Machine Learning Services
AWS

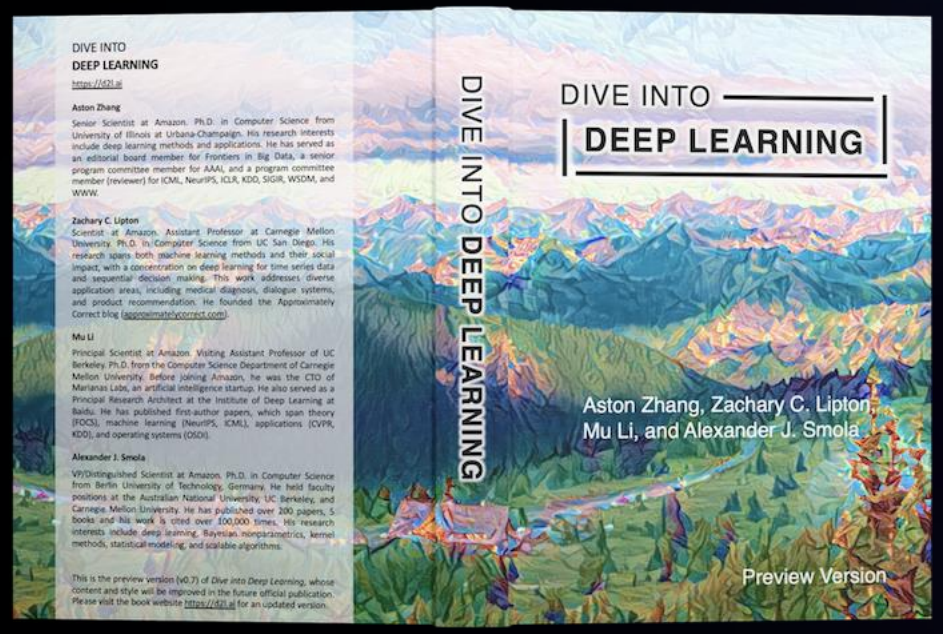
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Building an end-to-end data strategy

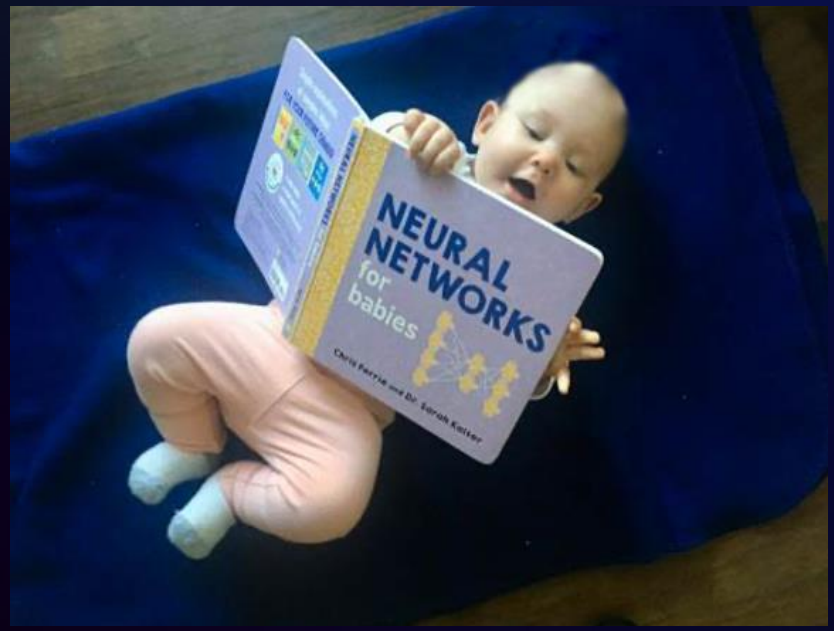


Catalog and govern | AWS Lake Formation, Amazon DataZone

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5 years ago

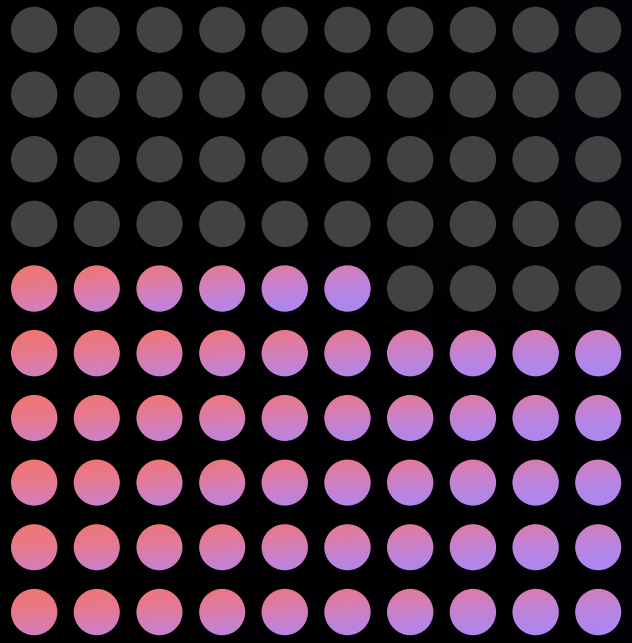


Today

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ML is mainstream today

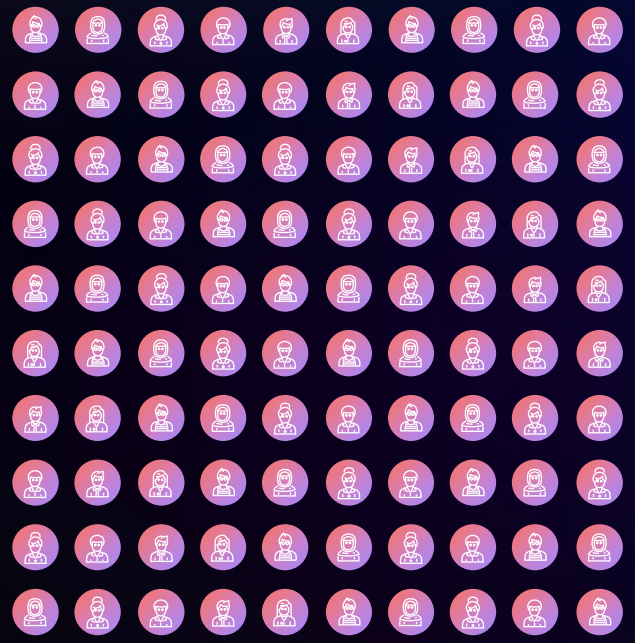
ML has become mainstream



56%

of all respondents report AI adoption in at least one function[1]

More customers do ML on AWS than anywhere else



100,000+

customers use AWS AI/ML services

[1]Source: McKinsey Global Survey on AI, December 2021

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AWS offers the broadest and deepest ML capabilities

AI SERVICES

SPECIALIZED | **BUSINESS PROCESSES** | **SEARCH** | **CONVERSATION** | **CODE + DEVOPS** | **INDUSTRIAL** | **HEALTH**

CORE | **TEXT** | **SPEECH** | **VISION**

AMAZON SAGEMAKER

CANVAS
No-code ML for business analysts

STUDIO LAB
Learn ML

GROUND TRUTH
Label data

STUDIO IDE

Prepare data
Store features
Geospatial ML
Build with notebooks
Train models
Tune parameters
Deploy in production
Manage and monitor

CI/CD | GOVERNANCE | RESPONSIBLE ML

EDGE MANAGER
Manage edge devices

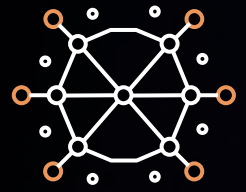
ML FRAMEWORKS & INFRASTRUCTURE

PyTorch, Apache MXNet, TensorFlow | Amazon EC2 | CPUs | GPUs | AWS Inferentia | AWS Trainium | Habana Gaudi | FPGA

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Six key trends driving ML innovation



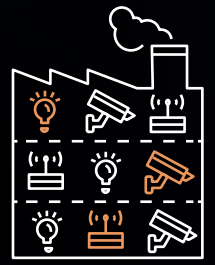
Model sophistication



Data growth



ML industrialization



ML-powered use cases



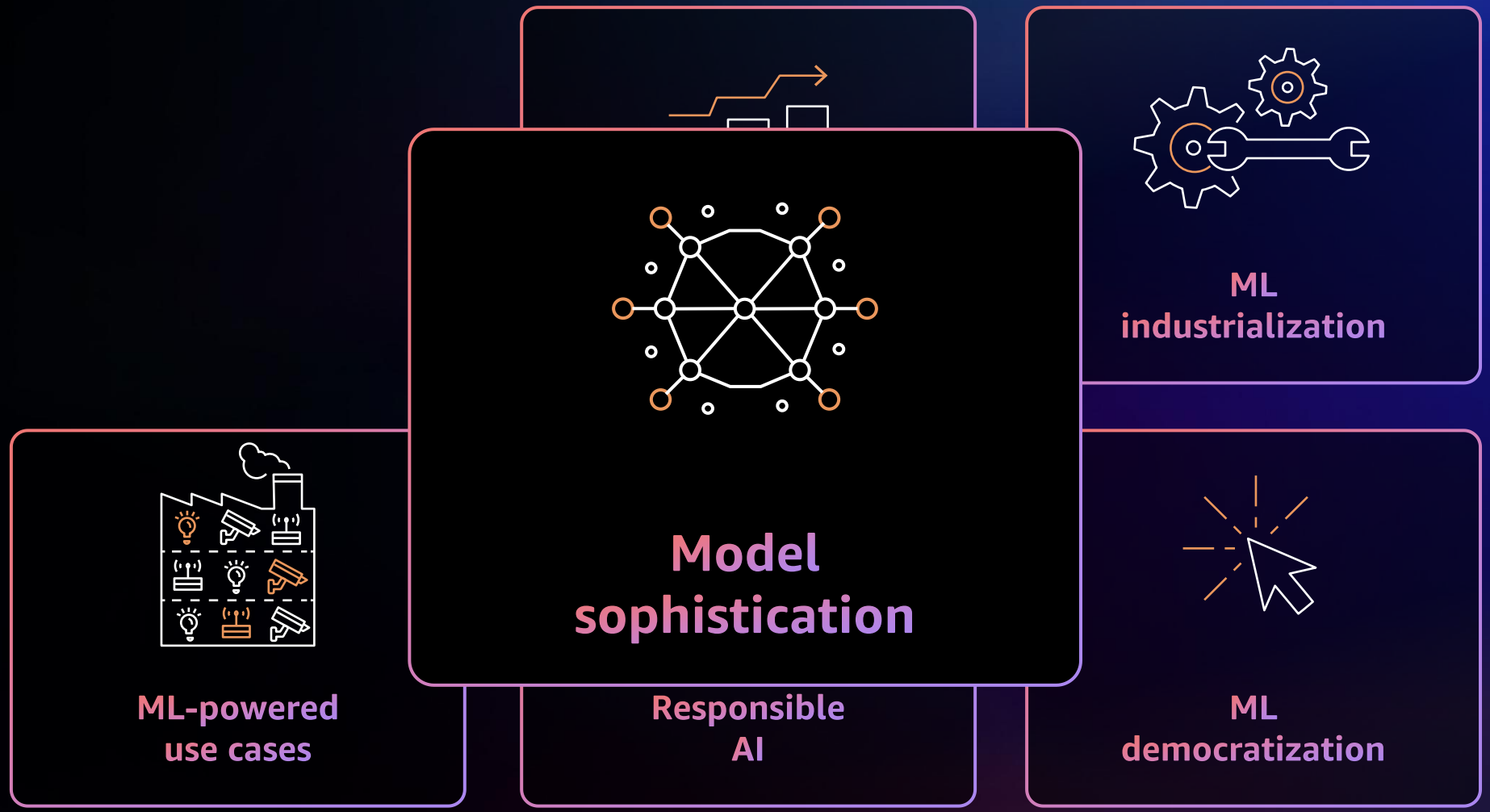
Responsible AI



ML democratization

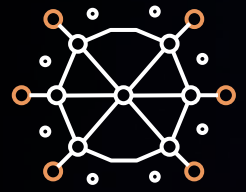
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Six key trends driving ML innovation

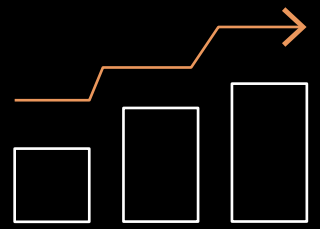


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Six key trends driving ML innovation



Model sophistication



Data growth



ML industrialization



ML-powered use cases

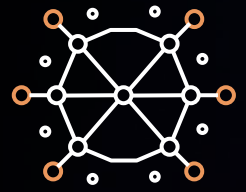
Responsible AI



ML democratization

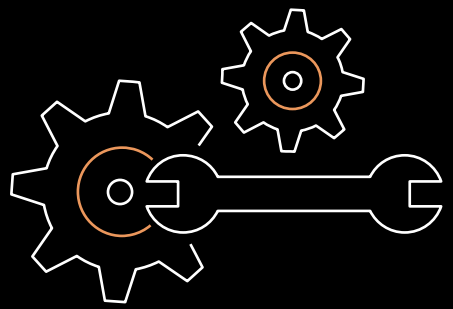
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Six key trends driving ML innovation

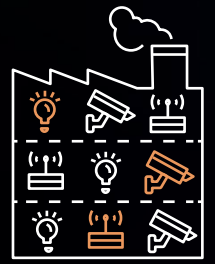


Model sophistication





ML industrialization



ML-powered use cases

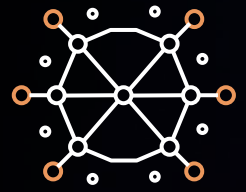
Responsible AI



ML democratization

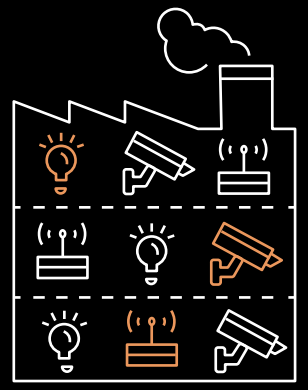
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Six key trends driving ML innovation



Model sophistication





ML-powered use cases

Responsible AI



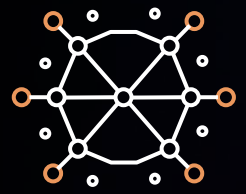
ML industrialization



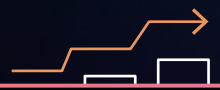
ML democratization

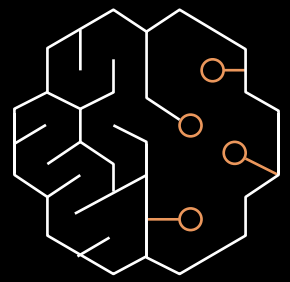
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Six key trends driving ML innovation



Model sophistication

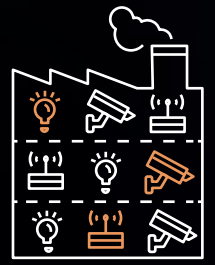




Responsible AI



ML industrialization



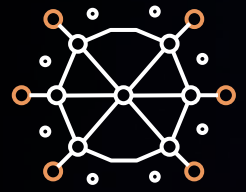
ML-powered use cases



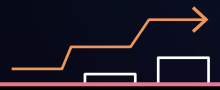
ML democratization

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Six key trends driving ML innovation



Model sophistication

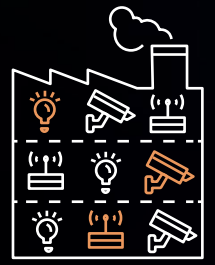




ML democratization



ML industrialization



ML-powered use cases

Responsible AI

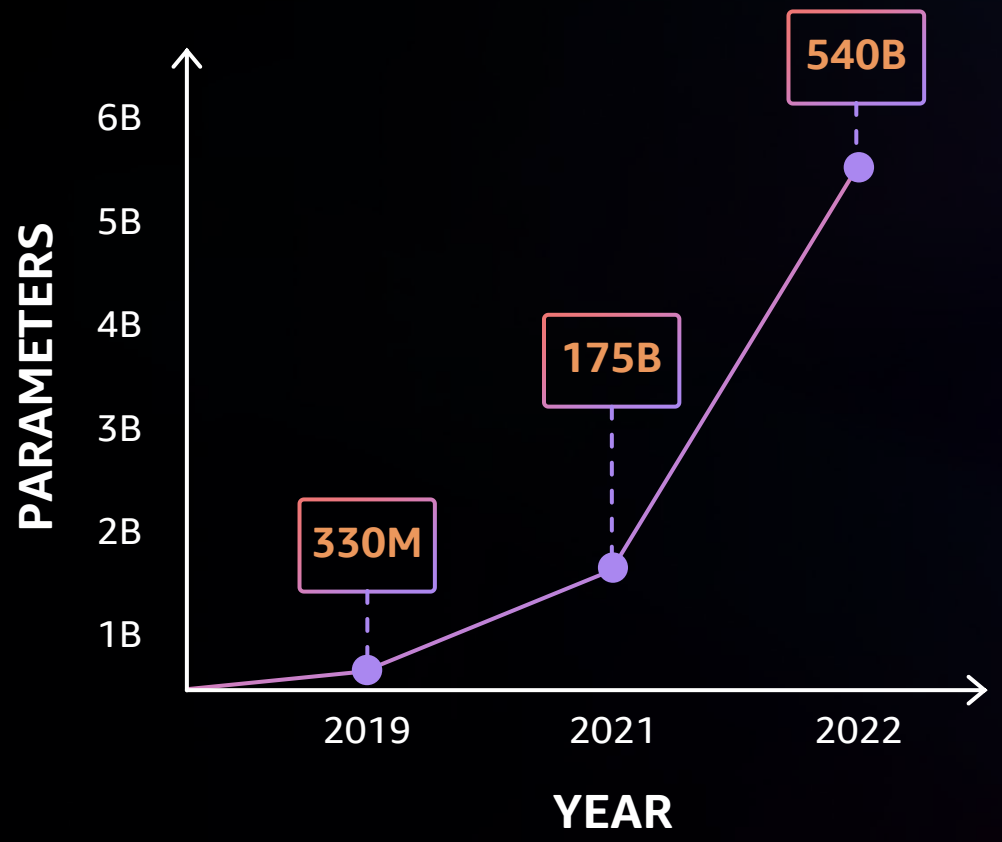
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Trend 1: Model sophistication



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Rise of foundation models



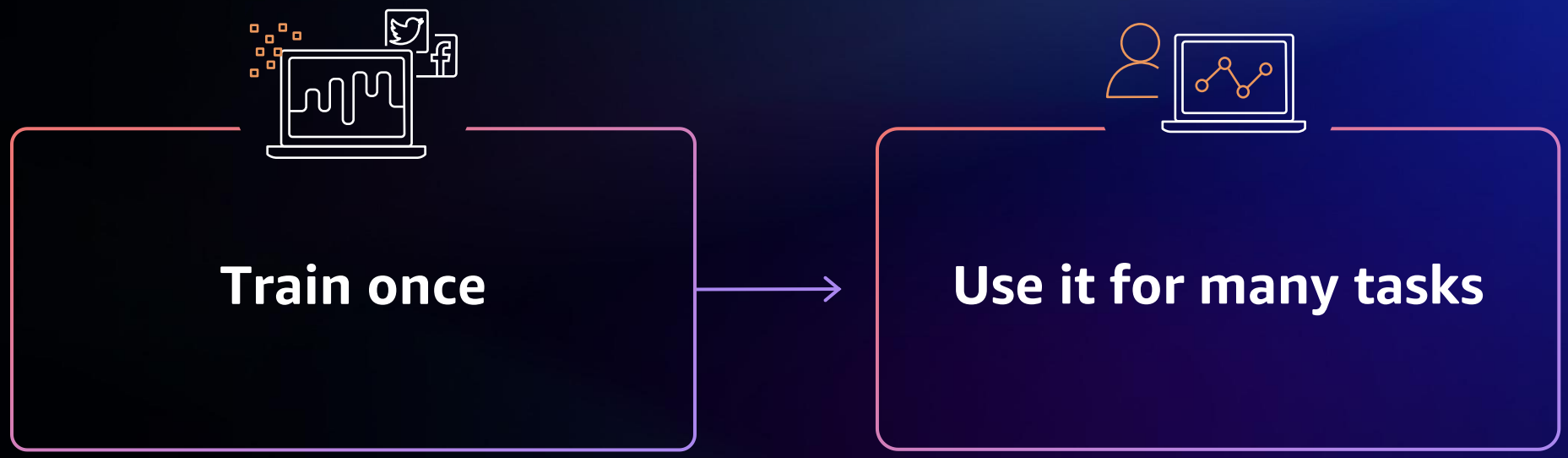
2019–2022

1,600x

increase in size of model as measured by number of parameters

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What is a foundation model?



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NEW!

Amazon CodeWhisperer

Build applications faster with the ML-powered coding companion

Available in all major IDEs as an extension

Preview

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upload-s3.py

```
1
```

upload-s3.py

```python
import boto3
from botocore.exceptions import ClientError
import logging

"""
Function to upload a file to S3 using server-side encryption.
    :param file_name: File to upload
    :param bucket: Bucket to upload to
    :param object_name: S3 object name. If not specified then file_name is used
    :param s3_client: If not specified then a new client is created.
"""


```



NEW!

Stability AI models on Amazon SageMaker

Use open source foundation models from Stability AI through SageMaker

Generally available

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stability.ai

Emad Mostaque
Founder and CEO, Stability AI
@EMostaque

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AI by the people, for the people

Open source foundation model AI

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Our communities

DEVELOPER COMMUNITIES BUILDING THE FUTURE OF AI



OpenBioML



CarperAI



DeepFloyd
Coming soon



LAION



eleutherai



Harmonai

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Stable Diffusion

THE FIRST FOUNDATION MODEL TO GO GLOBAL



Floral Wolf



Color Splashes



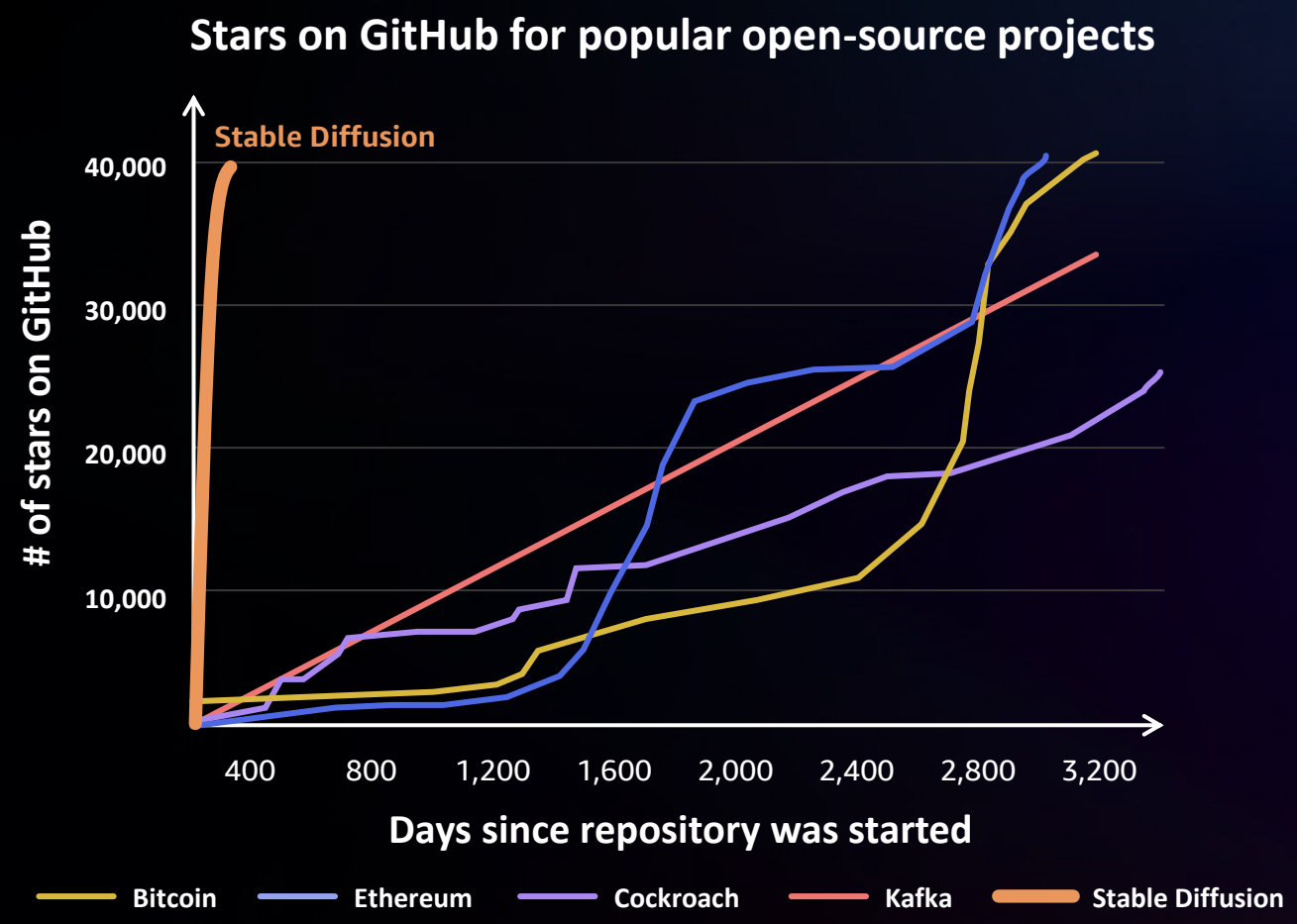
Cat Knight

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Stable Diffusion

THE FIRST FOUNDATION MODEL TO GO GLOBAL



Stable Diffusion accumulated **40,000** stars in its first 90 days, a benchmark other projects achieve in years or decades

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Source: GitHub

Stable Diffusion 2.0

CLEANER DATASET, BETTER QUALITY, LESS BIAS, AND FASTER







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Stable Diffusion 2.0

APPROACHING PHOTOREALISM





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Stable Diffusion 2.0

UNLIMITED CONTENT





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Stable Diffusion 2.0

UNLIMITED CREATIVITY





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Customized Stable Diffusion 2.0

TRAIN TO YOUR OWN STYLE



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Stable Diffusion 2.0 Depth to Image

TRANSFORM IMAGES DYNAMICALLY



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Stable Diffusion 2.0 Depth to Image

TRANSFORM IMAGES DYNAMICALLY







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Stable Diffusion 2.0 Inpainting

CHANGE IMAGE DETAILS





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Stable Diffusion 2.0 Upscaler



4x



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Distilled Stable Diffusion

FASTER, CHEAPER, BETTER

Time to generate an image

5.6 Seconds → 0.9 Seconds

Steps to generate an image

50 Steps → 5 Steps

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Scalability & training with Amazon SageMaker



GPT-Neo X optimization using SageMaker distributed training: **60% faster** from 103 to 163 TFLOPS/GPU

Resiliency against GPU failures

Trained LLMs + Stable Diffusion 2.0

Models in pipeline: audio, video, 3D, code (all training now)

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Deploy Stable Diffusion **today** on Amazon SageMaker



Test and deploy at scale within your AWS account



Jupyter notebooks and code samples

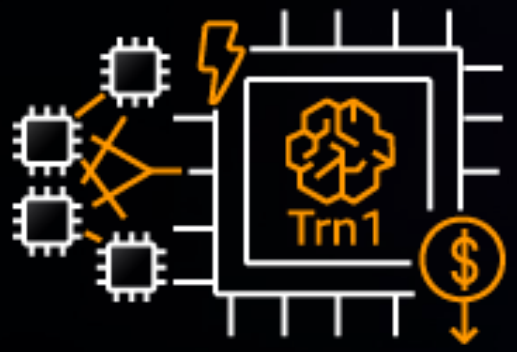


Fine-tune and adapt the model for your use case

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Training foundation models efficiently



Amazon EC2 Trn1 instances

60% more accelerator memory (vs. P4d)

2x network bandwidth (vs. P4d)

Native support for PyTorch and TensorFlow

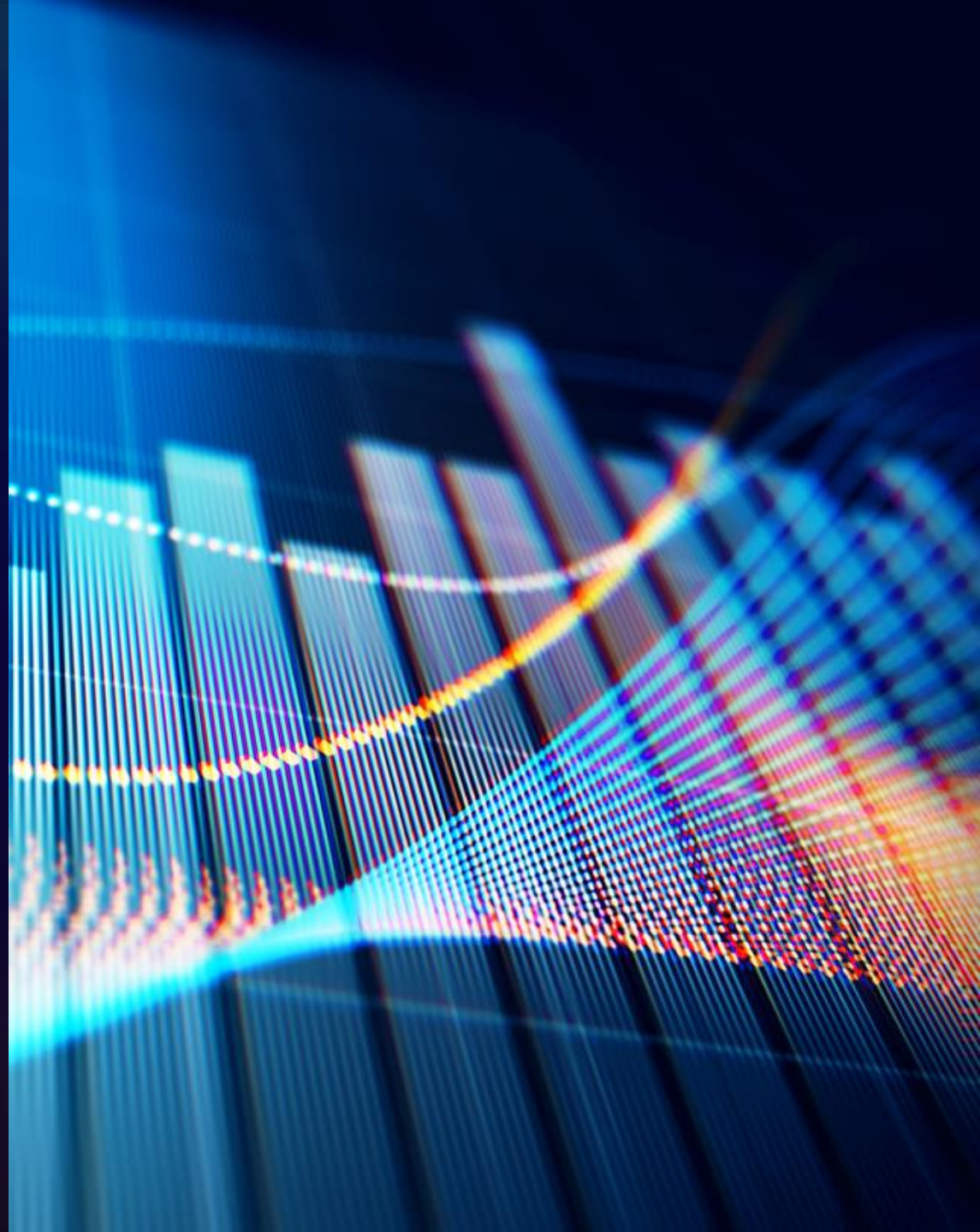
Train on Trn1 and **deploy** anywhere

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Trend 2:
Data growth



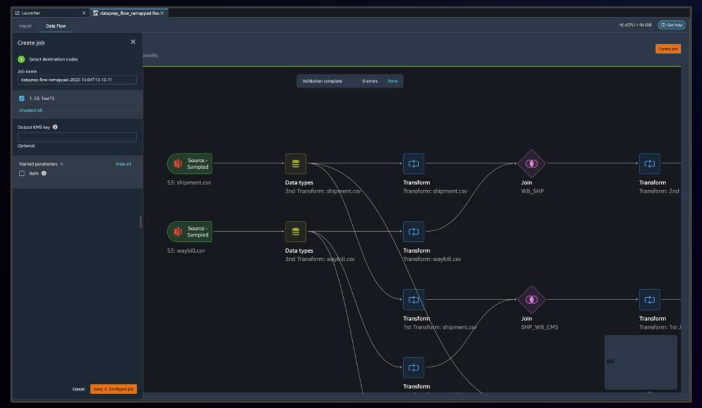
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Data preparation capabilities



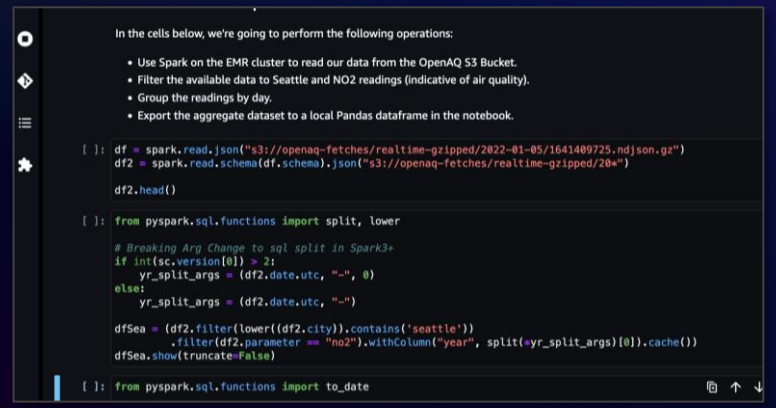
Amazon SageMaker Ground Truth

Data labeling for images, video, audio, and more



Amazon SageMaker Data Wrangler

Low-code data preparation for tabular data

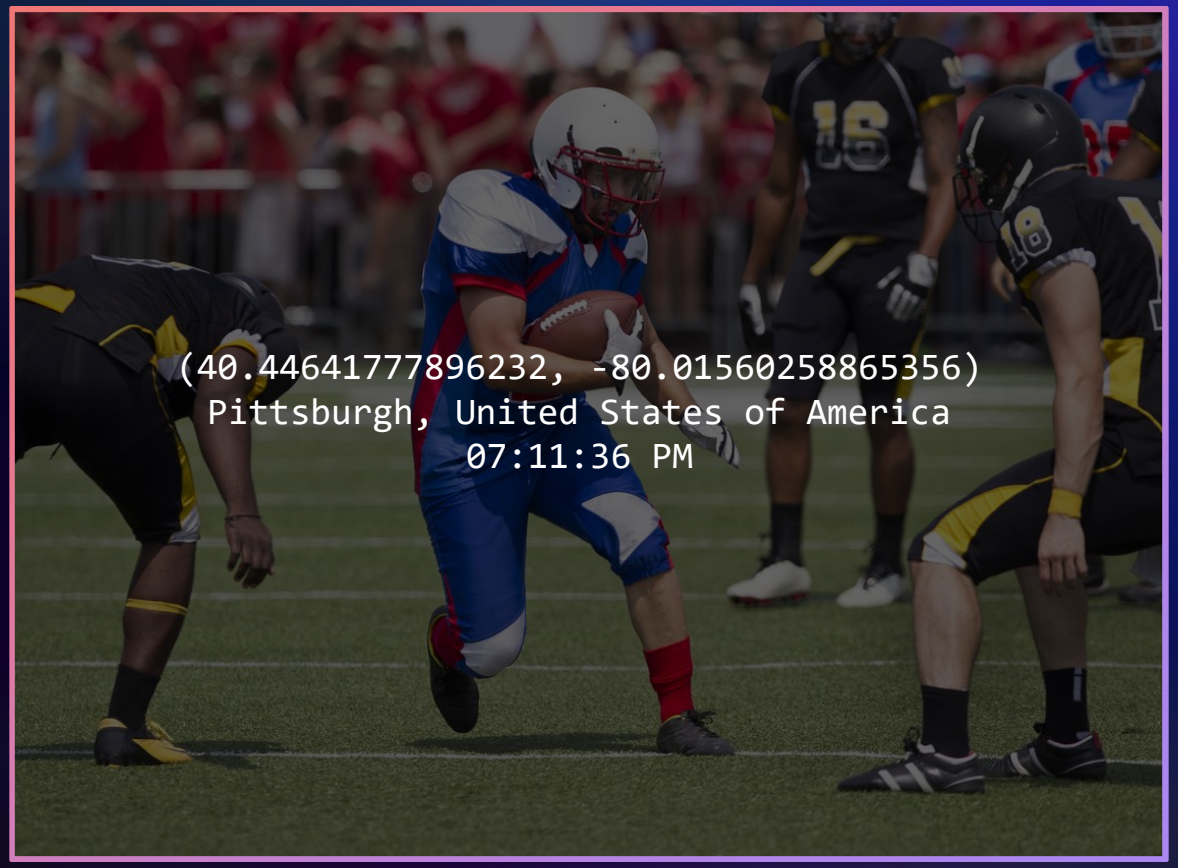


Amazon SageMaker Studio notebooks

Data processing in notebooks using Spark on Amazon EMR

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NEW!

Amazon SageMaker geospatial capabilities

Build, train, and deploy ML models using geospatial data

Preview

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BMW GROUP

Marco Görgmaier
General Manager, Data Transformation & Artificial Intelligence, BMW Group

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At the BMW Group we believe we do more than moving people from A to B

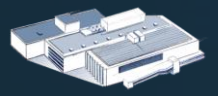


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Growing smarter with our data & AI-driven value chain



Research & Development



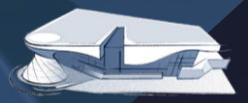
Production & Logistics



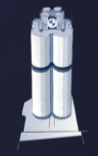
Vehicles



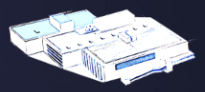
Customer, Brand, Sales



Finance, HR, Quality



Supplier Network



With our Data, Analytics & AI Ecosystem we can build on a strong foundation to harvest previously siloed data across the BMW Group and scale AI use cases across our value chain.

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Sustainable mobility for urban cities



Predict the **impact of new traffic regulations** on urban ecosystems and BMW customers



Help **identifying optimal locations** for new charging stations



Predict **impact of parking prices** on mobility and emissions

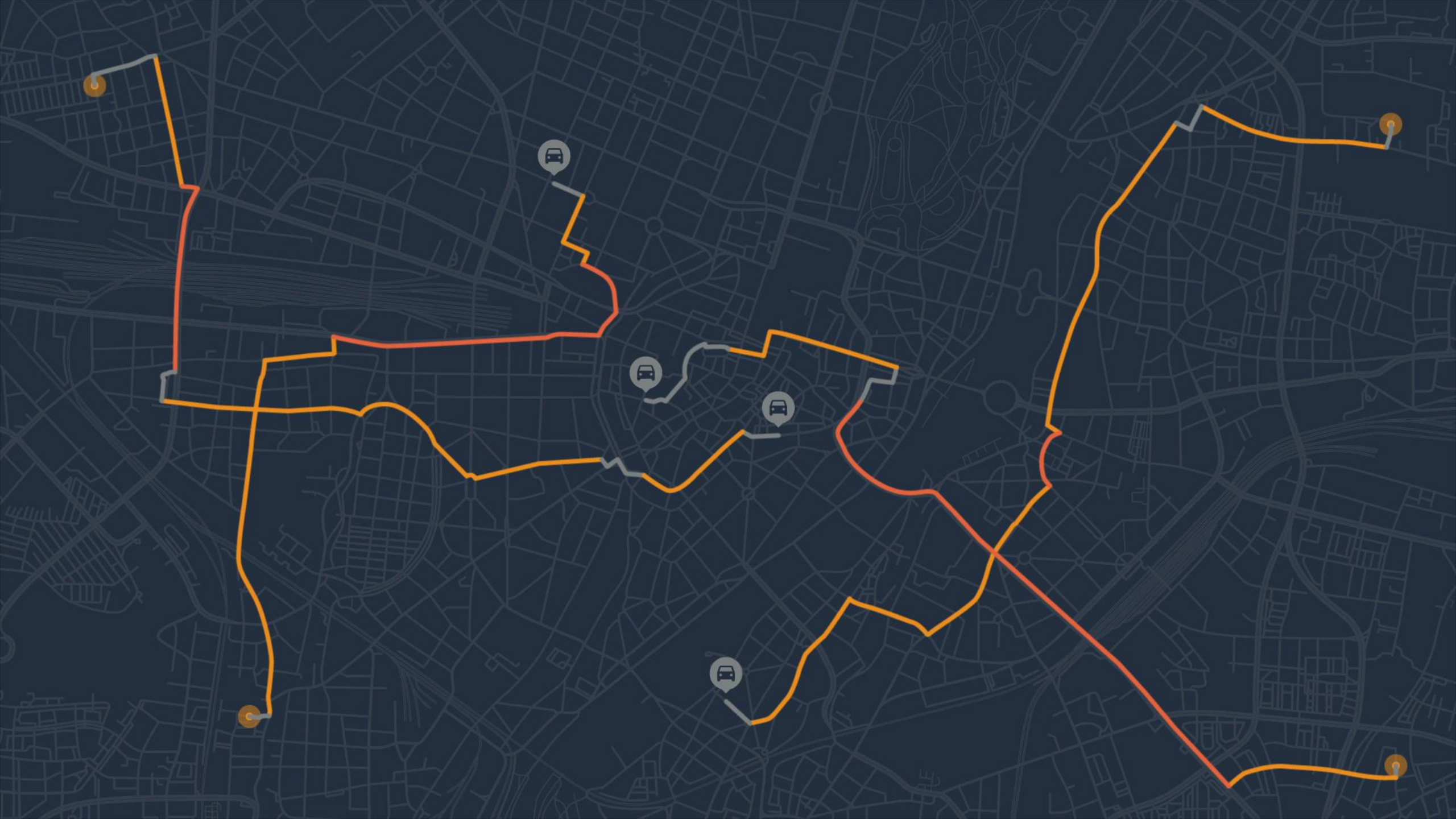
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Sustainability solution using the new Amazon SageMaker geospatial capabilities



Can we predict the affinity of drivers for an electric vehicle based on their driving behavior?

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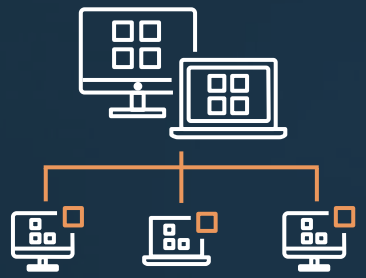




Amazon SageMaker makes it easy to work with geospatial data



Single API access to disparate data



Built-in algorithms to enrich data



Visualizing tools tailored for geospatial data

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Putting our expertise for urban mobility into practice



FROM IDEA TO SOLUTION IN 8 WEEKS

We were able to cover the entire ML lifecycle—from exploration to inference

80% ACCURACY IN PREDICTION

The model achieved high accuracy in predicting the vehicle types

AMAZON SAGEMAKER AS ENABLER

Amazon SageMaker geospatial capabilities made it easy to achieve these results

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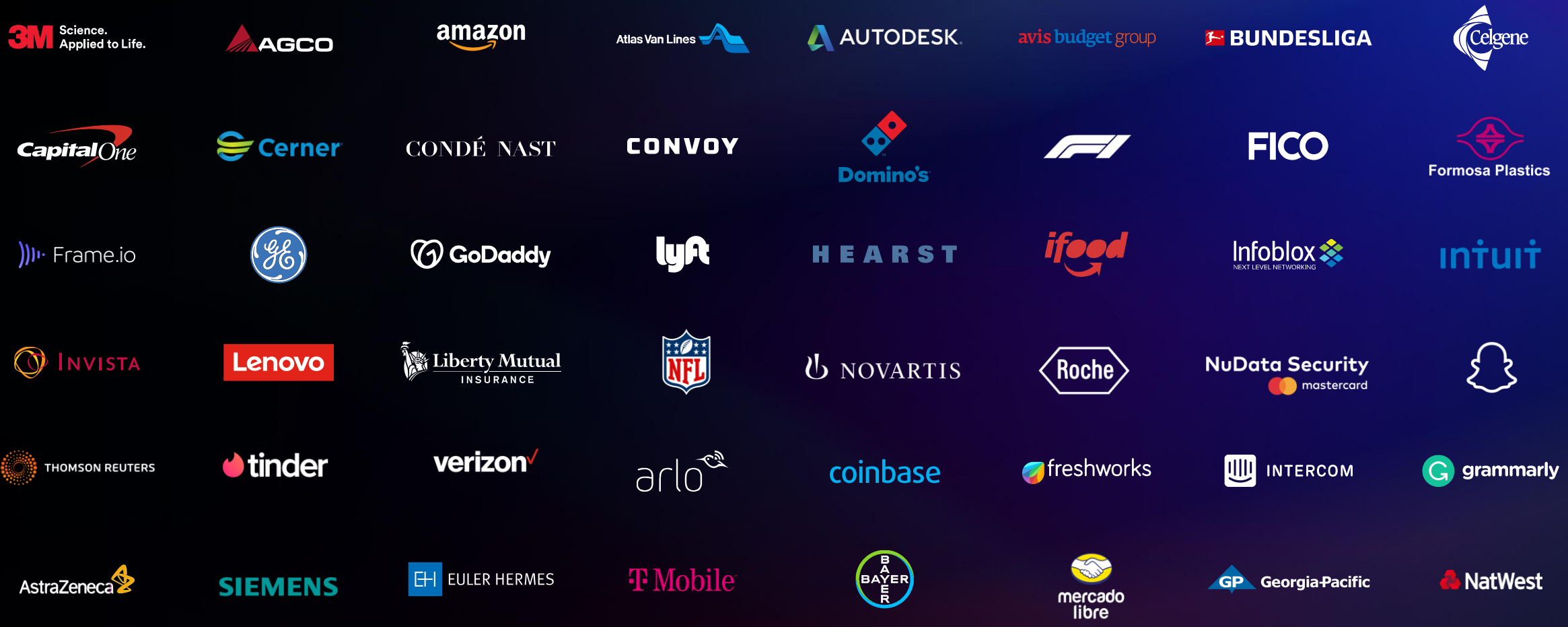
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Trend 3:
ML industrialization



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Tens of thousands of customers industrializing ML with Amazon SageMaker



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Alexa

Anand Victor

VP, Alexa ML Builder Experience

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Alexa's mission

BECOME AN INDISPENSABLE ASSISTANT, A TRUSTED ADVISOR, AND A FUN AND CARING COMPANION

130K+
Skills

100M+
Devices

900K+
Developers

17
Language variants

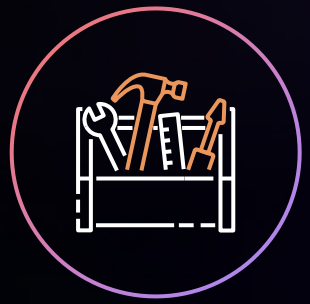


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Enabling ML at Alexa scale



Employ thousands of ML models



Enable thousands of ML builders



Use millions of GPU hours

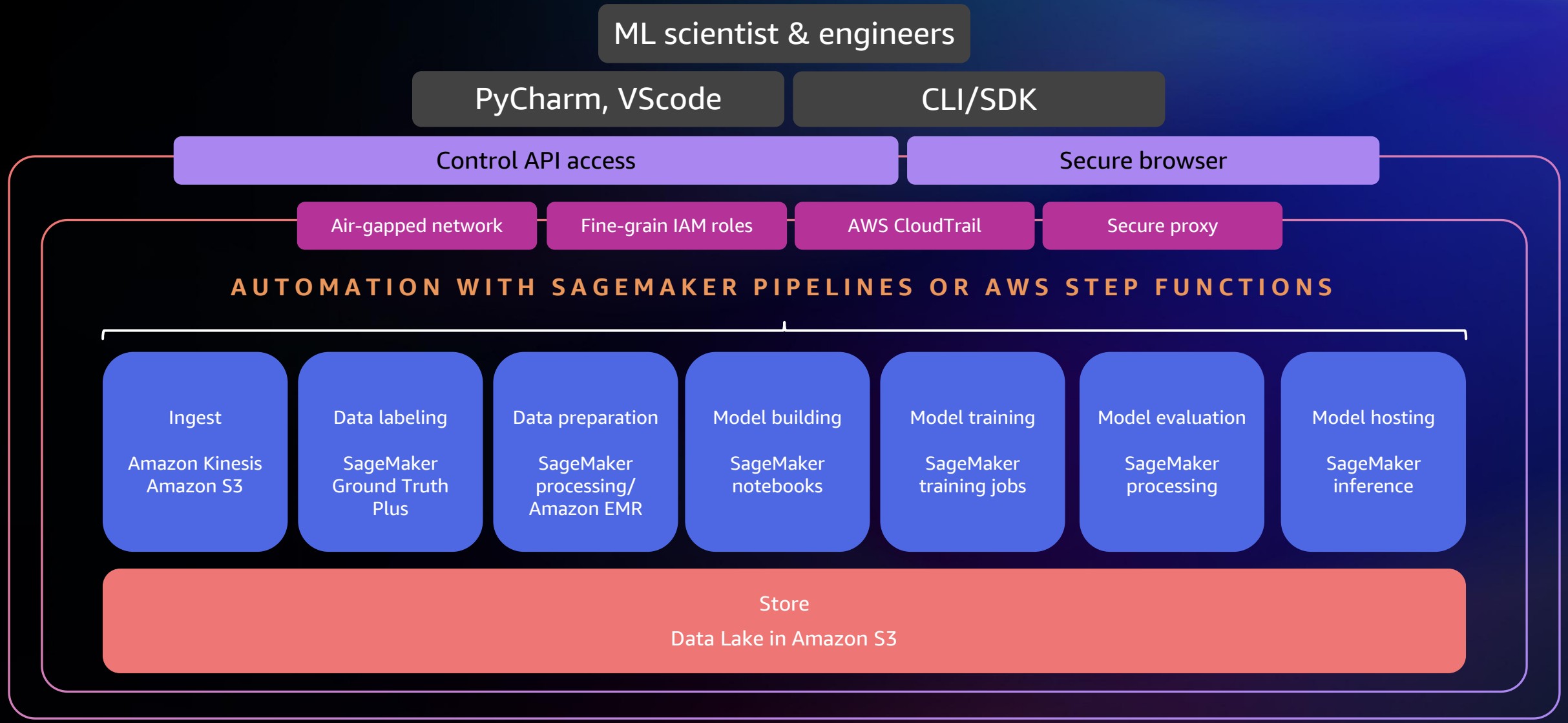


Maintain customer trust and privacy

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Using SageMaker for ML at Alexa scale



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What are our builders saying about SageMaker?

SAGEMAKER NOW POWERS MULTIPLE SPEECH, VISION, AND ALEXA SKILL MODELS



"It's almost TOO easy to launch a new experiment. One command, and I can have a dozen parallel experiments running—this would take me 20–40 minutes for each experiment before."

"I don't have to wait around to get compute resources or worry about setting up and tearing down infrastructure."

ML builders like it

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What are business leaders saying about SageMaker?

SAGEMAKER NOW POWERS MULTIPLE SPEECH, VISION, AND ALEXA SKILL MODELS



BU leader:

"SageMaker's pay-for-use pricing increases our GPU utilization and enables us to train more models with the same amount of compute."

Business leaders

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NEW!

The next generation of SageMaker Studio notebooks

Built-in data preparation, real-time collaboration, and automated deployment

Generally available

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Real-time collaboration



Central shared workspaces



Support for BitBucket and AWS CodeCommit



Autosave experiments, models, and artifacts

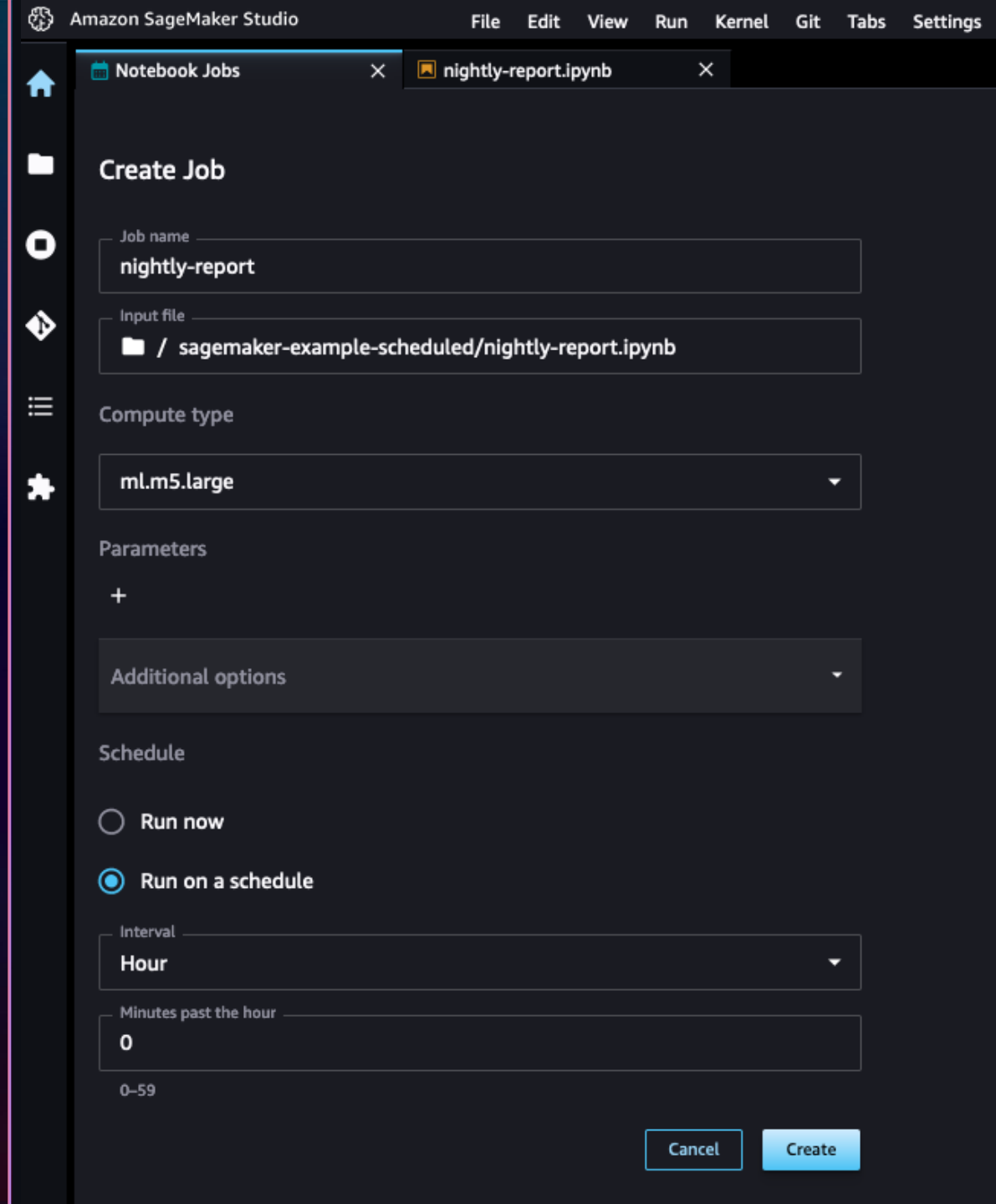
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Automated notebook deployment

Automatically run notebooks on a periodic schedule

Manage scheduled notebooks jobs

Deploy notebooks in hours instead of days



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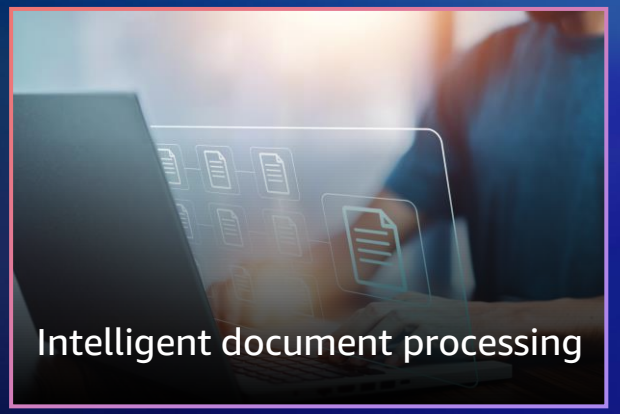
Trend 4: ML-powered use cases



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Enhance customer experience

Better and faster decision making

Improve business operations

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Contact center innovation with Amazon Transcribe

STATE AUTO Insurance Companies

Reviewed 83% more claims

WiX

Increased customer sentiment visibility to 100%

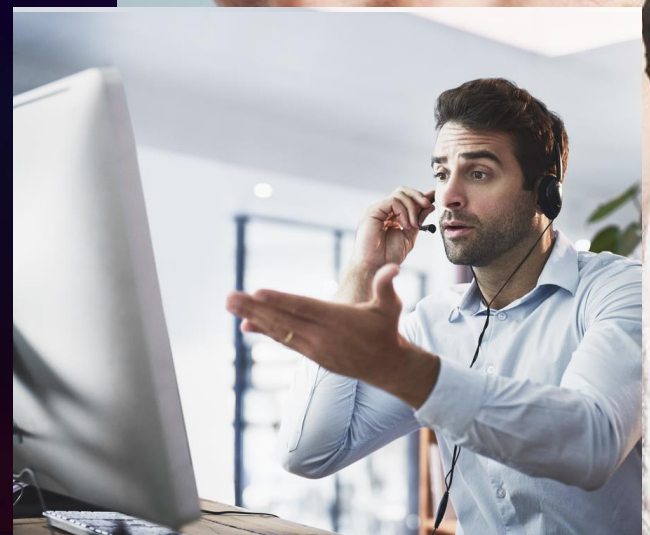
:talkdesk®

Reduced average handle time by 24% for a major food logistics enterprise

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Live call analytics improves customer experience



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NEW!

Amazon Transcribe Call Analytics

Real-time capabilities

Boost agent productivity and improve customer experience

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Intelligent document processing with Amazon Textract

PENNYMAC℠

Reduced document processing time from hours to minutes

Elevance℠ Health

Automated 90% of the document classification for claims processing

bluevine

Automated the processing of tens of thousands of loan applications per day

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NEW!

Amazon Textract

Analyze Lending

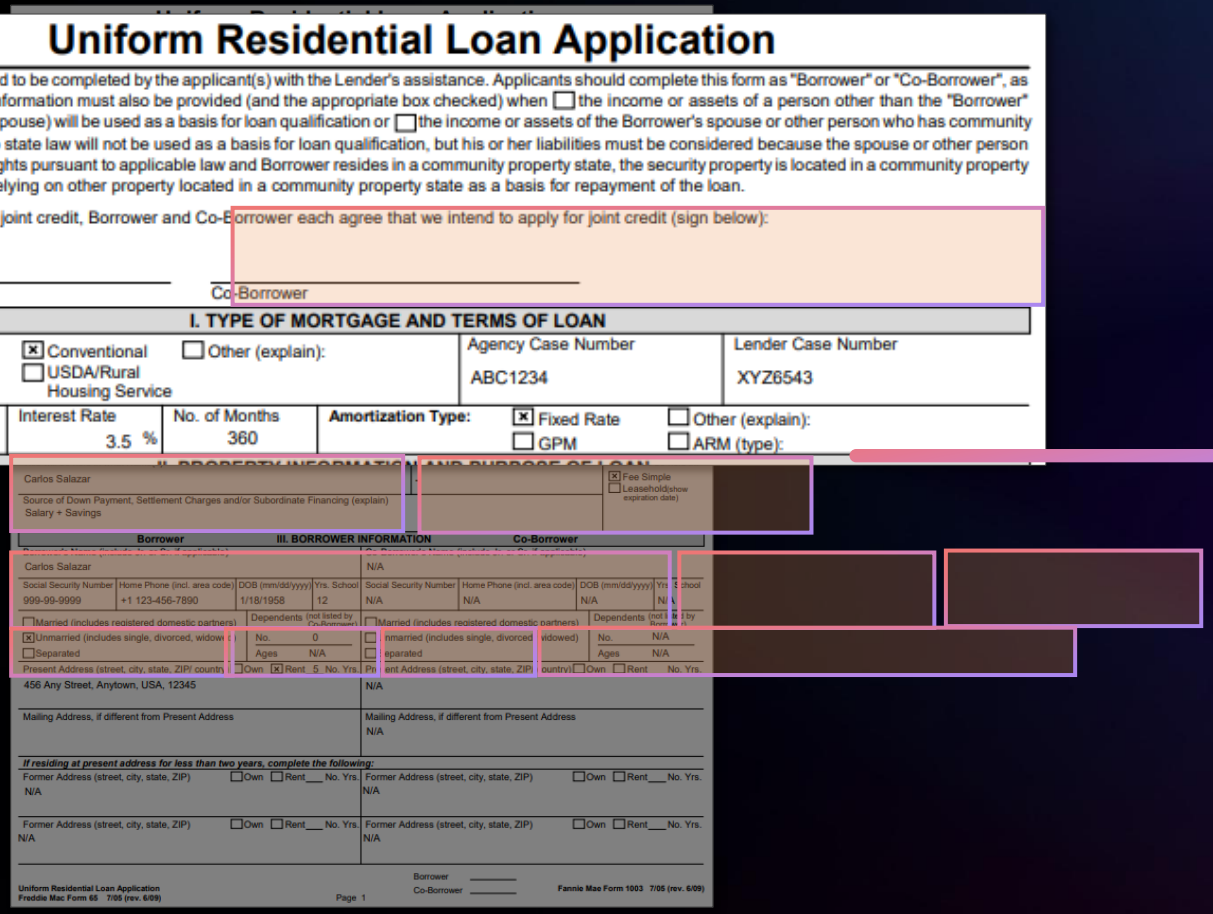
Accelerate time to process lending documents

Generally available

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How it works

Original document



Uniform Residential Loan Application

s designed to be completed by the applicant(s) with the Lender's assistance. Applicants should complete this form as "Borrower" or "Co-Borrower", as orrower information must also be provided (and the appropriate box checked) when ☐ the income or assets of a person other than the "Borrower" rower's spouse) will be used as a basis for loan qualification or ☐ the income or assets of the Borrower's spouse or other person who has community rsuant to state law will not be used as a basis for loan qualification, but his or her liabilities must be considered because the spouse or other person roperty rights pursuant to applicable law and Borrower resides in a community property state, the security property is located in a community property ower is relying on other property located in a community property state as a basis for repayment of the loan.

cation for joint credit, Borrower and Co-Borrower each agree that we intend to apply for joint credit (sign below):

Co-Borrower

I. TYPE OF MORTGAGE AND TERMS OF LOAN

☐ VA ☐ FHA ☒ Conventional ☐ USDA/Rural Housing Service ☐ Other (explain):

Agency Case Number: ABC1234

Lender Case Number: XYZ6543

Interest Rate: 3.5 %

No. of Months: 360

Amortization Type: ☒ Fixed Rate ☐ GPM ☐ Other (explain): ☐ ARM (type):

Carlos Salazar

Source of Down Payment, Settlement Charges and/or Subordinate Financing (explain)
Salary + Savings

☒ Fee Simple ☐ Leasehold (show expiration date)

Borrower III. BORROWER INFORMATION Co-Borrower

Carlos Salazar

Social Security Number	Home Phone (incl. area code)	DOB (mm/dd/yyyy)	Yrs. School
999-99-9999	+1 123-456-7890	1/18/1958	12

☐ Married (includes registered domestic partners) Dependents (not listed by Co-Borrower)
☒ Unmarried (includes single, divorced, widowed) No. 0
☐ Separated Ages N/A

Present Address (street, city, state, ZIP, country) ☐ Own ☒ Rent 5 No. Yrs.
456 Any Street, Anytown, USA, 12345

Mailing Address, if different from Present Address

If residing at present address for less than two years, complete the following:

Former Address (street, city, state, ZIP) ☐ Own ☐ Rent No. Yrs. N/A

Former Address (street, city, state, ZIP) ☐ Own ☐ Rent No. Yrs. N/A

N/A

Social Security Number	Home Phone (incl. area code)	DOB (mm/dd/yyyy)	Yrs. School
N/A	N/A	N/A	

☐ Married (includes registered domestic partners) Dependents (not listed by Borrower)
☐ Unmarried (includes single, divorced, widowed) No. N/A
☐ Separated Ages N/A

Present Address (street, city, state, ZIP, country) ☐ Own ☐ Rent No. Yrs.
N/A

Mailing Address, if different from Present Address
N/A

Former Address (street, city, state, ZIP) ☐ Own ☐ Rent No. Yrs. N/A

Former Address (street, city, state, ZIP) ☐ Own ☐ Rent No. Yrs. N/A

Uniform Residential Loan Application
Freddie Mac Form 65 7/05 (rev. 6/09)
Page 1
Borrower
Co-Borrower
Fannie Mae Form 1003 7/05 (rev. 6/09)

Output

```
Document Class: UNIFORM RESIDENTIAL LOAN APPLICATION
Borrower First Name: JORGE
Borrower Last Name: SOUZA
Borrower Middle Name:
Co-Borrower First Name: GEORGINA
Co-Borrower Last Name: DAVIS
Co-Borrower Middle Name: AMY
Type of Mortgage and Terms of Loan:
Loan Type: CONVENTIONAL
Agency Case Number: ABC1234
Lender Case Number: XYZ6543
Loan Amount: $552,500
Interest Rate: 3.555%
Number of Months: 360
Amortization Type: FIXED RATE
```

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Amazon Monitron

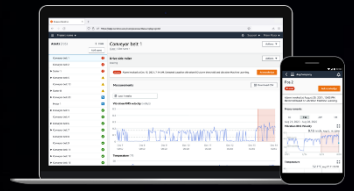
REDUCE DOWNTIME WITH END-TO-END MACHINE MONITORING



Monitron sensors



Monitron gateway



Monitron app

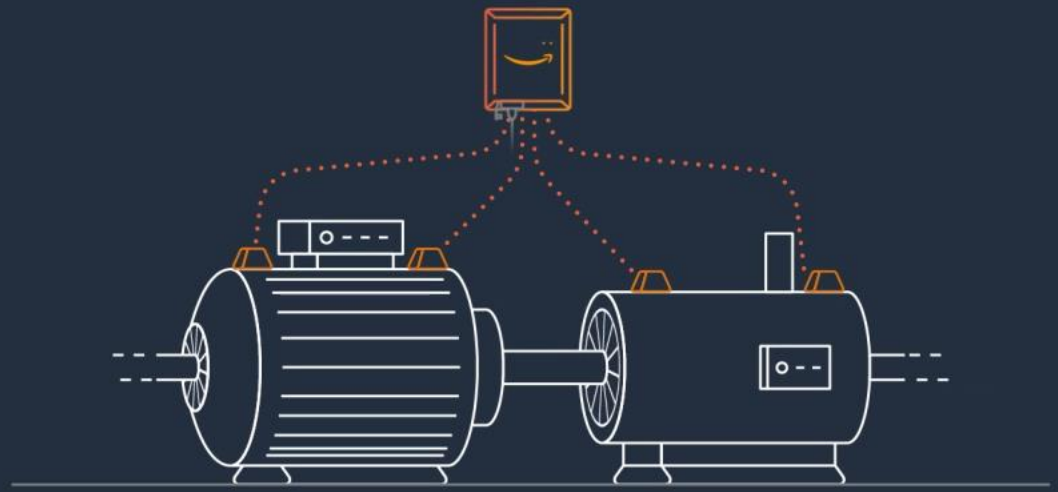
End-to-end solution for predictive maintenance

Helps you track and review developing faults

No ML expertise required

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A.K. Karan
Senior Director—Digital Transformation, Baxter

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Baxter

Global manufacturer of **healthcare and life saving products**

70+ manufacturing locations worldwide

Broad product portfolio of **50,000+** SKUs















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Diverse product portfolio

Baxter

Front Line Care



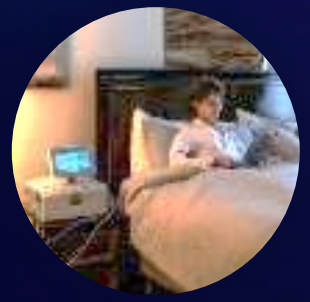
Medication Delivery



Pharmaceuticals



Renal Care



Advanced Surgery



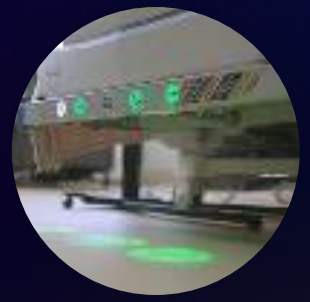
Acute Therapies



Clinical Nutrition



PSS & GSS



MISSION: SAVE AND SUSTAIN LIVES

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Operations

24 x 7 x 360

Global footprint

Complex supply chain



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Critical assets

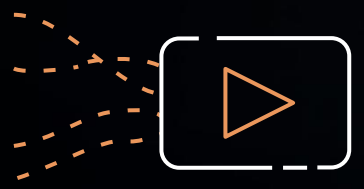


Continuous duty cycle operation

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Challenges with predictive maintenance

Plug and play



Agnostic



Ease of use



Scale



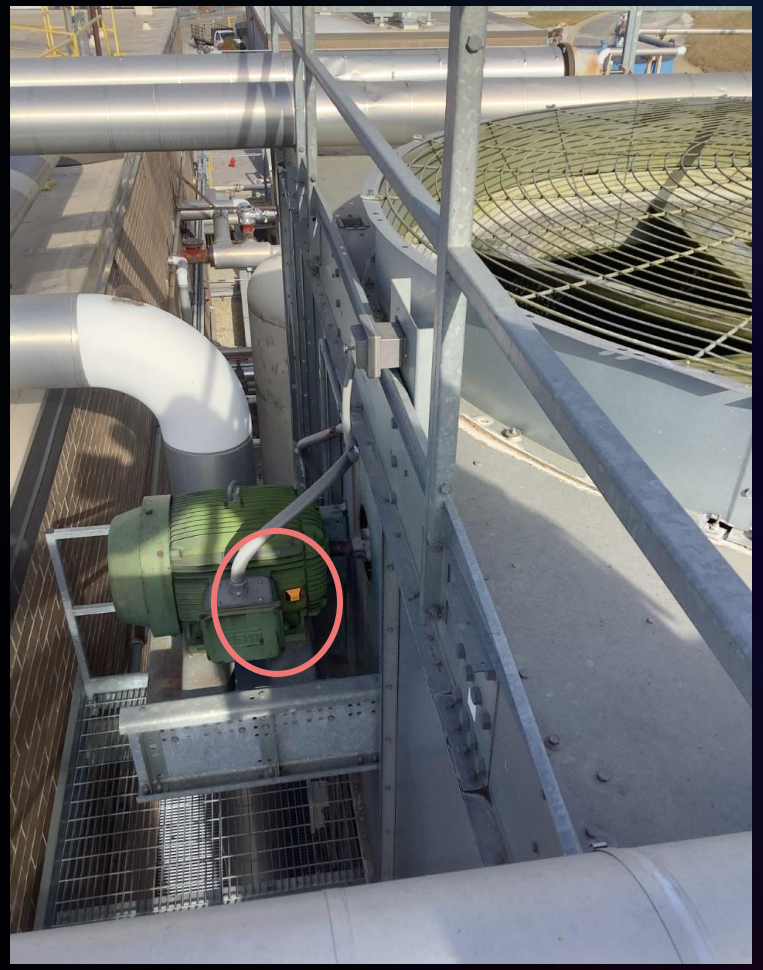
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Amazon Monitron for predictive maintenance







Cooling Tower provides chilled water for 2 manufacturing zones

- Monitron provided a High ISO Vibration alarm
- Technician responded to the alarm and identified gearbox in a near critical failure state
- Maintenance crew was scheduled to replace the gear box with minimal interference to operations

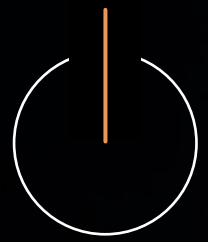
Value

- Avoided 12 hours of unplanned downtime
- Avoided emergency repair costs

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Our journey . . .



Start

Started with 400 sensors in one of our Lighthouse plants



Launch

Launched for the entire site—2500 sensors



Scale

Scaling to global manufacturing sites

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Results

500

Downtime elimination*
(machine hours)

7M

Production impact*
(units)

10K

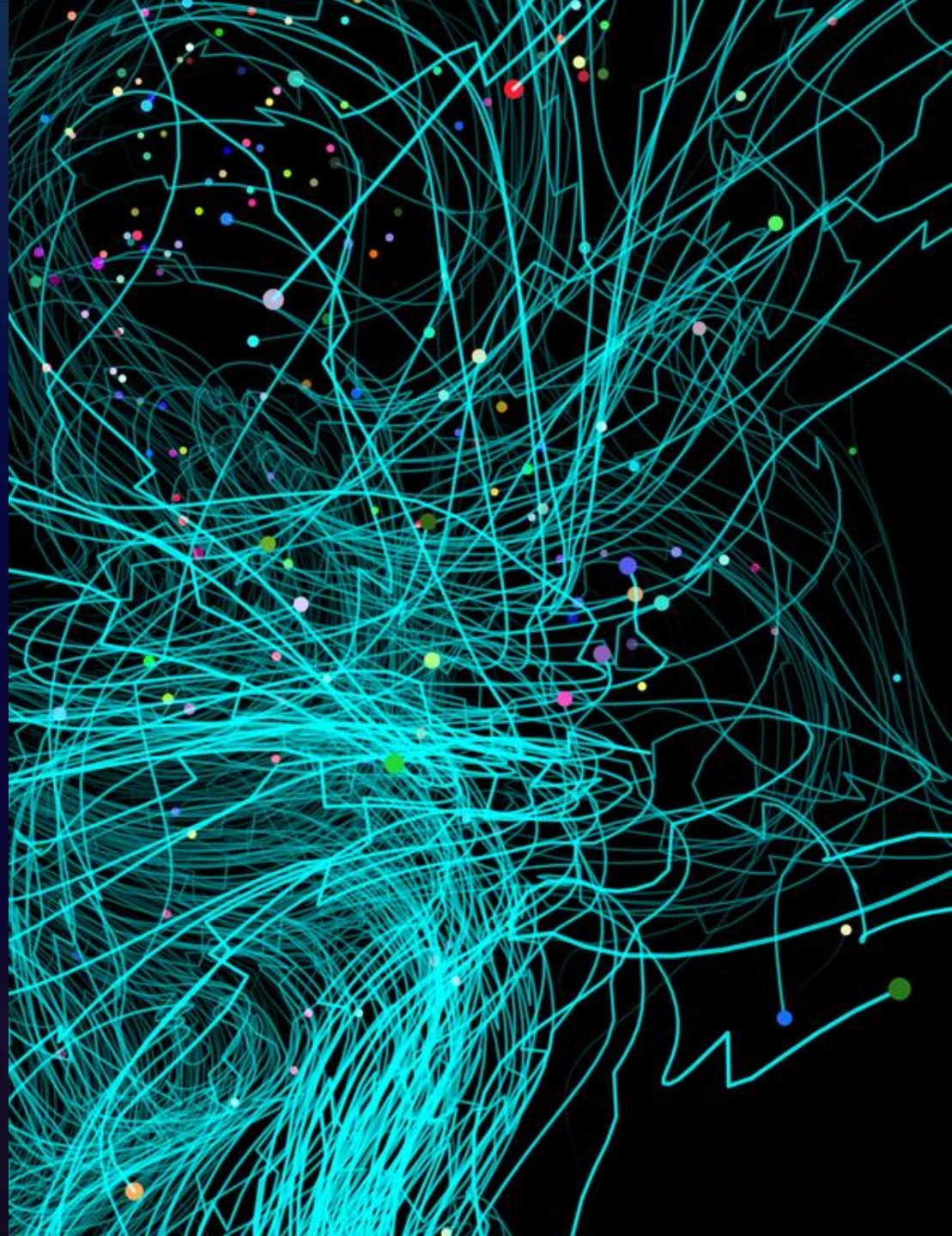
Patients impacted*

* Estimated



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Trend 5: Responsible AI



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The reach of AI and ML is growing

Global spending on AI-based technologies will reach **$204 billion by 2025**

57% of executives say AI would **transform their organization** in the next three years

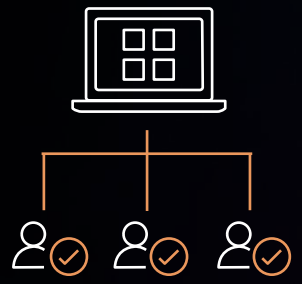
AI can play a role in nearly **every part of an organization**

With the growth of AI comes **responsibility**

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What is responsible AI?



Fairness



Explainability



Robustness



Privacy and security



Governance

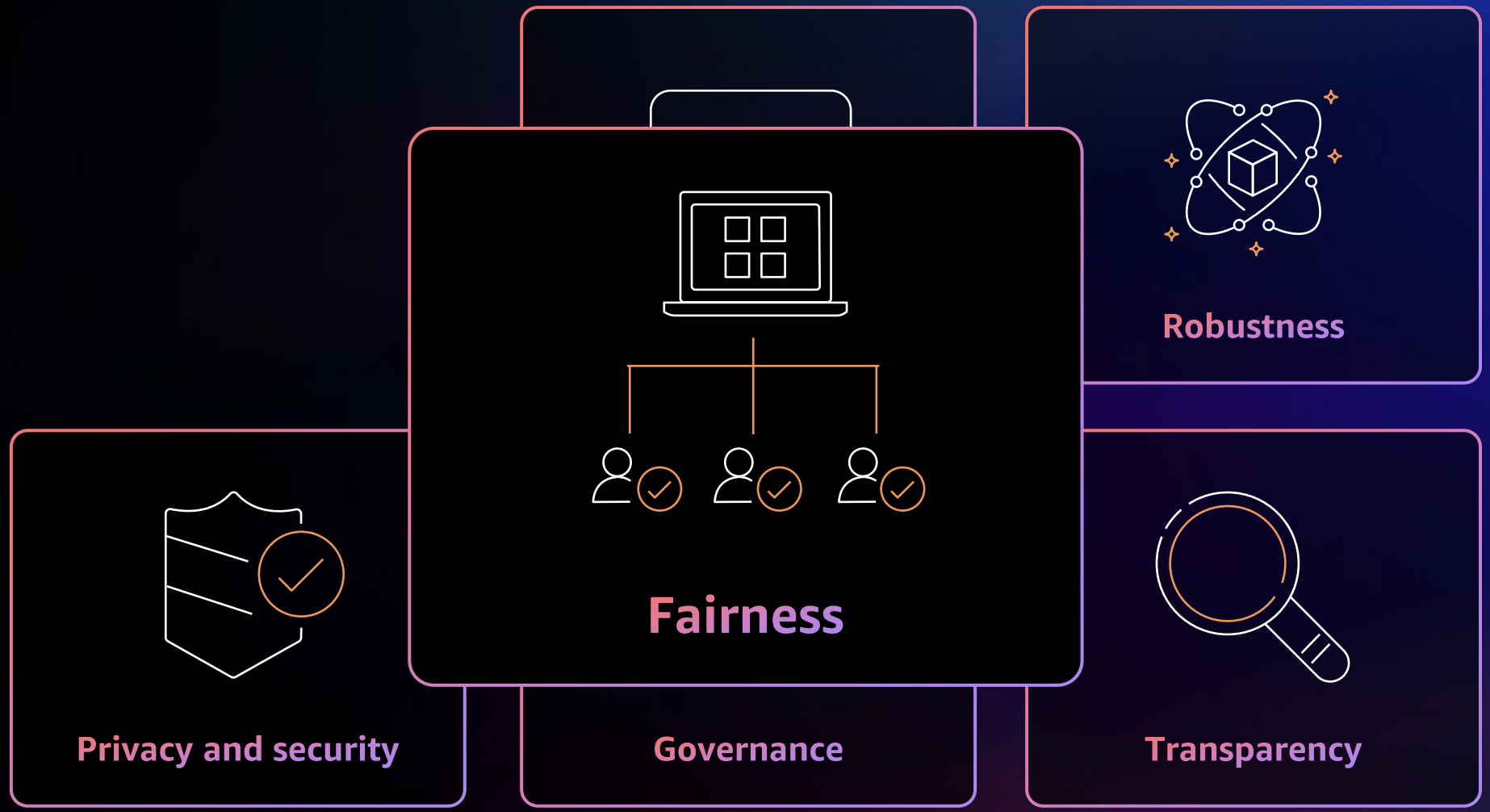


Transparency

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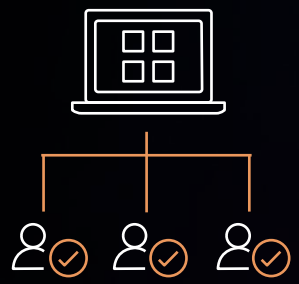
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What is responsible AI?

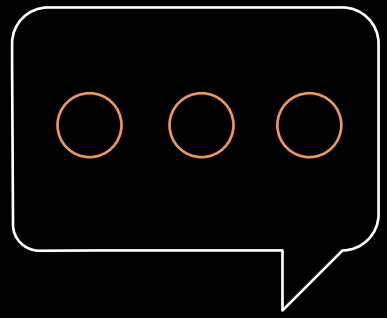


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What is responsible AI?



Fairness



Explainability



Robustness



Privacy and security

Governance

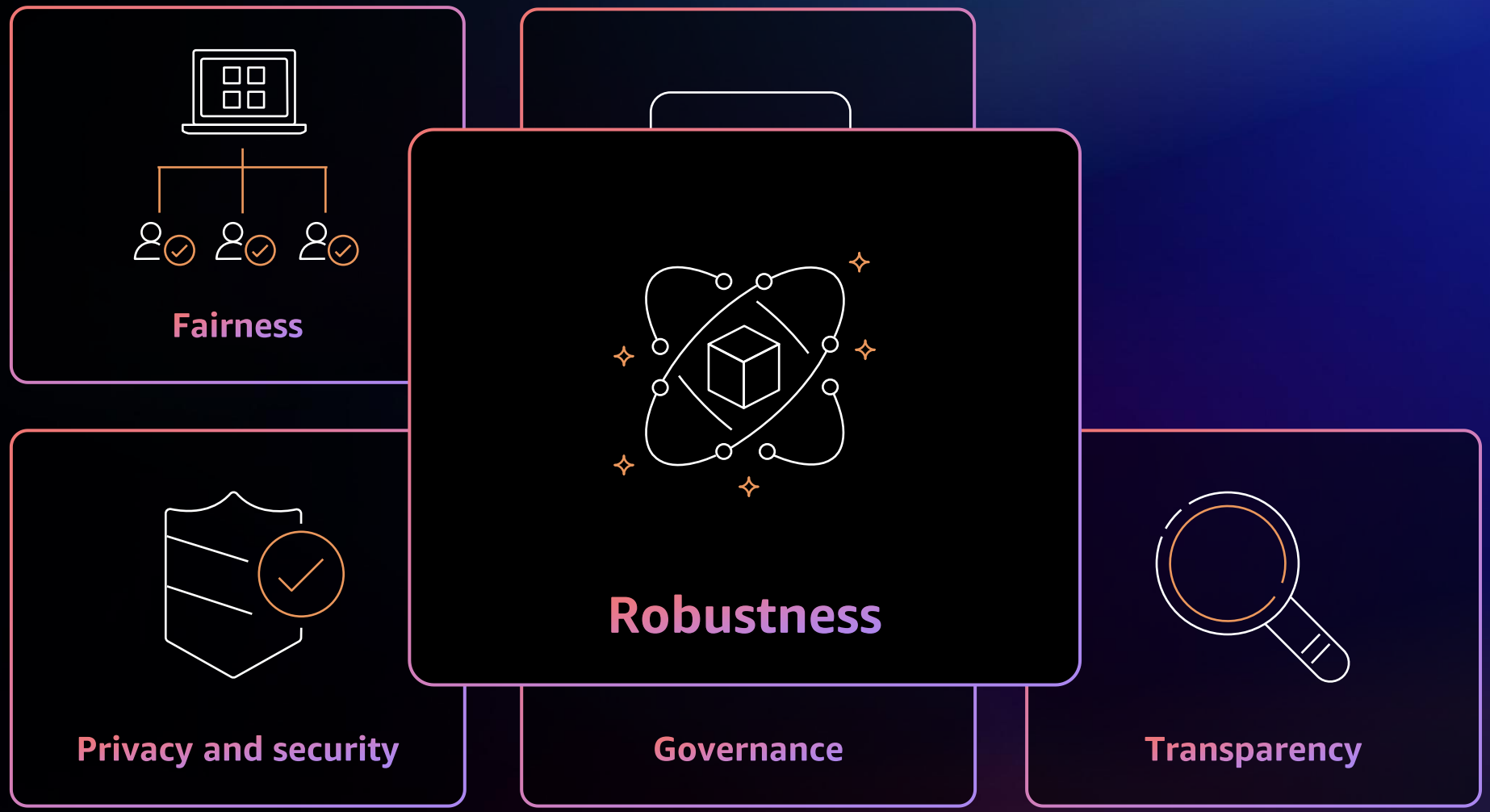


Transparency

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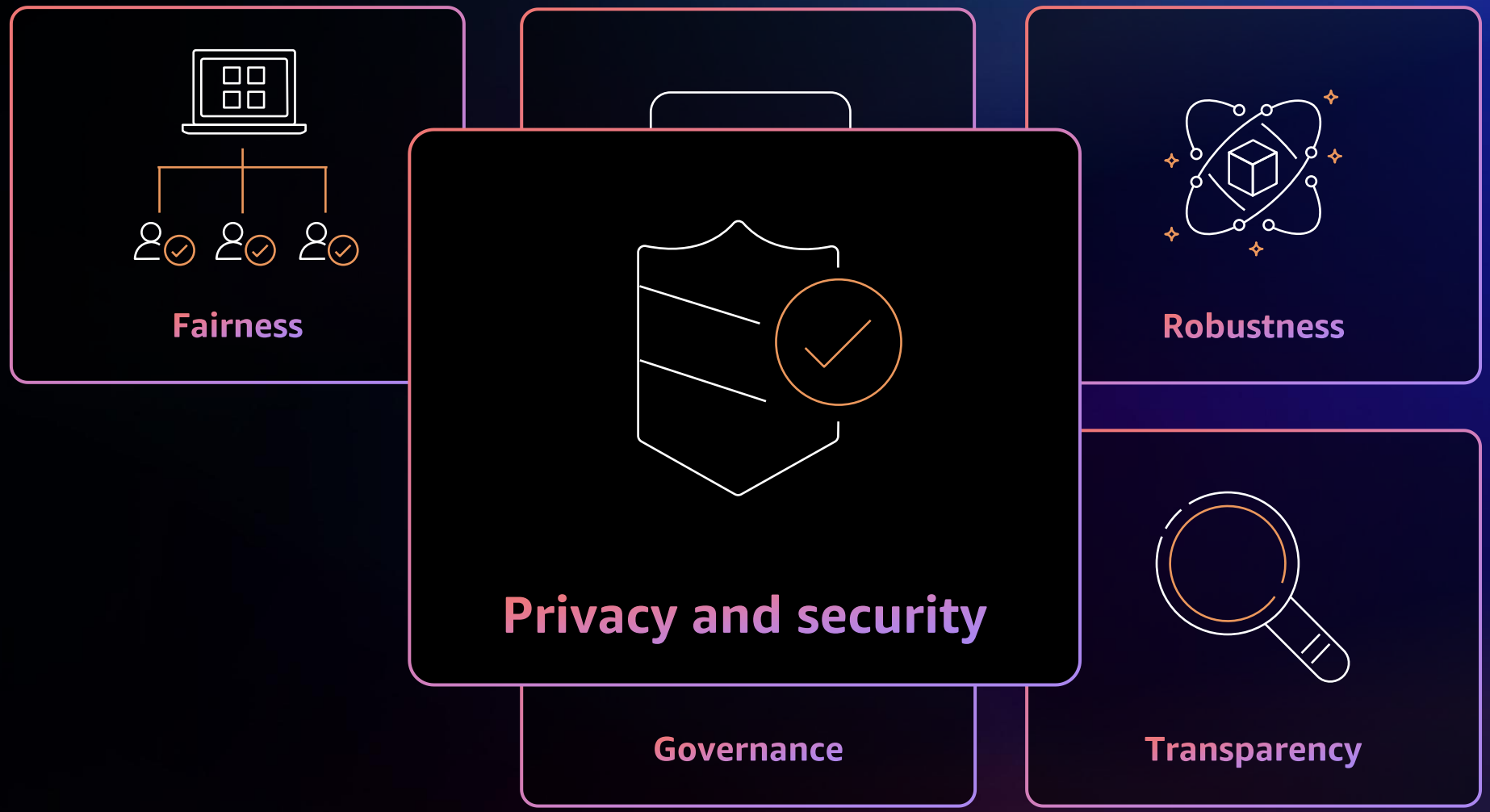
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What is responsible AI?



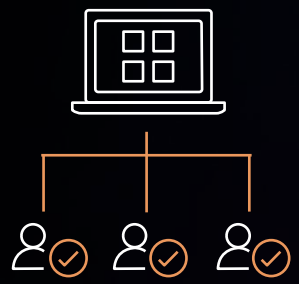
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What is responsible AI?

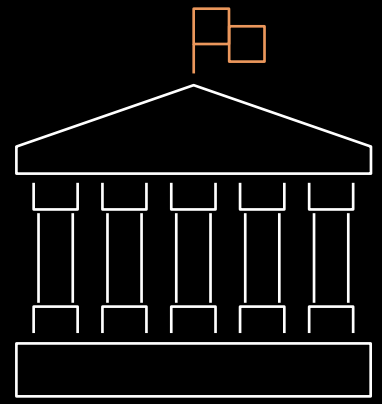


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What is responsible AI?



Fairness



Governance



Robustness



Privacy and security

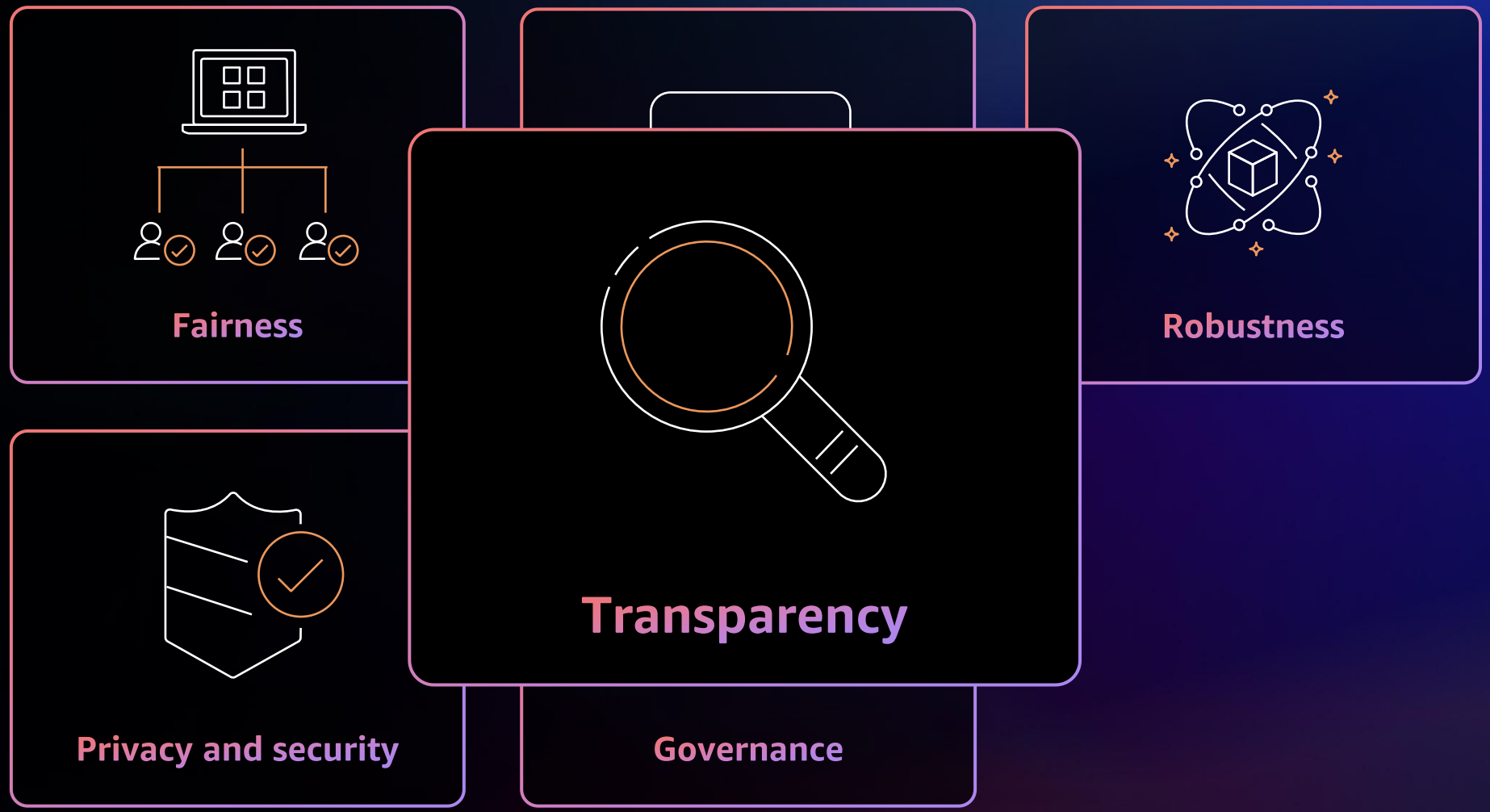


Transparency

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What is responsible AI?



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AWS AI Service Cards

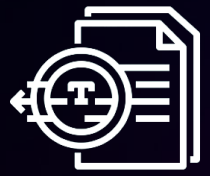
NEW!

PROVIDE TRANSPARENCY TO CUSTOMERS ON RESPONSIBLE AI

Three new AI service cards



Amazon Rekognition Face Matching



Amazon Textract Analyze ID



Amazon Transcribe EN-US Batch

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New fairness and bias mitigation course



Machine Learning University

N E W !

Free, public course on fairness criteria and bias mitigation

Taught by Amazon data scientists who train AWS employees on ML

9+ hours of lectures and hands-on exercises

>>> Get started today

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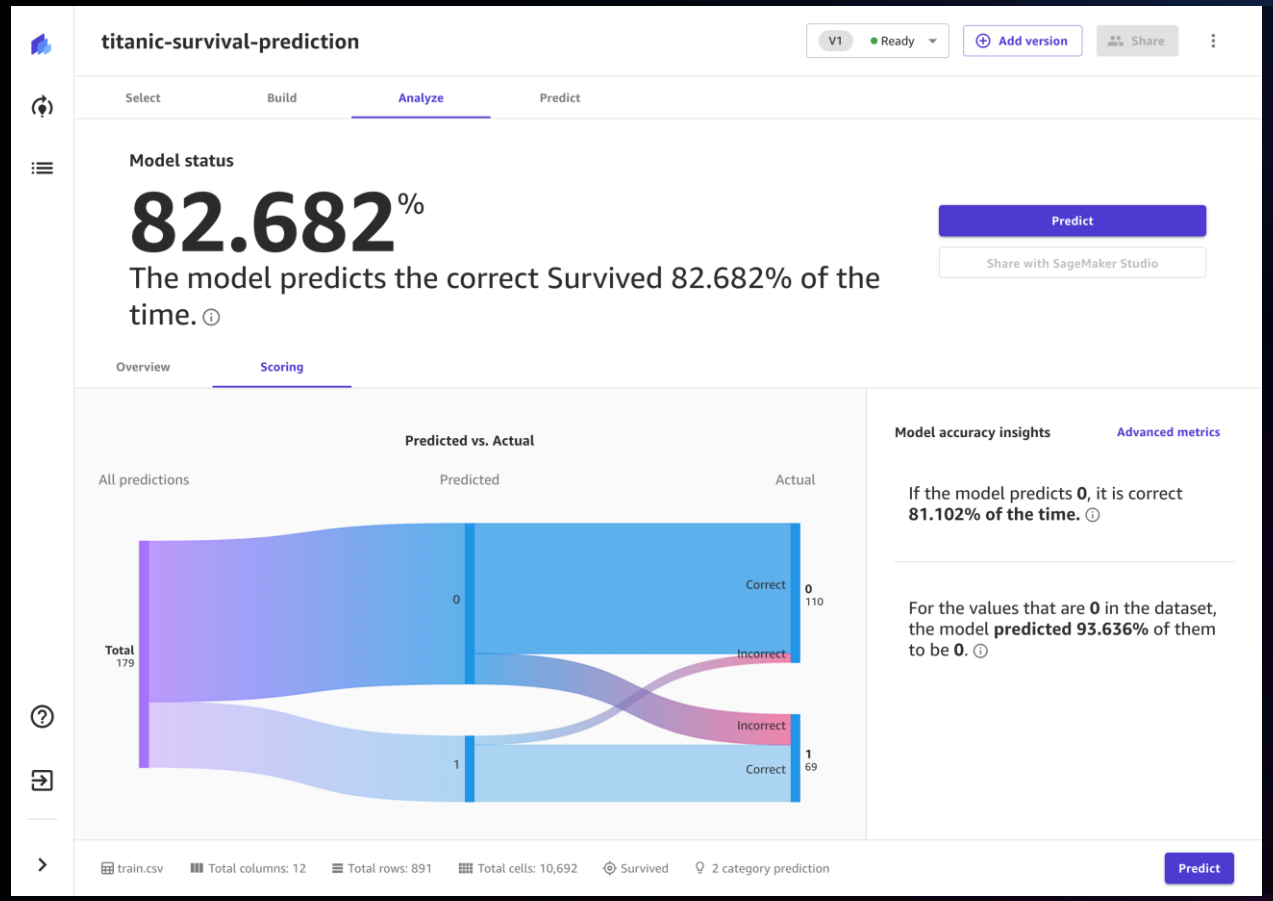
Trend 6:
ML democratization



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Amazon SageMaker Canvas

BUILD ML MODELS AND GENERATE ACCURATE PREDICTIONS—NO CODE REQUIRED



SAMSUNG

3M

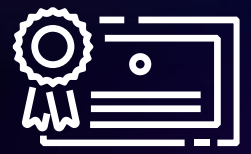
SIEMENS

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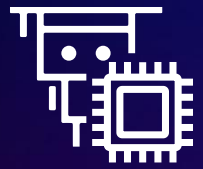
29 million trained by 2025



AWS DeepRacer League



Training and certification



AWS AI/ML Scholarship

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SUMMARY

Trends driving ML growth

- Model sophistication
- Data growth
- ML industrialization
- ML-powered use cases
- Responsible AI
- ML democratization

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