AI/ML for Data and Analytics

Aditya Challa

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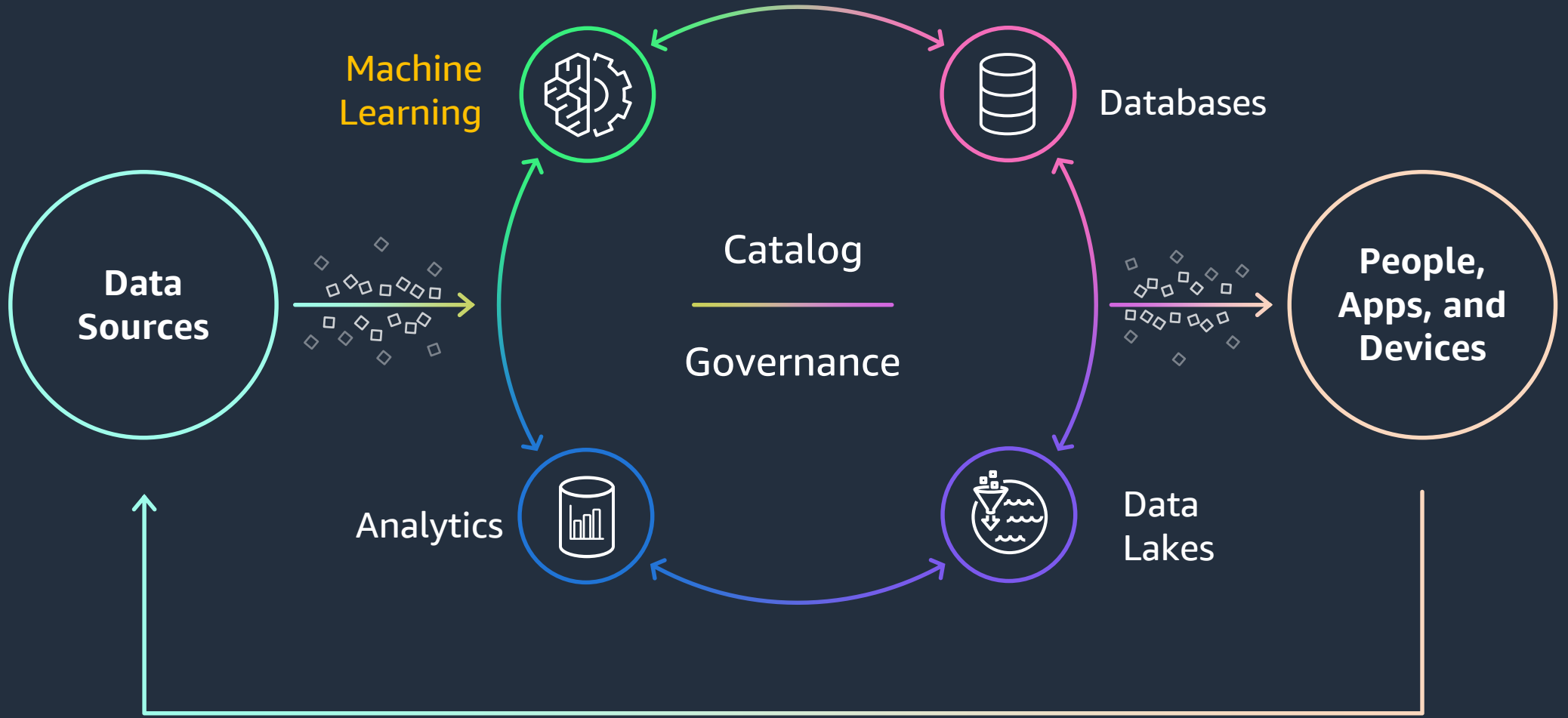
Modern data strategy in action



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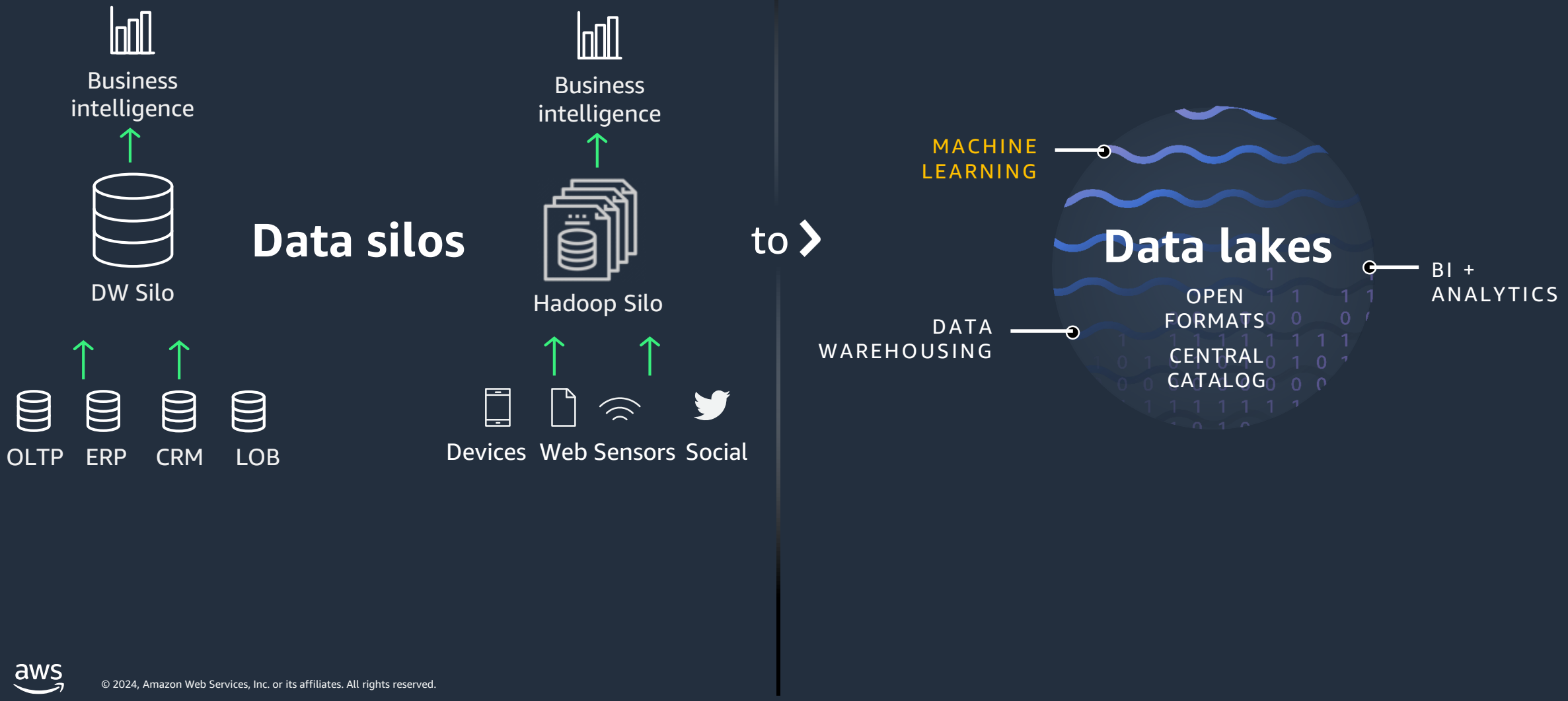
The convergence of traditional data silos into data lakes



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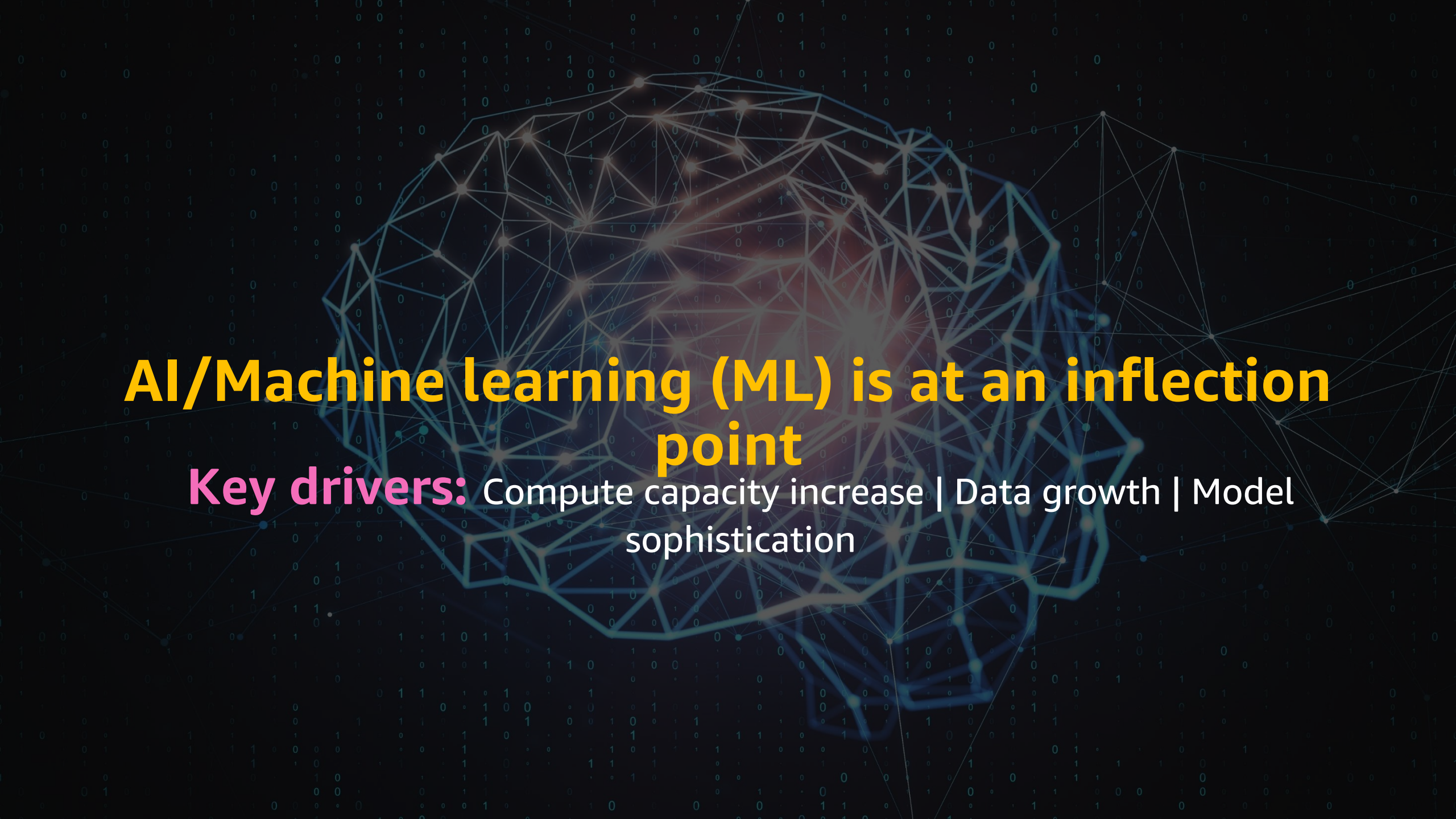
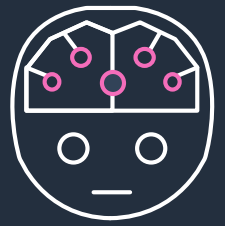


AI/Machine learning (ML) is at an inflection point

Key drivers: Compute capacity increase | Data growth | Model sophistication

AI, ML, Deep learning?



Artificial intelligence (AI)

Any technique that allows 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

Generative AI

Powered by large models that are pretrained on vast corpuses of data and commonly referred to as foundation models (FMs)

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Challenges we are hearing from state and local government customers

Demand for government services is rising while resources and capacity to deliver them **aren't keeping pace**

Citizens increasingly expect government to **provide modern digital experiences** for conducting online transactions

Aging infrastructure for data capture, storage, and management **creates friction** for leveraging data for analytics and machine learning

Complex security, privacy, and compliance requirements create barriers to change and block adoption of many SaaS solutions

Risk averse culture and institutional inertia slow innovation

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Machine learning is going mainstream in public sector

Emergency management
Emergency management, emergency response

Finance and administration
Tax, revenue, regulatory/compliance, fraud, budget, purchasing/procurement

Health and benefits
Local hospitals and clinics, public health, child welfare, homelessness, seniors/youth, health/food, environmental

Assessments and permitting
Planning and zoning, assessment, land admin/recorder of deeds, mapping, watershed, housing

Constituent engagement
Contact center, website, mobile

Economic development
Grants and benefits administration, workforce development, corporate relations, land clearance/redevelopment

Elections
Registration, voter management, polling, voting management, candidate management

Enforcement
Police, jails, courts, animal control

Education and library
K–12 and early childhood, adult education, library

Utilities
Electric/gas/water/sewer, waste management, generation/distribution

Transportation
Traffic, mass transit, parking, airports, ports

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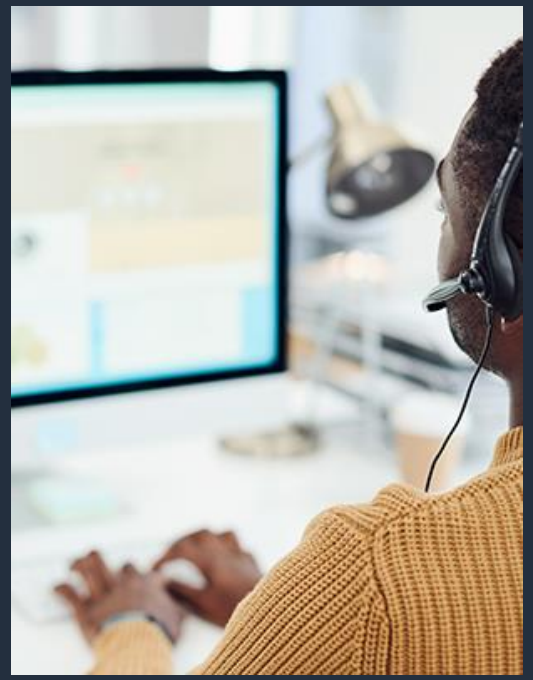
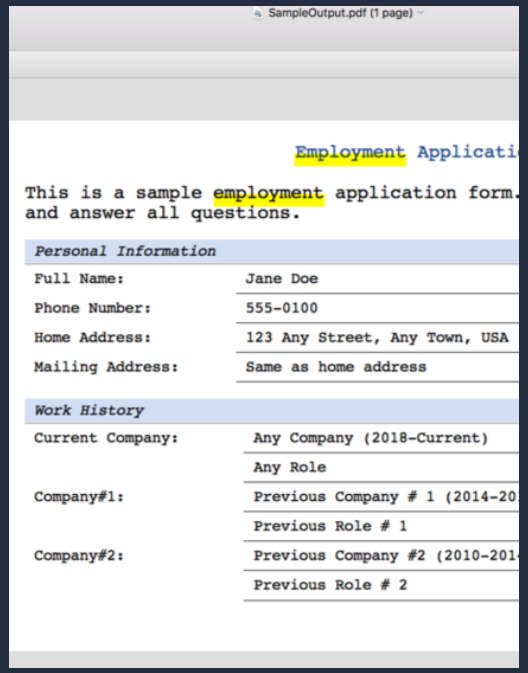
Top AI/ML use cases for state and local government



Speech and language



Intelligent document processing

Computer vision

Predictions and insights

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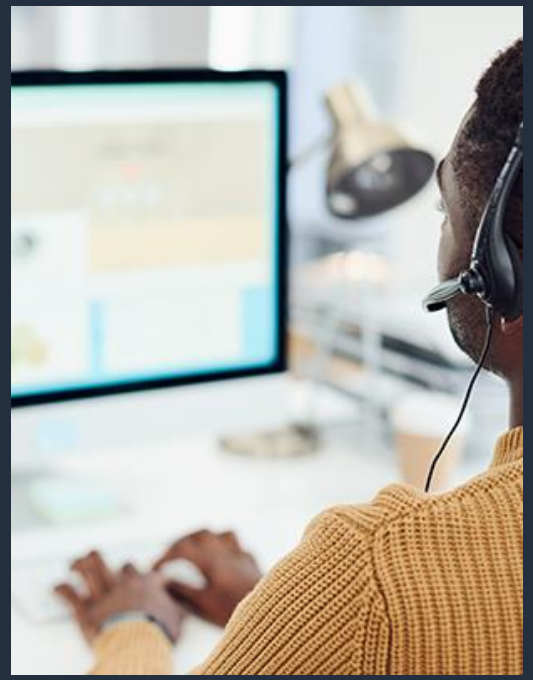
Top AI/ML use cases for state and local government



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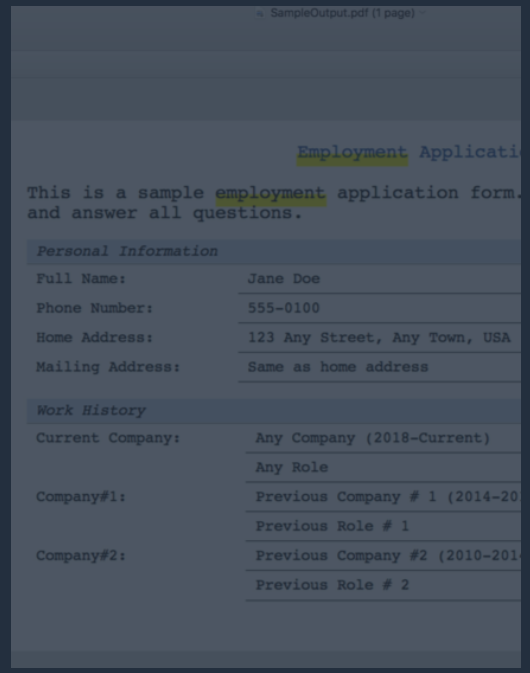
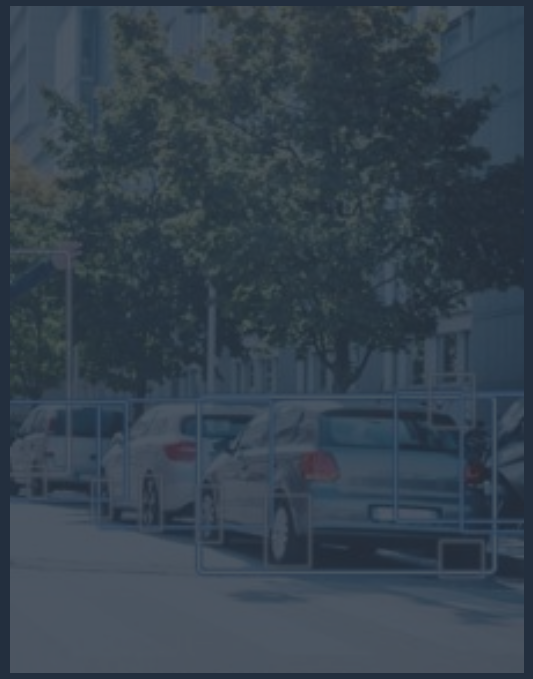


Intelligent document processing



Computer vision

Predictions and insights

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AI/ML-Enabled Citizen engagement

Engage citizens and drive improvements in customer satisfaction

- Improve contact center agent effectiveness with real-time translation and decision support using Amazon Connect and Contact Center Intelligence
- Analyze call and text interactions with citizens to spot issues and trends and drive improvement
- Improve self service

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Using AI to improve agent efficiency

"During peak hours, previously you're 45-50 minutes on hold, and now that's has been reduced to about three and a half minutes. One of the other benefits we've gotten from Amazon Connect is sentiment analysis. On a call, we get real-time feedback on whether or not the customer was happy, frustrated, or angry…"

—Benny Chacko, Deputy General – LA County Internal Services Department

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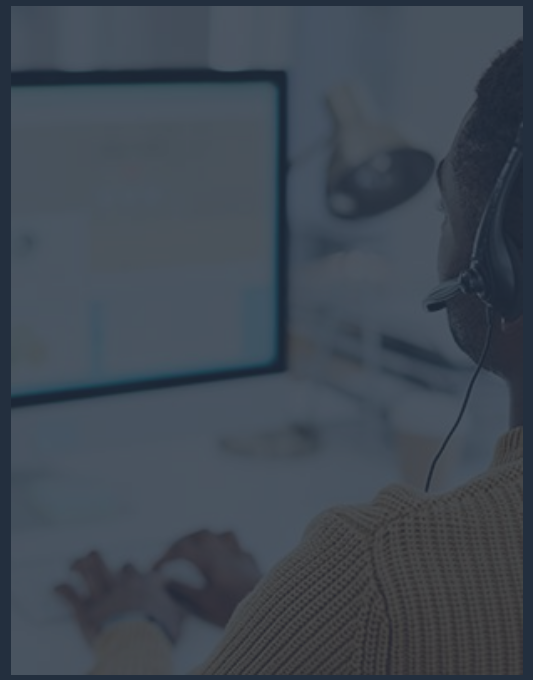
Top AI/ML use cases for state and local government



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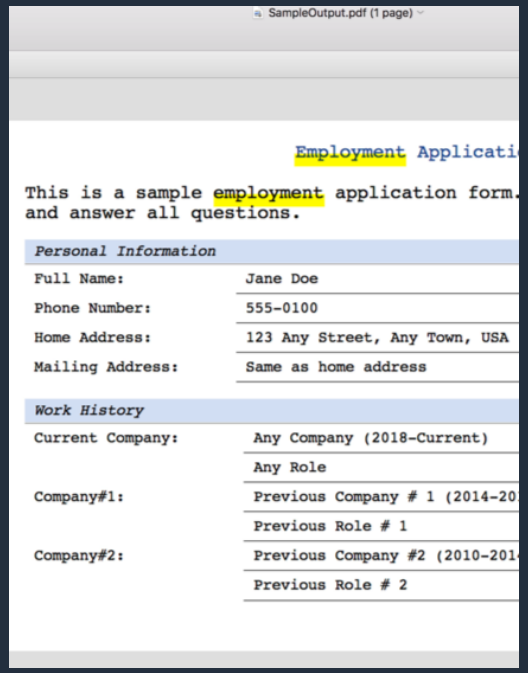

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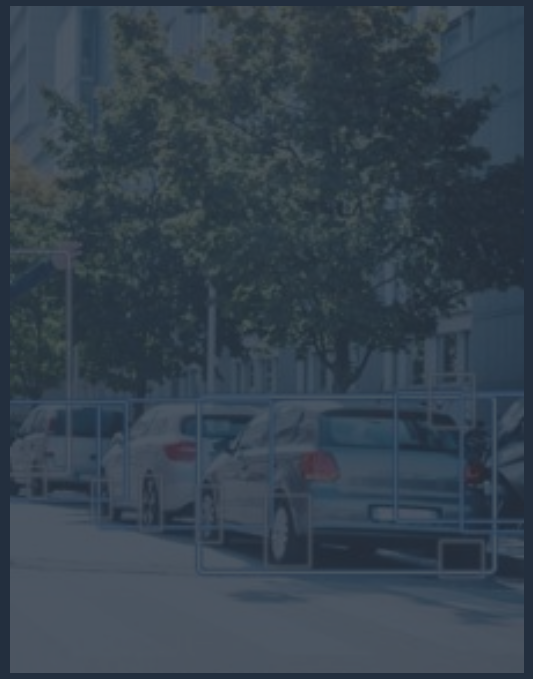

Computer vision

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Extract insights from unstructured content

Extract insights from unstructured documents and forms, like images, PDFs, and audio

- Analyze text with natural language processing (NLP) to identify topics, extract entities, understand sentiment, and classify documents with Amazon Textract, Amazon Rekognition, and Amazon Comprehend
- Translate content at scale with Amazon Translate

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King County Assessor’s Office

CHALLENGE

Reduce data entry, eliminate data errors, and improve data time lines.

SOLUTION

Intelligent documents processing for documents and electronic files, streamlining & unlock data and information from paper documents and electronic files

RESULTS

King County employees will focus on higher value, more satisfying work, and ultimately help the County realize its vision for connected communities, connected data, and connected government.”

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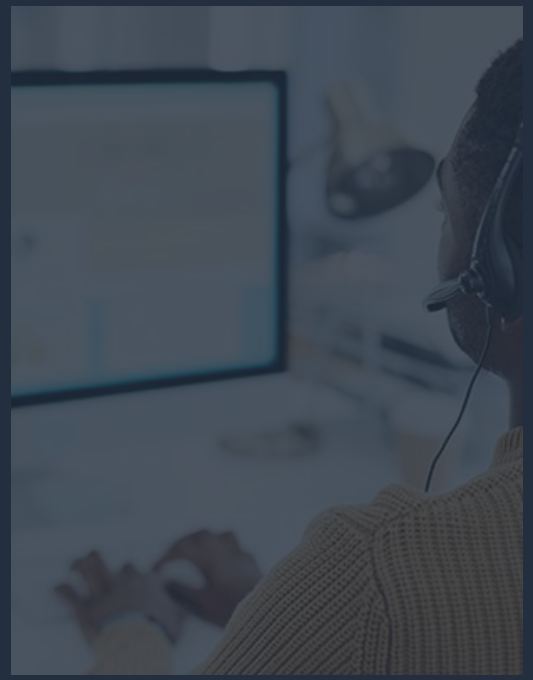
Top AI/ML use cases for state and local government



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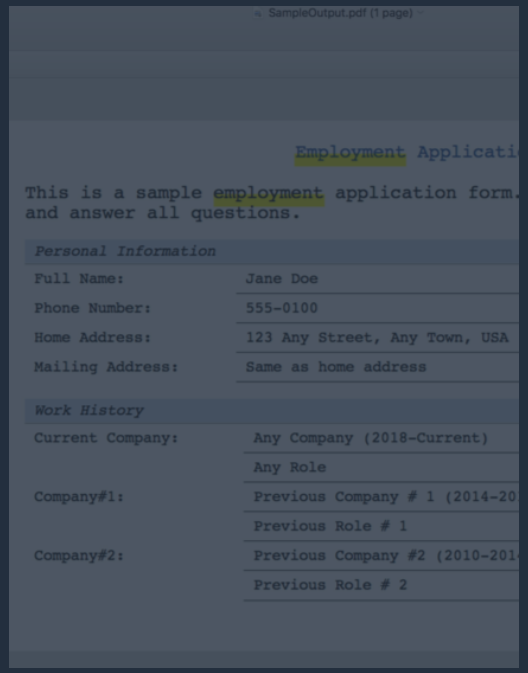

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Content analysis and object detection

Extract insights and identify objects of interest from large volumes of images and videos with Amazon Rekognition

- Detect personal protective equipment (PPE) to improve worker safety
- Analyze vehicle traffic and pedestrian and bicycle safety
- Detect objects of interest in video and reduce human effort required to review footage

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Assessing damage from natural disasters

EagleView runs deep learning models on AWS to make quicker, more accurate assessments of property damage within 24 hours of a natural disaster. Amazon Elastic Inference makes those workflows more cost effective at scale.

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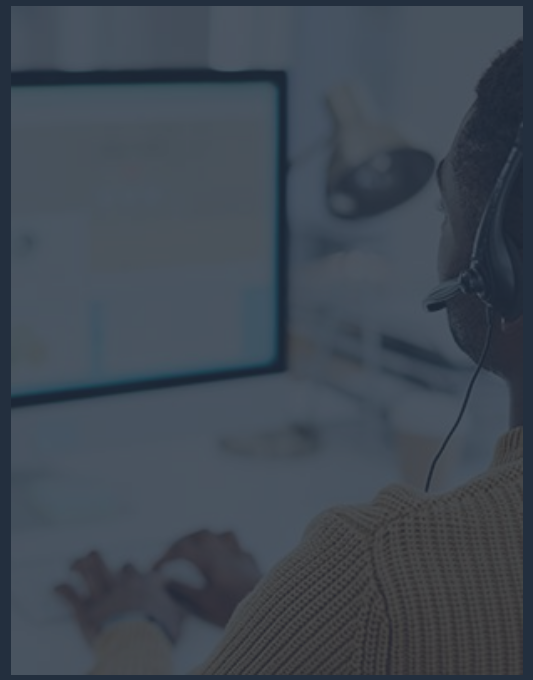
Top AI/ML use cases for state and local government



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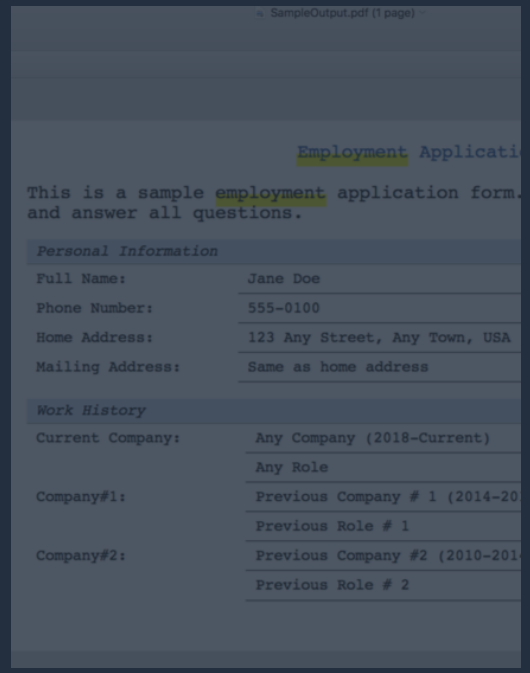

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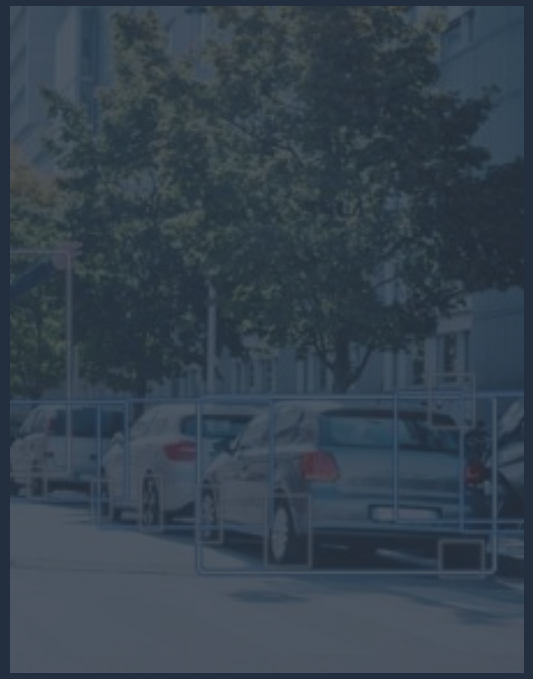

Computer vision

Predictions and insights

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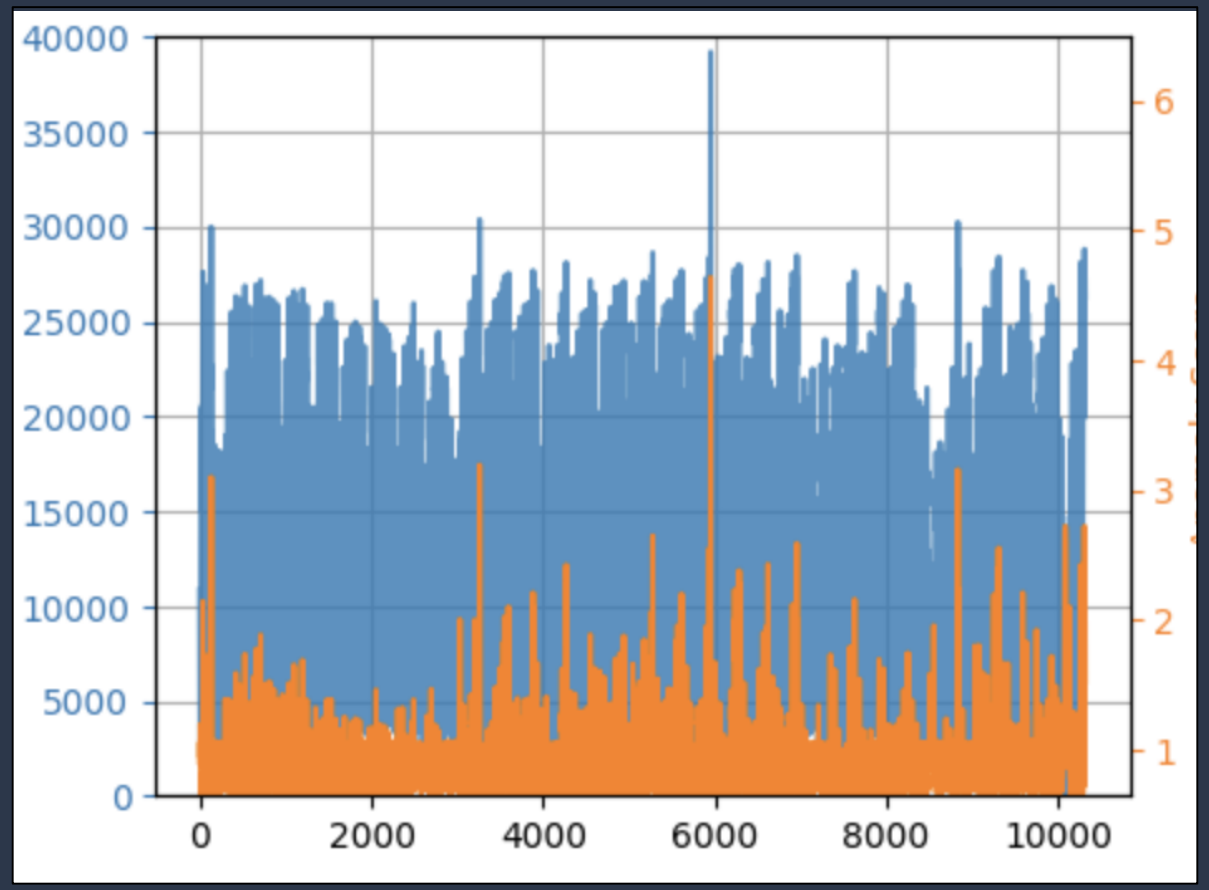
Fraud detection and prevention

Detect and prevent fraud, waste, and abuse

- Enhance accuracy and speed to help detect and prevent waste fraud and abuse
- Managed service approach with prebuilt ML models for fraud detection
- Supervised and unsupervised models for developing highly targeted models to utilize customer data as part of fraud prevention efforts



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aws machine learning

Identify fraud and other anonymous activities

FINRA, one of the largest security regulators in the United States, was established to monitor and regulate financial trading practices; using Amazon EMR, FINRA can capture, analyze, and store a daily influx of 135 billion records in order to identify fraud and other anonymous activities

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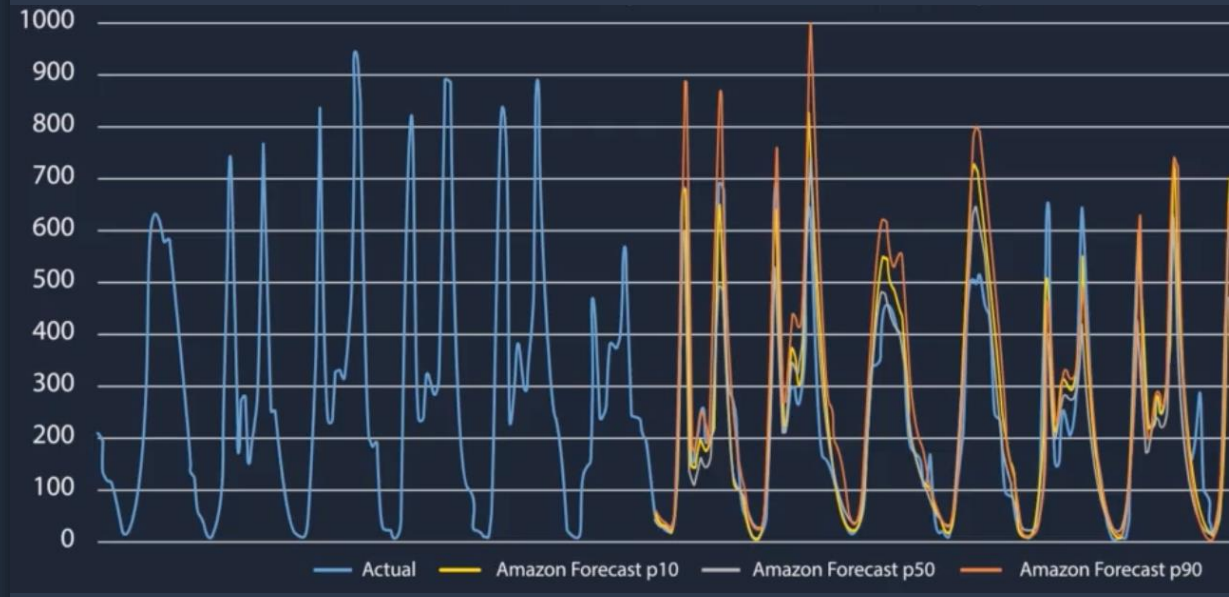
Machine learning to forecast trends and support decisions

Accurate, time series forecast with machine learning

- Predicting service demand or program activities
- Allocating resources to optimize impact and outcomes for citizens
- Financial planning and revenue / cost forecasts



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Predictions and forecasts from IoT and sensor data

Leverage data from smart cities and facilities

- Smart cities
- Predictive maintenance
- Facility management

Learn more about Amazon Monitron

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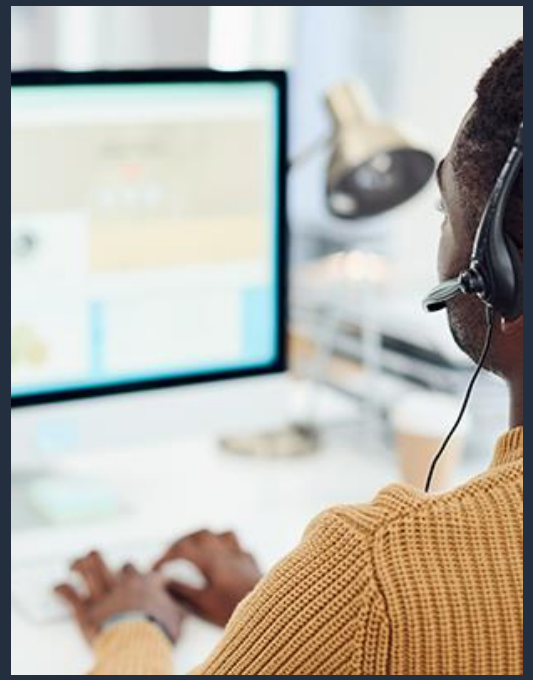
What and with whom would you like to explore?



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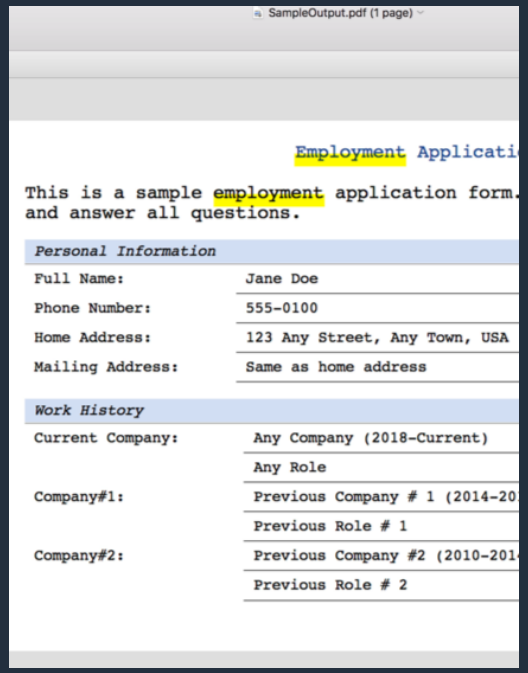

Intelligent document processing

Computer vision

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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

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

CORE

TEXT
- Amazon Translate
- Amazon Comprehend

SPEECH
- Amazon Polly
- Amazon Transcribe

VISION
- Amazon Textract
- Amazon Rekognition
- AWS Panorama

ML SERVICES

SAGEMAKER CANVAS
No-code ML for business analysts

SAGEMAKER STUDIO LAB
Learn ML

SAGEMAKER GROUND TRUTH
Label data

SAGEMAKER STUDIO | RSTUDIO

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

CI/CD

SAGEMAKER 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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Generative AI on AWS

Generative AI is top of mind for ~~most~~ all of our customers

Key drivers: Model size | Transformer technology | Ease of access

Expectations: Massive productivity gains | Innovations @ scale

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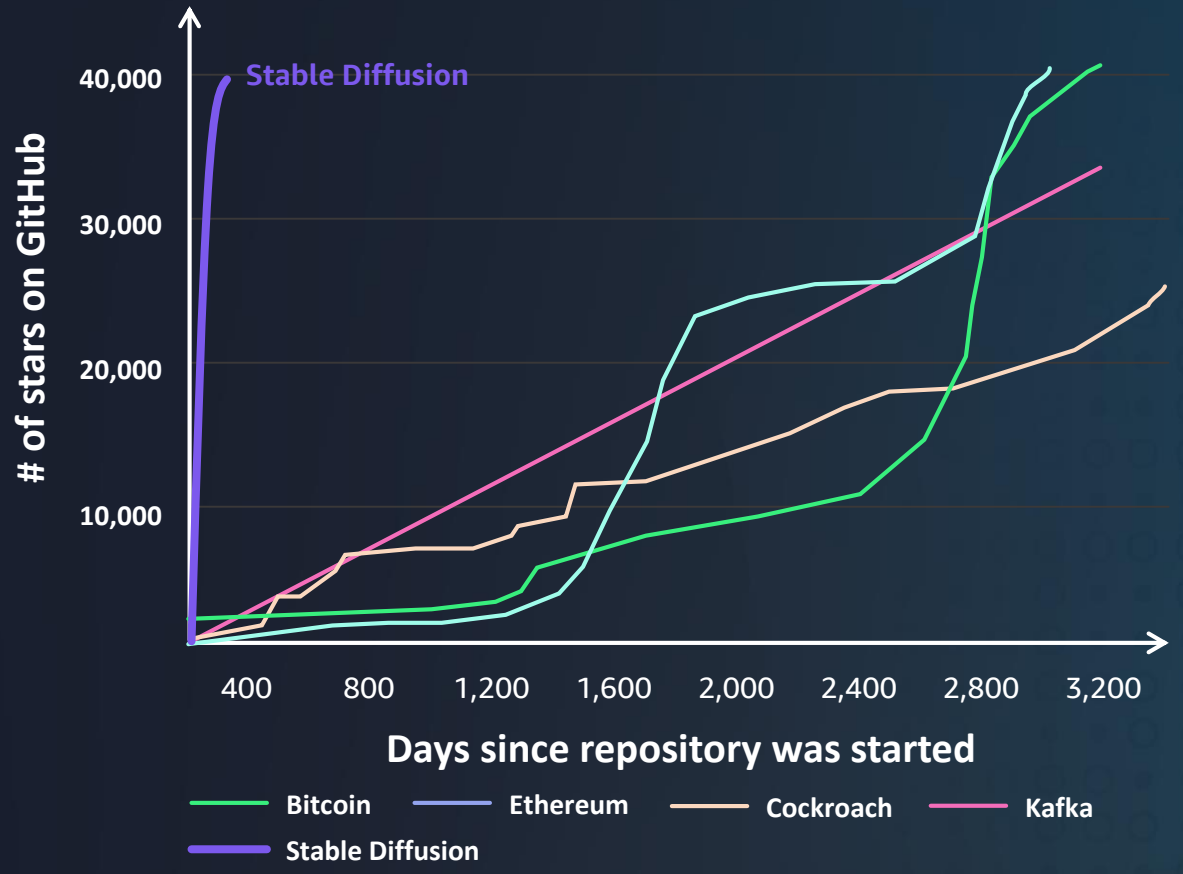
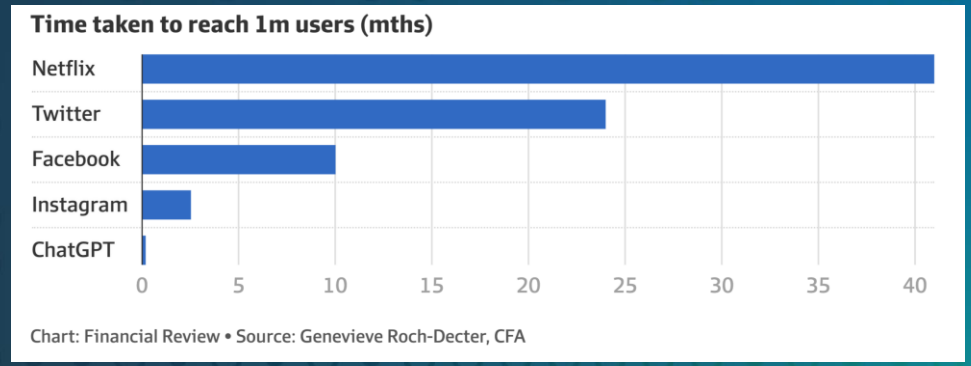
Generative AI is the fastest growing trend in AI

Stable Diffusion accumulated 40k stars on GitHub in its first 90 days



ChatGPT reached the 1 million users mark in just 5 days ...



... and surged to 57 million users in its first month after launch.

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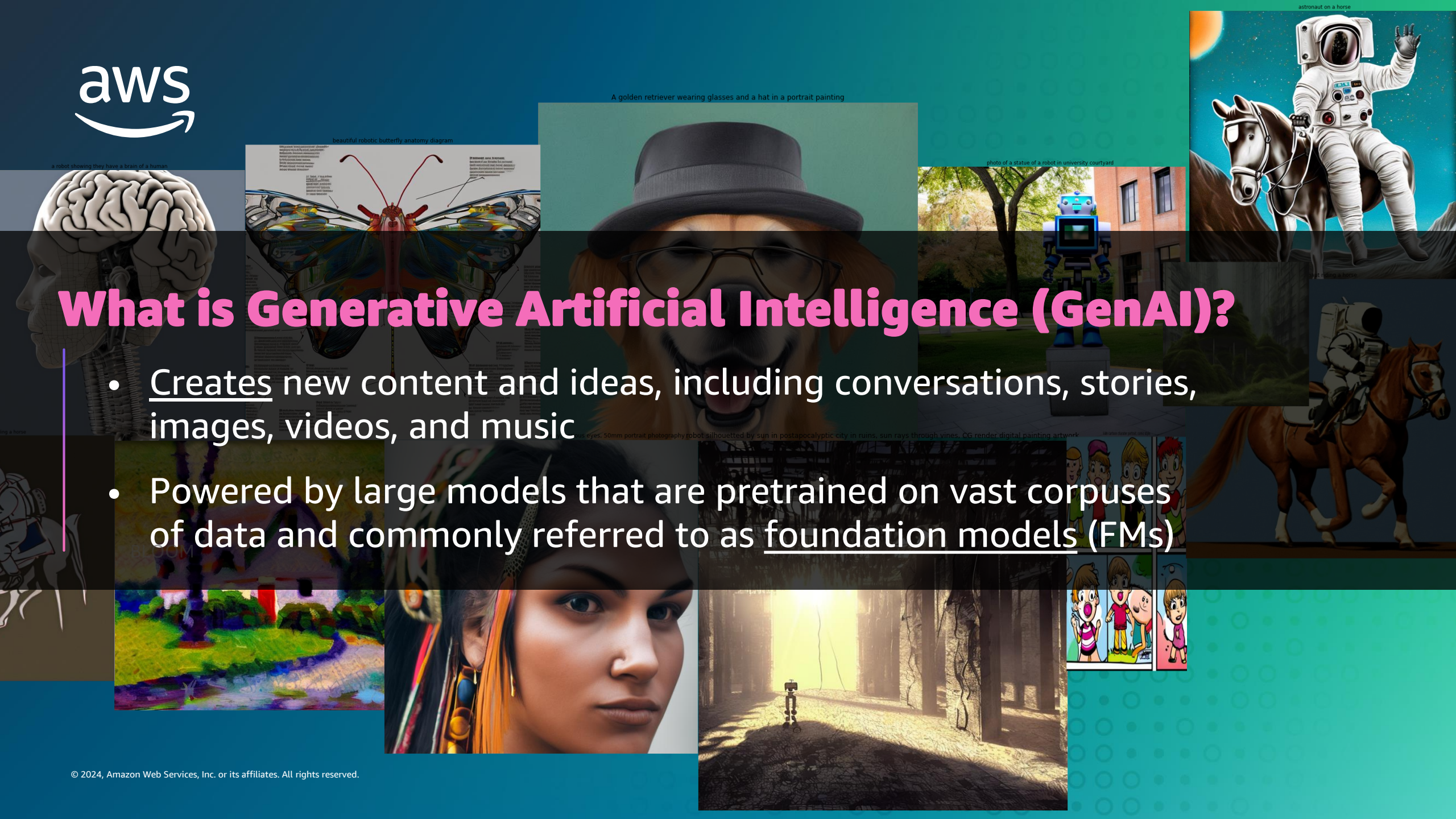

What is Generative Artificial Intelligence (GenAI)?

- Creates new content and ideas, including conversations, stories, images, videos, and music
- Powered by large models that are pretrained on vast corpuses of data and commonly referred to as foundation models (FMs)

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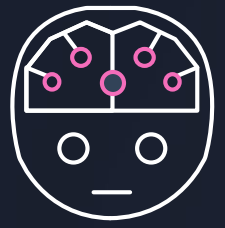
Where does Generative AI fit?



Artificial intelligence (AI)

Any technique that allows 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

Generative AI

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Common Use cases

Text generation

Q&A

Text summarization

Text extraction

Paraphrase rephrase

Search

Code generation

Image generation

Image classification

Audio generation

Video generation

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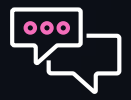
Generative AI public sector application examples



Constituent Communications

Citizen engagement and feedback, transparency

Public Health

Personalized care, population health assessments

Public Safety

Public safety and crime prevention, Emergency response and disaster management

Transportation

Trafic optimization, autonomous vehicle control, personalized transportation experiences

Finance

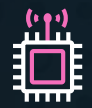
Budget Optimization, fraud detection, risk assessment and mitigation

Constituent Services

Urban planning, Personalized urban services

Energy and utilities

Energy management, Waste management, Smart grid optimization



Research and Engagement

Environmental monitoring

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Instead of sending your data to the model, bring the model to your data.

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Amazon generative AI portfolio

Choice of many Foundation Models

AI services

Amazon Bedrock

Amazon

Titan Text

Titan Embeddings

Third party

Jurassic-2

Claude

Stable Diffusion

Amazon CodeWhisperer

Amazon

AI coding companion

ML services

SageMaker

JumpStart

Publicly available

stability.ai

Text2Image
Upscaling

alexa

AlexaTM 20B

Flan T-5 models
DistilGPT2, GPT2
Bloom models

Proprietary models

co:here

Cohere generate-med

Lighton

Lyra-Fr10B

AI21labs

Jurassic-1 Grande 17B

ML frameworks & infrastructure

Self-managed ML

Meta PyTorch

3-way collaboration to move models to production on Amazon EC2 and SageMaker

Hugging Face

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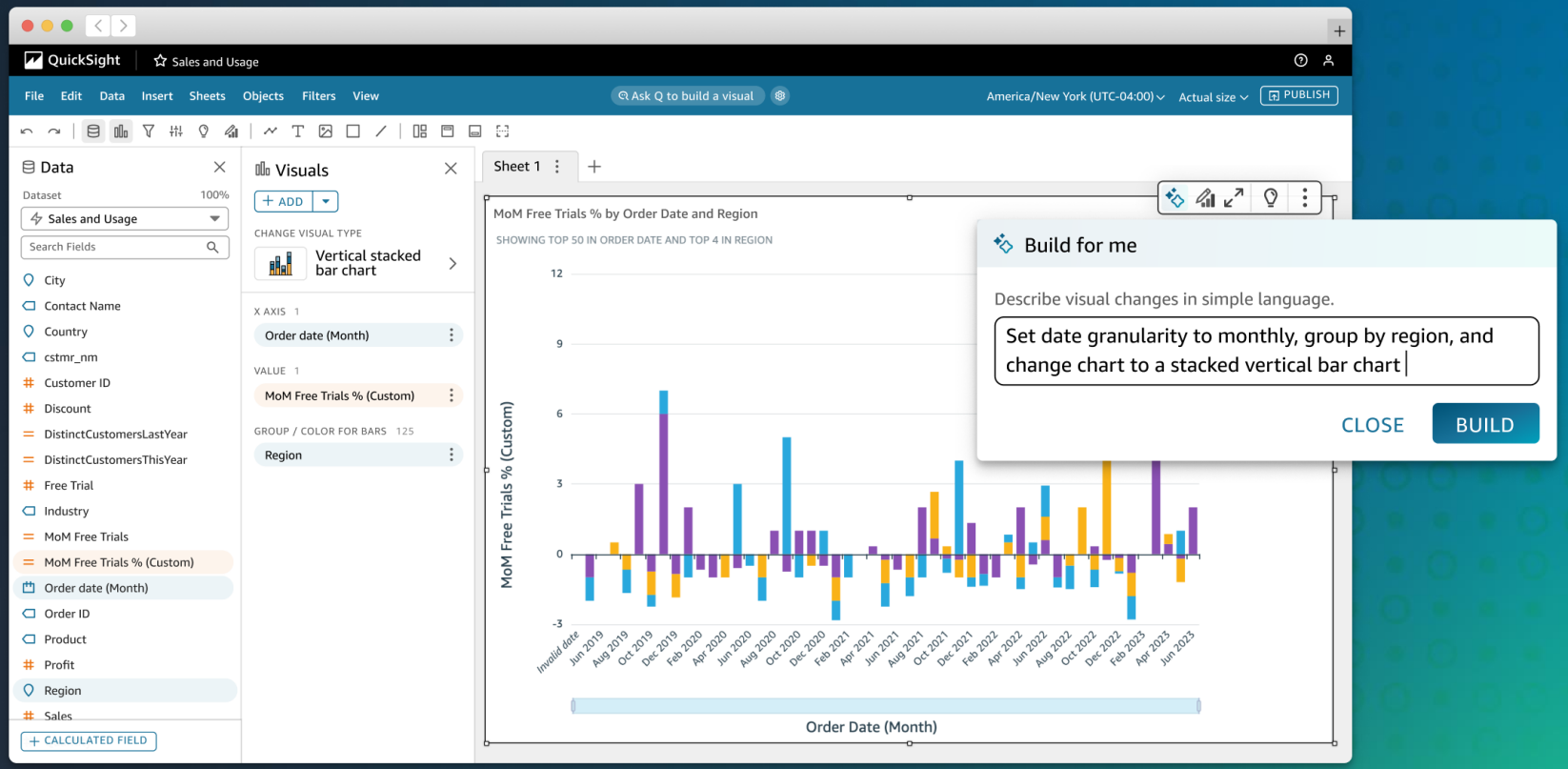
Visual authoring in **QuickSight**

Use everyday language to generate and fine-tune visuals in seconds



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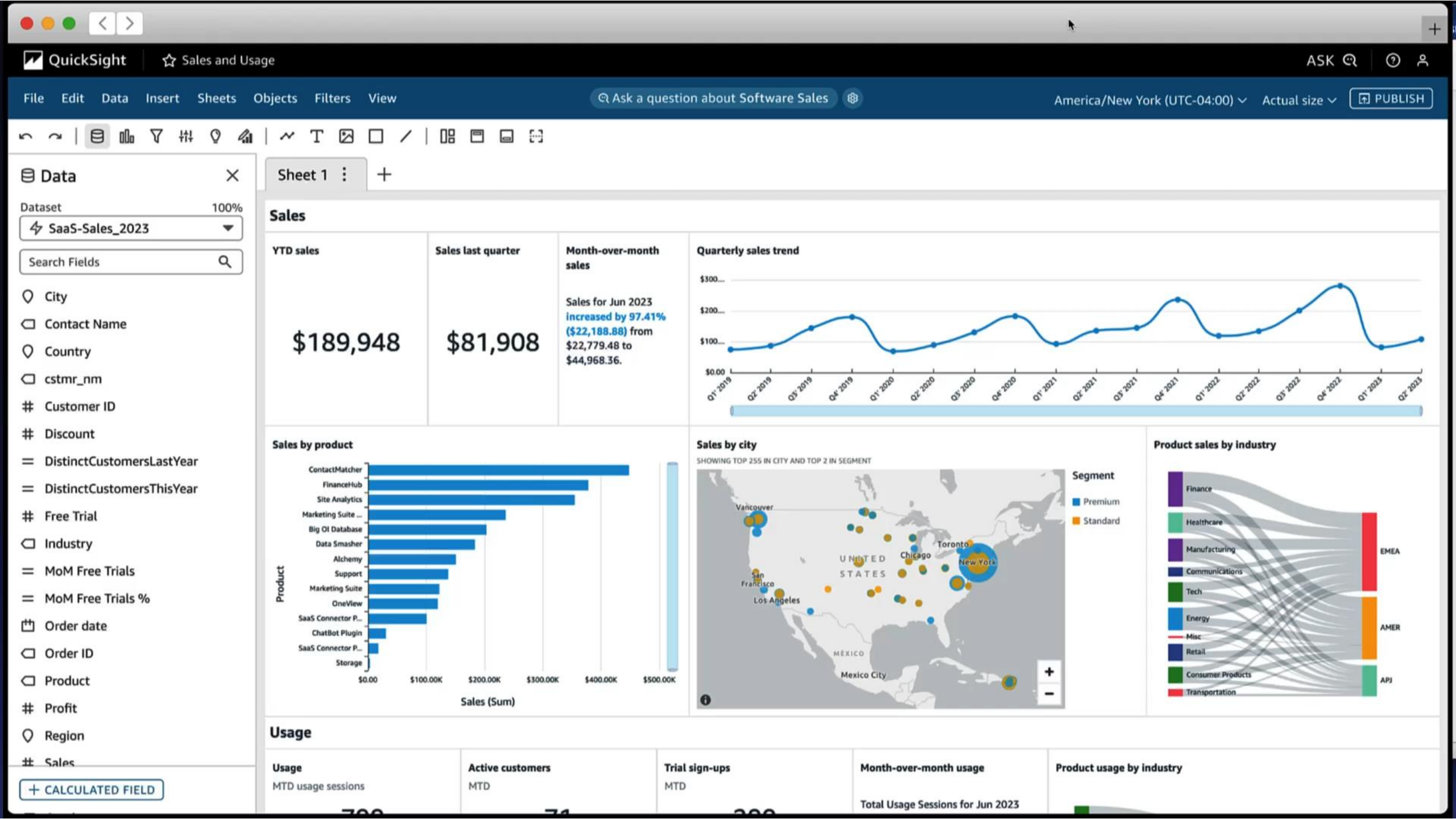
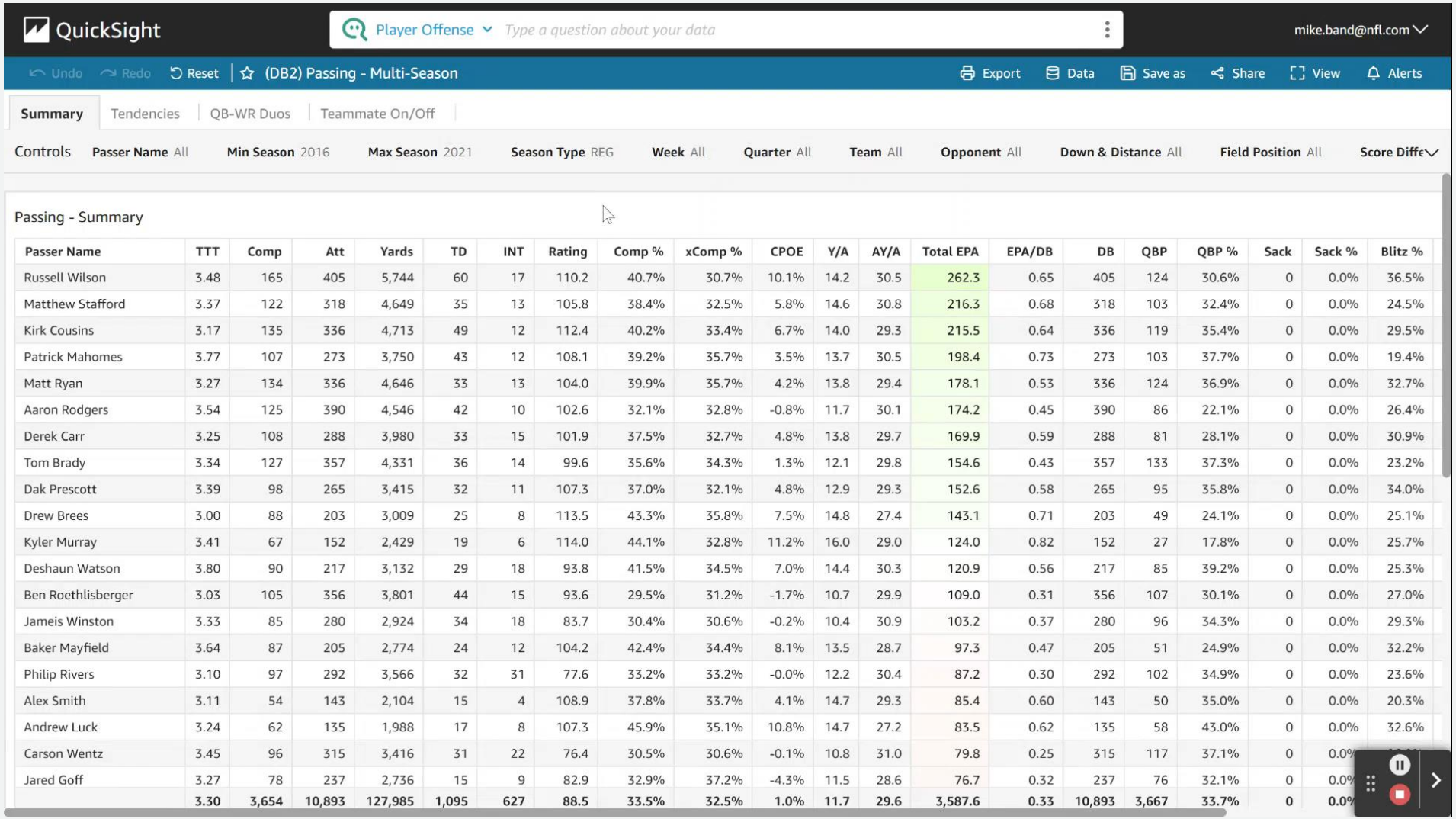

QuickSight
Sales and Usage
ASK
File Edit Data Insert Sheets Objects Filters View
Ask a question about Software Sales
America/New York (UTC-04:00)
Actual size
PUBLISH
Data
Dataset 100%
SaaS-Sales_2023
Search Fields
City
Contact Name
Country
cstmr_nm
Customer ID
Discount
DistinctCustomersLastYear
DistinctCustomersThisYear
Free Trial
Industry
MoM Free Trials
MoM Free Trials %
Order date
Order ID
Product
Profit
Region
Sales
+ CALCULATED FIELD
Sheet 1
Sales
YTD sales
$189,948
Sales last quarter
$81,908
Month-over-month sales
Sales for Jun 2023 increased by 97.41% ($22,188.88) from $22,779.48 to $44,968.36.
Quarterly sales trend
$300...
$200...
$100...
$0.00
Q1' 2019 Q2' 2019 Q3' 2019 Q4' 2019 Q1' 2020 Q2' 2020 Q3' 2020 Q4' 2020 Q1' 2021 Q2' 2021 Q3' 2021 Q4' 2021 Q1' 2022 Q2' 2022 Q3' 2022 Q4' 2022 Q1' 2023 Q2' 2023
Sales by product
ContactMatcher
FinanceHub
Site Analytics
Marketing Suite ...
Big OI Database
Data Smasher
Alchemy
Support
Marketing Suite
OneView
SaaS Connector P...
ChatBot Plugin
SaaS Connector P...
Storage
Product
$0.00 $100.00K $200.00K $300.00K $400.00K $500.00K
Sales (Sum)
Sales by city
SHOWING TOP 255 IN CITY AND TOP 2 IN SEGMENT
Segment
Premium
Standard
Vancouver
Toronto
Chicago
New York
UNITED STATES
San Francisco
Los Angeles
MÉXICO
Mexico City
Product sales by industry
Finance
Healthcare
Manufacturing
Communications
Tech
Energy
Misc
Retail
Consumer Products
Transportation
EMEA
AMER
APJ
Usage
Usage
MTD usage sessions
Active customers
MTD
Trial sign-ups
MTD
Month-over-month usage
Total Usage Sessions for Jun 2023
Product usage by industry

How the NFL uses Generative AI to get instant answers



Passing - Summary

Passer Name	TTT	Comp	Att	Yards	TD	INT	Rating	Comp %	xComp %	CPOE	Y/A	AY/A	Total EPA	EPA/DB	DB	QBP	QBP %	Sack	Sack %	Blitz %
Russell Wilson	3.48	165	405	5,744	60	17	110.2	40.7%	30.7%	10.1%	14.2	30.5	262.3	0.65	405	124	30.6%	0	0.0%	36.5%
Matthew Stafford	3.37	122	318	4,649	35	13	105.8	38.4%	32.5%	5.8%	14.6	30.8	216.3	0.68	318	103	32.4%	0	0.0%	24.5%
Kirk Cousins	3.17	135	336	4,713	49	12	112.4	40.2%	33.4%	6.7%	14.0	29.3	215.5	0.64	336	119	35.4%	0	0.0%	29.5%
Patrick Mahomes	3.77	107	273	3,750	43	12	108.1	39.2%	35.7%	3.5%	13.7	30.5	198.4	0.73	273	103	37.7%	0	0.0%	19.4%
Matt Ryan	3.27	134	336	4,646	33	13	104.0	39.9%	35.7%	4.2%	13.8	29.4	178.1	0.53	336	124	36.9%	0	0.0%	32.7%
Aaron Rodgers	3.54	125	390	4,546	42	10	102.6	32.1%	32.8%	-0.8%	11.7	30.1	174.2	0.45	390	86	22.1%	0	0.0%	26.4%
Derek Carr	3.25	108	288	3,980	33	15	101.9	37.5%	32.7%	4.8%	13.8	29.7	169.9	0.59	288	81	28.1%	0	0.0%	30.9%
Tom Brady	3.34	127	357	4,331	36	14	99.6	35.6%	34.3%	1.3%	12.1	29.8	154.6	0.43	357	133	37.3%	0	0.0%	23.2%
Dak Prescott	3.39	98	265	3,415	32	11	107.3	37.0%	32.1%	4.8%	12.9	29.3	152.6	0.58	265	95	35.8%	0	0.0%	34.0%
Drew Brees	3.00	88	203	3,009	25	8	113.5	43.3%	35.8%	7.5%	14.8	27.4	143.1	0.71	203	49	24.1%	0	0.0%	25.1%
Kyler Murray	3.41	67	152	2,429	19	6	114.0	44.1%	32.8%	11.2%	16.0	29.0	124.0	0.82	152	27	17.8%	0	0.0%	25.7%
Deshaun Watson	3.80	90	217	3,132	29	18	93.8	41.5%	34.5%	7.0%	14.4	30.3	120.9	0.56	217	85	39.2%	0	0.0%	25.3%
Ben Roethlisberger	3.03	105	356	3,801	44	15	93.6	29.5%	31.2%	-1.7%	10.7	29.9	109.0	0.31	356	107	30.1%	0	0.0%	27.0%
Jameis Winston	3.33	85	280	2,924	34	18	83.7	30.4%	30.6%	-0.2%	10.4	30.9	103.2	0.37	280	96	34.3%	0	0.0%	29.3%
Baker Mayfield	3.64	87	205	2,774	24	12	104.2	42.4%	34.4%	8.1%	13.5	28.7	97.3	0.47	205	51	24.9%	0	0.0%	32.2%
Philip Rivers	3.10	97	292	3,566	32	31	77.6	33.2%	33.2%	-0.0%	12.2	30.4	87.2	0.30	292	102	34.9%	0	0.0%	23.6%
Alex Smith	3.11	54	143	2,104	15	4	108.9	37.8%	33.7%	4.1%	14.7	29.3	85.4	0.60	143	50	35.0%	0	0.0%	20.3%
Andrew Luck	3.24	62	135	1,988	17	8	107.3	45.9%	35.1%	10.8%	14.7	27.2	83.5	0.62	135	58	43.0%	0	0.0%	32.6%
Carson Wentz	3.45	96	315	3,416	31	22	76.4	30.5%	30.6%	-0.1%	10.8	31.0	79.8	0.25	315	117	37.1%	0	0.0%	
Jared Goff	3.27	78	237	2,736	15	9	82.9	32.9%	37.2%	-4.3%	11.5	28.6	76.7	0.32	237	76	32.1%	0	0.0%	
	3.30	**3,654**	**10,893**	**127,985**	**1,095**	**627**	**88.5**	**33.5%**	**32.5%**	**1.0%**	**11.7**	**29.6**	**3,587.6**	**0.33**	**10,893**	**3,667**	**33.7%**	**0**	**0.0%**	

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How to address Generative AI in Public Sector

- How can we support you in ensuring accuracy and authority of model outputs?
- How can we use “guardrails” to minimize inappropriate content?
- How can we maximize the public investment and minimize cost?
- What are your latency requirements for specific use cases?
- What are the potential regulatory, data privacy, & security considerations that may dictate model architecture.
- How can we ensure proprietary, copyrighted and IP concerns are addressed?

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