AWS re:Invent

WIN311

Start using AI/ML/DL in your .NET applications today

Thorr Giddings

Senior Solutions Architect,
Microsoft Platform

Amazon Web Services

Sreelaxmi Pai

Partner Solutions Architect,
Microsoft Platform

Amazon Web Services

AWS re:Invent

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aws

"Any sufficiently advanced technology is indistinguishable from magic"

Arthur Clarke

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Agenda

AI/ML/DL overview

Amazon Rekognition

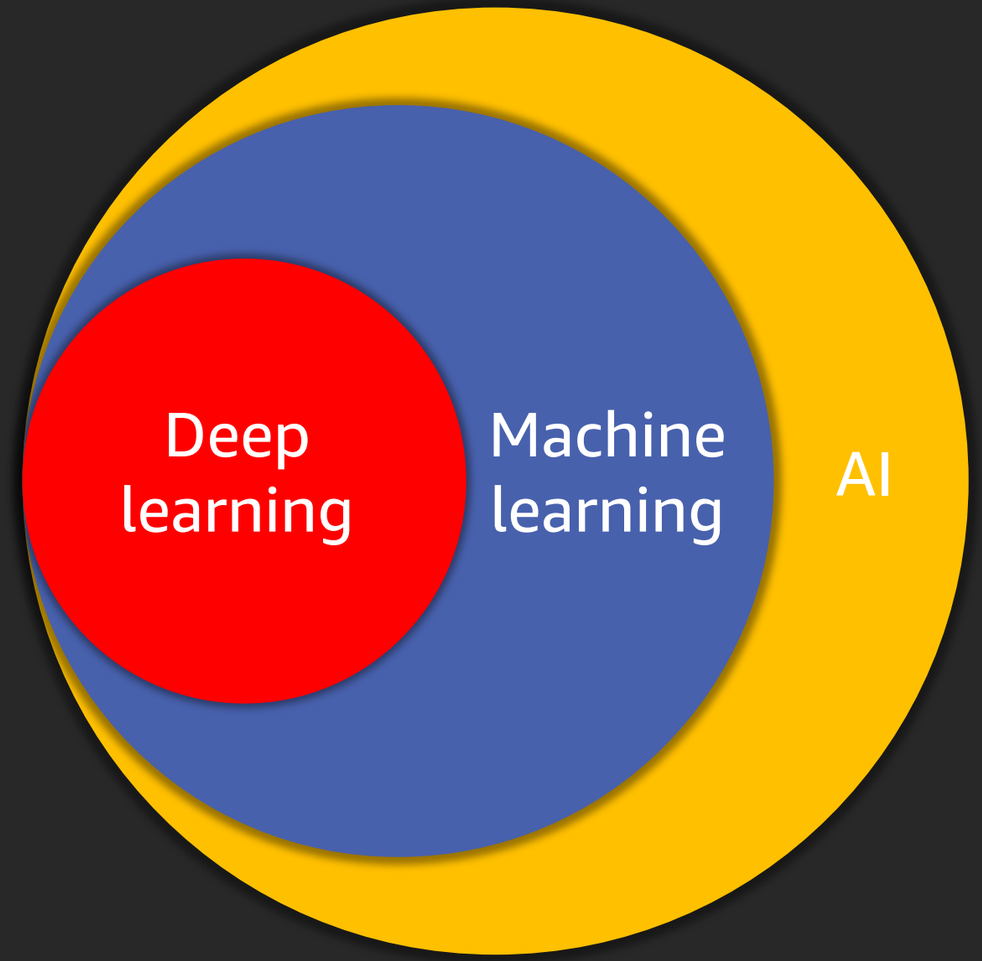
Amazon Lex

Amazon Comprehend

Amazon Translate and Amazon Polly

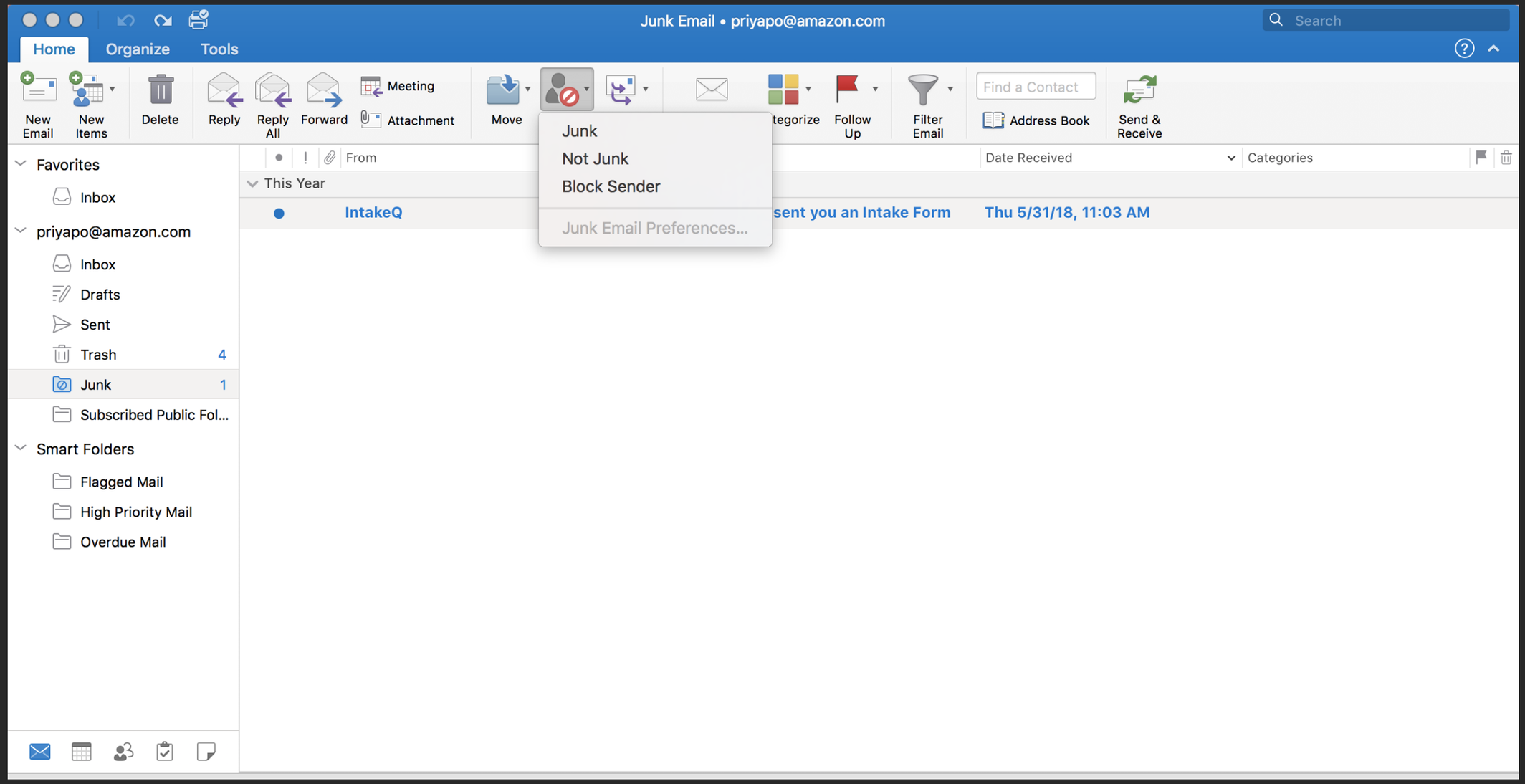
AI/ML/DL overview

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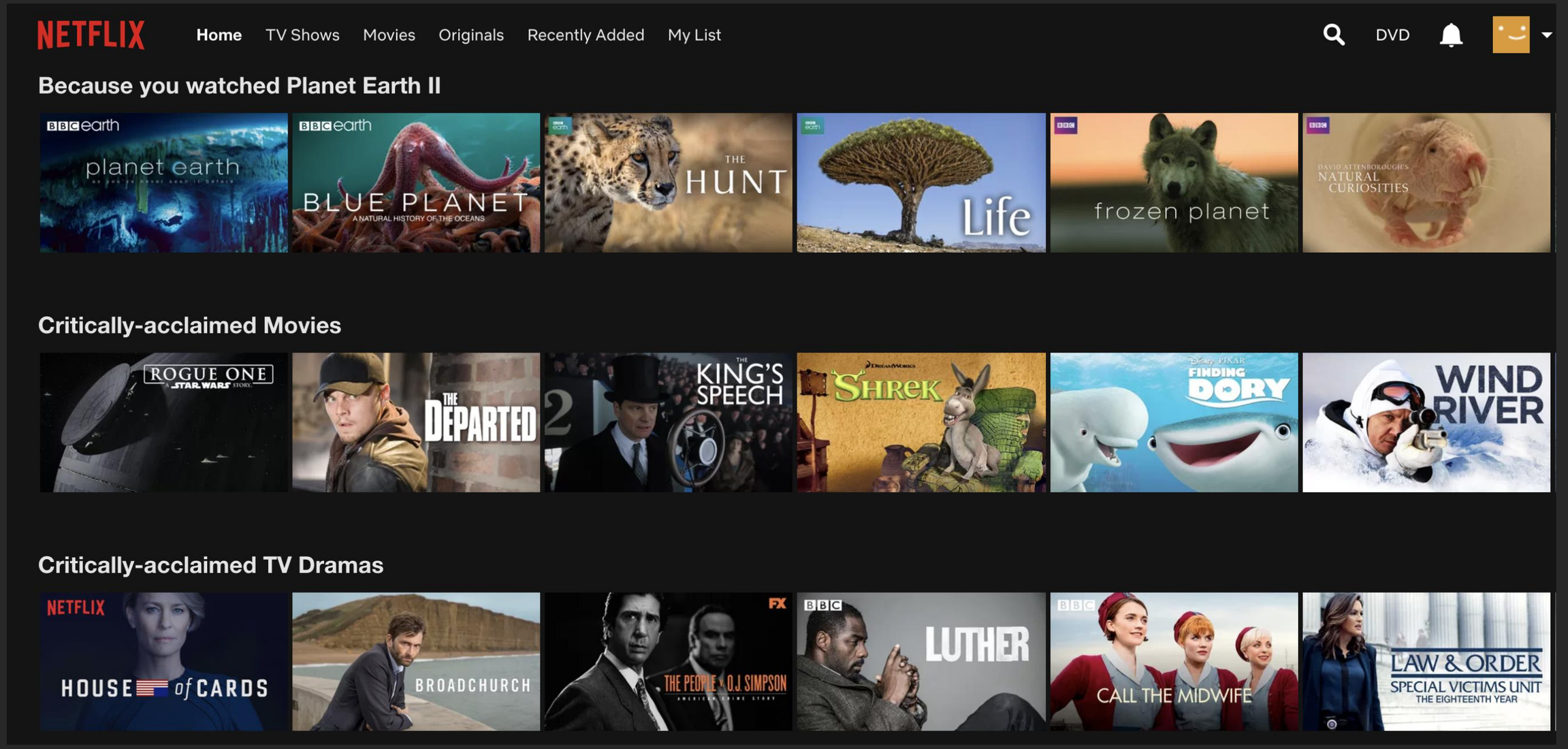


- AI: Capability of a machine to perform tasks that normally require human intelligence
- ML: Ability to learn without being explicitly programmed
- DL: Techniques for learning in neural networks

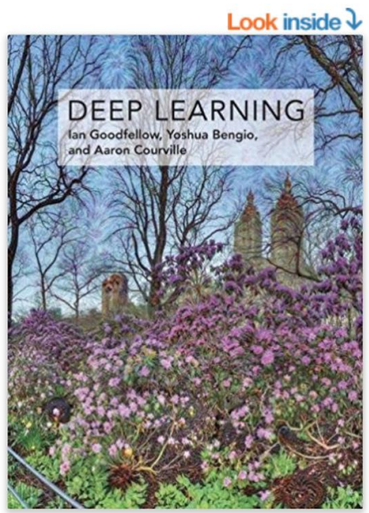
Everyday use of machine learning



Everyday use of machine learning



Everyday use of machine learning



Deep Learning (Adaptive Computation and Machine Learning) Hardcover – November 18, 2016

by Ian Goodfellow (Author), Yoshua Bengio (Author), Aaron Courville (Author), Francis Bach (Editor)

151 customer reviews

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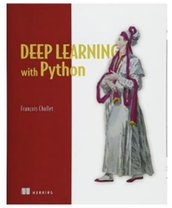
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An introduction to a broad range of topics in deep learning, covering mathematical and conceptual background, deep learning techniques used in industry, and research perspectives.

"Written by three experts in the field,
—**Elon Musk**, cochair of OpenAI; co

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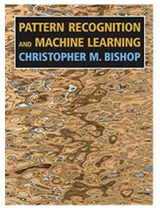
Page 1 of 20



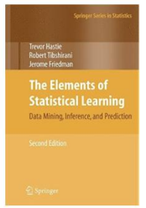
Deep Learning with Python
› Francois Chollet
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#1 Best Seller in Speech & Audio Processing
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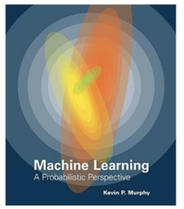
Hands-On Machine Learning with Scikit-Learn and TensorFlow:...
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Hardcover
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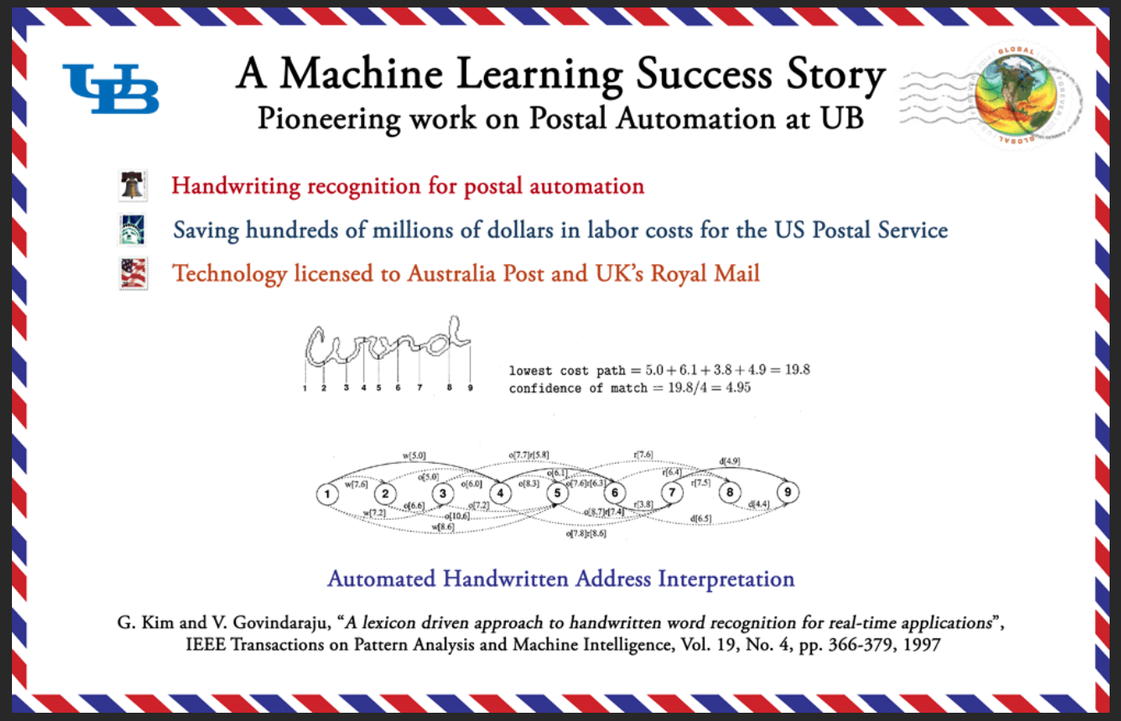


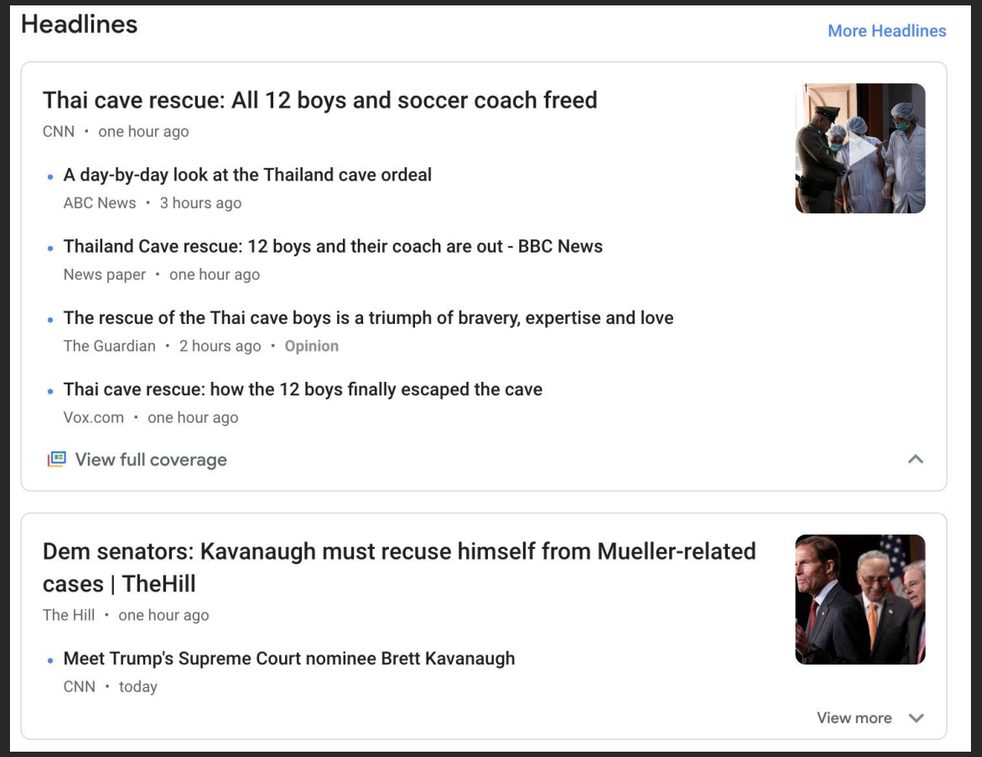
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Trevor Hastie
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Hardcover
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Machine Learning: A Probabilistic Perspective (Adaptive Computation...
› Kevin P. Murphy
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Hardcover
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Supervised vs. unsupervised learning

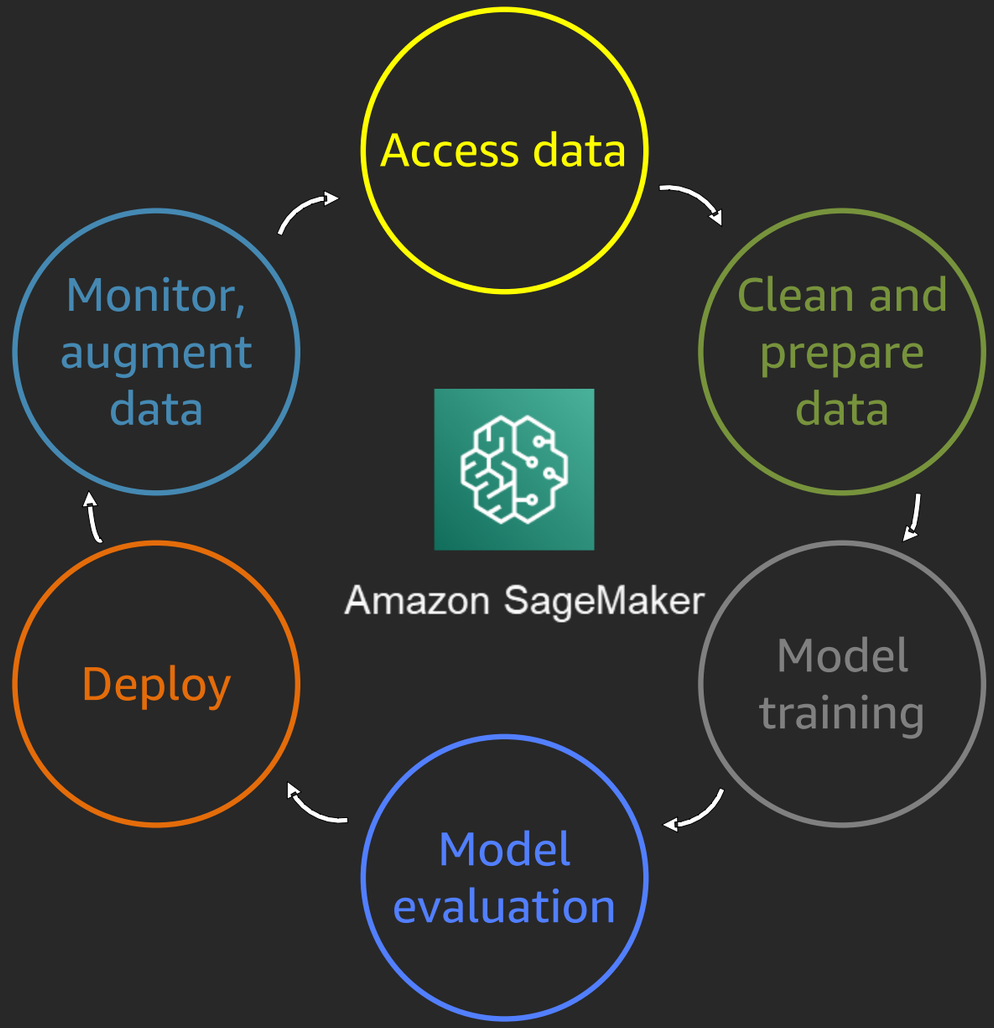




- Dataset with right answers
- Classification – discrete class label
- Regression – continuous quantity

- Right answers unknown
- Clustering
- Network analysis

End-to-end machine learning process



The AWS ML stack

Broadest and deepest set of capabilities

AI services

Vision	Speech	Language	Chatbots	Forecasting	Recommendations
Amazon Rekognition Image Amazon Rekognition Video Amazon Textract	Amazon Polly Amazon Transcribe	Amazon Translate Amazon Comprehend and Amazon Comprehend Medical	Amazon Lex	Amazon Forecast	Amazon Personalize

ML services

Amazon SageMaker	Ground Truth	Notebooks	Algorithms + AWS Marketplace	Reinforcement learning	Training	Optimization	Deployment	Hosting

ML frameworks + infrastructure

Frameworks	Interfaces
TensorFlow, mxnet, PYTORCH	GLUON, Keras

Infrastructure
Amazon EC2 P3 and P3DN, Amazon EC2 G4 and C5, FPGAs, DL Containers and AMIs, Amazon ECS, Amazon EKS, AWS IoT Greengrass, Amazon Elastic Inference, AWS Inferentia

The AWS ML stack

Broadest and deepest set of capabilities

AI services

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ML services

Amazon SageMaker

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The AWS ML stack

Broadest and deepest set of capabilities

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ML Services

 Amazon SageMaker

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ML Frameworks + Infrastructure

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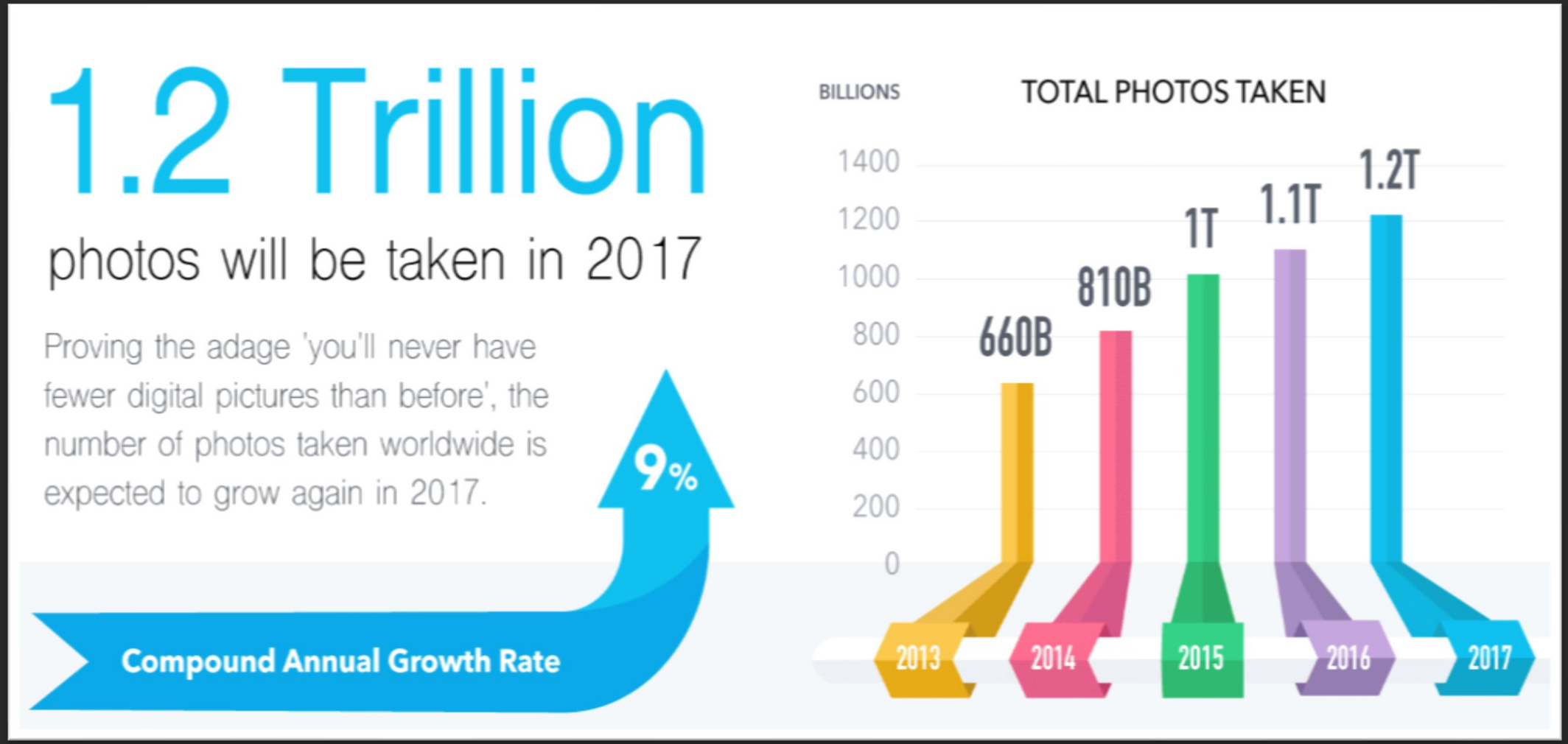
INFRASTRUCTURE

 Amazon EC2 P3 and P3DN
 Amazon EC2 G4 and C5
 FPGAs
 DL Containers & AMIs
 Amazon ECS
 Amazon EKS
 AWS IoT Greengrass
 Amazon Elastic Inference
 AWS Inferentia

Amazon Rekognition

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Explosive growth trends



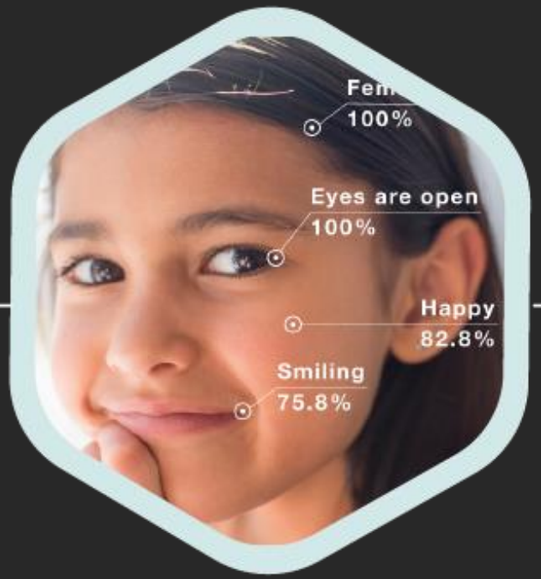
Amazon Rekognition

Deep-learning-based image recognition service

Search, verify, and organize millions of images



Object and scene Detection



Facial analysis



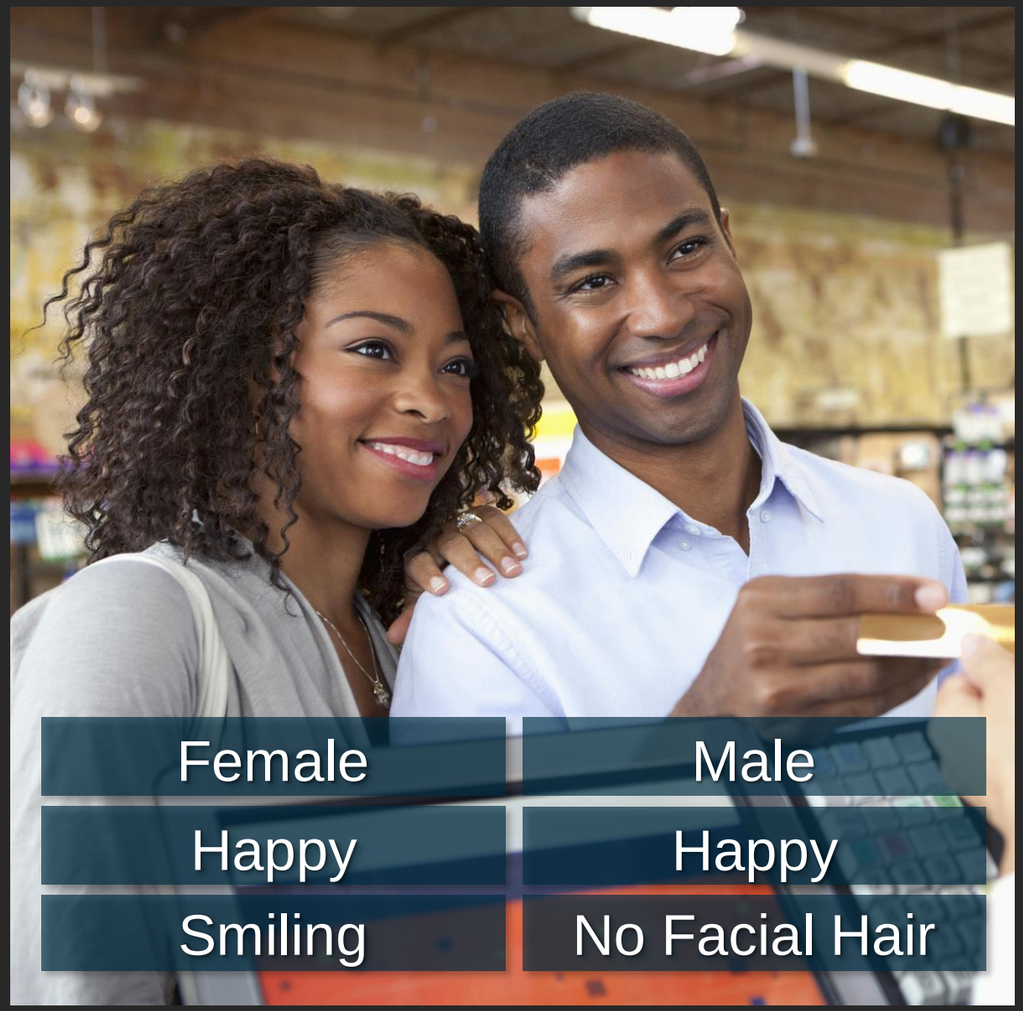
Face comparison

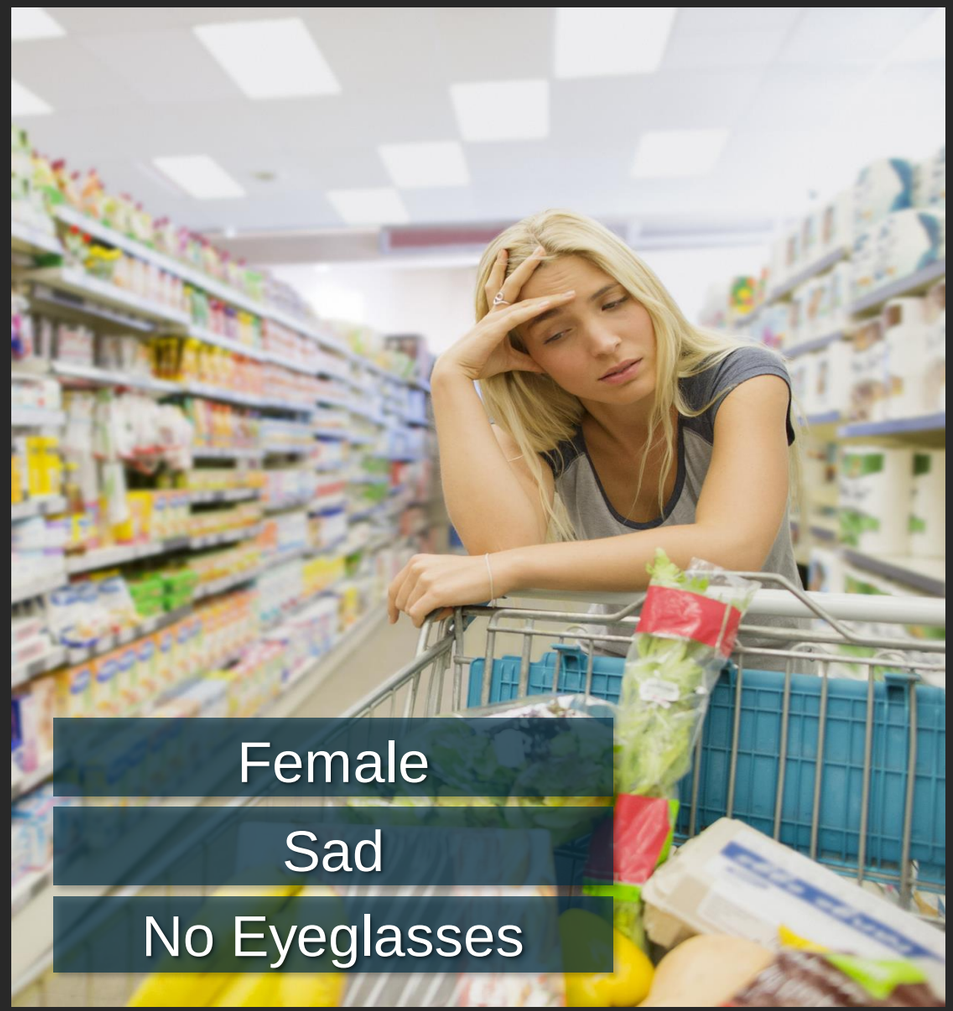


Facial recognition

Amazon Rekognition: Use case

Retail: Demographic and sentiment analysis





Amazon Rekognition: Use case

Targeted marketing: Demographic and sentiment analysis

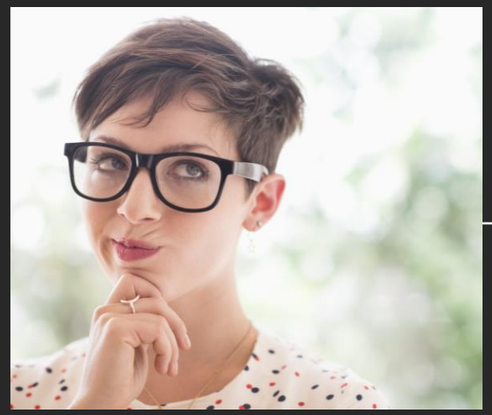
Person A



Sees



Person B



Sees



Amazon Rekognition: Face recognition





Amazon Rekognition: Face recognition

- Family photo sharing apps can use face recognition to group all faces of the same person in a family
- Entertainment and news organizations can index decades of archived images to find celebrities
- Secure campuses/workplaces can use face search to ensure all personnel in their facilities are authorized to be there
- Public safety teams can leverage face collections to automate tracking of persons of interest

Amazon Rekognition: Video

- Real-time analysis of streaming video
- Person identification and pathing
- Face recognition
- Facial analysis
- Objects, scenes, and activities detection
- Inappropriate-video detection
- Celebrity recognition

Amazon Rekognition

- Fully managed deep-learning-based system
- SDK/NuGet package for .NET
- Pay as you go
- Integrated with AWS and AI services: Amazon S3, Amazon Lex, and Amazon Polly
- Scalable and low cost
- Available in our Ireland, N. Virginia, Oregon, Ohio, Tokyo, Sydney, Mumbai, Frankfurt, London, Singapore, N. California, Seoul and GovCloud West Regions

Demo

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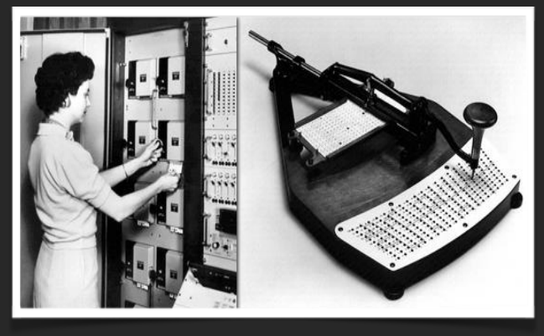
Amazon Lex: A service for building conversational interfaces using voice and text

AWS re:Invent

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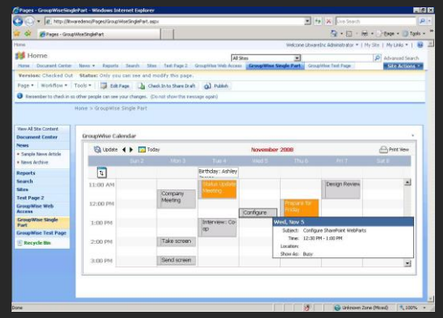
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Amazon Lex: Advent of conversational interactions



1st gen:

Punch cards and memory registers



2nd gen:

Pointers and sliders



3rd gen:

Conversational interfaces

Developer challenges

Security

Speech recognition

Authentication

Language understanding

Messaging platforms

Disparate systems

Availability

Business logic

Scale

Testing

Mobile

Conversational interfaces need to combine a large number of sophisticated algorithms and technologies

Conversational access



Natural



On demand



Accessible



Efficient

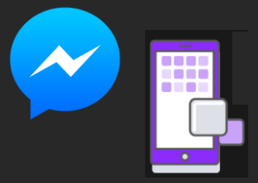
Amazon Lex: Complete solution



Amazon Lex: Features



Text and speech language understanding: Powered by the same technology as Alexa



Build once and deploy to multiple platforms



Designed for builders: Efficient and intuitive tools to build conversations; scales automatically



Enterprise ready: Connect to enterprise systems via SaaS connectors

Versioning and alias support



Continuous learning: Monitor and improve your bot

Amazon Lex: Use cases



Contact-center bots

Chatbots for customer service

- Account inquiries
- Bill payment
- Service update
- Etc.



Informational bots

Chatbots for everyday consumer requests

- News updates
- Weather information
- Game scores
- Etc.



Application bots

Build powerful interfaces to mobile applications

- Book tickets
- Order food
- Manage bank accounts
- Etc.



Enterprise productivity bots

Streamline enterprise work activities and improve efficiencies

- Check sales numbers
- Marketing performance
- Inventory status
- Etc.



Internet of Things (IoT) bots

Enable conversational interfaces for device interactions

- Wearables
- Appliances
- Auto
- Etc.

Amazon Lex: “Book a hotel”



“Book a hotel in NYC”

Book | a | hotel | in | NYC

Automatic speech recognition

Hotel booking

New York City

Natural language understanding

Intent/slot model

Utterances

Hotel booking	
City	New York City
Check in	April 19th
Check out	April 21st

“Can I go ahead with the booking?

λ

Confirmation: “Your hotel is booked for April 19th”

Amazon Polly



“Your hotel is booked for April 19th”

Amazon Lex

- Fully managed deep-learning-based system
- SDK/NuGet package for .NET
- Pay as you go
- Scalable and low cost
- Available in our Ireland, N. Virginia, and Oregon Regions

Demo

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Demo

https://aws.amazon.com/getting-started/projects/bots-just-got-better-net-toolkit-lex-lambda-cognito/module-one/

https://www.youtube.com/watch?v=wpafE1hLvB8&t=0s&list=PLhr1KZpdzukcZEpM1wap9dkr3zgTRdRrD&index=12

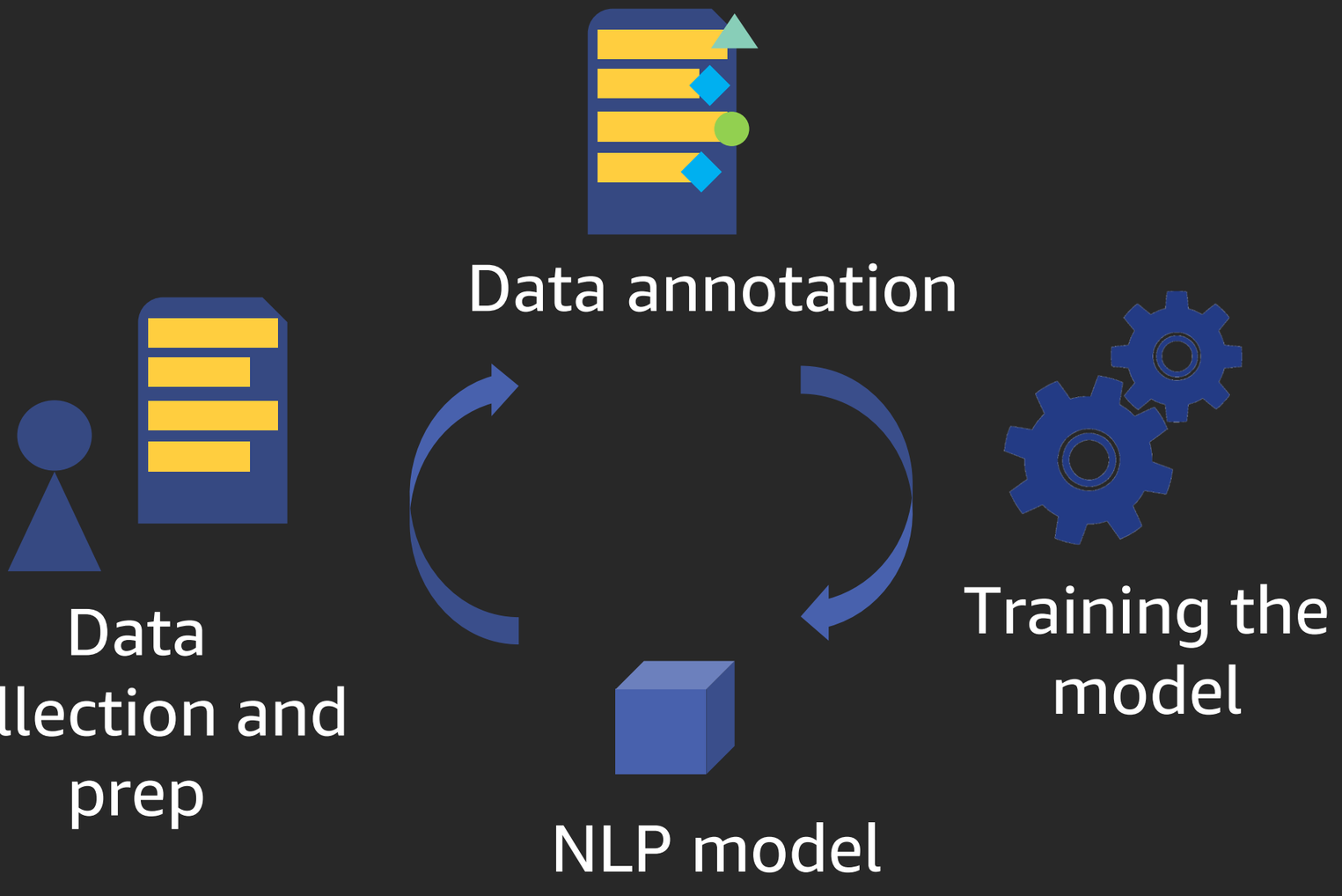
Amazon Comprehend: The AWS text analytics workload

AWS re:Invent

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Training NLP is hard and expensive

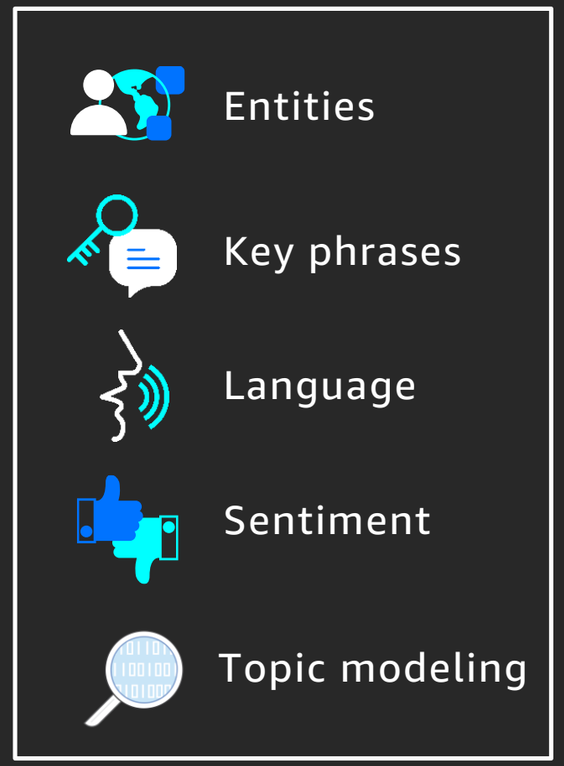


- Learn machine learning
- Specialize in NLP concepts
- Continuously train and retrain models
- Finally, use the data

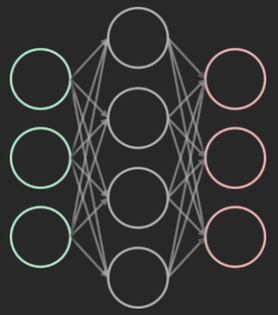
Amazon Comprehend

Discover insights and relationships in text





Powered by deep learning



Amazon Comprehend: Most common patterns

Content personalization: Customers are using Amazon Comprehend NLP output to understand related documents based on entities, phrases, or even topic similarities for trends analysis to drive content personalization and recommendations

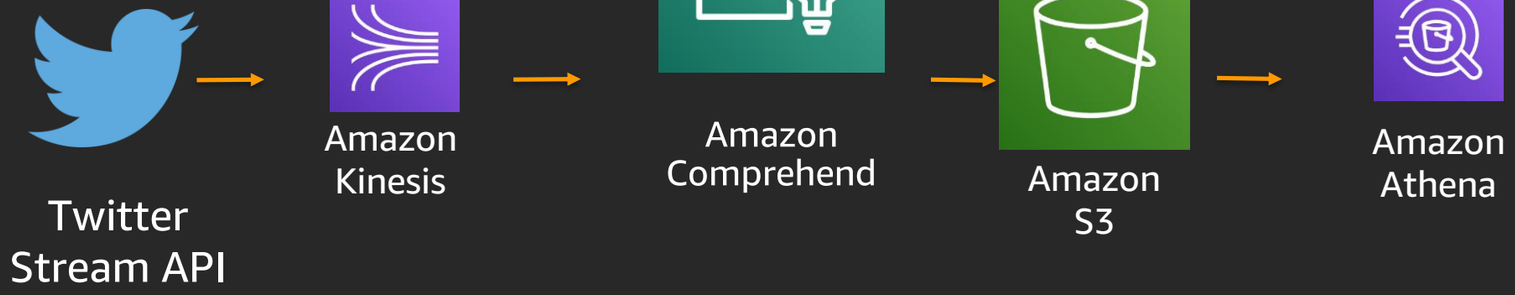
Semantic search: Customers using Amazon Comprehend to index entities for boosting and ranking search results

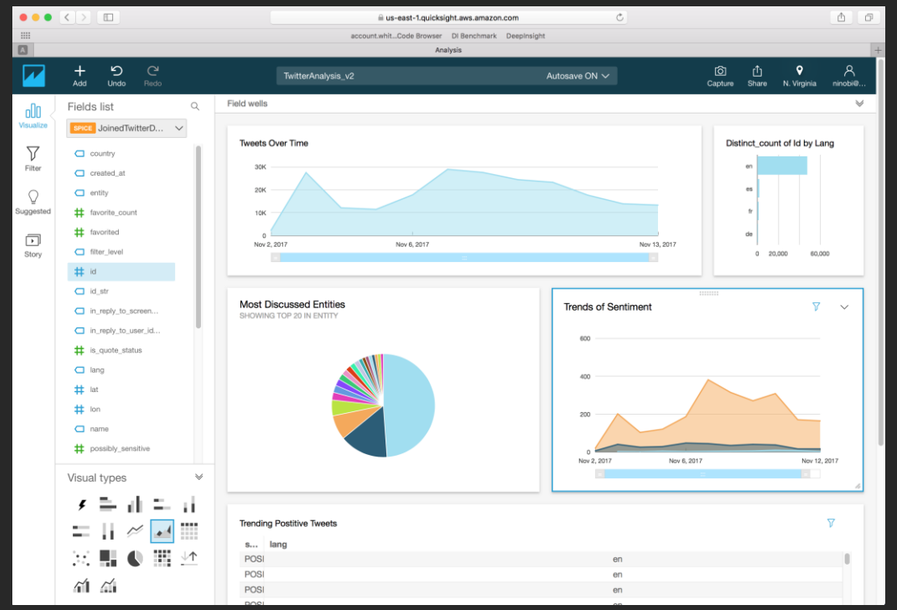
Intelligent data warehouse: Customers are using Amazon Comprehend to query unstructured data in relational databases, process data within the data lake (Amazon S3), then insert the data back into the data warehouse

Social analytics: Customers are using Amazon Comprehend to ingest, process and analyze trends from entities and sentiment from social media posts across Twitter and Facebook

Information management: Customers are using Amazon Comprehend for indexing and finding related content for enterprise information management and various internal business processes, including compliance and IT.

Analyze social media postings and comments to organize and classify customer feedback and look for common patterns





Visualize results in Amazon QuickSight

Amazon Comprehend

- Fully managed deep-learning-based system
- SDK/NuGet package for .NET
- Pay as you go
- Scalable and low cost
- Arabic, Chinese , English, French, German, Italian, Portuguese, and Spanish
- Available in Ohio, N. Virginia, Oregon, Singapore, Sydney, Canada, Frankfurt, Ireland, London, Montreal, and GovCloud

Demo

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Demo

https://aws.amazon.com/blogs/machine-learning/build-a-social-media-dashboard-using-machine-learning-and-bi-services/

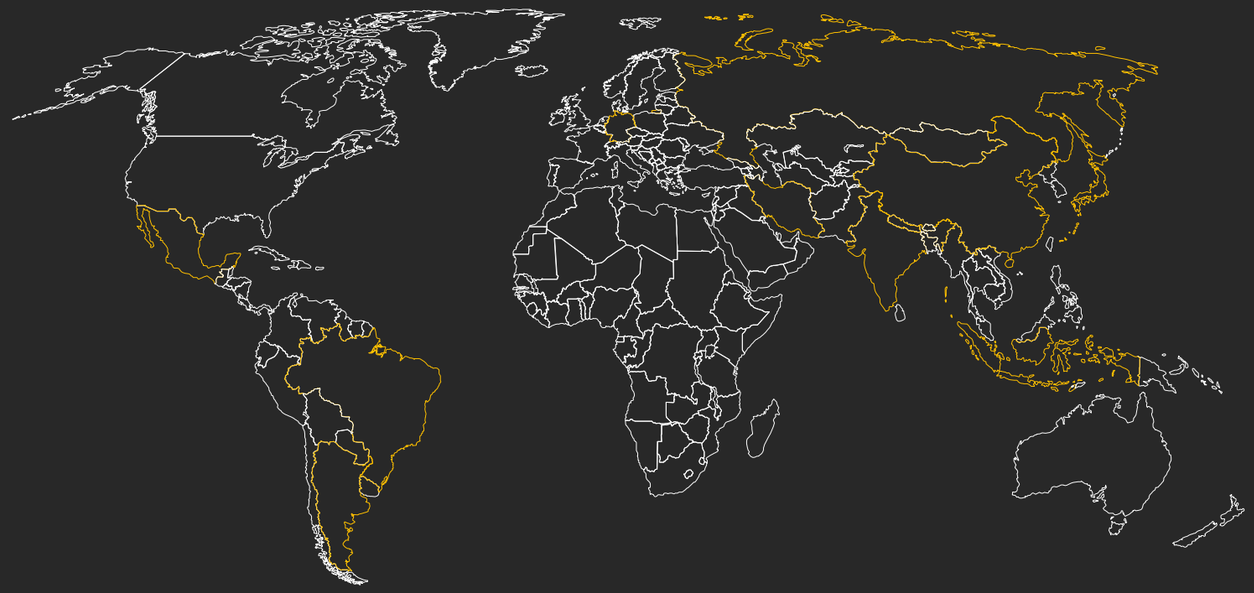
Amazon Translate

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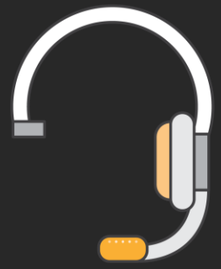
55%



of consumers buy only on sites in their own language

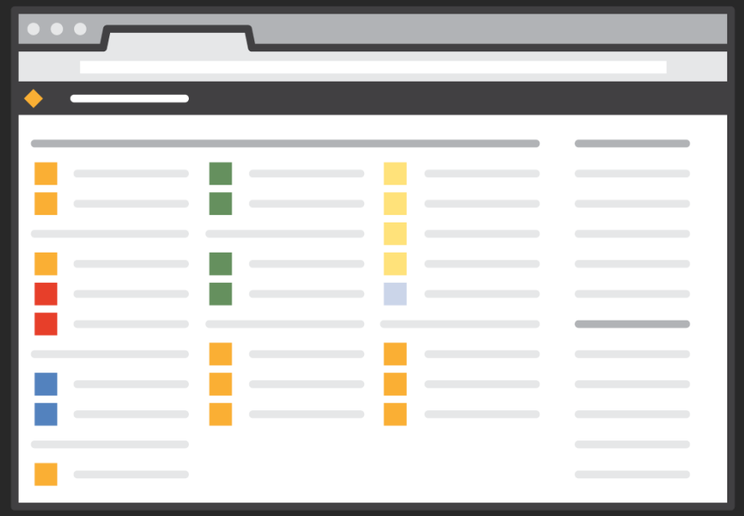


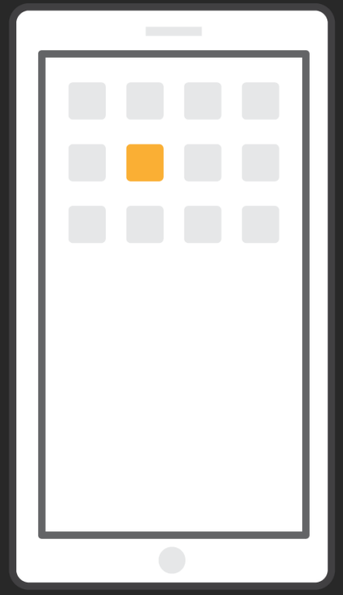




Source: CSA Research

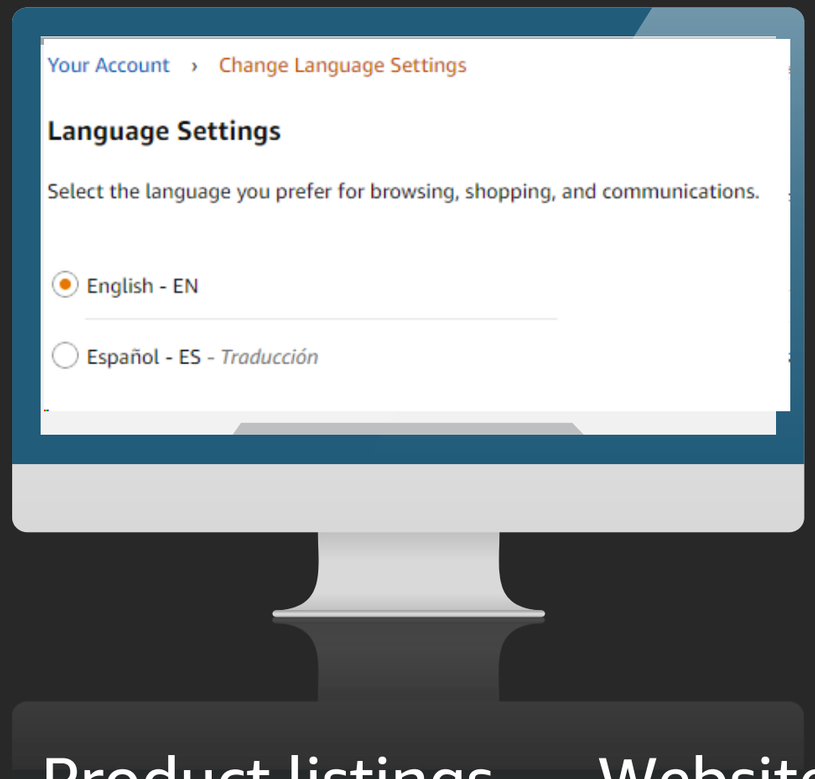
Making it a viable solution only for an organization's most precious, core assets







Machine translation at Amazon.com



100s of billions of words

Product listings, descriptions, search queries

Website strings and functional content

Interpersonal communication: customer, vendor, and seller support

Product documentation and support content

Use for high-volume and time-sensitive content

Machine translation

- **User-authored content** (reviews, forums, etc.)
- **Interpersonal communications** (e.g., gaming chat, customer service)
- **Insight extraction** (e.g., sentiment, document classification)
- **Content discovery**
- **Subtitles/live captioning**



Post-edited machine translation

- UI
- Marketing materials
- Regulatory filings
- Product documentation

Share of worldwide digital content

Features



Supports translating between 54 languages



Translate plain text



Real-time (sentence < 500 ms on average) or batch



Native language detection

Why customers prefer Amazon Translate

Lower cost – Maintain quality

"Overall turnaround time was cut by 67%, while maintaining the same high quality standards. Our total costs were reduced respectively."

—Ofer Shoshan, CEO at One Hour Translation

It delivers the best ROI

At $15/1M characters + state-of-the-art quality

Built to integrate with other AWS services

To support solutions (e.g., text analytics, multilingual transcription, processing)

Higher pace of innovation and customer obsession

We move faster, we build for businesses

Amazon Translate

- Fully managed deep-learning-based system
- SDK/NuGet package for .NET
- Pay as you go
- Scalable and low cost
- Amazon Translate supports translation between the following 54 languages: Afrikaans, Albanian, Amharic, Arabic, Azerbaijani, Bengali, Bosnian, Bulgarian, Chinese Simplified, Chinese Traditional, Croatian, Czech, Danish, Dari, Dutch, English, Estonian, Farsi (Persian), Finnish, French, Canadian French, Georgian, German, Greek, Hausa, Hebrew, Hindi, Hungarian, Indonesian, Italian, Japanese, Korean, Latvian, Malay, Norwegian, Pashto, Polish, Portuguese, Romanian, Russian, Serbian, Slovak, Slovenian, Somali, Spanish, Swahili, Swedish, Tagalog, Tamil, Thai, Turkish, Ukrainian, Urdu, and Vietnamese. Between these languages, the service supports 2804 translation combinations.
- Available in our Ohio, N. Virginia, Oregon, N California, London, Paris, Stockholm, Hong Kong, Sydney, Mumbai, Seoul, Singapore, Tokyo, Canada, Frankfurt, Ireland, and GovCloud Regions

Amazon Polly

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What is Amazon Polly?

- A service that converts text into lifelike speech
- Offers 59 lifelike voices across 29 languages
- Low-latency responses enable developers to build real-time systems
- Developers can store, replay, and distribute generated speech

Amazon Polly: Quality

Natural-sounding speech

A subjective measure of how close TTS output is to human speech



Accurate text processing

Ability of the system to interpret common text formats such as abbreviations, numerical sequences, homographs, etc.

Today in Las Vegas, Nevada, it's 90°F.



"We Live for the Music," live from the Madison Square Garden.



Highly intelligibile

A measure of how comprehensible speech is

Peter Piper picked a peck of pickled peppers.



Amazon Polly: Language portfolio

EMEA:

- **Danish**
- **Dutch**
- **British English**
- **French**
- **German**
- **Icelandic**
- **Italian**
- **Norwegian**
- **Polish**
- **Portuguese**
- **Romanian**
- **Russian**
- **Spanish**
- **Swedish**
- **Turkish**
- **Welsh**
- **Welsh English**

Americas:

- **Brazilian Portuguese**
- **Canadian French**
- **English (US)**
- **Spanish (US)**
- **Spanish (Mexico)**

APAC:

- **Australian English**
- **Indian English**
- **Japanese**
- **Korean**
- **Mandarin Chinese**
- **Hindi**
- **Arabic**



Duolingo voices its language learning service using Amazon Polly

> With Amazon Polly our users benefit from the most lifelike Text-to-Speech voices available on the market.
>
> **—Severin Hacker**
> CTO, Duolingo



Duolingo is a free language-learning service where users help translate the web and rate translations

- Spoken language crucial for language learning
- Accurate pronunciation matters
- Faster iteration thanks to TTS
- As good as natural human speech

Read the blog post >>

Amazon Polly

- Fully managed deep-learning-based system
- SDK/NuGet package for .NET
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