



INNOVATE2018

ONLINE CONFERENCE



Demystifying Machine Learning on AWS (Level 200)

Steve Shirkey, Specialist Solution Architect

A Long History of Machine Learning at Amazon



Personalized
recommendations



Fulfillment
automation and
inventory
management



Drones

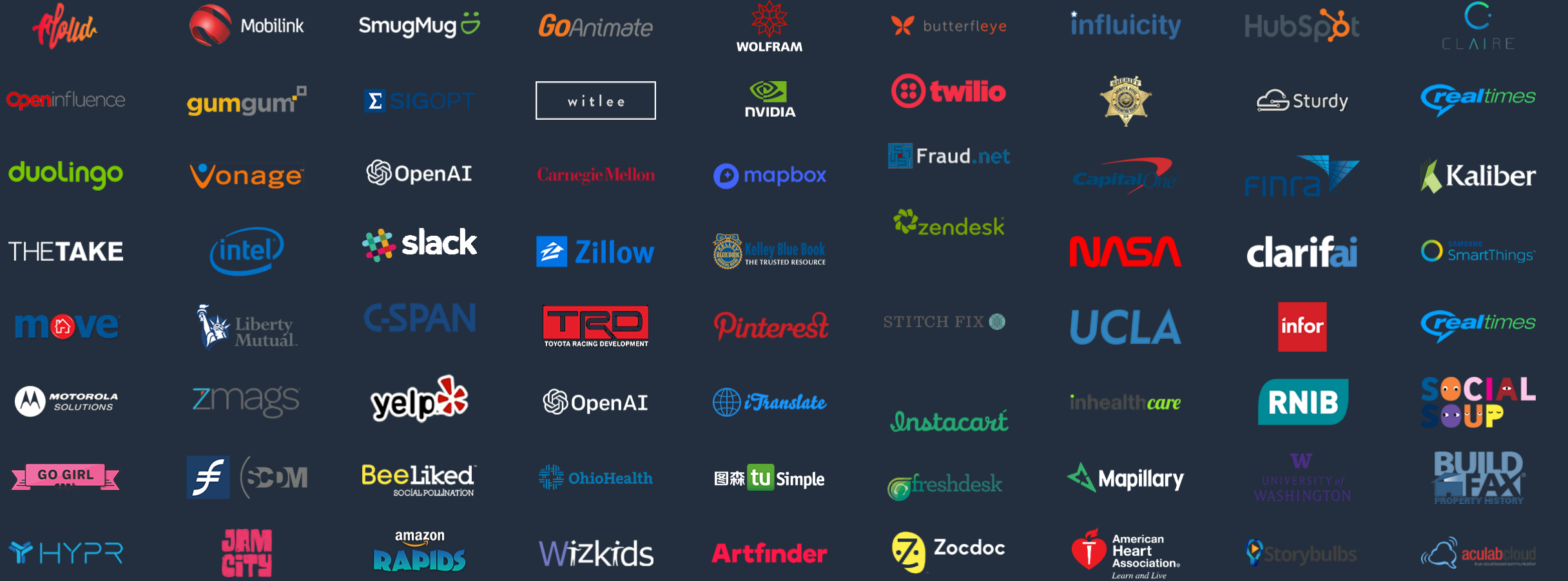


Voice driven
interactions



Inventing
entirely new
customer
experiences

Customer ML Workloads on AWS



ML @ AWS: OUR MISSION

**Put machine learning in the
hands of every developer
and data scientist**

The Amazon Machine Learning Stack

APPLICATION SERVICES

PLATFORM SERVICES

FRAMEWORKS & INTERFACES

The Amazon Machine Learning Stack

APPLICATION SERVICES

PLATFORM SERVICES

FRAMEWORKS & INTERFACES

Foundation Layer: Frameworks & interfaces



Tesla V100
GPUs

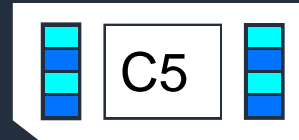
5,120 Tensor cores

128GB of memory

1 Petaflop of compute

NVLink 2.0

~14X faster than P2



72 vCPUs
3.0 GHz Intel
Xeon (Skylake)
processors
Advanced Vector
Extension (AVX)
512
144 GB of memory
Nitro Hypervisor

**25%
improvement in**



AWS Deep Learning AMI

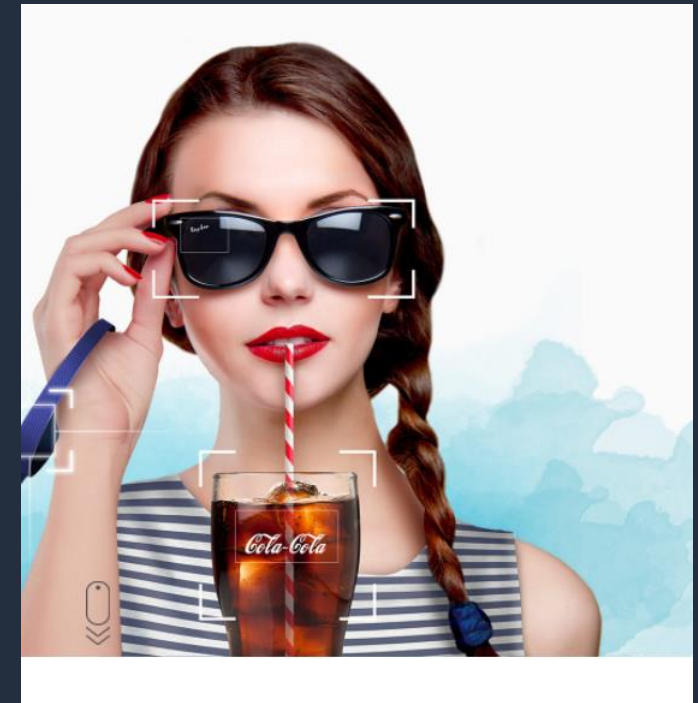


Using Deep Learning to Drive Targeted Advertising

GumGum uses deep learning to provide actionable insights to help advertisers create highly visible and targeted campaigns.

- Mantii, GumGum's real-time social media listening tool built on deep learning, can **analyze the more than 1.8 billion social images posted daily**, where 80% of them lack text to help marketers find them.
- With deep learning on AWS using **Apache MXNet and Amazon EC2 P2 instances**, the company **reduced model training time from 21 hours to 6 hours**.

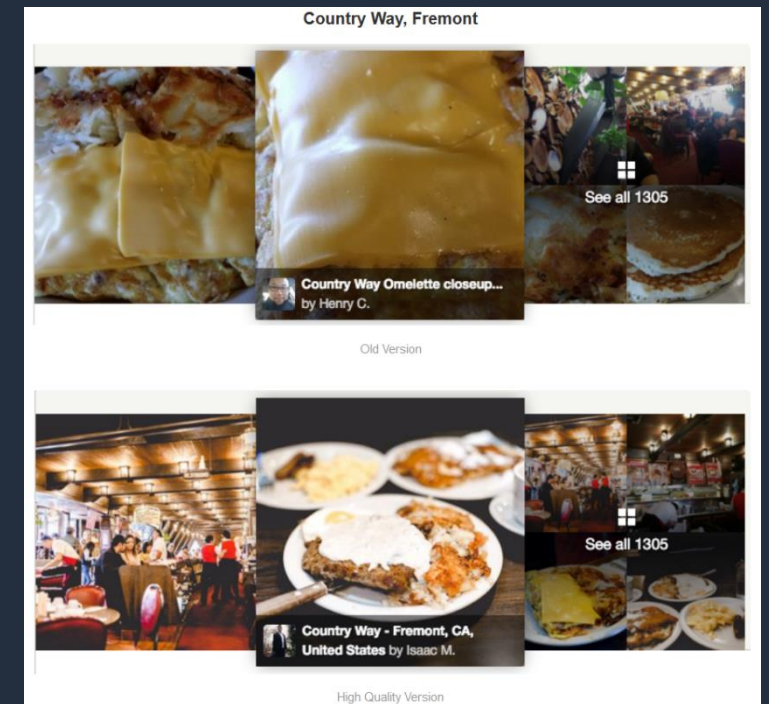
gumgum



Deep Learning Helps Yelp Identify Cover Photos

Yelp, the popular crowd-sourced business review site, uses deep learning algorithms to help select appealing cover photos for reviews.

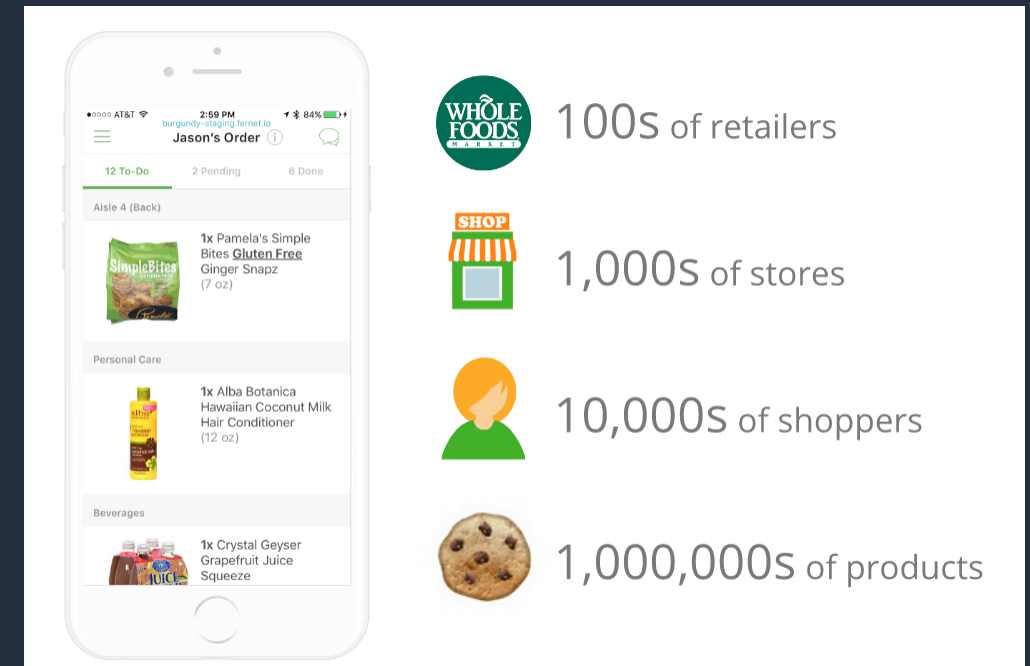
- Uses **GPUs on AWS** with the **cuDNN-accelerated Caffe deep learning framework** to train models for accurate image recognition.
- Created an automatic and systematic way for cover photo selection instead of being subject to selection bias.



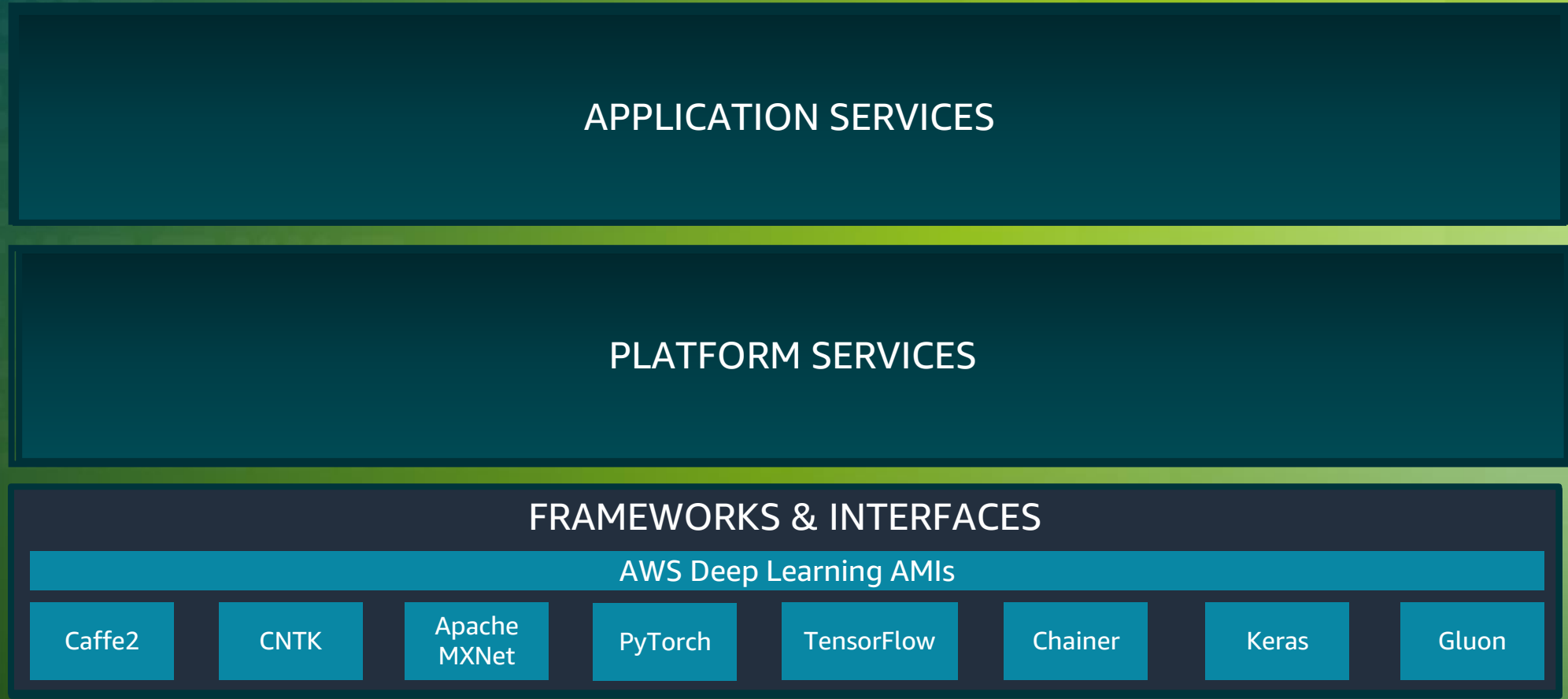
Helping Shoppers Be Efficient Using Deep Learning

Instacart, an Internet-based grocery delivery service, uses deep learning to help their thousands of personal shoppers be more efficient.

- Trained deep learning models using **Keras and TensorFlow** to build a scoring generator that helps customers shop based on prior purchases.
- Utilized Tesla K80 GPUs on the Amazon cloud for significant performance and efficiency gains and to reduce customer shopping times by minutes per trip. At scale, **every minute saved will translate into 618 years of shopping time per year.**



The Amazon Machine Learning Stack



The Amazon Machine Learning Stack

APPLICATION SERVICES

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FRAMEWORKS & INTERFACES

AWS Deep Learning AMIs

Caffe2

CNTK

Apache
MXNet

PyTorch

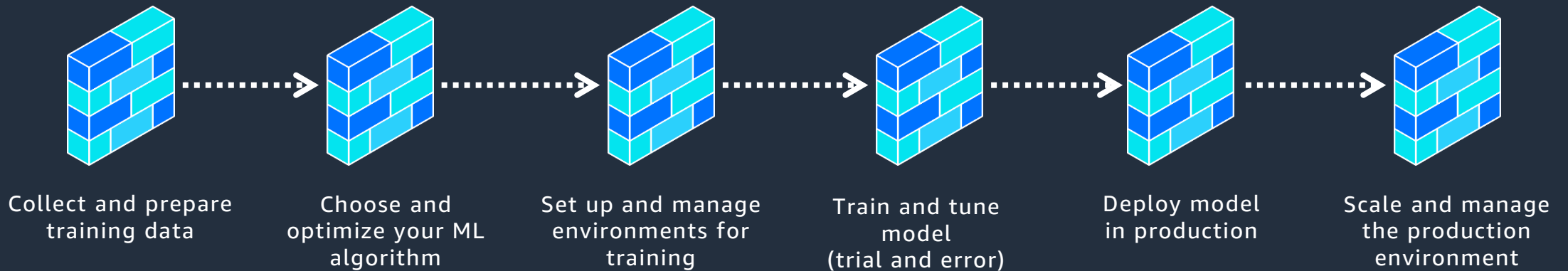
TensorFlow

Chainer

Keras

Gluon

ML is still too complicated for everyday developers



Amazon SageMaker

Easily build, train, and deploy machine learning models



Collect and prepare
training data



Choose and
optimize your ML
algorithm



Set up and manage
environments for
training



Train and tune
model
(trial and error)



Deploy model
in production



Scale and manage
the production
environment

Amazon SageMaker



Pre-built
notebooks for
common
problems



Built-in, high
performance
algorithms

BUILD



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ALGORITHMS

K-Means Clustering
Principal Component
Analysis
Neural Topic Modelling
Factorization Machines
Linear Learner -
Regression

XGBoost
Latent Dirichlet Allocation
Image Classification
Seq2Seq
Linear Learner -
Classification

FRAMEWORKS

Apache MXNet
TensorFlow

Caffe2, CNTK,
PyTorch, Torch



Set up and
manage
environments for
training



Train and tune
model (trial
and error)



Deploy model
in production



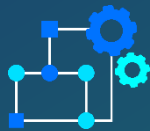
Scale and manage
the production
environment

BUILD

Amazon SageMaker



Pre-built
notebooks for
common
problems



Built-in, high
performance
algorithms

BUILD



One-click
training



Hyperparameter
optimization

TRAIN



Deploy model
in production

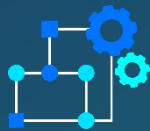


Scale and manage
the production
environment

Amazon SageMaker



Pre-built
notebooks for
common
problems



Built-in, high
performance
algorithms

BUILD



One-click
training



Hyperparameter
optimization

TRAIN



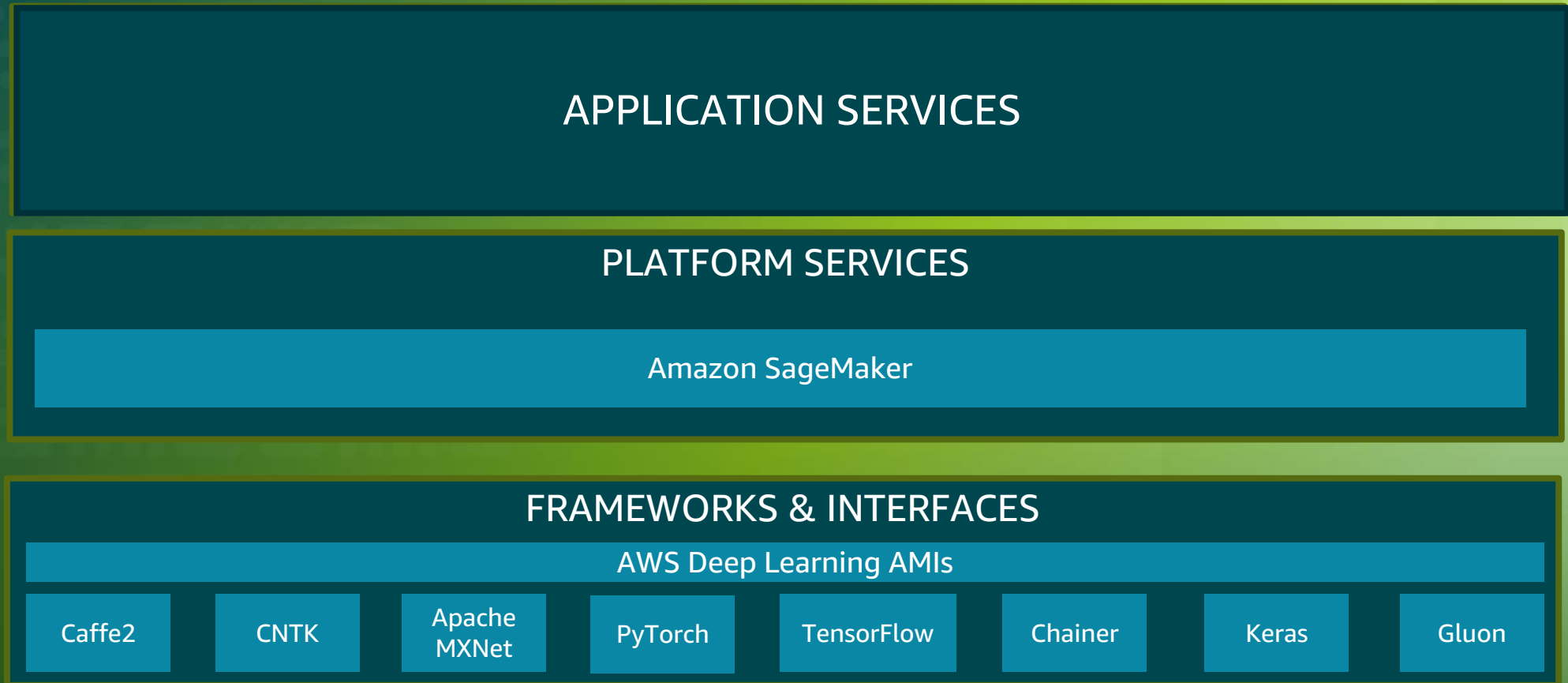
One-click
deployment



Fully managed
hosting with auto-
scaling

DEPLOY

The Amazon Machine Learning Stack



The Amazon Machine Learning Stack

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Amazon SageMaker

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AWS Deep Learning AMIs

Caffe2

CNTK

Apache
MXNet

PyTorch

TensorFlow

Chainer

Keras

Gluon

Amazon Rekognition Image

Deep learning-based image analysis service



Object and scene
Detection



Facial
analysis



Face
comparison



Facial
recognition



Celebrity
recognition



Image
moderation

Amazon Rekognition Image

Detecting Text in Images



DetectText

Results:

| IT'S - 97% |

| MONDAY - 99% |

| but - 97% | keep - 96% |

| Smiling - 99% |

Pinterest

SmugMug

Amazon Rekognition Video

Video Analysis **NEW!**



Object and activity
detection



Person
tracking



Face
recognition



Real-time live
stream



Content
moderation



Celebrity
recognition

Smartphone Video

00:05:00



Amazon Rekognition Video

Real-time or Batch



Stored Video

Amazon S3

Media search index

Unsafe video detection

Investigative analysis



Video Live Stream

Amazon Kinesis Video Stream

Public safety immediate response

Home monitoring

Democratizing Selling Art with Deep Learning

Artfinder uses deep learning to match artists and potential buyers through its website as well as through Emma, its AI art curator.

- Recommends art by using deep learning models and Amazon Rekognition on AWS to analyze over 500,000 art pieces and to perform complex correlations between images.
- Uses AWS Lambda and Elastic Search to improve performance in processing art color palettes and refining customer search.

Artfinder



Amazon Polly

Turn text into lifelike speech using deep learning

Dynamic Life-like Text-to-Speech



Wide Selection of
Voices and Languages



Synchronize
Speech



Fine-grained
Control



Unlimited Replay

Amazon Polly

Text to Speech (TTS) with Life-like Voice

Use Cases

Content Creation

Mobile & Desktop Applications

Internet of Things (IoT)

Education & E-Learning

Telephony

Game Development

Key Features

52 Voices across 25 languages

Lip-Syncing & Text Highlighting

Fine-grained Voice Control

Custom Vocabularies

Available in 14 AWS regions

Amazon Transcribe

Automatic speech recognition



Support for
both regular &
telephony audio



S3
integration



Time
stamps



Punctuation
&
formatting



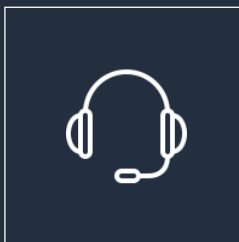
Recognize
multiple
speakers



Custom
vocabulary

Amazon Transcribe

Potential Use Cases



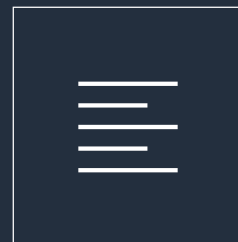
Call
centers



Subtitles for
VOD



Broadcast
closed
captions



Transcribe
meetings

Amazon Lex



Amazon Lex

Use Cases



Contact Center Bots

Chatbots for customer service IVR

Account inquiries
Bill payment
Service update



Informational Bots

Chatbots for everyday consumer requests

News updates
Weather information
Game scores



Application Bots

Build powerful interfaces to mobile applications

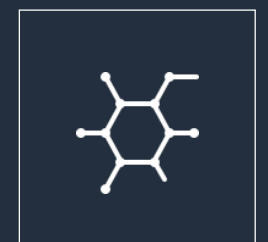
Book tickets
Order food
Manage bank accounts



Enterprise Productivity Bots

Streamline enterprise work activities and improve efficiencies

Check sales numbers
Marketing performance
Inventory status



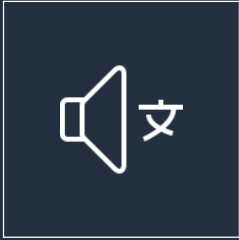
Internet of Things (IoT) Bots

Enable conversational interfaces for device interactions

Wearables
Appliances
Auto

Amazon Translate

Neural Machine Translation



Real time
translation



Powered by
deep learning



12 language
pairs with more
to come



Language
detection

Amazon Comprehend

Natural language processing



Sentiment



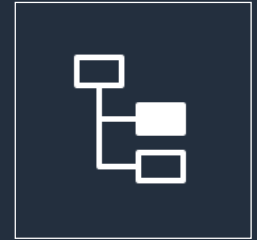
Entities



Key phrases



Languages



Topic modeling

Powered By Deep Learning

Amazon Comprehend

Extract insight from text

Amazon.com, Inc. is located in Seattle, WA and was founded July 5th, 1994 by Jeff Bezos. Our customers love buying everything from books to blenders at great prices

Named Entities

- Amazon.com: Organization
- Seattle, WA: Location
- July 5th, 1994: Date
- Jeff Bezos: Person

Keyphrases

- Our customers
- books
- blenders
- great prices

Sentiment

Positive

Language

English

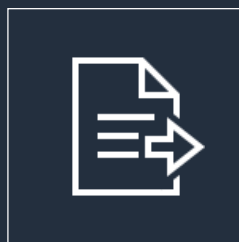
Amazon Comprehend

Topic modeling

Fully managed topic modeling service



Fully managed
topic modeling
service



Extract up to 100
topics from a corpus
of documents



Automatically
organizes documents
into the topics

How do we enable enterprises to
leverage ML and learn from
Amazon's experience?

Amazon ML Solutions Lab

Lots of companies doing Machine Learning lack expertise and are unable to unlock business potential



Leverage Amazon experts with decades of ML experience with technologies like Amazon Echo, Amazon Alexa, Prime Air and Amazon Go

Amazon ML Solutions
Lab provides the
missing ML expertise



Brainstorming



Modeling



Teaching

ML Solutions in AWS Marketplace

Data Solutions



alteryx



splice
MACHINE

ML & Data Science



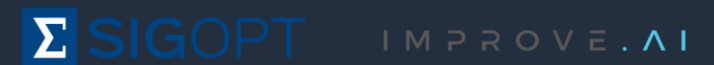
compellon



bitfusion



Intelligent Solutions

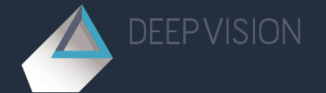


IMPROVE.AI

clarifai

twinword api

SDL*



Plasticity

aws.amazon.com/mp/ai

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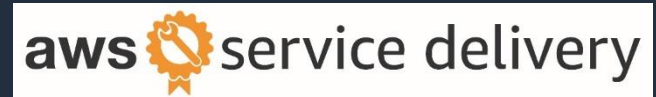
AWS Competency Partners

APN Partners who have demonstrated technical proficiency and proven customer success in specialized solution areas.



AWS Marketplace

A digital catalog with thousands of software listings from independent software vendors that make it easy to find, test, buy, and deploy software that runs on AWS.



AWS Service Delivery Partners

APN Partners with a track record of delivering specific AWS services to customers.

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