AWS re:Invent

AIM212

ML in retail: Solutions that add intelligence to your business

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The customer journey

Interest & research

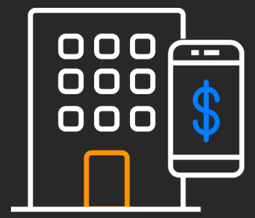


63% expect personalization as standard – 74% frustrated when not offered

Engage & evaluate



Justify & purchase



78% willing to leave if fast/free shipping isn't offered at checkout

Anticipate & track



Tracking detail checked 8x expecting new info

Inquire & return



Loyalty & advocacy



60% of consumers unhappy with returns or not even willing to try

Top retail challenges where ML can help

Promote & recommend



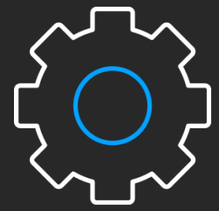
63% expect personalization as standard – 74% frustrated when not offered

Plan & forecast



Costs reduction, meeting customer demand, process optimization, and future vision that improves decision making

Digital transformation



C-level executives realize AI/ML transforms stores, forecasts, and recommendations but need to know which scenarios to prioritize today

#1

AI CxO ranking as game-changer

#8

AI CxO ranking by IT spend

How ML can improve your business

Enhanced insights

Insights from reports, metrics, and ML models to put some light on your business and on your competitors' actions; fundamental assets for better decision making

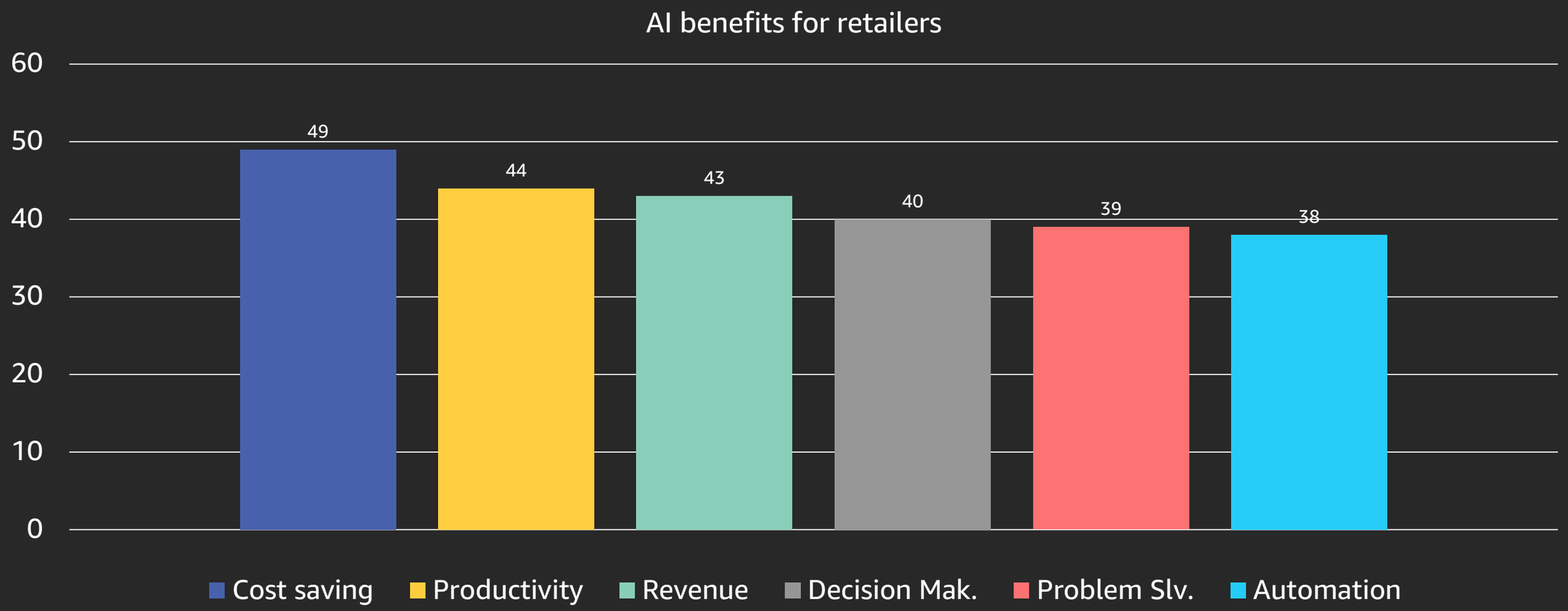
Improved user experience

You need to retain your users and attract new ones; the features you offer to your customers will make all the difference

Optimized process improvement

Optimize to reduce costs and time to market; you can always find new ways of improving processes

What are the benefits of AI/ML for the retailers?



Source: https://www.statista.com/statistics/805303/world-ai-benefits-for-retailers

Retailer's journey through AI/ML

Techniques used to solve common retail challenges

Product classification	Product recommendation	Similar items	Search personalization
Demand forecast	Inventory planning	Financial forecasting	Resource planning (workforce)
Visual search	Aggregate demographic analysis	Store layout design and planning	Suspicious activity detection with video (security)

AI/ML @ AWS

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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 & Comprehend Medical	Amazon Lex	Amazon Forecast	Amazon Personalize

ML services

Amazon SageMaker

Ground Truth	Notebooks	Algorithms + marketplace	Reinforcement learning	Training	Optimization	Deployment	Hosting

ML frameworks + infrastructure

FRAMEWORKS	INTERFACES
TensorFlow, mxnet, PYTORCH	GLUON, Keras

INFRASTRUCTURE								
EC2 P3 & P3DN	EC2 G4 EC2 C5	FPGAS	DL containers & AMIs	Amazon Elastic Container Service	Amazon Elastic Kubernetes Service	AWS IoT Greengrass	Amazon Elastic Inference	AWS Inferentia

"Many retailers have asked AWS to help them leverage Amazon's decades of experience serving retail customers around the world, which is why we've built services like Amazon Personalize, Amazon Forecast, and Amazon Connect – all of which incorporate Amazon.com innovations and technology to help AWS's retail customers operate more efficiently and deliver better customer experiences at lower cost."

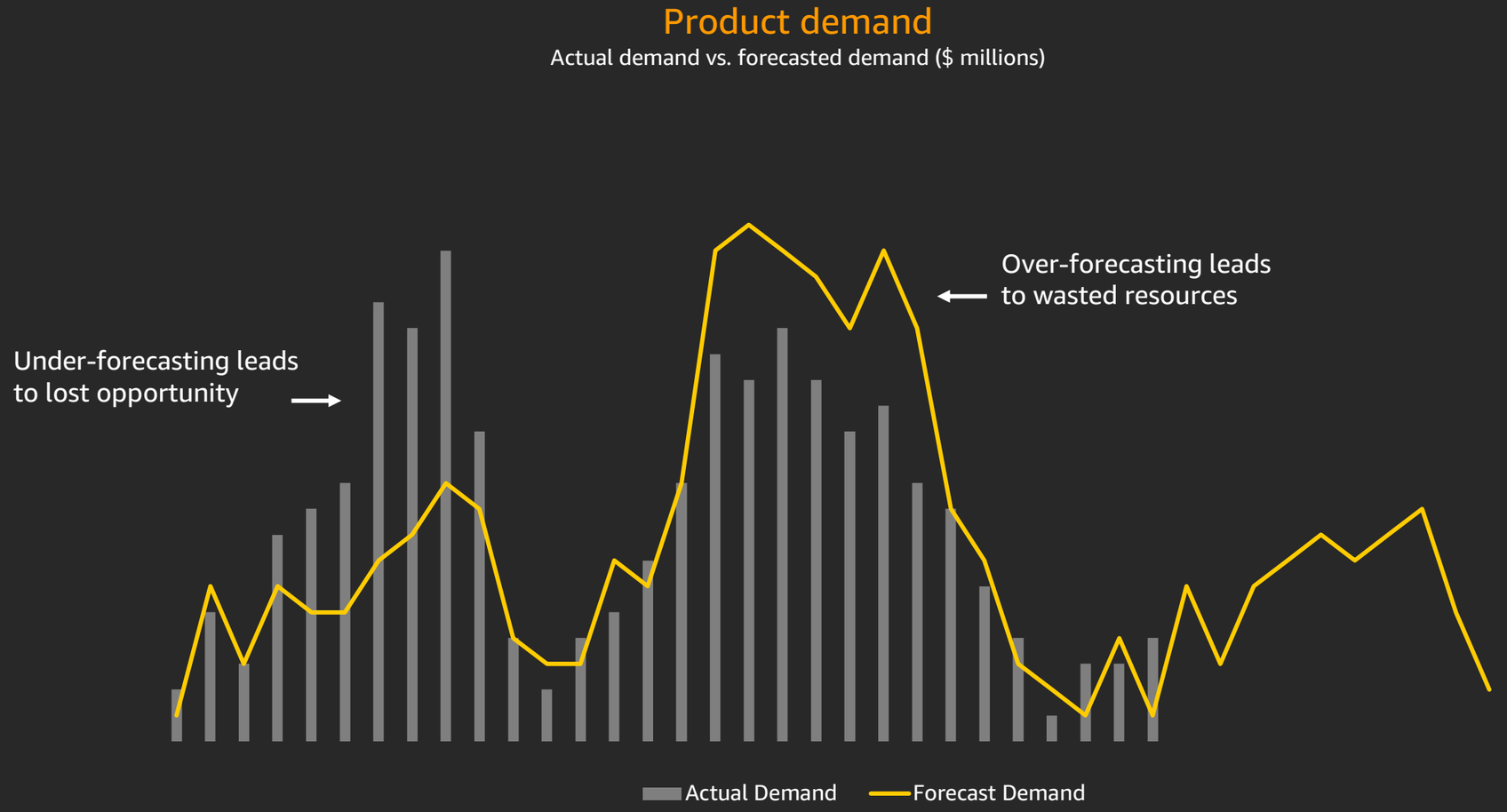
Andy Jassy

CEO, Amazon Web Services

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Forecasting

Forecasting is the science of predicting the future



Forecasting

Impact of under- and over-forecasting



Evolution of forecasting technology at Amazon.com over two decades

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Forecasting at Amazon.com

Early R&D investment to improve forecasting



Traditional statistics can predict demand for some products with reasonable accuracy



Everyday household products



Products specific to seasons

Linear or (repeated) seasonal demand patterns

Forecasting at Amazon.com

Using machine learning to solve complex forecasting problems

15x improvement in accuracy

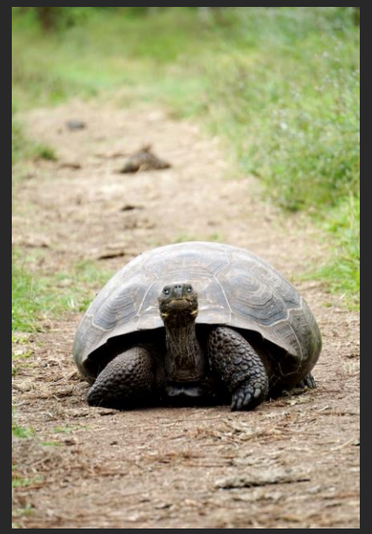
Use of deep learning



High-price variability



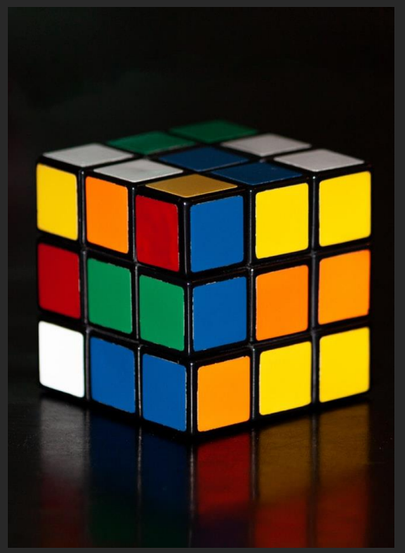
Regional vs. national demand



Slow-moving products



New products

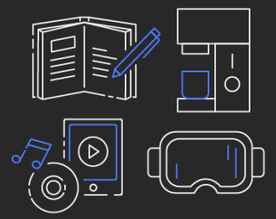


Highly seasonal products

Turtle photo by Cedric Fox on Unsplash; Rubix Cube photo by Elijah Ekdahl on Unsplash

Forecasting at Amazon.com

Accurate forecasting is critical for delivering on customer promises



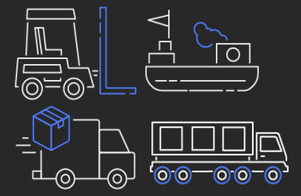
Product availability

Demand forecasting for over 400MM products across 10K ZIP codes



Lower price

Inventory and fulfillment cost reduction to provide customers low prices



Fast delivery

12 shipping options with free same-day delivery



Amazon

Forecast

Predict future business conditions with the same technology as used by Amazon.com

Amazon Forecast

Automated machine learning service for accurate forecasting



Fully managed service

Automatically sets up data pipeline, training, and prediction



Highly accurate

50% improvement in accuracy over traditional methods



Easy to use

No deep learning experience required



Your data, your models

Encrypted with customer keys through AWS Key Management Service (AWS KMS)

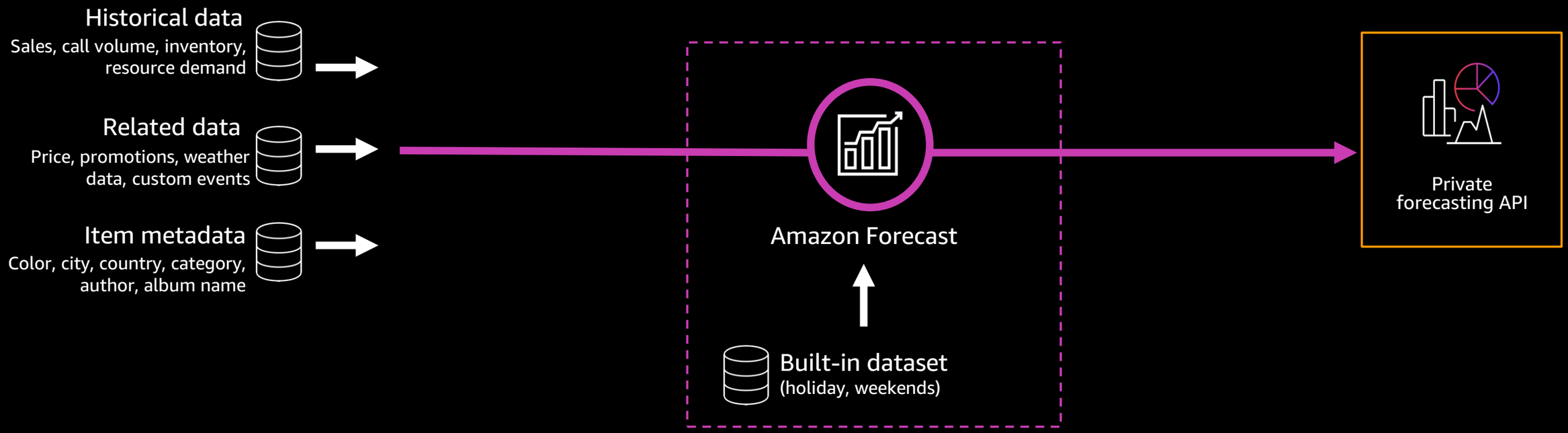
Amazon Forecast

Datasets used for forecasting

Use of historical data to predict future values	Target time-series dataset	The primary variable to predict with its historical values (demand, sales)
Use of related attributes and categorical data	Non-time-varying metadata	Categorical data that provides more context about items (color, city, channel)
Use of known time-varying data specific to your business	Related time-varying dataset	Time-varying related features that may impact the target value (price, promotion, weather)
Use of publicly known time-varying data	Built-in dataset	Built-in time-varying related data that may impact target value (holidays, weekends)

Amazon Forecast

The technology that powers the world's largest e-commerce business



Get started with the console or API

Point Amazon Forecast to your data stored in Amazon S3

Automatically train your custom ML model

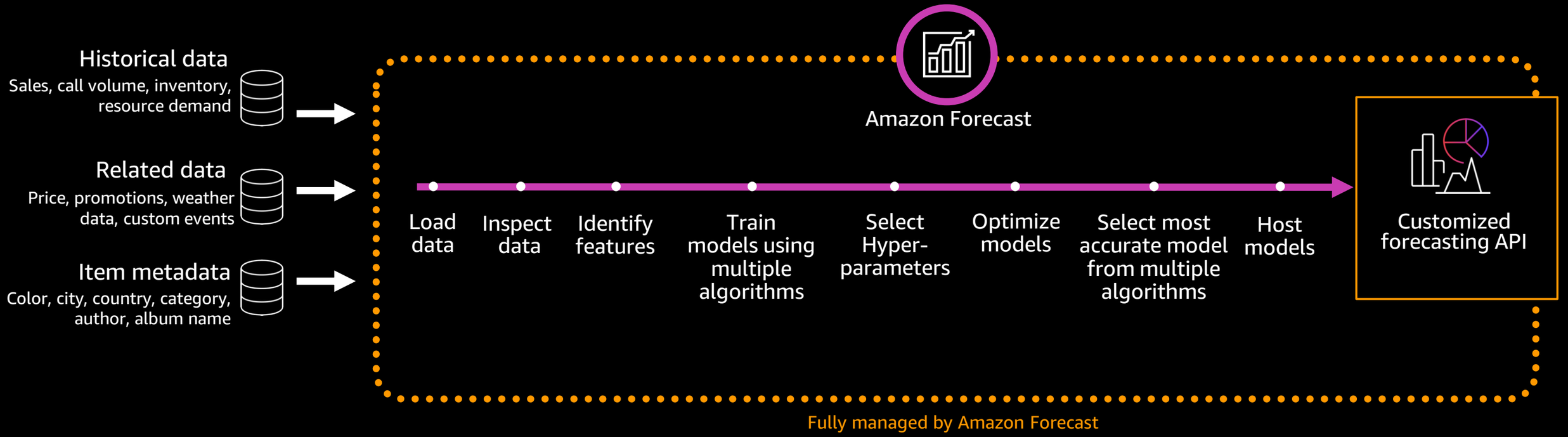
Let Amazon Forecast auto-select the best one for your data through AutoML

Generate accurate forecasts

Retrieve forecasts through the console or private API

Amazon Forecast

Behind the scenes



Amazon Forecast

Handles tricky forecasting scenarios



Missing values



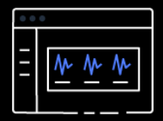
Product discontinuation



Cold start
(new product introduction)



Highly spiky data



Irregular seasonality



Sensitivity analysis
(future price change)

Inventory planning case study: CasaOne

CasaOne – Furniture rental e-commerce company

Business challenge:

Predict product demand for fast and slow-moving products across cities

Reduce inventory buildup in warehouse



Beds



Floor lamps



Storage



Sofas



Side tables



Dining tables

- ✓ Monthly furniture subscription
- ✓ Operating in 6+ cities
- ✓ Leasing term from 1 month to 12 months

Inventory planning case study

CasaOne – Furniture rental e-commerce company

CasaOne

*“With Amazon Forecast, our sales prediction accuracy has **improved by 20%** compared to our existing forecasting algorithm. This means we can stock the right products and save on purchase costs."*

Madhusudan Kagwad, Co-founder and
Head of Products CasaOne

Inventory planning case study: OMOTOR

OMOTOR – Machine learning SaaS provider

Business challenge:

Help an automotive customer predict sales across 185 vehicles in Brazil



- ✓ SaaS provider in Brazil
- ✓ Integrates AI solutions
- ✓ Provides services in cognition, ML, image recognition, and bots

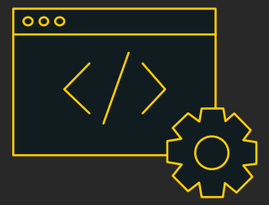
Demo

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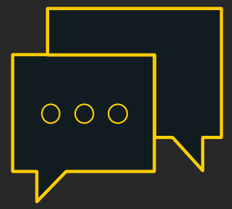
Users increasingly expect every interaction to be personalized



Activity & product recommendation



Search personalization



Personalized notifications



Emails

Personalization offers material business results



Engagement



Product discovery



Conversion



Revenue

Effective personalization involves multiple hard problems



Custom models

Personalization models must accurately reflect business context and user behavior



Real time

Personalization must be responsive to the changing user intent



Cold starts

New users should get relevant recommendations; new items should show in recommendations



Popularity trap

Naïve models give recommendations similar to popular items



Scale

Recommendations should scale across millions of users and items



Amazon

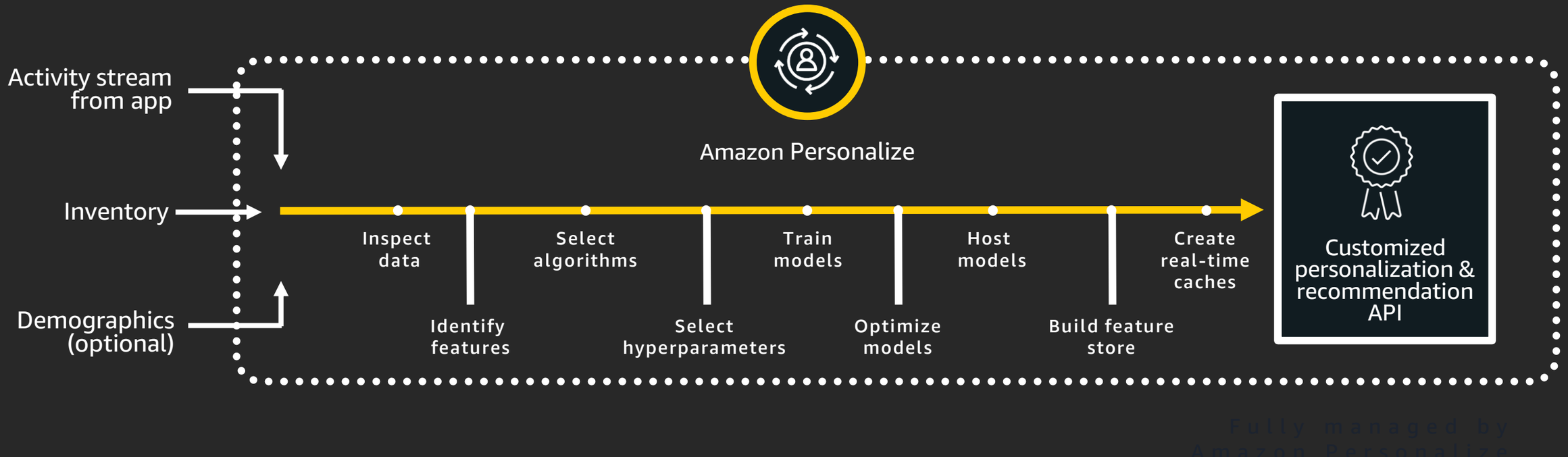
Personalize

Real-time personalization and recommendations, based on the same technology used at Amazon.com

Amazon Personalize: Machine learning personalization and recommendations



Amazon Personalize: Machine learning personalization and recommendations



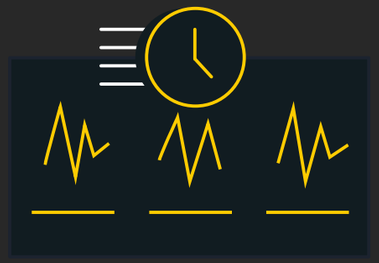
Improve customer experiences with personalization and recommendations



Deliver high-quality recommendations



Real time



Easy to use



Works with almost any product or content

KEY FEATURES

Responsive to changes in intent

Automated machine learning

Deep learning algorithms

"Amazon Personalize saves us up to 60% of the time needed to set up and tune the infrastructure and algorithms for our ML models when compared to building and configuring the environment on our own. It is ideal for both small developer teams who are trying to build the case for ML and large teams who are trying to iterate rapidly at reasonable cost."



Ishwar Bharbhari

Director of Information Technology

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Customers

Personalizing customer experiences

Domino’s uses Amazon Personalize to customize and scale relevant marketing communications to customers based on time, context, and content, thereby improving and enhancing their experience with the Domino’s brand



Demo

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Source: https://unsplash.com/photos/0UECcInuCR4

Ground Truth



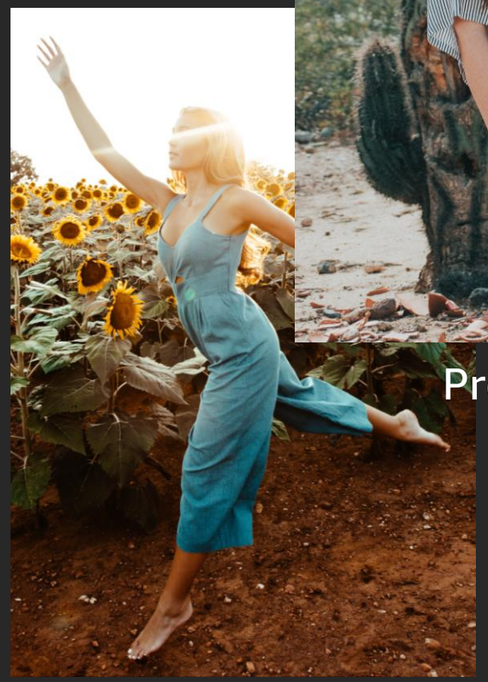
Amazon Elastic Inference



Amazon SageMaker

Visual search







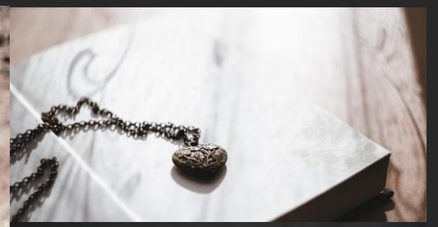
Product 2

Product 1

Recommended products by

Amazon Personalize







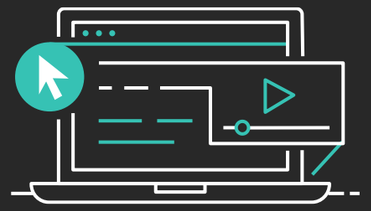
Products 3, 4 & 5

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Role-based ML learning paths for developers, data scientists, data platform engineers, and business decision makers



70+ free digital ML courses from AWS experts let you learn from real-world challenges tackled at AWS



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AWS Certified Machine Learning - Specialty exam

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aws training and certification

Thank you!

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