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AIM333

How Taco Bell is improving digital availability with ML forecasting

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Agenda

Introduction to Amazon Forecast as a fully managed ML-forecasting service

Learn how Taco Bell incorporated Amazon Forecast to improve digital availability

Shorten time to market with Amazon Forecast

Resources and getting started

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Introduction to Amazon Forecast

Brandon Nair

Senior Product Manager, Amazon Forecast
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The AWS ML stack

AI SERVICES

HEALTH AI

- NEW Amazon HealthLake
- Amazon Transcribe Medical
- Amazon Comprehend Medical

INDUSTRIAL AI

- NEW AWS Panorama + AWS Panorama Appliance
- NEW Amazon Monitron
- NEW Amazon Lookout for Equipment
- NEW Amazon Lookout for Vision

ANOMALY DETECTION

- NEW Amazon Lookout for Metrics

CODE AND DEVOPS

- NEW Amazon DevOps Guru
- Amazon CodeGuru

VISION

- Amazon Rekognition

SPEECH

- Amazon Polly
- Amazon Transcribe +Medical

TEXT

- Amazon Comprehend +Medical
- Amazon Translate
- Amazon Textract

SEARCH

- Amazon Kendra

CHATBOTS

- Amazon Lex

PERSONALIZATION

- Amazon Personalize

FORECASTING

- Amazon Forecast

FRAUD

- Amazon Fraud Detector

CONTACT CENTERS

- Contact Lens
- Voice ID For Amazon Connect

ML SERVICES

Amazon SageMaker

Label data

AMAZON SAGEMAKER STUDIO IDE

- NEW Aggregate & prepare data
- NEW Store & share features
- Auto ML
- Spark/R
- NEW Detect bias
- Visualize in notebooks
- Pick algorithm
- Train models
- Tune parameters
- NEW Debug & profile
- Deploy in production
- Manage & monitor
- NEW CI/CD

Human review

FRAMEWORKS & INFRASTRUCTURE

TensorFlow, mxnet, PyTorch, GLUON, Keras, scikit learn, Horovod, DeepGraphLibrary

- AWS Deep Learning AMIs (DLAMI) & AWS Deep Learning Containers
- GPUs & CPUs
- Amazon Elastic Inference
- Trainium
- Inferentia
- FPGA

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Amazon Forecast is a fully managed ML service

CREATE ACCURATE ML-BASED FORECASTS WITHOUT ANY ML EXPERTISE

Historical data
Sales, inventory, call volume, resource demand

Related data
Price, promotions, in-stock, weather data, custom events

Item metadata
Color, city, category, brand, author, size



Built-in AWS curated datasets (holidays, weather)

Predictions
Easy-to-consume predictions in open CSV or Parquet format for each item at every time step

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Three pillars of Amazon Forecast service



Automate model build with no or low code

Ease of deployment and operations

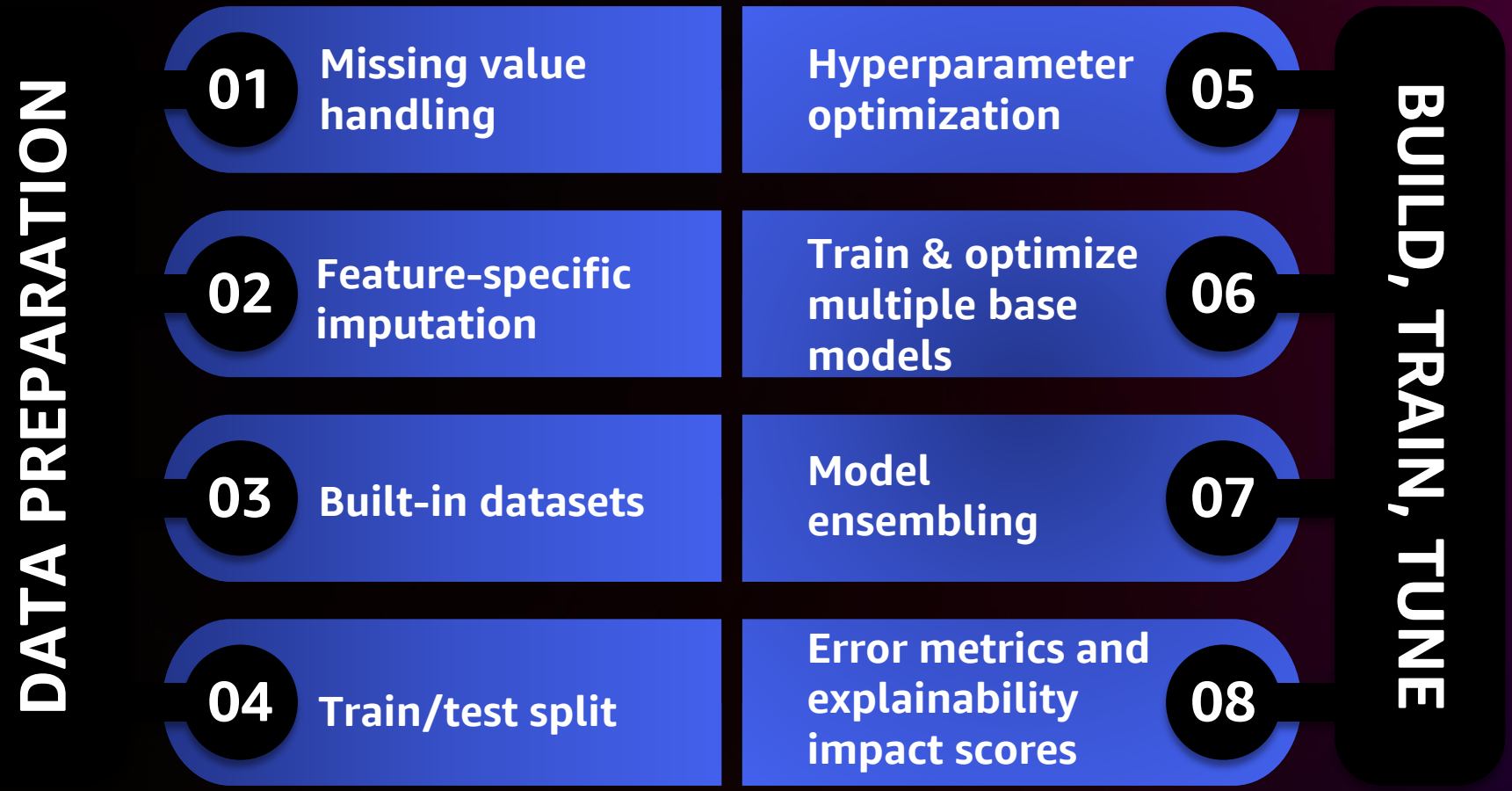
Tools to extract business insights

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Accurate ML-based forecasts with low/no code

AMAZON FORECAST USES AUTOML TO ABSTRACT AWAY THE ML-BUILD PROCESS



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Deploy and operationalize your forecasts

HOST MODELS, COMPUTE INFERENCES, MONITOR, AND RETRAIN

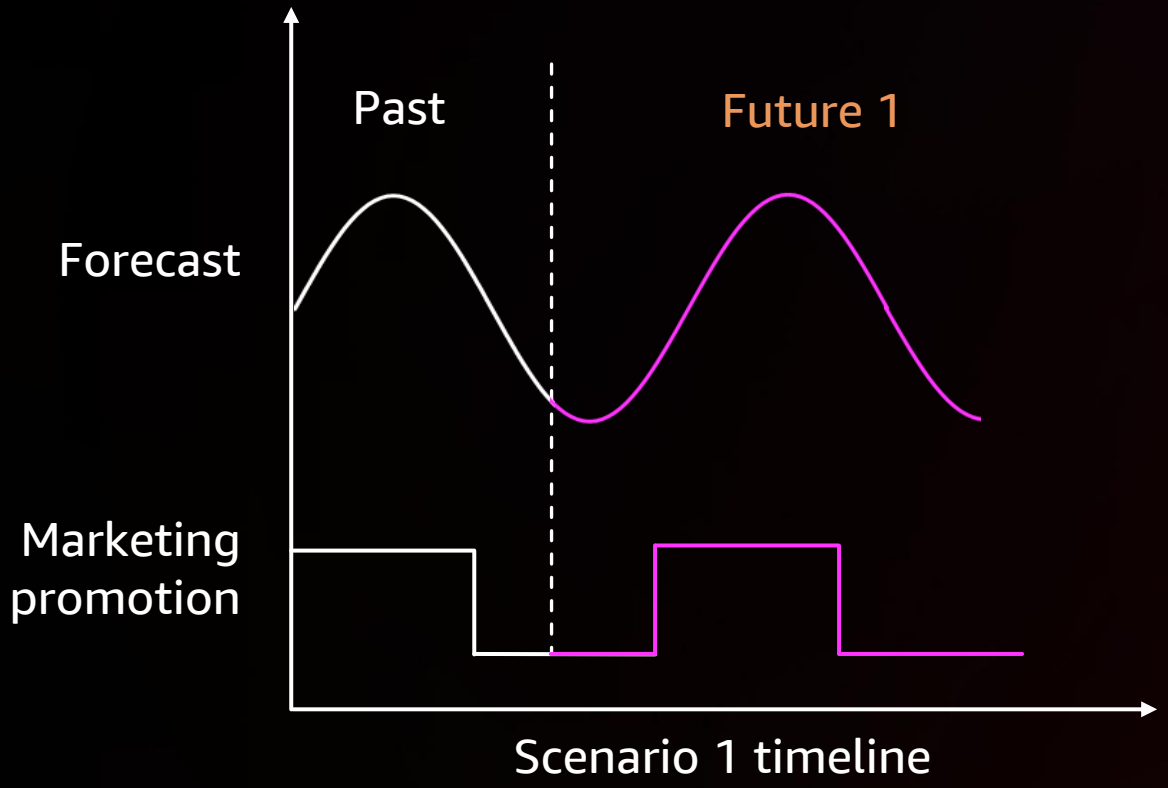


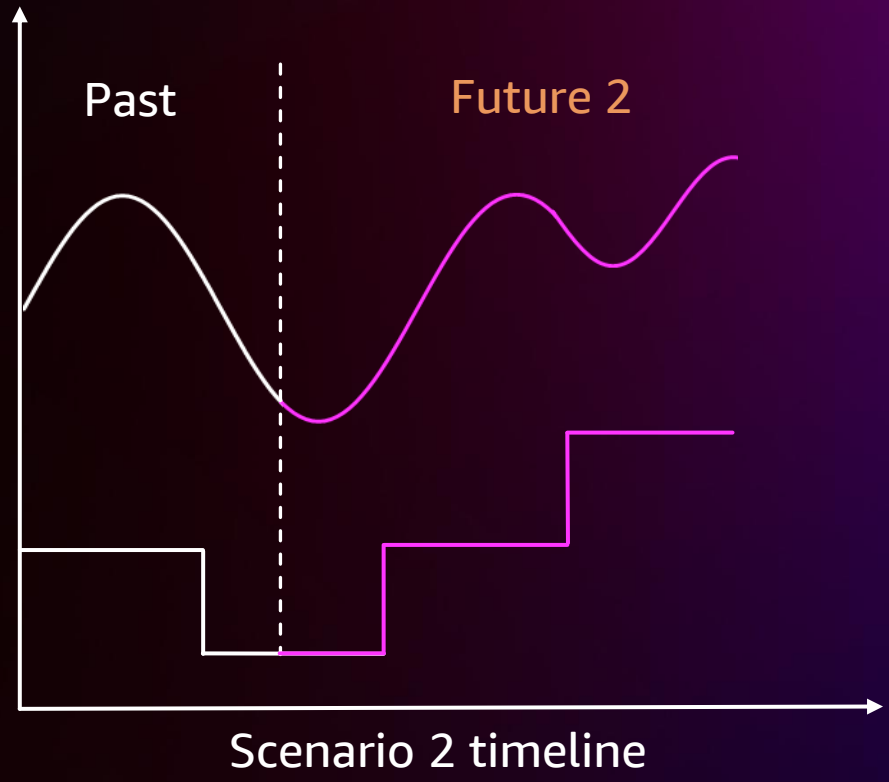
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Extract business insights using what-if analysis

ANALYZE IMPACT OF BUSINESS LEVERS THROUGH SCENARIO PLANNING



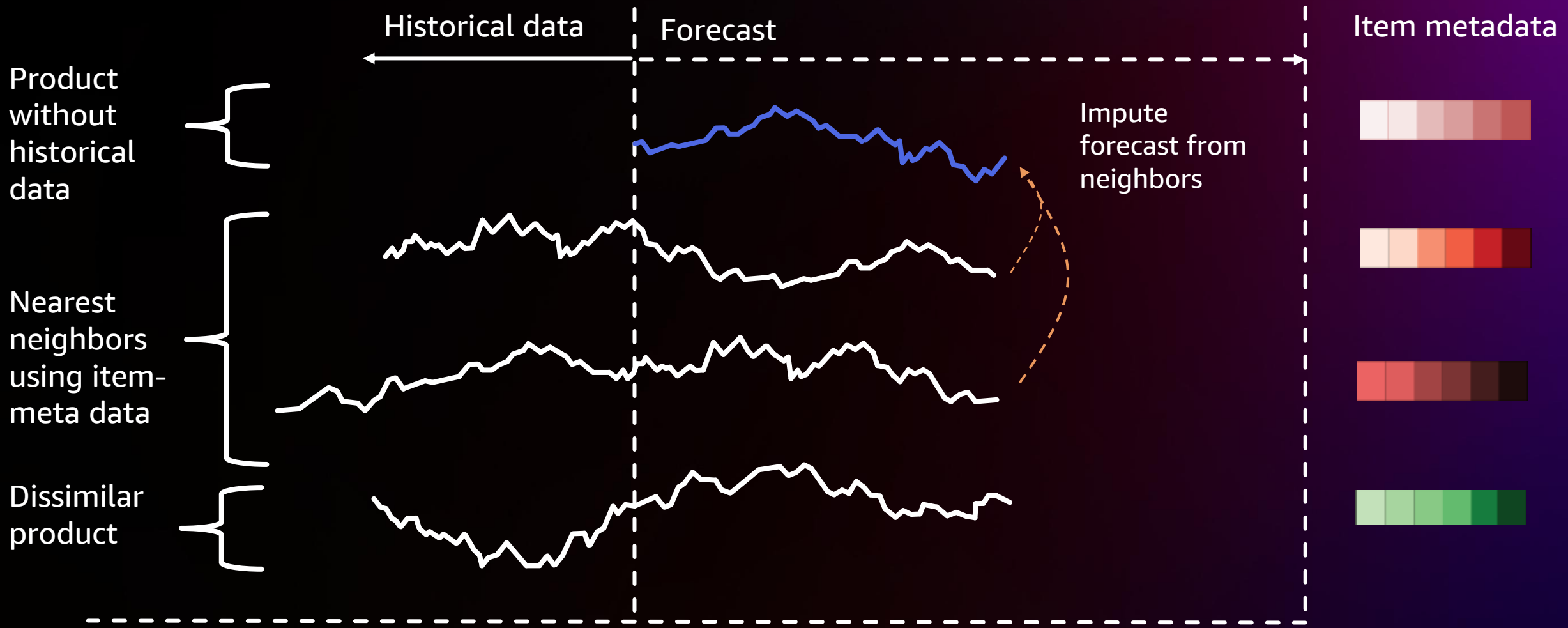


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New launch: forecast for cold-start products

USE ITEM-META DATA TO CREATE FORECASTS UP TO 45% MORE ACCURATE



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Amazon Forecast customers



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Taco Bell
Improving digital availability with ML forecasting

Niraj Revankar

Director, Data and Analytics
Taco Bell

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About Taco Bell

7000+
U.S. locations

800+
International locations

$114M+
Taco Bell Foundation scholarship and grants

42M+
Customers per week

1 billion+
Orders per year





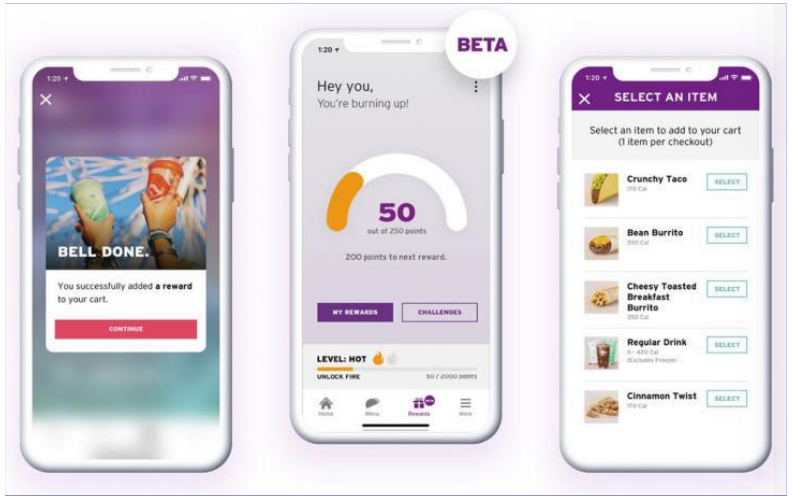
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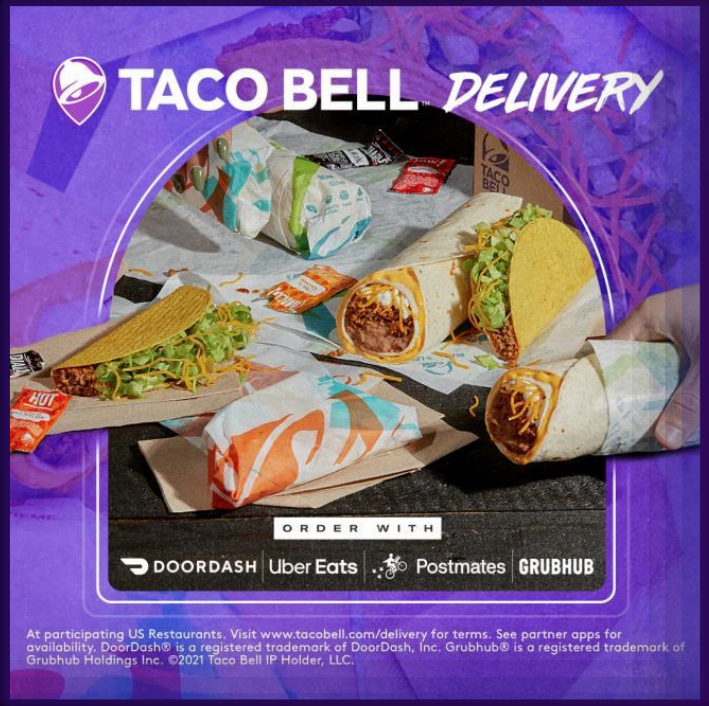
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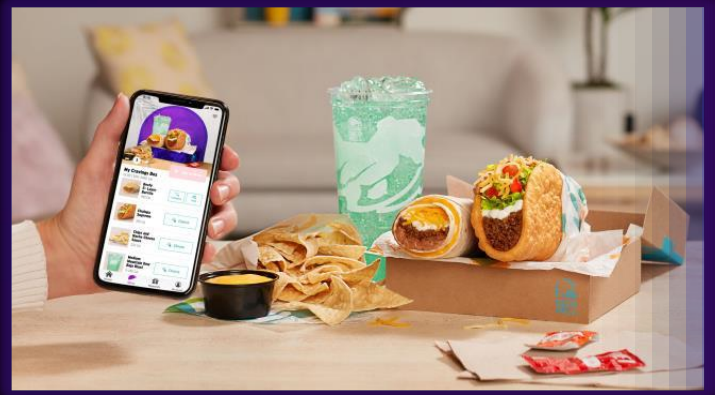
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Tech @ Taco Bell











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Data architecture

Automated/cognitive pipelines

Real-time/batch patterns

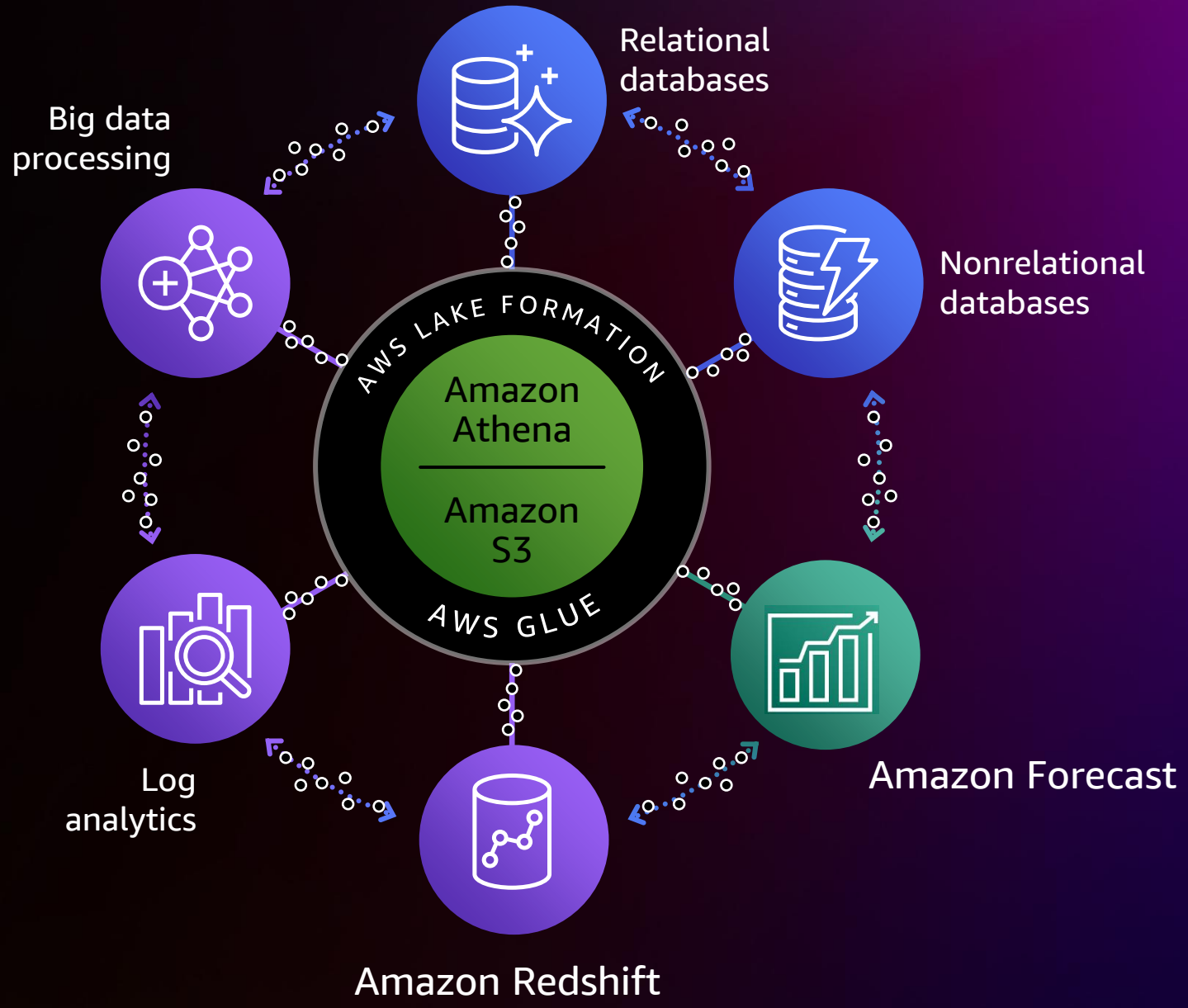
SQL access to raw data

Structured, semi, and unstructured

AI/ML ready

Data sources

- Restaurant tech
- MarTech
- Call center



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Digital channels



E-commerce
mobile & web apps



1P delivery



Kiosk

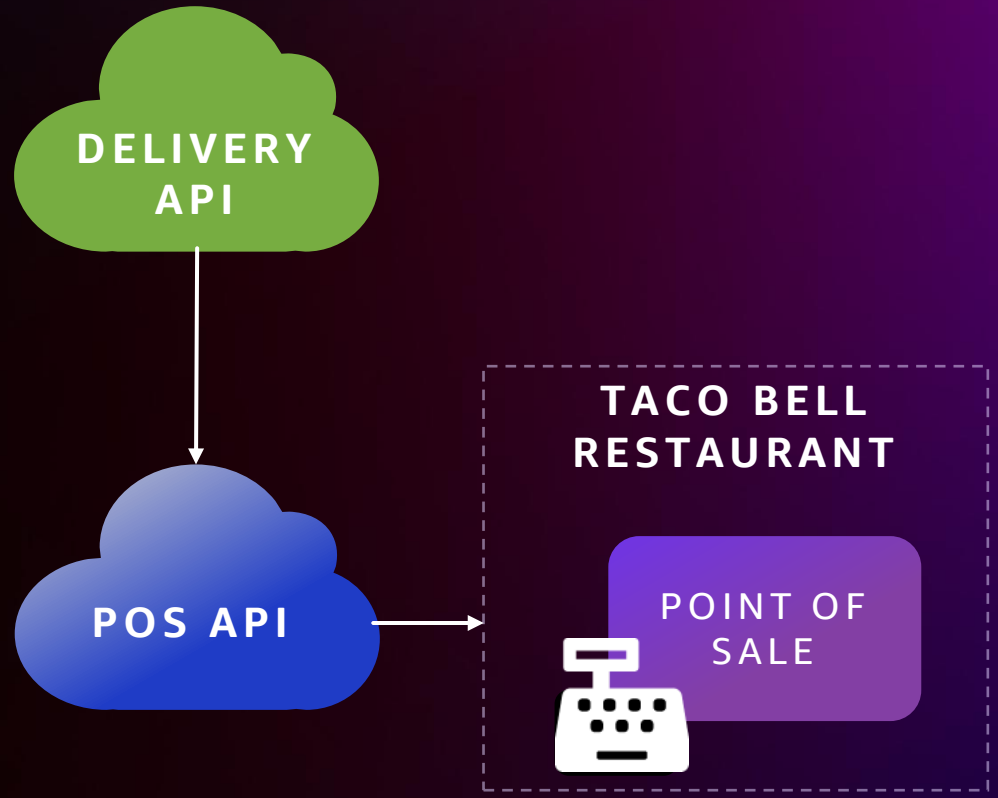


3P delivery

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Ensuring digital channels are online

- Delivery integration is complex
- Multiple reasons for store to be disabled
- Hard to determine if the store is offline
- Requires human identification and intervention to bring the store online



Opportunity to use data and analytics to reduce restaurant downtime

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Improving digital availability objectives

Improve stakeholder visibility

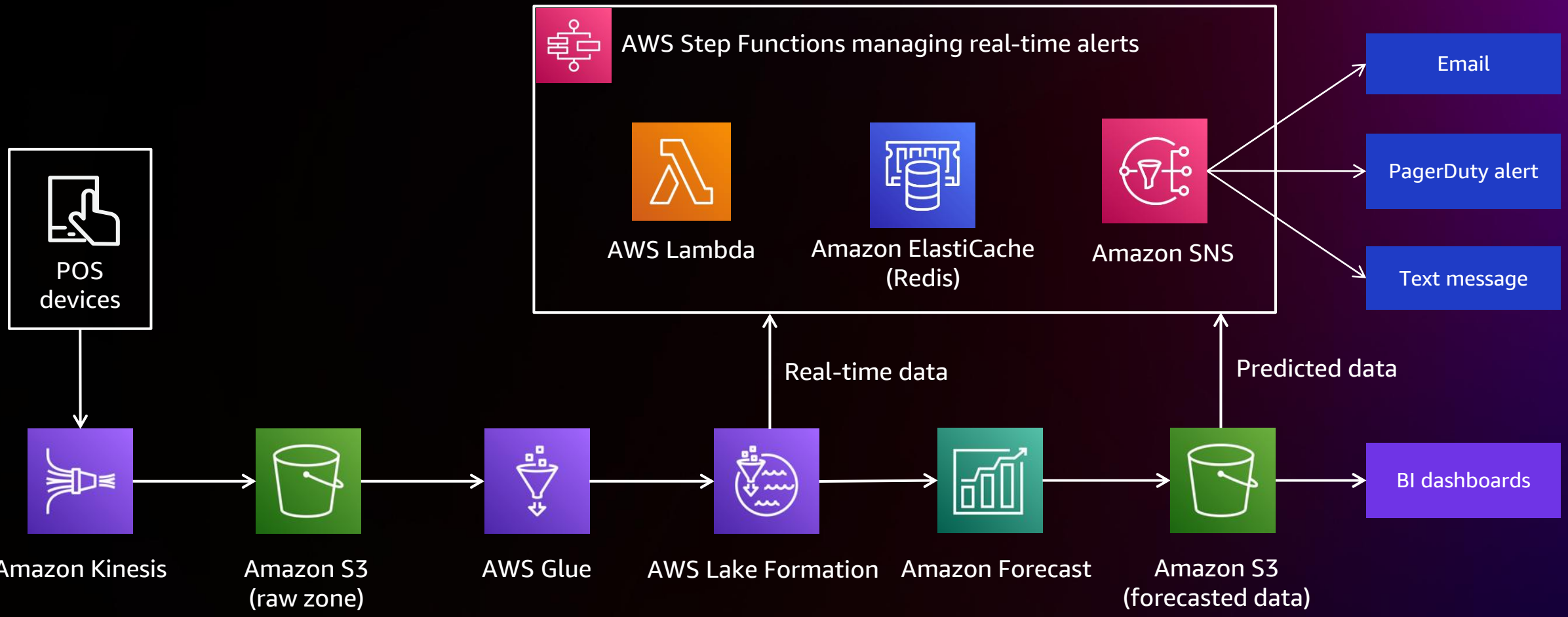
Leveraging data science

Monitor real time POS

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Taking action from insights



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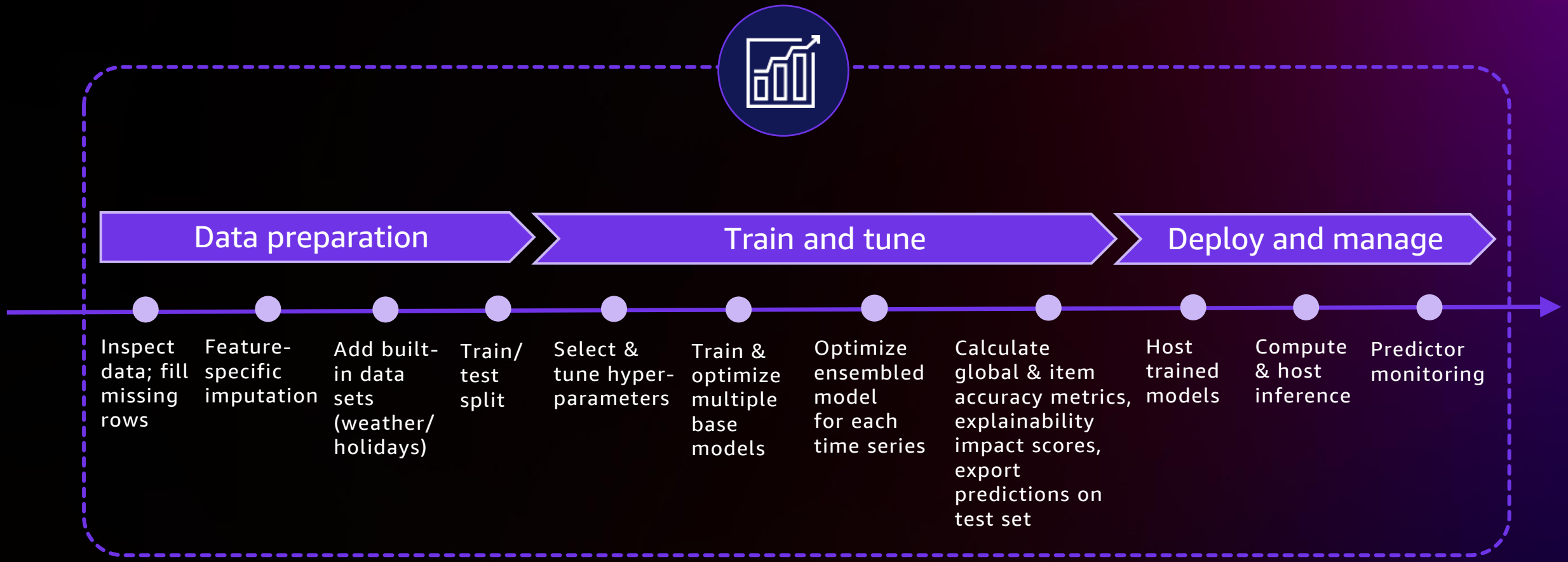
Shortening time to market

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Amazon Forecast addresses the entire ML lifecycle

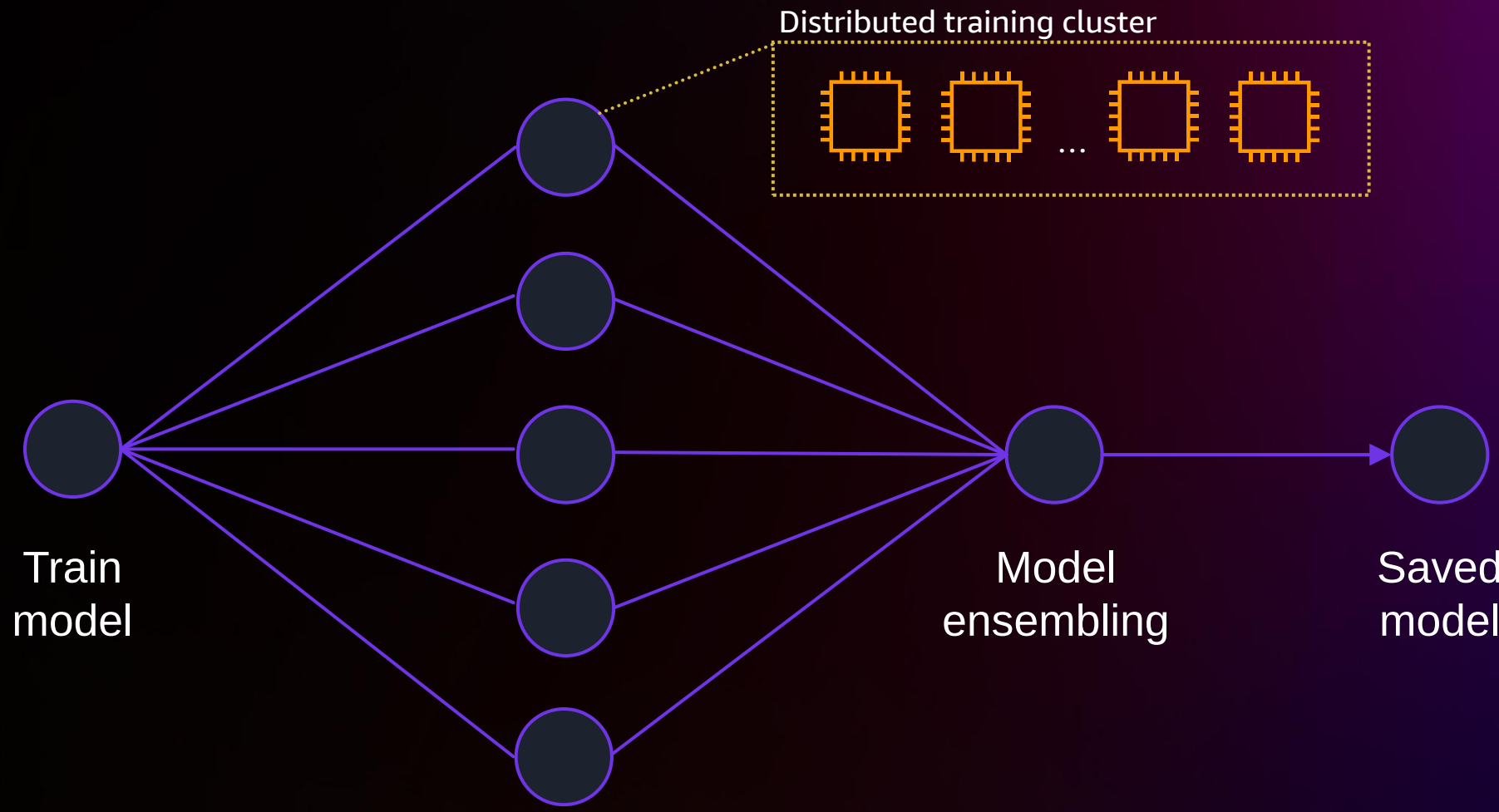
PURPOSE-BUILT FOR TIME-SERIES FORECASTING SO YOU CAN BE MORE PRODUCTIVE



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Amazon Forecast AutoPredictor training

AUTOMATIC MODEL TRAINING, HYPERPARAMETER OPTIMIZATION, AND ENSEMBLING FOR EACH TIME SERIES



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Deploy Amazon Forecast workloads in minutes

AWS CLOUDFORMATION ENSURES RELIABLE AND AUTOMATIC CLOUD RESOURCE PROVISIONING



Solution guidance stacks 1-n

- Create S3 bucket
- Create AWS Identity and Access Management (IAM) roles and permissions
- AWS Systems Manager parameters
- Amazon SNS topic and subscription
- AWS Step Functions state machines

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Managing Amazon Forecast workflows

AWS STEP FUNCTIONS PROVIDES WORKFLOW MANAGEMENT FOR APPLICATIONS

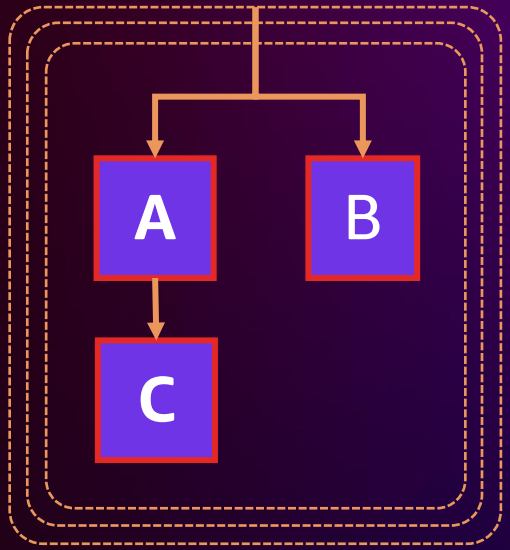
"I want to import data and train a model"



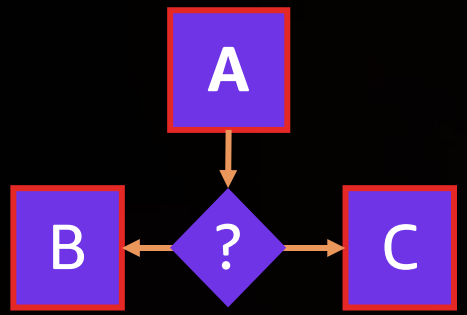
"I want to wait for model training to complete"



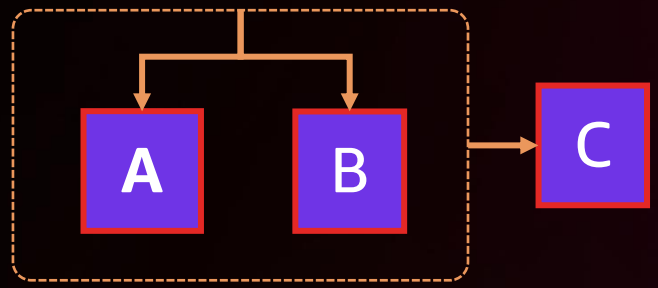
"I want concurrent workflow execution"



"I want to predict from the most accurate model"



"I want to import data in parallel"

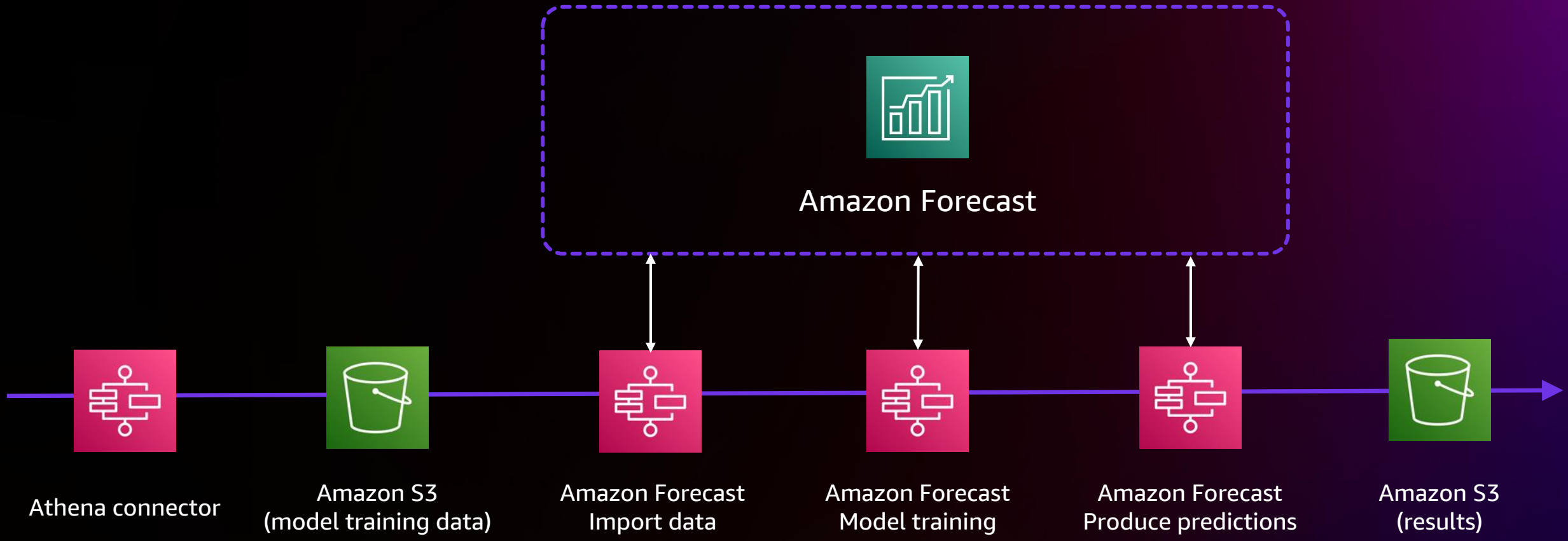


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Automate the entire workflow

AWS STEP FUNCTIONS SEQUENCES AMAZON FORECAST API CALLS



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Key takeaways

- Amazon Forecast is a purpose-built time series forecasting service
- Taco Bell was able to implement two production workflows in less than 3 weeks, which has helped increase sales
- Amazon Forecast makes it easy to experiment, deploy, and automate

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Interested in shortening your innovation cycle?



Follow the same no-code MLOps process as Taco Bell and others

Visit our Amazon Forecast GitHub to get started today

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Thank you!

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