

# AI in retail at Walmart's scale

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**Walmart Global Tech**

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**Walmart**  **Global Tech**

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NON-SENSITIVE INFORMATION CLASSIFICATION



# Walmart

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Weekly ~240M customers and members visit ~10,500 stores and clubs in 19 countries and eCommerce websites



Walmart is a people-led, tech-powered omnichannel retailer helping people save money and live better



With FY 2023 revenue of \$611B, Walmart employs over 2.1M associates worldwide

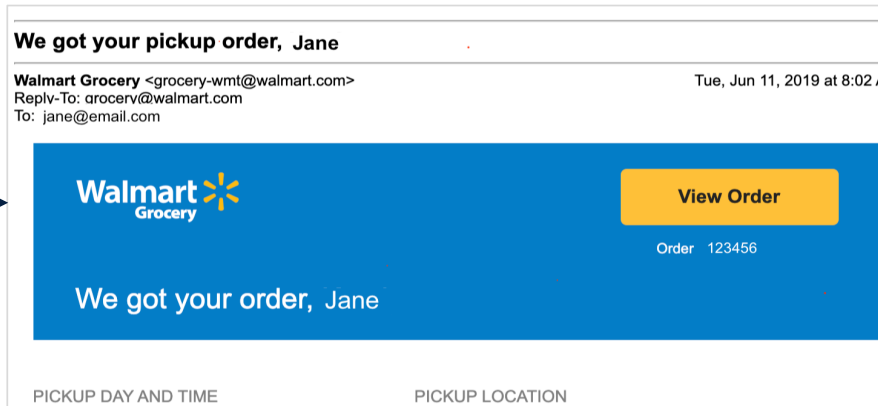
90% of Americans live within 10 miles of a Walmart or a Sam's Club



# AI in eCommerce

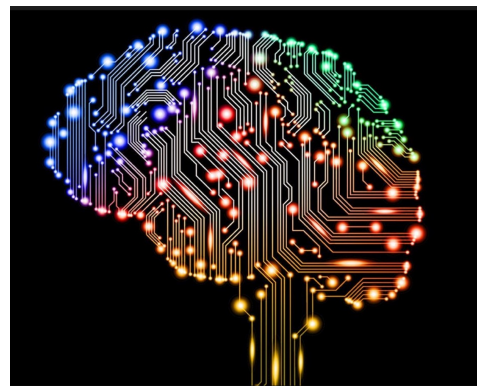
Powering Next-Gen Customer Experience

# Personalizing Online Grocery Substitution Experience



Out-of-stock – rare sight @ Walmart but it happens!

Next best item?



AI Powered Smart Subs

Personalized signals, constraints, deep learning







Finding the right substitution is complex, time consuming and if not done right - can cost the business!







# Personalizing Customer Interactions

## Similar items you might like

Based on what customers bought

			
<a href="#">+ Add</a>	<a href="#">+ Add</a>	<a href="#">+ Add</a>	<a href="#">+ Add</a>
<b>\$1.12</b> <small>\$1.40/oz</small> Great Value Kasher Basil Leaves, 0.8 oz ★★★★☆ 76	<b>\$2.12</b> <small>\$3.42/oz</small> McCormick Basil Leaves, 0.62 oz Mixed Spices & Seasonings ★★★★★ 51	<b>\$2.18</b> <small>\$3.46/oz</small> Tone's Sweet Leaf Basil, 0.63 OZ ★★★★★ 34	<b>\$3.83</b> <small>69.6 ¢/oz</small> Badia Oregano Whole Spice, 5.5 oz Bottle ★★★★★ 7

## Reorder your essentials

			
<a href="#">+ Add</a>	<a href="#">+ Add</a>	<a href="#">+ Add</a>	<a href="#">+ Add</a>
<small>Sponsored</small> <b>\$3.82</b> <small>191 ¢/oz</small> Alfaro's Artesano Golden Wheat Bakery Bread, No Artificial Color...	<b>\$2.02</b> each <small>72.0 ¢/lb</small> Marketside Fresh Organic Bananas, Bunch	<b>Now \$3.48</b> <small>\$3.98 290 ¢/oz</small> Freshness Guaranteed Mini Chocolate Chip Muffins, 12 oz, 12...	<b>\$2.98</b> <small>221 ¢/fl oz</small> Yakult Light Nonfat Probiotic Drink, 2.7 fl. oz., 5 Bottles



# Elevating Search Experience

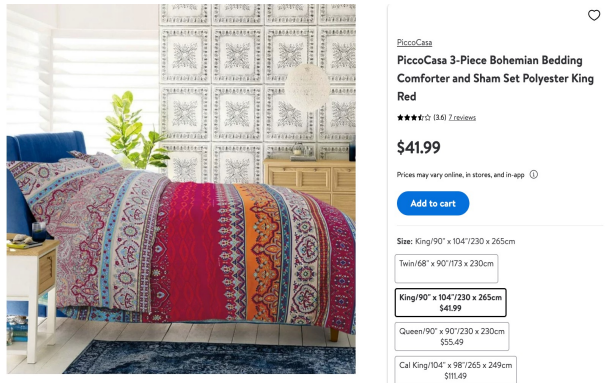
AI helps in product discovery and provides a delightful experience.

## How does it work?

- Understanding the intent of a query (e.g., 'red formal shirt for men')
- Retrieving the right set of items
- Ordering the items in a manner so that the most relevant items come at the top of the search results

The screenshot shows the Walmart.com search results page for the query "red formal shirt for men". The page features a navigation bar with the Walmart logo, "Departments", and "Services" links. The search bar contains the query "red formal shirt for men". Below the search bar, there are filters for "Brand", "In-store", "Price", "Speed", and "Subscription". The main content area displays "Results for 'red formal shirt for men' (1000+)" with a price range of "\$12.99 - \$13.58". Two product listings are visible: a CenturyX Men's Long Sleeve Button Up Shirt for \$12.99 and a YIWEI Men Casual Fashion Slim Fit Long Sleeve Casual Business Formal Dress Tops Shirt for \$13.58. Both items have a "Free shipping, arrives in 3+ days" label.

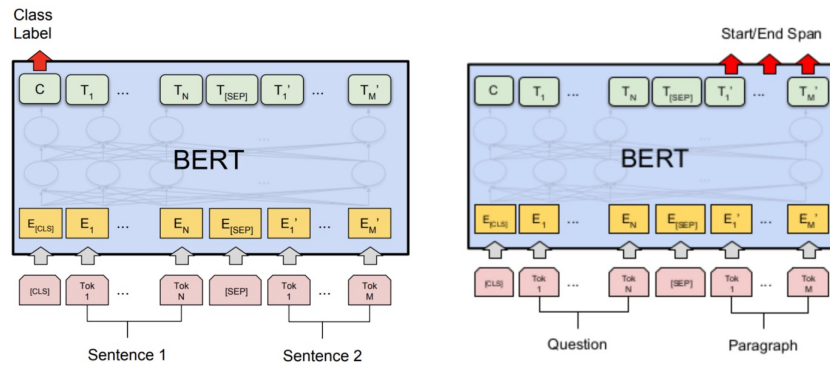
# Enriching Product Catalog



Available a variety of colors and styles of floral patterns, make your bedroom a lively room. Made with 100% superior quality polyester, fill with breathable and skin-friendly polyester. Reactive printing of red bohemian pattern has better moisture absorption than ordinary printing, high color fastness, not easy to shrink and fade, no nitrogen is added in the printing, and no harmful substances are contained. Quilting process makes the filler even and not easy to agglomerate, can fix the quilt core. Highest washing temperature 30°C, hang dry, don't bleach, don't dry cleaning, tumble dry on low with similar colors and low-temperature iron when needed. Available four sizes (Twin/Queen/King/Cal king), package includes one comforter and two pillowcases in one gift box.

- 100% high quality polyester
- Includes 1 comforter and 2 pillowcases
- Machine Washable for easy care, tumble dry
- Available sizes: Twin/Queen/King/Cal king
- Reactive printing of red bohemian pattern has high color fastness, not easy to shrink and fade

## Attribute Extraction Pipeline



Attribute	Value
Brand	PiccoCasa
Bed Size	King
Pattern	Floral Bohemian
...	...

- Source of truth powering product info/search - requiring extreme precision (>95%)

- Hundreds of ML/DL models along with Gen AI with thousands of attributes power catalog scale inferencing

- More than 20M items enriched monthly
- Over 20K CPU cores for live inferencing
- ~40 GPU cores for training and batch inferencing

# AI in Retail Ecosystem & Processes

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Driving Efficiency and Productivity across the Value Chain



# AI in Grocery Distribution Centers

Typical quality inspection flow



Samples for inspection



Inspection by QC Associates



Log inspection details



Cross check with manuals



Accept / Reject

## Why is quality inspection complicated?

- Different size and guidelines for defect identification\*



Decay



Shriveled Ends



Scars Damage



Sunken Areas

- Challenges: Subjectivity | Accuracy | Time consuming



- Custom designed imaging device for image capture
- Backbone is a computer vision model pipeline
- Models for object detection, defect classification

# Robotic Scrubbers at Sam's Club

## How does it work?

- Cloud-connected Inventory Scan by robotic scrubbers captures data as it moves autonomously around the club
- Deep learning-based vision models help in
  - Verification of pricing accuracy
  - Product stock levels
  - Product localization
- Inventory Scan assures items are available and easy to locate in the club, freeing up time for our associates to focus on members and deliver the shopping experience they deserve



# Cross Market Analytics for Walmart International



Unified view for the items to analyze the performance of items and suppliers

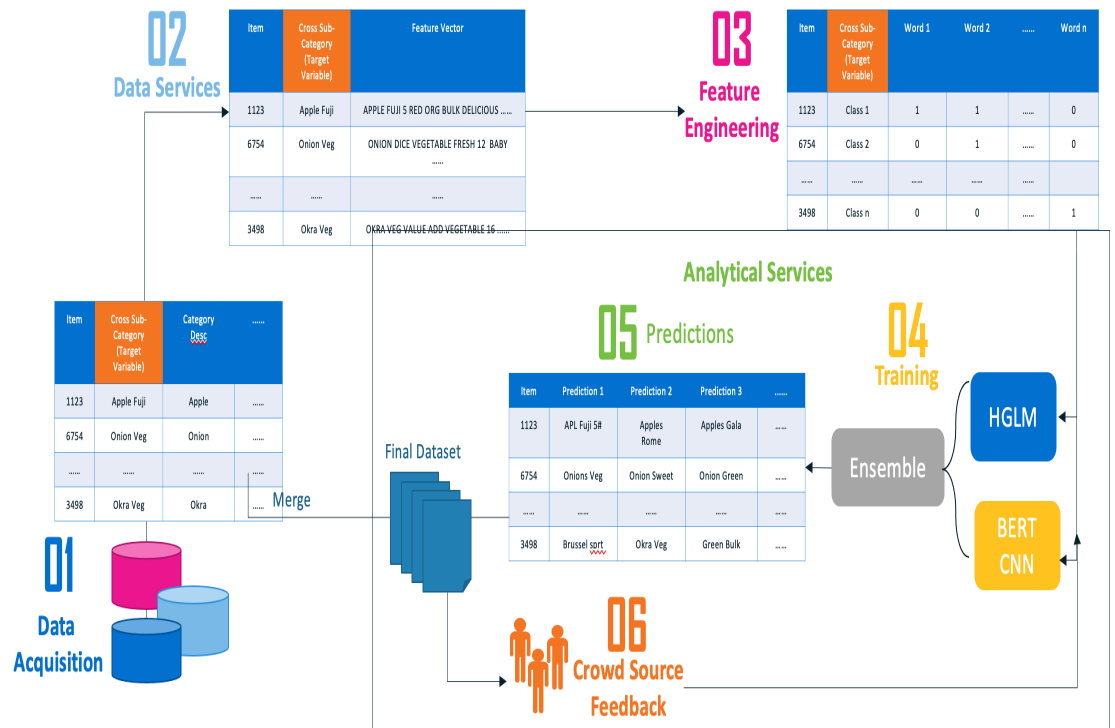


Multi-Market Item Categorization model uses US item categorization as base to train deep learning models to categorize International items.

Joint buy opportunities

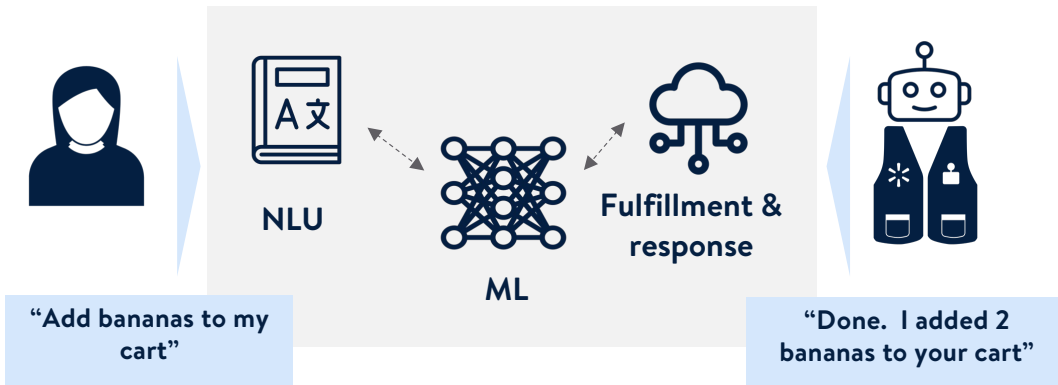
Reduced item cost with right seller

## Multi-Market Item Categorization Solution Overview



# Conversational AI

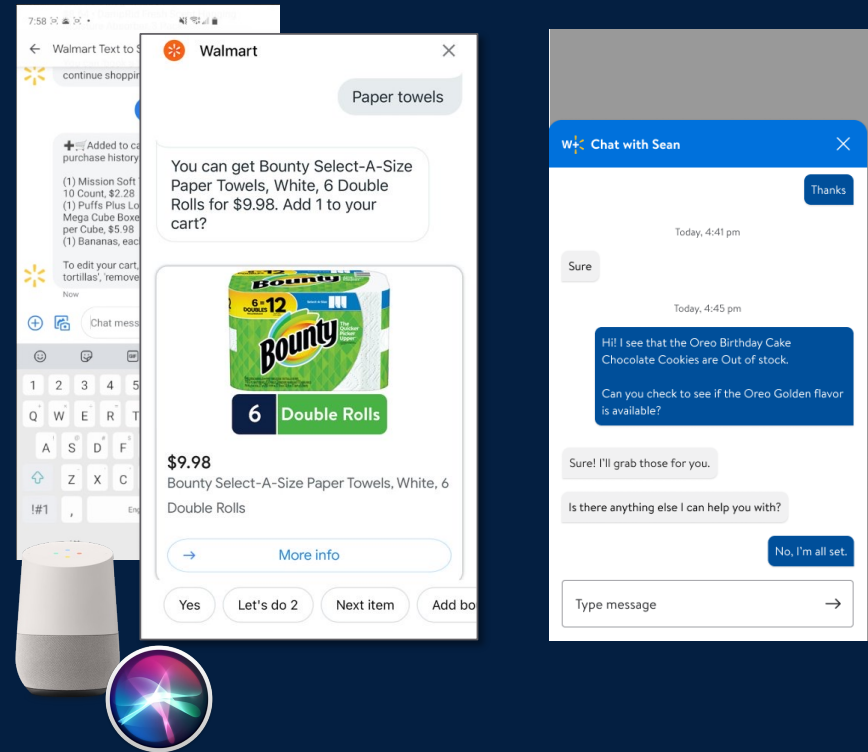
Conversational AI is the technology that enables humans to interact with machines through *natural* language



Natural Language Understanding - Deep Learning - Full Stack / Mobile Conversational UX

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Digital assistants enable customers to express their needs quickly at the point of need...

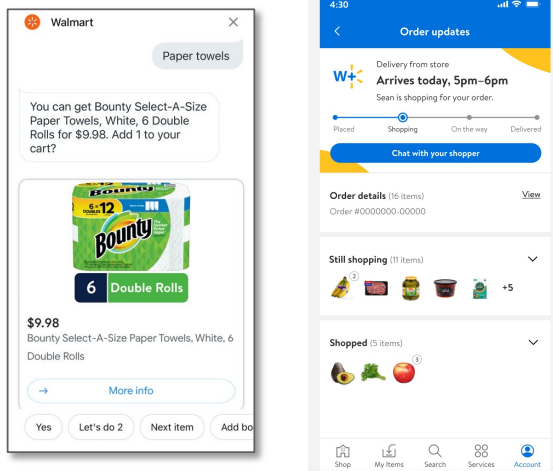


Walmart Conversational AI

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# Conversational AI Focus Areas

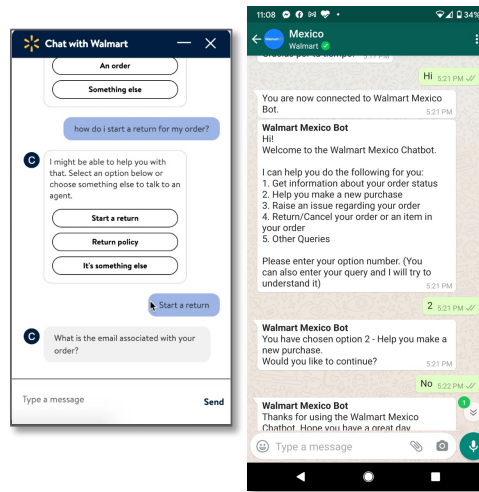
## Point of need shopping



**Messaging, Voice & In-store Assistants**  
“add paper towels to my cart”

Conversational Assistant – Google Assistant, Siri shortcuts and Text to Shop

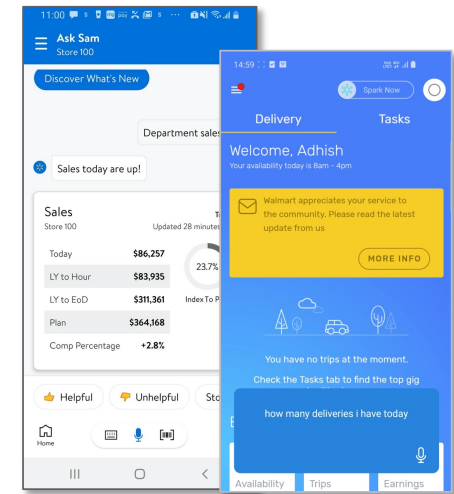
## Care automation



**Care “Bots”**  
“Where is my order?”, “Is milk available?”

US Customer Care, International Customer Care, Marketplace

## Handsfree Associate



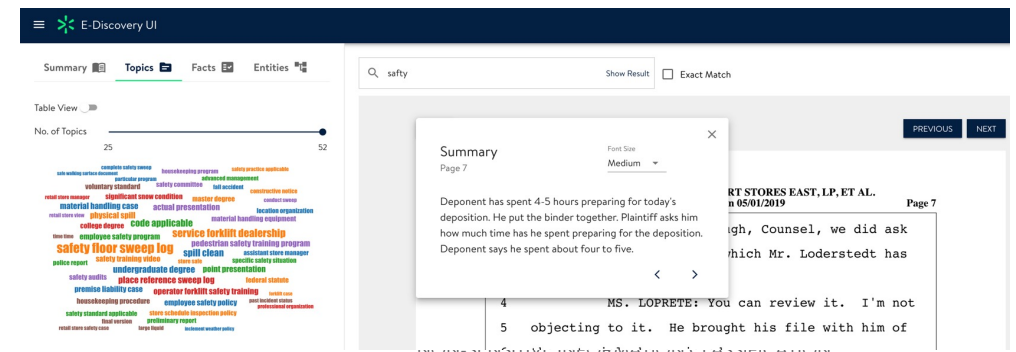
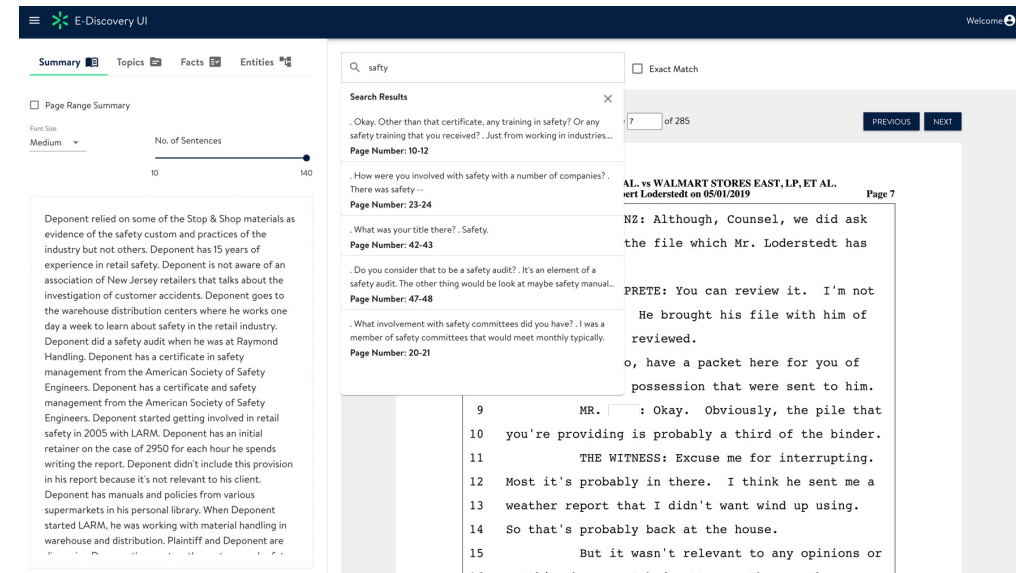
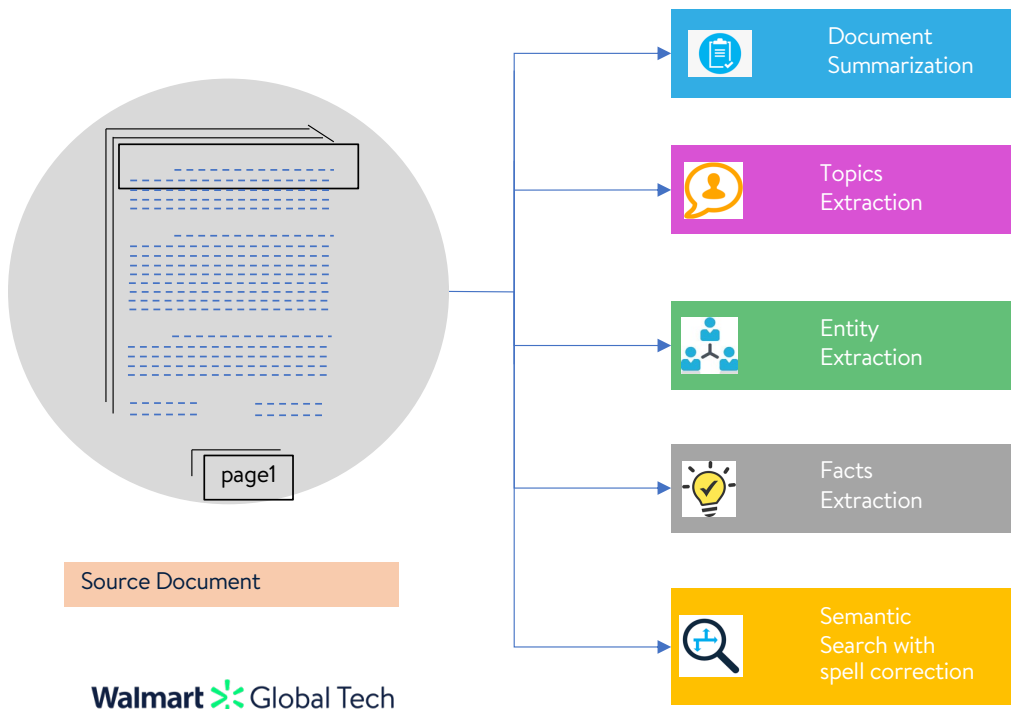
**Ask Sam & Last Mile Delivery**  
“What’s my schedule?”, “Where are the bananas?”, “Where is my next delivery?”

Ask Sam, Last Mile Delivery



# Document Intelligence in Enterprise Business Processes

- Summarize content of 200+ page documents
- Identify relevant topics, facts and entities
- Enables prep work, improving productivity and bringing consistency across processes



# Walmart ML Platform: Element

Developing transformational ML platform capabilities that simplify the adoption of AI/ML at scale



Platform capabilities for all Data Science lifecycle stages



**Ready to use DS environment**

- Zero set-up
- Rapid Iterative Development
- Data Connectors(20+)
- Deployment Types (Batch, Real-time)
- Libraries (700+)



**On-Demand Infrastructure**

- CPU, GPU, TPU
- Multi-cloud
- Resource Optimization
- Cost Attribution
- Auto Scaling



**Standardization & Re-use**

- Reproducible Environments
- Code re-use
- Model as a service
- Model Management
- MLOps



**Model Management**

- Model Governance
- Model Catalog
- Model Monitoring



**AI Solutions & Marketplace**

- Vision (OCR, SuperResolution)
- Language (Sentiment Analysis, Topic Modeling)
- Decision & Forecasting (Anomaly Detection, Content Moderator)
- AutoML

## Lessons Learned

- Deep business understanding essential for successful AI problem formulation
- Rapid experimentation and fail-fast framework brings agility
- Being transparent on AI capabilities wins stakeholder trust
- Model monitoring and maintenance is must for sustaining impact

# Q & A

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Thank You!

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