



Unleashing the Power of Large Language Models at DoorDash for a Seamless Shopping Adventure

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New Business Verticals

DoorDash Inc.

What is DoorDash?

DoorDash is a technology company that connects consumers with their favorite local businesses in more than 30 countries across the globe. DoorDash is your door to more: the local commerce platform dedicated to enabling merchants to thrive in the convenience economy, giving consumers access to more of their communities, and providing work that empowers.

Restaurants → Everything Store

DoorDash's vision has always been to deliver all the best of your neighborhood right to your doorstep, from restaurants to convenience, grocery, retail, pet supplies, and more.



We want to capture all shoppable moments

We are doing this by growing beyond Restaurants into **new verticals** including **Grocery**, **Convenience**, **Alcohol**, **Flowers**, **Retail**, as well as **Gifting**, and more!





New Verticals is a paradigm shift in ML applications in the three sided marketplace for DoorDash

*Merchants can have 100K+ SKU's in their inventory!
The Dasher shops and delivers.*



**Real-time Inventory
Prediction /
Product Knowledge Graph**

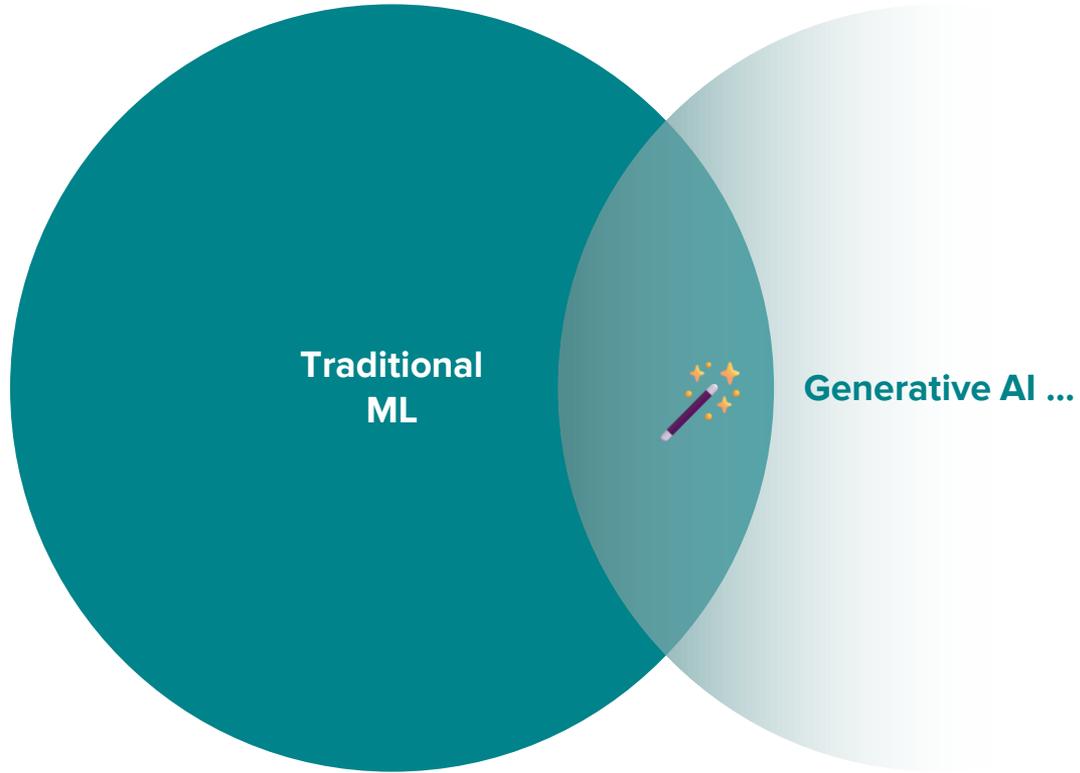
**Personalization /
Search Ranking /
Substitutions**

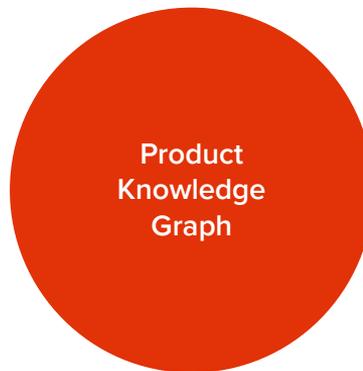
**Core Dispatch /
Batching Algorithms /
Dasher Shopping Efficiency / Fair
Pay /
Substitutions /
Fulfilment and Quality**



**Supply+Demand/
Delivery Window Estimation**





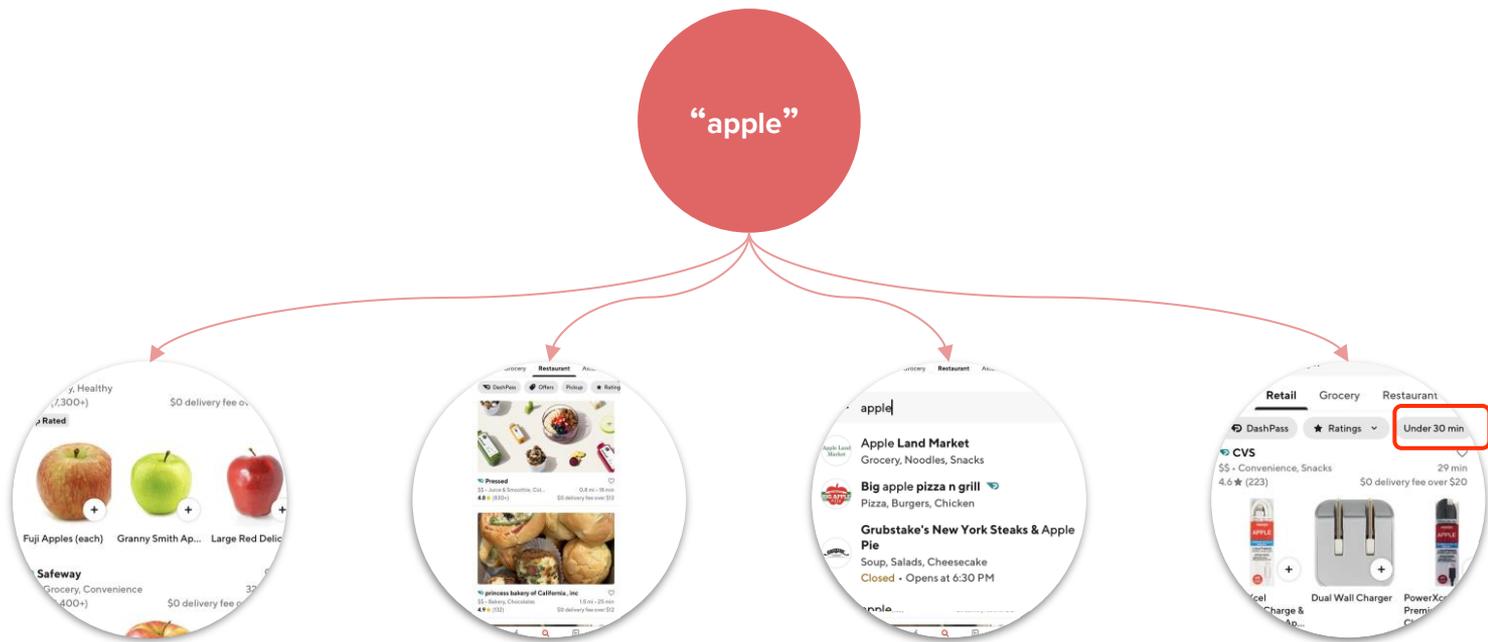




Search



Search at DoorDash is Multi-intent + Multi-entity-type + Geo-Aware



A Grocery Intent for the fruit

A Restaurant Intent for apple juice/ pies

A Store Intent for a nearby store

A Retail Intent for Apple (the brand) compatible products

Geo-aware

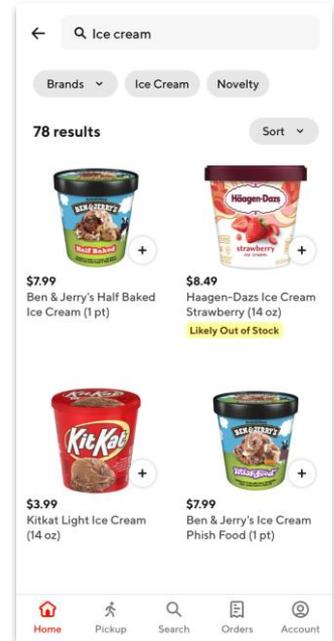
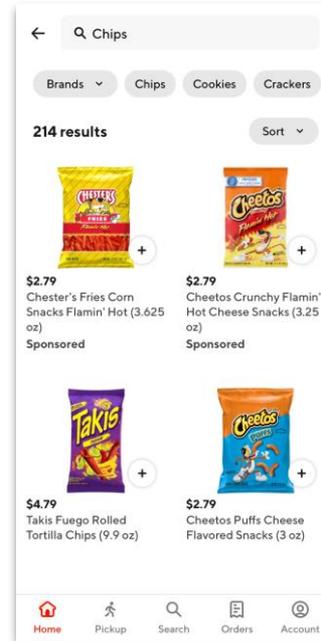
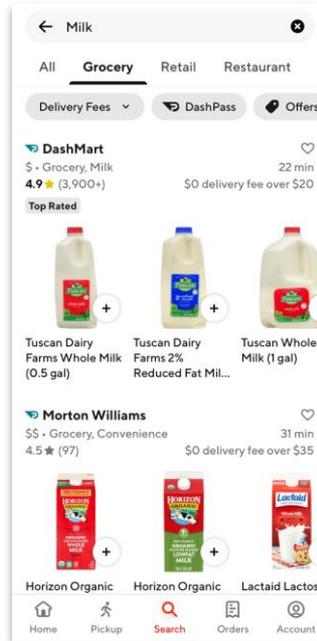
Besides being multi-intent and geo-aware, Search also needs to be **Personalized**

Why?

Consider the queries to the right.
The results may not work for *any* of you!

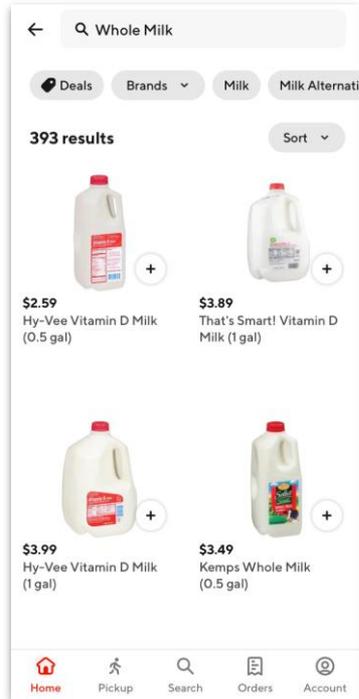
There could be hundreds of search results. They could be better ranked by the user's

- Dietary preferences
- Brand preferences
- Price sensitivity
- Flavor preferences
- Interests
- Shopping habit

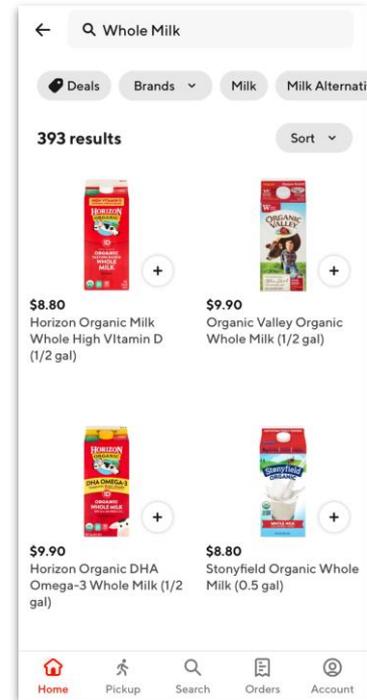


If done right, personalization within search can be delightful!

Unpersonalized Results

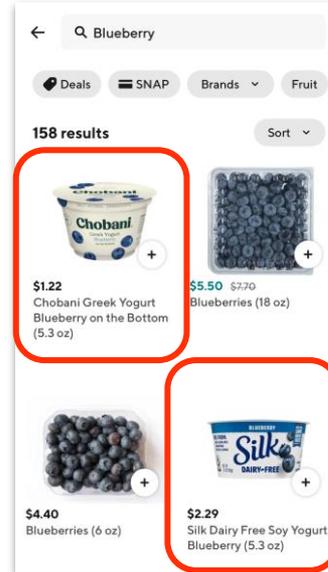


Personalized for a User with Organic Preference



But can go wrong, if **relevance** guardrails are not there!

User has
strong affinity
toward yogurt



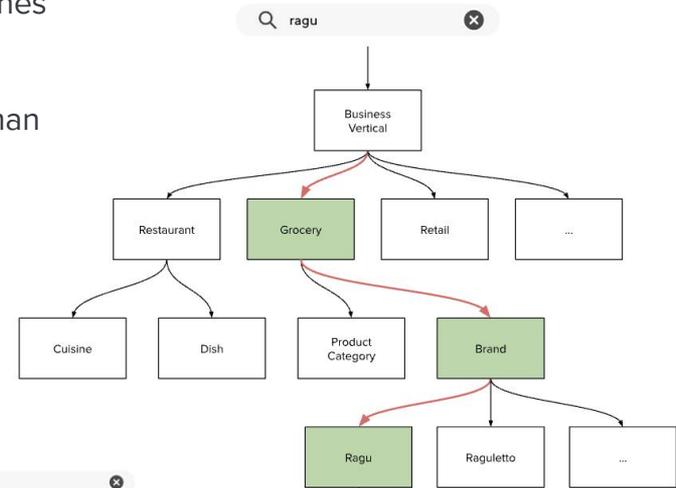
Understanding Query Intent in Search



- We want to organize the search results in a way that best matches the customer's search intent
- We train relevance model based on engagement signals + human annotations, but
 - Engagement data is often noisy
 - Engagement data is sparse for tail queries
 - Human annotations are expensive & time consuming

We are successfully leveraging LLMs to

- **Improve training data quality at scale**
- **Assign labels to tail queries**



Ragu Traditional Old World Style Pasta...

Many in stock



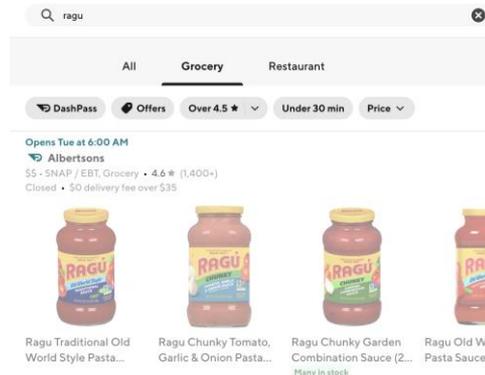
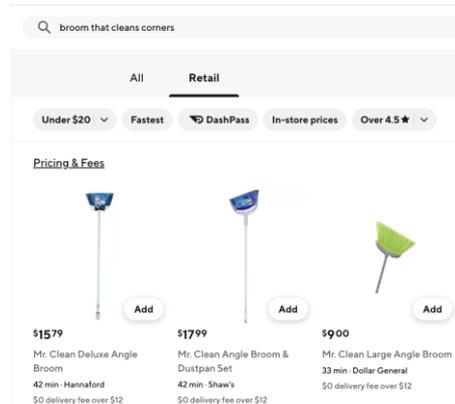
Ragu Old World Style Pasta Sauce with Mea...

Many in stock



Ragu Chunky Garden Combination Sauce (2...

Many in stock

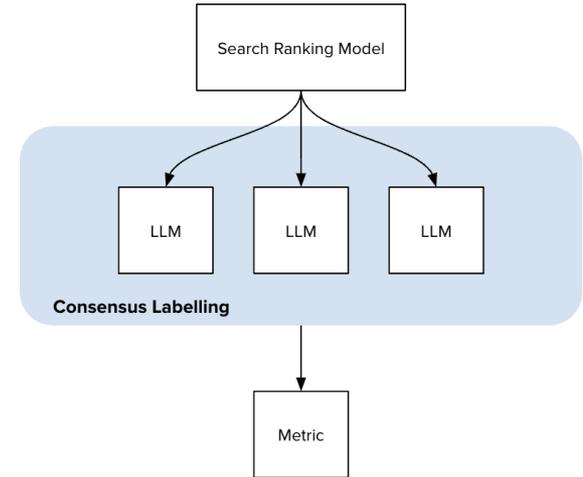
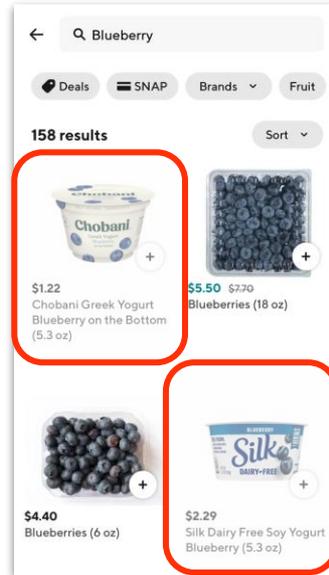


Automated Relevance Labels for Search



Relevance models depend on human annotations are costly and time consuming. Human annotations can be largely augmented by LLMs.

LLMs can help judge the relevance and filter irrelevant items out!





Product Knowledge Graph

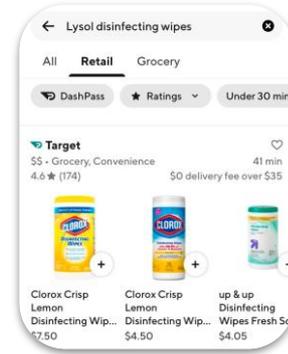


Accurate and **enriched** product info is the **foundation** of Shopping Experience/Quality

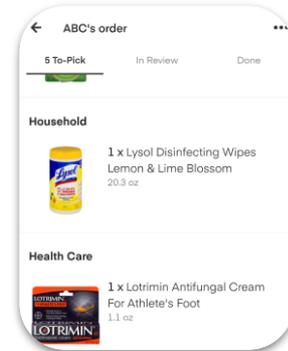


Clorox Crisp Lemon Disinfecting Wipes (75ct)

- **Brand:** Clorox
- **L3/L4 Taxonomy:** Cleaning Supplies > Disinfectants
- **Size:** 3.7
- **Size Unit:** OZ
- **Count:** 75
- **Flavor:** Lemon & Lime Blossom
- **Purchase Type:** Unit
- **Description:** Cleans and kills 99.9% of viruses and bacteria on hard, nonporous surfaces. Safe for use on hard.....



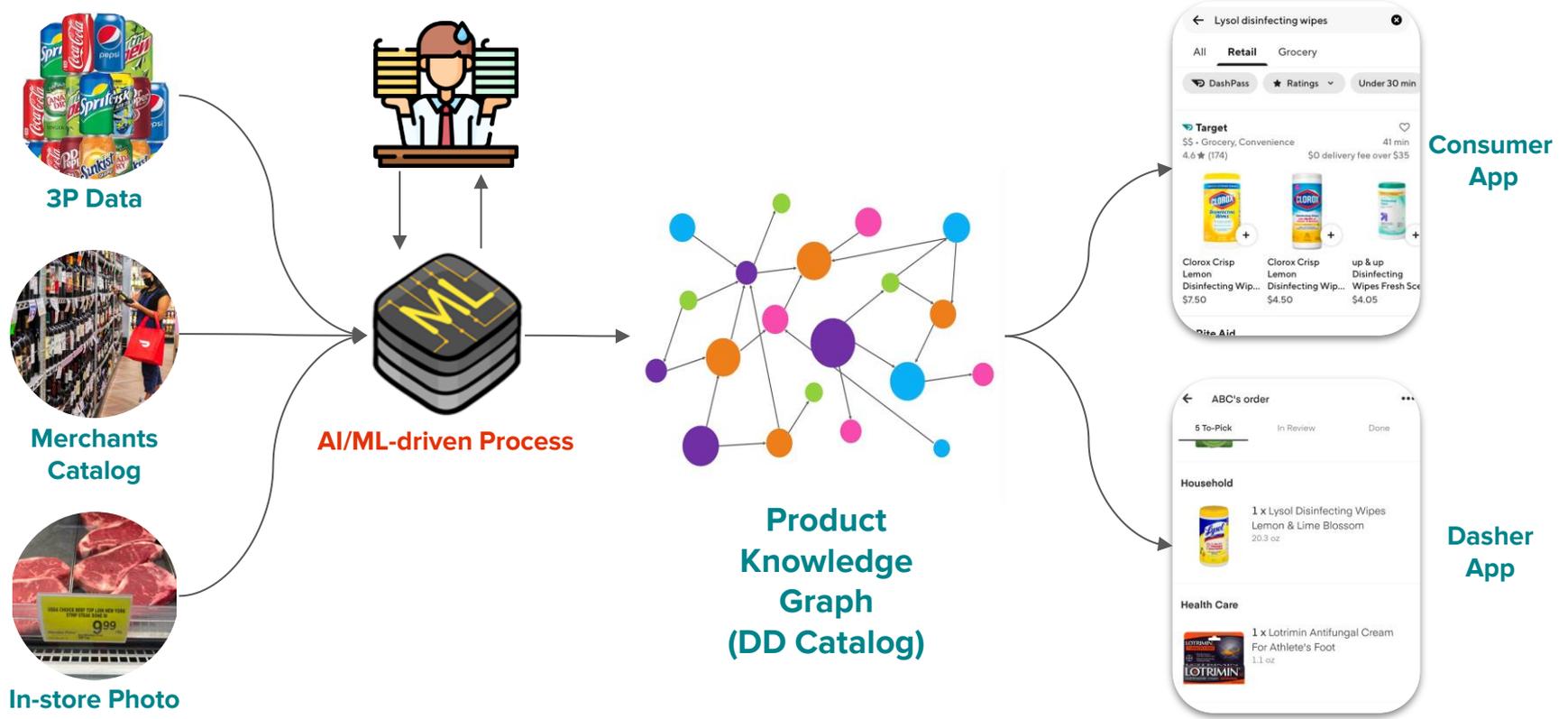
Consumer App



Dasher App



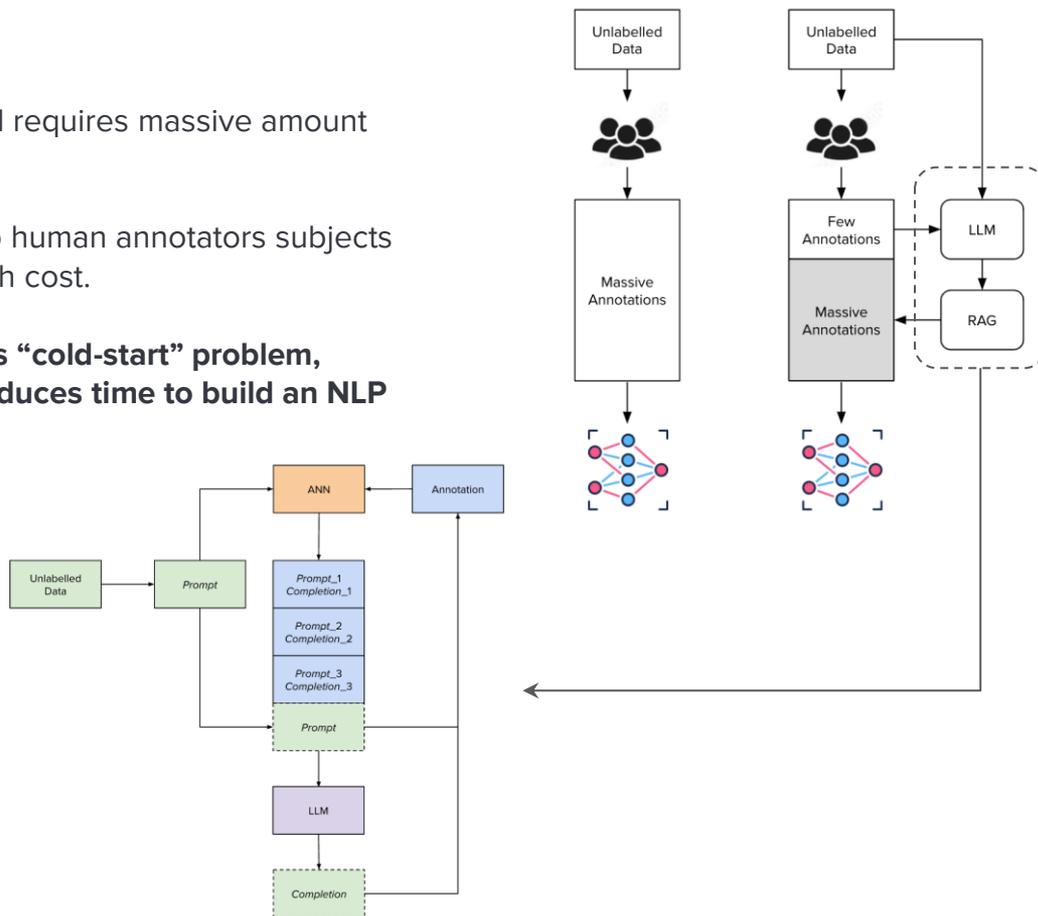
Moving to a “human-in-the-loop” AI/ML-driven approach is the key



LLM Assisted Product Knowledge Graph Building



- Training an accurate NLP model requires massive amount of high-quality annotations.
- Outsourcing annotation tasks to human annotators subjects to long turnaround time and high cost.
- **LLM-assisted annotation solves “cold-start” problem, reduces operation cost, and reduces time to build an NLP model from weeks to days.**

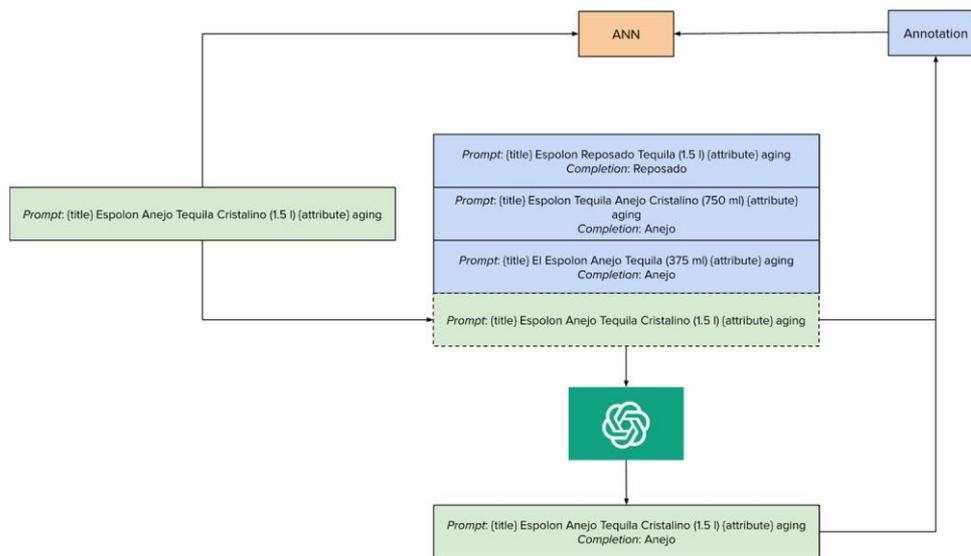


LLM Assisted Product Knowledge Graph Building



- To uniquely identify and link Alcohol products we need to extract N attributes
- We start with a few golden annotation
- We use **Retrieval Augmented Generation (RAG)** to generate **many more** silver annotations
- We then fine-tune an LLM to build a Generalized Attribute Extraction model

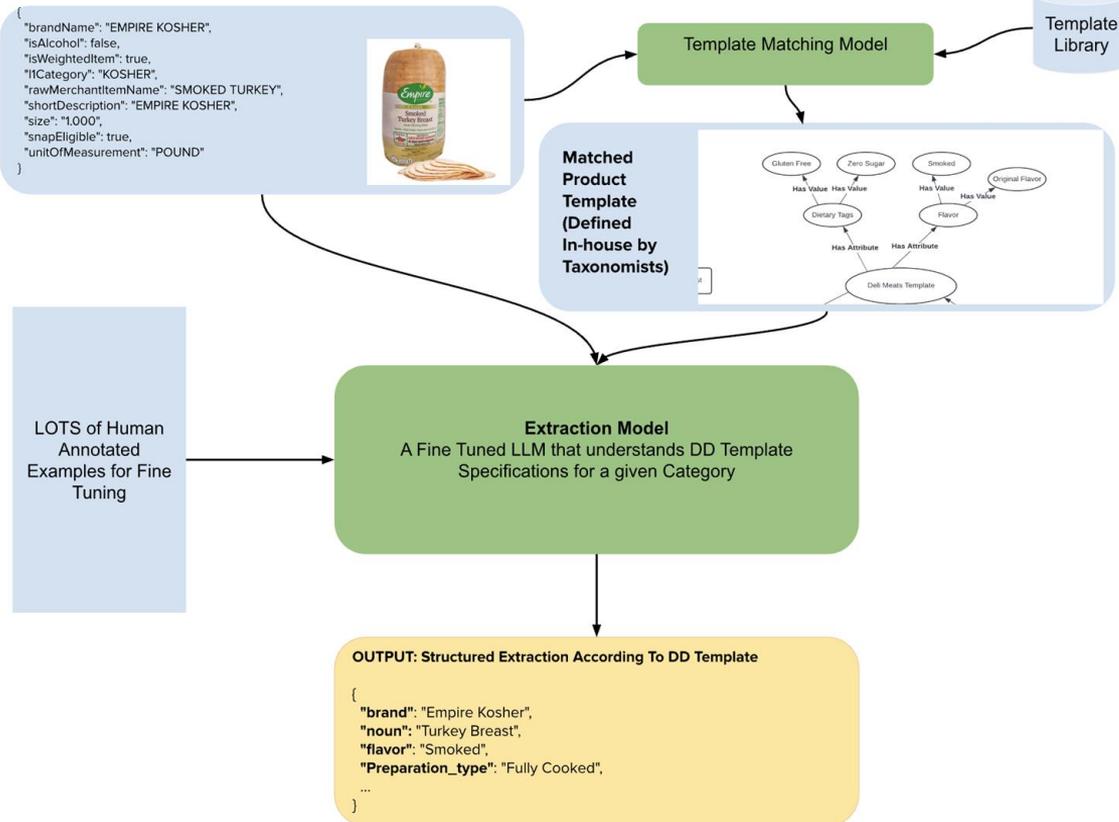
Category	Attribute	Example
Wine	Region	Sonoma County
	Vintage	2012
	Grape Variety	Riesling
	Sweetness Level	Semi-sweet
Spirits	Flavor	Pineapple
	Aging	Silver
	ABV	80 Proof
	Container	Plastic Bottle
Beer	Flavor	Sour Apple
	Container	Can
	Calorie Content	Light



LLM Assisted Product Knowledge Graph Building



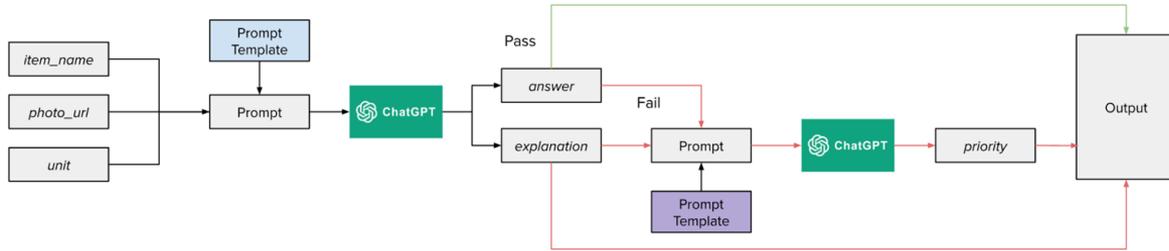
INPUT: Semi-structured Data About Mx SKU + Image



Finding Inaccuracies in the Catalog



- We construct a natural language prompt based on primary attributes
- We also classify the issue into different priority buckets based on stakeholder-provided definition



answer: Fail

explanation: The photo shows a package of 'Land O' Frost Premium Meat' with the label 'Oven Roasted Turkey Breast' prominently displayed. The package also indicates that it contains '1 LB' (16 ounces) of product, which matches the product title 'Land O' Frost Turkey Breast Honey Smoked (16 oz)'. **However, the flavor specified in the title is 'Honey Smoked' and the package in the photo says 'Oven Roasted'.**



P0: Major inconsistency that needs to be fixed ASAP.

P1: Medium inconsistency that needs to be fixed timely but not immediately.

P2: Minor inconsistency that can be added to the backlog.

Land O' Frost Turkey Breast **Honey Smoked** (16 oz)

Technical Challenges



- **Prompt tuning and evaluation at scale**
 - Leveraging distributed computing APIs such as Ray to accelerate LLM inference
- **Fine-tuning and domain adaptation**
 - Fine Tuning (LoRA, QLoRA etc.) LLMs with internal data
 - Adopting RAG methods
 - Chain LLM and search engine using Agents
- **Building high throughput and low latency pipelines**
 - Distilling and quantizing LLM models to student models for online inference



Next Stages of Exploration

Next Stages of Exploration



Enhancing existing LLMs

- Build DoorDash domain-specific LLM
- Adopt multi-modal LLMs
- Latency, quality, cost optimization

Better integration

- Inject external knowledge to in-house ML models via LLM
- Various type of RAG
- Smarter and more agent integration

More use cases

- Free Form Natural Language Search
- Cold Start Personalization

Promo Code:
GROCERYAI



Thank you!

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