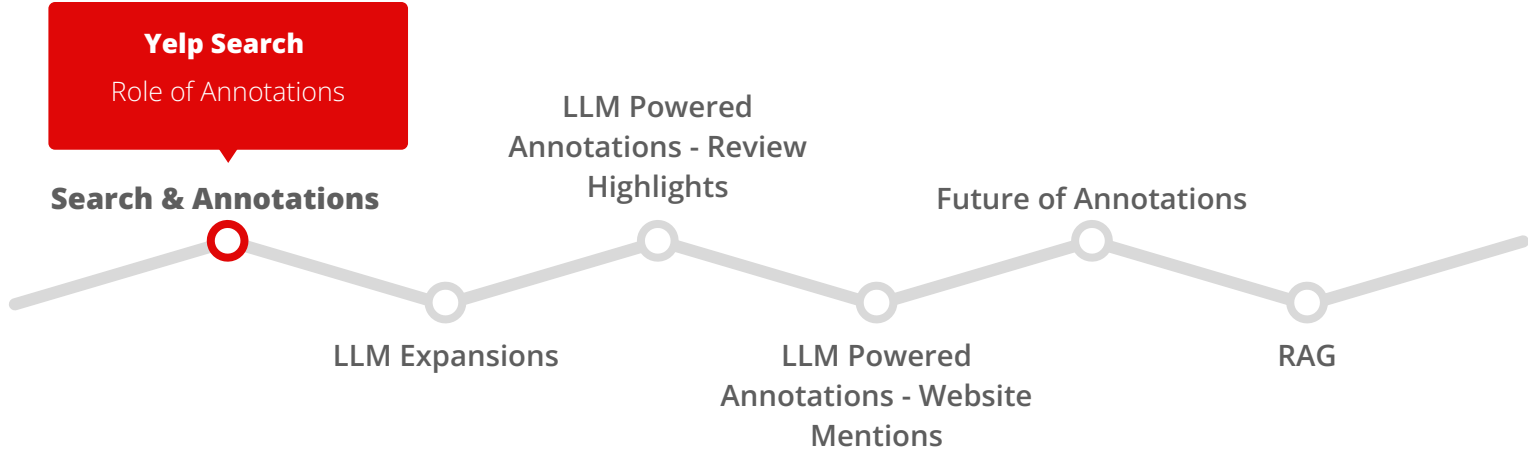


# RELEVANCE PROOF IN YELP SEARCH: LLM-POWERED ANNOTATIONS





tacos, cheap dinner, Max's

New York, NY 10001



Yelp for Business

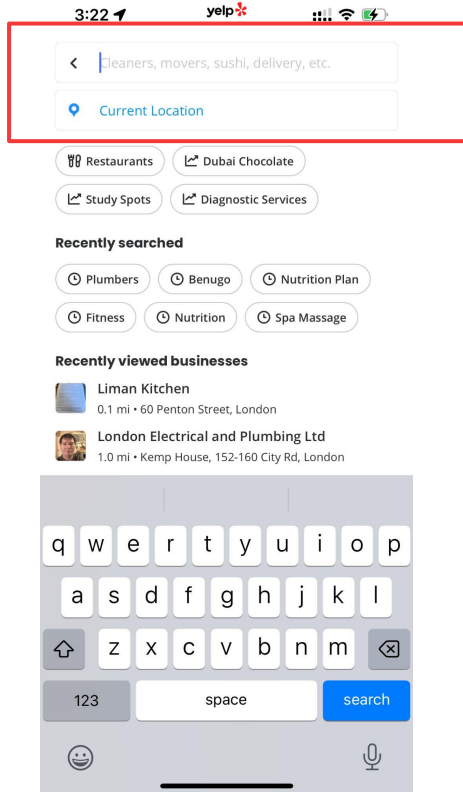
Write a Review



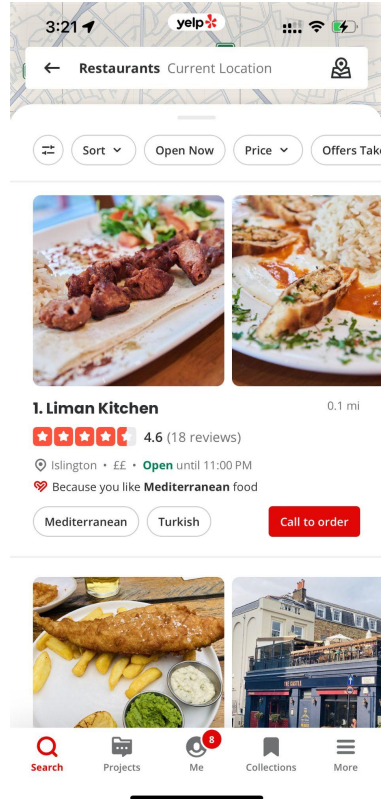
Restaurants Home Services Auto Services More



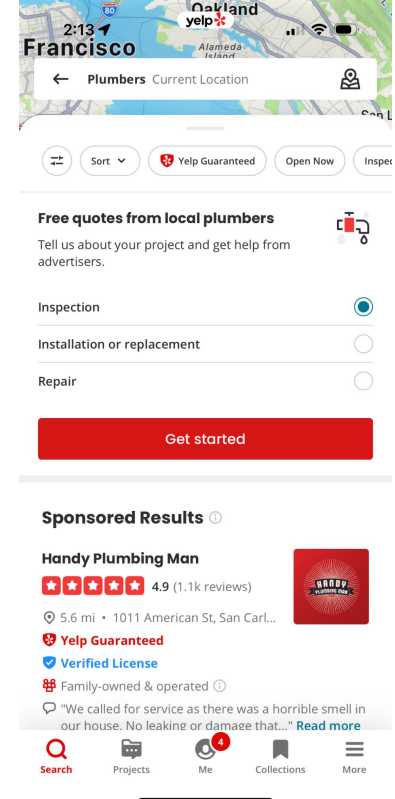
# Search Flow



## Restaurants Search



## Services Search



# Search Engine Results Page (SERP)



Korean Corndogs

San Francisco, CA



Yelp for Business ▾

Write a Review



Restaurants ▾ Home Services ▾ Auto Services ▾ More ▾

Outdoor Seating

### Category

Hot Dogs

Korean

Donuts

### Features

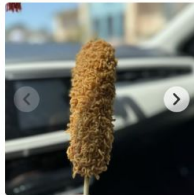
- Good for Lunch
- Good for Kids
- Good for Groups
- Dogs Allowed
- Full Bar
- Good for Brunch

[See all](#)

### Distance

- Bird's-eye View
- Driving (5 mi.)
- Biking (2 mi.)
- Walking (1 mi.)
- Within 4 blocks

## All "korean corndogs" results in San Francisco, California – September 2024



### 1. STIX

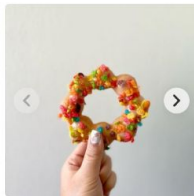
★★★★☆ 4.1 (389 reviews)

Hot Dogs Bubble Tea Korean \$ • Parkside

Open until 8:00 PM



Start Order



### 2. The Mochi Donut Shop

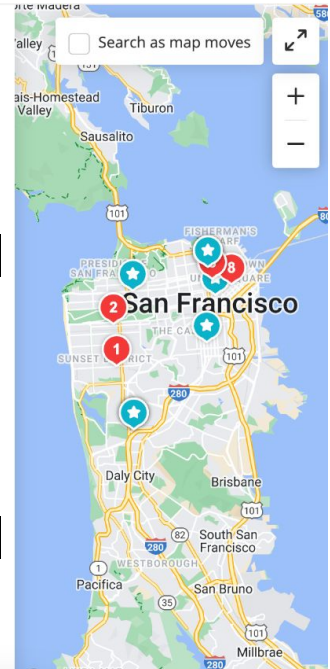
★★★★☆ 4.0 (103 reviews)

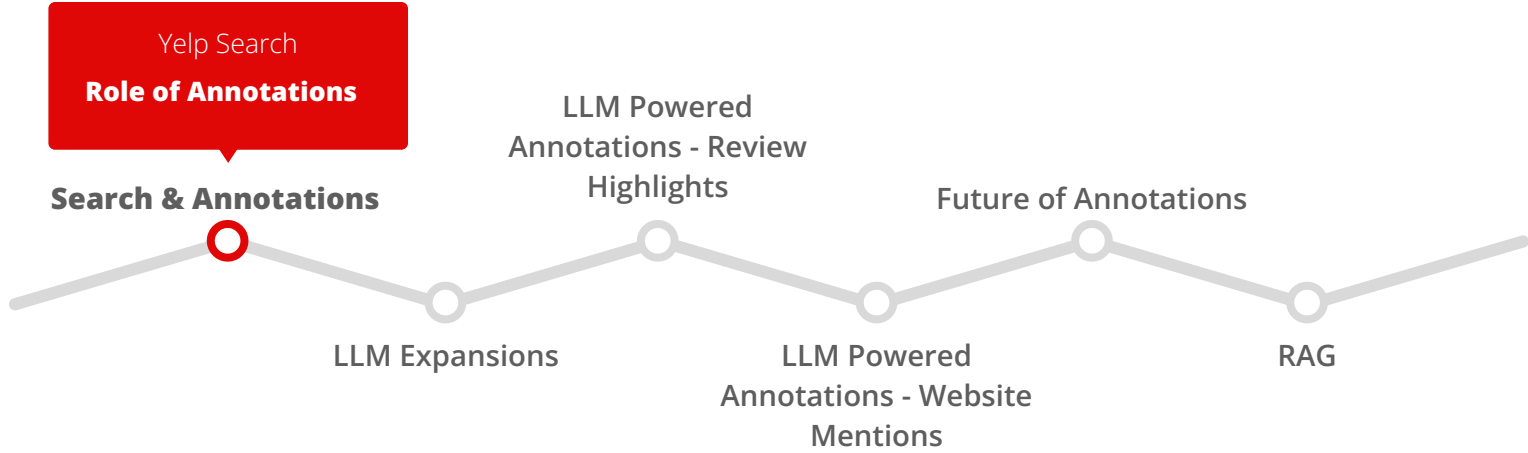
Donuts Hot Dogs \$ • Outer Sunset

Open until 7:00 PM



Start Order

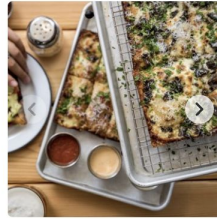




# Annotations

Additional information about a search result

- Relevance proof
- Unique features / differentiators
- Personalized appeal



### 3. Square Pie Guys

4.3 (914 reviews)

Pizza Chicken Wings Salad \$\$ • SoMa

Open until 9:30 PM

Vegetarian friendly • Vegan friendly

"The **pizza** was delicious and I really appreciated the extra care!" [more](#)

Outdoor seating ✓ Delivery ✓ Takeout

Start Order



### 13. Montesacro SOMA

4.4 (1k reviews)

SoMa • \$\$ • Open until 9:30 PM

Great for **happy hour**

"This is now on my list of favorite **pizza** places in San Francisco..." [Read more](#)

Pizza

Italian

Wine Bars

Order

# Review Highlights

- A type of annotation
- Spans of review text, often with a bolded word or phrase

★★★★★ Nov 13, 2023

Amazing pizza and pasta place in the sunset district!

The atmosphere for the restaurant was great! It is perfect for a date spot and even for a casual meal. They have options to sit outside as well inside. However the wait time could definitely get long.

I got the Margarita Pizza, Vodka Pasta, and Cacio de Pepe Pasta. The pasta was pretty normal and nothing too amazing. The cream for each was extremely evident and was pretty heavy. As a result I wouldn't really recommend the pastas.

The pizza was a different story. **The pizza was truly remarkable and outstanding.** In the Bay Area there are few to many restaurants that have good pizza. It was light and extremely flavorful. Although it was a simple pizza, the sauce and the way the cheese melted really allows the pizza to stand out. The dough was cooked very well and was a perfect mix of crunchy and chewy.

Overall it was a delight! I would definitely recommend it to anyone, as I will definitely be going back!



## 25. Fiorella – Sunset

★★★★★ 4.2 (363 reviews)

Italian Pizza Cocktail Bars \$\$\$ • Inner Sunset

**Closed** until 5:00 PM

“The **pizza** was truly remarkable and outstanding.” [more](#)

✓ Outdoor seating ✓ Delivery ✓ Takeout



# What makes a good annotation?

## Yelp has a dual responsibility

Portray the business accurately

Be clear to the user, surfacing useful information

## Prioritization of Annotation types

01

Confirmation of business relevance

02

Something interesting or unique about the business

03

Supplementary information about the business

# Annotator Service

Given a business, search query, and Yelp user

Determine the best annotation(s) to show for the result

Based on the rough principles laid out previously



## 25. Fiorella - Sunset

4.2 (363 reviews)

Italian Pizza Cocktail Bars \$\$\$ • Inner Sunset

Closed until 5:00 PM



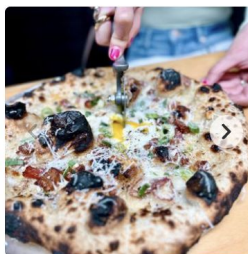
### Annotator Service

← "The **pizza** was truly remarkable and outstanding." [more](#)

← Reviewed by 1 friend

← Locally owned & operated • Established in 1997 ⓘ

← Outdoor seating Delivery Takeout



## 25. Fiorella - Sunset

4.2 (363 reviews)

Italian Pizza Cocktail Bars \$\$\$ • Inner Sunset

Closed until 5:00 PM

← "The **pizza** was truly remarkable and outstanding." [more](#)

Outdoor seating Delivery Takeout

# Relevance Proof





[Yelp for Business](#)
[Write a Review](#)

[Restaurants](#)
[Home Services](#)
[Auto Services](#)
[More](#)
 Outdoor Seating

## Category

 Hot Dogs

 Korean

 Donuts

## Features

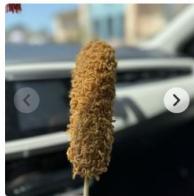
- Good for Lunch
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[See all](#)

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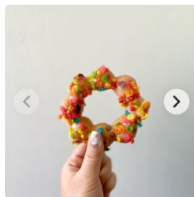
Hot Dogs Bubble Tea Korean \$ • Parkside

Open until 8:00 PM

“I'm there! **Korean corn dogs** have been the latest food trend and the popular one is located in San...” [more](#)

✗ Outdoor seating ✓ Delivery ✓ Takeout

Start Order



### 2. The Mochi Donut Shop

★★★★☆ 4.0 (103 reviews)

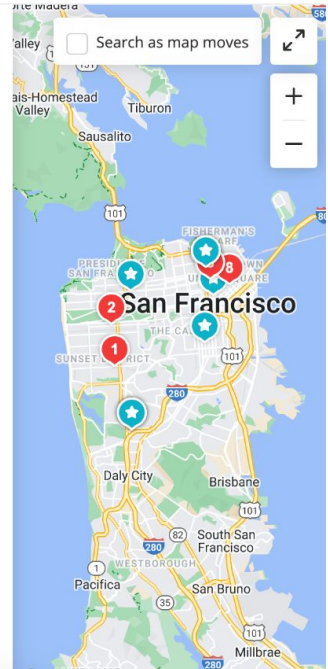
Donuts Hot Dogs \$ • Outer Sunset

Open until 7:00 PM

“They also offer other food like **Korean corn dogs** and boba drinks. Next time I'm in the area I'd love...” [more](#)

✗ Outdoor seating ✓ Delivery ✓ Takeout

Start Order



# Annotation Roadmap

## Key considerations as we make progress:

- Leverage community content
- Right balance between LLMs, manual work, simple coded strategies
- Keep iterating to improve intelligence of annotations

☑ Certified professionals

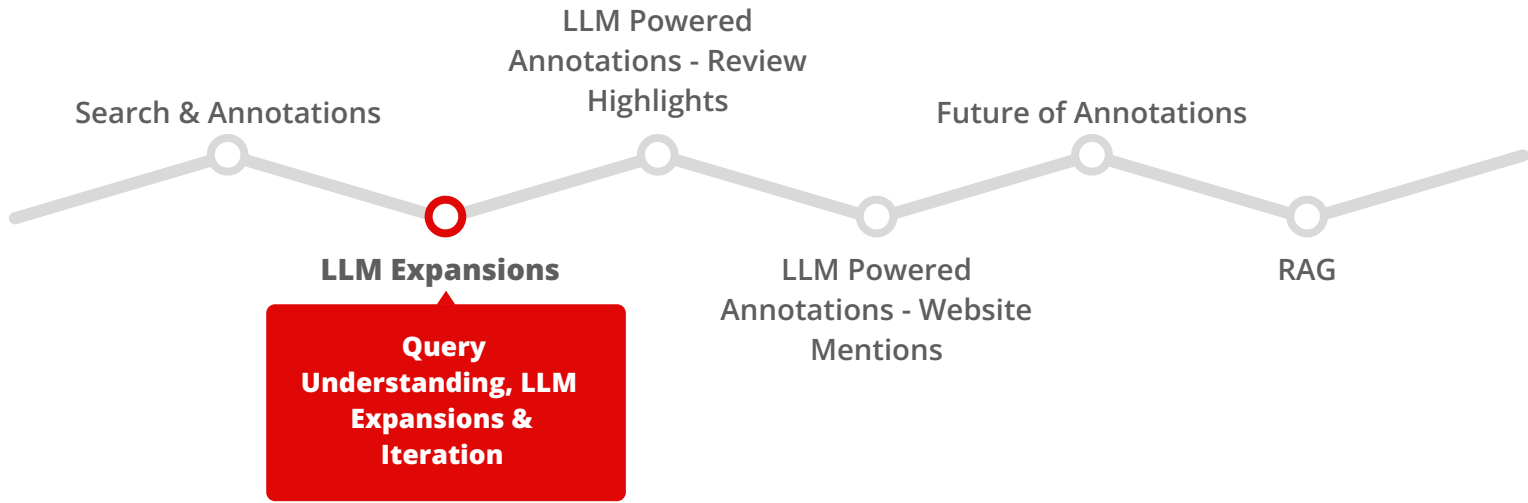
✓ Outdoor seating, Delivery, Takeout



💬 "If you're on the hunt for an authentic Italian **pizza** experience, look no further than "That's Amore..." **more**



?



# Query Understanding

First step in developing LLM expansions is understanding user intent.

What is the user looking for

- A specific category of businesses
- Particular dish or service
- A specific business or chain
- Broad query including many types of businesses
- etc

"Dentists"

"Mango sticky rice"

"Custom landscaping"

"McDonalds"

"Things to do as a tourist in London"

"restaurant for a wedding reception"

"Movers that can handle grand pianos"

# LLM Query Expansions

Given a search query, which phrases are most important to highlight from business reviews?

starbucks



London, United Kingdom



Key Phrases:

- Search query -> Starbucks
- Categories -> Cafes, Breakfast
- Offerings -> Coffee, tea, muffins

affordable hair salons

London, United Kingdom



Key Phrases:

- Search query -> affordable hair salon
- Adjectives -> affordable, cheap, value for money
- Categories -> hair salon
- Offerings -> haircut, blowout, styling, hair dyeing

# Query Expansion Iterations

Multiple iterations of this process

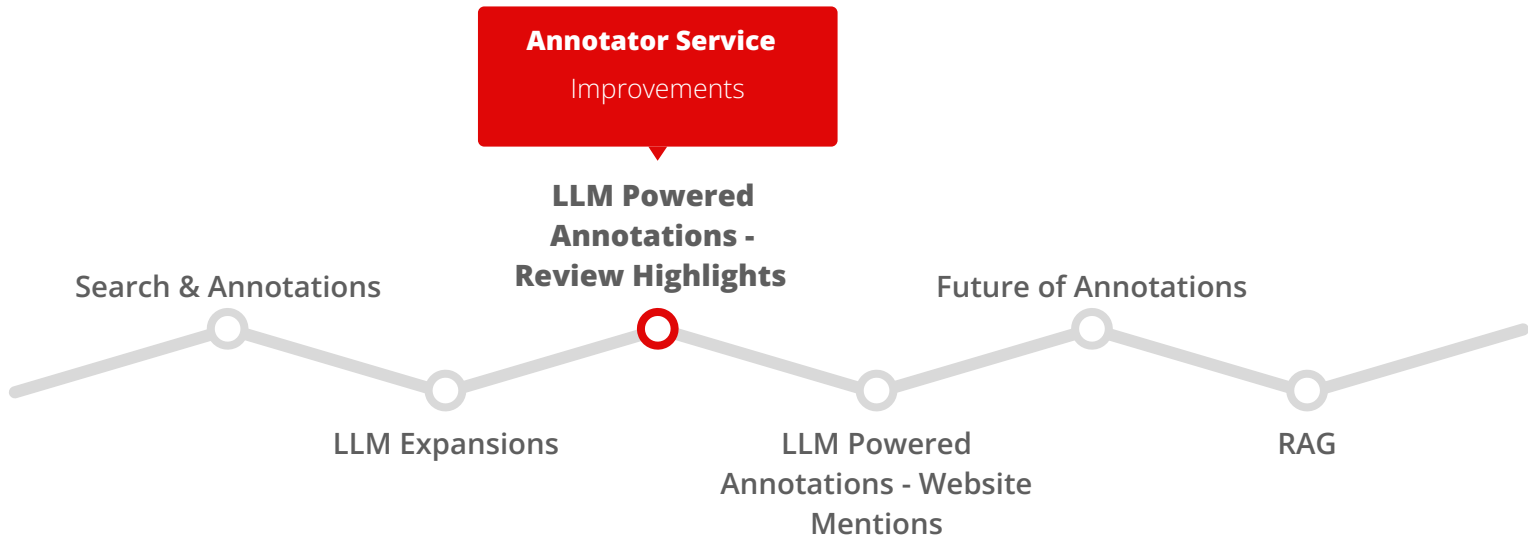
**Modularity** - expansions can be plugged into various systems

Iteration and scaling discussed more in a [Haystack US talk](#) (QR code below)

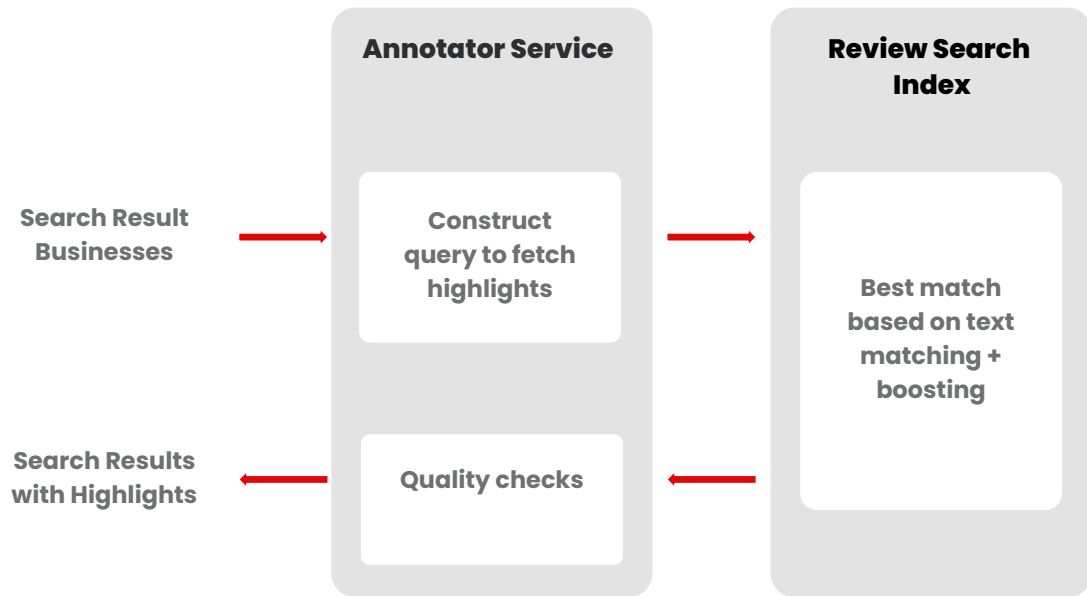


- May 2022  
Query: healthy food  
Key concepts: healthy food, healthy, organic
- March 2023  
healthy food -> healthy food, healthy, organic,  
low calorie, low carb
- September 2023  
healthy food -> healthy food, healthy options,  
healthy | nutritious, organic, low calorie, low  
carb, low fat, high fiber | fresh, plant-based,  
superfood





# Review Highlights Infrastructure



# Areas of Improvements

## Query Understanding

Matching on search query only

No strategy for unseen queries

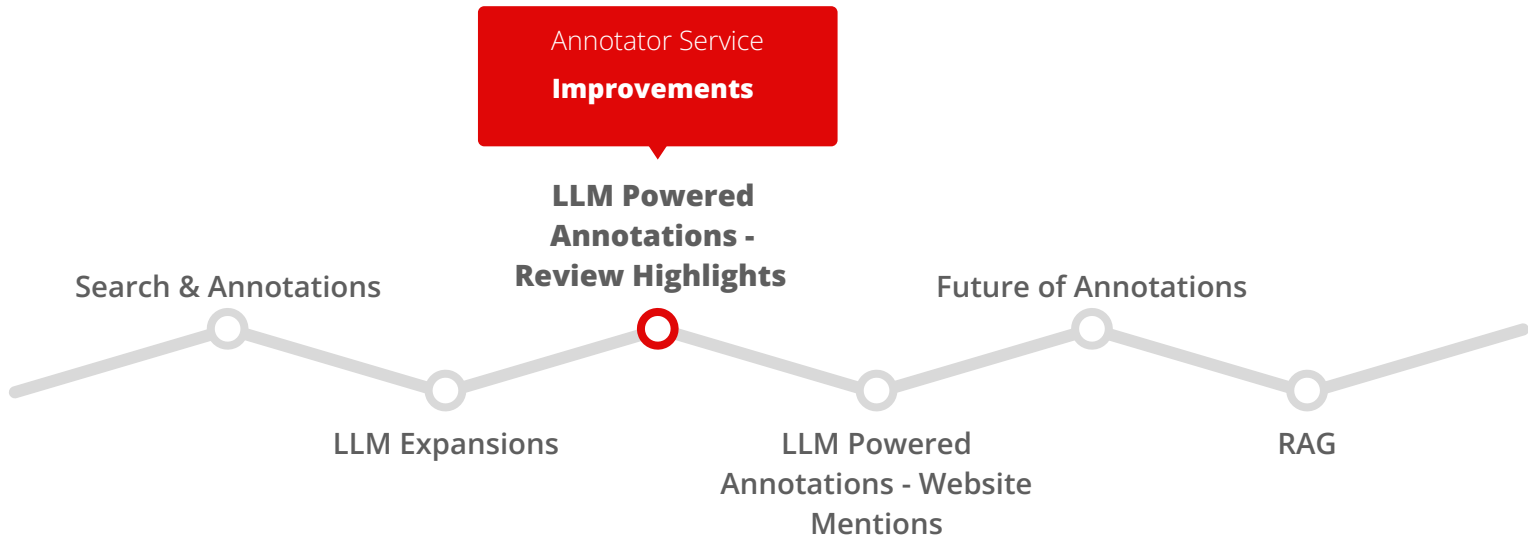
## Visibility into Selection

Single top match doesn't allow any extra control

## Handling Text Data

Stemmer reacts unexpectedly to some phrases

Highlights clipped incoherently



# Improvements

## Shortcomings

Matching on search query only

No strategy for unseen queries

## Improvements

Recall based on search query and relevant phrases

Heuristic for unseen queries

## Query Understanding

# LLM Expansions in Highlights

Integrated LLM expansions by recalling on relevant phrases instead of just search queries

Heuristic for unseen queries

~8x increase in number of phrases to match on per search

healthy food -> healthy food, healthy options, healthy | nutritious, organic, low calorie, low carb, low fat, high fiber | fresh, plant-based, superfood

“Great place for **healthy food** options. They have pre-made salads and sandwiches.” [more](#)

“Packed full of **healthy** vegan goodness, the Buddha bowl of rice and veggies feels both virtuous and...” [more](#)

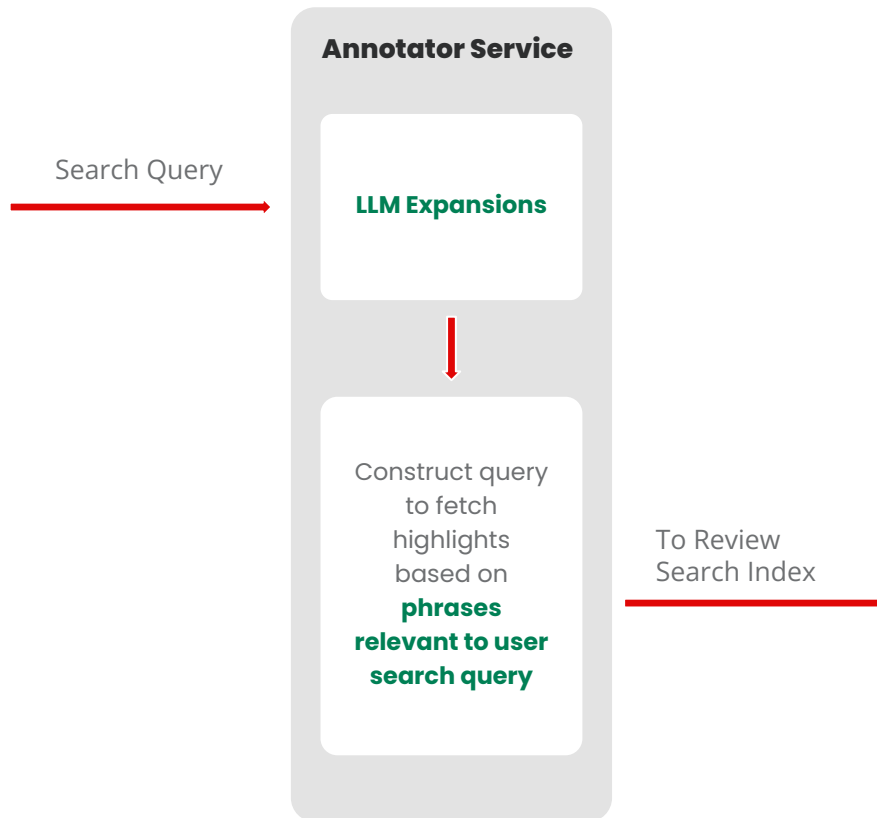
“I never knew vegan food can be so **nutritious** and delicious.” [more](#)

“Falafel were also among the best I ever had, **fresh**, moist, perfect. Roast aubergine also excellent...” [more](#)

## Query Understanding

# LLM Expansions in Highlights

Easy to slot into our existing architecture without an overhaul



# Improvements

## Shortcomings

Single top match doesn't allow any extra control

## Improvements

Top 5 best matches returned, allowing smart ranking

Filtering based on quality checks



# Highlight Scoring Model

Intuitively, we care about - recency, relevance of phrase, grammatical correctness, while trying to represent the business rating accurately

Smart ranking model uses those features, trained on hand labeled data.

"Korean corn dogs" -> "Korean corn dogs", "corn dogs"

Examples:

[2020] I did an online order to get my family some **Korean corndog**

vs

[2023] A great place in SF to get your **Korean corndog** fix

[2023] This spot really curbs the craving for authentic **Korean corn dogs**

vs

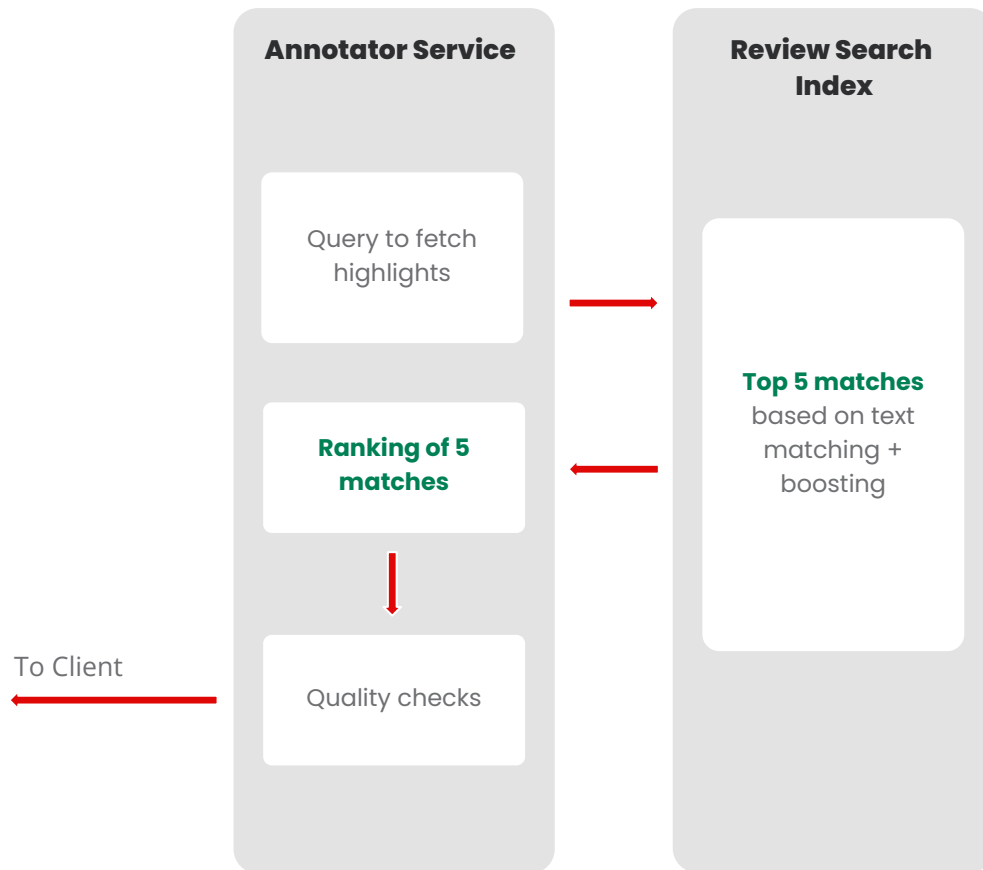
[2023] The **corndog** and wasabi mayo was a delicious pairing

## Visibility into Selection

# Highlight Scoring Model

Returning multiple matches instead of single match allows us to incorporate smart ranking

Easy to slot into our existing architecture without an overhaul



# Filtering Inappropriate Content

We filter out highlights with inappropriate content, or with bad formatting

A GREAT PLACE IN SF to GET your KOREAN CORNDOG fix

Call us at +1 94560362973 for Korean corndogs

Any highlights with NSFW content

# Improvements

## Shortcomings

Highlights clipped incoherently



Enforce matching on sentence boundaries

Stemmer reacts unexpectedly to some phrases

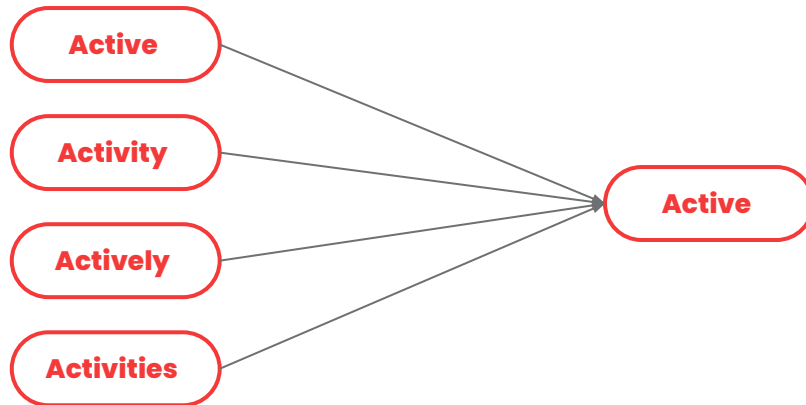


Special handling of hard to stem phrases

# Handling Bad Stemming

Phrases like “active” stemmed to the same root as “activities” resulting in incorrect matching and bolding

Maintain hardcoded list of incorrect stemming, use it for filtering



“The plants were healthy, the roads were **active** and the view was beautiful.” [more](#)



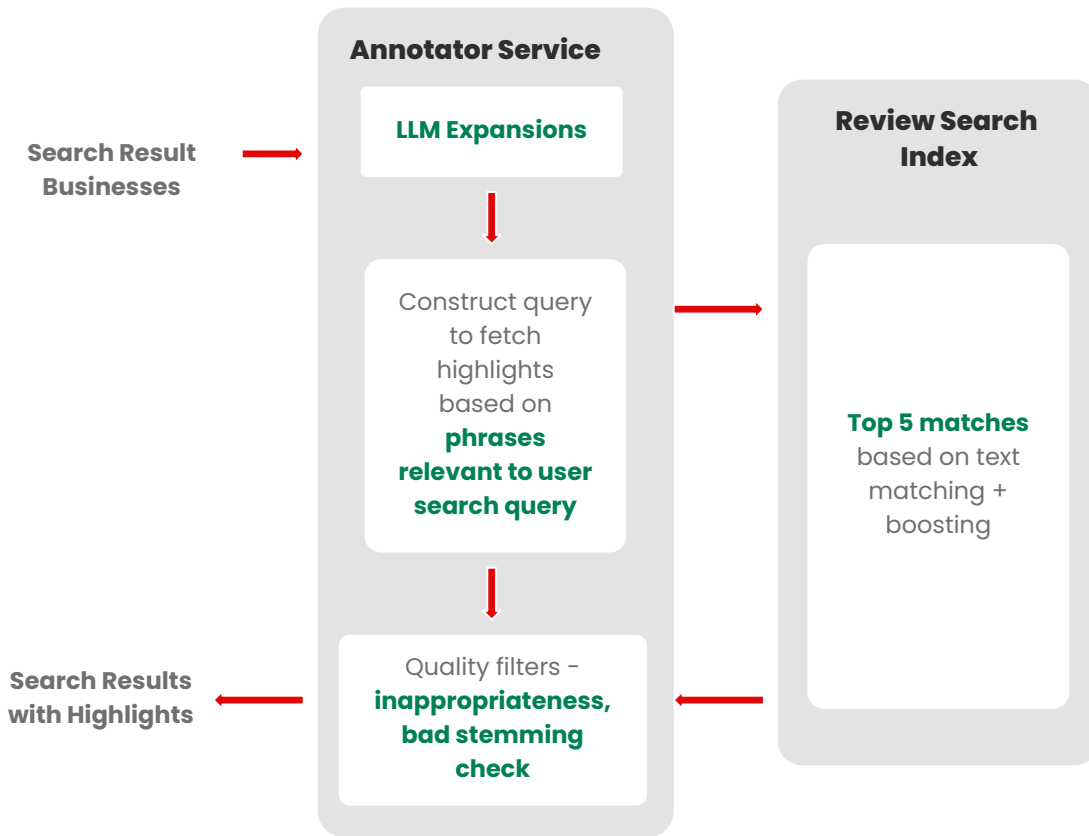
Filter out bad stemming, fall back to a highlight with a less relevant phrase



“It was **fun** to walk around and browse through all the shops: you could spend all the in the area as...” [more](#)

# Result: Smarter Retrieval Flow

# New Highlights Infrastructure



# Comparison between old and new

## Old System

Incomplete sentences, sentiment unclear

2:20 San Rafael

mango sticky rice San Francisco, C...

Sort Open Now Price Offers Take

**12. Kan Kiin Brunch & Thai Eatery**

★★★★☆ 3.8 (271 reviews)

Daly City • \$\$ • Closed until 11:00 AM

"eat the flesh inside. 5/5 -Mango Sticky Rice: So in case you do..." [Read more](#)

Thai Breakfast & Brunch Reserve

**13. Kowloon Tong Dessert Cafe**

★★★★☆ 3.5 (1.1k reviews)

Inner Richmond • \$ • Closed until 5:00 PM

"from, including classics (mango sticky rice, glutinous sesame..." [Read more](#)

## New System

Complete thoughts, sentiment clear

2:19

mango sticky rice San Francisco, C...

Sort Open Now Price Offers Take

**13. Kowloon Tong Dessert Cafe**

★★★★☆ 3.5 (1.1k reviews)

Daly City • \$\$ • Closed until 11:00 AM

"Mango sticky rice: The mango was fresh and ripe!" [Read more](#)

Thai Breakfast & Brunch Reserve

**13. Kowloon Tong Dessert Cafe**

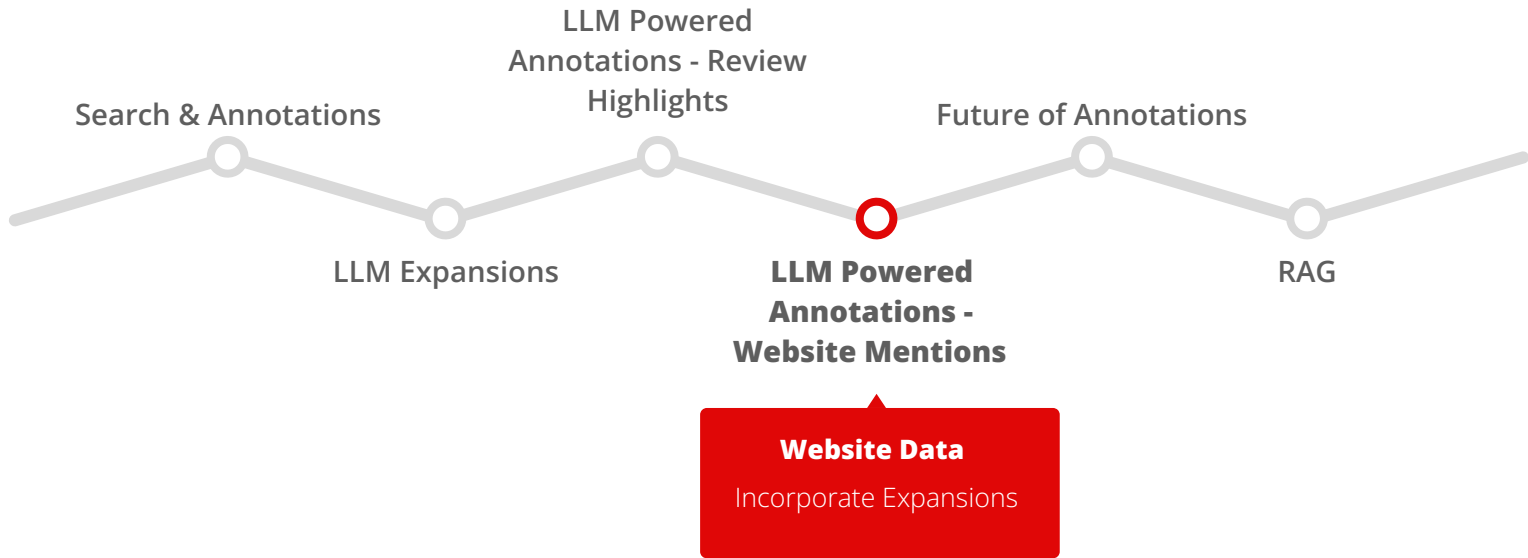
★★★★☆ 3.5 (1.1k reviews)

Inner Richmond • \$ • Closed until 5:00 PM

"Their mango sticky rice is also good!! Decent place to get..." [Read more](#)

Desserts Cafe Chicken Wings Order





**How can we provide relevance proof for low content or unreviewed businesses?**

# Website Data

A business with 0 reviews

Website mentions “butter chicken” and “kadai chicken”

Surfacing this to the user provides strong proof of the business’ relevance



## Indian Delight

Authentic Indian Cuisine

[Home](#) [Menu](#) [Contact](#)

### Welcome to Indian Delight

Experience the rich and diverse flavors of India with our authentic dishes. We specialize in Butter Chicken and Kadai Chicken, prepared with the finest ingredients and traditional recipes.

### Our Menu

#### Butter Chicken

Butter Chicken is a rich and creamy dish made with tender chicken pieces cooked in a tomato-based sauce with butter and cream. It's a perfect blend of spices and flavors that will leave you wanting more.

#### Kadai Chicken

Kadai Chicken is a spicy and flavorful dish made with chicken, bell peppers, onions, and a blend of traditional Indian spices. It's cooked in a wok-like pan called a "kadai", which gives it a unique taste and texture.

### Contact Us

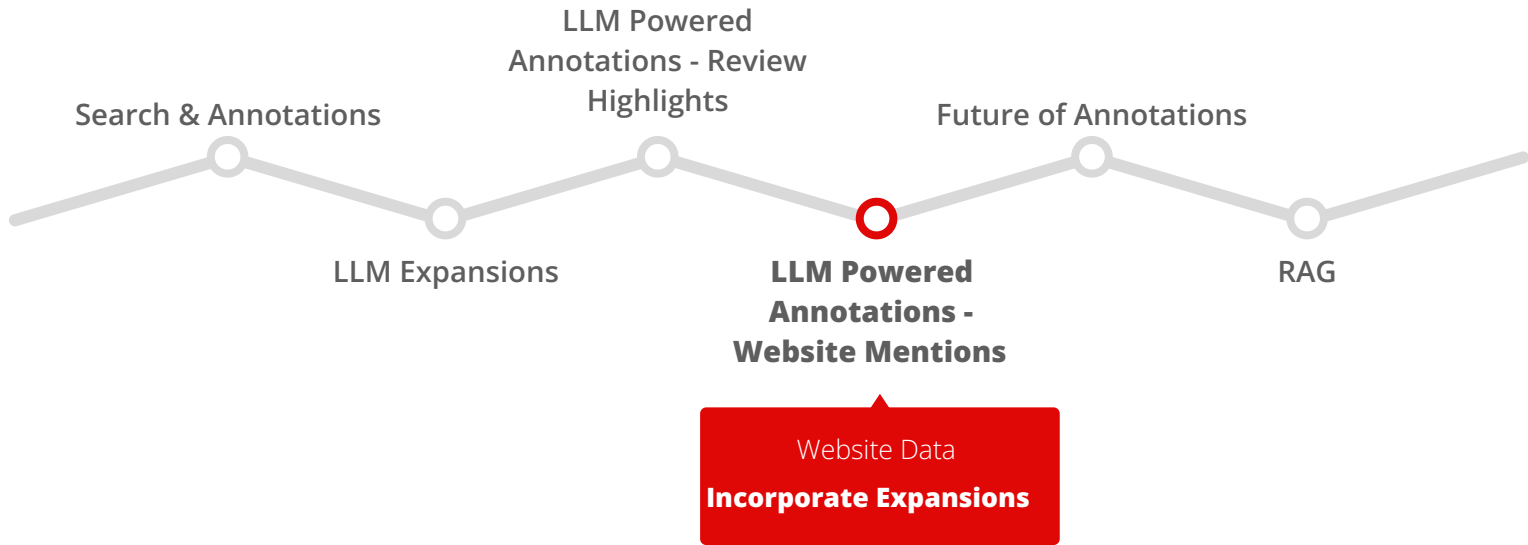
Address: 123 Spice Lane, Flavor Town, IN 45678  
Phone: (123) 456-7890  
Email: [info@indiandelight.com](mailto:info@indiandelight.com)

# Challenges

- Scale of data
- Information synthesis
- Quality

## <h2>Welcome to Crystal Harbor</h2>

<p>Nestled within the vibrant metropolis of Grandoria, <b>Crystal Harbor</b> is a hidden gem that offers an unparalleled blend of urban sophistication and natural splendor. This enchanting destination, spanning over 500 acres, is a sanctuary where the hustle and bustle of city life gives way to serene landscapes, cultural landmarks, and unforgettable experiences.</p>



# Solution

- Use LLM expansions
- Resource of phrases to match on, consisting of all possible search queries and their expansions

## Welcome to **Crystal Harbor**

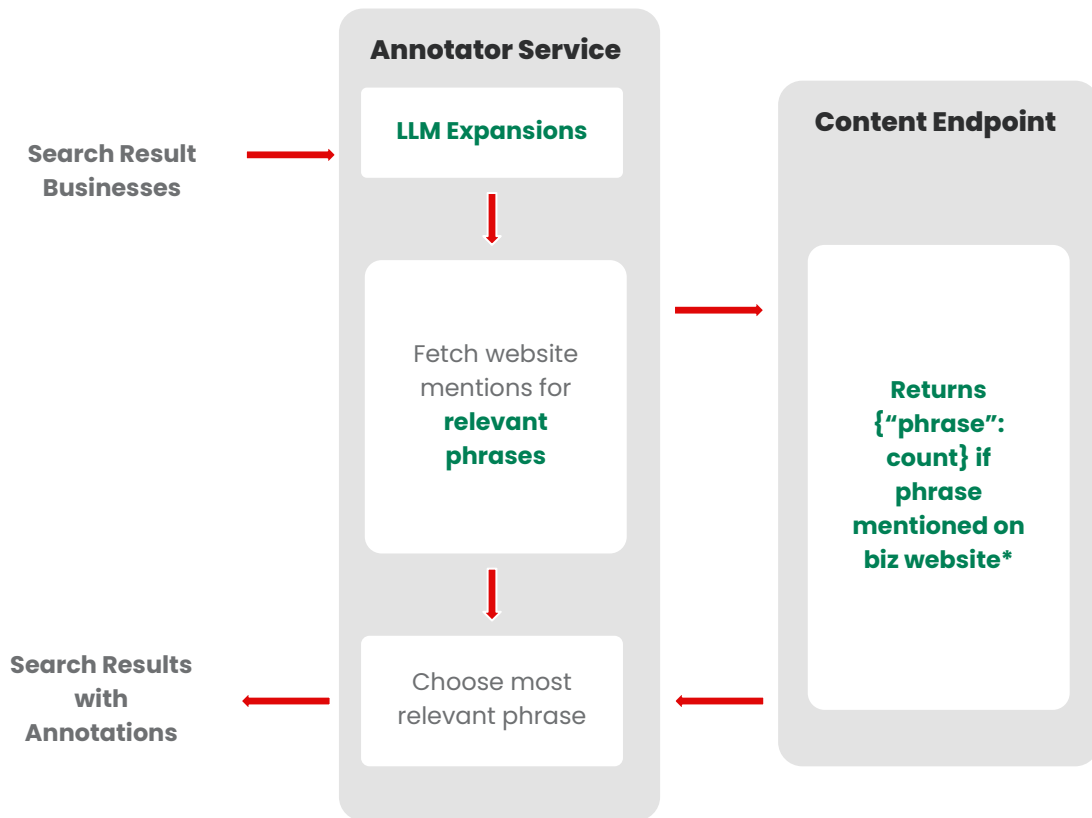
Nestled within the **vibrant** metropolis of Grandoria, **Crystal Harbor** is a **hidden gem** that offers an unparalleled blend of **urban** sophistication and **natural** splendor. This enchanting **natural destination**, spanning over 500 acres, is a **sanctuary** where the hustle and bustle of city life gives way to serene **landscapes, cultural landmarks,** and **unforgettable experiences.**



{**vibrant: 1, Crystal Harbor: 2, hidden gem: 1, urban: 1, natural: 2, destination: 1, sanctuary: 1, landscapes: 1, cultural landmarks: 1, unforgettable experiences: 1**}

\* Only for businesses that provide Yelp with their website URL

# Website Mentions Infrastructure



# Examples

3:37 | nutrition plan Amherst, MA, United States

Sort | Open Now | Price | Offers Take

**FT**  
FITNESS TOGETHER

**Fitness Together - Amherst**  
4.2 (5 reviews)

Amherst, MA | Open until 5:00 PM

On their website: **nutrition plan**

Great trainers, very knowledgeable and supportive. Great customer service and attitudes. They... [Read more](#)

Trainers | Gyms | Call

Search | Projects | Me | Collections | More

11:40 | Financial Services Sacramento, CA...

Sort | Open Now | Price | Good for Kids

**63. California Capital**  
4.7 (3 reviews)

1792 Tribute Rd, Ste 270, Sacrame...

On their website: **financial planning**

**64. Mo Tax Services**  
4.3 (13 reviews)

8066 Sunset Ave, Ste 100, Fair Oaks

Verified License

"I'm grateful for the assistance provided by Mo Ta..." [Read more](#)

**65. Taxes 'N Books, Inc.**  
4.5 (35 reviews)

1210 H St, Downtown

"And I am happy to say I'll be getting back some..." [Read more](#)

**66. Oportun**

Search | Projects | Me | Collections | More

11:43 | spa Minnetonka, MN, United States

Sort | Open Now | Price | Good for Kids

**49. Skin Rehab Aesthetics**  
5.0 (1 review)

Skin Care, Medical Spas, Laser Hair...  
14525 MN-7, Ste 170, Minnetonka

On their website: **massage**

**50. Reflect Salon | Aveda | Plymouth**  
3.3 (43 reviews)

\$\$\$ • Day Spas, Hair Salons, Mass...  
3530 Vicksburg Ln N, Ste 400, Plym...

"Excellent service. Had a mini spa retreat: 90 mi..." [Read more](#)

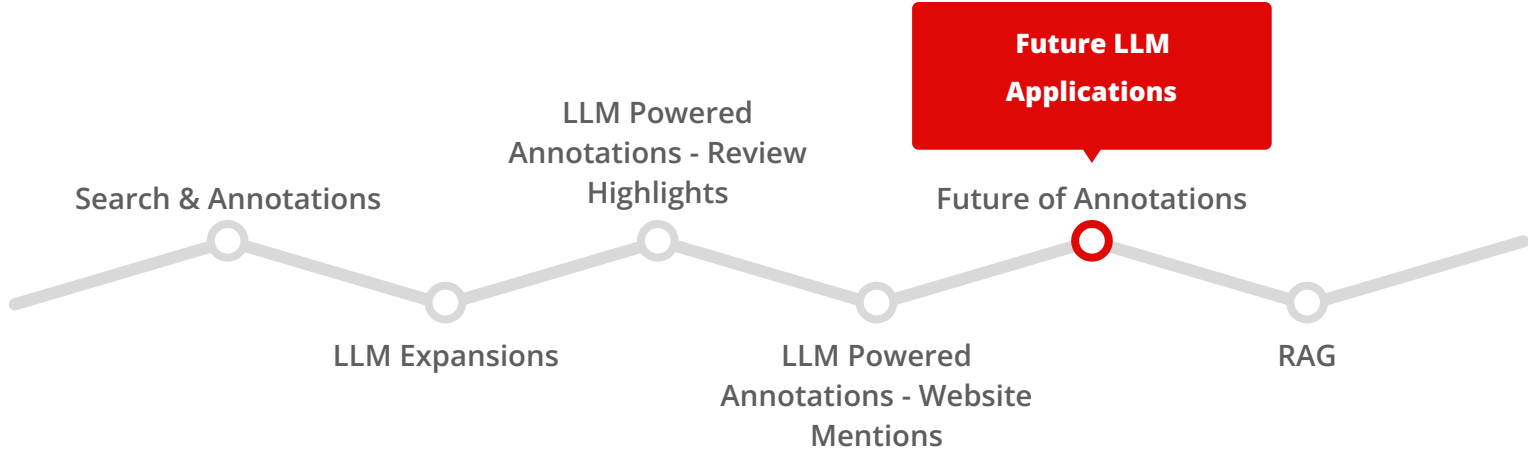
**51. BAYSIDE NAILS & SPA**  
4.8 (8 reviews)

Nail Salons, Cosmetics & Beauty S...  
14707 Excelsior Blvd, Minnetonka

"Best new nail spa in town! The staff is so friendly..." [Read more](#)

Search | Projects | Me | Collections | More





# LLM Expansions & Phrase counts

Re-usability of approaches and signals

Future explorations:

1. Other applications of phrases
  - a. On the menu: <phrase>
  - b. X reviews mention <phrase>

Website mentions: {**vibrant: 1, Crystal Harbor: 2, hidden gem: 1, urban: 1, natural: 2, destination: 1, sanctuary: 1, landscapes: 1, cultural landmarks: 1, unforgettable experiences: 1**}



Menu mentions: {**butter chicken: 2, kadai chicken: 2, chicken curry: 1**}

Review mentions: {**butter chicken: 20, kadai chicken: 12, chicken curry: 10, indian food: 50, fresh ingredients: 4**}

# LLMs in Highlight Selection

Future explorations:

2. Offline precomputation of highlights for biz-query pairs

## 11. Konban

 4.4 (244 reviews)

Izakaya Chelsea



LLM prompt receives recent reviews of the business, query = "restaurants"



We loved this place so much that my friend and I just kept pausing throughout the door to recall just how **memorable** it was. I will definitely go back again and again!

# LLMs in Annotation Selection

Future explorations:

- Offline precomputation of all annotations for a search page, with awareness of the other results on the page

Korean Corndogs San Francisco, CA

Restaurants Home Services Auto Services More

**All "korean corndogs" results in San Francisco, California - September 2024**

**1. STIX**  
 4.1 (389 reviews)  
 Hot Dogs Bubble Tea Korean \$ • Parkside  
 Open until 8:00 PM  
 Outdoor seating Delivery Takeout

**2. The Mochi Donut Shop**  
 4.0 (103 reviews)  
 Donuts Hot Dogs \$ • Outer Sunset  
 Open until 7:00 PM  
 Outdoor seating Delivery Takeout

Start Order Start Order

Map showing San Francisco with markers for STIX (1) and The Mochi Donut Shop (2).

# LLMs in Annotation Selection

Future explorations:

- Offline precomputation of all annotations for a search page, with awareness of the other results on the page

Korean corndogs are their **specialty**, users have called them **crunchy** and **satisfying**

Korean Corndogs San Francisco, CA

Restaurants Home Services Auto Services More

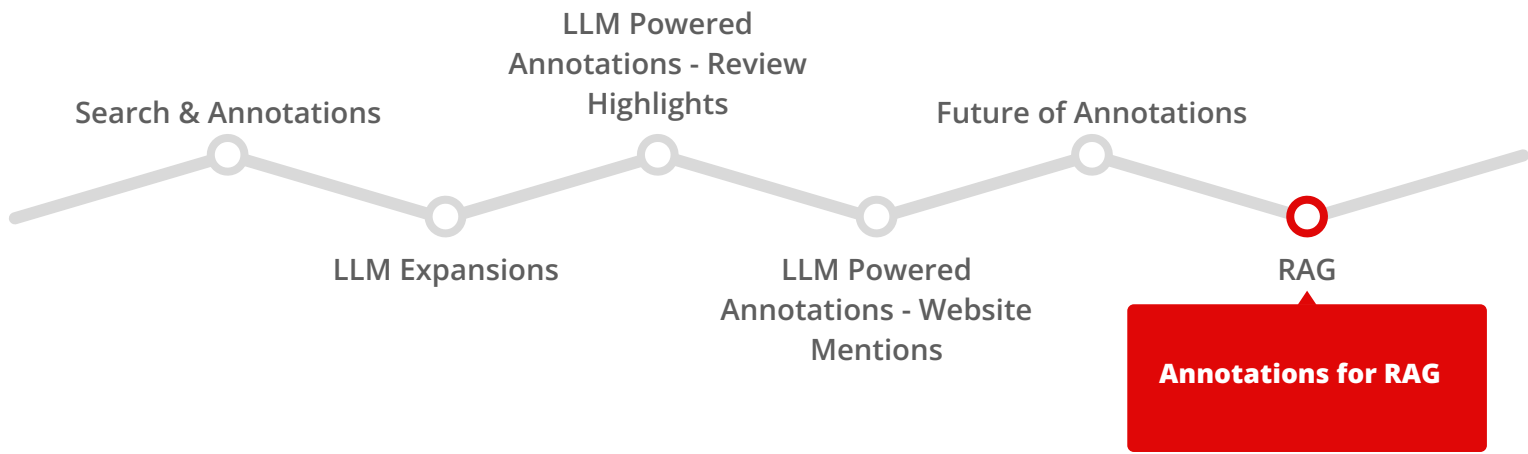
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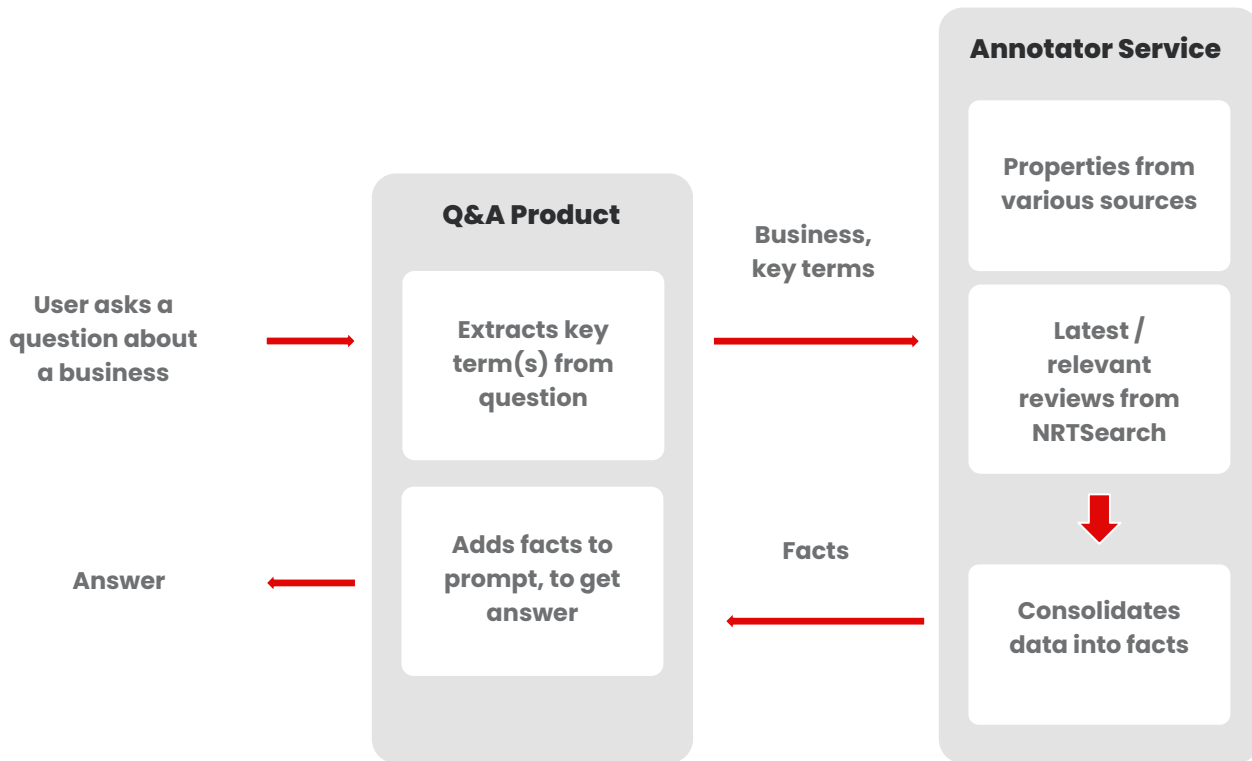
Map showing San Francisco area with markers for STIX (1) and The Mochi Donut Shop (2).

Known more for donuts, but they have **interesting corndog flavors** and beginner friendly **half-and-half options**



# Annotator Service for RAG

- Retrieval-Augmented Generation
- Powers multiple internal use cases



**THANK YOU!**

**QUESTIONS?**

