

References (delete or hide for presentation)

- Rubric with tasks - [link](#)
- Team project plan - [link](#)
- Roadmap - [link](#)
- MITRE/Gallup motivation - [study](#)



Scraps to Scrumptious



A RAG based chat tool for food saving and
recipe curation

Devin Suy, Nadia Tantsyura, Randy Louie, Robert Greer, Thomas Lai



Team



Devin Suy



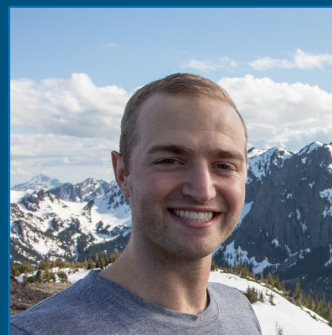
Nadia Tantsyura



Thomas Lai



Randy Louie



Robert Greer

Scraps to Scrumptious

Our **Food Retrieval-Augmented Generation System** uses extensive recipe data to tailor meals based on your pantry and dietary needs. This not only makes nutritious cooking easy and accessible but also helps in minimizing food waste.

Key Features:

- Personalized meal suggestions based on dietary restrictions and available ingredients.
 - Dynamic adjustments for lower calories, sodium, fat, or sugar.
 - Ingredient substitutions to maximize pantry resources.
 - Real-time information integration for unknown ingredients.
-

Scenarios of Use:

1

Allergy Check
& Dietary
Restrictions:

Whether you're allergic to peanuts or following a vegan diet, our system can suggest suitable recipes.

2

Ingredient
Exclusion &
Multiple
Restrictions:

From avoiding dairy to managing multiple allergies, our system can recommend recipes that fit your needs.

3

Cultural and
Ethical
Preferences:

Respect for your religious or ethical food preferences is a priority. Our system can suggest halal or beef-free recipes.

4

Healthy
Options &
Child-Friendly
Recipes:

Whether you're on a low-carb diet or need a kid-friendly, egg-free snack, our system has you covered.

5

Ingredient
Availability:

Even if you're out of tomatoes or eggs, our system can suggest recipes that don't require these ingredients.

6

Medical
Conditions:

Our system can suggest dessert recipes suitable for diabetics or heart-healthy dinner recipes for those with high cholesterol.

7

Explicit
Avoidance:

If you want a chicken soup recipe without garlic, our system can provide one.

Health Benefits



Encourages healthy eating by providing tailored recipes.



Improves quality of life, especially for low-resource homes.



Ensures you can always cook something wonderful, regardless of your dietary needs or pantry limitations.



Contributes to the reduction of food waste, thereby enhancing your sense of well-being

The annual impact of food waste in the United States is like...

driving
one million
loaded semi
trucks



every household tossing
\$1,500
into the wind

dumping the water filling 9 million
Olympic swimming pools into an empty field



Source: *From farm to kitchen: The environmental impacts of U.S. food waste* | US EPA. (2022, November 28). US EPA.



Farms

17%



Manufacturing

15%



Consumer-facing
businesses

20%



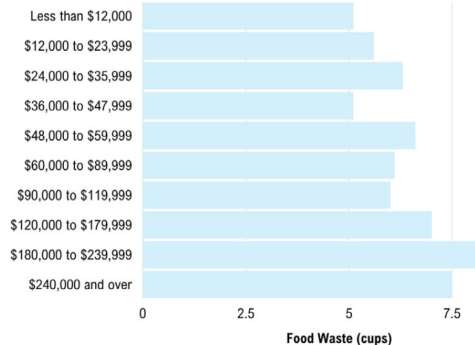
Homes

48%



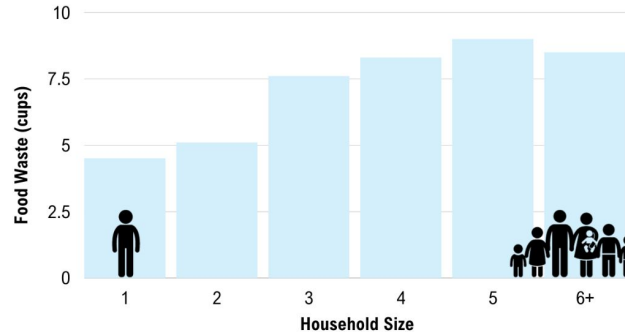
Food Waste by Household Income

Average cups wasted per household over one week



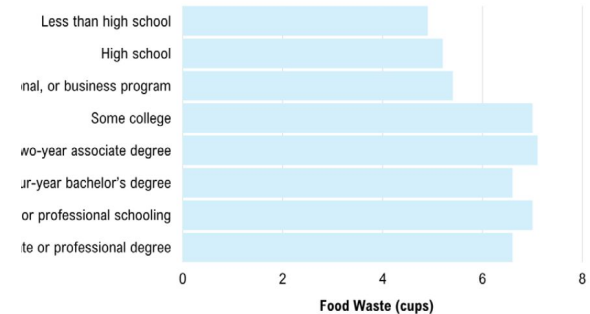
Food Waste by Household Size

Average cups wasted per household over one week



Food Waste by Highest Education

Average cups wasted per household over one week



Survey Findings

Top Food-Saving Motivators

Percentage of respondents who indicate the issue motivates them “a fair amount” or “a great deal” to reduce their food waste



82% saving **money**

76%

managing home more **efficiently**



60% feeling guilty when throwing away food

44%

considering global or national **food shortages**

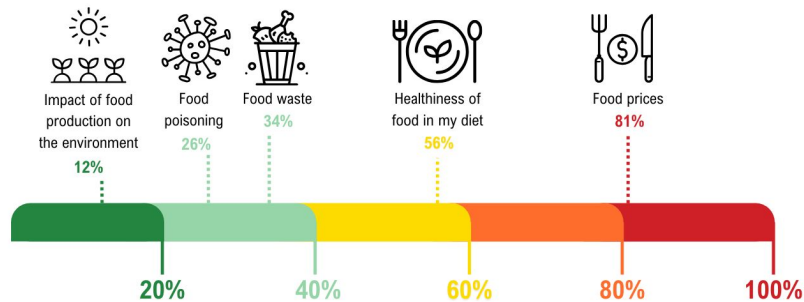


40% reducing impact on the **environment**

What Worries Us?

Percentage of respondents who identified the food issue as a top concern

- 81%** Food prices
- 56%** The healthiness of food in my diet
- 34%** Food waste
- 31%** Hormones, steroids, or antibiotics in food
- 29%** Being able to afford to buy enough food for myself/my family
- 28%** The use of pesticides to grow food
- 26%** Food poisoning (e.g., Salmonella and E. Coli)
- 23%** Genetically modified food
- 19%** Availability of food in stores
- 17%** How food producers and farmers are treated
- 16%** The amount of food packaging
- 15%** The impact of food production and waste on climate change
- 14%** Animal welfare
- 12%** Difficulty recycling food packaging
- 12%** The impact of food production on the environment

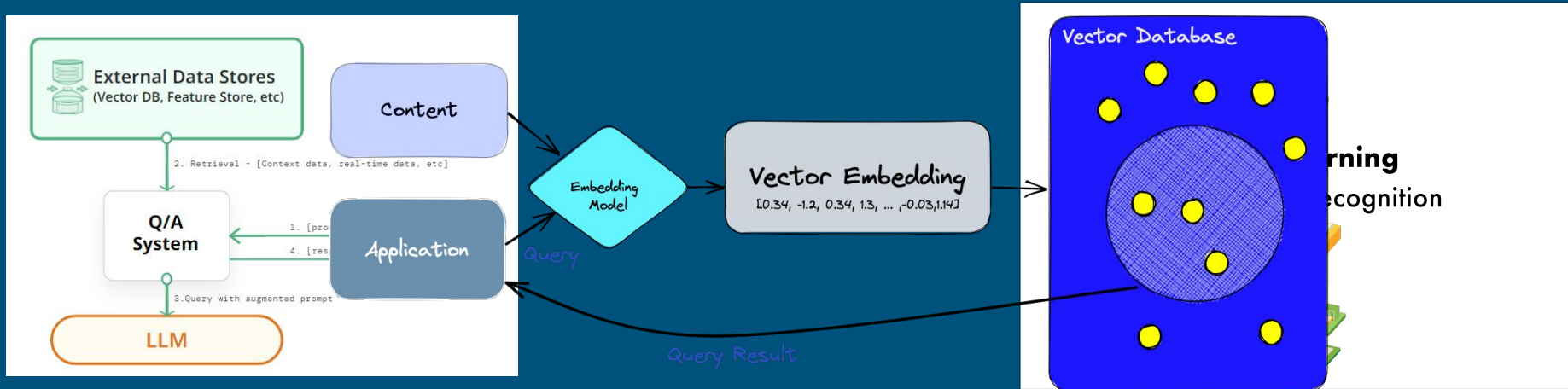


Roadmap - Household Opportunities

Crawl - Chat based RAG System

Walk - Expand from static dataset to ingest from multiple sources

Run - Integrate with image classifier system that monitors available food



MVP

I'm making dinner for four today but I need to be able to prepare it under 45 minutes. My family prefers Asian flavors.

02:22:06 PM

The Bang Bang Shrimp and Asian Beef and Noodles recipes both look very promising - they are Asian-inspired, can be prepared in under 45 minutes, and serve around 4 people.

Here are the instructions for the Bang Bang Shrimp:

Bang Bang Shrimp

Ingredients:

- 1 lb shrimp, peeled and deveined
- 1/2 cup mayonnaise
- 1/4 cup sweet chili sauce
- 2 tbsp honey
- 2 tsp sriracha sauce
- 1 tsp rice vinegar

Type your message...

SEND

OPEN DEBUG PANEL

Main Features

RAG Search

Allergy Safety

Interactive Chat History

Dynamic Function Calls

Continuous Dialogue Prompting

```
1  {
2
3    "role": "user",
4    "content": [
5      {
6        "type": "text",
7        "text": "I want to make a pasta dinner for my family of 6 tonight but I only have an hour to prepare the food."
8      }
9    ]
10  },
11  {
12    "role": "assistant",
13    "content": [
14      {
15        "type": "tool_use",
16        "id": "toolu_bdrk_01Tys2YfPXDUK55DTvxwAL35",
17        "name": "query_food_recipe_vector_db",
18        "input": {
19          "queries": [
20            "quick pasta recipes",
21            "pasta recipes for family",
22            "one hour pasta meals"
23          ]
24        }
25      }
26    ]
27  },
28  {
29    "role": "user",
30    "content": [
31      {
32        "type": "tool_result",
33        "tool_use_id": "toolu_bdrk_01Tys2YfPXDUK55DTvxwAL35",
34        "content": "Metadata: {'recipe_id': '288125.0', 'name': 'Perfect Homemade Pasta or Spaghetti for Kitchenaid Mixers', 'cook_time': 'PT15M', 'prep_time': 'PT2H', 'total_time': 'PT2H15M', 'recipe_c"
35      }
36    ]
37  },
38  {
39    "role": "assistant",
40    "content": [
41      {
42        "type": "text",
43        "text": "<search_quality_reflection>\n\nThe initial search provided some potentially relevant pasta recipes, but many of them seem to take longer than an hour to prepare or have unclear preparation"
44      },
45      {
46        "type": "tool_use",
47        "id": "toolu_bdrk_01QqbJfPkx5Ligxy6P9FGunx",
48        "name": "query_food_recipe_vector_db",
49        "input": {
50          "queries": [
```

Dynamic Function Calling

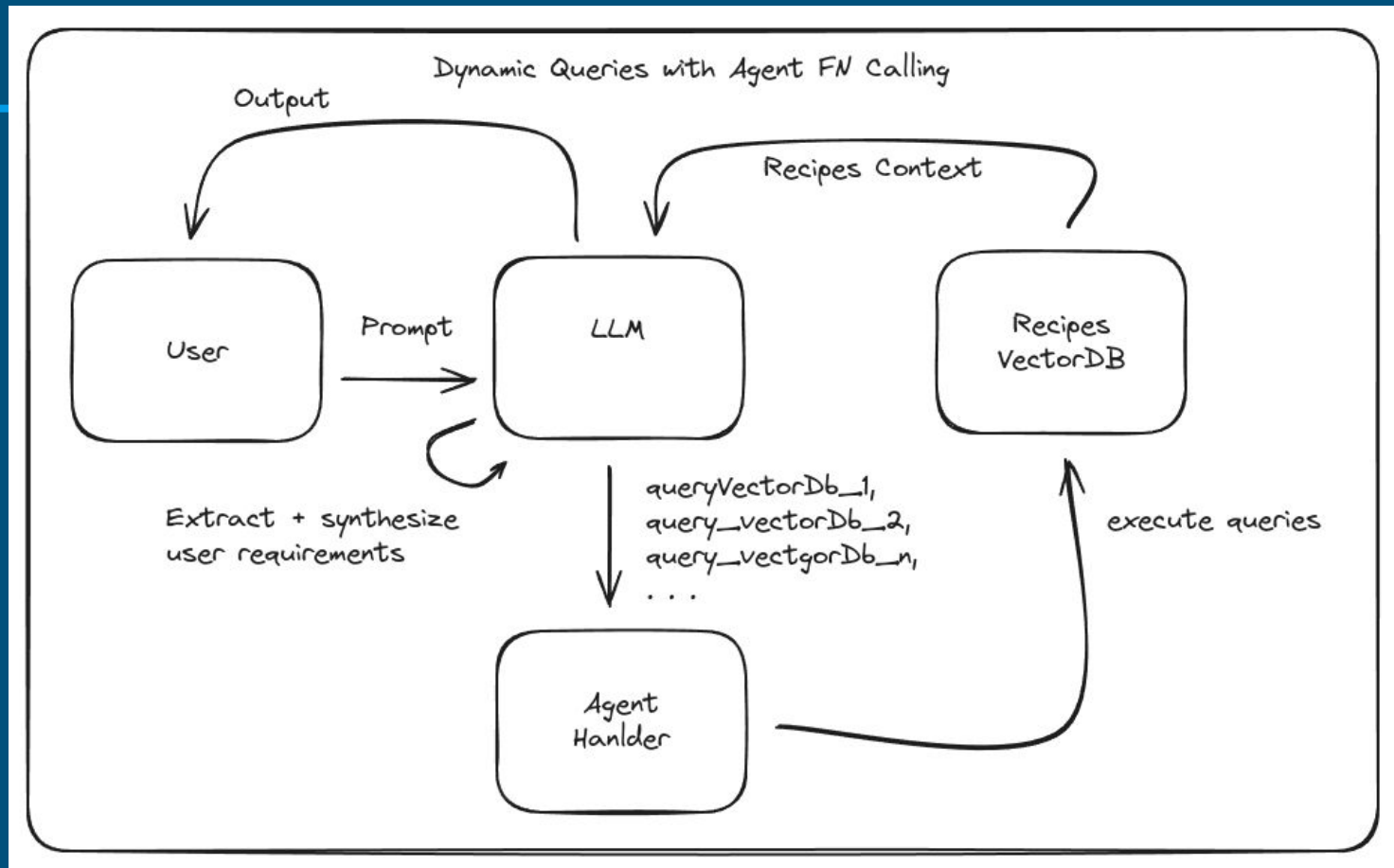
To move canvas, hold mouse wheel or spacebar while dragging, or use the hand tool

Static RAG Architecture

Output



Dynamic Function Calling



Dynamic Function Calling

Debug Panel

Selected View

MSG HISTORY

FN CALLS

```
[
  {
    "type": "text",
    "text": "I'm making dinner for four today but I need to be able to prepare it under 45 minutes. My family prefers Asian flavors."
  },
  {
    "type": "tool_use",
    "id": "toolu_bdrk_019EswvbeWFB3hTzJ2TqEjKE",
    "name": "query_food_recipe_vector_db",
    "input": {
      "queries": [
        "asian recipes",
        "quick recipes under 45 minutes",
        "dinner for 4 people"
      ]
    }
  }
]
```

×

Debug Panel

Selected View

MSG HISTORY

FN CALLS

I'm making dinner for four today but I need to be able to prepare it under 45 minutes. My family prefers Asian flavors.

```
{"queries":["asian recipes","quick recipes under 45 minutes","dinner for 4 people"]}
```

```
{"queries":["Bang Bang Shrimp recipe","Asian Beef and Noodles recipe"]}
```

I forgot to mention, my family is strictly vegetarian

```
{"queries":["vegetarian asian recipes","quick under 45 minutes","dinner for 4"]}
```


Data set

Data set

- Food.com recipes via Kaggle
- 541,383 unique recipes
- 28 columns
- Collected from 1999-2020



Usage in RAG

1. **Indexing (A way to find the recipes)**
 - a. Create new column by concat these columns:
 - i. RecipeName
 - ii. Description
 - iii. RecipeCategory
 - iv. Keywords
2. **Retrieval (The information for the LLM)**
 - i. RecipeIngredients
 - ii. RecipeIngredientQuantities
 - iii. Nutrition Information
 - iv. CookingTime
 - v. RecipeServings
 - vi. RecipeInstructions

Example RAG

Query

"I want a recipe for seasoning a prime rib and vegetables with cognac"

Index

High cosine similarity with recipe 522513:

Roast Prime Rib au Poivre Mixed Peppercorns Low Carbs White, black, green, pink peppercorns add wonderful flavor special prime rib. possible, search butcher carries dry-aged beef-it's tender, flavorful, juicy non-aged variety. full-bodied California Cabernet Sauvignon French Bordeaux perfect wine serve. vegetables, mix butter tarragon cooked baby carrots green beans delicious accompaniment. High Protein High In... < 4 Hours

Retrieval

Instructions:

Position rack in center of oven and preheat to 450°F. Place beef, fat side up, in shallow roasting pan. Sprinkle beef with salt. Mix mustard and garlic in small bowl. Spread mustard mixture over top of beef. Sprinkle 2 tablespoons crushed peppercorns over mustard mixture.", "Roast beef 15 minutes. Reduce heat to 325° F. Roast until meat thermometer inserted into center of beef registers 125°F. for medium-rare, tenting loosely with foil if crust browns too quickly, about 2 hours 45 minutes. Transfer beef to platter. Tent with foil to keep warm.

Ingredients:

Dijon mustard - 2, garlic - 4, peppercorns - 2, shallot - 1/3, cognac - 3.5, brandy - 1/3

Nutrition:

Calories - 2063.4,, Fat - 172.4, SaturatedFat - 71.4, Cholesterol - 433.8, Sodium - 766.3, Carbohydrate - 3.2, Fiber - 0.7, Sugar - 0.1, Protein - 117

Evaluation - What is a good Recipe?

- LLM as a Judge - Judge the Quality of the response
- LLM as a Gatekeeper - Does not violate user requests

```
Model: func_call_rerank
User Query:
I have a peanut allergy but I like thai food. I also don't enjoy spicy food much, and want a meal with low carbs. Give a recipe with ingredients and instructions.
```

```
Recipe reviewed:
Thai Shrimp and Vegetable Curry
```

```
Score: 4
```

```
Reasoning:
1. Accuracy: The recipe closely matches the user's query, providing a Thai-inspired dish that is peanut-free and low in carbs. The specified dietary restrictions and preferences are well-addressed.
2. Clarity: The instructions are clear and easy to follow, with precise cooking times and temperatures.
3. Creativity: The recipe demonstrates a creative approach by using shrimp and a variety of vegetables in a coconut milk-based curry, which is a unique twist on a classic Thai dish.
4. Completeness: The recipe includes all necessary details, such as ingredient measurements, preparation steps, and serving suggestions.
5. Healthiness: The recipe provides a balanced nutritional profile, with a focus on lean protein, vegetables, and healthy fats from the coconut milk. It aligns well with the user's dietary considerations.
6. User Feedback: The recipe is likely to receive high ratings from users for its taste and ease of preparation, making it an appealing option for those with peanut allergies and a preference for low-spice, low-carb meals.
=====
```

```
Model: rerank
Yes, the response correctly follows the user's request. The generated recipe suggestions are peanut-free and appropriate for someone with a peanut allergy.
=====
```

```
Model: rerank
Yes, the response correctly follows the user's request for a vegan breakfast recipe.
=====
```

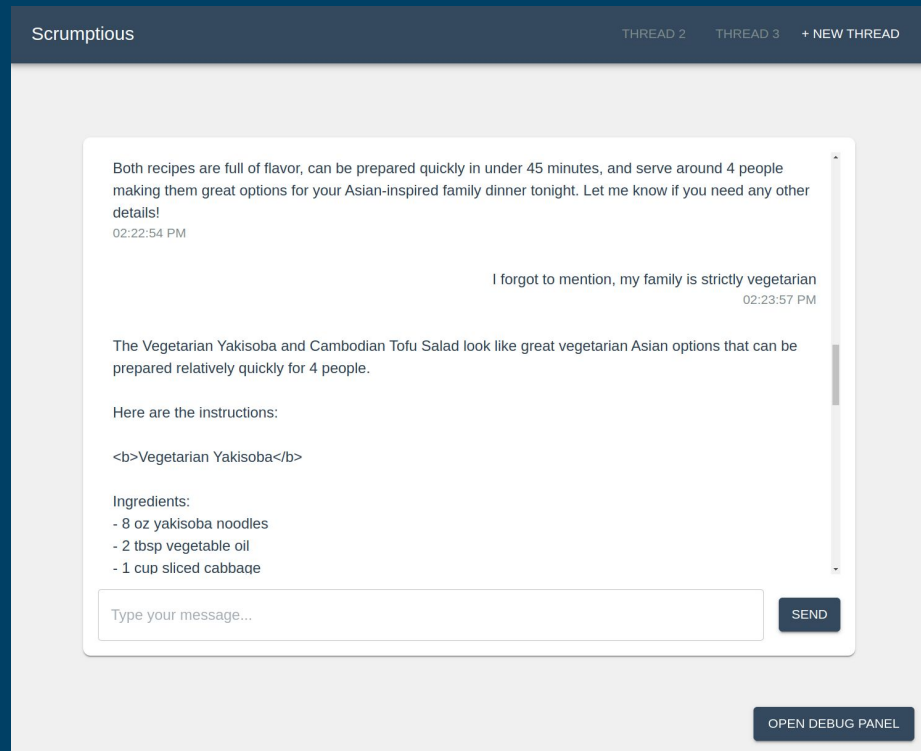
```
Model: rerank
Yes, the response correctly follows the user's request for a dairy-free pasta recipe.
=====
```

Remaining Items

- Testing and Tuning of RAG hyperparameters
 - Seek for better response based on Evaluation result
- Deployment and Hosting
 - Implementation with Web Search
- Human Eval - User Survey of how well the generated recipes are

Conclusion

Our mission is to help households reduce food waste by turning overlooked ingredients into delicious meals, promoting health and sustainability one recipe at a time.



Live Demo
