

## Gen AI Bootcamp

# Group 3 AI Recipe Tutor

Team members:

Caleb Lin, Evelyn Tseng, Elva Yang

Coaches:

Mencher Chiang, Yu-Sheng Li

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## Zesty Lemon Garlic Shrimp Pasta

SERVINGS: 4

PREPPING TIME: 15 MIN

COOKING TIME: 20 MIN

### Ingredients

8 oz linguine pasta  
2 tbsp olive oil  
1 lb large shrimp, peeled and deveined  
Salt to taste  
Black pepper to taste  
1 tbsp minced garlic  
1 tsp red pepper flakes  
1/2 cup chicken broth  
1 cup fresh lemon juice  
Zest of 1 lemon  
1/2 cup finely chopped fresh parsley  
Grated Parmesan cheese for serving

### Instructions

- **Cook the pasta:** Bring a large pot of salted water to a boil. Add the linguine and cook until al dente, according to the package instructions. Drain and set aside.
- **Prepare the shrimp:** Meanwhile, heat the olive oil in a large skillet over medium-high heat. Add the shrimp, season with salt and pepper, and sauté until they turn pink, about 2-3 minutes per side. Remove the shrimp from the skillet and set aside.
- **Make the sauce:** In the same skillet, add the minced garlic and red pepper flakes. Cook until the garlic is fragrant, about 1 minute. Stir in the chicken broth, lemon juice, and lemon zest. Bring the mixture to a simmer and cook for about 5 minutes, or until the sauce has reduced by half.
- **Combine the pasta and shrimp with the sauce:** Return the shrimp to the skillet. Add the cooked pasta and toss to combine, making sure the pasta is well-coated with the sauce.
- **Serve:** Remove the skillet from the heat. Sprinkle with the chopped fresh parsley and grated Parmesan cheese. Serve immediately.

# Introduction

## Objective

Develop an AI-powered chatbot that assists users in learning cooking techniques and designing recipes based on their dietary preferences

## Bot's Goal

- Acts as an AI-powered recipe tutor specializing in personalized cooking guidance.
- Provides recipes, ingredient lists, step-by-step instructions, and estimated cooking times.
- Adapts to dietary restrictions such as vegetarian, gluten-free, or low-carb preferences.
- Offers corrections and tips when users make mistakes or express confusion.
- Uses search grounding for real-time trends and accurate recipe information.

# What Makes Us Unique

## User Interaction & Experience

- **Conversational AI** with a simple text-based interaction loop.
- Friendly and engaging tone to **simulate a helpful cooking tutor**.
- **Image-based recipe recognition** allows users to upload dish photos for identification and recipe suggestion.

## AI Assistant Logic

- **Defined personality and responsibilities** through system prompts.
- **Search grounding and dynamic responses** enable real-time recipe retrieval, trend updates, and personalized suggestions based on user preferences.
- **AI-powered image analysis** identifies dishes from uploaded photos and suggests possible recipes.



# Technical Implementation

## System Prompt

Defines AI's role, expertise, and behavior.

## AI Response Generation

Uses a pre-trained model (**Gemini-2.0-flash**) to generate informative responses.

## User Input Handling

Accepts free-text input for flexibility and allows users to **upload food images for recipe identification**.

## Looping Mechanism

Allows continuous conversation until the user decides to exit.

## Search Grounding

Queries external sources for up-to-date recipe trends and real-time ingredient information

# Challenges & Solutions

## Challenges

- **No suitable existing database for RAG**  
→ Hard to retrieve structured recipe data
- **Web scraping is too slow**  
→ Delays in fetching recipes.
- **Expanding functionality**  
→ Lacks interactive and visual elements

## Solutions

- **Use web scraping** to gather structured data
- **Switch to search grounding** for faster retrieval
- **Integrate image recognition** to identify ingredients and suggest recipes

How do we make this an usable AI in daily life?

# Demo!

<https://github.com/caleblin125/CookingTutor/tree/main>

# RAG-based

Self-created simple dataset:

recipe_name	Cuisine	Ingredients	Instructions	prep_time	cook_time	total_time	Servings	Website	
4-Ingredient Orange Chicken	Chinese	1 cup orange marmalade, ½ cup Kansas City-	1. Preheat the oven to 400 degrees F (200	5	20	25	4	<a href="https://www.allr">https://www.allr</a>	
Veggie Lo Mein	Chinese	1/3 cup low-sodium soy sauce, 1 1/2 tablespo	1. Whisk soy sauce, hoisin sauce, sesame o	15	15	30	4	<a href="https://www.allr">https://www.allr</a>	
Pappardelle with Jammy Onion Ragù	Italian	7 tablespoons butter divided, 8 cups yellow o	1. Melt 5 tablespoons butter in a very larg	15	50	65	6	<a href="https://www.allr">https://www.allr</a>	
German Apple Cake	German	1 cup vegetable oil, 2 large eggs, 2 cups whit	1. Preheat the oven to 350 degrees F (175	15	45	60	24	<a href="https://www.allr">https://www.allr</a>	
Beef Miso Ramen	Japanese	1 (8 ounce) beef sirloin steak, ½ cup gluten-fr	1. Combine steak and soy sauce in a plastic	10	15	25	2	<a href="https://www.allr">https://www.allr</a>	
Chicken Teriyaki	Japanese	1 cup low-sodium soy sauce, 1/4 cup sake, 3 t	1. Combine soy sauce, sake, rice vinegar, a	10	15	25	3	<a href="https://www.allr">https://www.allr</a>	
Miso Soup	Japanese	4 cups water, 2 teaspoons dashi granules, 3 t	1. Gather all ingredients.\n2. Combine wat	5	10	15	4	<a href="https://www.allr">https://www.allr</a>	
Japanese-Style Rolled Omelet (Tamagoyaki)	Japanese	4 large eggs, 4 teaspoons water, 1 teaspoon	1. Add eggs to a bowl, along with water, s	10	10	20	2	<a href="https://www.allr">https://www.allr</a>	
Easy Mochi	Japanese	1 cup sweetened red bean paste, 1 cup glutir	1. Gather all ingredients.\n2. Wrap red be	90	5	95	8	<a href="https://www.allr">https://www.allr</a>	
Japanese-Style Deep-Fried Shrimp	Japanese	1 pound medium shrimp, peeled (tails left on	1. Gather all ingredients.\n2. Place shrimp	10	15	25	4	<a href="https://www.allr">https://www.allr</a>	

**Retrieve the recipe from the database using its name.**

→ If found, use the database content.

→ If not found, skip the database content and generate the recipe using Gemini.

## Scenario for using the database content:

🗨️ AI Recipe Tutor: Hello! I'm your AI recipe assistant for any cooking & recipe question you have!

👤: How to make easy mochi?

🗨️ AI Recipe Tutor: I found this recipe easy mochi in the database:

Cuisine: Japanese

Ingredients: 1 cup sweetened red bean paste, 1 cup glutinous rice flour, 1 teaspoon green tea powder (matcha), 1 cup water

Instruction: 1. Gather all ingredients. \n2. Wrap red bean paste in aluminum foil and place in the freezer until solid, about 1 hour.

prep\_time: 90

cook\_time: 5

total\_time: 95

Servings: 8

Website: <https://www.allrecipes.com/recipe/193307/easy-mochi/>

Need more details or adjustments?





## Scenario for skipping the database content and generating the recipe using Gemini:



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👤: How to make pasta?  
 • AI Recipe Tutor: Okay, let's learn how to make pasta! This is a foundational skill, and once you nail the basics, you

**\*\*Dietary Notes:\*\*** This recipe is naturally vegetarian and vegan. To make it gluten-free, simply use gluten-free pasta.

**\*\*Yields:\*\*** 2 servings

**\*\*Prep time:\*\*** 5 minutes

**\*\*Cook time:\*\*** 15 minutes

**\*\*Ingredients:\*\***

- \* 8 ounces (225g) spaghetti (or any long pasta like linguine or fettuccine)
- \* 1/4 cup extra virgin olive oil
- \* 4-6 cloves garlic, thinly sliced (adjust to your preference)
- \* 1/4 teaspoon red pepper flakes (or more, to taste)
- \* 1/4 cup reserved pasta water (this is KEY!)
- \* Salt, to taste
- \* Freshly ground black pepper, to taste
- \* 2 tablespoons chopped fresh parsley, for garnish (optional, but recommended)
- \* Grated Parmesan cheese, for serving (optional, but not traditional)

**\*\*Equipment:\*\***

- \* Large pot
- \* Colander
- \* Large skillet or pan

**\*\*Instructions:\*\***

1. **\*\*Boil the Pasta:\*\*** Fill a large pot with generously salted water (the water should taste like the sea!). Bring to a boil.
2. **\*\*Prepare the Garlic and Oil:\*\*** While the pasta is cooking, heat the olive oil in a large skillet or pan over medium heat.
3. **\*\*Reserve Pasta Water:\*\*** Before draining the pasta, use a measuring cup to reserve about 1/4 cup of the pasta water.
4. **\*\*Combine and Emulsify:\*\*** Drain the pasta in a colander, but do *not* rinse it. Immediately add the drained pasta to the skillet.
5. **\*\*Emulsify the Sauce:\*\*** This is where the magic happens! Increase the heat to medium. Using tongs, continue to toss the pasta and sauce.
6. **\*\*Season and Serve:\*\*** Season with salt and freshly ground black pepper to taste. Stir in the chopped parsley (if using).

**\*\*Tips and Troubleshooting:\*\***

- \* **\*\*Salt the Pasta Water:\*\*** This is your only chance to season the pasta itself. Don't be shy with the salt!
- \* **\*\*Don't Burn the Garlic:\*\*** I cannot stress this enough. Burnt garlic ruins the whole dish. Keep the heat low and watch it closely.
- \* **\*\*Pasta Water is Your Friend:\*\*** Seriously, don't forget it! It's what makes the sauce creamy and helps it cling to the pasta.
- \* **\*\*Emulsification is Key:\*\*** The goal is to create a creamy sauce, not just oily pasta. Toss vigorously to combine the pasta and sauce.
- \* **\*\*Spice Level:\*\*** Adjust the amount of red pepper flakes to your liking. Start with a small amount and add more if you like it spicy.
- \* **\*\*Variations:\*\*** Once you master this basic recipe, you can add other ingredients like:
  - \* Cooked shrimp or other seafood
  - \* Sautéed vegetables (like broccoli, spinach, or mushrooms)
  - \* Sun-dried tomatoes
  - \* Lemon zest

**\*\*Now, do you have any questions about any of these steps? Perhaps you're unsure about what "emulsify" means, or maybe**

# Why Choose Search Grounding Over RAG?

	Search Grounding	RAG
Overview	Real-time queries fetch the latest information.	Uses an internal vector database
Information Update Speed	Always retrieves real-time information, ideal for dynamic content.	Requires periodic updates, risking outdated data
Development & Maintenance Costs	Uses search engines, reducing maintenance and costs.	Needs database setup, data scraping, and maintenance.
Query Speed	Fetches results directly, usually faster.	Slower with larger datasets, hardware-dependent.
Relevance & Misinformation Risks	Provides more reliable results through search engine matching.	May return irrelevant data or hallucinate if the database is lacking.
Use Cases	News, regulations, market trends, real-time updates.	Internal knowledge bases, FAQs, private data queries.

# Demo for the main AI Recipe Tutor

[https://github.com/caleblin125/Cooking  
Tutor/tree/main](https://github.com/caleblin125/CookingTutor/tree/main)

# Conclusion

The AI Recipe Tutor project demonstrates how AI can enhance culinary learning by offering personalized, dynamic, and engaging recipe assistance.

With further improvements, such as enhanced search grounding, better image-based recipe recognition, **multilingual support**, and **the ability to generate visualized cooking charts and ingredient breakdowns**, it can become a powerful tool for home cooks and food enthusiasts worldwide.



# Questions or Feedback?