
CAPSTONE PROJECT

RECIPE PREPARATION AGENT

Presented By:

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OUTLINE

- **Problem Statement**
- **Proposed Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT

Statement 16.

The **Recipe Preparation Agent** helps users cook meals using only the ingredients they have on hand. By inputting available groceries, users receive tailored recipe suggestions using a RAG-based AI system. The agent retrieves relevant recipes and generates step-by-step instructions adapted to ingredient limitations. It offers substitutions, cooking tips, and dietary adjustments based on user preferences or restrictions. Designed to reduce food waste and save time, it turns pantry items into practical meal solutions.

This AI assistant makes everyday cooking smarter, simpler, and more sustainable.

PROPOSED SOLUTION

The proposed system addresses the challenge of helping users cook meals based on the limited ingredients they have on hand. By leveraging IBM Cloud's Watsonx, Granite LLMs, and Agent Lab, the solution uses advanced AI techniques to retrieve and generate custom recipe suggestions while minimizing food waste and optimizing user experience. The solution will consist of the following components:

- **Data Collection**
 - A dataset of ~13,000 structured recipes by Joseph R. Martinez is uploaded to IBM Cloud Object Storage.
 - Each recipe contains ingredients, instructions, cuisine tags, and dietary details.
- **Retrieval Mechanism (RAG-based)**
 - The system uses a Retrieval-Augmented Generation (RAG) approach to fetch relevant recipes based on the user's input ingredients.
 - Recipes are retrieved using semantic similarity from the stored dataset.
- **AI-Powered Adaptation using Watsonx Granite Models**
 - The retrieved recipe is passed to IBM's Granite foundation model to adapt the instructions based on ingredient availability.
 - Cooking tips and modifications are suggested according to the user's dietary preferences.
- **Agentic Workflow (Agent Lab)**
 - The entire logic is implemented as an AI agent within Watsonx Agent Lab.
 - The agent combines retrieval, prompt engineering, and model inference in a single workflow.
- **Deployment**
 - The AI agent is deployed through Watsonx Runtime and accessed via the Endpoint URL.
 - This ensures scalability and seamless user interaction.
- **Evaluation**
 - The system is tested based on user satisfaction, relevance of suggested recipes, and response accuracy.
 - Future improvements include user feedback integration for recipe quality and personalization tuning.

SYSTEM APPROACH

The "System Approach" section outlines the overall strategy and methodology for developing and implementing the Recipe Preparation Agent using IBM Cloud services. The system leverages AI and RAG-based techniques integrated via Agent Lab to deliver customized recipe recommendations. Here's the structure for this section:

- **System Requirements**
 - IBM Cloud account
 - Watsonx.ai access with Agent Lab enabled
 - IBM Granite 8-8-3b-instruct model
 - IBM Cloud Object Storage (for uploading the recipe dataset)
 - Recipe Dataset: ~13,000 structured recipes
- **Libraries & Tools Used**
 - IBM Watsonx Agent Lab (for creating and deploying agents)
 - Watsonx Runtime (for executing LLMs via endpoint)
 - IBM Granite LLM APIs (for recipe adaptation and text generation)
 - Prompt Engineering Techniques (used within agent tools for tailoring outputs)

ALGORITHM & DEPLOYMENT

- This section outlines the algorithmic foundation and deployment strategy for the Recipe Preparation Agent. The solution utilizes a **Retrieval-Augmented Generation (RAG)** approach integrated with IBM's **Granite large language models**, enabling personalized recipe generation based on user-provided ingredients.
- **Algorithm Selection:**
 - The system uses a RAG (Retrieval-Augmented Generation) architecture. This approach combines:
 - **Retrieval** of relevant recipe documents from a dataset stored in IBM Cloud Object Storage
 - **Generation** of custom recipe instructions using the **IBM Granite LLM** hosted on Watsonx
 - RAG is chosen for its strength in handling open-ended user queries by grounding generation on reliable, retrieved documents — ideal for cooking scenarios with dynamic ingredients and preferences.
- **Data Input:**

The input to the system includes:

 - A list of available ingredients entered by the user
 - Optional preferences such as dietary restrictions or cuisine type
 - These inputs are passed to the Watsonx agent, which uses them to guide the retrieval and generation process.

GENERATION PROCESS AND DEPLOYMENT

■ Generation Process

- Retrieved recipes are fed into IBM's **Granite foundation model** via the Watsonx Runtime
- The model adapts instructions to:
 - Remove unavailable ingredients
 - Suggest substitutions
 - Offer dietary/cooking tips
- The generation process is controlled via **prompt engineering** inside the Agent Lab environment

■ Deployment

- The final AI agent is deployed in **Watsonx Agent Lab's Deployment Service**.
- This allows easy integration into web interfaces or other client applications
- The system supports **scalable** and **real-time interaction**

DEPLOYMENT PROOF 01/02

Successfully deployed project.

The screenshot shows a web browser window with the URL `datapatform.cloud.ibm.com/ml-runtime/spaces/aea5b853-e94d-4a5f-be49-882b2f947b43/deployments`. The page title is "Recipe Preparation Agent's Space". The "Deployments" tab is selected, showing a table with one deployment: "Recipe Preparation Agent". The deployment is "Online" and "Deployed". The asset is "Recipe Preparation Agent" (Ai service) with the tag "wx-agent". It was last modified "4 hours ago" by "Priyanshu Kamal (You)".

Deployment spaces /

Recipe Preparation Agent's Space

Overview Assets **Deployments** Jobs Manage

🔍 Search

Name	Type	Status	Asset	Asset type	Tags	Last modified
Recipe Preparation Agent	Online	✅ Deployed	Recipe Preparation Agent	Ai service	wx-agent	4 hours ago Priyanshu Kamal (You)

Items per page: 20 1-1 of 1 items 1 of 1 pages

4 30°C Light rain Search ENG IN 20:12 02-08-2025

DEPLOYMENT PROOF 02/02

The screenshot shows a web browser window displaying the IBM Watsonx deployment page for the 'Recipe Preparation Agent'. The browser's address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx`. The page header includes the IBM Watsonx logo, an 'Upgrade' button, and user information for 'Priyanshu Kamal's Account' in 'Dallas'. The breadcrumb trail is 'Deployment spaces / Recipe Preparation Agent's Space / Recipe Preparation Agent /'. The main content area shows the agent is 'Deployed' and 'Online'. There are three tabs: 'API reference' (selected), 'Test', and 'Preview'. The 'API reference' tab displays 'Endpoints for inferencing' with two sections: 'Private endpoint' and 'Public endpoint'. Each section contains two URLs and a 'Bearer <token>' field with the value 'IAM'. Below the endpoints is a link to 'Learn more about the 2021-05-01 version query parameter'. At the bottom, there is a 'Code snippets' section with tabs for 'cURL', 'Java', 'JavaScript', 'Python', and 'Scala'. On the right side, a sidebar titled 'About this deployment' provides details: Name (Recipe Preparation Agent), Description (I am an AI-powered assistant that generates personalized recipes based on ingredients users have.), Deployment Details (Deployment ID: 33afd977-b71c-47..., Serving name: No serving name., Software specification: runtime-24.1-py3.11, Hardware specification: Extra extra small: 1 CPU and 2 GB RAM, Copies: 1), Tags (wx-agent), and Associated asset (Recipe Preparation Agent, 22e566c3-c9ee-4acc-8e72-c2e4a34ab642). The Windows taskbar at the bottom shows the date as 02-08-2025 and time as 20:12.

Deployment spaces / Recipe Preparation Agent's Space / Recipe Preparation Agent /

Recipe Preparation Agent Deployed Online

API reference Test Preview

Endpoints for inferencing ⓘ

Private endpoint

`https://us-south.ml.cloud.ibm.com/ml/v4/deployments/33afd977-b71c-4738-8c32-1412521bad7e/ai_service?version=2021-05-01`

`https://us-south.ml.cloud.ibm.com/ml/v4/deployments/33afd977-b71c-4738-8c32-1412521bad7e/ai_service?version=2021-05-01`

Public endpoint

`https://us-south.ml.cloud.ibm.com/ml/v4/deployments/33afd977-b71c-4738-8c32-1412521bad7e/ai_service?version=2021-05-01`

`https://us-south.ml.cloud.ibm.com/ml/v4/deployments/33afd977-b71c-4738-8c32-1412521bad7e/ai_service?version=2021-05-01`

[Learn more](#) about the 2021-05-01 version query parameter

Code snippets

cURL	Java	JavaScript	Python	Scala
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About this deployment

Name
Recipe Preparation Agent

Description
I am an AI-powered assistant that generates personalized recipes based on ingredients users have.

Deployment Details
Deployment ID: 33afd977-b71c-47...
Serving name: No serving name.
Software specification: runtime-24.1-py3.11
Hardware specification: Extra extra small: 1 CPU and 2 GB RAM
Copies: 1

Tags
wx-agent

Associated asset
Recipe Preparation Agent
22e566c3-c9ee-4acc-8e72-c2e4a34ab642

RESULT

The Recipe Preparation Agent successfully generates personalized recipe instructions tailored to the user's available ingredients and dietary preferences. The system demonstrates effectiveness in retrieving and adapting recipe content using the RAG approach powered by IBM's Granite foundation model.

■ Observed Outcomes

- The agent retrieves **relevant recipes** with high semantic match to user-provided ingredients.
- IBM Granite LLM accurately **adapts instructions**, removes unavailable items, and suggests valid substitutions.
- Users receive **complete, step-by-step cooking instructions** tailored to their constraints and preferences.

■ Examples of Output

- Given: *“eggs, tomatoes, onions, rice”*
Output: *Tomato Egg Fried Rice* with precise steps, suggested substitutions like *“use green peas instead of bell peppers”*, and tips such as *“best served with chutney or yogurt.”*

Visuals in forthcoming slides.

TEST RESULT 01 – 1/3

Input – “I have rice, pulses, capsicum and beans.”

The screenshot displays the IBM Watsonx interface for the Recipe Preparation Agent. The browser address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The page title is "Recipe Preparation Agent" with status indicators "Deployed" and "Online". The "Preview" tab is selected, showing a chat history. The user's input is "I have rice, pulses, capsicum and beans." The agent's response is as follows:

Title: Rice, Pulses, Capsicum, and Beans Stir-Fry

Prep Time: 10 minutes **Cook Time:** 15 minutes **Servings:** 2

Ingredients Used:

- Rice
- Pulses (used instead of lentils)
- Capsicum (used instead of bell peppers)
- Beans (used instead of green beans)

The interface also includes a "New chat" button and a search bar at the bottom.

TEST RESULT 01 – 2/3

The screenshot displays a web browser window with the URL `datapatform.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The browser's address bar shows the IBM Watsonx logo and the user's account, Priyanshu Kamal's Account, with a location of Dallas. The page title is "Recipe Preparation Agent" and it is marked as "Deployed" and "Online". The interface has three tabs: "API reference", "Test", and "Preview", with the "Preview" tab selected. The "Preview" tab shows a recipe for "Beans (used instead of green beans)". The recipe includes a list of instructions and tips. The instructions are: 1. Cook the rice according to package instructions. Set aside. 2. In a large pan, heat a tablespoon of oil over medium heat. 3. Add the pulses and beans to the pan. Stir-fry for 5 minutes. 4. Add diced capsicum and continue to stir-fry for another 5 minutes. 5. In a small bowl, mix together 2 tablespoons of soy sauce, 1 tablespoon of sesame oil, and a pinch of sugar. 6. Pour the sauce over the stir-fried pulses, beans, and capsicum. Mix well to coat. 7. Continue to cook for another 5 minutes, until the vegetables are tender but still crisp. 8. Serve the stir-fry hot over the cooked rice. The tips are: • Make sure to clean and cut your vegetables into similar-sized pieces for even cooking. • If you don't have sesame oil, you can use regular cooking oil. At the bottom of the preview, there is a text input field with the placeholder "Type something..." and a "Send" button. The browser's taskbar at the bottom shows the Windows logo, a search bar, and various application icons. The system tray on the right shows the date and time as 15:19 on 02-08-2025, along with icons for network, volume, and power.

Recipe Preparation Agent Deployed Online

API reference Test **Preview**

Beans (used instead of green beans)

Instructions:

1. Cook the rice according to package instructions. Set aside.
2. In a large pan, heat a tablespoon of oil over medium heat.
3. Add the pulses and beans to the pan. Stir-fry for 5 minutes.
4. Add diced capsicum and continue to stir-fry for another 5 minutes.
5. In a small bowl, mix together 2 tablespoons of soy sauce, 1 tablespoon of sesame oil, and a pinch of sugar.
6. Pour the sauce over the stir-fried pulses, beans, and capsicum. Mix well to coat.
7. Continue to cook for another 5 minutes, until the vegetables are tender but still crisp.
8. Serve the stir-fry hot over the cooked rice.

Tips:

- Make sure to clean and cut your vegetables into similar-sized pieces for even cooking.
- If you don't have sesame oil, you can use regular cooking oil.

Type something... Send

TEST RESULT 01 – 3/3

The screenshot displays the IBM Watsonx web interface. The browser address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The page title is "Recipe Preparation Agent" with a status of "Deployed" and "Online". The "Preview" tab is selected, showing a chat interface with a list of instructions for preparing a dish. The instructions include: "Make sure to clean and cut your vegetables into similar-sized pieces for even cooking.", "If you don't have sesame oil, you can use regular cooking oil.", and "For extra flavor, add some minced garlic or ginger when sautéing the vegetables." Below these are "Optional Notes" and a "Dietary Note" stating the recipe is vegetarian and suitable for most dietary preferences. The chat interface also includes a "New chat" button and a text input field with the placeholder "Type something...".

Recipe Preparation Agent Deployed Online

API reference Test **Preview**

[New chat](#) +

Recipe Preparation Agent

- Make sure to clean and cut your vegetables into similar-sized pieces for even cooking.
- If you don't have sesame oil, you can use regular cooking oil.
- For extra flavor, add some minced garlic or ginger when sautéing the vegetables.

Optional Notes:

- Adding some chopped scallions or a sprinkle of sesame seeds on top can enhance the presentation.
- For a spicier dish, consider adding a pinch of red pepper flakes.

Dietary Note: This recipe is vegetarian and suitable for most dietary preferences. If you need it to be gluten-free, ensure you're using tamari instead of soy sauce.

Enjoy your meal!

► How did I get this answer?

Type something...

TEST RESULT 02 – 1/3

Input – “I have tomatoes, onions, garlic, and pasta. Can you suggest a simple dinner recipe.”

The screenshot displays the IBM Watsonx web interface. At the top, the browser address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The page header includes the IBM Watsonx logo, an 'Upgrade' button, and user information for 'Priyanshu Kamal's Account' in 'Dallas'. The breadcrumb trail indicates the location: 'Deployment spaces / Recipe Preparation Agent's Space / Recipe Preparation Agent /'. The main heading is 'Recipe Preparation Agent', with status indicators 'Deployed' (green checkmark) and 'Online' (grey button). Below this are tabs for 'API reference', 'Test', and 'Preview', with 'Preview' being the active tab. A 'New chat +' button is located in the top right of the chat area. The chat history shows a user message at 03:17 PM: 'I have tomatoes, onions, garlic, and pasta. Can you suggest a simple dinner recipe?'. The agent's response, also at 03:17 PM, provides the following details: 'Title: Simple Garlic Tomato Pasta', 'Prep Time: 15 minutes Cook Time: 15 minutes Servings: 2', and a list of 'Ingredients Used: Pasta, Tomatoes, Onion, Garlic'. At the bottom of the chat area is a text input field with the placeholder 'Type something...' and a send button. The Windows taskbar at the very bottom shows the system clock as 15:17 on 02-08-2025, along with weather (31°C, Partly sunny) and various application icons.

TEST RESULT 02 – 2/3

The screenshot displays the IBM Watsonx interface for the 'Recipe Preparation Agent'. The browser address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The page header includes the IBM Watsonx logo, an 'Upgrade' button, and user information for 'Priyanshu Kamal's Account' in 'Dallas'. The breadcrumb trail is: [Deployment spaces](#) / [Recipe Preparation Agent's Space](#) / [Recipe Preparation Agent](#) /.

The main heading is 'Recipe Preparation Agent' with status indicators 'Deployed' (green checkmark) and 'Online' (grey button). Below this are three tabs: 'API reference', 'Test', and 'Preview' (which is active). A 'New chat +' button is located in the top right corner of the chat area.

The chat area contains the following text:

Garlic

Oil (or butter if available)

Salt

Red pepper flakes (optional)

Instructions:

1. Bring a large pot of salted water to a boil. Add your pasta and cook according to package instructions until al dente. Reserve 1 cup of pasta water before draining.
2. While the pasta cooks, heat a drizzle of oil (or a small knob of butter if you have it) in a large pan over medium heat. Add chopped onions and sauté until translucent.
3. Add minced garlic to the pan and cook for another minute until fragrant.
4. Add diced tomatoes to the pan. Season with salt and red pepper flakes (if using). Let it simmer for about 10 minutes.

At the bottom of the chat area is a text input field with the placeholder text 'Type something...' and a send button (arrow icon).

The Windows taskbar at the bottom shows the system clock as 15:17 on 02-08-2023, the language as ENG IN, and the weather as 31°C Partly sunny.

TEST RESULT 02 – 3/3

The screenshot displays the IBM Watsonx web interface. The browser address bar shows the URL: `datapatform.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The page header includes the IBM Watsonx logo, an 'Upgrade' button, and user information for 'Priyanshu Kamal's Account' in 'Dallas'. The breadcrumb trail indicates the location: 'Deployment spaces / Recipe Preparation Agent's Space / Recipe Preparation Agent /'. The main heading is 'Recipe Preparation Agent', with status indicators 'Deployed' (green checkmark) and 'Online' (grey pill). Below this are tabs for 'API reference', 'Test', and 'Preview', with 'Preview' being the active tab. The 'Preview' section shows a chat interface with a message: 'reserved pasta water if needed to create a smooth sauce.' followed by a numbered step: '6. Serve hot, garnished with extra cheese or fresh basale leaves if you have them.' Below this are sections for 'Tips:' (bullet points about reserving pasta water and adding spices), 'Optional Notes:' (bullet points about toasting breadcrumbs and adding herbs), and a 'Dietary Note' stating the recipe is vegetarian and gluten-free. At the bottom of the chat area is a text input field with the placeholder 'Type something...' and a send button. The Windows taskbar at the bottom shows the date as 02-08-2025 and time as 15:17.

Deployment spaces / Recipe Preparation Agent's Space / Recipe Preparation Agent /

Recipe Preparation Agent ✓ Deployed Online

API reference Test **Preview**

New chat +

reserved pasta water if needed to create a smooth sauce.

6. Serve hot, garnished with extra cheese or fresh basale leaves if you have them.

Tips:

- Make sure to reserve some pasta water before draining. The starchy water can help adjust the sauce's consistency.
- If you like it spicy, add more red pepper flakes or a pinch of chili powder.

Optional Notes:

- For added flavor, you could toast some breadcrumbs in a dry pan and sprinkle them over the finished dish.
- Fresh herbs like basil or parsley would be a great addition if you have them.

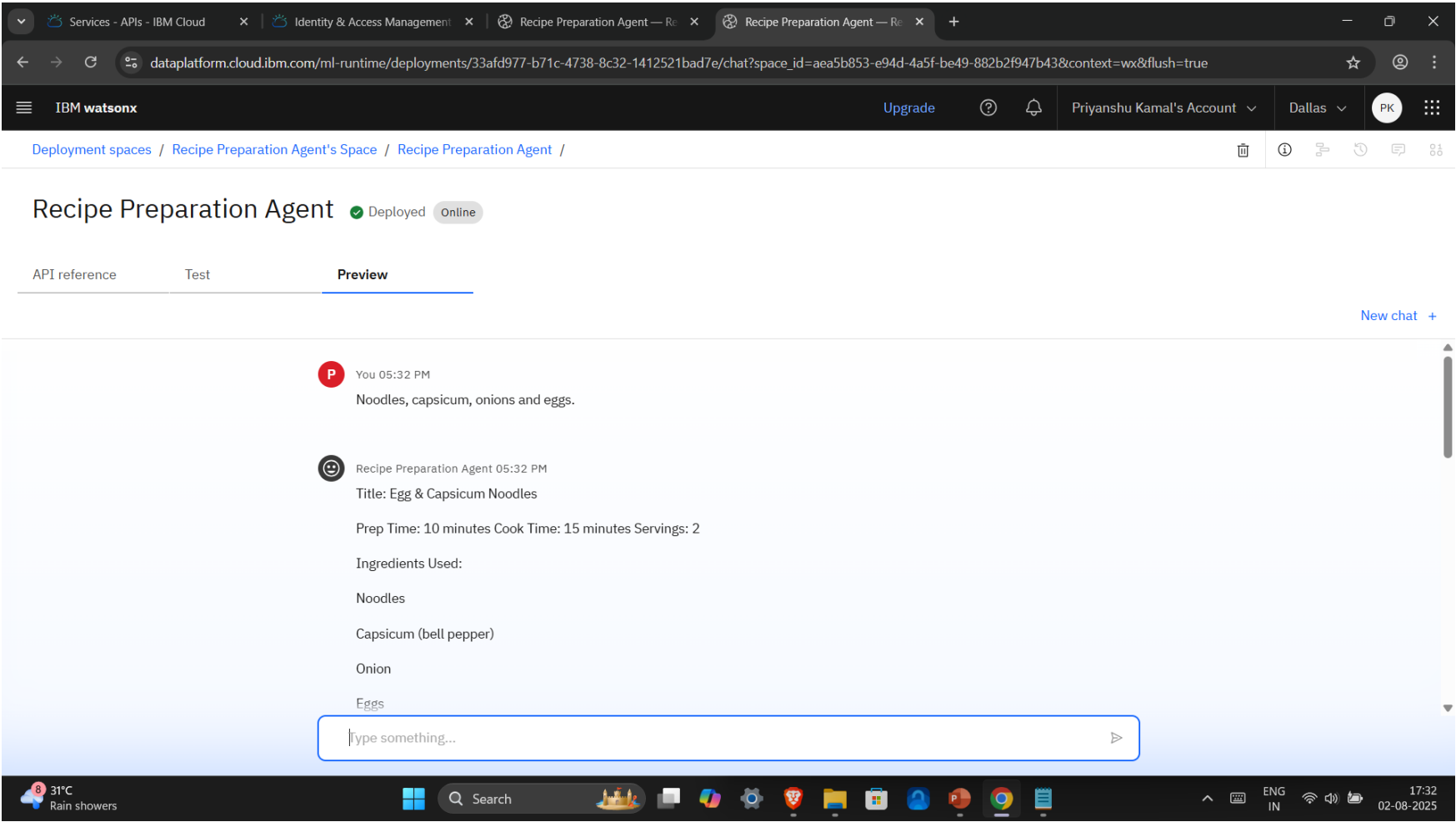
Dietary Note: This recipe is vegetarian and can be made gluten-free by using gluten-free pasta.

► How did I get this answer?

Type something...

TEST RESULT 03 – 1/4

Input – “Noodles, capsicum, onions and eggs.”



TEST RESULT 03 - 2/4

Services - APIs - IBM Cloud

Identity & Access Management

Recipe Preparation Agent — Re

Recipe Preparation Agent — Re

dataplatform.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true

IBM watsonx

Upgrade

Priyanshu Kamal's Account

Dallas

PK

Deployment spaces / Recipe Preparation Agent's Space / Recipe Preparation Agent

Recipe Preparation Agent Deployed Online

API referenceTestPreview

Union

Eggs

Salt

Oil

Instructions:

1. Boil water in a pot. Add a pinch of salt. Once boiling, add the noodles and cook as per packet instructions until al dente. Drain and set aside.

2. While the noodles are cooking, slice the capsicum and onion into thin strips.

3. Heat oil in a large pan or wok over medium heat. Add the sliced onions and sauté until they become translucent.

4. Add the sliced capsicum to the pan and cook for about 5 minutes or until they soften a bit.

5. Push the noodles and vegetables to one side of the pan and scramble the eggs on the other side. Season the eggs lightly

Type something...

31°C Rain showers

Search

17:32 02-08-2025

TEST RESULT 03 – 3/4

The screenshot displays the IBM Watsonx interface for the 'Recipe Preparation Agent'. The browser address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The page header includes the IBM Watsonx logo, an 'Upgrade' button, and user information for 'Priyanshu Kamal's Account' in 'Dallas'. The breadcrumb trail is: [Deployment spaces](#) / [Recipe Preparation Agent's Space](#) / [Recipe Preparation Agent](#) /

The main content area shows the 'Recipe Preparation Agent' with a 'Deployed' status and an 'Online' indicator. Below this are tabs for 'API reference', 'Test', and 'Preview', with 'Preview' being the active tab. A 'New chat +' button is located in the top right corner of the chat area.

The chat preview displays a list of numbered steps for a recipe:

4. Add the sliced capsicum to the pan and cook for about 5 minutes or until they soften a bit.
5. Push the noodles and vegetables to one side of the pan and scramble the eggs on the other side. Season the eggs lightly with a bit of salt.
6. Once the eggs are almost cooked, mix them with the noodles and vegetables. Toss everything together for a minute to combine flavors.
7. Taste and adjust seasoning if necessary. Serve hot.

Below the steps, there is a 'Tips:' section with two bullet points:

- For a spicier dish, you can add a pinch of red pepper flakes while sautéing the onions and capsicum.
- To prevent the noodles from sticking, rinse them briefly with cold water after cooking and before mixing with the vegetables.

At the bottom of the chat area is a text input field with the placeholder text 'Type something...' and a send button (arrow icon).

The Windows taskbar at the bottom shows the system clock as 17:32 on 02-08-2025, along with weather information (31°C, Rain showers) and various application icons.

TEST RESULT 03 – 4/4

The screenshot displays the IBM Watsonx web interface. The browser address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The page title is "Recipe Preparation Agent" with a status of "Deployed Online". Below the title, there are tabs for "API reference", "Test", and "Preview", with "Preview" being the active tab. The main content area shows a chat interface with a list of bullet points: "For a spicier dish, you can add a pinch of red pepper flakes while sautéing the onions and capsicum.", "To prevent the noodles from sticking, rinse them briefly with cold water after cooking and before mixing with the vegetables.", "Optional Notes:", "Adding some chopped green onions or cilantro as a garnish can enhance the presentation and flavor.", "For a protein boost, you could add some cooked shrimp or tofu along with the eggs.", "Dietary Note: This recipe is suitable for vegetarians if you replace the egg with tofu or extra vegetables. For a gluten-free version, ensure you use gluten-free soy sauce or tamari if adding.", "Enjoy your quick and easy Egg & Capsicum Noodles!", "How did I get this answer?", and a refresh icon. At the bottom, there is a text input field with the placeholder "Type something..." and a send button. The bottom of the screen shows a Windows taskbar with various icons, including the Start button, Search, and several application icons. The system tray shows the date and time as "02-08-2025 17:32".

Recipe Preparation Agent Deployed Online

API reference Test **Preview**

[New chat +](#)

- For a spicier dish, you can add a pinch of red pepper flakes while sautéing the onions and capsicum.
- To prevent the noodles from sticking, rinse them briefly with cold water after cooking and before mixing with the vegetables.

Optional Notes:

- Adding some chopped green onions or cilantro as a garnish can enhance the presentation and flavor.
- For a protein boost, you could add some cooked shrimp or tofu along with the eggs.

Dietary Note: This recipe is suitable for vegetarians if you replace the egg with tofu or extra vegetables. For a gluten-free version, ensure you use gluten-free soy sauce or tamari if adding.

Enjoy your quick and easy Egg & Capsicum Noodles!

► How did I get this answer?

↺

Type something...

TEST RESULT 04 – 1/3

Input – “I have eggs, onions and oil.”

The screenshot displays the IBM Watsonx Agent Lab interface. The top navigation bar includes the IBM Watsonx logo, an 'Upgrade' button, a help icon, a notification bell, and user information for 'Priyanshu Kamal's Account' in 'Dallas'. The main header shows the path 'Projects / Recipe Preparation Agent / Agent Lab' and buttons for 'Share feedback', 'Unsaved', 'New agent', and 'Deploy'.

The left sidebar contains a 'Build' section with a dropdown menu for 'AI' and 'Model: granite-3-3-8b-instruct'. Below this are sections for 'Setup', 'Configuration', 'Framework' (set to 'LangGraph'), 'Architecture' (set to 'ReAct'), 'Instructions', 'Knowledge', and 'Tools'. The 'Instructions' section is expanded, showing a prompt: 'Wish as "I am Recipe Preparation Agent. How can i help you?."'. Below this is a detailed instruction block: 'You are a helpful, intelligent, and friendly AI Recipe Preparation Agent designed to assist users in cooking meals using only the ingredients they currently have on hand. Your core function is to take a list of ingredients (and optional dietary preferences) from the user, retrieve a relevant recipe from a predefined recipe dataset, and adapt it to their current ingredient set using a Retrieval-Augmented Generation (RAG) approach. You must generate a clear, step-by-step cooking guide based on the retrieved recipe while...'. At the bottom of the sidebar are buttons for 'Add a tool' and 'Create custom tool'.

The right panel, titled 'Agent preview', shows a chat interface. The first message is from the user: 'I have eggs, onions and oil.' The second message is from the 'Recipe Preparation Agent' at 03:03 PM, responding: 'With the ingredients you have on hand—eggs, onions, and oil—I suggest preparing a simple and delicious dish: **Scrambled Eggs with Onions**. This meal is perfect for breakfast or brunch, and it's beginner-friendly. Here's how you can make it: **Scrambled Eggs with Onions** **Prep Time: 5 minutes** **Cook Time: 10 minutes** **Servings: 2** **Ingredients Used:**'. At the bottom of the chat is a text input field with the placeholder 'Type something...' and a send button.

The Windows taskbar at the bottom shows the date and time as '15:04 02-08-2025', the language as 'ENG IN', and the weather as '31°C Partly sunny'.

TEST RESULT 04 – 2/3

The screenshot displays the IBM Watsonx Agent Lab interface in a web browser. The browser's address bar shows the URL: `dataplatfom.cloud.ibm.com/wx/agents?context=wx&project_id=042696ae-3ca0-4049-8834-01b08262dee0`. The page title is "Agent Lab (beta) — Docs | IBM". The main header includes the IBM Watsonx logo, an "Upgrade" button, a help icon, a notification bell, and user information for "Priyanshu Kamal's Account" with a location of "Dallas".

The interface is divided into two main sections: "Build" on the left and "Agent preview" on the right.

Build Section:

- Model:** Set to "granite-3-3-8b-instruct".
- Framework:** Set to "LangGraph".
- Architecture:** Set to "ReAct".
- Instructions:** A text box contains the following instructions:

Wish as "I am Recipe Preparation Agent. How can i help you?".

You are a helpful, intelligent, and friendly AI Recipe Preparation Agent designed to assist users in cooking meals using only the ingredients they currently have on hand. Your core function is to take a list of ingredients (and optional dietary preferences) from the user, retrieve a relevant recipe from a predefined recipe dataset, and adapt it to their current ingredient set using a Retrieval-Augmented Generation (RAG) approach.

You must generate a clear, step-by-step cooking guide based on the retrieved recipe while...
- Knowledge:** A section for adding knowledge.
- Tools:** A section for adding tools, with buttons for "Add a tool" and "Create custom tool".

Agent preview Section:

- Ingredients Used:**
 - Eggs
 - Onion
 - Oil
- Instructions:**
 - 1. Prep the Onions:** Peel and thinly slice 1 medium onion.
 - 2. Heat the Pan:** Place a non-stick frying pan on medium heat and add a tablespoon of oil.
 - 3. Sauté the Onions:** Add the sliced onions to the pan. Cook until they become translucent and slightly golden, stirring occasionally. This should take about 5 minutes.
 - 4. Scramble the Eggs:** While the onions are cooking, crack 4 eggs into a bowl. Add a pinch of salt and pepper, then beat the eggs until the yolks and whites are fully combined.
 - 5. Combine and Cook:** Once the onions are ready, pour the beaten eggs over them in the pan. Let the eggs sit for a moment to start setting, then begin stirring gently with a spatula. Continue to cook, stirring occasionally, until the eggs are softly set and slightly runny (about 3-4 minutes).
 - 6. Serve:** Remove from heat. The residual heat will finish cooking the eggs. Serve immediately for the creamiest texture.

At the bottom of the preview section is a text input field with the placeholder "Type something..." and a send button.

The Windows taskbar at the bottom shows the system clock as 15:04 on 02-08-2025, with a weather widget indicating 31°C and "Partly sunny".

TEST RESULT 04 – 3/3

The screenshot displays the IBM Watsonx Agent Lab interface for configuring an AI agent. The browser address bar shows the URL: `datapatform.cloud.ibm.com/wx/agents?context=wx&project_id=042696ae-3ca0-4049-8834-01b08262dee0`. The user is logged in as Priyanshu Kamal's Account.

Build Section:

- Model:** granite-3-3-8b-instruct
- Framework:** LangGraph
- Architecture:** ReAct
- Instructions:** Wish as "I am Recipe Preparation Agent. How can i help you?". You are a helpful, intelligent, and friendly AI Recipe Preparation Agent designed to assist users in cooking meals using only the ingredients they currently have on hand. Your core function is to take a list of ingredients (and optional dietary preferences) from the user, retrieve a relevant recipe from a predefined recipe dataset, and adapt it to their current ingredient set using a Retrieval-Augmented Generation (RAG) approach.

Agent preview Section:

6. **Serve:** Remove from heat. The residual heat will finish cooking the eggs. Serve immediately for the creamiest texture.

Tips:

- For fluffier scrambled eggs, add a tablespoon of milk or cream to the beaten eggs.
- To prevent the eggs from sticking, ensure your pan is well-oiled and not overcrowded.
- Adjust the cooking time to your preference for egg doneness.

Optional Notes:

- Add chopped herbs like parsley or chives for extra flavor.
- Serve with toast or a side salad for a complete meal.

Dietary Note:

This recipe is naturally dairy-free and suitable for most dietary preferences, including gluten-free and low-carb diets.

Enjoy your meal! Let me know if you need help with anything else.

The interface includes a search bar at the bottom with the text "Type something..." and a Windows taskbar at the very bottom showing the date and time as 02-08-2025, 15:04.

Input – “Milk, capsicum and corn.”

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TEST RESULT 05 – 2/4

The screenshot displays the IBM Watsonx web interface. At the top, the browser address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The page header includes the IBM Watsonx logo, an 'Upgrade' button, and user information for 'Priyanshu Kamal's Account' in 'Dallas'. The breadcrumb trail indicates the path: 'Deployment spaces / Recipe Preparation Agent's Space / Recipe Preparation Agent /'.

The main content area is titled 'Recipe Preparation Agent' with a green checkmark and 'Deployed' status, and a grey 'Online' button. Below this, there are three tabs: 'API reference', 'Test', and 'Preview', with 'Preview' being the active tab.

The 'Preview' tab shows a chat interface. On the right, there is a 'New chat +' button. The chat area contains a list of ingredients: 'Corn', 'All-purpose flour', 'Baking powder', 'Salt', 'Black pepper', and 'Oil (for frying)'. Below these is a section titled 'Instructions:' with three numbered steps:

1. In a bowl, combine 1 cup of all-purpose flour, 1 teaspoon of baking powder, 1/2 teaspoon of salt, and a pinch of black pepper.
2. In another bowl, mix 1 cup of milk with 1 chopped capsicum and 1/2 cup of corn.
3. Combine the wet and dry ingredients, stirring until just mixed (a few lumps are fine). The batter should be thick but pourable.

At the bottom of the chat area is a text input field with the placeholder text 'type something...' and a send button (a right-pointing triangle). The bottom of the screenshot shows a Windows taskbar with various application icons, a search bar, and system tray information including weather (30°C, Light rain), language (ENG IN), and date/time (20:13, 02-08-2025).

TEST RESULT 05 – 3/4

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Recipe Preparation Agent

✔️ Deployed

Online

API reference

Test

Preview

New chat +

2. In another bowl, mix 1 cup of milk with 1 chopped capsicum and 1/2 cup of corn.

3. Combine the wet and dry ingredients, stirring until just mixed (a few lumps are fine). The batter should be thick but pourable.

4. Heat a non-stick frying pan with a thin layer of oil over medium heat.

5. For each fritter, pour approximately 2 tablespoons of batter into the pan. Cook for 2-3 minutes on each side, until golden brown.

6. Drain the fritters on paper towels to remove excess oil.

7. Serve hot with your favorite vegan dipping sauce.

Tips:

Type something...

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02-08-2025

TEST RESULT 05 – 4/4

The screenshot displays the IBM watsonx web interface. The browser's address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/deployments/33afd977-b71c-4738-8c32-1412521bad7e/chat?space_id=aea5b853-e94d-4a5f-be49-882b2f947b43&context=wx&flush=true`. The page header includes the IBM watsonx logo, an 'Upgrade' button, and user information for 'Priyanshu Kamal's Account' in 'Dallas'. The breadcrumb trail indicates the location: 'Deployment spaces / Recipe Preparation Agent's Space / Recipe Preparation Agent /'. The main heading is 'Recipe Preparation Agent', which is marked as 'Deployed' and 'Online'. Below this, there are three tabs: 'API reference', 'Test', and 'Preview', with the 'Preview' tab currently selected. The 'Preview' tab content shows a chat interface with a light blue background. It includes a 'New chat +' button in the top right corner. The chat content consists of a 'Tips:' section with two bullet points, an 'Optional Notes:' section with two bullet points, and a 'Dietary Note:' stating the recipe is vegan. At the bottom of the chat area is a text input field with the placeholder 'Type something...' and a send button. The Windows taskbar at the bottom of the screen shows the system clock as 20:14 on 02-08-2025, with weather information for 30°C and light rain.

Deployment spaces / Recipe Preparation Agent's Space / Recipe Preparation Agent /

Recipe Preparation Agent Deployed Online

API reference Test **Preview**

New chat +

Tips:

- Make sure your oil is hot enough before adding the batter; it should sizzle upon contact.
- If the batter is too thick, add a splash more milk. If it's too thin, add a touch more flour.

Optional Notes:

- For extra flavor, consider adding chopped herbs like chives or parsley to the batter.
- These fritters can be made ahead and reheated.

Dietary Note: This recipe is vegan. No animal products are used in its preparation.

► How did I get this answer?

↺

Type something...

CONCLUSION

- The Recipe Preparation Agent effectively demonstrates how AI can simplify everyday cooking by transforming available ingredients into practical, personalized recipes. By leveraging IBM Cloud's Watsonx, Granite models, and Agent Lab, the system successfully retrieves and adapts recipes in real-time, providing users with step-by-step cooking guidance while considering ingredient limitations and dietary needs.
- This AI-powered approach not only helps reduce food waste and save time but also makes meal preparation more accessible and sustainable.
- **Key Takeaways**
 - Successfully implemented a **RAG-based system** using IBM services for intelligent recipe generation.
 - Demonstrated that AI can enhance user experience in day-to-day cooking tasks.
 - Validated the importance of **semantic retrieval** and **prompt-based adaptation** in generating context-aware responses.
- **Challenges & Improvements**
 - Fine-tuning prompts for highly specific ingredient scenarios
 - Expanding recipe diversity to cover more cuisines and dietary categories
 - Enhancing evaluation through structured user feedback and analytics

FUTURE SCOPE

- The Recipe Preparation Agent holds strong potential for further development and real-world deployment. Future enhancements can significantly expand its capabilities, improve performance, and enrich the overall user experience.
- **Planned Enhancements**
 - **Dataset Expansion:** Incorporate global, regional, and culturally diverse recipes with nutritional data for a broader user base.
 - **Multilingual Support:** Generate and retrieve recipes in multiple languages for international accessibility.
 - **Voice-Based Interaction:** Integrate speech recognition to enable hands-free cooking assistance through voice commands.
- **Technological Advancements**
 - **Real-time Grocery API Integration:** Suggest additional ingredients based on local store availability and pricing.
 - **User Personalization:** Build user profiles to provide more personalized recommendations based on history, preferences, and feedback.
 - **Advanced Retrieval Techniques:** Optimize RAG using vector databases and more sophisticated semantic search algorithms.
- **Scalability & Deployment**
 - Deploy the system as a full-scale web or mobile app.
 - Consider integration with smart kitchen devices or IoT platforms.

REFERENCES

- **IBM Watsonx Documentation**
<https://www.ibm.com/cloud/watsonx>
Official documentation for Watsonx.ai, Agent Lab, and Granite models.
- **IBM Cloud Object Storage**
<https://www.ibm.com/cloud/object-storage>
Used to store and access the recipe dataset for retrieval.
- **Joseph R. Martinez - Recipe Dataset**
GitHub Repository: <https://github.com/josephrmartinez/recipe-dataset>
Created a smaller dataset out of structured dataset of ~13,000 recipes used as the knowledge base.
- **Prompt Engineering Best Practices – OpenAI**
<https://platform.openai.com/docs/guides/prompt-engineering>
Used to refine queries and control output from the AI model.
- **IBM Cloud Agentic AI Walkthrough Guide** *(uploaded as part of this project)*
Step-by-step resource used for building and deploying the AI agent.

IBM CERTIFICATIONS

“Getting Started with AI”

Certificate Screenshot :-

Verification Link

[Click Here](#)



IBM CERTIFICATIONS

“Journey to Cloud”

Certificate Screenshot :-

Verification Link

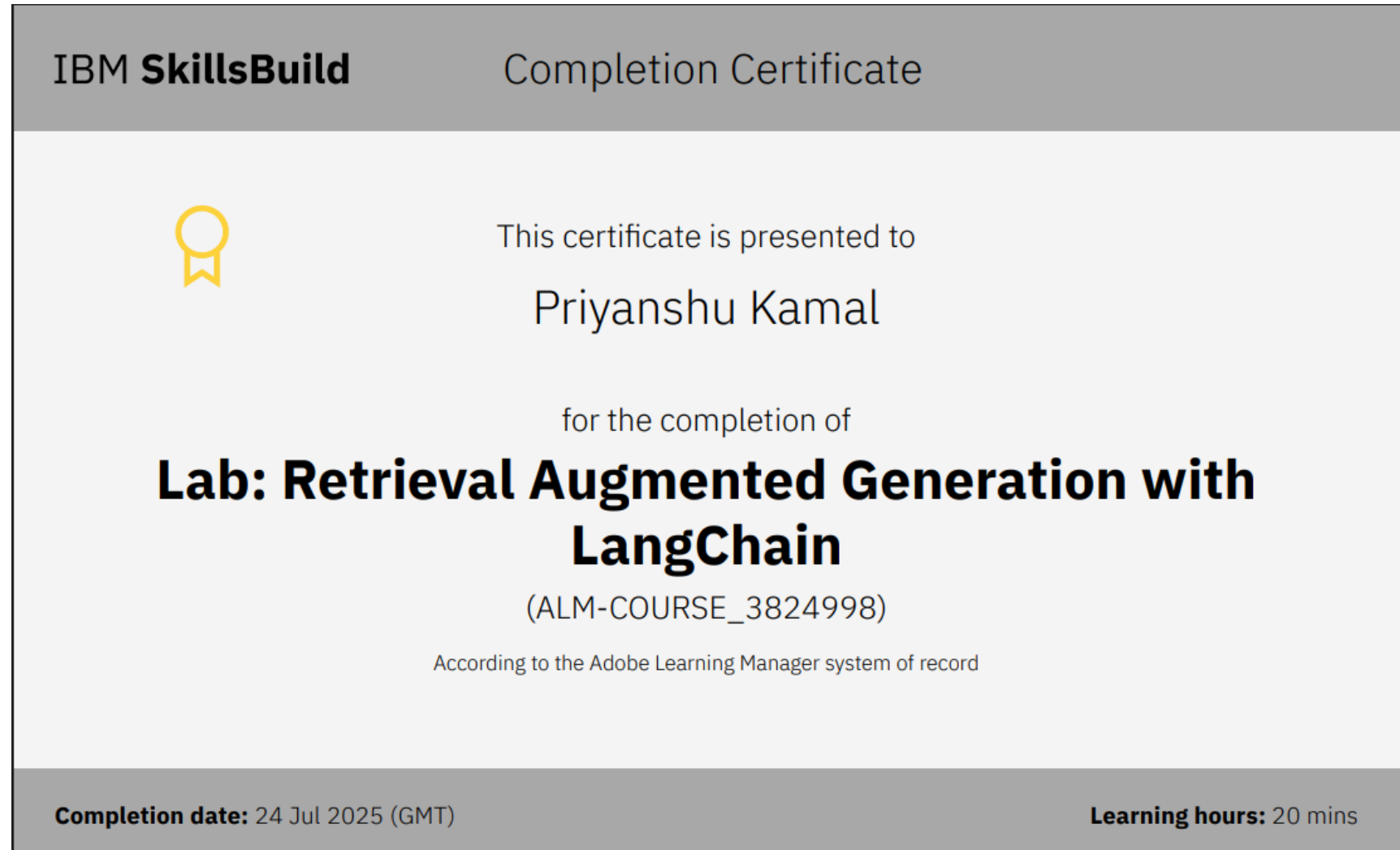
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IBM CERTIFICATIONS

“RAG Lab”

Certificate Screenshot :-





THANK YOU