
CAPSTONE PROJECT

RECIPE PREPARATION AGENT USING IBM GRANITE

Presented By:

**1. Ashish Thakur – Himachal Pradesh University – Department
of Data Science and Artificial Intelligence**

OUTLINE

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

PROBLEM STATEMENT

- Many users struggle with daily meal planning and waste ingredients they already have. The problem is to suggest personalized recipes based on available ingredients, including dietary needs and substitutions, using AI. The system must retrieve and generate step-by-step cooking instructions, helping reduce food waste and cooking stress.

PROPOSED SOLUTION

- The proposed system is a **Recipe Preparation Agent** implemented using IBM Cloud services, specifically leveraging the capabilities of **IBM Watsonx.ai**, **Granite foundation models**, and **LangGraph**. The agent follows a **Retrieval-Augmented Generation (RAG)** architecture to provide personalized cooking assistance based on user-input ingredients.
- The solution architecture consists of the following components:
- **IBM Granite LLM (granite-3-3-8b-instruct)**: Used for generating context-aware, step-by-step recipe instructions, substitutions, and dietary recommendations.
- **IBM Granite Embedding Model**: Converts recipe documents and user input into vector embeddings for semantic similarity search.
- **LangGraph with ReAct pattern**: Enables a modular and interactive agent framework, allowing the agent to retrieve knowledge and reason over multiple steps before producing a final output.
- **Vector Store (FAISS)**: Stores embedded recipe documents to support semantic search and retrieval based on ingredient matching.
- **IBM Watsonx Agent Lab**: Used to design, test, and deploy the agent using no-code and low-code tools within IBM Cloud Lite.
- **Deployment**: The final agent is deployed as a web-based chatbot through **IBM Cloud**, accessible via a secure public endpoint. It integrates with Watsonx runtime for inference and API orchestration.

SYSTEM APPROACH

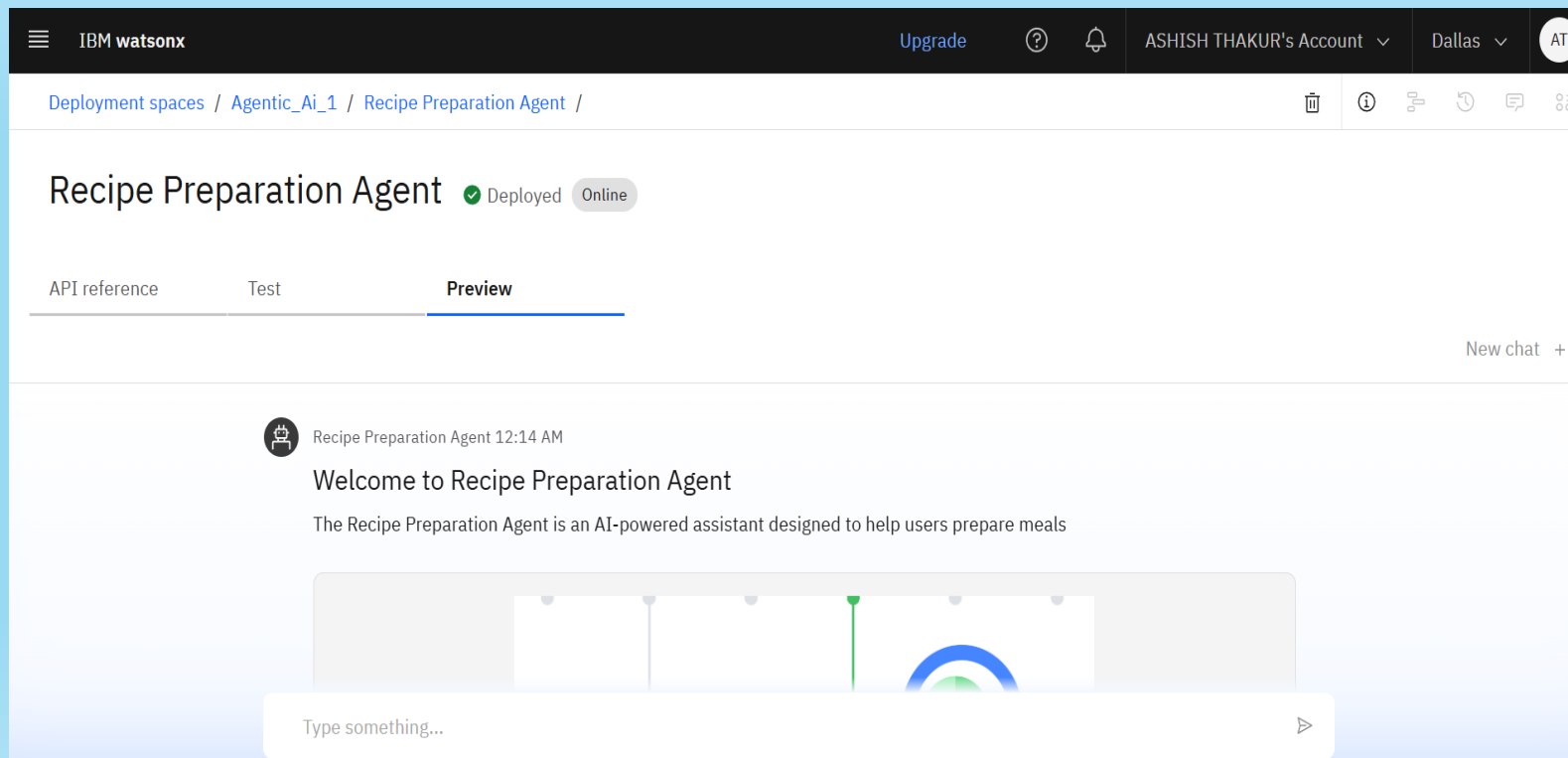
- The system is built using **IBM Watsonx.ai** and follows a **Retrieval-Augmented Generation (RAG)** architecture. Recipes are embedded using the **IBM Granite Embedding Model** and stored in a **FAISS vector store** for efficient retrieval.
- An agent developed using **LangGraph with ReAct** retrieves relevant recipes based on user input and uses the **Granite-3-3-8b-instruct** model to generate personalized, step-by-step instructions along with substitutions and dietary adjustments.
- The complete solution is deployed on **IBM Cloud Lite** through **Watsonx Agent Lab**, offering a web-based interface for users to interact with the system.

ALGORITHM & DEPLOYMENT

- **Algorithm:**
- The system uses a **Retrieval-Augmented Generation (RAG)** pipeline:
- **Input Processing:** User provides available ingredients and preferences.
- **Embedding:** Input and recipe dataset are embedded using the **IBM Granite Embedding Model**.
- **Retrieval:** Relevant recipes are fetched via **FAISS** based on semantic similarity.
- **Generation:** Retrieved data and user context are passed to **Granite-3-3-8b-instruct** to generate:
 - Step-by-step recipe instructions
 - Ingredient substitutions
 - Cooking tips and dietary adjustments
- **Deployment:**
- The agent is created and tested in **Watsonx Agent Lab** using **LangGraph (ReAct pattern)**.
- Deployed as a **web-based AI assistant** on **IBM Cloud Lite**.
- Provides a publicly accessible interface for users to interact with the agent in real-time.

RESULT

The system successfully returns personalized recipes based on user-provided ingredients. It suggests creative substitutions and considers dietary preferences (e.g., vegan, gluten-free). Screenshot outputs show step-by-step instructions and interactive chat interface via Watsonx. Include visualizations and comparisons between predicted and actual counts to highlight the model's performance.



IBM watsonx

Upgrade ?

ASHISH THAKUR's Account

Dallas

AT

Deployment spaces / Agentic_Ai_1 / Recipe Preparation Agent /

Recipe Preparation Agent

Deployed Online

API referenceTestPreview

New chat +

Quick start samples

I have rice, eggs, and tomatoes. What can I cook?

I have pasta but no cheese. Can you suggest a dinner recipe and any substitutions?

I'm vegan and I have chickpeas, spinach, and onions. Any good recipe ideas

Type something...

IBM watsonx

Upgrade ?

ASHISH THAKUR's Account

Dallas

AT

Deployment spaces / Agentic_Ai_1 / Recipe Preparation Agent /

Recipe Preparation Agent

Deployed Online

API referenceTestPreview

New chat +

You 12:15 AM

I'm vegan and I have chickpeas, spinach, and onions. Any good recipe ideas

Recipe Preparation Agent 12:15 AM

Hi, I am Recipe Preparation Agent. How can I help you?

I can help you find a recipe using the ingredients you have. Here's a simple recipe for Spinach and Chickpea Curry:

Ingredients:

- 1 onion
- 2 cloves garlic
- 1 can chickpeas
- 1 can diced tomatoes
- 1 cup spinach

Type something...

Recipe Preparation Agent ✔ Deployed Online

API reference Test **Preview**

New chat +

Instructions:

1. Heat olive oil in a large pan over medium heat.
2. Add the chopped onion and minced garlic, sauté until the onion is translucent.
3. Add the diced tomatoes, chickpeas, and spices. Stir well.
4. Cover the pan and let it simmer for about 15 minutes.
5. Add the spinach and cook until it wilts.
6. Season with salt and pepper to taste.

Enjoy your vegan meal!

If you need more recipe ideas or variations, I can do a quick search for you.

► How did I get this answer?



Type something...



About this deployment ×

Name 


Recipe Preparation Agent

Description 


The Recipe Preparation Agent is an AI-powered assistant designed to help users prepare meals


Deployment Details

Deployment ID: 044fab16-77a0-45...

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](#)

89f722d9-cfc7-4ced-8399-eb64fee1cab3

CONCLUSION

- The Recipe Preparation Agent demonstrates how AI can simplify daily cooking, reduce food waste, and provide useful dietary support. Using IBM Granite and LangGraph, the agent delivers meaningful recipe guidance in real time. The system is scalable and adaptable for integration into smart kitchen apps. Highlight any challenges encountered during the implementation and potential improvements. Emphasize the importance of accurate bike count predictions for ensuring a stable supply of rental bikes in urban areas.

FUTURE SCOPE

- Future enhancements include:
 - - Integrating voice input for hands-free cooking support
 - - Expanding the recipe database with multilingual and regional recipes
 - - Real-time inventory syncing with kitchen IoT devices
 - - Personal health tracking with nutrition-aware recipe adjustments
 - - Offline support for edge devices

REFERENCES

- IBM Watsonx Documentation – <https://www.ibm.com/watsonx>
- IBM Granite Models – IBM Research Foundation Models
- LangGraph & LangChain – <https://docs.langchain.com>
- FAISS: Facebook AI Similarity Search – <https://github.com/facebookresearch/faiss>
- Recipe Dataset (optional source) – Kaggle: Food.com Recipes and Reviews Dataset
- Retrieval-Augmented Generation (RAG) – Facebook AI Research Blog

IBM CERTIFICATIONS

In recognition of the commitment to achieve
professional excellence



Ashish Thakur

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence



Issued on: Jul 17, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/3c074650-07f2-4ce8-94f8-395cb6644d19>



IBM CERTIFICATIONS

In recognition of the commitment to achieve
professional excellence



Ashish Thakur

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution



Issued on: Jul 19, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/ad07f89a-2c95-4f74-92ce-5c113218a7e6>



IBM CERTIFICATIONS

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

Ashish Thakur

for the completion of

**Lab: Retrieval Augmented Generation with
LangChain**

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 24 Jul 2025 (GMT)

Learning hours: 20 mins



THANK YOU