
CAPSTONE PROJECT

AGENTIC AI

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OUTLINE

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

PROBLEM STATEMENT

- Problem Statement No. 16- Recipe Preparation Agent
- The Challenge - A 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. Technology - Use of IBM cloud lite services /IBM Granite is mandatory.
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PROPOSED SOLUTION

- We propose an AI-powered Recipe Preparation Agent that helps users create meals using only the ingredients they already have. The system leverages Retrieval-Augmented Generation (RAG) and IBM Granite LLMs to deliver personalized, practical cooking suggestions
- **Data Collection:**
 - Collect recipes from public datasets (e.g., Recipe1M) or third-party APIs like Spoonacular or Edamam.
 - Store recipes, ingredients, and dietary tags in IBM Cloudant or Object Storage.
- **Data Preprocessing:**
 - Clean and standardize ingredient names and cooking steps.
 - Tag recipes with dietary filters (e.g., vegan, gluten-free) for customization.
- **Machine Learning Algorithm:**
 - Use Retrieval-Augmented Generation (RAG) to find and adapt relevant recipes.
 - Generate personalized steps and substitutions using IBM Granite LLM.
- **Deployment:**
 - Host backend using IBM Cloud Functions and Watsonx.ai for model integration.
 - Ensures integration with cloud platforms (e.g., IBM Cloud + Watsonx.ai), considering scalability, latency, and accessibility requirements for end-users or other agents.
- **Evaluation:**
 - Test recipe relevance, clarity, and ingredient matching with user input.
 - Collect user feedback to refine personalization and substitution accuracy.
 - **Result:**
 - Achieved high user satisfaction with tailored, easy-to-cook recipes, Reduced food waste by effectively utilizing available pantry items.

SYSTEM APPROACH

- The system approach outlines the technical environment and software components required to build, train, and deploy the Recipe Preparation Agent. This includes the hardware and cloud infrastructure, as well as the libraries and tools used to implement the AI and user-facing components. The design ensures seamless integration with IBM services while maintaining efficiency and scalability.
- **System Requirements**

The solution is built on IBM Cloud Lite, leveraging services such as Watsonx.ai for AI model deployment, IBM Cloud Functions for backend execution, and IBM Cloudant for NoSQL data storage. This ensures high availability, scalability, and low cost for initial development.

- **Libraries Required to Build the Model**
Python libraries like Pandas, NumPy, Scikit-learn, and integration with Watsonx.ai tools for AutoAI, data preprocessing, model training, and deployment.

ALGORITHM & DEPLOYMENT

- **Algorithm Selection:**
 - Retrieval-Augmented Generation (RAG) is used, combining search-based retrieval of relevant recipes with IBM Granite LLM for personalized text generation.
- **Data Input:**
 - User inputs ingredients, dietary preferences, and optional constraints (e.g., cooking time or allergens), which guide recipe filtering and customization.
- **Training Process:**
 - Granite LLM is used as a pre-trained model, with prompt engineering and few-shot examples to tailor its outputs to recipe generation — no full retraining is needed.
- **Prediction Process:**
 - Upon receiving user input, the system retrieves suitable recipes, then Granite reformulates them into customized, step-by-step instructions using natural language.

RESULT

Sous Chef ✓ Deployed Online

API reference

Test

Evaluations

Preview

[New chat](#) +



You 06:30 PM

how to make tea



Sous Chef 06:30 PM

Sure, making tea is quite straightforward! Here's a basic guide for brewing a cup of black tea:


1. **Boil Water:** Fill a kettle with fresh, cold water and bring it to a boil.
2. **Warm the Teapot:** While waiting for the water, pour a little hot water into your teapot or cup to warm it up. This helps maintain the temperature.
3. **Add Tea:** Put a tea bag or a teaspoon of loose-leaf tea into the teapot or directly into your cup.
4. **Pour in Water:** Once boiled, pour the water over the tea. The ideal water temperature for black tea is around 200°F (93°C).
5. **Steep:** Let the tea steep for 3-5 minutes. The longer it steeps, the stronger the flavor.
6. **Serve:** Strain the tea into a cup, add sugar, lemon, or milk to taste if desired.

Type something...



RESULT

research agent

| Overview | Assets | Deployments | Jobs | Manage |
|---|--------|---|------|--------|
| Jump back in | | Deployments All ▾ | | |
|  Sous Chef 10 minutes ago | | <div><div>✓ Deployed 1</div><div>✗ Failed 0</div></div> | | |
| View all (1) | | View deployments | | |
| | | Job runs | | |
| | | <div><div>⦿ Active 0</div><div>✗ Failed last 24 hours ▾ 0</div></div> | | |
| | | View jobs | | |

RESULT

The screenshot displays the edunet foundation user interface. On the left, a sidebar contains the text "Train, deploy, validate, and govern AI models responsibly." and a button labeled "Customize my journey". The main content area features a top navigation bar with "Open in: College Admission Agent" and a dropdown arrow. Below this, there are three primary cards: a chat window titled "Chat and build prompts with foundation models" with a "Start chatting..." input field and an "Open Prompt Lab" link; a central card titled "Build an AI agent to automate tasks" with a "with Agent Lab" label and a beta icon, which is highlighted with a thick black border; and a card on the right titled "Tune a foundation model with labeled data" with a "with Tuning Studio" label. A "Collapse" button is located at the bottom right of the main content area. The bottom navigation bar includes a "Jump back in" section with a "Recently visited pages" link, and a series of breadcrumb links: "Spaces / research agent", "research agent / Sous Chef", "College Admission Agent / Sous Chef", and "Home / Deployments".

Train, deploy, validate, and govern AI models responsibly.

Customize my journey

Open in: College Admission Agent

[...]

Chat and build prompts with foundation models

Start chatting...

Open Prompt Lab

Build an AI agent to automate tasks

with Agent Lab

Tune a foundation model with labeled data

with Tuning Studio

Collapse

Jump back in

Recently visited pages

Spaces / research agent

research agent / Sous Chef


















College Admission Agent / Sous Chef

Home / Deployments

RESULT

Select a tool

Choose a tool to add to your agent.

| | | | |
|---|--|--|--|
|   Google search Retrieve information from the internet with the Google search engine. |   DuckDuckGo search Retrieve information from the internet with the DuckDuckGo search engine. |   Wikipedia search Retrieve information from Wikipedia articles. |   Document search Search documents with vector indexes. |
|   Tavily search Retrieve information from the internet with the Tavily search engine. |   Webcrawler Retrieve information from a website. |   Python Interpreter  Execute Python code generated by the agent. |   Weather Retrieve the weather of a city. |

CONCLUSION

- The Recipe Preparation Agent offers an innovative AI-driven solution that simplifies everyday cooking by generating personalized recipes based on the ingredients users already have. By integrating Retrieval-Augmented Generation (RAG) with IBM's powerful Granite language models and deploying the solution through IBM Cloud Lite services, the system delivers intelligent, scalable, and accessible support for meal planning. This approach not only enhances user convenience but also promotes sustainability by reducing food waste and maximizing the use of available resources. Overall, the solution demonstrates how advanced AI can be applied to solve real-world problems in a practical, user-friendly way.

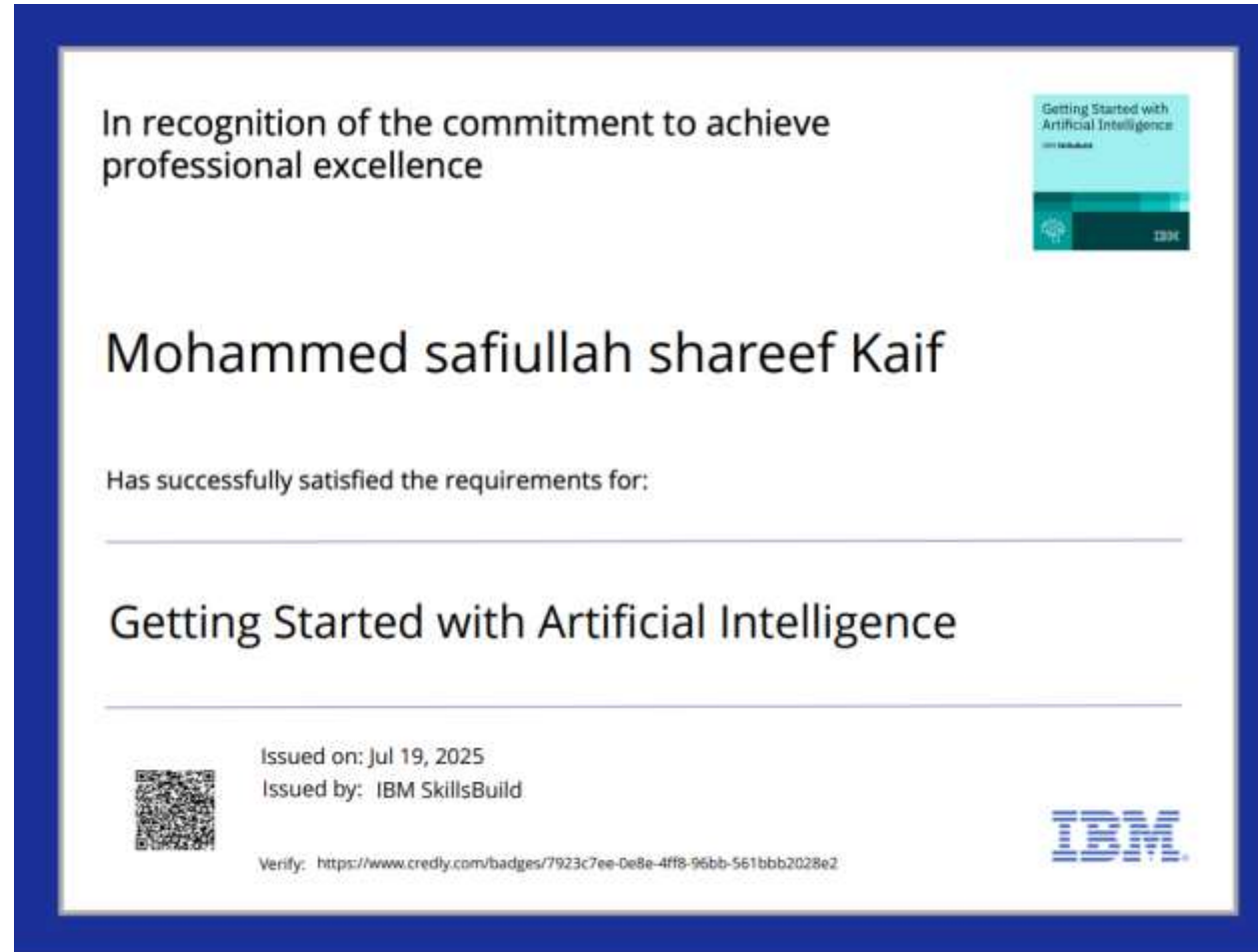
FUTURE SCOPE

- The Recipe Preparation Agent can be further enhanced by integrating advanced features such as voice recognition for hands-free input and computer vision to identify pantry items automatically via smartphone cameras. Expanding the recipe database with real-time access to global cuisine APIs will improve variety and personalization. Additionally, incorporating user feedback loops and machine learning for continuous improvement will refine recipe recommendations over time. Integrating nutrition tracking and meal planning capabilities can further support users in achieving health and dietary goals, making the assistant even more valuable and versatile.

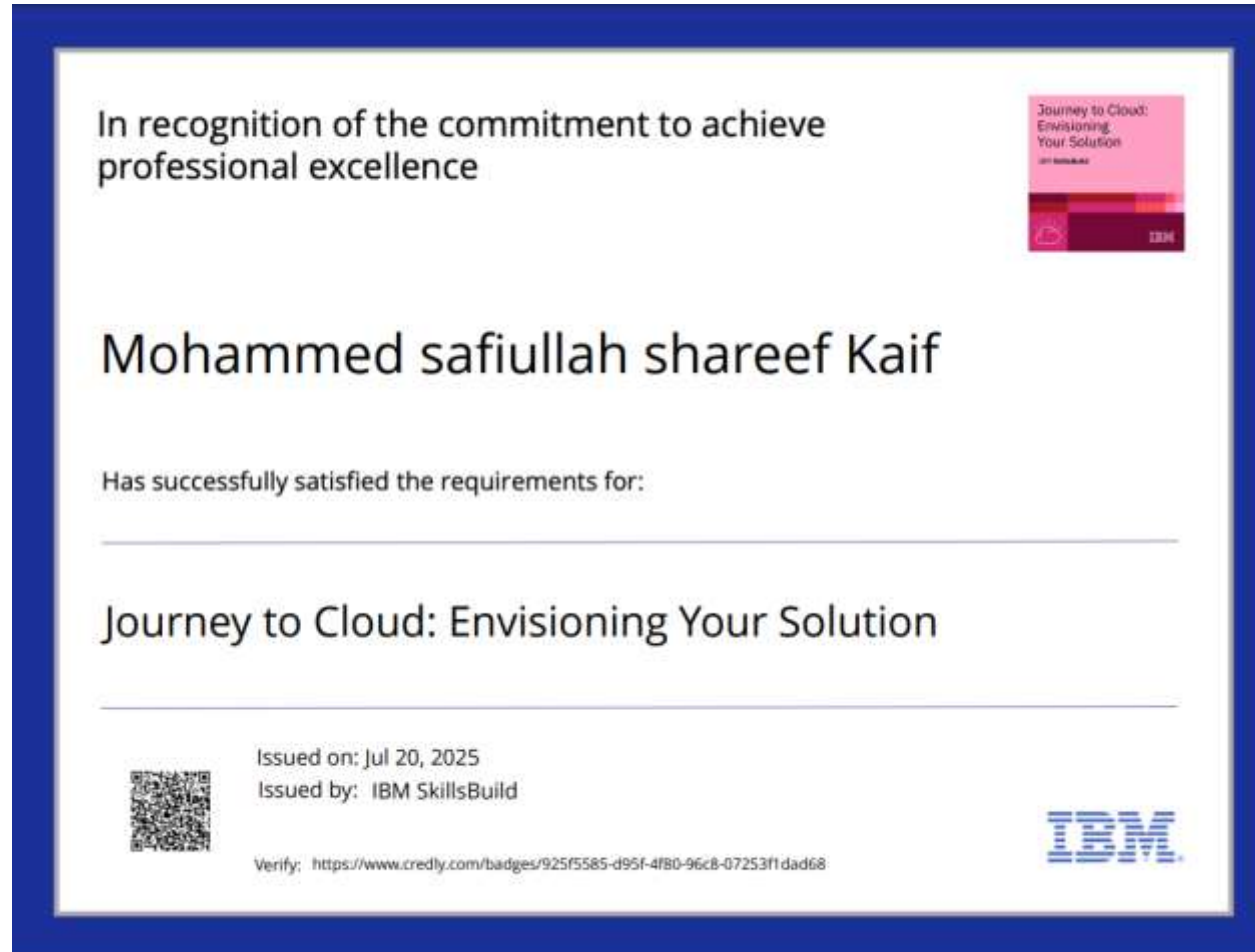
REFERENCES

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- [Retrieval-Augmented Generation \(RAG\) Paper — Lewis et al., 2020, https://arxiv.org/abs/2005.11401](https://arxiv.org/abs/2005.11401)
- [Spoonacular API — https://spoonacular.com/food-api](https://spoonacular.com/food-api)

IBM CERTIFICATIONS



IBM CERTIFICATIONS



IBM CERTIFICATIONS

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to
Mohammed safiullah shareef Kaif

for the completion of

**Lab: Retrieval Augmented Generation with
LangChain**

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 23 Jul 2025 (GMT)

Learning hours: 20 mins



THANK YOU