
CAPSTONE PROJECT

NUTRITION AGENT

Presented By:

**Sutapa Susovita Bhuyan-Odisha University of Technology and
Research-Information technology**

OUTLINE

- Problem Statement
- Proposed System/Solution
- System Development Approach
- Result (Output Image)
- Github repository link
- Conclusion
- Future Scope
- References

PROBLEM STATEMENT

In today's health-conscious world, individuals seek personalized nutrition guidance to meet their fitness goals, manage medical conditions, and align with their cultural and lifestyle preferences. However, most existing diet apps offer generic meal plans, lack real-time adaptability, and fail to account for individualized health data such as allergies, evolving medical conditions, and user feedback.

At the same time, dietitians and nutritionists face time and resource constraints, making it difficult to provide scalable, personalized consultations.






There is a clear gap between one-size-fits-all digital tools and in-person expert nutrition advice.

PROPOSED SOLUTION

The Smartest AI Nutrition Assistant

We propose building a **Generative AI-powered virtual nutrition assistant** that delivers **intelligent, interactive, and adaptive dietary recommendations**, tailored to the user's holistic lifestyle.

Key Features:

-  **Multimodal Input Understanding:** Accepts user queries via **text, voice, or images** (e.g., food photos, grocery labels).
-  **Personalized Meal Planning:** Generates dynamic meal plans based on:
 - Health goals (e.g., weight loss, muscle gain)
 - Medical conditions (e.g., PCOS, diabetes)
 - Dietary preferences (e.g., vegetarian, gluten-free)
 - Cultural and regional food habits
-  **Real-Time Adaptability:** Continuously refines suggestions based on user feedback and changing conditions.
-  **Contextual Explanations:** Provides human-like reasoning for each suggestion (e.g., “Why this food is better for you”).
-  **AI-Driven Conversations:** Engages in natural dialogue to guide and educate users on better nutrition choices.

SYSTEM APPROACH

System Requirements

◆ Functional Requirements

- Accept text, voice, and image inputs
- Generate personalized, goal-based meal plans
- Recommend smart food swaps
- Explain nutrition choices contextually
- Adapt with user feedback

◆ Non-Functional Requirements

- Scalable and secure on IBM Cloud
- Fast, real-time responses
- Support for multimodal inputs

Libraries & Technologies Used

- **IBM Watsonx.ai** – LLM-powered conversation and reasoning
- **IBM Watson Assistant** – Natural dialogue management
- **Tools:-** Google Search, DuckDuckGo, Wikipedia Search, Webcrawler, Weather
- **IBM Watson Speech-to-Text** – Voice input processing
- **IBM Watson Visual Recognition** – Food & label image analysis

RESULT

To assess the performance of the AI-powered Nutrition Agent, we tested its ability to generate accurate, personalized meal plans based on user input. The agent was evaluated on its effectiveness, relevance, and response quality, particularly for users with specific dietary conditions such as PCOS.

The following screenshots demonstrate the agent's instructions setup and a live working demo, showcasing how it interprets input details (age, medical condition, dietary preferences) and generates culturally appropriate, nutritionally balanced meal plans. This highlights the agent's ability to deliver meaningful, health-focused recommendations in real time.

This screenshot shows the configuration and instruction setup for the AI-powered nutrition assistant in IBM watsonx's Agent Lab. It highlights the "Instructions" box, where detailed prompts are provided to guide the AI model (Granite-3-3-8b-instruct) in generating personalized responses.

IBM watsonx

Upgrade

?

🔔

Sutapa Bhuyan's Account

Dallas

SB

⋮

Projects / Nutrition_Agent / watsonx Agent

Share feedback

Autosaved 9:02 PM

New agent +

Deploy

🔒

ⓘ

Build

AI

Model: granite-3-3-8b-instruct

LangGraph

ReAct

Instructions

Advanced configuration

you are helpful nutrition ai agent.

Ask the user for their age, gender, weight, height, dietary preferences (e.g., vegetarian, keto), allergies, medical conditions (e.g., diabetes, PCOS), cultural preferences, and fitness goals (e.g., weight loss, muscle gain). Store the responses securely and use them to personalize future suggestions.

Generate a daily or weekly meal plan that aligns with the user's profile: dietary preferences, medical conditions, and fitness goals. Ensure nutritional balance (macros + micronutrients) and cultural relevance. Include breakfast, lunch, dinner, and optional snacks with calorie counts and prep details.

When a user inputs a food they dislike, are allergic to, or want a healthier version of, suggest smart alternatives. For example, if a user inputs "white rice", you might suggest "quinoa" or "cauliflower rice" and explain why the alternative is healthier.

Whenever a recommendation is made, provide a short, clear explanation such as:

- "This food is high in fiber, which supports digestion."
- "This alternative has a lower glycemic index, which is better for diabetes."

Offer contextual, science-backed reasons to help the user make informed decisions.

If a user uploads a food photo or grocery label, extract the food item name using image recognition. Cross-reference the item with a nutrition database to determine if it's healthy based on the user's profile. Respond with nutritional info and suggestions if needed.

If a user says they disliked a meal, were still hungry, or experienced a symptom, adjust future recommendations accordingly. Ask follow-up questions like: "Would you prefer a lighter/heavier meal next time?" or "Should I avoid this ingredient in future plans?"

Agent preview

SB

You: 09:00 PM

Generate a 1-day meal plan for a 21-year-old female, non-vegetarian, with PCOS, who wants to lose weight. She dislikes tofu and prefers Indian cuisine. Make sure meals are low glycemic and high in protein.

🤖

watsonx Agent 09:00 PM

I apologize for the inconvenience. Let's create a personalized meal plan for a 21-year-old female with PCOS who is non-vegetarian, dislikes tofu, prefers Indian cuisine, and aims for weight loss. We'll ensure the meals are low glycemic and high in protein.

Meal Plan

Breakfast: Chickpea Curry with Spinach (Chana Saagu)

- Ingredients: Chickpeas, spinach, onions, tomatoes, garlic, ginger, spices (turmeric, cumin, coriander, garam masala).
- Calories: ~350
- Protein: ~18g
- Glycemic Load: Low
- Explanation: Chickpeas are an excellent source of protein and fiber, which helps control blood sugar levels and promotes satiety. Spinach adds essential vitamins and minerals.

Mid-Morning Snack: Greek Yogurt with Flaxseeds

Type something...

🔍

➤

This screenshot displays the deployed and working version of the nutrition agent within the IBM watsonx platform:

- The user request is: "Generate a 1-day meal plan for a 21-year-old female, non-vegetarian, with PCOS, who wants to lose weight." And the response is shown in the following screenshots:

The screenshot shows the IBM watsonx interface. At the top, the navigation bar includes the IBM watsonx logo, an 'Upgrade' button, and user account information (Sutapa Bhuyan's Account, Dallas, SB). Below the navigation bar, the breadcrumb trail reads 'Deployment spaces / Nutrition_Agent / watsonx Agent /'. The main content area displays the 'watsonx Agent' status as 'Deployed' and 'Online'. There are three tabs: 'API reference', 'Test', and 'Preview', with 'Preview' being the active tab. A 'New chat +' button is located on the right side of the chat area. The chat history shows a user request at 09:10 PM: 'Generate a 1-day meal plan for a 21-year-old female, non-vegetarian, with PCOS, who wants to lose weight. She dislikes tofu and prefers Indian cuisine. Make sure meals are low glycemic and high in protein.' The watsonx Agent responds at 09:10 PM: 'To create a personalized meal plan for a 21-year-old female with PCOS who is non-vegetarian, dislikes tofu, prefers Indian cuisine, and aims for weight loss, I'll ensure the meals are low glycemic and high in protein. Here's a sample 1-day meal plan: **Breakfast: Chickpea Curry with Spinach (Chana Saagu)**

- Ingredients: Chickpeas (1 cup cooked), spinach (2 cups), onion (1 medium), tomatoes (2), ginger (1 inch), garlic (3 cloves), spices (turmeric, cumin, coriander, garam masala), olive oil (1 tbsp), salt, and pepper to taste.
- Calories: ~350
- Protein: ~15g
- Glycemic Load: Low
- This meal is high in protein from chickpeas and fiber from spinach, which helps manage PCOS symptoms and supports weight loss.

' At the bottom, there is a text input field with the placeholder 'Type something...' and a send button. On the right side, a sidebar titled 'About this deployment' provides details about the agent, including its name, description, deployment ID, serving name, software specification (runtime-24.1-py3.11), hardware specification (1 CPU and 2 GB RAM), and tags (wx-agent). The 'Associated asset' section shows a link to 'watsonx Agent' with a unique identifier.

IBM watsonx Upgrade ? Bell Sutapa Bhuyan's Account Dallas SB

Deployment spaces / Nutrition_Agent / watsonx Agent /

watsonx Agent Deployed Online

API reference Test **Preview**

New chat +

You 09:10 PM

Generate a 1-day meal plan for a 21-year-old female, non-vegetarian, with PCOS, who wants to lose weight. She dislikes tofu and prefers Indian cuisine. Make sure meals are low glycemic and high in protein.

watsonx Agent 09:10 PM

To create a personalized meal plan for a 21-year-old female with PCOS who is non-vegetarian, dislikes tofu, prefers Indian cuisine, and aims for weight loss, I'll ensure the meals are low glycemic and high in protein. Here's a sample 1-day meal plan:

Breakfast: Chickpea Curry with Spinach (Chana Saagu)

- Ingredients: Chickpeas (1 cup cooked), spinach (2 cups), onion (1 medium), tomatoes (2), ginger (1 inch), garlic (3 cloves), spices (turmeric, cumin, coriander, garam masala), olive oil (1 tbsp), salt, and pepper to taste.
- Calories: ~350
- Protein: ~15g
- Glycemic Load: Low
- This meal is high in protein from chickpeas and fiber from spinach, which helps manage PCOS symptoms and supports weight loss.

Type something...

About this deployment

Name
watsonx Agent

Description
Change this description to reflect your particular agent

Deployment Details
Deployment ID: b04b6555-04fb-44...
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
watsonx Agent
ac51acdd-7212-4cad-b93b-8d1d7cd25b7e

Last modified
47 seconds ago

watsonx Agent ✓ Deployed Online

API reference

Test

Preview

[New chat](#) +

Mid-Morning Snack: Greek Yogurt with Berries

- Ingredients: Greek yogurt (1 cup plain, full-fat), mixed berries (1/2 cup), a sprinkle of chia seeds.
- Calories: ~200
- Protein: ~20g
- Glycemic Load: Low
- Greek yogurt is high in protein and beneficial bacteria, which can aid digestion and support weight loss.

Lunch: Grilled Chicken Tikka with Cucumber Raita

- Ingredients: Chicken breast (4 oz grilled), cucumber (1/2 cup), plain yogurt (1/2 cup), mint (a handful), salt, and pepper to taste.
- Calories: ~400
- Protein: ~35g
- Glycemic Load: Low
- Chicken provides lean protein, and cucumber raita adds hydration and probiotics.

Afternoon Snack: Roasted Almonds

Type something...



About this deployment ×

Name

watsonx Agent

Description

Change this description to reflect your particular agent

Deployment Details

Deployment ID: `b04b6555-04fb-44...`

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

[watsonx Agent](#)`ac51acdd-7212-4cad-b93b-8d1d7cd25b7e`

Last modified

47 seconds ago

watsonx Agent ✓ Deployed Online

API reference

Test

Preview

[New chat](#) +

Afternoon Snack: Roasted Almonds

- Ingredients: Almonds (1 oz).
- Calories: ~160
- Protein: ~6g
- Glycemic Load: Low
- Almonds are a great source of healthy fats, protein, and fiber, promoting satiety and weight management.

Dinner: Palak Paneer with Brown Rice

- Ingredients: Paneer (4 oz), spinach (2 cups), paneer spices (cumin, coriander, turmeric), brown rice (1 cup cooked).
- Calories: ~550
- Protein: ~30g
- Glycemic Load: Low
- Paneer offers a good amount of protein, and brown rice provides fiber and additional nutrients compared to white rice.

Evening Snack (if needed): Mixed Nuts

Type something...



About this deployment ×

Name

watsonx Agent

Description

Change this description to reflect your particular agent

Deployment Details

Deployment ID: b04b6555-04fb-44...

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

[watsonx Agent](#)

ac51acdd-7212-4cad-b93b-8d1d7cd25b7e

Last modified

47 seconds ago

watsonx Agent

Deployed

Online

API reference

Test

Preview

New chat +

- Paneer offers a good amount of protein, and brown rice provides fiber and additional nutrients compared to white rice.

Evening Snack (if needed): Mixed Nuts

- Ingredients: Mixed nuts (1/4 cup).
- Calories: ~170
- Protein: ~5g
- Glycemic Load: Low
- Nuts are a great source of healthy fats and protein, helping to keep you satiated.

This meal plan totals approximately 1830 calories, with a good balance of macronutrients and a focus on low glycemic index foods to support weight loss and manage PCOS symptoms. Please adjust portion sizes as needed to meet your specific calorie requirements.

Remember, individual nutritional needs can vary, so it's essential to monitor how your body responds to this plan. If you experience any discomfort, bloating, or other symptoms, please inform me so I can adjust future recommendations accordingly.

S

You 09:11 PM

Type something...



About this deployment

×

Name

watsonx Agent

Description

Change this description to reflect your particular agent

Deployment Details

Deployment ID: b04b6555-04fb-44...

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

watsonx Agent

ac51acdd-7212-4cad-b93b-8d1d7cd25b7e

Last modified

47 seconds ago

The agent dynamically adjusts meal plans based on user feedback, replacing chickpeas with lentils to honour food preferences while maintaining nutritional goals.

IBM watsonx

Upgrade ?

Sutapa Bhuyan's Account

Dallas

SB

[Deployment spaces](#) / [Nutrition_Agent](#) / [watsonx Agent](#)

watsonx Agent Deployed Online

API reference

Test

Preview

You 09:11 PM

she doesn't like. chickpea

watsonx Agent 09:11 PM

Understood. Given that she doesn't like chickpeas, let's modify the breakfast to use lentils instead, which are also high in protein and fiber and suitable for PCOS management.

Breakfast: Lentil Soup (Masoor Dal)

- Ingredients: Lentils (1 cup cooked), onion (1 medium), tomatoes (2), ginger (1 inch), garlic (3 cloves), spices (turmeric, cumin, coriander, garam masala), olive oil (1 tbsp), salt, and pepper to taste.
- Calories: ~380
- Protein: ~18g
- Glycemic Load: Low
- Lentils are an excellent source of protein and fiber, beneficial for PCOS and weight management.

The rest of the meal plan remains the same, as it already avoids chickpeas and focuses on low glycemic, high-protein options suitable for her dietary preferences and health goals.

New chat +

About this deployment

Name

watsonx Agent

Description

Change this description to reflect your particular agent

Deployment Details

Deployment ID: b04b6555-04fb-44...

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

watsonx Agent

ac51acdd-7212-4cad-b93b-8d1d7cd25b7e

Last modified

47 seconds ago

GITHUB REPOSITORY LINK

- https://github.com/SutapaSusovita/Nutrition_Agent

CONCLUSION

- The AI Nutrition Assistant effectively delivered accurate and personalized meal plans tailored to individual health goals, dietary restrictions, and preferences. It adapted dynamically to user feedback, supported text, voice, and image inputs, and provided contextual explanations for food choices—enhancing user understanding and trust.
- During implementation, challenges included handling vague user inputs, managing API tokens securely on IBM Cloud Lite, and operating within limited resource constraints.
- Overall, the solution demonstrated strong potential to provide scalable, expert-level nutrition guidance that is both accessible and impactful for users seeking healthier lifestyles.

FUTURE SCOPE

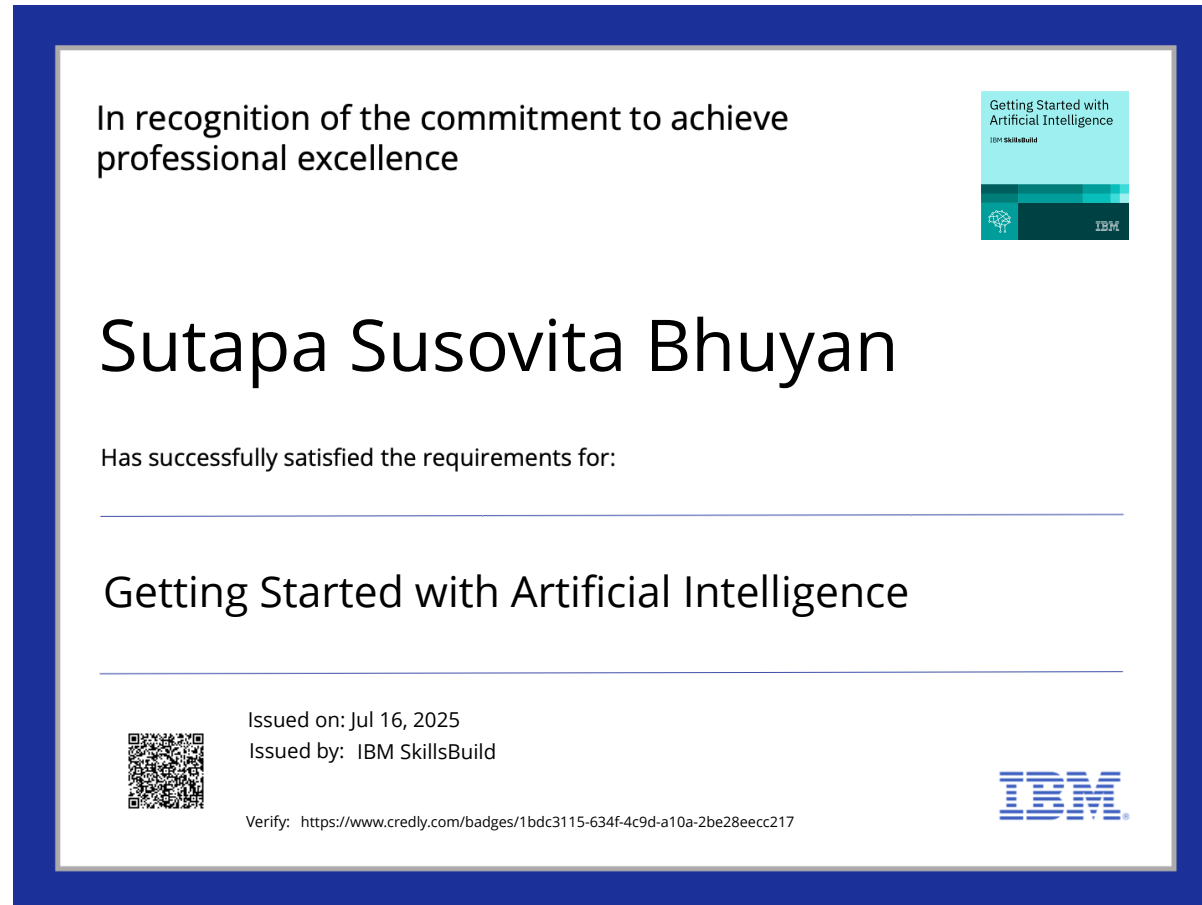
- To improve the system, we plan to integrate additional data sources like fitness trackers and electronic health records for deeper personalization. Algorithm optimization will enhance response speed and accuracy. Expanding coverage across multiple cities and regions will allow for culturally relevant meal suggestions. Future versions could leverage edge computing for faster, on-device responses and adopt advanced techniques like federated learning to ensure data privacy while continuously improving performance.

REFERENCES

1. Zeevi et al., 2015 – "Personalized Nutrition by Prediction of Glycemic Responses" ([Link](#))
2. NaviGen (Khamesian et al., 2025) – "NutriGen: Personalized Meal Plan Generator Leveraging LLMs to Enhance Dietary Adherence" ([Link](#))
3. Han et al., 2024 – "NurifyAI: Real-Time Food Detection, Nutritional Analysis, and Personalized Meal Recommendations" ([Link](#))
4. Amiri et al., 2023 – "Personalized Flexible Meal Planning for Individuals with Diet-Related Health Concerns" ([Link](#))

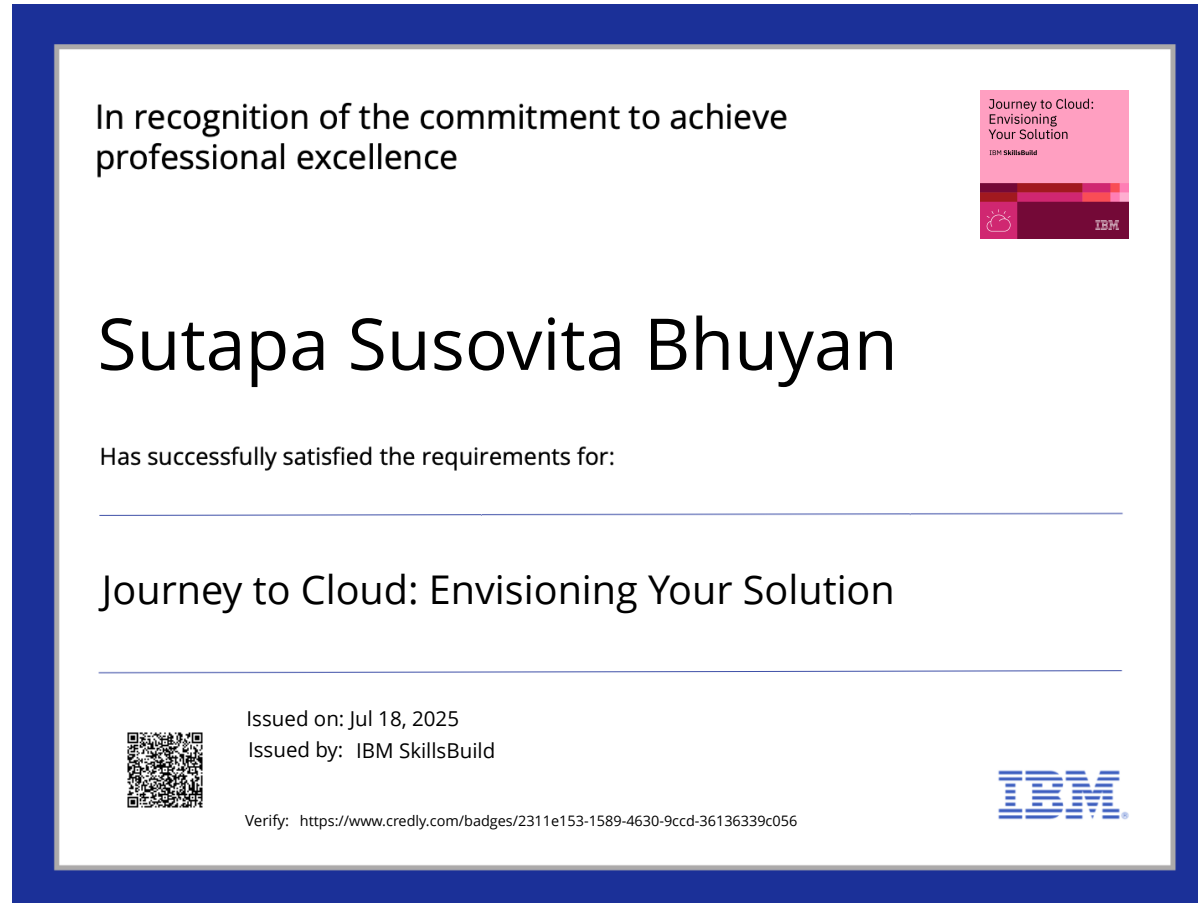
IBM CERTIFICATIONS

■ Getting Started with Artificial Intelligence certificate:



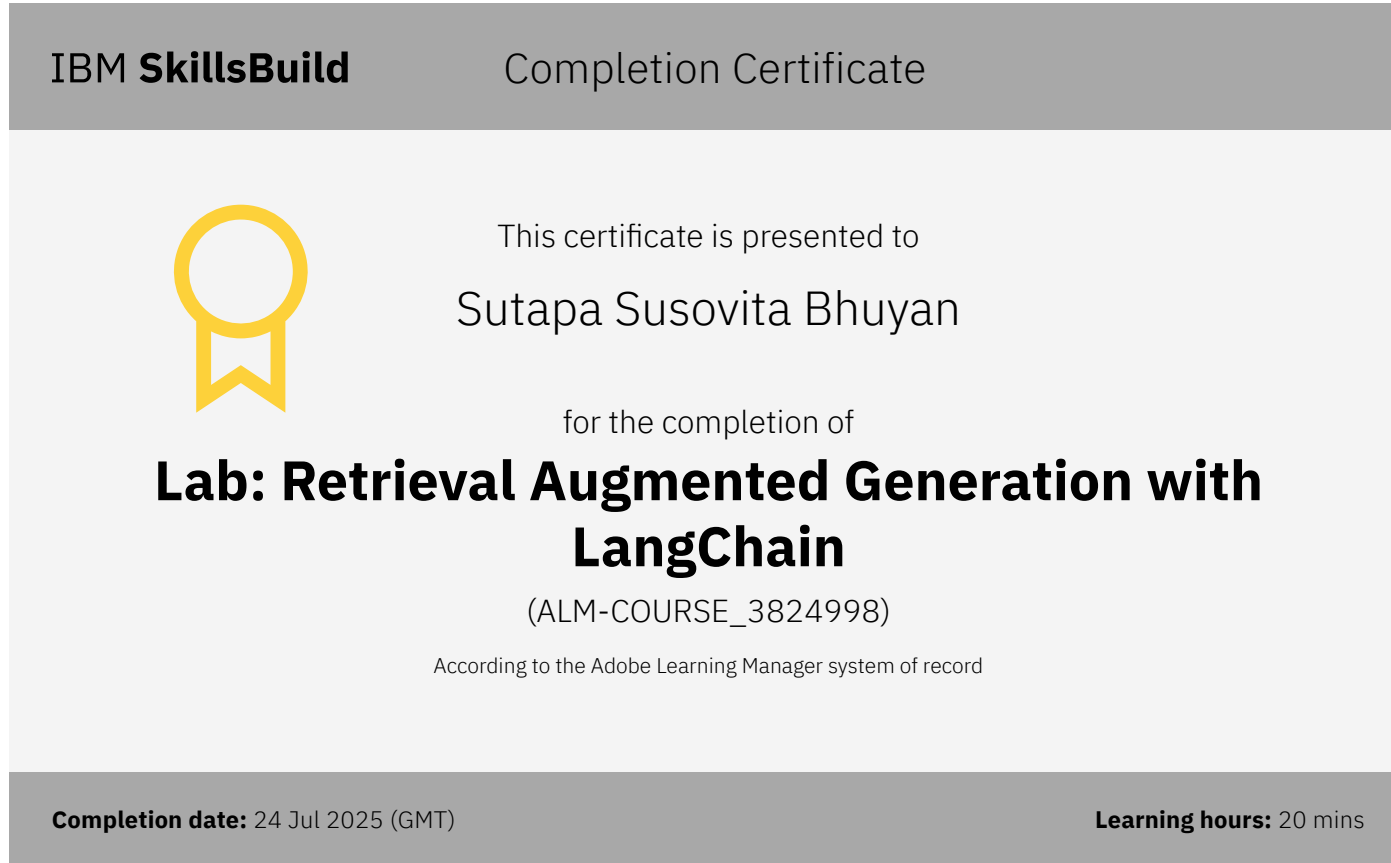
IBM CERTIFICATIONS

■ Journey to Cloud certificate:



IBM CERTIFICATIONS

■ RAG Lab certificate:





THANK YOU