
CAPSTONE PROJECT

The Smartest AI Nutrition Assistant

Presented By:

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OUTLINE

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

PROBLEM STATEMENT

"In an era of growing health consciousness, individuals are increasingly seeking personalized nutrition guidance tailored to their unique needs. However, most existing solutions offer generic diet plans, lack real-time adaptability, and fail to account for a person's holistic lifestyle, cultural preferences, allergies, and evolving health conditions. Moreover, dietitians and nutritionists often encounter challenges in scaling personalized consultations due to time, availability, and resource limitations."

PROPOSED SOLUTION

This project proposes the development of a robust, AI-driven system called “**The Smartest AI Nutrition Assistant**”, which uses state-of-the-art **generative AI models** and IBM’s AI cloud ecosystem to deliver **highly personalized, context-aware nutrition planning**. The system will:

- Understand user inputs through a **chat-based interface** that collects key information such as **age, gender, allergies, medical conditions**, dietary preferences (e.g., vegetarian, Jain), and personal health goals (e.g., weight loss, diabetes control, muscle gain).
- Analyze this profile to generate **daily or weekly meal plans**, personalized according to **nutritional requirements, health constraints**, and **cultural preferences**.
- Provide **explanations behind recommendations**, including macronutrient and micronutrient considerations, and suggest **healthier food alternatives**.
- Allow for **manual feedback and iterative refinement** of plans to reflect evolving user needs.

By integrating **user-provided data** with **domain knowledge and large language models**, the assistant fills the gap between **generic diet apps** and **costly one-on-one consultations**, offering a smart, scalable alternative for personalized dietary planning.

SYSTEM APPROACH

The proposed solution utilizes IBM's AI and cloud services to build a responsive, intelligent, and scalable nutrition assistant:

- **IBM Granite Foundation Models (via Watsonx.ai):** Powers natural language understanding, contextual reasoning, and dynamic content generation.
- **IBM Watson Assistant:** Acts as the primary conversational interface to enable real-time, interactive user communication.
- **IBM Cloud Object Storage:** Handles secure storage of user-uploaded data such as meal plans and profile information.
- **IBM Cloudant NoSQL Database:** Stores structured user data including health profiles, dietary logs, preferences, and feedback securely and efficiently.
- **Front-End Interface:** Developed using React.js (or similar web technologies) to create a responsive user experience, deployed via IBM Cloud App Services.

ALGORITHM & DEPLOYMENT

System Functionality Breakdown

1. Input Handling

- Users interact with the system through a **web-based chat interface** using **typed text queries**.

2. User Profiling & Health Analysis

- Based on the user's **self-reported information** (e.g., health goals, dietary restrictions, lifestyle), a **personalized health profile** is created.
- This profile drives all subsequent AI-generated outputs to ensure dietary suggestions are safe and relevant.

3. Meal Plan Generation

- **IBM Granite Foundation Models** (via Watsonx) are used to generate **personalized meal plans**.
- The system considers:
 - **Caloric requirements**
 - **Macronutrient and micronutrient targets**
 - **Cultural and dietary preferences**
 - **Exclusion criteria** like allergens or disliked ingredients

4. Deployment & Integration

- The full-stack solution is **hosted on IBM Cloud** using secure, scalable infrastructure.
- The backend is integrated with **Watson Assistant** and **Cloudant NoSQL DB** for real-time processing and data storage.
- The front-end offers a clean, interactive user interface for ongoing engagement and feedback.

Step 1 : Make sure the resource list is empty if not delete the resources created earlier.

The screenshot displays the IBM Cloud console's 'Resource list' page. The interface is dark-themed. At the top, a navigation bar includes the 'IBM Cloud' logo, a search bar, and user account information ('Ramitha R Account'). A sidebar on the left contains icons for various services. The main content area is titled 'Resource list' and features a 'Create resource' button. Below the title is a table with columns: Name, Group, Location, Product, Status, and Tags. Each column has a corresponding filter input. The table lists several resource categories, each with a count of zero in parentheses: Compute, Containers, Networking, Storage, Converged infrastructure, Enterprise applications, AI / Machine Learning, Analytics, Blockchain, Databases, Developer tools, Observability, and Migration.

Name	Group	Location	Product	Status	Tags
Filter by name or IP address...	Filter by group...	Filter...	Filter...	Filter...	Filter...
Compute (0)					
Containers (0)					
Networking (0)					
Storage (0)					
Converged infrastructure (0)					
Enterprise applications (0)					
AI / Machine Learning (0)					
Analytics (0)					
Blockchain (0)					
Databases (0)					
Developer tools (0)					
Observability (0)					
Migration (0)					

Step 2 : Visiting the Watsonx.ai home page to create the AI Agent

The screenshot displays the IBM Watsonx.ai home page. At the top, a dark navigation bar includes the IBM Watsonx logo, a help icon, a notification bell, and user account information for 'Ramitha R Account' in the 'Dallas' region. The main content area features a large 'Welcome back, Ramitha' message. Below this, there are three primary action cards: 'Chat and build prompts with foundation models' (with a 'Start chatting...' button and 'Open Prompt Lab' link), 'Build an AI agent to automate tasks' (with 'Agent Lab' and a beta badge), and 'Tune a foundation model with labeled data' (with 'Tuning Studio'). A 'Customize my journey' button is also present. The bottom section, titled 'Discover', contains a 'Developer access' panel with fields for 'Project or deployment space' (set to 'Project or deployment space'), 'Project ID' (a long alphanumeric string), and 'watsonx.ai URL' (https://us-south.ml.cloud.ibm.com). To the right of this is a 'Developer hub' section with a grid icon and text about starting coding fast and making API requests.

IBM watsonx

Welcome back, Ramitha

Open in: nutrition_agent

Train, validate, tune and deploy AI models.

Customize my journey

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

Discover

Collapse Discover section

Developer access

Project or deployment space

Project ID

Project or deployment space

00000000-0000-0000-0000-00000000

watsonx.ai URL

https://us-south.ml.cloud.ibm.com

Developer hub

New watsonx Developer Hub to start coding fast.

Make your first API request to inference a foundation model in watsonx.ai. Find the

Step 3 : Creating a sandbox project and defining the required details and a storage.

IBM watsonx

Upgrade?

?

🔔

Ramitha R Account ▾

Dallas ▾

RR

⋮

Create a project

Start with a new, blank project or select from where to import an existing project.

+ New

📁 Local file

📁 Sample

Define details

Name

Nutrition

Description (optional)

What's the purpose of this project?

Tags (optional)

Add tags

Add tags to make projects easier to find. To add tags, separate them with commas and press Enter.

Storage

Cloud Object Storage-je

Project includes integration with [Cloud Object Storage](#) for storing project assets.

Advanced settings

▾

Cancel

Create

Step 4 : Associating a runtime service to the project which acts as a powerhouse.

The screenshot displays the IBM watsonx web interface. At the top, a dark navigation bar includes the 'IBM watsonx' logo, an 'Upgrade' link, a help icon, a notification bell, and user account information for 'Ramitha R Account' in the 'Dallas' region. Below this, a breadcrumb trail shows 'Projects / Nutrition'. A secondary navigation bar contains tabs for 'Overview', 'Assets', 'Deployments', 'Jobs', and 'Manage', with 'Manage' being the active tab. On the left, a sidebar menu lists 'Project' settings (General, Access control, Environments, Resource usage) and 'Tools' (Pipeline). The 'Services & integrations' section is highlighted in the sidebar. The main content area is titled 'Services & integrations' and features two tabs: 'IBM services (1)' (active) and 'Third-party integrations'. A descriptive text states: 'Associate IBM Cloud services with this project to add tools, compute environments, or other capabilities. [Learn more.](#)'. Below this is a search bar labeled 'Find services' and a blue 'Associate service +' button. A table lists the associated services:

<input type="checkbox"/>	Name	Service type
<input type="checkbox"/>	watsonx.ai Runtime-kz	watsonx.ai Runtime

Step 5: Initialization of User Profile for Personalized Nutritional Recommendations

IBM watsonx

Upgrade ?

Ramitha R Account

Dallas

RR

Projects / Nutrition / Agent Lab

Share feedback B

Unsaved

New agent +

Deploy

Build

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

Agent preview

Setup

Configuration

Framework Architecture

LangGraph ReAct

Instructions

Ask the user in the following order:
1. Age
2. Gender
3. Any health conditions (e.g., diabetes, thyroid, etc.)
4. Dietary preference (vegetarian or non-vegetarian)

Knowledge

Tools

Add a tool Create custom tool

Added tools (5)

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.

RR You: 10:35 AM

Hi

watsonx Agent 10:35 AM

Hello! To assist you better with your nutrition needs, could you please provide me with some details?

1. What is your age?
2. What is your gender?
3. Do you have any health conditions, such as diabetes, thyroid, etc.?
4. What is your dietary preference - vegetarian or non-vegetarian?
5. Are there any known allergies I should be aware of?

► How did I get this answer?

RR You: 10:36 AM

21, Female,Thyroid, Vegetarian, None

watsonx Agent 10:36 AM

Thank you for providing the information. Here's what I have:

• Age: 21
• Gender: Female
• Health Condition: Thyroid
• Dietary Preference: Vegetarian
• Allergies: None

How can I assist you with your nutrition needs?

► How did I get this answer?

Type something...

Build

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

Setup

Configuration

Framework: LangGraph Architecture: ReAct

Instructions

Ask the user in the following order:

- Age
- Gender
- Any health conditions (e.g., diabetes, thyroid, etc.)
- Dietary preferences (vegetarian or non-vegetarian)

Knowledge

Tools

Add a tool Create custom tool

Added tools (5)

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.

Agent preview

RR You: 10:38 AM

What should i eat for next two weeks to loose weight

watsonx Agent 10:38 AM

To provide you with a personalized meal plan, I need to consider your health condition, which is thyroid. Here's a general guideline for a vegetarian meal plan that could help with weight loss, but please consult with a healthcare professional or a dietitian for a tailored plan:

- High-Protein Foods:** Include legumes (lentils, chickpeas, beans), tofu, tempeh, quinoa, and nuts in your diet. Protein helps in maintaining muscle mass while losing weight.
- Fiber-Rich Foods:** Consume plenty of fruits, vegetables, whole grains, and oats. Fiber aids in digestion and keeps you feeling full, reducing overeating.
- Healthy Fats:** Incorporate avocados, olive oil, and fatty fish (like salmon, though it's non-vegetarian, it's often included in vegetarian diets due to its omega-3 content) for a balanced diet.
- Portion Control:** Be mindful of portion sizes to avoid overeating.
- Hydration:** Drink plenty of water throughout the day.
- Regular Exercise:** Combine your diet with regular physical activity for better results.

Given your thyroid condition, it's crucial to maintain a balanced diet and avoid extreme diets that could negatively impact your thyroid function.

For a more detailed plan, consider consulting with a healthcare provider or a dietitian who can take into account your specific needs and health condition.

Would you like me to find some vegetarian meal plans online for you?

► How did I get this answer?

Type something...

edunet

foundation

Step 6 : After successfully saving the project create an API Key.


IBM watsonx

Upgrade

Ramitha R Account

Dallas

RR



Ramitha R

koushikkumar.hanu@gmail.com

[Edit IBMid profile](#)

Dark theme off

Profile

Git integrations

User API key

✓ User API key is successfully created. Your new key is stored in IBM watsonx and IBM Cloud.

User API key

A user API key is required to authenticate runtime operations in IBM watsonx.
Rotate keys as needed to create a new key and phase out the current key. [Learn more](#)

Rotate

Name	Creation date	Status
cpd-apikey-IBMid-6980010DKL-2025-08-01T04:05:34Z	August 1, 2025 at 9:35:34 AM	✓ Active

Step 7 : Deploy the project

IBM watsonx

Upgrade ? 🔔 Ramitha R Account Dallas RR

Deployment spaces / Agentic AI / watsonx Agent /

watsonx Agent Deployed Online

API reference Test Preview

Endpoints for inferencing ⓘ

Private endpoint

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/c38a3c4d-c826-4bf5-a780-36c3c864fcdc/ai_service?version=2021-05-01

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/c38a3c4d-c826-4bf5-a780-36c3c864fcdc/ai_service_stream?version=2021-05-01

Public endpoint

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/c38a3c4d-c826-4bf5-a780-36c3c864fcdc/ai_service?version=2021-05-01

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/c38a3c4d-c826-4bf5-a780-36c3c864fcdc/ai_service_stream?version=2021-05-01

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

Code snippets

cURL

Java

JavaScript

Python

Scala

```
# NOTE: you must set $API_KEY below using information retrieved from your IBM Cloud account (https://dataplatform.cloud.ibm.com/docs/content/wsj/analyze-data/ml-authentication)
export API_KEY=<your API key>

export IAM_TOKEN=$(curl --insecure -X POST --location "https://iam.cloud.ibm.com/identity/token" \
--header "Content-Type: application/x-www-form-urlencoded" \
--header "Accept: application/json" \
--data-urlencode "grant_type=urn:ibm:params:oauth:grant-type:apikey" \
--data-urlencode "apikey=$API_KEY" | jq -r '.access_token')

# TODO: manually define and pass values to be scored below

curl --location "https://us-south.ml.cloud.ibm.com/ml/v4/deployments/c38a3c4d-c826-4bf5-a780-36c3c864fcdc/ai_service_stream?version=2021-05-01" \
--header "Content-Type: application/json" \
--header "Accept: application/json" \
```

About this deployment ×

Name

watsonx Agent

Description

Change this description to reflect your particular agent

Deployment Details

Deployment ID: c38a3c4d-c826-4b...

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

0bec9a25-65ea-4fde-8eac-eeae1fe7535a

Last modified

10 minutes ago

Created on

Aug 1, 2025

RESULT

Agent preview

RR You: 10:43 AM

Hi

watsonx Agent 10:43 AM

Hello! To assist you better with your nutrition needs, could you please provide me with some details?

1. What is your age?
2. What is your gender?
3. Do you have any health conditions, such as diabetes, thyroid, etc.?
4. What is your dietary preference - vegetarian or non-vegetarian?
5. Are there any known allergies I should be aware of?

► How did I get this answer?

RR You: 10:43 AM

21,Female,Thyroid,Vegetarian,Lactose intolerant

watsonx Agent 10:43 AM

Thank you for providing the information. Here's what I have:

- Age: 21
- Gender: Female
- Health Condition: Thyroid
- Dietary Preference: Vegetarian
- Allergy: Lactose intolerant

How can I assist you with your nutrition needs?

► How did I get this answer?

RR You: 10:43 AM

Type something...



Agent preview

► Dietary Preference: Vegetarian

- Allergy: Lactose intolerant

How can I assist you with your nutrition needs?

► How did I get this answer?

RR You: 10:43 AM

Diet plan to loose 2kgs in next two weeks

watsonx Agent 10:43 AM

I understand you're looking to lose 2 kg in the next two weeks and follow a vegetarian diet while considering your thyroid condition and lactose intolerance. Here's a general diet plan suggestion, but please consult with a healthcare professional or a registered dietitian to ensure it aligns with your specific needs and health conditions.

Sample Meal Plan

Day 1 & 2:

- Breakfast: Oatmeal with almond milk, chia seeds, and fresh berries.
- Snack: A small handful of nuts (like almonds).
- Lunch: Quinoa salad with mixed vegetables (bell peppers, cucumbers, tomatoes) and a lemon-olive oil dressing.
- Snack: Sliced apple with a tablespoon of sunflower seed butter.
- Dinner: Lentil soup with a side of whole-grain bread.

Day 3 & 4:

- Breakfast: Smoothie with spinach, banana, lactose-free yogurt, and flaxseeds.
- Snack: Carrot and celery sticks with hummus.
- Lunch: Chickpea salad with mixed greens, avocado, and balsamic vinaigrette.
- Snack: Rice cakes topped with lactose-free cream cheese and cucumber slices.
- Dinner: Stir-fried tofu with mixed vegetables (broccoli, snap peas, carrots) and brown rice.

Day 5 & 6:

- Breakfast: Whole grain toast with avocado and a sprinkle of sunflower seeds.
- Snack: A small bowl of mixed fruit (like melon, grapes, and kiwi).
- Lunch: Vegetable curry with chickpeas served with brown rice.
- Snack: Cucumber slices with guacamole.
- Dinner: Baked eggplant with a side of quinoa and a green salad.

Day 7:

- Breakfast: Same as Day 1.
- Snack: Same as Day 1.
- Lunch: Same as Day 2.
- Snack: Same as Day 2.
- Dinner: Same as Day 3.

Remember to drink plenty of water throughout the day and adjust portion sizes according to your energy needs. Incorporate regular physical activity into your routine, as it complements dietary changes for weight loss.

Please consult with a healthcare professional before starting any new diet plan, especially considering your thyroid condition and lactose intolerance. They can provide personalized advice and monitor your progress safely.

Would you like information on exercises to complement this diet plan or any other nutrition-related queries?

► How did I get this answer?



Type something...



Nutrition Agent Interaction Summary:

In this interaction, I communicated with the AI-powered Watsonx Nutrition Agent to generate a personalized diet plan based on the following criteria:

- **Age:** 21
- **Gender:** Female
- **Health Condition:** Thyroid
- **Dietary Preference:** Vegetarian
- **Allergy:** Lactose intolerant
- **Goal:** Weight loss (2 kg in 2 weeks)

The agent successfully generated a **7-day vegetarian meal plan** that:

- Avoids lactose-containing products
- Is rich in whole grains, legumes, fruits, and vegetables
- Supports thyroid health by incorporating nutrient-dense foods
- Recommends hydration, physical activity, and professional consultation

This demonstrates how an AI-based nutrition assistant can personalize dietary recommendations efficiently, catering to medical conditions, preferences, and health goals. It also highlights the potential of AI agents in promoting preventive health and wellness.

CONCLUSION

The Smartest AI Nutrition Assistant successfully transforms the experience of nutritional planning from a static, app-driven model to an interactive, intelligent, and continuously learning AI health partner. It integrates multimodal communication, generative AI, and health reasoning capabilities to provide hyper-personalized nutrition advice at scale. By leveraging IBM's robust AI ecosystem, the system ensures accuracy, scalability, and user engagement while addressing real-world limitations of accessibility, cultural diversity, and dietary complexity.

FUTURE SCOPE

- Seamless integration with **fitness wearables** (e.g., Fitbit, Apple Watch) for real-time diet adjustments.
- Expansion to include **regional Indian diets**, local languages, and cultural dietary rules.
- Addition of **AI-powered grocery list generator**, syncing weekly plans to local store availability.
- Companion **mobile app** with voice-only mode for elderly and visually impaired users.
- Real-time analytics dashboard for nutritionists and healthcare professionals.

REFERENCES

- IBM Watsonx.ai documentation
- IBM Cloud Lite Services
- Granite Model API (LLM reference)
- WHO Dietary Guidelines
- USDA Nutrition Database

IBM CERTIFICATIONS

- Screenshot/ credly certificate(getting started with AI)



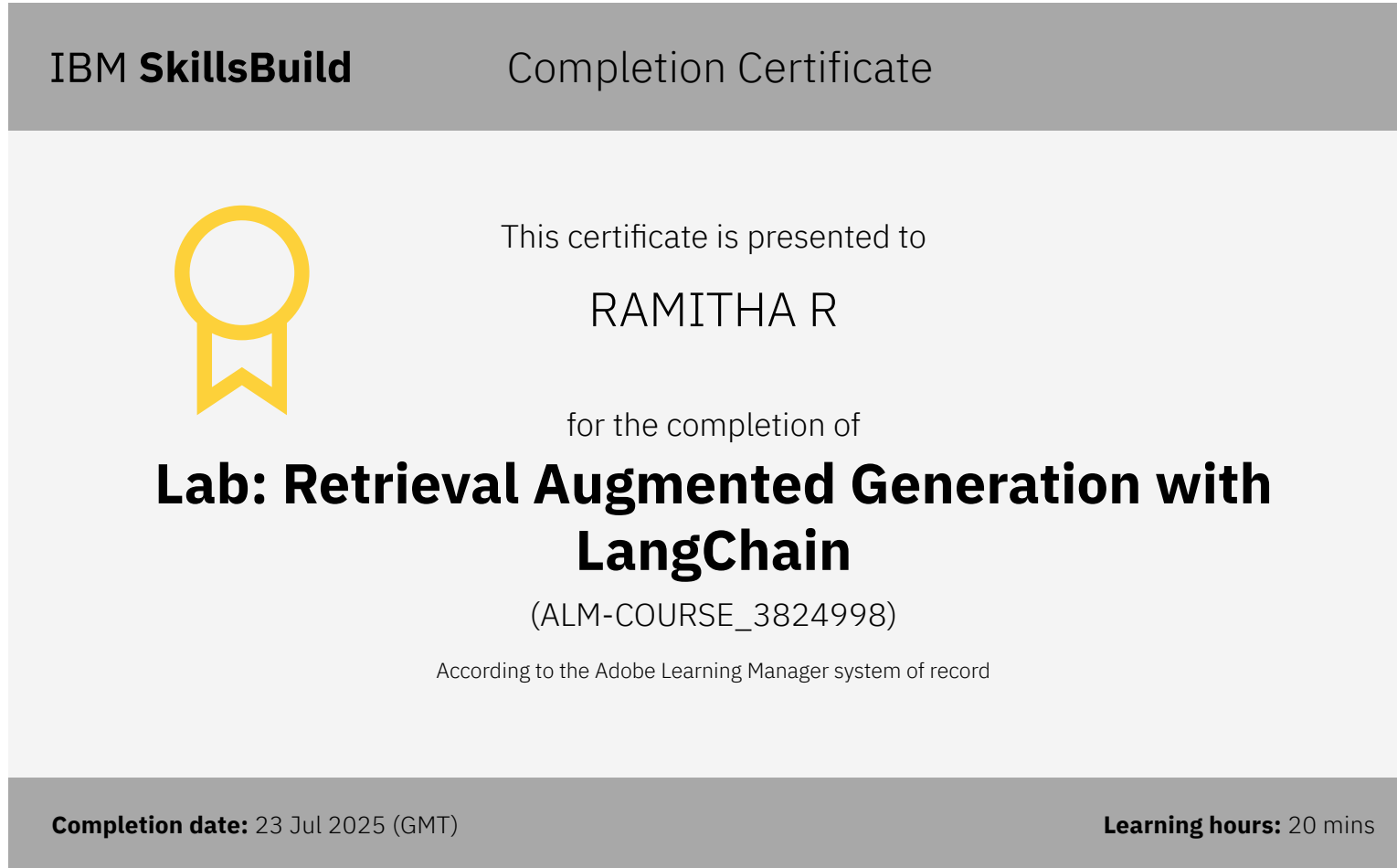
IBM CERTIFICATIONS

- Screenshot/ credly certificate(Journey to Cloud)



IBM CERTIFICATIONS

- Screenshot/ credly certificate(RAG Lab)





THANK YOU