CAPSTONE PROJECT

NUTRITION AGENT

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OUTLINE

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PROBLEM STATEMENT

In today's health-conscious world, individuals seek **personalized nutrition guidance** tailored to their goals, medical needs, and cultural preferences. However, most existing tools provide **generic diet plans** that fail to consider key factors like **food allergies, chronic conditions (e.g., diabetes, hypertension), regional eating habits, and evolving fitness goals**.

Moreover, these tools lack **real-time adaptability**, and users rarely receive **explanations or justifications** for the recommendations provided — making it difficult to trust or follow them consistently.

Meanwhile, **dieticians and nutritionists** face challenges in scaling personalized consultations due to **time and resource limitations**, leaving a large number of people underserved.

Proposed Solution:
An **AI-powered Nutrition Agent** that uses **Natural Language Processing (NLP)** and **Generative AI** to interact with users via chat, understand their health profiles, preferences, and goals, and deliver **personalized meal plans**, **intelligent food swaps**, and **contextual nutritional explanations** — adapting dynamically to user feedback and daily needs.

TECHNOLOGY USED

The **Nutrition Agent** leverages advanced AI technologies and IBM Cloud services to deliver real-time, personalized dietary guidance through a chat interface. The key technologies used are:

1. IBM Cloud Lite Services

IBM Cloud Lite provides the cloud infrastructure for deploying and hosting the Nutrition Agent. It offers:

- Scalable compute and storage resources
- Access to IBM's AI models and services
- Seamless integration with Watsonx and Granite foundation models

2. Natural Language Processing (NLP)

NLP is used to:

- Understand user queries in natural language
- Extract relevant information (e.g., dietary goals, food preferences, allergies)
- Enable smooth and contextual conversations between the user and the AI agent

3. Retrieval-Augmented Generation (RAG)

While this project does not use a vector database, the **RAG-inspired structure** helps the agent:

- Reason through multiple steps using structured flows
- Simulate grounded responses by referencing pre-modeled dietary logic and prompts
- Improve answer quality through task decomposition and response synthesis

4. IBM Granite Model – granite-3-3-8b-instruct

This instruction-tuned large language model is the core engine powering the Nutrition Agent. It enables:

- High-quality, context-aware, and informative response generation
- Reasoning and decision-making using the ReAct (Reasoning + Acting) framework
- Support for diverse tasks like meal planning, food substitution, and fitness-related advice

IBM CLOUD SERVICES USED

The Nutrition Agent project utilizes key IBM Cloud services to develop, deploy, and manage the AI assistant effectively. These services provide the foundation for building a robust, scalable, and intelligent system.

1. **IBM Cloud Watsonx AI Studio**
- Used to design and manage AI workflows
- Allows integration of the Granite foundation model within prompt flows
- Provides an interactive environment for experimentation, chaining, and testing of model outputs

2. **IBM Cloud Watsonx AI Runtime**
- Executes the deployed Granite models in a scalable environment
- Supports real-time inference of AI responses through APIs
- Ensures low-latency, secure, and high-availability access to the model

3. **IBM Cloud Agent Lab**
- Serves as the orchestration environment for deploying intelligent agents
- Provides tooling for managing agent behavior, conversation flow, and debugging
- Supports LangGraph integration for task-routing and logic chaining

4. **IBM Granite Foundation Model (granite-3-3-8b-instruct)**
- The central AI model used for generating personalized meal plans, food swaps, and explanations
- Trained and hosted within IBM's trusted AI environment
- Tuned for instruction-following, reasoning, and high-quality natural language generation

WOW FACTORS

This agent significantly improves access to **personalized nutrition guidance**, enabling users to make healthier choices effortlessly. It eliminates the need for manual meal planning and generic advice by offering **intelligent, adaptive, and culturally relevant dietary suggestions**.

Unique Features:

1. **Context-aware Meal Planning :** Generates daily meal plans tailored to user goals, medical conditions, and preferences.
2. **Interactive Food Swaps with Explanations :** Suggests healthier alternatives along with the reason behind each substitution.
3. **Natural Language Conversation :** Users can interact just like they would with a human dietician, using simple chat commands.
4. **Real-Time Personalization :** Adapts dynamically based on user feedback, likes/dislikes, and fitness goals.
5. **Goal-Oriented Guidance :** Supports use cases like weight loss, muscle gain, or lifestyle improvement with appropriate nutritional support.
6. **No Appointment Needed :** Offers 24/7 access to intelligent nutritional assistance — scalable and on-demand.

END USERS

The Nutrition Agent is designed to serve a wide range of individuals and institutions seeking intelligent, personalized nutrition guidance. Its adaptability and accessibility make it valuable for both personal and professional use.

1. Health-Conscious Individuals

- People aiming to manage weight, improve fitness, or follow a healthier lifestyle
- Users with specific dietary restrictions or medical conditions like diabetes, PCOS, or hypertension

2. Healthcare & Nutrition Professionals

- Dieticians and nutritionists can use the agent as a support tool to scale personalized advice
- Wellness coaches, fitness trainers, and lifestyle consultants

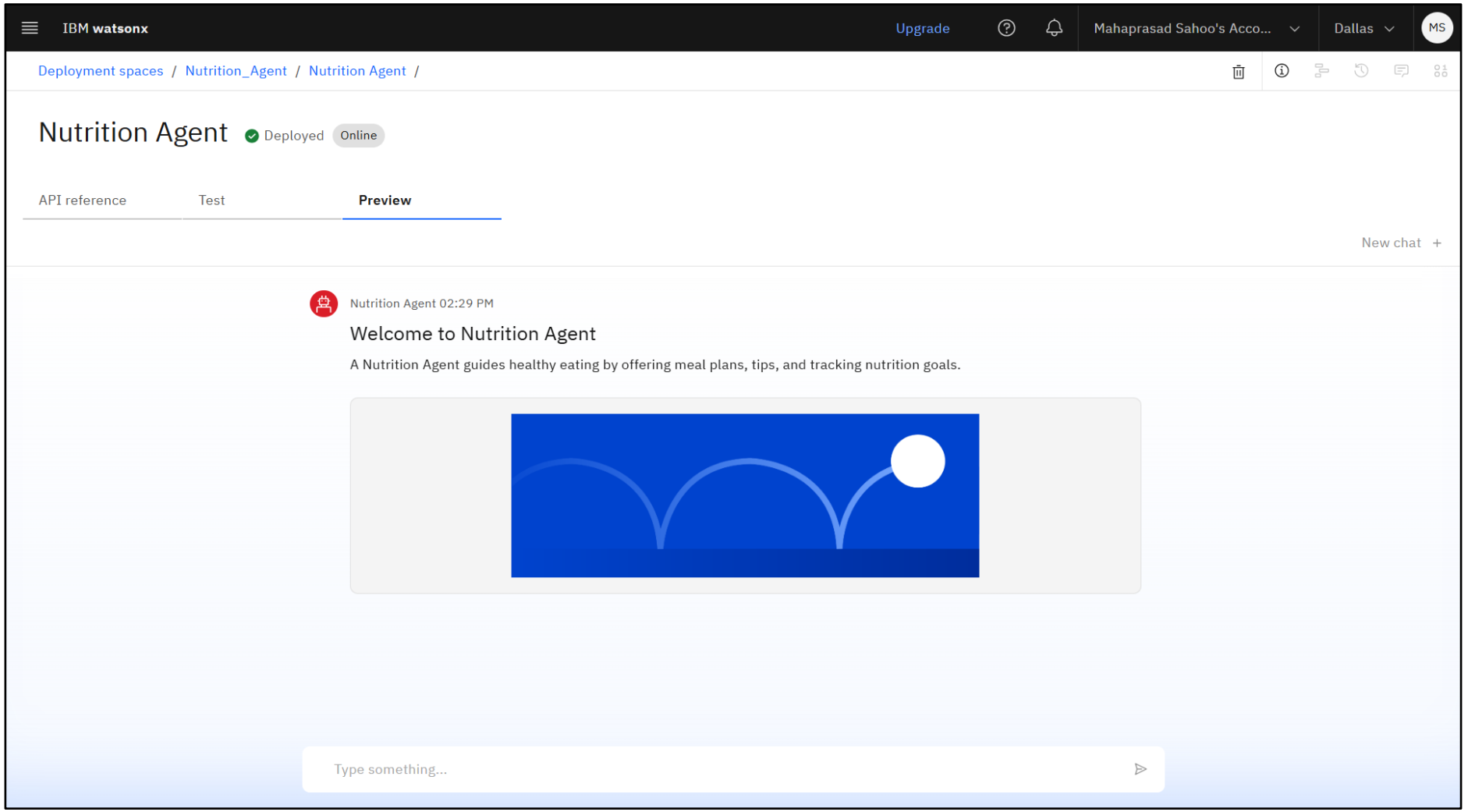
3. Educational Institutions

- Schools and universities can integrate the agent into health awareness programs
- Students studying dietetics, healthcare, or AI applications in health

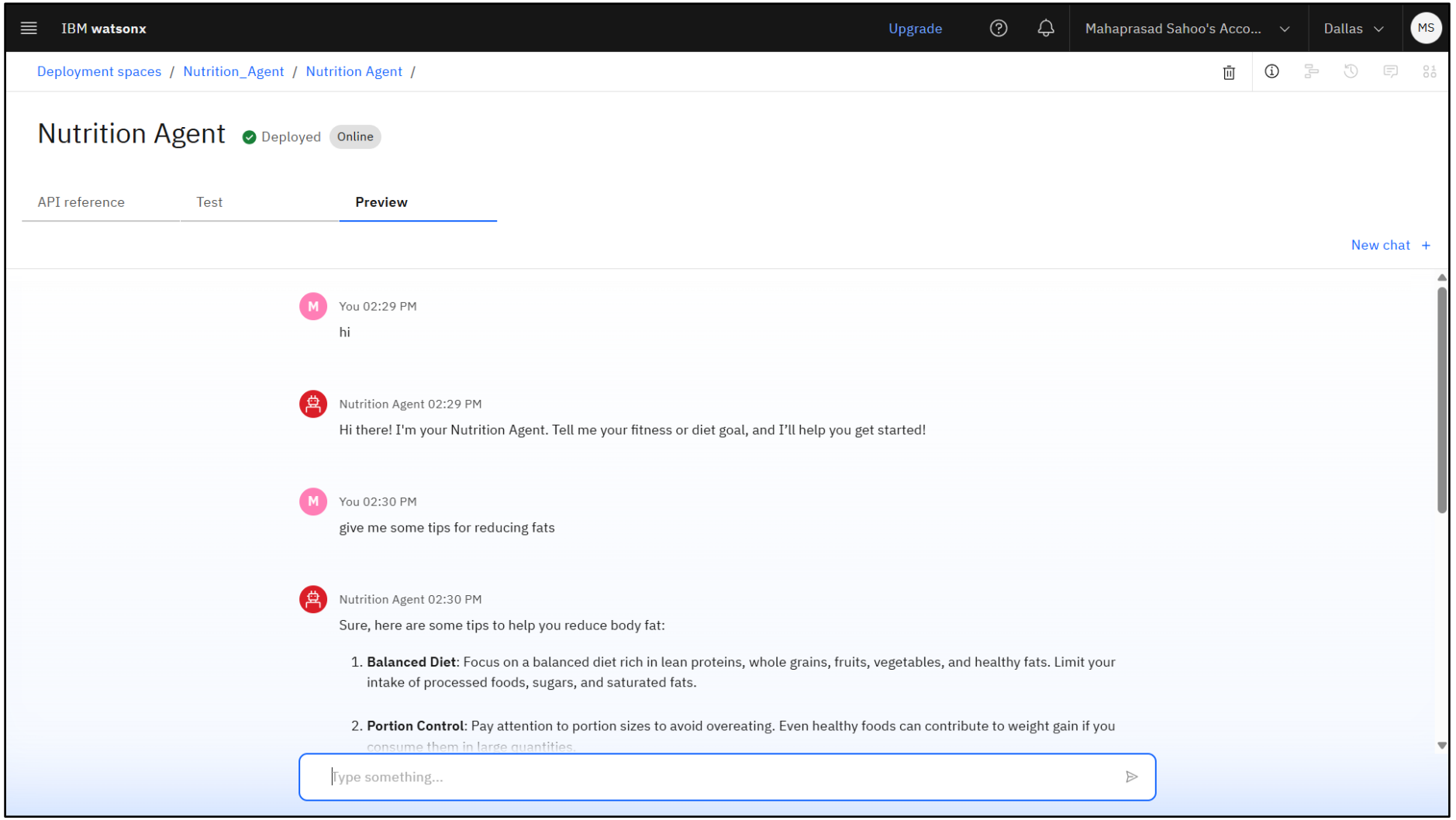
4. Corporate Wellness Programs

- HR departments can offer it as part of employee well-being initiatives
- Companies promoting healthy living through internal platforms

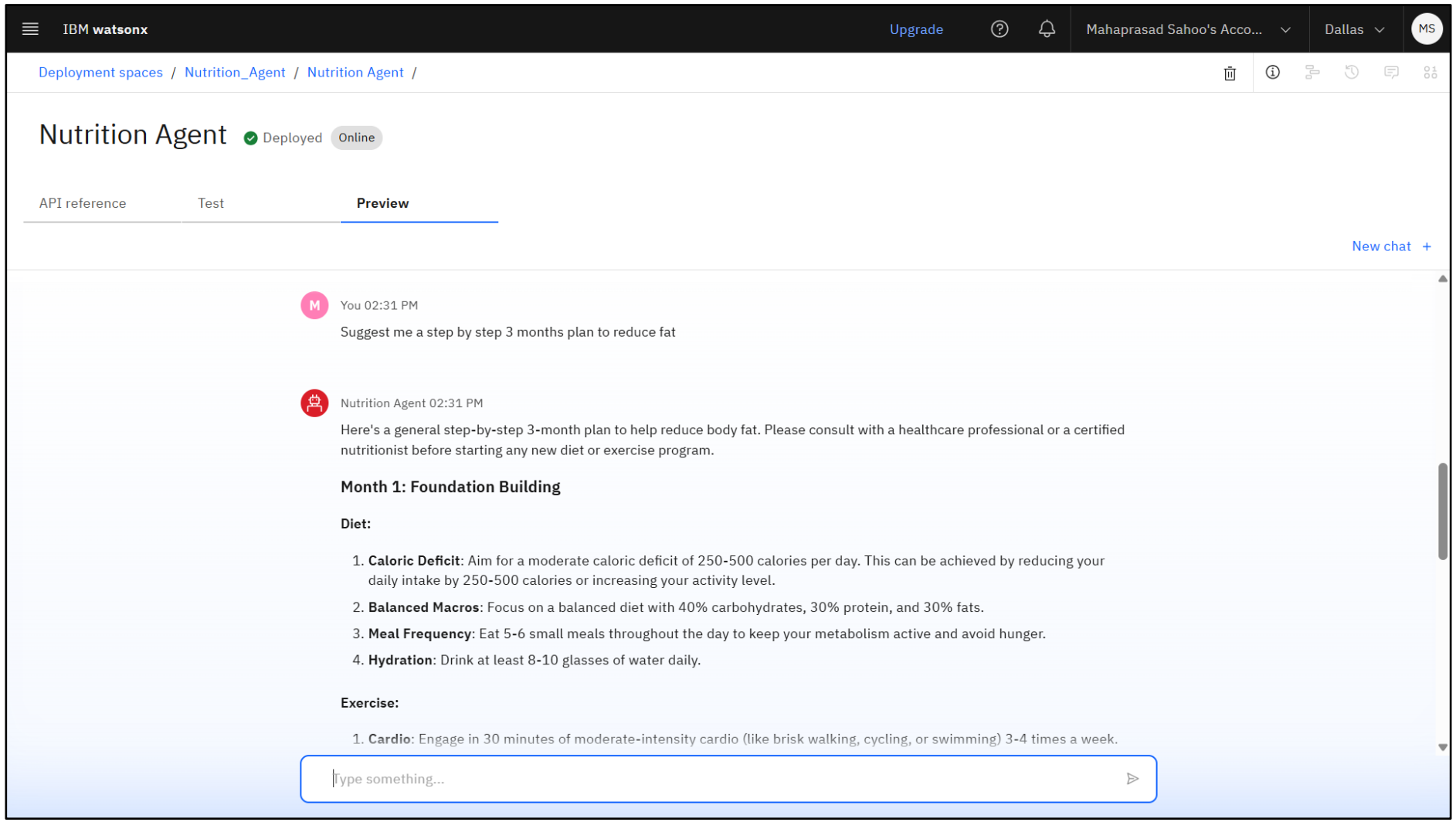
RESULTS



RESULTS



RESULTS



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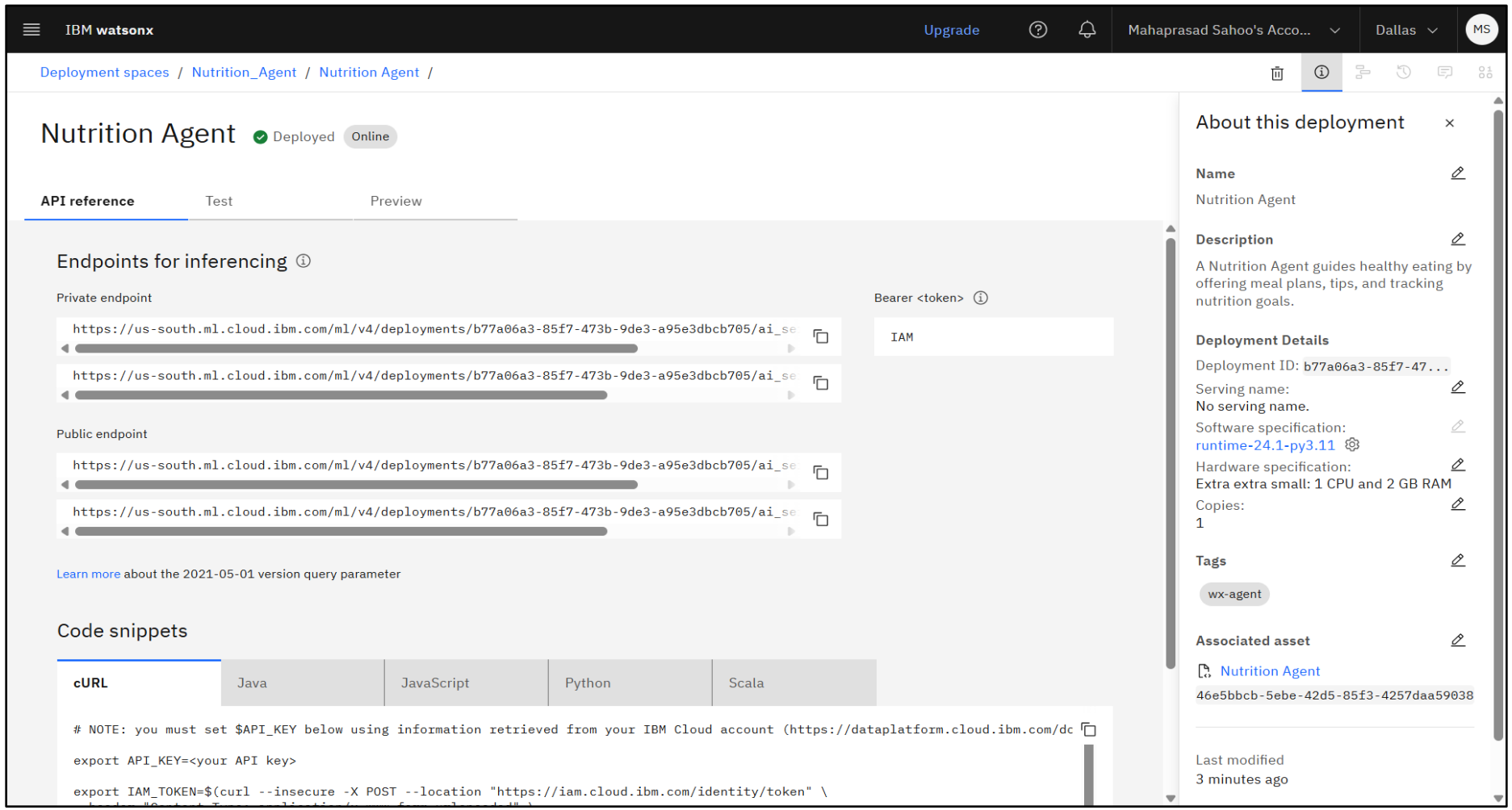
DEPLOYED AI AGENT



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CONCLUSION

The **Nutrition Agent** demonstrates how generative AI can revolutionize the way individuals access and manage their nutritional health. By leveraging **Natural Language Processing**, **instruction-tuned LLMs**, and structured reasoning through **Langraph** and **ReAct**, the agent is capable of generating **dynamic meal plans**, **healthy food alternatives**, and **goal-aligned dietary recommendations**.

Unlike traditional diet applications, this system offers:

- **Personalized and adaptive responses** tailored to user health profiles
- **Contextual explanations** that help users understand *why* a suggestion is being made
- A **conversational, user-friendly experience** without the need for scheduled consultations

It significantly reduces the time and cognitive load associated with manual diet tracking, while promoting **healthy lifestyle choices** through intelligent automation.

In the long term, this approach can enhance **preventive healthcare**, support **chronic condition management**, and make **expert-level nutrition guidance accessible to all**—scaling far beyond what human professionals can deliver alone.

FUTURE SCOPE

The Nutrition Agent can be further enhanced to support a wider range of user needs, technologies, and platforms. Potential future developments include:

1. **Multilingual Support :** Enable the agent to understand and respond in multiple regional and international languages to serve a broader audience.
2. **Voice-Activated Nutrition Assistant :** Integrate voice input/output to allow hands-free interaction, especially useful for visually impaired or busy users.
3. **Real-Time Collaboration with Healthcare Providers :** Enable data sharing with dieticians, fitness coaches, or doctors for integrated care and expert review.
4. **Advanced Nutrition Gap Detection :** Use AI to identify missing nutrients, unhealthy patterns, or risks in users' diets, and suggest focused improvements.
5. **Integration with Health and Fitness Platforms :** Sync with apps like Fitbit, Google Fit, or Apple Health to adjust recommendations based on activity, vitals, and real-time biometrics.
6. **AI-Assisted Diet Report Generation :** Automatically generate weekly nutrition reports, calorie breakdowns, and recommendations for improvement based on ongoing usage.

IBM CERTIFICATIONS

1. GETTING STARTED WITH AI

2. RAG LAB CERTIFICATE

IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Mahaprasad Sahoo

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 19 Jul 2025 (GMT)

Learning hours: 20 mins

3. JOURNEY TO CLOUD

In recognition of the commitment to achieve professional excellence

Journey to Cloud: Envisioning Your Solution
IBM SkillsBuild

Mahaprasad Sahoo

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/5bd13001-0eed-433f-95d4-39ddce63d3bf

IBM

GITHUB LINK

GitHub Repo Link : https://github.com/mahaprasadsahoo12/Nutrition_Agent

THANK YOU

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