

# CAPSTONE PROJECT

## NUTRITION AGENT

**Presented By:**

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# OUTLINE

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

# PROBLEM STATEMENT

- In today's world, people are becoming increasingly health-conscious and aware of the impact of diet on their overall well-being. However, most existing nutrition tools fail to meet individual needs because:
- They provide **generic meal plans** without considering unique health goals or medical backgrounds.
- They **lack adaptability**, offering static suggestions that do not evolve with the user's lifestyle or conditions.
- They **ignore cultural and dietary restrictions**, making them less relevant to diverse populations.
- They do not process **real-world input** such as food images or grocery labels for analysis.
- **Dieticians and nutritionists** face constraints in time and resources, limiting their ability to deliver personalized guidance to a large population.
- This gap between generic digital tools and personalized in-person consultation creates a significant challenge in delivering effective nutrition solutions at scale.

# PROPOSED SOLUTION

- The proposed system aims to deliver real-time, personalized nutrition advice using generative AI, NLP, and multimodal input processing. It creates adaptive, health-specific meal plans while considering user preferences and medical needs. The solution includes the following components:
- **Multimodal Input Understanding:**  
Accept and interpret inputs via text, voice, and images.  
Analyze food photos and dietary queries using NLP and image recognition to extract nutritional context.
- **User Profiling and Personalization:**  
Manage user data like health goals, conditions, allergies, and dietary restrictions.  
Use this information to generate relevant and culturally appropriate meal plans.
- **Meal Plan Generation and Smart Recommendations:**  
Generate daily or weekly meal plans using AI tailored to user needs.  
Include nutrient-balanced suggestions and offer smart food swaps.
- **Contextual Reasoning and Explanation:**  
Provide AI-generated explanations for all suggestions.  
Allow users to query the system for deeper understanding and rationale.
- **Adaptive Feedback and Learning Loop:**  
Collect feedback to refine future recommendations.  
Update meal plans based on evolving health and preference data.
- **Deployment:**  
Develop a web-based assistant using Watsonx.ai on IBM Cloud Lite.  
Use IBM Granity for managing AI workflows and model logic.
- **Evaluation:**  
Assess accuracy and relevance of suggestions using performance metrics.  
Incorporate user feedback to improve the system continuously.

# SYSTEM APPROACH

- **Development Tools & Stack:**
- **Watsonx.ai:** For building intelligent agents capable of understanding and generating language, analyzing images, and learning from interaction.
- **IBM Cloud Lite:** For hosting APIs, managing backend services, and storing user sessions securely.
- **IBM Granity:** For managing workflows and model orchestration.
- **Python + Flask API:** Backend handling for model requests and user input.
- **Multimodal Input:** Integration of NLP (text), voice recognition, and image classification models.
- **Databases Used:**
  - USDA Food & Nutrition Database
  - Indian Food Composition Tables (IFCT)
  - Custom datasets on allergies, food labels, and recipes
- **Architecture** follows a modular pipeline:
- User Input → Preprocessing → Intent Recognition → Meal Planning Engine → Feedback Loop → Output Delivery

# ALGORITHM & DEPLOYMENT

- **AI Components and Workflow:**
- **Input Analysis:**
  - a) Text: Tokenization, Named Entity Recognition (e.g., diet type, allergies)
  - b) Image: Food classification using pre-trained CNNs or IBM Visual Recognition
  - c) Voice: Converted to text using speech-to-text APIs
- **Recommendation Logic:**
  - a) GPT-based or fine-tuned LLMs for meal generation and reasoning
  - b) Rule-based filters for allergies and restrictions
  - c) Calorie balancing using nutrition databases
- **Deployment on IBM Cloud Lite:**
  - a) REST API endpoints for all interaction modes
  - b) Granity to manage session state, history, and feedback loop
  - c) Secure data storage and user profile management
- **Feedback Adaptation:**
  - a) Tracks user choices and satisfaction ratings
  - b) Adjusts future meal plans accordingly

# RESULT

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Projects / nutrition / watsonx Agent

Share feedback β Autosaved 7:33 PM New agent + Deploy 🔗 🔒 ⓘ

Build

AI Model: llama-3-3-70b-instruct

Configuration

Framework

LangGraph

Architecture

ReAct

Instructions

Advanced configuration

You are a helpful assistant that uses tools to answer questions in detail. When greeted, say "Hi, I am watsonx.ai agent. How can I help you?"You are a helpful and intelligent assistant called the Smartest AI Nutrition Agent, built using Watsonx.ai.

Knowledge

Vector index

Extra\_knowledge

Clear chat

If you want to add a vector index to the agent, clear the agent preview chat.

Tools

Add a tool

Create custom tool

Agent preview

GK You: 07:33 PM

Hii

watsonx Agent 07:33 PM

Hi, I am watsonx.ai Nutrition Agent. How can I help you with your diet, meal plans, or nutrition goals today?

► How did I get this answer?

↺

Type something...

🔍 ➤



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Share feedbackβAutosaved 7:35 PMNew agent +Deploy🔗🔒📄

Agent preview

GKYou: 07:34 PM

Give me 3 day diet plan for weight loss and I am a vegetarian

👤watsonx Agent 07:34 PM

Here is a 3-day diet plan for weight loss that is vegetarian:

Day 1

- Breakfast: Oatmeal with fruit and nuts (250 calories)
  - 1 cup cooked oatmeal
  - 1/2 cup mixed berries
  - 1 tablespoon chopped almonds
- Lunch: Vegetable stir-fry with brown rice (400 calories)
  - 1 cup cooked brown rice
  - 1 cup mixed vegetables (broccoli, bell peppers, carrots)
  - 1 tablespoon olive oil
  - 1 teaspoon soy sauce
- Snack: Carrot sticks with hummus (100 calories)
  - 4-5 carrot sticks
  - 2 tablespoons hummus
- Dinner: Lentil soup with whole grain bread (500 calories)
  - 1 cup cooked lentils
  - 1 cup vegetable broth
  - 1 slice whole grain bread

Day 2

- Breakfast: Greek yogurt with honey and walnuts (300 calories)
  - 6 ounces Greek yogurt
  - 1 tablespoon honey
  - 1 ounce chopped walnuts
- Lunch: Grilled vegetable sandwich with avocado (450 calories)

Type something...

🔗▶

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Agent preview

- 1/2 avocado
- 1 tablespoon hummus

- Snack: Cucumber slices with dill dip (100 calories)
  - 4-5 cucumber slices
  - 2 tablespoons dill dip
- Dinner: Quinoa and black bean bowl with roasted vegetables (550 calories)
  - 1 cup cooked quinoa
  - 1 cup cooked black beans
  - 1 cup roasted vegetables (sweet potatoes, Brussels sprouts, red onion)

Day 3

- Breakfast: Smoothie bowl with spinach, banana, and almond milk (350 calories)
  - 2 cups spinach
  - 1 banana
  - 1 cup almond milk
  - 1/2 cup sliced almonds
- Lunch: Vegetable and bean chili with whole grain crackers (500 calories)
  - 1 cup cooked chili
  - 1/2 cup cooked beans (kidney beans, black beans)
  - 1 ounce whole grain crackers
- Snack: Rice cakes with almond butter and banana slices (150 calories)
  - 2 rice cakes
  - 2 tablespoons almond butter
  - 1 banana slice
- Dinner: Grilled portobello mushrooms with roasted vegetables and quinoa (500 calories)
  - 1 cup cooked quinoa
  - 1 cup roasted vegetables (asparagus, bell peppers, zucchini)
  - 1 grilled portobello mushroom

Type something...

🔗▶

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GK

Resource hub

Foundation models

Explore foundation models from IBM and other third-parties depending on your use case.

[Explore foundation models →](#)

Prompts

Data

Projects

Notebooks

Agents

What's new

Save resources by training, deploying, and inferencing foundation models that are fine tuned with the low-rank adaptation technique

Aug 01, 2025

→

The mistral-medium-2505 foundation model is now available in the Frankfurt region

Jul 30, 2025

→

Token usage limit increased with the watsonx.ai Runtime Lite plan

Jul 30, 2025

→

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# CONCLUSION

This project demonstrates the potential of generative AI to act as a **scalable, intelligent, and empathetic nutrition advisor**.

## Achievements:

- Delivered personalized, culturally sensitive meal plans
- Enabled users to interact naturally using voice, text, or image
- Offered context-based food suggestions and swaps
- Adapted to users' evolving preferences and medical needs

The system effectively **bridges the gap** between one-size-fits-all apps and time-intensive dietitian consultations.

# FUTURE SCOPE

## Next Steps for Enhancement:

- Integrate with **wearable fitness and health devices** (e.g., Fitbit, Apple Watch)
- Add **voice response generation** to complete multimodal interaction
- Implement **multilingual support** (e.g., Hindi, Spanish, Tamil)
- Enable **offline meal planning mode** with caching
- Extend to other domains: maternal nutrition, child nutrition, sports nutrition

## Research Expansion:

- Fine-tune on clinical datasets for disease-specific diets
- Introduce emotional tone analysis for user engagement
- Incorporate real-time grocery price and availability

# REFERENCES

- IBM Cloud Documentation: <https://cloud.ibm.com/docs>
- Watsonx.ai Developer Portal: <https://dataplatform.cloud.ibm.com>
- USDA Food & Nutrient Database
- Indian Food Composition Tables (IFCT)
- WHO Guidelines on Healthy Eating
- Research Paper: “Personalized Nutrition via AI – Trends and Technologies” (Springer, 2023)
- AI in Healthcare Journal, IEEE 2022

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IBM **SkillsBuild**

Completion Certificate



This certificate is presented to  
**Goonj Abhay Kunden**

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