

CAPSTONE PROJECT

NUTRITION AGENT

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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

IBM watsonx

Upgrade



Shakiba Fatima's Account

Dallas

SF



Projects / Nutrition_Agent



Launch IDE



Overview

Assets

Deployments

Jobs

Manage

Find assets

Import assets

New asset

3 assets



All assets

Asset types

> Data access

1

> Data




1

> Agents

1

All assets



<input type="checkbox"/>	Name	Last modified	
<input type="checkbox"/>	 watsonx Agent Agent	Now Modified by you	⋮
<input type="checkbox"/>	 Doctor_knowledge Vector index	12 minutes ago Modified by you	⋮
<input type="checkbox"/>	 knowledge.pdf PDF	12 minutes ago Modified by you	⋮

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



Recent work

Projects

Nutrition_Agent



2 h ago

Deployment spaces

Nutrition_deploy1

2 h ago

Build

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

Instructions

Advanced configuration

respond with.
"Hi, I am watsonx.ai Nutrition Agent. How can I help you with your diet, meal plans, or nutrition goals today?"
You can:
Understand user inputs via text, voice, or image (e.g., food pictures, grocery labels)

Knowledge

Vector index

Doctor_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

Added tools (5)

Google search

Retrieve information from the internet with the Google search engine.

Agent preview

SF You: 08:20 PM

hi

watsonx Agent 08:20 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?

SF You: 08:20 PM

What is a balanced diet?

watsonx Agent 08:20 PM

A balanced diet includes a variety of foods from all five major food groups: fruits, vegetables, grains, protein, and dairy. It provides essential nutrients your body needs to function properly — including carbohydrates, proteins, fats, vitamins, and minerals — in the right proportions.

How did I get this answer?

Type something...

Upgrade?Shakiba Fatima's AccountDallasSF

re feedbackAutosaved 8:20 PMNew agent +Deploy

Agent preview

SFYou: 08:22 PM

Give me 5 day diet plan to loose 2 kg weight ,my age is 21, non vegetarian with no medical history

watsonx Agent 08:22 PM

Here is a 5-day diet plan that can help you lose 2 kg weight, considering your age, non-vegetarian diet, and no medical history:

Day 1

- Breakfast: Oatmeal with fruits and nuts (250 calories)
- Lunch: Grilled chicken breast with brown rice and mixed vegetables (400 calories)
- Snack: Carrot sticks with hummus (100 calories)
- Dinner: Baked fish with quinoa and steamed broccoli (500 calories)

Total calories: 1250 calories

Day 2

- Breakfast: Scrambled eggs with whole wheat toast and avocado (300 calories)
- Lunch: Turkey and avocado wrap with mixed greens (450 calories)
- Snack: Greek yogurt with berries (150 calories)
- Dinner: Grilled chicken breast with roasted sweet potatoes and green beans (500 calories)

Upgrade?Shakiba Fatima's AccountDallasSF

re feedbackAutosaved 8:23 PMNew agent +Deploy

Agent preview

Dinner: Grilled chicken breast with brown rice and mixed vegetables (400 calories)

Total calories: 1400 calories

Day 3

- Breakfast: Smoothie bowl with banana, spinach, almond milk, and almond butter topping (350 calories)
- Lunch: Grilled chicken breast with brown rice and mixed vegetables (400 calories)
- Snack: Hard-boiled egg and cherry tomatoes (100 calories)
- Dinner: Shrimp and vegetable stir-fry with brown rice (550 calories)

Total calories: 1400 calories

Day 4

- Breakfast: Whole wheat toast with avocado and poached eggs (300 calories)
- Lunch: Chicken Caesar salad (400 calories)
- Snack: Cottage cheese with cucumber slices (150 calories)
- Dinner: Baked chicken breast with roasted asparagus and quinoa (500 calories)

Total calories: 1350 calories

Day 5

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

IBM CERTIFICATIONS

In recognition of the commitment to achieve professional excellence



Shakiba Fatima

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Getting Started with Artificial Intelligence



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IBM CERTIFICATIONS

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

Shakiba Fatima

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