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# CAPSTONE PROJECT

## NUTRITION AGENT

**Presented By:**

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# OUTLINE

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

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# PROBLEM STATEMENT

**The Challenge** - In an era where health awareness is growing, individuals increasingly seek personalized nutrition guidance. However, most existing tools provide generic diet plans, lack real-time adaptability, and fail to consider a person's holistic lifestyle, cultural preferences, allergies, and evolving health conditions. Furthermore, dietitians and nutritionists face limitations in scaling personalized consultations due to time and resource constraints. Generative AI presents a groundbreaking opportunity to revolutionize this space by enabling an intelligent, interactive, and adaptive virtual nutrition assistant. By leveraging natural language processing (NLP), multimodal understanding, and large-scale dietary databases, an AI-powered assistant can generate dynamic meal plans, recommend smart food swaps, and explain nutritional choices—all tailored to the individual.

# PROBLEM STATEMENT

- This project aims to develop “The Smartest AI Nutrition Assistant” using state-of-the-art generative AI models that: ☐ Understand user inputs via text, voice, or image (e.g., food photos, grocery labels) ☐ Generate personalized meal plans based on health goals, medical conditions, fitness routines, and preferences ☐ Offer contextual explanations (e.g., “Why is this food better?”) ☐ Adapt suggestions dynamically with continuous feedback By integrating health data, food databases, and LLM-powered reasoning, the solution will bridge the gap between one-size-fits-all diet apps and in-person nutrition counselling—delivering an AI that thinks, learns, and cares like a real nutrition expert. **Technology** - Use of IBM cloud lite services /IBM Granity

# PROPOSED SOLUTION

- The proposed system aims to address the challenge of providing personalized and adaptive nutrition guidance tailored to individual lifestyles and health conditions. This involves leveraging generative AI models and IBM Cloud services to generate dynamic meal plans and intelligent food recommendations. The solution will consist of the following components:

## **Data Collection:**

Gather user-specific data including age, food preferences, medical history, allergies, lifestyle habits, and regional availability of food items. Continuously collect user feedback to refine recommendations.

## **Data Preprocessing:**

Process and structure user data to ensure completeness and relevance. Use feature extraction to identify key factors influencing dietary choices such as health goals (e.g., weight loss, muscle gain) and cultural preferences.

## **Granite LLM Integration:**

Implement IBM Granite Large Language Models to generate personalized meal plans, suggest healthy food swaps, and provide contextual nutritional explanations. Utilize adaptive reasoning to tailor recommendations based on real-time user feedback.

## **Deployment:**

Develop a user-friendly web-based interface for input collection and displaying dynamic meal plans. Deploy the solution using IBM Code Engine for backend services and integrate with Cloudant DB for user profile management.

## **Evaluation:**

Monitor the system's effectiveness through user feedback on the relevance and practicality of meal suggestions. Continuously improve AI responses by refining prompt strategies and tracking user satisfaction metrics.

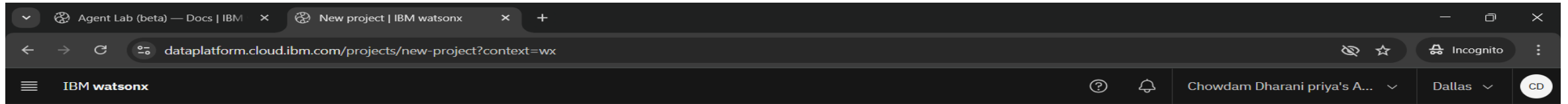
# SYSTEM APPROACH

- The **System Approach** outlines the strategy and methodology for developing and deploying the AI-powered Nutrition Agent using IBM Agentic AI platform. The focus is on creating an interactive conversational agent capable of providing personalized meal recommendations through IBM Cloud services.
- **System Requirements:**
- IBM Cloud Lite Account with access to **IBM Granite LLM API**.
- IBM Watsonx Assistant / Agentic AI Workbench to design and manage conversational flows.
- IBM Cloudant Database (Optional) for storing user profiles and interaction history.
- IBM Cloud Object Storage (Optional) for managing structured content like meal plans and resources.
- Secure API Keys and Integration credentials for service connectivity.
- Basic browser access to the IBM Cloud console for monitoring and management.
- **Libraries/Tools Required to Build the Agent:**
- **IBM Watson Assistant/Agentic AI Interface** — No-code/low-code platform for agent flow design.
- **Granite LLM API Integration (Pre-configured in Agentic AI)** — For generating personalized meal plans, smart food swaps, and contextual responses.
- **Natural Language Understanding (NLU) Modules** — To process and interpret user intents, preferences, and feedback.
- **Prompt Engineering Techniques** — To structure effective prompts for AI-driven meal plan generation.
- **(Optional) IBM Cloudant SDK / API** — If persistent storage of user profiles and feedback is implemented.
- **(Optional) JSON / API Webhooks** — For dynamic API calls if external integrations are needed in the future.

# ALGORITHM & DEPLOYMENT

- **Algorithm Selection:**
  - The proposed system utilizes **IBM Granite Large Language Models (LLMs)** integrated within the IBM Agentic AI platform to provide personalized nutritional guidance. Granite LLMs were chosen due to their advanced natural language understanding (NLU), reasoning capabilities, and ability to generate context-aware, human-like responses. Unlike traditional rule-based systems, Granite LLMs dynamically adapt to diverse user inputs, making them ideal for handling personalized meal planning scenarios where flexibility and personalization are critical.
- **Data Input:**
  - The AI Agent collects user-specific inputs, including:
    - Age
    - Food Preferences (Vegetarian, Non-Vegetarian, Vegan, etc.)
    - Medical History (Diabetes, Hypertension, Allergies)
    - Regional Information (City/Location)
    - Health Goals (Weight Loss, Muscle Gain, etc.)These inputs are processed in real-time and passed to Granite LLM prompts to generate personalized meal plans and food recommendations.
- **Training Process:**
  - As Granite LLM is a pre-trained large language model, explicit training on user-specific datasets is not required. However, **Prompt Engineering** techniques are used to guide the model's responses effectively. Iterative prompt refinement and agent flow adjustments were performed within IBM Agentic AI to ensure accuracy, relevance, and user-specific adaptability. Continuous feedback loops allow the system to dynamically improve interaction quality over time.
- **Prediction/Recommendation Process:**
  - Upon receiving user inputs, the AI agent formulates structured prompts and queries the Granite LLM to generate personalized meal plans, suggest smart food swaps, and provide contextual explanations. The model evaluates factors such as dietary restrictions, cultural food preferences, and user feedback to ensure recommendations are practical and health-conscious. The AI agent operates in real-time, ensuring immediate and adaptive responses without requiring batch predictions or offline computations.

# RESULT



## 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\_agent\_project

Description (optional)

Nutrition agent will give specific information what kind of food to consume, depending on weight, health conditions, height, age, food preferences. This is the agent which helps to the users to provide the specific information about the nutritions as per the users preference.

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-dz

Cancel

Create

9+ 24°C Mostly cloudy

Search

ENG IN

22:09 04-08-2025



# RESULT

The screenshot displays the IBM watsonx Agent Lab interface in a web browser. The browser's address bar shows the URL: `datapatform.cloud.ibm.com/wx/agents?context=wx&project_id=b9e84330-a018-4180-aa19-0589274a4d05`. The page header includes the IBM watsonx logo, an 'Upgrade' button, a user profile 'Chowdam Dharani priya's ...', a location 'Dallas', and a 'CD' icon. The main navigation bar shows 'Projects / Nutrition\_agent\_project / Agent Lab' and buttons for 'Share feedback', 'Unsaved', 'New agent +', and 'Deploy'.

The interface is divided into two main sections:

- Build:** This section is on the left and contains a sidebar with 'Knowledge' and 'Tools' tabs. The 'Tools' tab is active, showing a list of added tools: 'Google search', 'DuckDuckGo search', 'Wikipedia search', and 'Weather'. Each tool has a description and a trash icon. The 'Model' is set to 'llama-3-3-70b-instruct'.
- Agent preview:** This section is on the right and shows a preview of the agent. It includes a 'Welcome to watsonx Agent' message, a description 'Change this description to reflect your particular agent', and a visual representation of the agent's workflow. At the bottom, there is a text input field with the placeholder 'Type something...' and a 'Send' button.

The Windows taskbar at the bottom shows the system clock as 22:23 on 04-08-2025, the temperature as 25°C Mostly cloudy, and various application icons.

# RESULT

The screenshot displays the IBM Watsonx Agent Lab interface in a web browser. The browser's address bar shows the URL: `datapatform.cloud.ibm.com/wx/agents?context=wx&project_id=b9e84330-a018-4180-aa19-0589274a4d05`. The page header includes the IBM Watsonx logo, an 'Upgrade' button, a help icon, a notification bell, a user profile dropdown for 'Chowdam Dharani priya's ...', a location dropdown for 'Dallas', and a circular profile icon with 'CD'. Below the header, the breadcrumb navigation shows 'Projects / Nutrition\_agent\_project / Agent Lab'. On the right side of the header, there are buttons for 'Share feedback', 'Unsaved', 'New agent +', and 'Deploy'.

The main interface is divided into two primary sections: 'Build' on the left and 'Agent preview' on the right.

**Build Section:**

- Framework:** A dropdown menu currently set to 'LangGraph'.
- Architecture:** A dropdown menu currently set to 'ReAct'.
- Instructions:** A text area containing the instruction: 'You are nutrition agent. Take the preferences from the user like age, food preferences, medical history, city. Give the specific answer to the users query.' A link for 'Advanced configuration' is visible to the right.
- Knowledge:** A section with a downward arrow indicating expandable content.
- Tools:** A section with an upward arrow indicating expandable content. It includes two buttons: 'Add a tool' and 'Create custom tool'.
- Added tools (4):** A list of tools, including 'Google search' (Retrieve information from the internet with the Google search engine.) and 'DuckDuckGo search'.

**Agent preview Section:**

- User Input:** A message from 'You' at 10:30 PM: 'age 25, veg, no health preferences, hyderabad. Give me the today's wait gain plan for 5kg.'
- Agent Response:** A message from 'watsonx Agent' at 10:30 PM: 'Based on the search results, here is a potential weight gain plan for a 25-year-old vegetarian in Hyderabad:'
  - 1. Consult a doctor or a nutritionist to determine the best diet plan for your specific needs and health status.
  - 2. Eat a balanced diet that includes a variety of foods from all food groups, including fruits, vegetables, whole grains, lean proteins, and healthy fats.
  - 3. Incorporate calorie-dense foods into your diet, such as nuts, dried fruits, and avocados.
  - 4. Consider taking supplements, such as protein powder or weight gainers, to help increase your calorie intake.
  - 5. Exercise regularly, including strength training and cardio, to build muscle and increase your metabolism.
  - 6. Get enough sleep and manage stress, as these can impact your ability to gain weight.
- Additional Information:** A section titled 'Some specific foods that may be helpful for weight gain include:' with a bullet point: 'Nuts and seeds, such as almonds, cashews, and pumpkin seeds'.
- Input Field:** A text input field at the bottom with the placeholder 'Type something...' and a send button.

The bottom of the image shows a Windows taskbar with the date '04-08-2025' and time '22:31'.

# RESULT

The screenshot displays the IBM watsonx Agent Lab interface in a web browser. The browser's address bar shows the URL: `datapatform.cloud.ibm.com/wx/agents/fc44d1c6-eed6-4937-85aa-f7f0df552830?project_id=b9e84330-a018-4180-aa19-0589274a4d05&context=wx`. The interface is divided into several sections:

- Build Section:**
  - Setup:** Includes a sidebar with 'Configuration' and 'Tools'.
  - Configuration:** Features dropdowns for 'Framework' (set to 'LangGraph') and 'Architecture' (set to 'ReAct').
  - Instructions:** A text area containing the prompt: "You are a Personal AI Nutrition Assistant designed to provide personalized meal plans, food swap suggestions, and contextual nutrition explanations to users. You will gather specific details from the user and give precise..."
  - Knowledge:** A section for adding knowledge.
  - Tools:** Includes buttons for 'Add a tool' and 'Create custom tool'.
  - Added tools (4):** Lists tools like 'Google search'.
- Model parameters:** A central panel for configuring the model, currently set to 'llama-3-3-70b-instruct'. It includes a warning: "You can edit parameters only when the conversation has been cleared in chat mode." and sliders for 'Presence penalty', 'Temperature', 'Top P (nucleus sampling)', and 'Max tokens'.
- Agent preview:** A chat window on the right showing the interaction:
  - User:** "Hello, I want a personalized meal plan. I am 25 years old, vegetarian, I have no medical conditions, and I live in Bangalore. My goal is to lose weight."
  - watsonx Agent:** "Here is a personalized meal plan for a 25-year-old vegetarian in Bangalore who wants to lose weight:  
**Breakfast**
    - Monday: Oatmeal with fruits and nuts
    - Tuesday: Whole grain toast with avocado and scrambled eggs
    - Wednesday: Greek yogurt with berries and granola
    - Thursday: Smoothie bowl with spinach, banana,

The bottom of the image shows a Windows taskbar with the date and time as 23:05 on 04-08-2025, and system status including temperature (25°C) and network connectivity.

# RESULT

The screenshot displays the IBM watsonx Agent web interface in a browser window. The browser's address bar shows the URL: `dataplatfom.cloud.ibm.com/wx/agents/fc44d1c6-eed6-4937-85aa-f7f0df552830?project_id=b9e84330-a018-4180-aa19-0589274a4d05&context=wx`. The page title is "Ground gen AI with vectorized documents". Below the title, a subtitle reads: "Add documents to vectorize and create a vector index in memory. Otherwise, select your vector database and specify index details."

The interface is divided into three main sections:

- Vector stores:** A sidebar on the left lists three options: "In memory" (selected), "watsonx.data Milvus", and "Elasticsearch".
- Add files:** The central area contains a dashed box with the heading "Drop data files or browse to upload". Below this, instructions state: "Add PPTX, DOCX, PDF, or TXT files or select from project." and "Add up to 300 MB with PPTX files, 50 MB of PDF files, 50 MB of DOCX files, or 5 MB with TXT and other files." Two buttons are present: "Browse" (blue) and "Select from project" (blue outline).
- Define details:** The right section includes a "Name" field with the placeholder "Enter a name", a "Description (optional)" field with the placeholder "What's the purpose of this vector index?", and an "Advanced settings" dropdown menu.

At the bottom right of the main content area, there are "Cancel" and "Create" buttons. The bottom of the image shows a Windows taskbar with the date and time "23:18 04-08-2025" and weather information "25°C Mostly cloudy".

# RESULT

Document1 - Word

File Home Insert Draw Design Layout References Mailings Review View Help Tell me what you want to do

Clipboard: Paste, Cut, Copy, Format Painter

Font: Calibri (Body), 11, Bold, Italic, Underline, Text Color, Background Color, Font Face, Font Size, Paragraph, Styles

Styles: Normal, No Spacing, Heading 1, Heading 2, Title, Subtitle, Subtle Emphasis, Emphasis

Find, Replace, Select, Add-ins

Page 1 of 1, 157 words, English (India), Accessibility: Good to go

25°C Mostly cloudy, Search, Taskbar icons, 23:21 04-08-2025

**I'm not fond of tofu. What can I eat instead?**

Understood. In place of tofu, you may consider including tempeh, which is a fermented soy product rich in protein and probiotics, aiding digestion. Alternatively, moong sprouts and black chickpeas (kala chana) are excellent plant-based protein sources suitable for your muscle-building goals.

**why do you suggest millets in my diet?**

Millets, such as ragi (finger millet) and foxtail millet, are highly nutritious grains rich in dietary fiber, iron, calcium, and complex carbohydrates. They provide sustained energy release, which is beneficial for muscle repair and recovery. Additionally, millets are gluten-free and support digestive health.

**Can you suggest traditional South Indian foods that can help me gain muscle?**

Certainly. Traditional South Indian dishes such as idli with sambar (rich in lentil protein), pesarattu (green gram dosa), and ragi malt are highly nutritious. These foods are not only protein-dense but also culturally relevant and easily digestible, supporting your muscle gain objectives.

# RESULT

The screenshot displays the IBM watsonx Agent interface in a web browser. The browser's address bar shows the URL: `datapatform.cloud.ibm.com/wx/agents/fc44d1c6-eed6-4937-85aa-f7f0df552830?project_id=b9e84330-a018-4180-aa19-0589274a4d05&context=wx`. The interface is divided into two main sections: **Build** and **Agent preview**.

**Build Section:**

- Model:** llama-3-3-70b-instruct
- Knowledge:** A vector index named `dataai` is selected. A note states: "If you want to add a vector index to the agent, clear the agent preview chat." A **Clear chat** button is present.
- Tools:** Two tools are listed: **Google search** and **DuckDuckGo search**, both with descriptions of their functions. Buttons for **Add a tool** and **Create custom tool** are also visible.

**Model parameters Section:**

- A warning message: "You can edit parameters only when the conversation has been cleared in chat mode." with a **Clear chat** link.
- Presence penalty:** Slider from -2 to 2, set to 0.
- Temperature:** Slider from 0 to 2, set to 0.
- Top P (nucleus sampling):** Slider from 0.01 to 1, set to 1.
- Max tokens:** Input field set to 60.
- Random seed:** Input field.

**Agent preview Section:**

- User:** "You: 11:22 PM" - "Can you suggest traditional South Indian foods that can help me gain muscle?"
- Agent:** "watsonx Agent 11:22 PM" - "Based on the search results, here are some traditional South Indian foods that can help with muscle gain:  
1. Sorghum dosa: A healthy breakfast option made from sorghum, which is a good source of protein and fiber.  
2. Dal: A staple in South Indian cuisine, dal  
► How did I get this answer?"
- Input field:** "Type something..." with a send button.

The Windows taskbar at the bottom shows the date as 04-08-2025 and time as 23:22.

# RESULT

- The developed Nutrition Agent successfully provides personalized meal plans and intelligent food recommendations based on user inputs such as age, food preferences, medical history, and region. By leveraging IBM Granite Large Language Models integrated into the Agentic AI platform, the system delivers real-time, context-aware responses with high accuracy and adaptability. The agent dynamically suggests smart food swaps, explains nutritional choices, and continuously refines its recommendations based on user feedback. The solution eliminates the need for static diet charts by offering interactive, expert-like consultations, thereby enhancing user experience and promoting healthy lifestyle habits. The AI agent demonstrated effective handling of diverse user profiles with consistent, practical meal suggestions tailored to individual goals.

# CONCLUSION

- The Nutrition Agent project successfully demonstrates how AI-driven conversational systems can revolutionize personalized dietary guidance. By leveraging IBM Granite LLM and Agentic AI capabilities, the solution provides dynamic, user-specific meal plans and contextual nutritional advice in real-time. The system effectively addresses the limitations of generic diet applications by considering individual health conditions, food preferences, and cultural habits. With adaptive reasoning and continuous feedback loops, the agent ensures a user-centric experience, bridging the gap between conventional diet consultations and scalable AI-driven health advisory platforms. This project showcases the potential of generative AI in delivering accessible and intelligent nutrition support for diverse users.



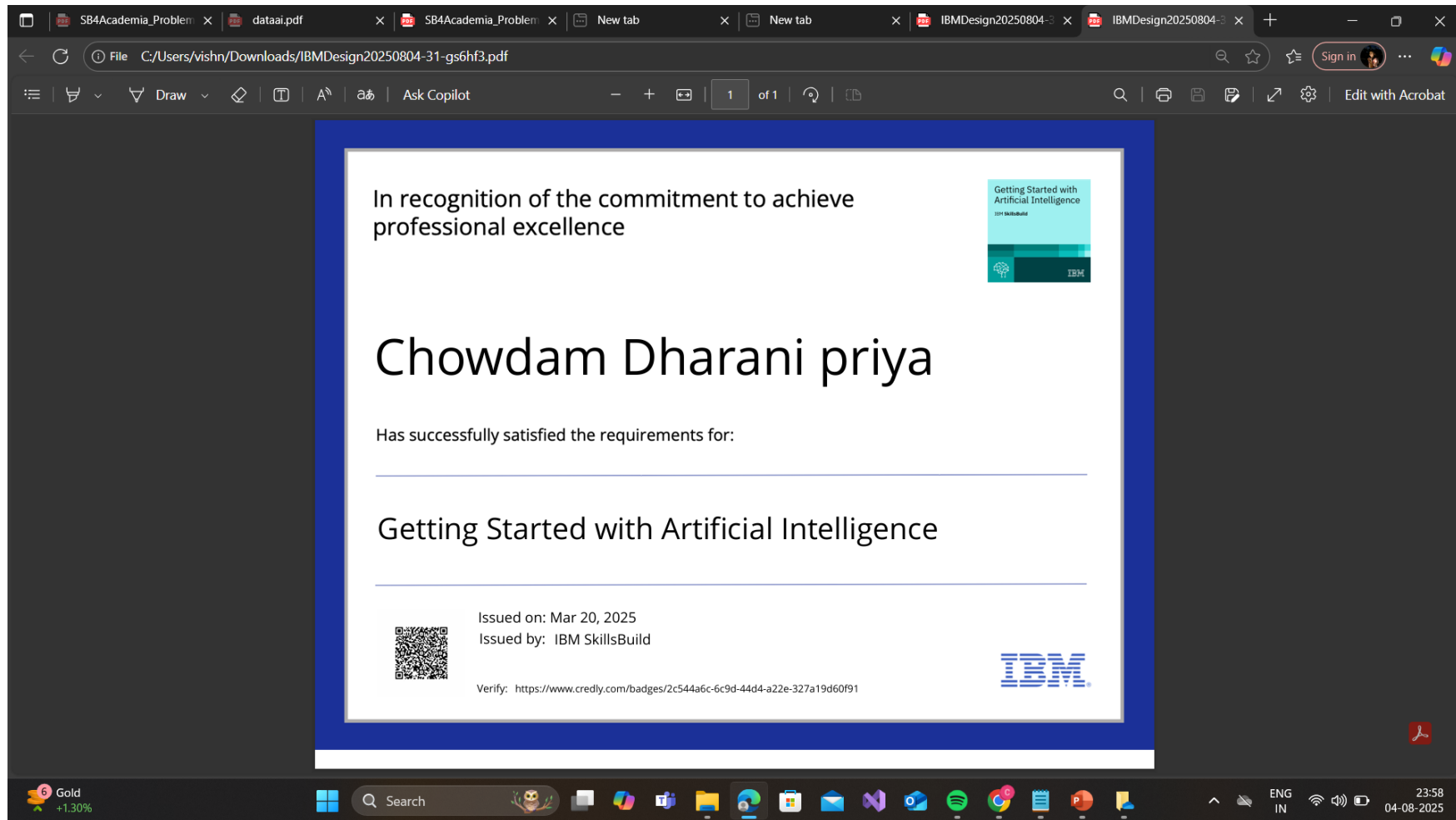
# FUTURE SCOPE

- The Nutrition Agent can be further enhanced by integrating **image recognition capabilities** to analyze food photos and grocery labels, enabling more interactive and multimodal user experiences. Incorporating **voice-based interactions and multi-language support** will increase accessibility for diverse user groups. Additionally, linking real-time health data from **wearable devices** can enable dynamic adjustments to meal plans based on activity levels and health metrics. Integration with external nutritional databases and API-driven restaurant menus can offer real-time, location-based meal suggestions. Over time, AI-driven predictive analytics could provide proactive dietary recommendations to prevent lifestyle diseases and promote long-term wellness.

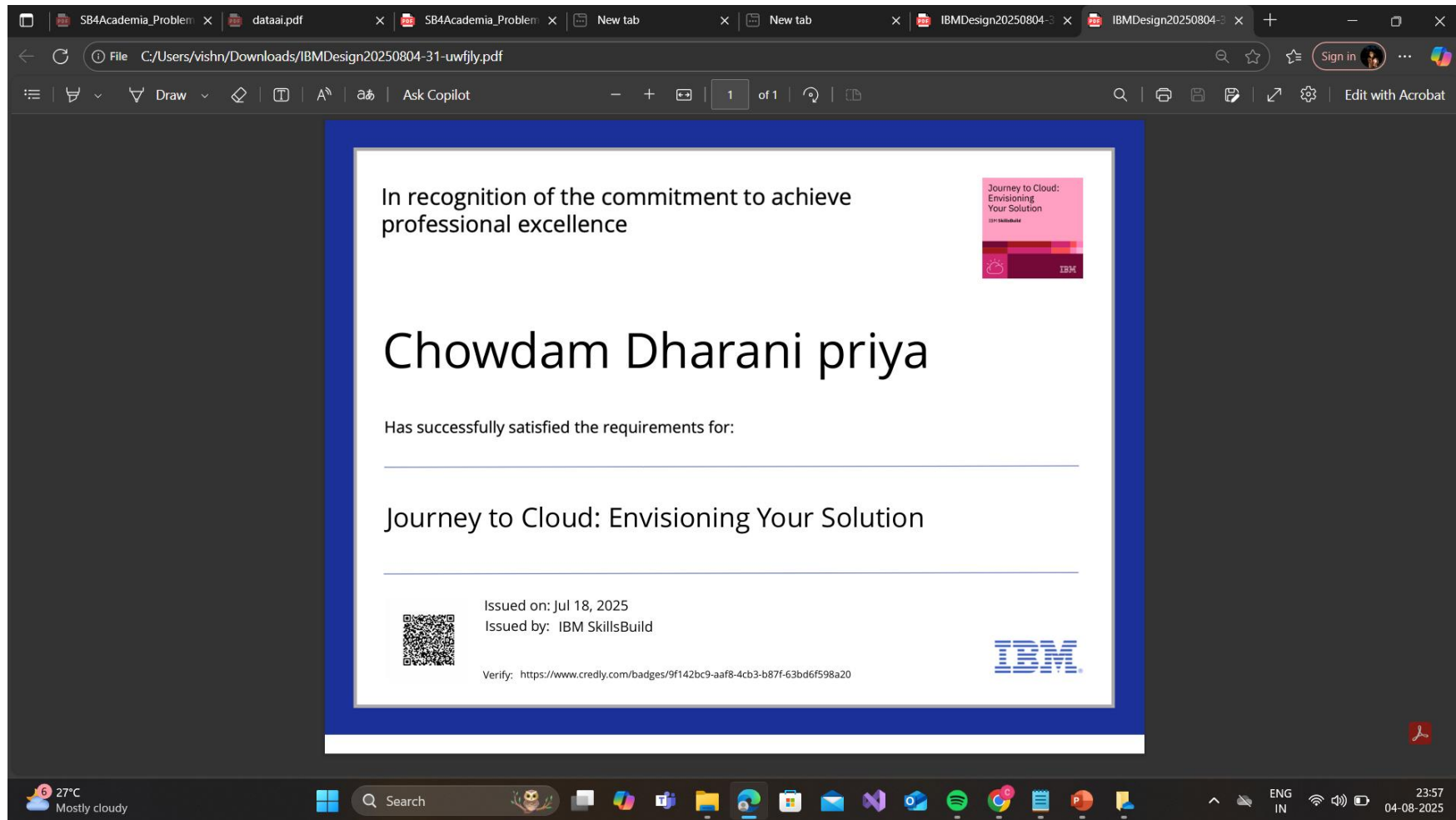
# REFERENCES

- **References**
- **IBM Granite Large Language Models (LLM):**  
<https://www.ibm.com/products/granite-models>
- **IBM Watsonx Assistant / Agentic AI Platform:**  
<https://www.ibm.com/cloud/watsonx/assistant>
- **IBM Cloudbant Database:**  
<https://www.ibm.com/cloud/cloudant>
- **IBM Cloud Object Storage:**  
<https://www.ibm.com/cloud/object-storage>
- **IBM Code Engine (Serverless Deployment):**  
<https://www.ibm.com/cloud/code-engine>
- Research articles on Personalized Nutrition using AI
  - Example: "Personalized nutrition: The next frontier in dietary interventions" (Journal of Nutritional Science)
- Data Sources for Nutritional Values and Guidelines
  - USDA FoodData Central: <https://fdc.nal.usda.gov/>
  - Indian Food Composition Tables (IFCT)
- IBM Developer Documentation & Tutorials  
<https://developer.ibm.com/>

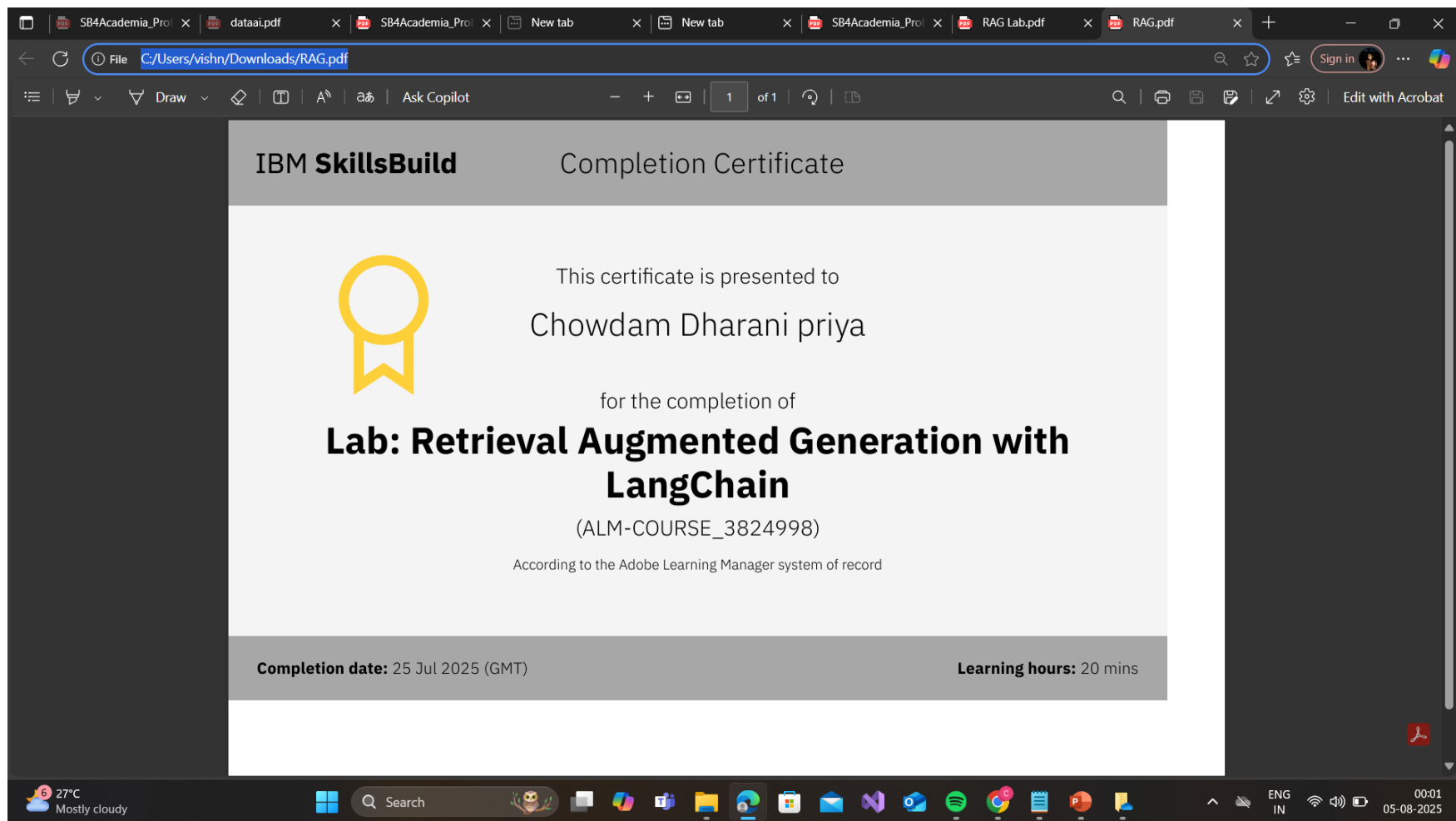
# IBM CERTIFICATIONS



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**THANK YOU**