CAPSTONE PROJECT

NUTRITION AGENT

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OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT

Problem Statement No.8- Nutrition Agent

Maintaining a balanced diet is essential for health, but individuals often lack access to personalized, real-time nutritional guidance tailored to their preferences, dietary restrictions, and health goals. The challenge is to develop a system that delivers accurate, context-aware, and multilingual dietary recommendations in dynamic scenarios like meal planning or grocery shopping, without relying on a specific dataset.

PROPOSED SOLUTION

- *The Agentic AI Nutrition Agent utilizes the Llama 3.3 70B Instruct model, hosted on IBM Cloud's Watsonx.ai platform, to provide personalized, multilingual dietary recommendations based on user queries.*
- **Input Handling**
  • Accept user inputs (e.g., dietary preferences, allergies, health goals, and contextual details like meal timing or location) via natural language queries in supported languages (English, German, French, Italian, Portuguese).
  • Leverage real-time inputs from user interactions or integrated devices (e.g., fitness trackers, smart kitchen appliances) without requiring a pre-collected dataset.
- **Machine Learning Algorithm**
  • Use the Llama 3.3 70B Instruct model for natural language understanding and generation to interpret queries and generate tailored recommendations.
  • Employ the model's pre-trained knowledge and reinforcement learning with human feedback (RLHF) to align responses with user preferences and nutritional guidelines.
  • Incorporate contextual analysis to provide time- and location-aware suggestions (e.g., breakfast options based on morning queries).
- **Deployment**
  • Deploy the Nutrition Agent on IBM Cloud using Watsonx.ai Runtime service, leveraging Llama 3.3's FP8 quantized weights for efficient inference.
  • Develop a multilingual user interface (web/mobile app) supporting English, German, French, Italian, and Portuguese.
  • Enable API integration for third-party applications (e.g., fitness apps, smart kitchen devices).
- **Evaluation**
  • Evaluate performance using metrics like recommendation relevance, user satisfaction (via feedback), and adherence to nutritional guidelines.
  • Monitor response quality in real-world scenarios, refining prompts or model interactions based on user feedback.

SYSTEM APPROACH

- The system is built on IBM Cloud, utilizing Watsonx.ai to host the Llama 3.3 70B Instruct model for scalable, multilingual AI capabilities.

System Requirements

- **Hardware**: IBM Cloud infrastructure with GPU support for Llama 3.3 inference.
- **Software**: Watsonx.ai Runtime, Python for scripting, and REST APIs for integration.
- **Input Sources**: Real-time user queries and device inputs (no pre-collected dataset).

Libraries Required

- **Python Libraries**: requests (for API calls), Flask/Django (for web interface).
- **Watsonx.ai SDK**: For model interaction and deployment.
- **Visualization Tools**: Matplotlib/Seaborn for result analysis (if needed).

ALGORITHM & DEPLOYMENT

- **Model:** Llama 3.3 70B Instruct (FP8 quantized), optimized for multilingual dialogue.
- **Justification:** 128k context length, pre-trained knowledge, and RLHF tuning enable complex, context-aware nutritional queries without extra training data.

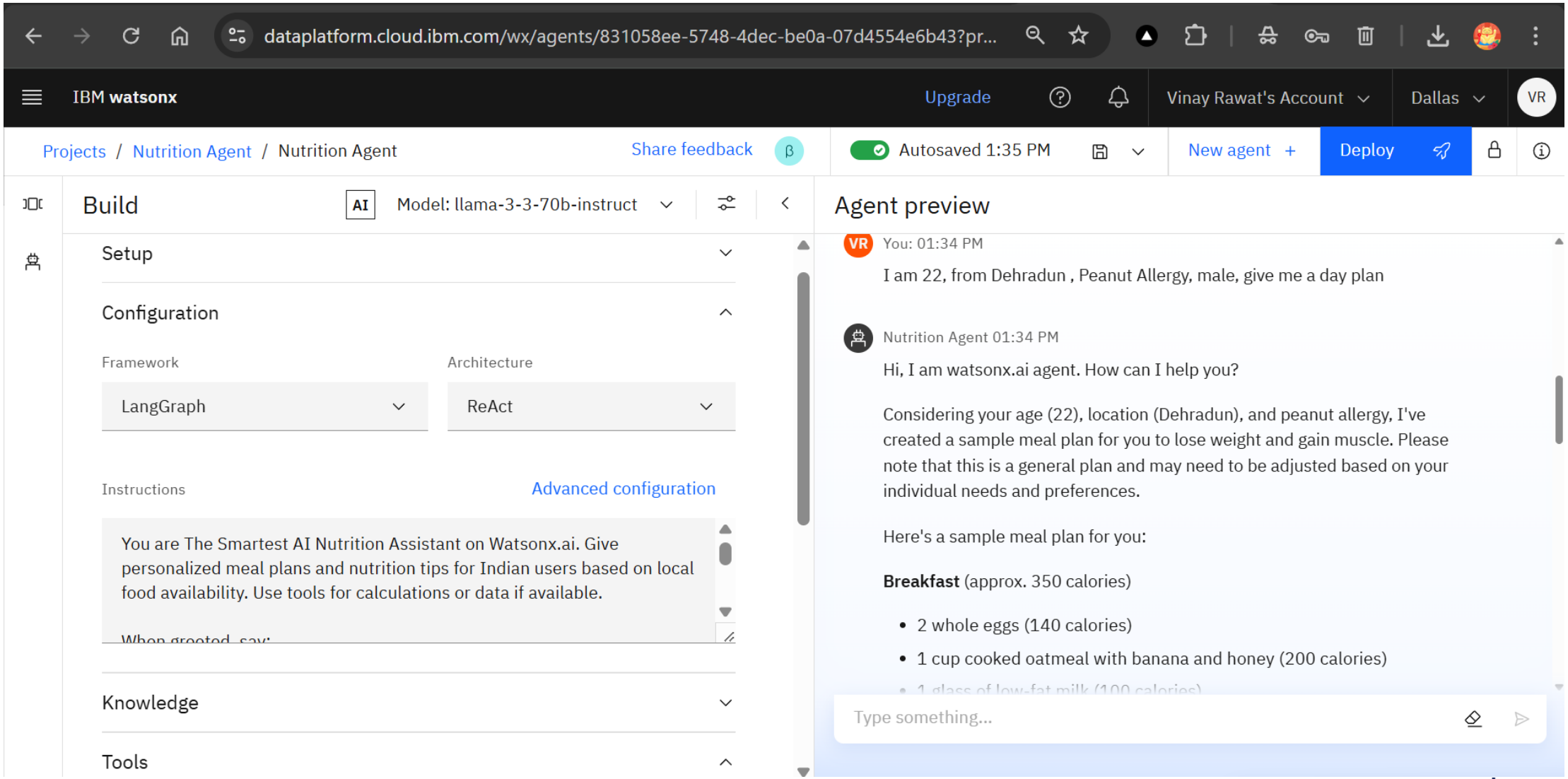
Input Handling

- **Inputs:** User queries (e.g., “low-carb dinner”), preferences (e.g., vegan), and context (time, location).
- **Multilingual:** Supports English, German, French, Italian, Portuguese.
- **Real-Time Data:** Integrates with APIs (e.g., wearables for calorie burn).
- **Processing**
- Uses pre-trained knowledge to generate recommendations without custom datasets.
- RLHF aligns responses with nutritional best practices.
- Contextual analysis tailors suggestions (e.g., lighter meals at night).

Deployment

- Log in to IBM Cloud (cloud.ibm.com) → Watsonx.ai.
- Create sandbox project, link Watsonx.ai Runtime.
- Select Llama 3.3 70B Instruct from foundation models.
- Add API tools (e.g., nutritional guidelines).
- Create deployment space, generate API key, deploy agent.
- Test queries, monitor deployment, ensure multilingual support and secure API access.

RESULT



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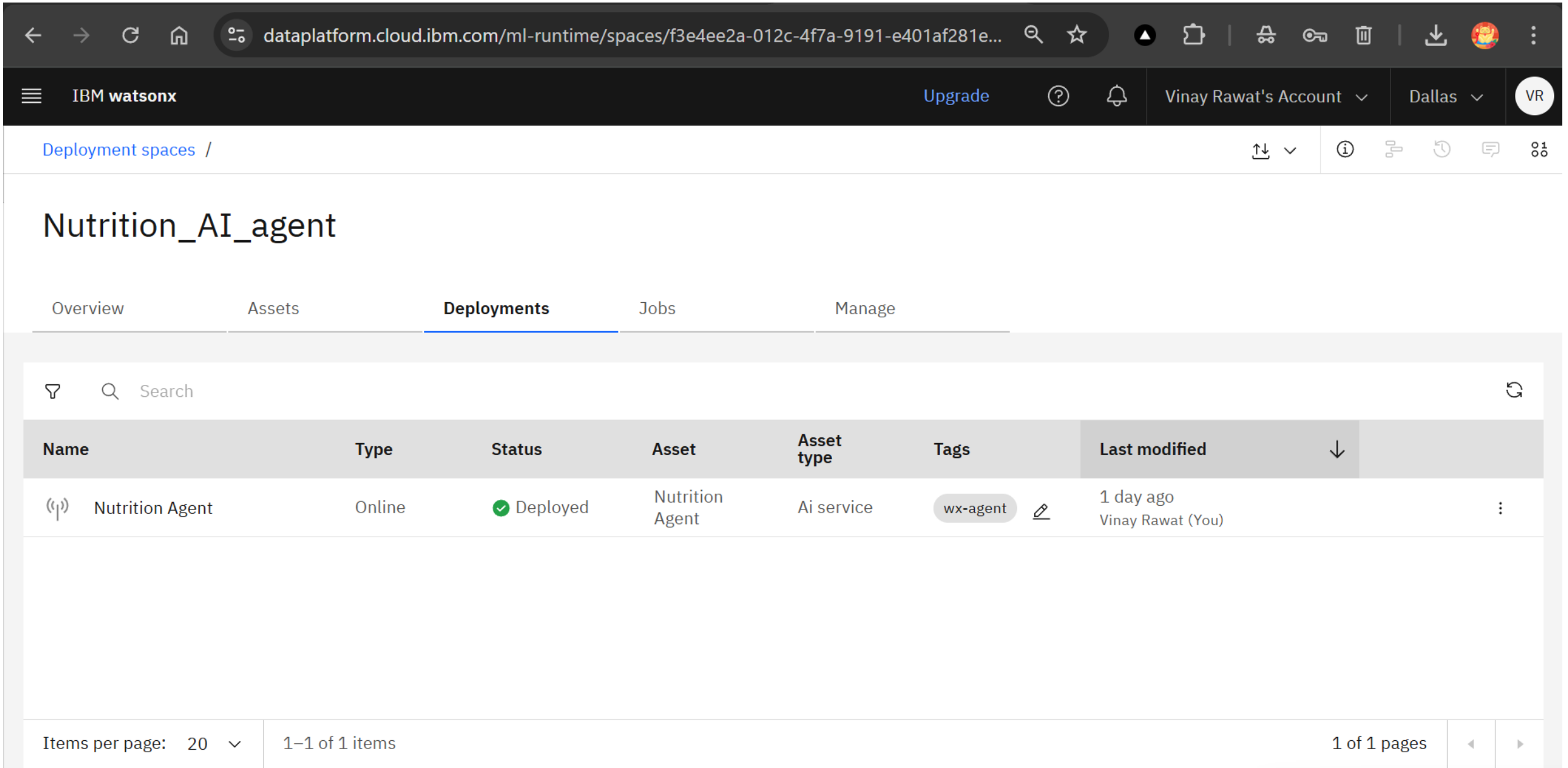

CONCLUSION

- The Agentic AI Nutrition Agent, powered by Llama 3.3 70B Instruct, effectively provides personalized, multilingual dietary recommendations without requiring a dataset. Leveraging IBM Cloud and Watsonx.ai, the system ensures scalability and user-friendly interaction. Challenges include ensuring cultural relevance across languages and maintaining privacy, addressed through secure deployment and RLHF. The solution promotes healthier dietary choices through accessible, real-time guidance.

FUTURE SCOPE

- Enhance cultural adaptation for dietary recommendations across diverse regions.
- Integrate additional input sources (e.g., IoT devices) for richer context.
- Expand language support beyond the current five languages.
- Explore edge computing for offline functionality in smart devices.

REFERENCES

- IBM Watsonx.ai Documentation: https://cloud.ibm.com/docs/watsonx
- Meta Llama 3.3 Model Card: https://www.llama.com/docs/model-cards-and-prompt-formats/
- “AI-Driven Personalized Nutrition,” Journal of AI in Healthcare, 2023 : https://ieeexplore.ieee.org/abstract/document/10842744/
- “Multilingual LLMs for Conversational AI,” arXiv, 2023 : https://arxiv.org/html/2411.11072v1
- IBM Cloud API Reference: https://cloud.ibm.com/apidocs

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Learning hours: 20 mins

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THANK YOU

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