CAPSTONE PROJECT

RECIPE PREPARATION 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

In everyday life, many people struggle to decide what to cook based on the limited ingredients they have at home. This often leads to food wastage, unnecessary shopping, and mealtime stress. Existing recipe apps typically require users to search for specific dishes or possess all the required ingredients, offering little flexibility. Additionally, they often fail to consider dietary preferences or cooking skill levels. There is a clear need for an intelligent system that helps users cook efficiently using available ingredients while offering suitable alternatives and nutritional awareness.

PROPOSED SOLUTION

- The proposed system is an intelligent Recipe Preparation Agent that assists users in preparing meals using only the ingredients they have on hand. Leveraging a Retrieval-Augmented Generation (RAG)-based AI system, the agent retrieves suitable recipes and adapts them based on ingredient availability, user preferences, and dietary restrictions.
- **Key Features:**
- **Ingredient-based Recipe Retrieval**: Users input their available groceries, and the system searches a recipe database using RAG to suggest viable meal options.
- **Substitutions and Adjustments**: The agent recommends ingredient substitutions and portion adjustments if certain ingredients are missing or in limited quantities.
- **Step-by-Step Instructions**: The system generates easy-to-follow preparation steps tailored to the adjusted recipe.
- **Dietary Awareness**: Supports user-defined dietary preferences (e.g., vegetarian, gluten-free, low-carb).
- **Smart Suggestions**: Provides cooking tips, prep time, nutritional info, and alternate options.

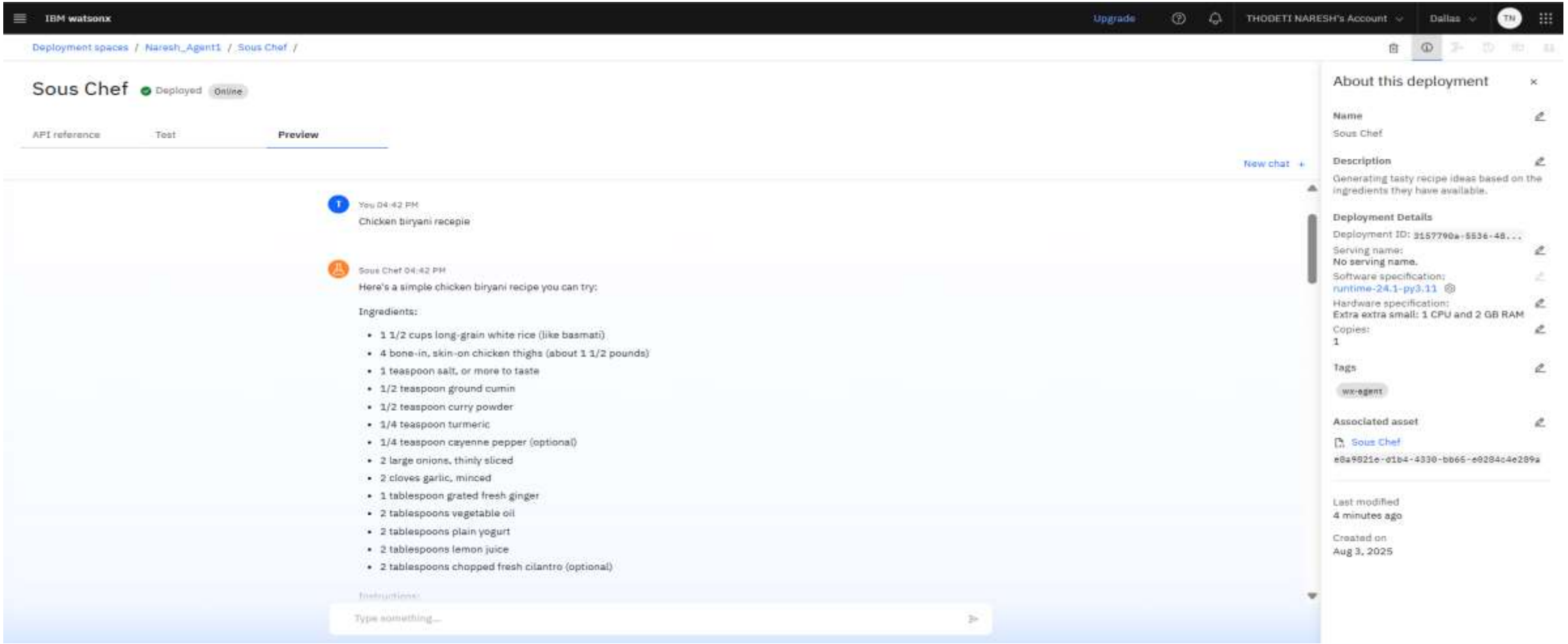
SYSTEM APPROACH

- **Technology Stack:**
- **IBM Cloud Lite**: For hosting backend services, databases, and deploying AI models.
- **IBM Watson Services / IBM Granite Model (RAG)**: For recipe retrieval, question answering, and generating cooking instructions.
- **Frontend**: Simple web/mobile UI (React.js or Flutter recommended).
- **Backend**: Python (Flask/FastAPI) to handle input, model interaction, and response formatting.
- **Database**: IBM Db2 or IBM Cloudant for storing recipe data and user inputs/preferences.
- **Libraries & Tools:**
- Transformers (HuggingFace), LangChain for RAG pipeline
- Natural Language Toolkit (NLTK), spaCy for preprocessing
- IBM Watson NLP / Granite (if available) for text processing

ALGORITHM & DEPLOYMENT

- **Algorithm Selection:**
- **Retrieval-Augmented Generation (RAG)**: Combines document retrieval with a generative model to produce context-aware, customized recipes.
- Uses semantic search to fetch relevant recipes from the database.
- Generates instructions conditioned on both retrieved documents and user constraints.
- **Data Input:**
- User-inputted ingredients
- Optional: Dietary restrictions, cooking time, meal type (e.g., breakfast/lunch)
- **Training & Integration:**
- Pretrained model (e.g., IBM Granite or open-source equivalent) is fine-tuned for recipe generation and instruction formatting.
- Data source: Kaggle recipe datasets, open food APIs (e.g., Spoonacular), or scraped cooking sites (for internal testing).
- **Deployment Steps:**
- Host model & APIs on IBM Cloud (Lite tier)
- Deploy frontend on IBM Code Engine or static web hosting
- Use CI/CD pipeline for model updates and bug fixes

RESULT



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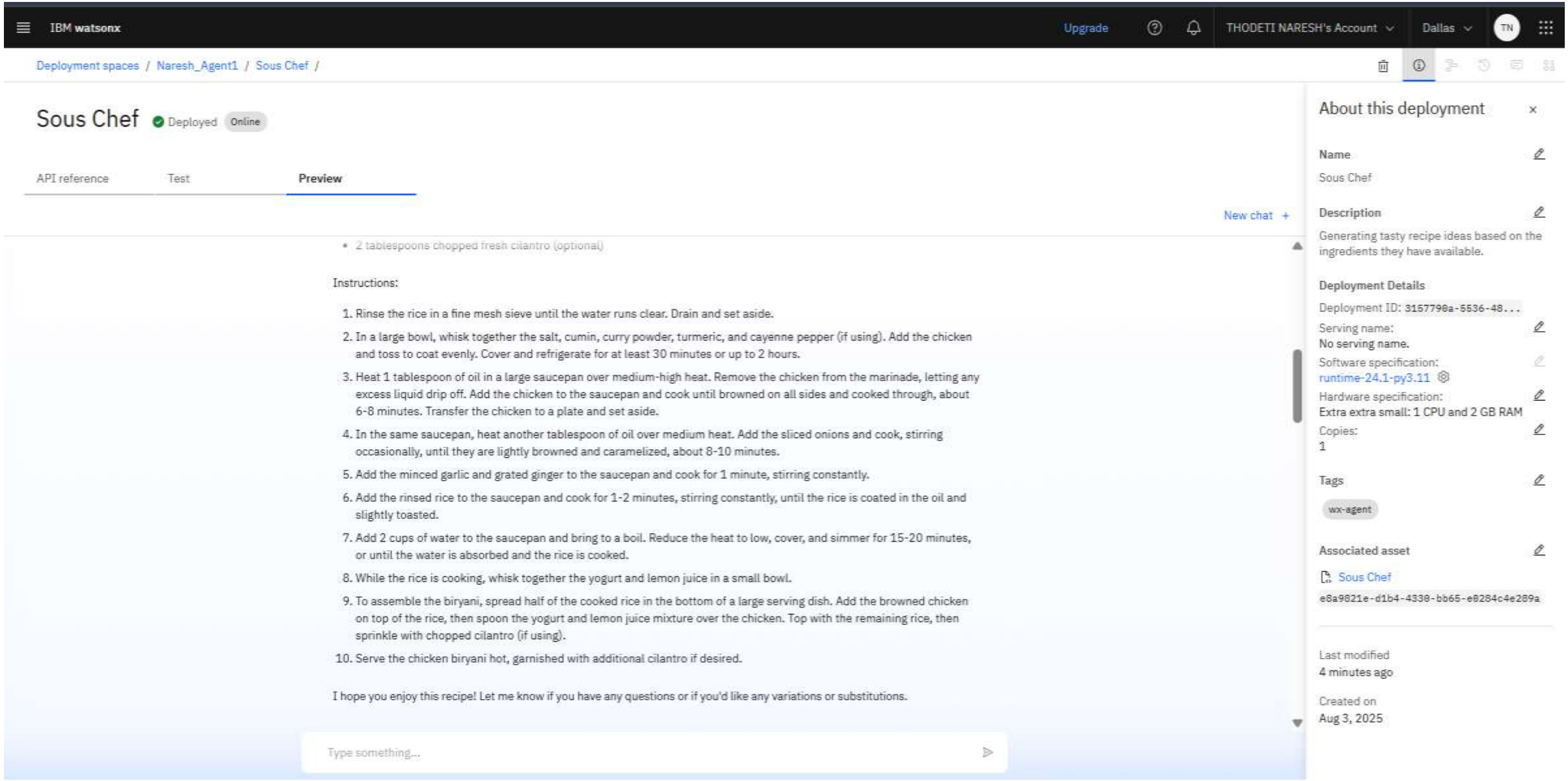

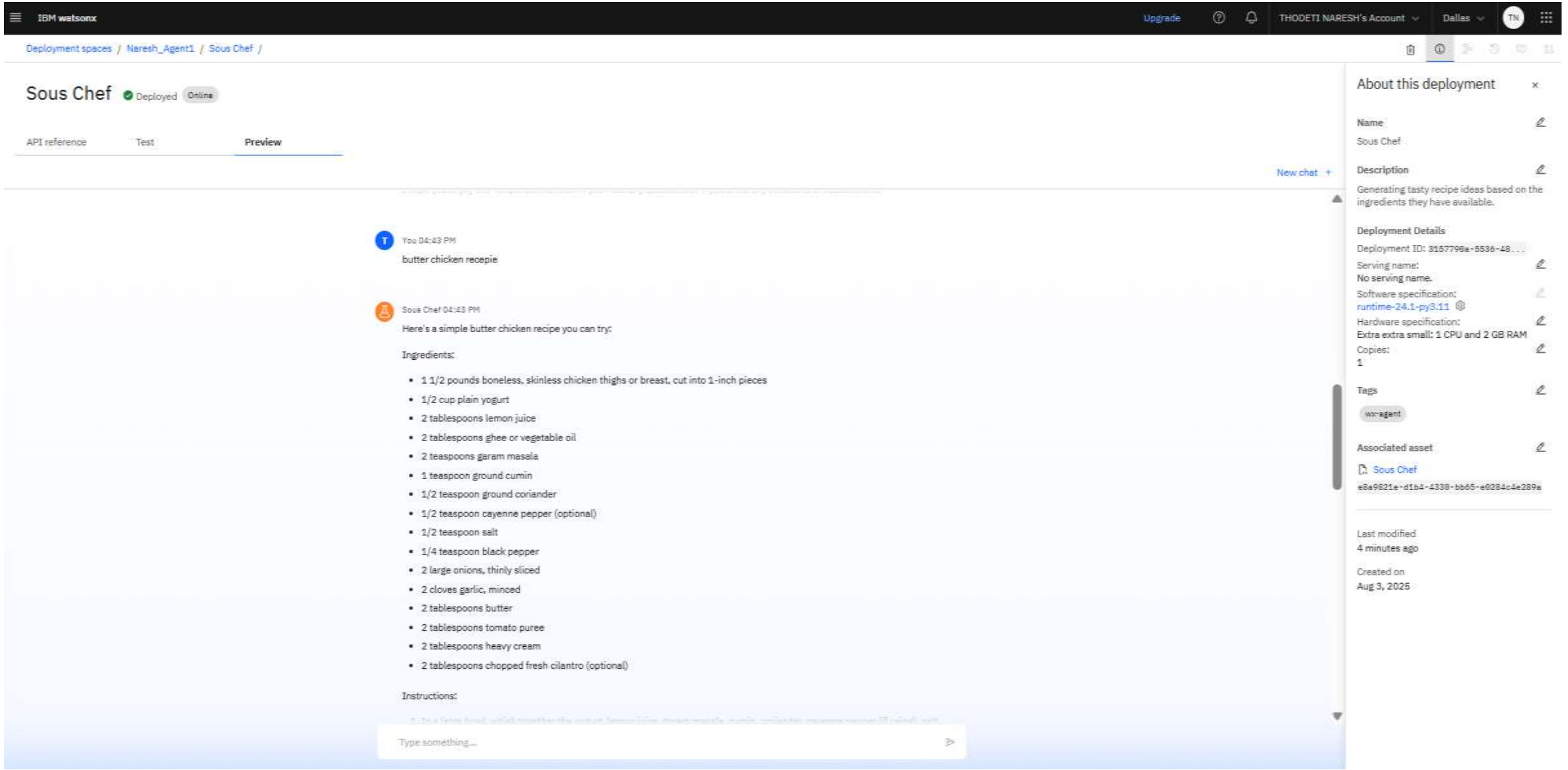

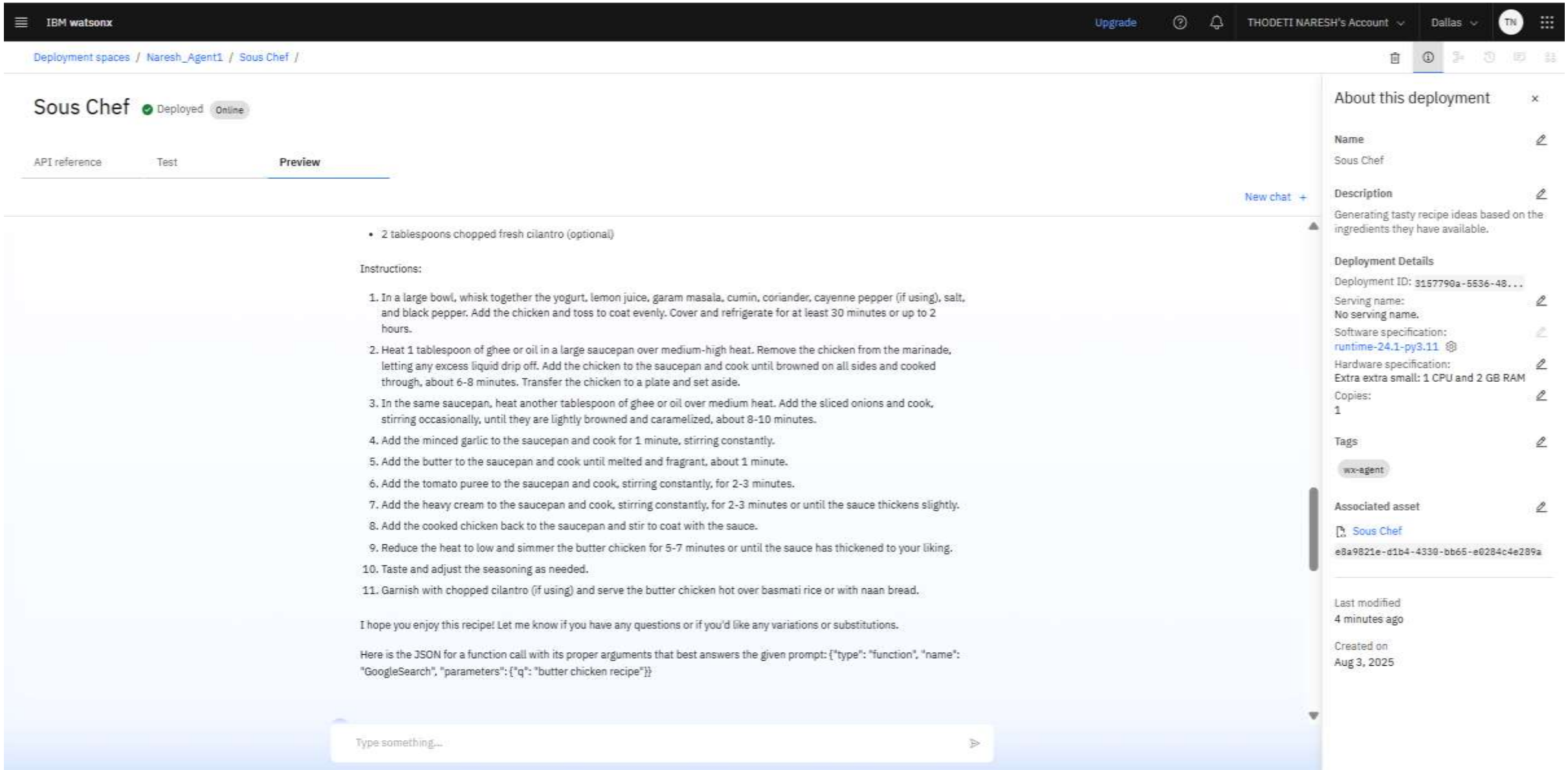

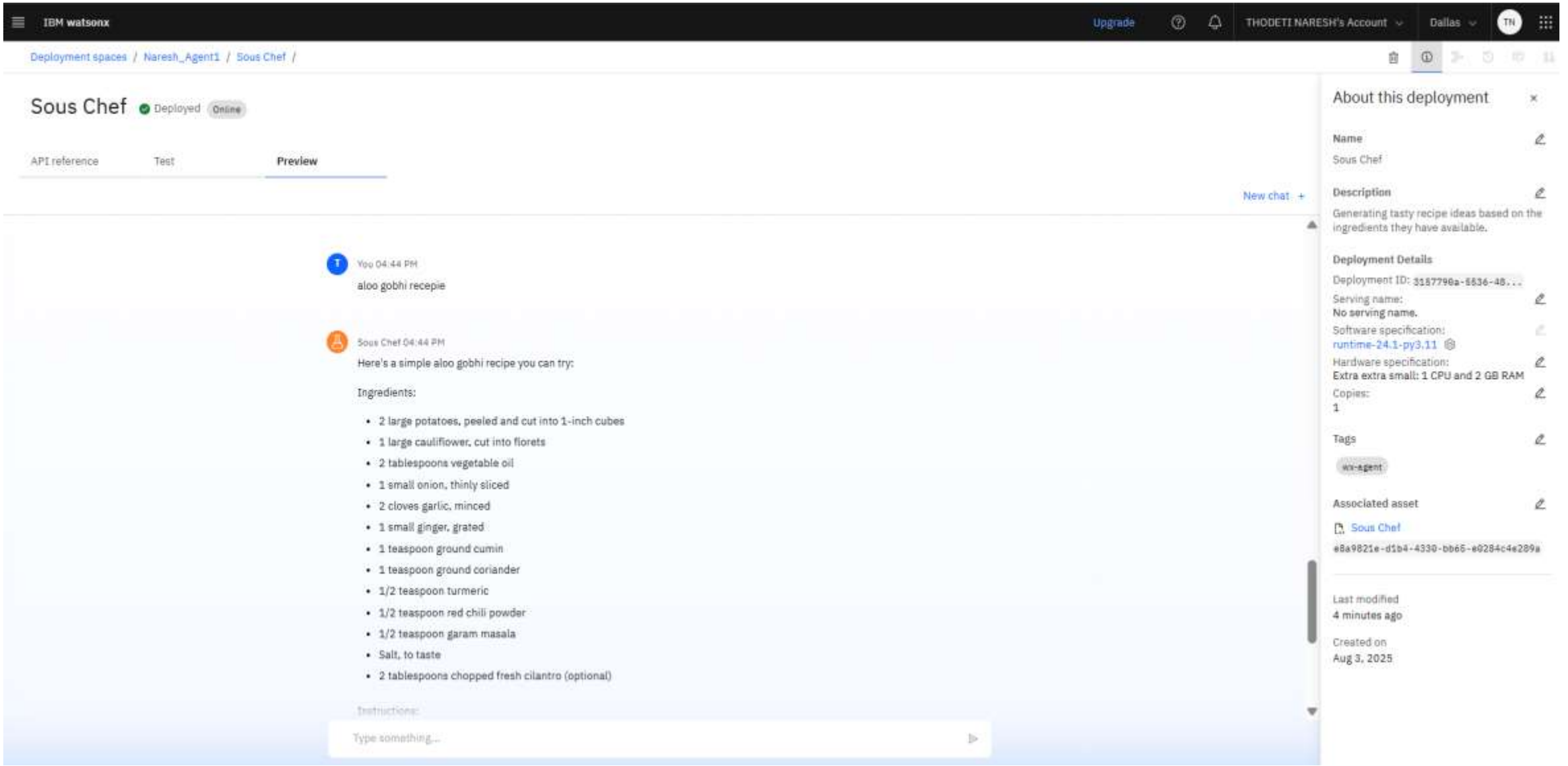

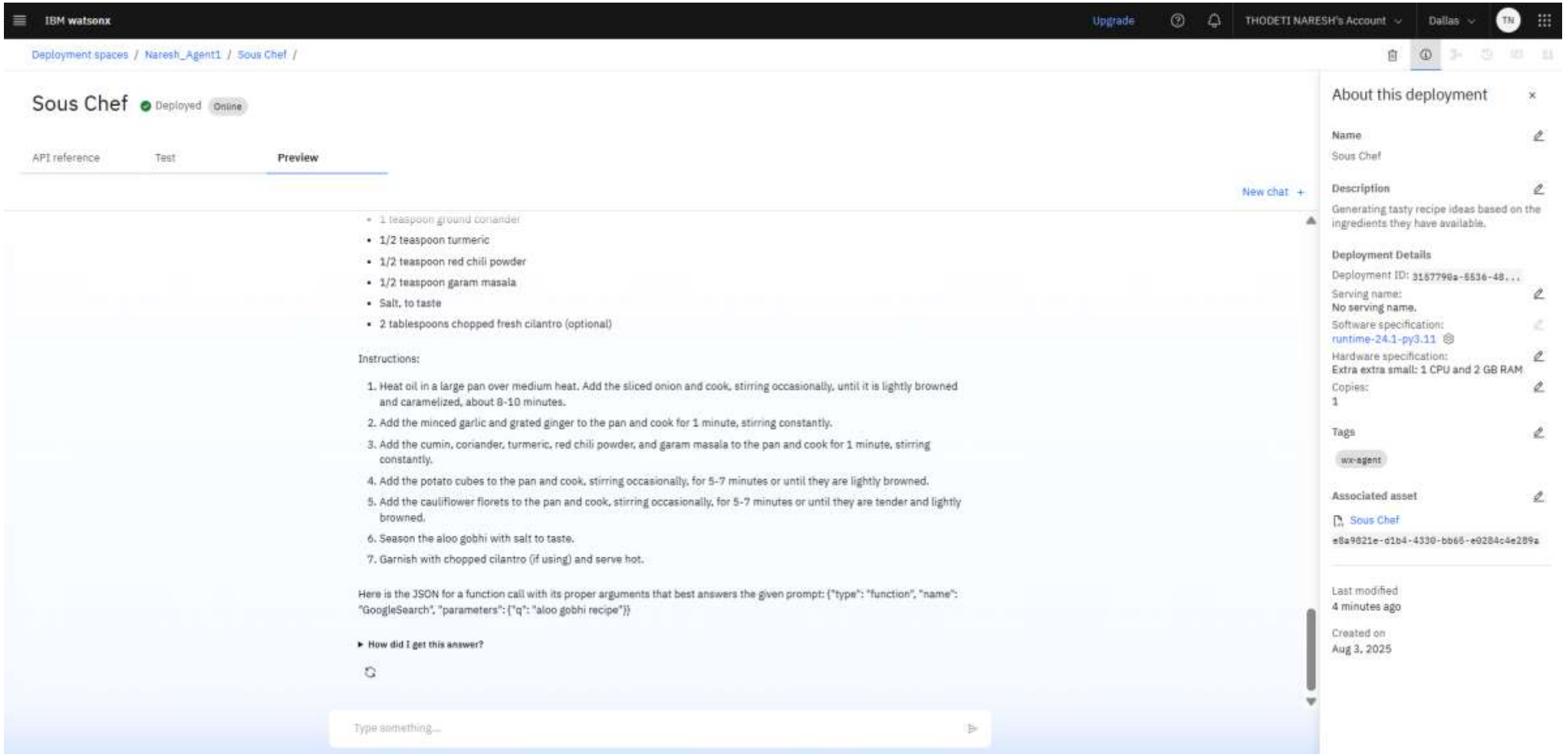

CONCLUSION

The Recipe Preparation Agent effectively transforms limited household ingredients into meaningful meal suggestions using AI. By reducing food waste and simplifying decision-making, it enhances the overall cooking experience. The use of IBM Granite and RAG ensures flexible, personalized, and scalable recipe generation.

FUTURE SCOPE

- **Voice Assistant Support**: Let users say “What can I cook with this?” using Alexa or Google Assistant.
- **Image-based Detection**: Users take a photo of their pantry; AI detects ingredients.
- **Nutritional Tracking**: Show calories, macros, etc.
- **Regional Recipe Support**: Offer Indian, Mexican, Korean, etc., recipes.
- **IoT Integration**: Connect with smart kitchen devices (e.g., smart oven)
- These ideas can make the agent more advanced and useful in real homes.

REFERENCES

- **IBM Watson NLP & Granite Documentation**
  - 📎 IBM Developer | Granite Foundation Models
  - ➤ Describes how to use IBM's foundation models and NLP tools in AI-driven applications.
- **IBM Cloudant Documentation**
  - 📎 IBM Cloudant Docs
  - ➤ Guides you in setting up and managing the NoSQL database for storing recipes and preferences.
- **IBM Cloud Lite Deployment Guide**
  - 📎 IBM Cloud Lite
  - ➤ Explains how to deploy applications for free using limited resources.
- **LangChain Documentation**
  - 📎 LangChain
  - ➤ Provides techniques for using Retrieval-Augmented Generation (RAG) in AI applications.
- **HuggingFace Transformers**
  - 📎 Hugging Face Docs

https://www.ibm.com/blogs/research/2023/10/granite-foundation-models/
https://www.researchgate.net/publication/339241441

IBM CERTIFICATIONS

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In recognition of the commitment to achieve professional excellence

Journey to Cloud: Envisioning Your Solution

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Has successfully satisfied the requirements for:

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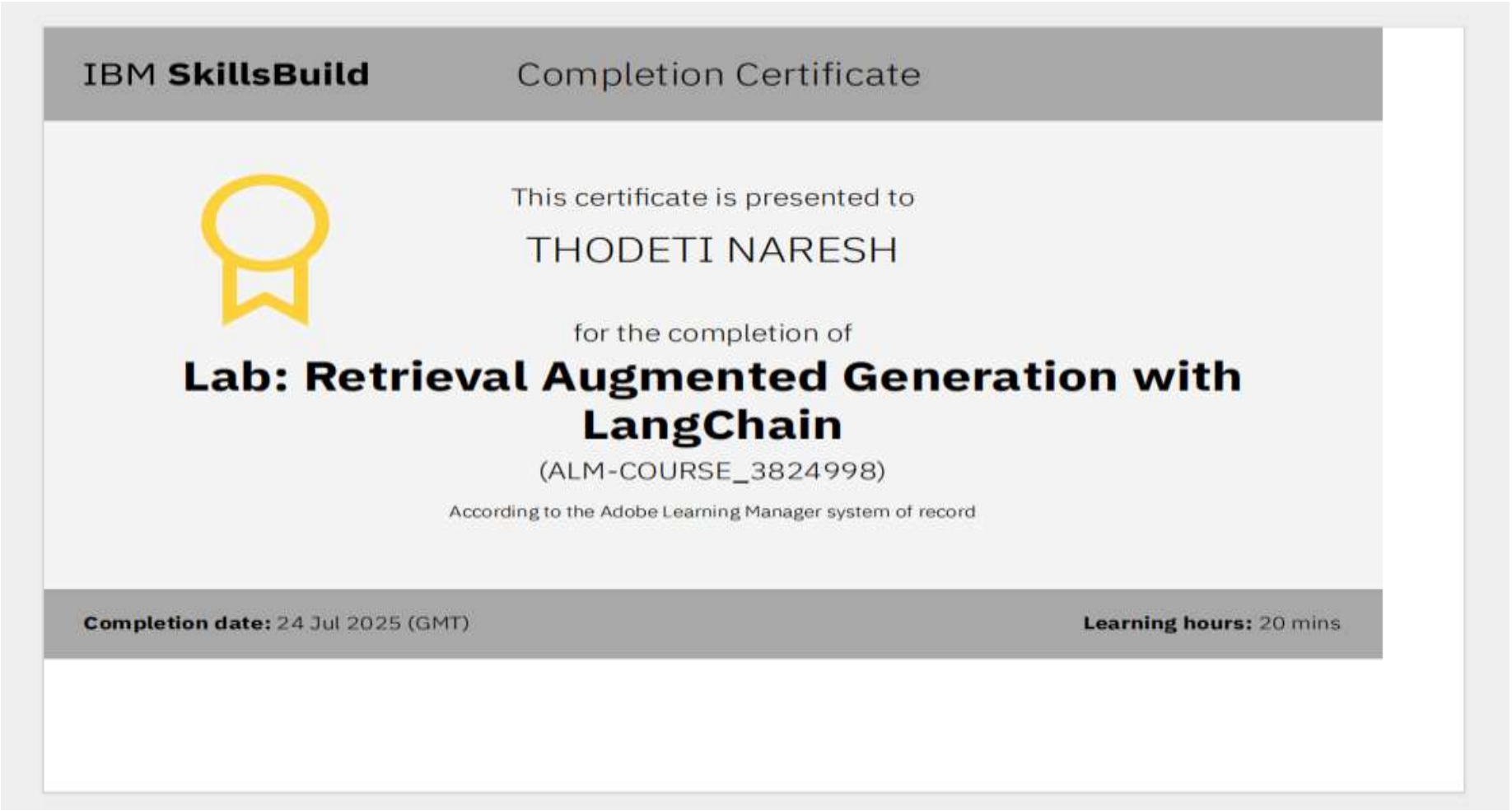

IBM **SkillsBuild** Completion Certificate

This certificate is presented to

THODETI NARESH

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

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