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# **CAPSTONE PROJECT**

## **RECIPE PREPARATION AGENT USING AGENTIC AI ON IBM CLOUD**

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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**

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# PROBLEM STATEMENT

Recipe Preparation Agent The Challenge - A Recipe Preparation Agent helps users cook meals using only the ingredients they have on hand. By inputting available groceries, users receive tailored recipe suggestions using a RAG-based AI system. The agent retrieves relevant recipes and generates step-by-step instructions adapted to ingredient limitations. It offers substitutions, cooking tips, and dietary adjustments based on user preferences or restrictions. Designed to reduce food waste and save time, it turns pantry items into practical meal solutions. This AI assistant makes everyday cooking smarter, simpler, and more sustainable. Technology - Use of IBM cloud lite services /IBM Granity is mandatory.

# PROPOSED SOLUTION

- The proposed system aims to address the challenge of predicting the required bike count at each hour to ensure a stable supply of rental bikes. This involves leveraging data analytics and machine learning techniques to forecast demand patterns accurately. The solution will consist of the following components:
- **Data Collection:**
  - Gather historical data on bike rentals, including time, date, location, and other relevant factors.
  - Utilize real-time data sources, such as weather conditions, events, and holidays, to enhance prediction accuracy.
- **Data Preprocessing:**
  - Clean and preprocess the collected data to handle missing values, outliers, and inconsistencies.
  - Feature engineering to extract relevant features from the data that might impact bike demand.
- **Machine Learning Algorithm:**
  - Implement a machine learning algorithm, such as a time-series forecasting model (e.g., ARIMA, SARIMA, or LSTM), to predict bike counts based on historical patterns.
  - Consider incorporating other factors like weather conditions, day of the week, and special events to improve prediction accuracy.
- **Deployment:**
  - Develop a user-friendly interface or application that provides real-time predictions for bike counts at different hours.
  - Deploy the solution on a scalable and reliable platform, considering factors like server infrastructure, response time, and user accessibility.
- **Evaluation:**
  - Assess the model's performance using appropriate metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), or other relevant metrics.
  - Fine-tune the model based on feedback and continuous monitoring of prediction accuracy.
- **Result:**

# SYSTEM APPROACH

## System requirements :

### Hardware Requirements

**Processor:** Intel i3 / AMD Ryzen 3 or higher

**RAM:** 4 GB (8 GB recommended)

**Storage:** Minimum 1 GB free

**Internet:** Stable internet connection (for IBM Cloud access)

## Cloud Requirements


- IBM Cloud Lite account
- Access to:
  - IBM **GenAI Studio** (Granite Model)
  - IBM **Watson Assistant** (for chatbot)
  - IBM **Cloud Functions** (optional backend logic)

# ALGORITHM & DEPLOYMENT







- **Algorithm Selection:**
  - The system uses IBM Granite LLM for natural language recipe generation based on ingredient input.
- **Data Input:**
  - User provides available ingredients in natural language (e.g., “tomato, rice, onion”).
- **Training Process:**
  - The system sends a prompt to IBM Granite, which returns a personalized recipe with steps and substitutions.
- **Prediction Process:**
  - The model instantly generates recipe suggestions via REST API in JSON format, enabling real-time responses.

# RESULT

The system generates a complete, step-by-step recipe based on user-provided ingredients. The output includes the recipe name, preparation instructions, ingredient substitutions, and dietary tips — all returned in real-time as a JSON response or chatbot message.

 IBM **watsonx**

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Deployment spaces / SmartChef02 / watsonx Agent /      

## watsonx Agent ✔ Deployed Online


watsonx Agent

API reference Test **Preview**

New chat +

 You 08:06 PM

"I have rice, tomato, and onion. What can I cook?"

 watsonx Agent 08:06 PM

Here are some recipes you can make with rice, tomato, and onion:


1. **Tomato Rice (Filling and Cozy) - Budget Bytes**

- Description: It's simply rice that has been cooked with onion, garlic, diced tomatoes, tomato paste, a couple of spices (cumin and chili powder), and a flavorful broth.
- URL: [Tomato Rice](#)

2. **Southern Tomatoes and Rice - Julia's Simply Southern**

- Description: Ingredients: 2 tbs Butter, 1 tsp Olive Oil, 2 c Uncooked Rice, 1 small to medium Vidalia Onion yellow onion will work too, 4 c Chicken Stock, 1...
- URL: [Southern Tomatoes and Rice](#)

Type something... ➤



# CONCLUSION

- The proposed Recipe Preparation Agent, leveraging IBM Granite and deployed on IBM Cloud, effectively demonstrates the power of **Agentic AI** to generate personalized recipes based on users' available ingredients. The system delivers accurate, relevant, and easy-to-follow cooking instructions in real-time, including intelligent ingredient substitutions and dietary recommendations. This highlights how Agentic AI can significantly enhance everyday decision-making in domestic contexts such as meal planning.
- A major implementation challenge involved designing precise prompts to consistently elicit complete and relevant recipe outputs from the Granite model. Additionally, integrating the AI with a responsive, user-friendly chat interface while maintaining low response latency demanded careful API design and backend optimization.



# FUTURE SCOPE

- Integrate more data sources such as seasonal ingredients and nutrition databases.
- Optimize AI algorithms for better accuracy and faster response.
- Support multiple regional languages and cuisines.
- Expand system coverage to various cities or regions.
- Use edge computing to reduce latency and enable offline use.
- Apply advanced machine learning for improved personalization.
- Add voice and image recognition for easier user interaction.

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# REFERENCES

- This project was supported by publicly available datasets from Kaggle, IBM Granite and IBM Cloud documentation, research papers on AI-driven recipe generation and prompt engineering, and literature on machine learning applications in personalized recommendation systems.

# IBM CERTIFICATIONS

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Completion Certificate



This certificate is presented to

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**Lab: Retrieval Augmented Generation with  
LangChain**

(ALM-COURSE\_3824998)

According to the Adobe Learning Manager system of record

**Completion date:** 25 Jul 2025 (GMT)

**Learning hours:** 20 mins



**THANK YOU**