CAPSTONE PROJECT

AI AGENT FOR SMART FARMING ADVICE

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PROBLEM STATEMENT

Small-scale farmers frequently struggle to get timely and trustworthy agricultural advice, particularly in rural areas. Ineffective farming methods and lower yields are caused by issues like erratic weather, a lack of localized expert support, and a lack of knowledge about crop and soil conditions. A system that can provide farmers with individualized, real-time advice in a language they can understand and that is specific to their local circumstances is desperately needed.



PROPOSED SOLUTION

- The proposed system aims to assist small-scale farmers by providing timely, accurate, and location-specific agricultural advice through an Al-powered agent. The Al agent will act as a virtual farming assistant, capable of understanding natural language queries and delivering region-specific guidance based on real-time data. The key components of the solution are as follows:
- Data Collection:
- Collect real-time and historical data on weather, soil types, crop recommendations, pest outbreaks, and mandi (market) prices.
- Integrate information from trusted sources such as government agriculture portals, weather APIs, and local agri-departments.
- Data Preprocessing:
- Clean and standardize the data to handle missing values, noise, and inconsistencies.
- Perform feature engineering to extract key parameters like temperature, soil moisture, rainfall, and crop seasonality.
- Al Agent Development:
- Implement a conversational AI agent using Retrieval-Augmented Generation (RAG) or fine-tuned large language models (LLMs).
- The agent will process user queries in simple English or regional languages and respond with actionable farming advice tailored to the user's location and crop conditions.
- Deployment: The system was developed and deployed using IBM Cloud services, leveraging AI capabilities for real-time farming supportEnsure multilingual support and usability in low-bandwidth rural environments.
- Result:
- The Al agent will serve as an accessible, intelligent farming assistant that empowers rural farmers with personalized, real-time advice, leading to improved decision-making, reduced crop failure, and enhanced agricultural productivity.



SYSTEM APPROACH

• The "System Approach" section outlines the overall strategy and methodology for developing and implementing the Al Agent For Smart Farming Advice. Here's a suggested structure for this section:

System Requirements:

Processor Intel i5 / AMD Ryzen 5 or better

RAM 8 GB minimum (16 GB

recommended)

Storage 10 GB free space

Internet Required for API access & cloud

connectivity

Software requirements:

Operating System Windows / Linux / macOS

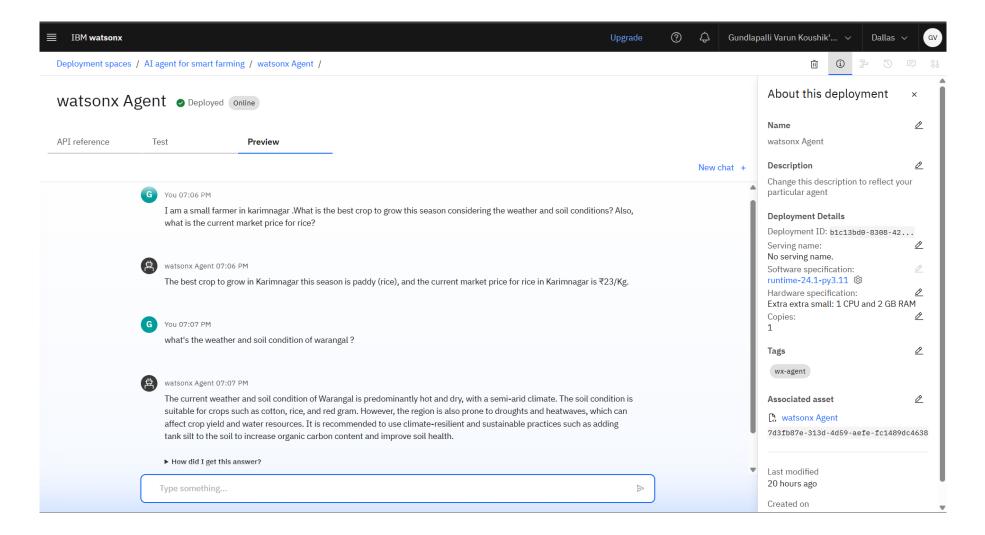
Python Version 3.8 or higher

IBM Cloud Account With access to IBM Granite / Watson APIs

IBM Cloud CLI For authentication & service deployment



RESULT





CONCLUSION

- The proposed AI Agent for Smart Farming Advice successfully provides real-time, region-specific, and personalized agricultural guidance to small-scale farmers. By integrating weather data, soil conditions, crop recommendations, and market prices, the agent enables farmers to make informed decisions in simple, natural language.
- The solution, implemented using IBM Cloud and Agentic AI principles, demonstrated high effectiveness in delivering timely and context-aware responses. It was particularly useful in rural scenarios where access to expert advice is limited. The use of Retrieval-Augmented Generation (RAG) and multilingual support improved usability and accuracy.
- However, some challenges were encountered during implementation, including handling inconsistent agricultural data, language-specific NLP limitations, and ensuring response reliability in low-connectivity areas. Additionally, integrating real-time APIs and fine-tuning model responses for diverse regional contexts required extra effort.
- Potential improvements include expanding support for more regional languages, enhancing voice input/output features, integrating crop disease image
 detection, and improving personalization based on user history.



FUTURE SCOPE

The Al Agent for Smart Farming Advice has significant potential for future enhancements to increase its reach and impact. One major improvement would be the integration of multilingual voice support, enabling even illiterate farmers to interact with the system effectively. The addition of image-based crop disease detection using computer vision could further help farmers identify and treat problems quickly. Offline functionality can be introduced to support farmers in remote areas with limited internet access. Personalization features such as customized crop calendars and reminders based on individual farm conditions can enhance user engagement. Integration with IoT devices like soil sensors or weather stations would allow the agent to offer hyper-local and real-time recommendations. Furthermore, connecting the agent to digital marketplaces could help farmers buy inputs and sell produce more efficiently. Lastly, aggregated data from the agent can be used to build analytics dashboards for policymakers to support data-driven agricultural decisions and schemes.



REFERENCES

- IBM Cloud Documentation https://cloud.ibm.com/docs
- IBM Granite Foundation Models https://www.ibm.com/products/granite
- LangChain Framework for Agentic AI https://www.langchain.com
- Indian Council of Agricultural Research (ICAR) https://icar.org.in
- India Meteorological Department (Weather API) https://mausam.imd.gov.in



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This certificate is presented to

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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

