
CAPSTONE PROJECT

AI AGENT FOR SMART FARMING ADVICE

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OUTLINE

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

PROBLEM STATEMENT

- Y Small-scale farmers in India often lack access to timely, location-specific, and actionable agricultural advice. This makes them vulnerable to unpredictable weather, suboptimal crop choices, pest attacks, and fluctuating market rates, resulting in reduced yields and unstable incomes. There is a critical need for an AI-based system that can interact in local languages, retrieve trusted agricultural data in real time, and provide personalized farming guidance.
- Y Objective: Develop an AI Agent powered by Retrieval-Augmented Generation (RAG) and deployed on IBM Cloud Lite/Granite that delivers real-time, localized advice on weather, soil conditions, crop selection, pest management, and market prices, supporting grassroots smart farming.

PROPOSED SOLUTION

- Y The Smart Farming AI Agent offers small-scale farmers:
- Y Conversational Interface in Local Languages: Farmers interact via text/voice in their native language for easy access.
- Y Trusted Data Integration: Weather data (forecast, rainfall, temperature) Soil conditions and health Crop recommendations based on season, soil, and market Pest/disease control and prevention suggestions Current local mandi rates for crops
- Y Retrieval-Augmented Generation (RAG): The system retrieves real-time information from reliable agricultural sources, processes it using advanced NLP models, and generates precise, actionable advice for the farmer.

SYSTEM APPROACH

- Y Cloud Platform: IBM Cloud Lite (mandatory), using Watson Studio, Object Storage, Watson Assistant, and optionally IBM Granite LLM for language support.
- Y System Flow: Farmer submits query in local language
Query is pre-processed and translated if necessary
RAG model retrieves relevant data, generates response
Dynamic, context-driven recommendation returned
Continuous learning from new queries and feedback

ALGORITHM & DEPLOYMENT

- Y Retrieval-Augmented Generation (RAG) combining retrieval of relevant data/documents with answer generation from a language model (using IBM Granite for multi-language support).
- Y Training Process :Fine-tune language model on agriculture-specific queries and responses
Dialog management and language understanding via Watson Assistant Real-time data ingestion from APIs Deployment.
- Y Application deployed on IBM Cloud Lite Containerized backend for RAG and integration services REST APIs for mobile/web/voice interfaces

RESULT

IBM watsonx

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Share feedback

New agent +

Deploy

Build

AI Model: llama-3-3-70b-instruct

Setup

Configuration

Framework

LangGraph

Architecture

ReAct

Instructions

Advanced configuration

Role:

You are a polite, multilingual farming agent that gives real-time, localized, and safe agricultural advice to small-scale farmers.

Interaction Rules:

Knowledge

Tools

Add a tool

Create custom tool

Added tools (5)

Google search

Retrieve information from the internet with the Google search engine.

Agent preview

RM You: 08:36 PM

My soil pH is 5.5, which fertilizer should I use for paddy?

GreenAdvisor 08:36 PM

Based on the search results, it appears that the best fertilizer for paddy soil with a pH of 5.5 is a matter of debate and depends on various factors such as the specific soil type, climate, and crop requirements. However, some general recommendations can be made.

For paddy soil with a pH of 5.5, it is recommended to use a fertilizer that is high in nitrogen, phosphorus, and potassium (NPK). A balanced fertilizer with a ratio of 10-10-10 (N-P-K) or 15-15-15 (N-P-K) can be used.

Additionally, it is important to consider the soil's acidity and alkalinity levels when selecting a fertilizer. For paddy soil with a pH of 5.5, which is slightly acidic, a fertilizer that is slightly acidic or neutral in pH can be used.

Some specific fertilizer recommendations for paddy soil with a pH of 5.5 include:

- Ammonium sulfate: This fertilizer is high in nitrogen and sulfur and can help to acidify the soil, making it more suitable for paddy cultivation.
- Urea: This fertilizer is high in nitrogen and can help to promote healthy plant growth.
- Diammonium phosphate: This fertilizer is high in phosphorus and nitrogen and can help to promote healthy plant growth and root development.

It is important to note that the specific fertilizer requirements for paddy soil with a pH of 5.5 may vary depending on the specific soil type, climate, and crop requirements. It is recommended to consult with a soil expert or agronomist to determine the best fertilizer for your specific situation.

In terms of safety precautions, it is important to follow the recommended application rates and handling

Type something...

RESULT

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Agent preview

Overall, the best fertilizer for paddy soil with a pH of 5.5 will depend on various factors, including the specific soil type, climate, and crop requirements. It is recommended to consult with a soil expert or agronomist to determine the best fertilizer for your specific situation.

How did I get this answer?

RM You: 08:37 PM

गन्ने की फसल में टॉप बोरेर कीट लगने पर क्या करना चाहिए?

GreenAdvisor 08:37 PM

गन्ने की फसल में टॉप बोरेर कीट लगने पर निम्नलिखित उपाय किए जा सकते हैं:

1. कार्बोफ्थूरन 3जी 1 किग्रा एआई/हेक्टेयर या थिमेट 10जी 3 किग्रा एआई/हेक्टेयर का उपयोग करें।

2. उपरोक्त रसायनों का उपयोग करने से पहले फसल की जांच करें और कीट की संख्या का अनुमान लगाएं।

3. कीटनाशकों का उपयोग करते समय सावधानी बरतें और सुरक्षा उपायों का पालन करें।

4. फसल की देखभाल के लिए एक एकीकृत कीट प्रबंधन रणनीति का पालन करें।

5. कीटनाशकों के उपयोग के अलावा, जैविक कीटनाशकों का उपयोग भी किया जा सकता है।

6. फसल की नियमित जांच करें और कीट की संख्या का अनुमान लगाएं।

7. कीट प्रबंधन के लिए विशेषज्ञों से परामर्श लें।

यह जानकारी विभिन्न स्रोतों से प्राप्त की गई है, जिनमें शोध पत्र, कृषि विभाग की वेबसाइटें, और कीट प्रबंधन विशेषज्ञों की सलाह शामिल है।

How did I get this answer?

Type something...

RESULT

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New agent +

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Agent preview

RM You: 08:38 PM

Give me the current minimum and maximum price for onions in tumkur

GreenAdvisor 08:38 PM

The current minimum and maximum price for onions in Tumkur is ₹23.0/kg and ₹2,150 respectively.

► How did I get this answer?

RM You: 08:39 PM

Is it going to rain in Arsikere village tomorrow? My village is near Hassan, Karnataka.

GreenAdvisor 08:39 PM

Based on the search results, it appears that there is a chance of rain in Arsikere village tomorrow. The weather forecast for Arsikere, Karnataka, India shows a 50% chance of rain and mostly cloudy conditions. It is recommended to check the weather forecast again tomorrow for the most up-to-date information.

Here are some specific weather forecasts for Arsikere village:

- Weather Underground: 10-Day Weather Forecast for Arsikere, India
- The Weather Channel: Weather Forecast and Conditions for Arsikere, Karnataka, India
- AccuWeather: Hourly Weather Forecast in Arsikere, Karnataka, India
- Ventusky: Arsikere Weather Forecast Maps

Please note that weather forecasts are subject to change and it's always a good idea to check multiple sources for the most accurate information.

► How did I get this answer?

Type something...

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RM⋮

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Build

AIModel: llama-3-3-70b-instruct⚙️<

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Agent preview

RMYou: 08:42 PM

ಶೂಟ್ ಮತ್ತು ಫ್ರೂಟ್ ಬೋರರ್ ಕೀಟಗಳು ನನ್ನ ಬದನೆಕಾಯಿ ಬೆಳೆ ಮೇಲೆ ದಾಳಿ ಮಾಡುತ್ತಿವೆ. ಏನು ಮಾಡಲಿ?

GreenAdvisor 08:42 PM

ಶೂಟ್ ಮತ್ತು ಫ್ರೂಟ್ ಬೋರರ್ ಕೀಟಗಳು ನಿಮ್ಮ ಬದನೆಕಾಯಿ ಬೆಳೆ ಮೇಲೆ ದಾಳಿ ಮಾಡುತ್ತಿವೆ. ಈ ಸಮಸ್ಯೆಯನ್ನು ಪರಿಹರಿಸಲು, ಕೆಳಗಿನ ಕ್ರಮಗಳನ್ನು ಅನುಸರಿಸಿ:

1. ಬೆಳೆಯನ್ನು ನಿಯಮಿತವಾಗಿ ಪರಿಶೀಲಿಸಿ ಮತ್ತು ಪೀಡಿತ ಹಣ್ಣುಗಳನ್ನು ತೆಗೆದುಹಾಕಿ.

2. ಫೆರೋಮೋನ್ ಟ್ರ್ಯಾಪ್‌ಗಳನ್ನು ಬಳಸಿ ವಯಸ್ಕ ಹುಳುಗಳನ್ನು ಸಿಕ್ಕಿಹಾಕಿ.

3. ಜೈವಿಕ ನಿಯಂತ್ರಣಕ್ಕಾಗಿ ಬಿಟಿ ಬಯೋ-ಲಾರ್ವಿಸೈಡ್ ಅಥವಾ ಬ್ಯೂವೆರಿಯಾ ಬ್ಯಾಸಿಯಾನಾವನ್ನು ಬಳಸಿ.

4. ದೀರ್ಘ ಮತ್ತು ಕಿರಿದಾದ ಹಣ್ಣುಗಳನ್ನು ಹೊಂದಿರುವ ತಳಿಗಳನ್ನು ಬೆಳೆಯಿರಿ.

5. ವಯಸ್ಕ ಹುಳುಗಳನ್ನು ಸಿಕ್ಕಿಹಾಕಲು ಟ್ರ್ಯಾಪ್‌ಗಳನ್ನು ಅಳವಡಿಸಿ.

6. ಟ್ರೇಸರ್ 45 ಎಸ್‌ಸಿ (ಸ್ಪ್ರಿನೋಸಾಡ್) ಅಥವಾ ಎಮಾಮೆಕ್ಸಿನ್ ಬೆಂಜೋಯೇಟ್‌ನಂತಹ ಜೈವಿಕ ಕೀಟನಾಶಕಗಳನ್ನು ಬಳಸಿ.

7. ಕೀಟ ಸಮಸ್ಯೆಯನ್ನು ನಿಯಂತ್ರಿಸಲು ನಿಯಮಿತ ಅಂತರಗಳಲ್ಲಿ ಸೆವಿಮೋಲ್ (0.1%) ಅನ್ನು ಸ್ಪ್ರೇ ಮಾಡಿ.

8. ನಿಯಂತ್ರಣ ಏಜೆಂಟುಗಳಾಗಿ ಎಂಟೊಮೊಪ್ಯಾಥೋಜೆನಿಕ್ ನೆಮಟೋಡ್‌ಗಳನ್ನು ಬಳಸಿ.

ಈ ವಿಧಾನಗಳ ಪರಿಣಾಮಕಾರಿತ್ವವು ಸೋಂಕಿನ ಹಂತ ಮತ್ತು ಋತುವಿನ ಮೇಲೆ ಅವಲಂಬಿತವಾಗಿರುತ್ತದೆ. ಬದನೆಕಾಯಿ ಬೆಳೆಯಲ್ಲಿ ಶೂಟ್ ಮತ್ತು ಫ್ರೂಟ್ ಬೋರರ್ ಕೀಟಗಳನ್ನು ನಿಯಂತ್ರಿಸಲು ಹೆಚ್ಚು ನಿರ್ದಿಷ್ಟ ಮಾರ್ಗದರ್ಶನಕ್ಕಾಗಿ ಕೀಟ ನಿರ್ವಹಣೆ ತಜ್ಞ ಅಥವಾ ಸ್ಥಳೀಯ ಕೃಷಿ ವಿಸ್ತರಣಾ ಕಚೇರಿಗೆ ಸಂಪರ್ಕಿಸಿ.

► How did I get this answer?

🔄

Type something...🔍➡

CONCLUSION

- Y The deployed AI Agent for Smart Farming Advice leverages IBM Cloud and advanced AI methods to provide timely, trusted, and localized agricultural guidance. This bridges the information gap for rural farmers, enabling better crop decisions, optimized resource use, and improved income, ultimately empowering the agricultural community at the grassroots.

FUTURE SCOPE

- Y Expand support for more Indian regional languages.
- Y Integrate satellite imagery for advanced crop/soil diagnostics.
- Y Personalized alerts (e.g., weather warnings, pest outbreaks, market price trends).
- Y Edge deployment for offline support. Integration with agricultural IoT devices.

REFERENCES

- Y Indian Meteorological Department (IMD) API/portal
- Y State government agriculture portals & bulletins
- Y IBM Cloud / Watson Assistant / Granite documentation
- Y Major Agritech platforms (e.g., Agmarknet, eNAM)
- Y Research: Data-driven AI in Smart Farming (IEEE, Springer)

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Completion Certificate



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