
CAPSTONE PROJECT

AI AGENT FOR SMART FARMING

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OUTLINE

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PROBLEM STATEMENT

An AI agent is needed to provide small-scale farmers with real-time, localized agricultural advice. This agent would help bridge the knowledge gap and bring smart farming to a grassroots level. The goal is to deliver timely, data-driven decisions that can reduce risk, increase crop yield, also provide rates of crops in local & national markets and boost income for farmers.

PROPOSED SOLUTION

- The proposed system is an AI agent for smart farming advice that uses Retrieval-Augmented Generation (RAG). This agent will provide real-time, localized guidance to small-scale farmers. The solution will retrieve trusted data from various sources, including agricultural departments, meteorological services, and agri-tech platforms. Farmers will be able to interact with the agent in their local language, asking questions such as "What crop is best for this season?" or "What is today's mandi rate for tomatoes?". **The solution will consist of the following components:**
- **Data Collection:**
 - Gather trusted data on weather forecasts, soil conditions, crop recommendations, pest control measures, and current market prices.
- **Data Preprocessing:**
 - Clean and preprocess the collected data to handle inconsistencies and missing values.
- **Machine Learning Algorithm:**
 - Implement a machine learning model llama-3-3-70-instruct that can understand and respond to farmer queries in their local language. The system will use the retrieved data to generate accurate and relevant advice.
- **Deployment:**
 - Develop a user-friendly interface or application for farmers to interact with the agent. The solution will be deployed on a scalable platform to ensure reliability and accessibility.
- **Evaluation:**
 - Assess the agent's effectiveness and accuracy in providing helpful advice.

SYSTEM APPROACH

The overall strategy for developing the AI agent will follow these steps:

- **System requirements** : Define the necessary hardware, software, and data requirements for the system.
- **Library required to build the model** : Identify and list the necessary libraries for building the llama-3-3-70-instruct model and the AI agent.
- **Watsonx.ai studio** : IBM cloud service.
- **Object Storage** : IBM cloud service.

ALGORITHM & DEPLOYMENT

- Here's an example structure for this section:
- **Algorithm Selection:**
 - The chosen algorithm will be a Retrieval-Augmented Generation (RAG) model, which is well-suited for providing specific, data-driven advice by combining a retrieval component with a generative model.
- **Data Input:**
 - The algorithm will use various input features, including farmer queries in their local language and retrieved data from trusted sources (e.g., weather, soil, and market price information).
- **Training Process:**
 - The model will be trained on a diverse dataset to improve its understanding of agricultural queries and its ability to generate accurate and context-aware responses.
- **Prediction Process:**
 - When a farmer asks a question, the agent will first retrieve relevant information from its knowledge base and then use this information to generate a precise answer.

RESULT


The screenshot displays the IBM watsonx Agent Lab interface. The top navigation bar includes the IBM watsonx logo, an 'Upgrade' button, a help icon, a notification bell, and user account information for 'Abhishek Barua's Account' in 'Dallas'. The main breadcrumb is 'Projects / farmingAgent / Agent Lab'. On the right, there are buttons for 'Share feedback', 'Unsaved', 'New agent +', and 'Deploy'.


The left sidebar is titled 'Build' and contains sections for 'Setup', 'Configuration', 'Instructions', 'Knowledge', and 'Tools'. Under 'Configuration', the 'Framework' is set to 'LangGraph' and the 'Architecture' is 'ReAct'. The 'Instructions' section contains the text: 'You are a helpful assistant that uses tools to answer questions in detail. When greeted, say "Hi, I am watsonx.ai agent. How can I help you?"'. The 'Tools' section has buttons for 'Add a tool' and 'Create custom tool'. Below this, it shows 'Added tools (1)'. The 'AI' model is set to 'llama-3-3-70b-instruct'.


The right panel, titled 'Agent preview', shows a chat history. The first message is from 'You' at 11:09 AM: 'hi'. The second message is from 'watsonx Agent' at 11:09 AM: 'Hi, I am watsonx.ai agent. How can I help you?'. Below this is a link '► How did I get this answer?'. The third message is from 'You' at 11:10 AM: 'What is today's mandi rate for tomatoes?'. The fourth message is from 'watsonx Agent' at 11:10 AM, providing a detailed response: 'The current mandi rate for tomatoes is ₹35.0 per kilogram in Punjab, ₹2616.42 per quintal in Madhya Pradesh, ₹3076.54 per quintal in Uttar Pradesh, ₹3703.27 per quintal in Maharashtra, and ₹3756.52 per quintal in Haryana. The prices may vary depending on the location and market.' Below this is another link '► How did I get this answer?'. At the bottom of the chat window is a text input field with the placeholder 'Type something...' and a send button.


RESULT







IBM watsonx

Upgrade ? 

Abhishek Barua's Account 

Dallas 

AB 

Deployment spaces /      

Abhishek_Agent_01



Overview






Assets


Deployments



Jobs

Manage

  Search

Name	Type	Status	Asset	Asset type	Tags	Last modified	
 watsonx Agent	Online	 Deployed	watsonx Agent	AI service	wx-agent 	39 seconds ago Abhishek Barua (You)	

Items per page: 20  1-1 of 1 items

1 of 1 pages  

RESULT

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Deployment spaces / Abhishek_Agent_01 / watsonx Agent /

watsonx Agent Deployed Online

API reference Test Preview

Endpoints for inferencing ⓘ

Private endpoint

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/150682c6-2021-4c6c-af6a-ea443002c7f0/ai_service?v=

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/150682c6-2021-4c6c-af6a-ea443002c7f0/ai_service_v

Public endpoint

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/150682c6-2021-4c6c-af6a-ea443002c7f0/ai_service?v=

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/150682c6-2021-4c6c-af6a-ea443002c7f0/ai_service_v

[Learn more](#) about the 2021-05-01 version query parameter

Bearer <token> ⓘ

IAM

Code snippets

cURL Java JavaScript Python Scala

About this deployment x

Name

watsonx Agent

Description

Change this description to reflect your particular agent

Deployment Details

Deployment ID: 150682c6-2021-4c...

Serving name: No serving name.

Software specification: runtime-24.1-py3.11 ⓘ

Hardware specification: Extra extra small: 1 CPU and 2 GB RAM

Copies: 1


Tags




wx-agent






Associated asset



[watsonx Agent](#) f4c45220-9c8b-4466-b6ca-2fa6160a8f0a

RESULT

 IBM watsonx


Upgrade ?  Abhishek Barua's Account ▾ Dallas ▾  AB 


Deployment spaces / Abhishek_Agent_01 / watsonx Agent /     

watsonx Agent  Deployed  Online


API reference Test **Preview**

New chat +

 You 11:28 AM
What type of crops suitable for winter season?

 watsonx Agent 11:28 AM
Some crops suitable for the winter season include:

1. Beets
2. Broccoli
3. Brussels Sprouts
4. Spinach
5. Carrots
6. Turnips
7. Lettuce
8. Cabbage

Type something... 

CONCLUSION

- The RAG-powered AI agent for smart farming advice effectively provides small-scale farmers with timely and localized agricultural guidance. The solution successfully retrieves trusted data from various sources to deliver accurate recommendations, bridging the knowledge gap and empowering farmers with data-driven decision-making.

FUTURE SCOPE

- Incorporate additional data sources, such as real-time satellite imagery for crop health monitoring.
- Optimize the RAG algorithm to provide faster and even more precise advice.
- Expand the system to cover more languages, crops, and regions to assist a wider range of farmers.
- Consider integrating emerging technologies like edge computing for offline access in remote areas.

REFERENCES

- Padhiary, M.; Saha, D.; Kumar, R.; Sethi, L.N.; Kumar, A. Enhancing Precision Agriculture: A Comprehensive Review of Machine Learning and AI Vision Applications in All-Terrain Vehicle for Farm Automation. *Smart Agric. Technol.* 2024, 8, 100483. [[Google Scholar](#)] [[CrossRef](#)]
- Ritambara, Shilpa Kaushal, and Shubham. 2024. "Frontiers of Artificial Intelligence in Agricultural Sector: Trends and Transformations". *Journal of Scientific Research and Reports* 30 (10):970-80. <https://doi.org/10.9734/jsrr/2024/v30i102518>.
- "Farmers in India are using AI for agriculture – here's how they could inspire the world": An article from the World Economic Forum that discusses the "AI4AI initiative" in Telangana, India, and its positive impact on chili farmers. Read more follow link : <https://www.weforum.org/stories/2024/01/how-indias-ai-agriculture-boom-could-inspire-the-world/>

IBM CERTIFICATIONS

- Getting Started With AI



IBM CERTIFICATIONS

- Journey to Cloud



IBM CERTIFICATIONS

- RAG Lab





THANK YOU