CAPSTONE PROJECT

PROJECT TITLE

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OUTLINE

- Problem Statement
- Proposed System/Solution
- System Development Approach
- Algorithm & Deployment
- Result (Output Image)
- Conclusion
- Future Scope
- References

PROBLEM STATEMENT

Develop an AI-powered Smart Farming Assistant using Retrieval-Augmented Generation (RAG) to provide small-scale farmers with real-time, localized agricultural advice. The agent delivers insights on weather, soil, crops, pests, and market rates in local languages, helping farmers make informed decisions that improve yield and income.

PROPOSED SOLUTION

- **Platform:** Built using Agentic AI deployed on IBM Cloud
- **Architecture:** Utilizes Retrieval-Augmented Generation (RAG) for intelligent responses based on trusted data
- **Language Accessibility:** Supports interactions in local languages and dialects
- **User Queries Supported:** Crop recommendations for current season. Local mandi (market) prices Pest control tips and soil condition advice
- **Benefits:** Empowers small-scale farmers with actionable, real-time insights. Improves decision-making, reduces crop risk, and increases profitability

SYSTEM APPROACH

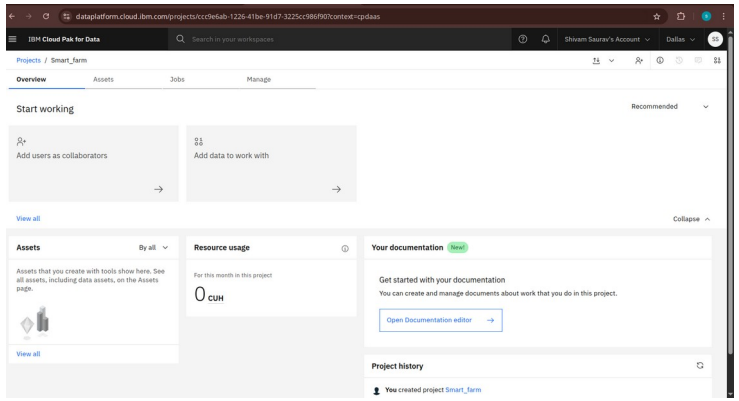
The system adopts a modular and scalable architecture powered by cloud-based services. It combines data ingestion from sensors, APIs, and user inputs with intelligent processing using NLP and Retrieval-Augmented Generation (RAG) models. A centralized decision engine handles query routing and context management, while storage systems maintain historical data for improved learning. The entire setup is deployed on IBM Cloud for seamless integration, security, and real-time accessibility through mobile and web platforms.

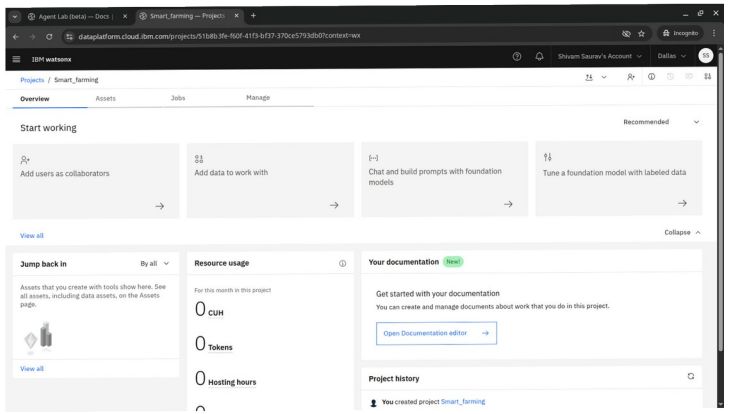
ALGORITHM & DEPLOYMENT

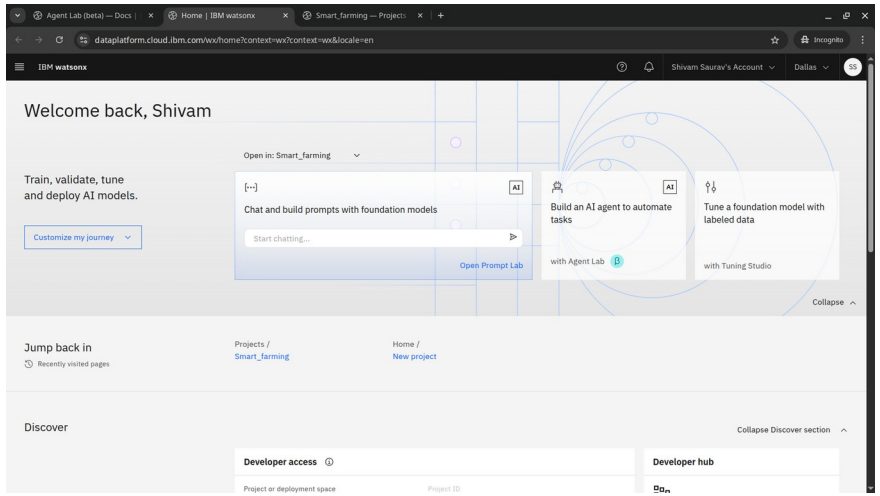
- The algorithm of the Smart Farming AI Agent relies on Retrieval-Augmented Generation (RAG) to generate accurate and context-aware replies. It uses Natural Language Processing (NLP) to handle local languages and applies intent detection to route queries like crop advice or market updates to the right tools. It integrates real-time data through APIs and cloud sources for weather, soil, and agricultural insights.

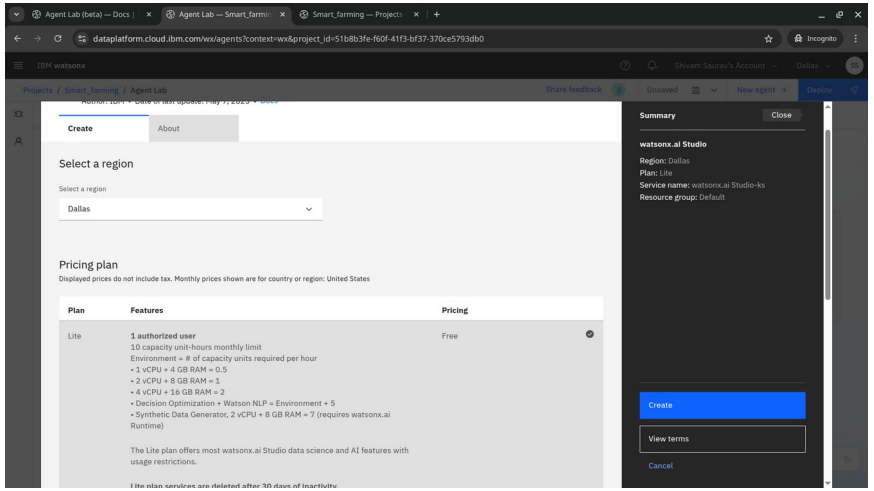
- For deployment, the system runs on IBM Cloud with secure execution through IBM’s runtime environment. It uses cloud storage for managing user data and integrates external services via API connectors. Farmers interact with the system via accessible web or mobile apps for seamless support.

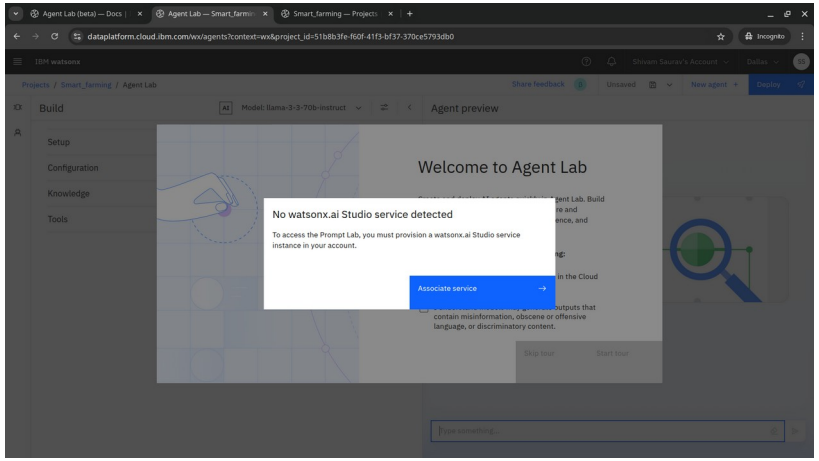
RESULT

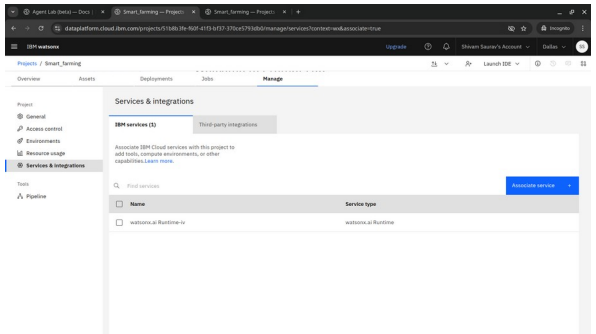












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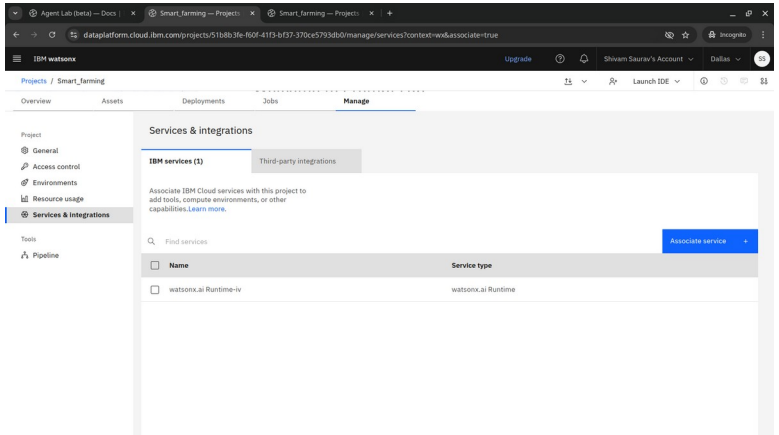

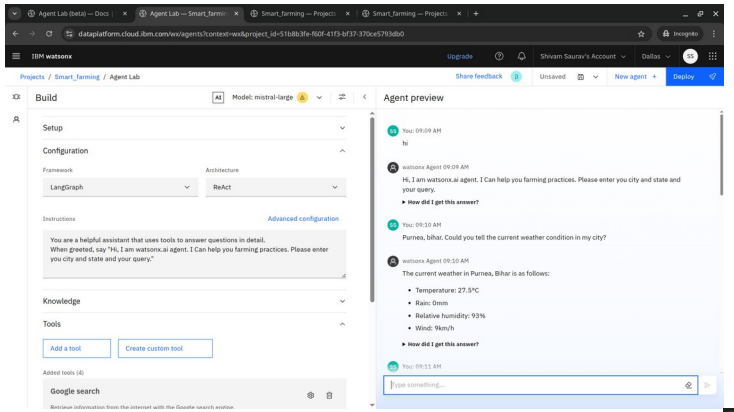

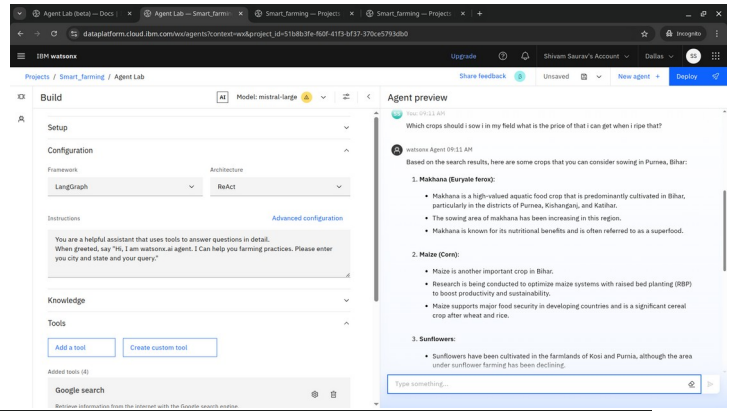

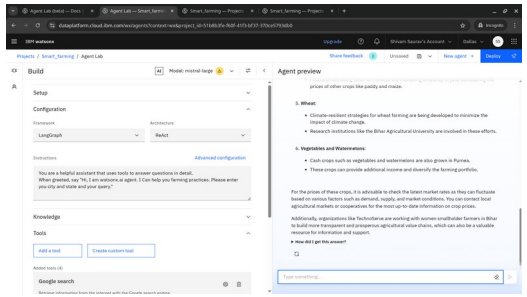

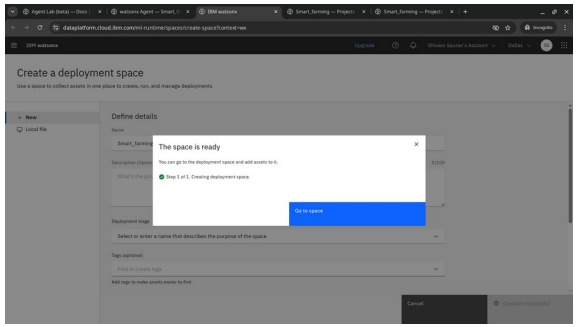

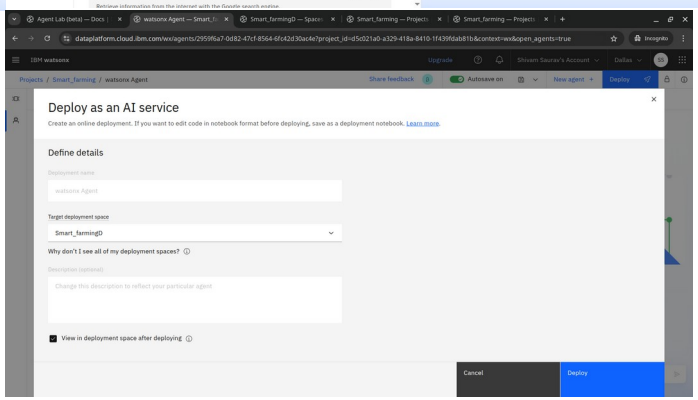

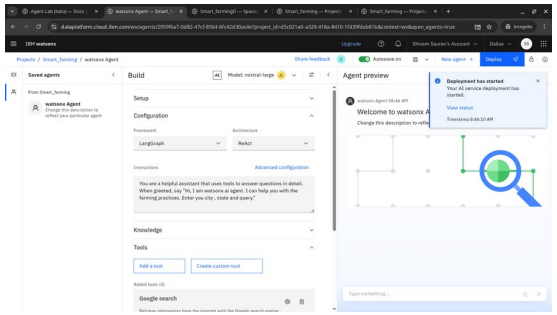

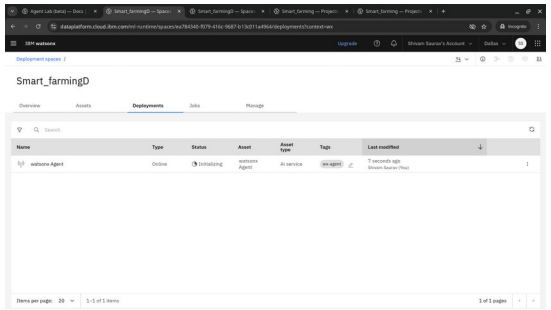

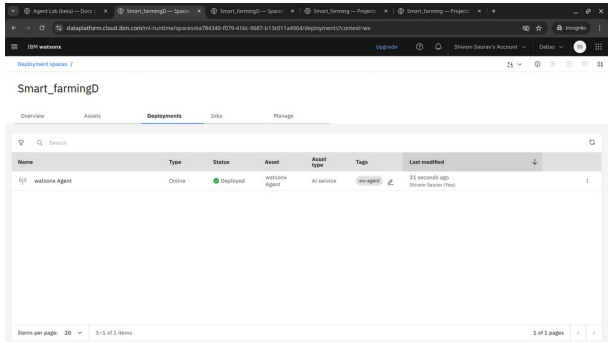

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CONCLUSION

The AI-powered Smart Farming Assistant represents a transformative leap toward accessible, data-driven agriculture for small-scale farmers. By harnessing Agentic AI and IBM Cloud infrastructure, the solution bridges the knowledge gap through real-time retrieval of critical insights on weather, crops, pests, and market trends. With natural language support and intelligent integration of tools like Google Search and DuckDuckGo, it empowers farmers to make timely decisions that reduce risk and boost yield. As the system evolves, its ability to adapt, scale, and personalize agricultural guidance will make it an indispensable companion for achieving sustainable growth at the grassroots level.

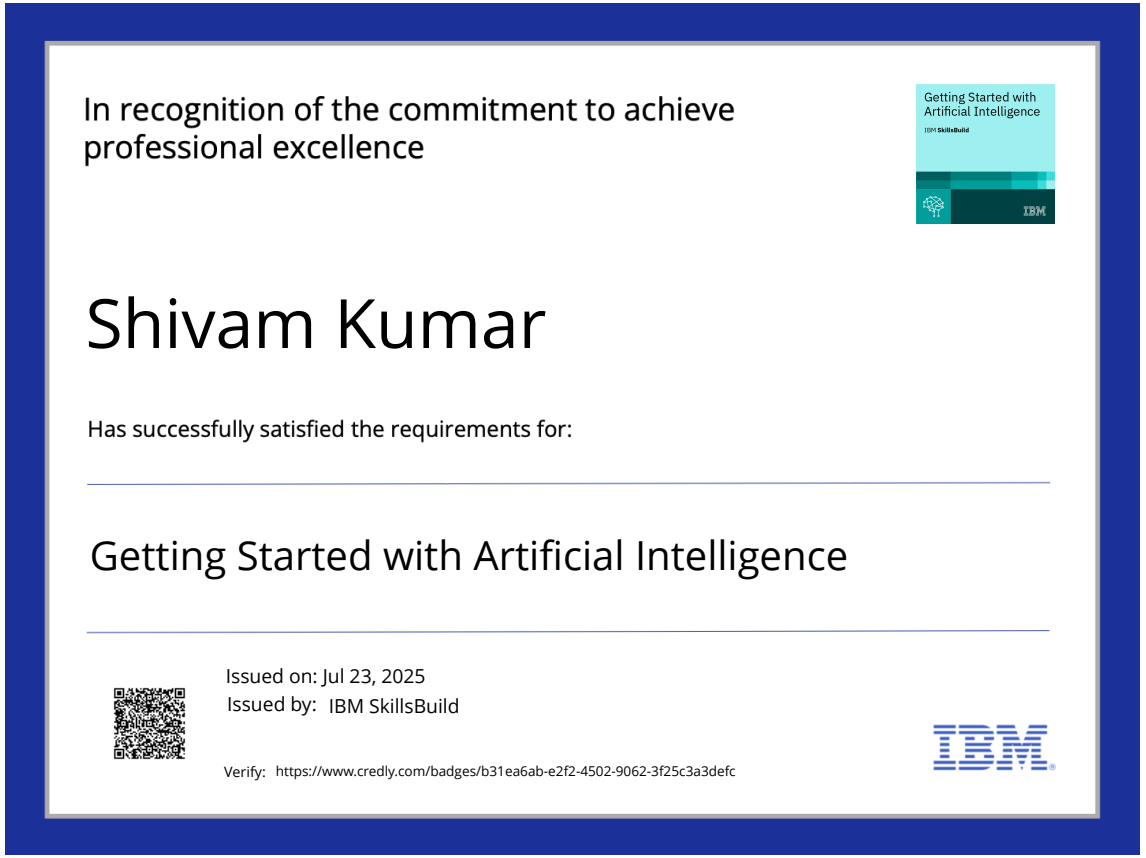
FUTURE SCOPE

AI Agent for Smart Farming has exciting future potential. It can support multiple languages, connect with sensors and satellites for real-time farming decisions, use blockchain for secure crop data and payments, and help farmers plan, sell, and learn—all tailored to their needs. Over time, it could become a personalized, all-in-one farming companion.

REFERENCES

- IBM Documentation Portal: Central hub for technical guides, product manuals, and cloud services.
- IBM Cloud Docs: Covers deployment, runtime environments, APIs, and cloud storage setup.
- English Wikipedia: Details on structure, history, and editorial practices.
- Wikipedia on RAG and AI: Search within Wikipedia for topics like Retrieval-Augmented Generation, Smart Farming, and AI applications.

IBM CERTIFICATIONS



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IBM **SkillsBuild** 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: 25 Jul 2025 (GMT) **Learning hours:** 20 mins

THANK YOU

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