CAPSTONE PROJECT

RESEARCH AGENT

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OUTLINE

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PROBLEM STATEMENT

Researchers and students face challenges in tracking and reviewing the ever-growing volume of academic papers and data.

Proposed Solution:
An AI Research Agent using NLP and RAG that searches, summarizes, and organizes academic content, recommends papers, and identifies research gaps using IBM Granite model.

TECHNOLOGY USED

- **IBM cloud lite services**

  A free-tier offering of IBM Cloud that allows users to build and deploy lightweight applications with limited resources.

- **Natural Language Processing (NLP)**

  A branch of AI that enables machines to understand, interpret, and respond to human language.

- **Retrieval Augmented Generation (RAG)**

  A technique that enhances AI responses by retrieving relevant information from a knowledge base before generating an answer.

- **IBM Granite model**

  A powerful foundation model from IBM trained on diverse data to perform a variety of language understanding and generation tasks.

- **Vector Indexing for RAG**

  A method of storing and searching document embeddings efficiently to enable fast and relevant information retrieval in RAG systems.

IBM CLOUD SERVICES USED

- **IBM Cloud Watsonx AI Studio**

  A collaborative environment in IBM Cloud for building, training, and deploying AI models using foundation models like Granite.

- **IBM Cloud Watsonx.AI runtime**

  A managed runtime on IBM Cloud that hosts and executes foundation models with scalability and security.

- **IBM Cloud Agent Lab**

  An interactive lab interface within Watsonx for developing, testing, and refining AI agents using Granite and custom logic.

- **IBM Granite foundation model**

  IBM’s large-scale, enterprise-grade language model designed for diverse generative AI tasks such as summarization, Q&A, and content generation.

- **IBM Cloud Object Storage**

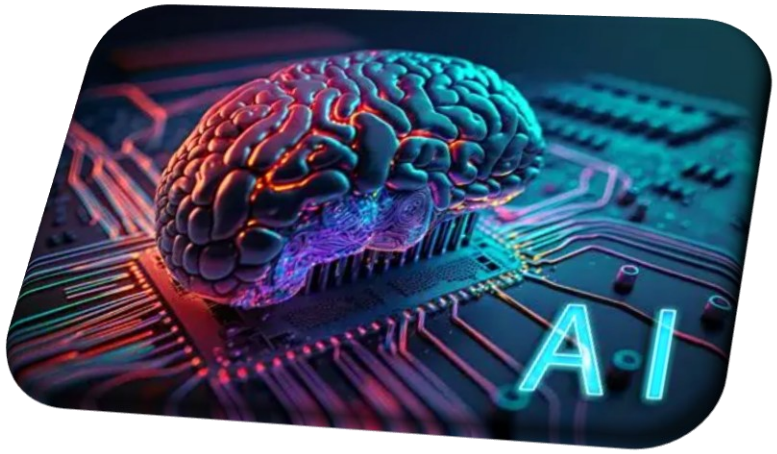
  A scalable, durable cloud storage service for storing and accessing unstructured data like documents, vectors, and models.

WOW FACTORS

This AI-powered agent transforms how researchers interact with scholarly information. It significantly reduces the time spent on literature reviews, improves the quality of research insights by leveraging contextual understanding, and assists early-stage researchers in finding a clear research direction. By making large volumes of academic knowledge more accessible and actionable, it also encourages interdisciplinary collaboration and knowledge reuse across fields.

Unique features:

- Semantic search across research papers, journals, and datasets.
- Auto-summarization of selected papers.
- Citation and reference analysis to trace influence.
- Paper recommendations based on current queries.
- Collaboration mapping for co-authors or instructions.



END USERS

- **Academic Researchers**

  Accelerates the discovery of relevant literature and supports hypothesis generation.

- **Research Institutions and Universities**

  Enhances research quality and collaboration through intelligent automation.

- **Industry R&D Teams**

  Speeds up innovation cycles by surfacing cutting-edge findings and trends.

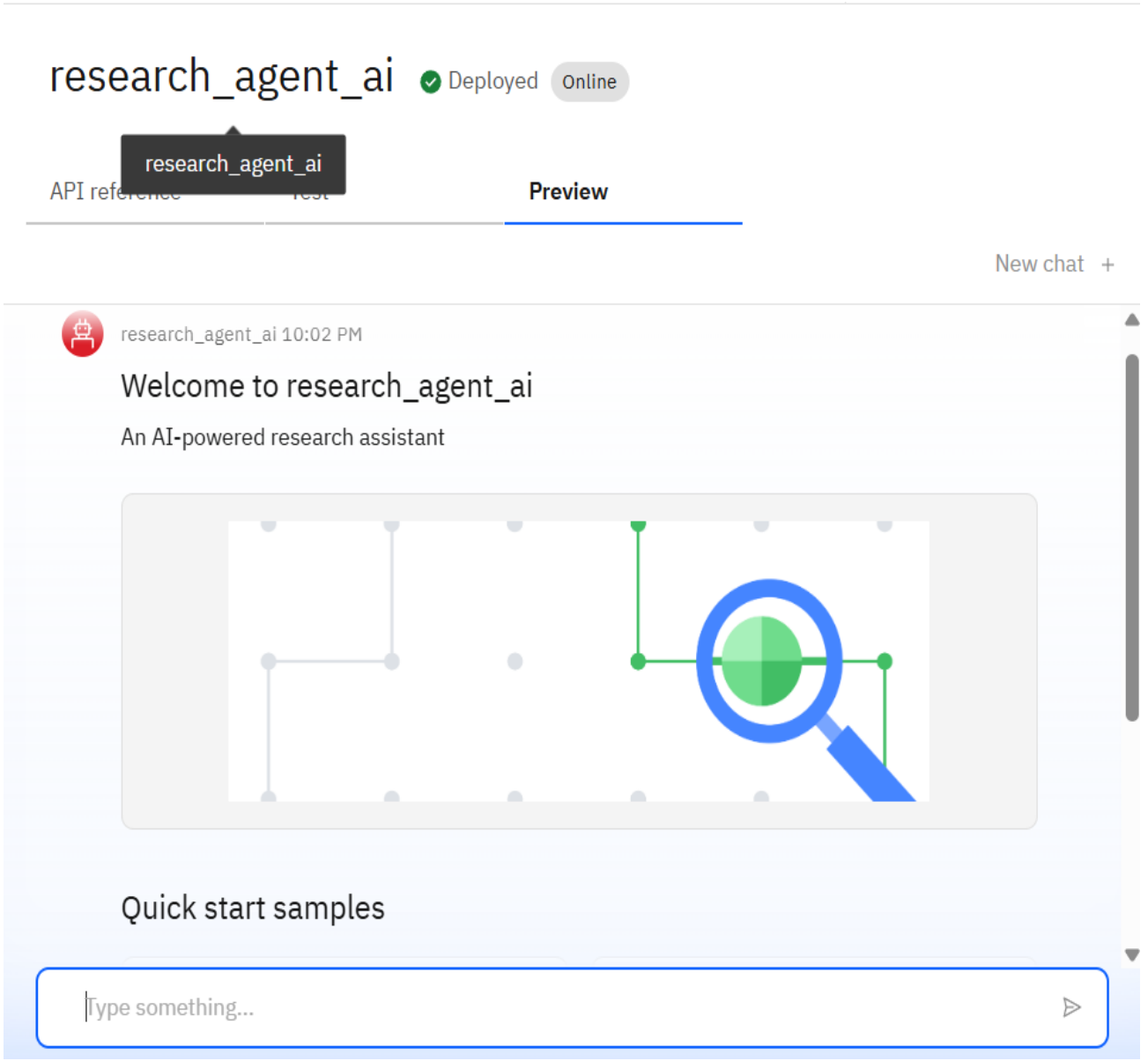
- **Educators**

  Aids in curating and summarizing academic content for effective teaching and course design.

RESULTS

Successfully deployed an interactive AI agent

Accepts user questions and returns research summaries



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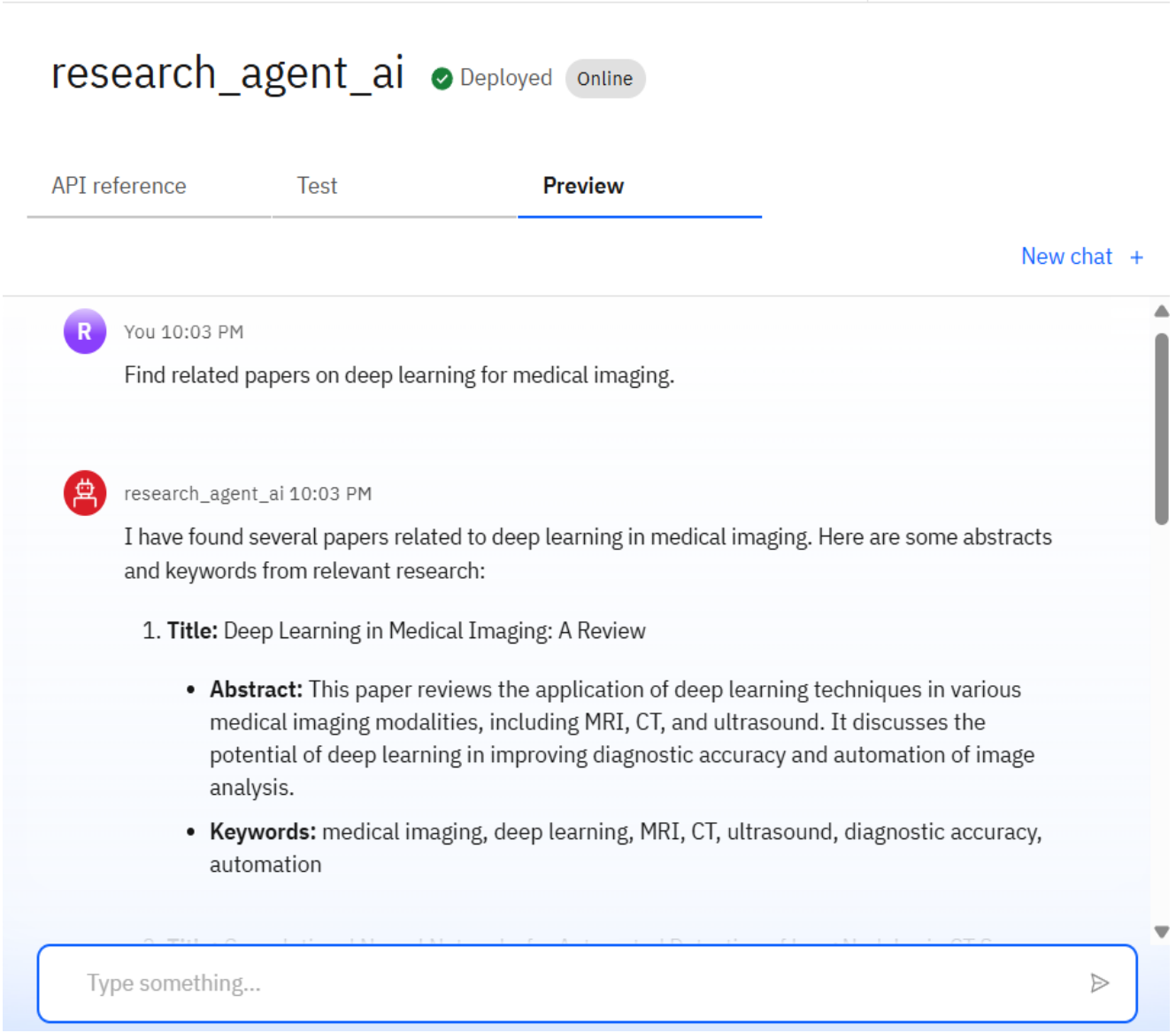
RESULTS

Extracts answers from uploaded vector index

Integrated with IBM Granite model for reliable NLP generation

Performance tested in IBM Watsonx runtime



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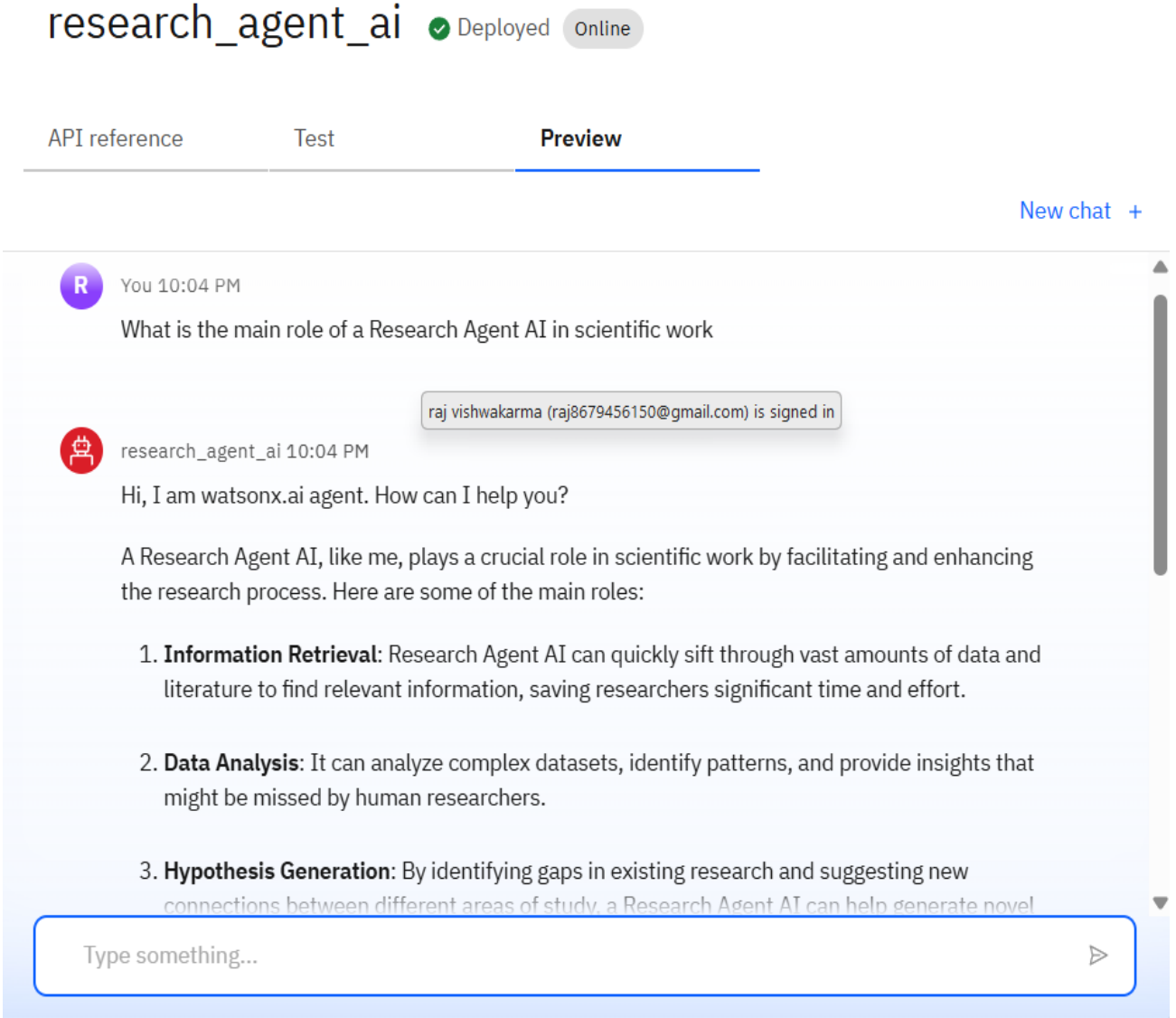
RESULTS

This screenshot displays a live interaction with the Research Agent AI, deployed on IBM Watsonx.ai using the Granite foundation model. When asked *"What is the main role of a Research Agent AI in scientific work?"*, the agent responds intelligently, showcasing its core capabilities:

- **Information Retrieval** – Quickly finding relevant literature.
- **Data Analysis** – Identifying patterns and insights.
- **Hypothesis Generation** – Suggesting new research directions.



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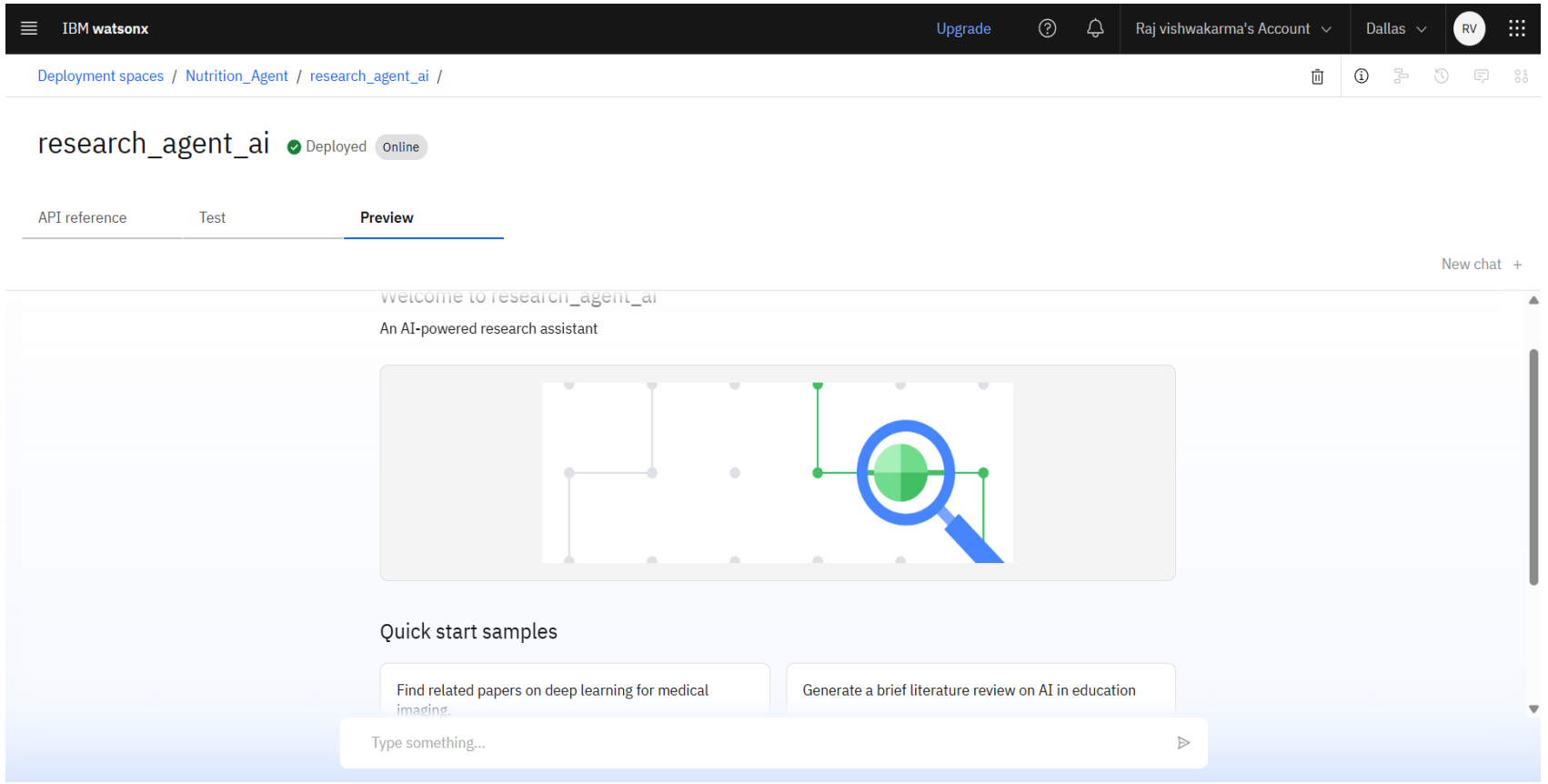
RESULTS

Deployed AI Agent



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CONCLUSION

- Streamlines literature review by quickly retrieving and summarizing relevant academic content.
- Automates citation and reference management, reducing manual effort.
- Boosts research productivity for students, researchers, and R&D professionals.
- Leverages IBM Granite for accurate, real-time understanding of complex queries.

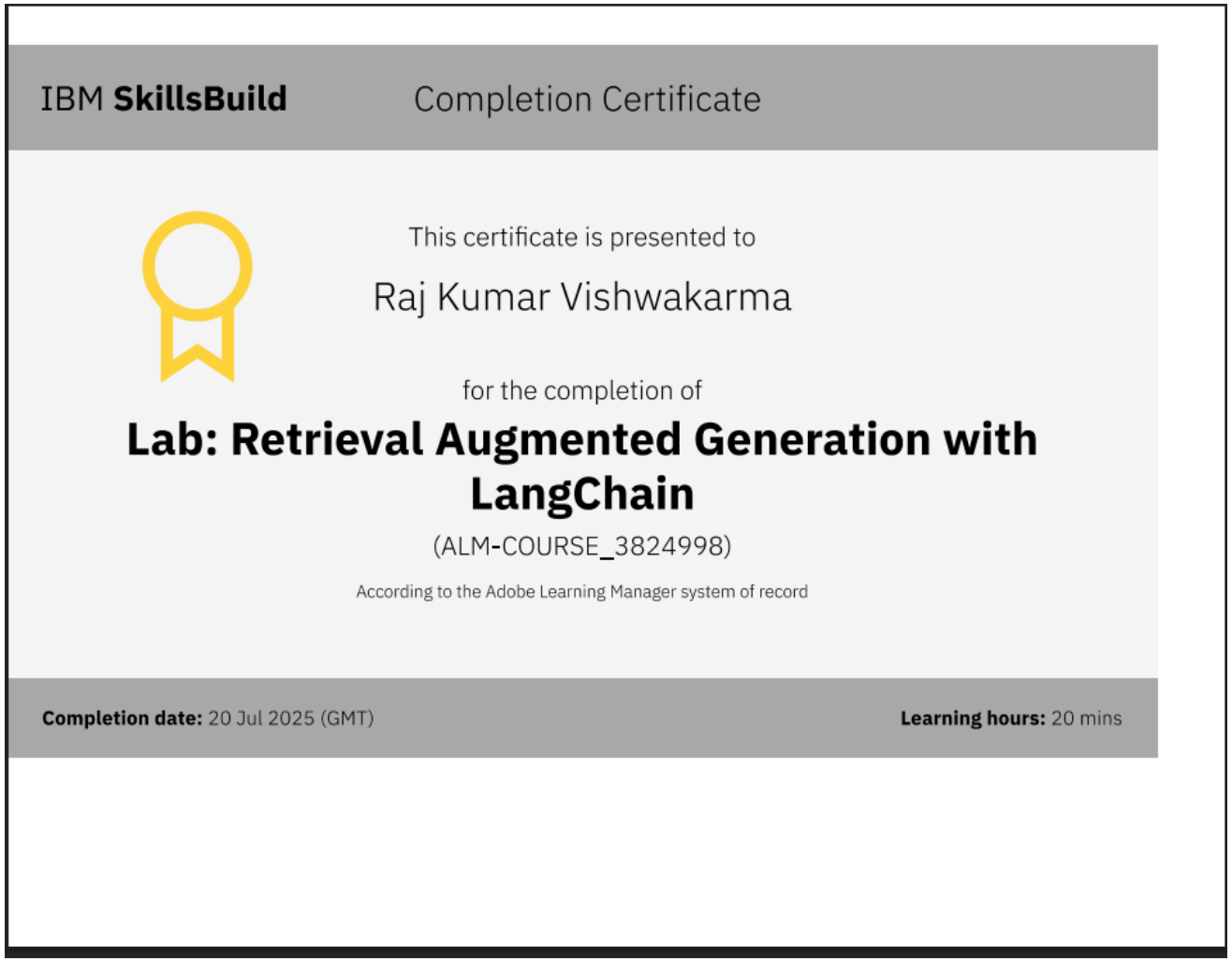
FUTURE SCOPE

- Multilingual Research Support
- Voice-Activated Research Assistant
- Real-Time Collaboration Features
- Research Gap and Novel Topic Identification
- Integration with Publishing Platforms
- Novel Topic Identification
- Auto Drafting Research Papers

IBM CERTIFICATIONS

- Screenshot/ credly certificate(getting started with AI)

RAG LAB certificate



IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Raj Kumar Vishwakarma

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 20 Jul 2025 (GMT) **Learning hours:** 20 mins

Git hub link : https://https://github.com/rajvishwakarma90/Research-Agent--Ai

THANK YOU

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