CAPSTONE PROJECT

RESEARCH AGENT

Presented By:

1. Student name :- Ranjan Raj
2. College name :- Jharkhand Rai University / Computer Science & Engineering.

edunet foundation

OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT

- In academic and industrial research, a significant amount of time is spent manually searching for literature, reading and summarizing papers, managing citations, and drafting content. These repetitive tasks not only slow down the research process but also increase the likelihood of human error and oversight. Researchers often face challenges in accessing relevant information quickly and organizing it efficiently. There is a growing need for an intelligent, automated system that can streamline these activities and enhance productivity and accuracy in research workflows.

PROPOSED SOLUTION

- The proposed solution is an AI-powered Research Agent that automates key research tasks using IBM Cloud Lite and IBM Granite. This system leverages natural language processing to:
- Search and retrieve relevant academic literature
- Summarize research papers into concise insights
- Manage and format references and citations
- Draft sections of research reports or papers
- Extract data and suggest research hypotheses
- By automating these processes, the Research Agent reduces manual effort, enhances accuracy, and improves overall research efficiency for both students and professionals.

SYSTEM APPROACH

Hardware Requirements

- **Minimum (for development or testing):**

Processor: Intel i5 or AMD Ryzen 5 (4-core)
RAM: 8 GB
Storage: 256 GB SSD
Internet: Stable connection (for accessing IBM Cloud, APIs, research databases)

- **Recommended (for smoother AI processing or deployment):**

Processor: Intel i7/Ryzen 7 or higher
RAM: 16 GB or more
Storage: 512 GB SSD or more
GPU: NVIDIA GPU (e.g., GTX 1660 or better) if doing local inference with models
Cloud Access: IBM Cloud Lite account for deployment and APIs

SYSTEM APPROACH

Software Requirements

- **Operating System:**

Windows 10/11, macOS, or Linux (Ubuntu recommended)

- **Programming Languages:**

Python 3.8+ (primary backend language)

Cloud Services (IBM):

IBM Cloud Lite Account (for deployment)

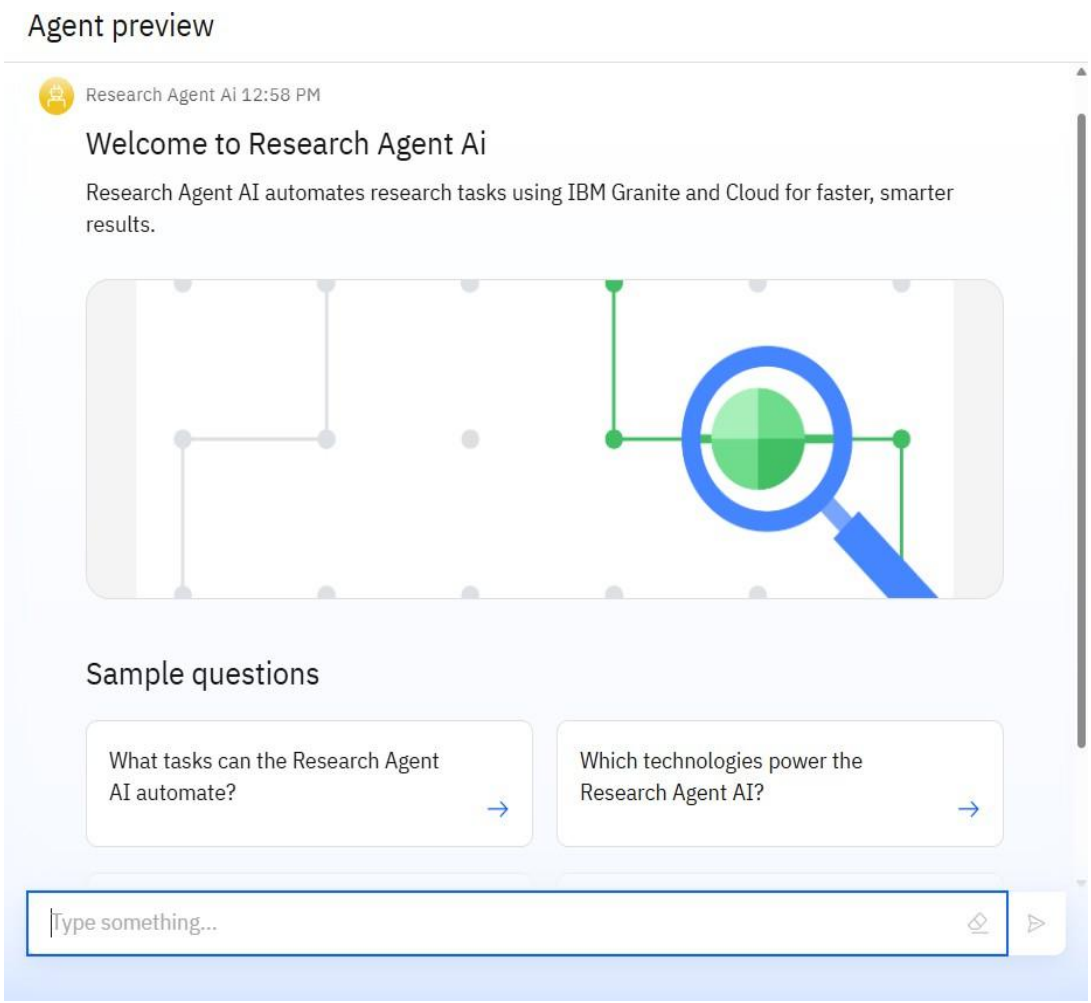
IBM Granite Model Access (via API or embedded runtime)

Optional: IBM Watson NLP tools, Watson Discovery

RESULT

Successfully deployed an interactive AI agent

Accepts user questions and returns research summaries



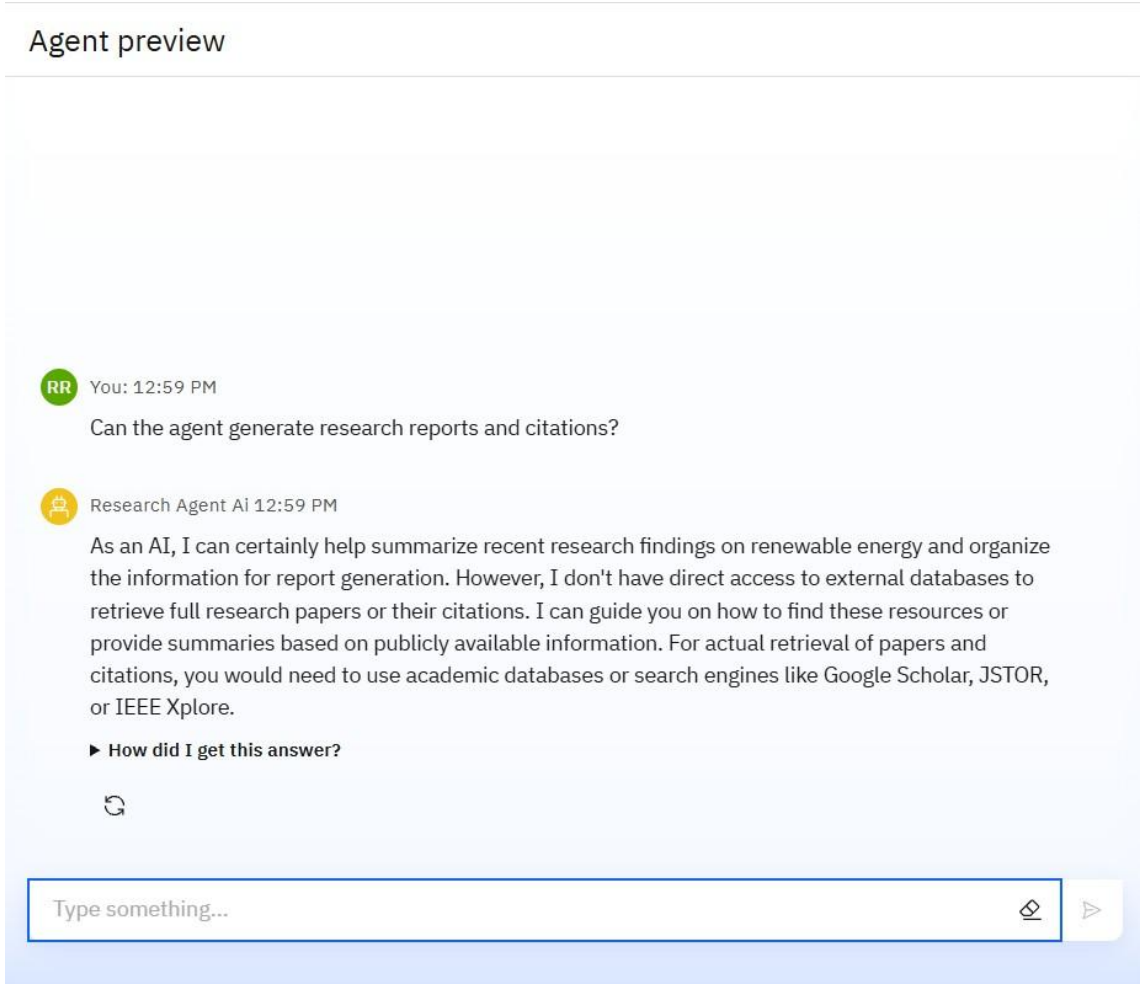
edunet foundation

RESULT

Extracts answers from uploaded vector index

Integrated with IBM Granite model for reliable NLP generation

Performance tested in IBM Watsonx runtime.

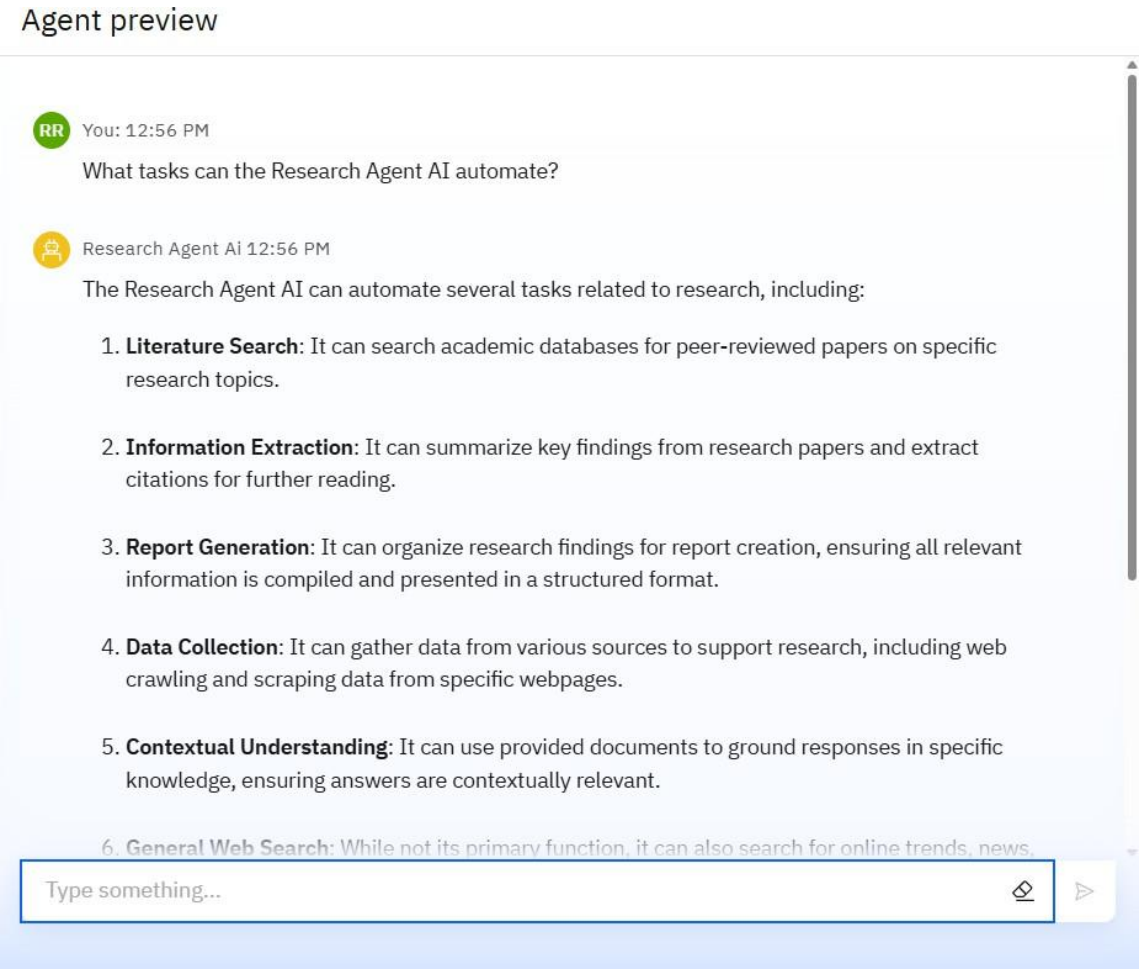


edunet foundation

RESULT

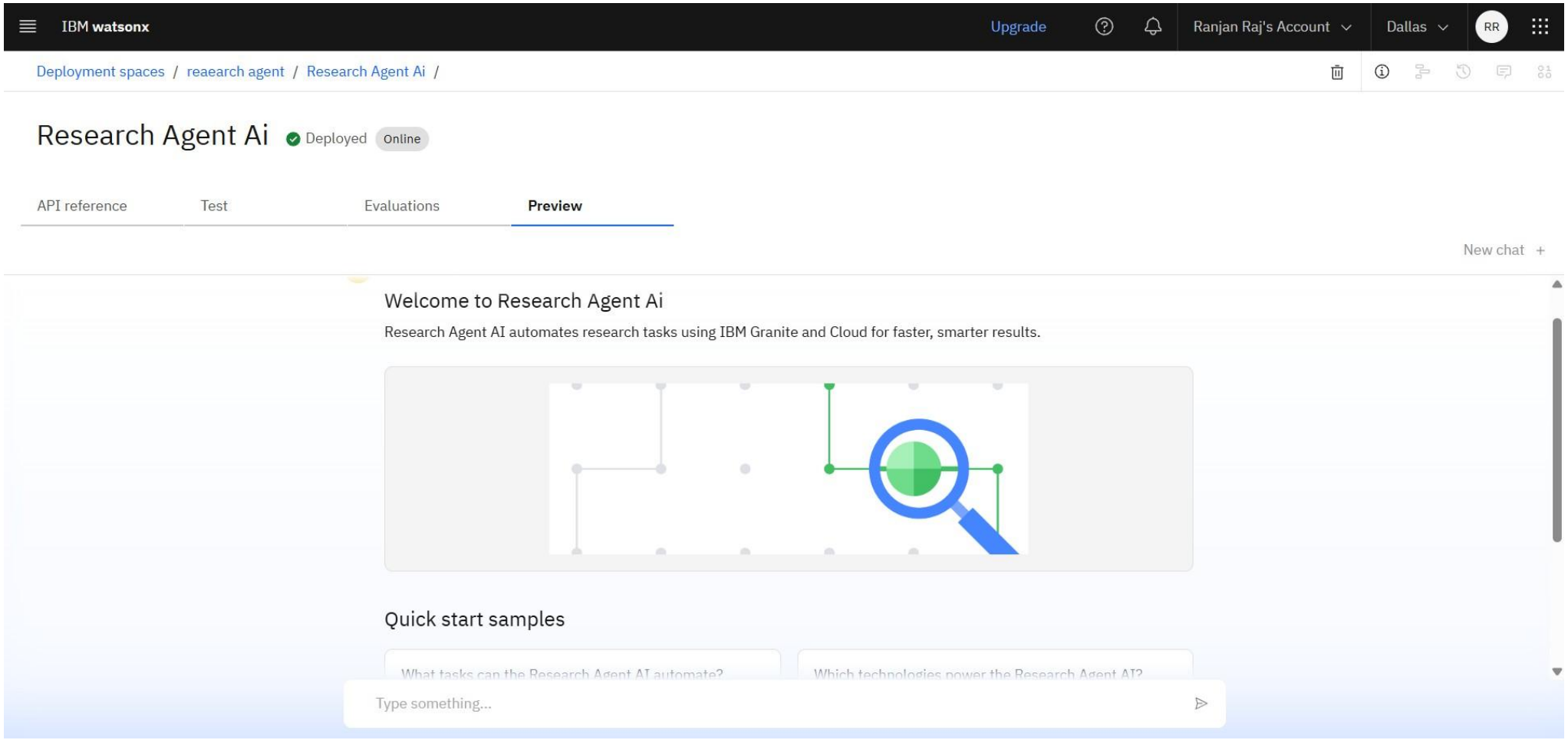
This screenshot displays a live interaction with the Research Agent AI, deployed on IBM Watsonx.ai using the Granite foundation model. When asked *"What is the main role of a Research Agent AI in scientific work?"*, the agent responds intelligently, showcasing its core capabilities.

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



RESULT

Deployed AI Agent



edunet foundation

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.

edunet
foundation

FUTURE SCOPE

- **Multilingual Support:**
  Enable research in regional and global languages for wider accessibility.
- **Voice-Based Interaction:**
  Integrate voice commands for hands-free research assistance.
- **Integration with Research Tools:**
  Support LaTeX, Microsoft Word, Google Scholar, and reference managers like Mendeley or Zotero.
- **Advanced Hypothesis Generation:**
  Use deeper AI models to suggest novel research ideas based on existing data.
- **Real-Time Collaboration:**
  Enable multiple users (students/researchers) to work on shared research projects via cloud.
- **Mobile & Web Accessibility:**
  Build a responsive web/mobile app for anytime, anywhere access.

REFERENCES

- IBM Granite – Foundation Model Documentation

(https://www.ibm.com/products/granite)

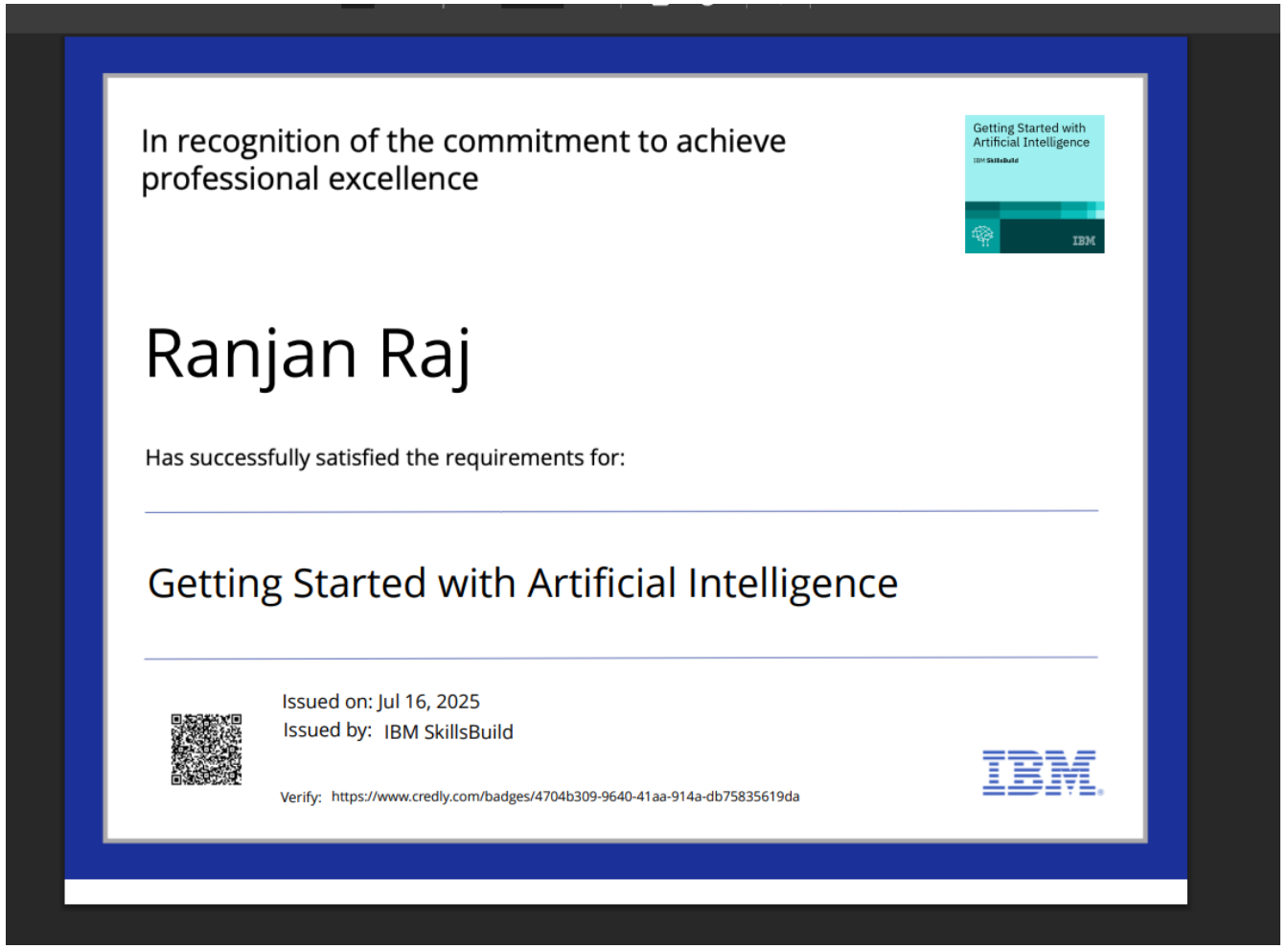
- IBM Cloud Lite – Cloud Services Overview

(https://www.ibm.com/cloud/lite)

- Research Paper: “Applications of NLP in Scientific Research Automation” – arXiv.org
- SpaCy NLP Library Documentation

(https://spacy.io/)

IBM CERTIFICATIONS



In recognition of the commitment to achieve professional excellence

Getting Started with Artificial Intelligence
IBM SkillsBuild
IBM

Ranjan Raj

Has successfully satisfied the requirements for:

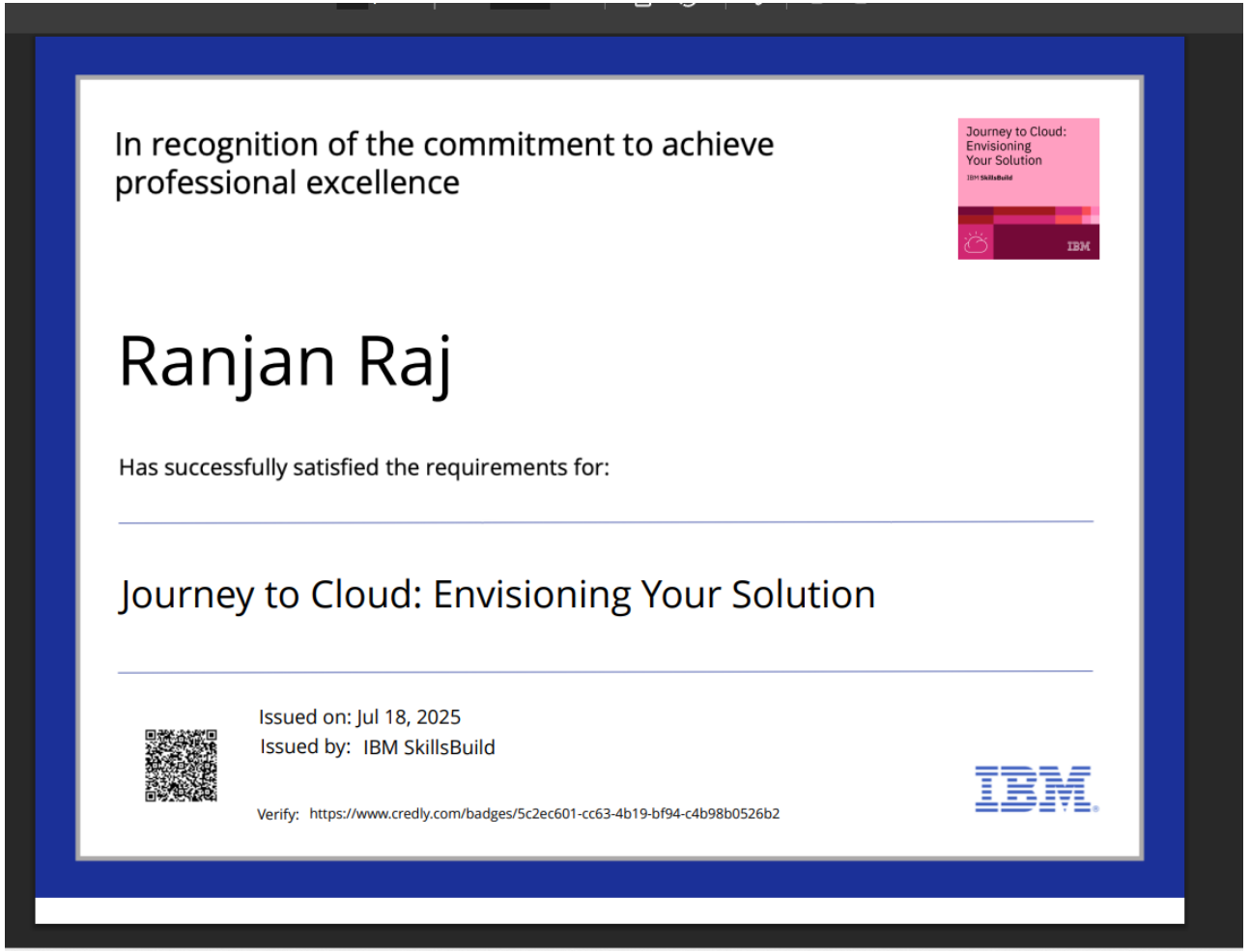
Getting Started with Artificial Intelligence

Issued on: Jul 16, 2025
Issued by: IBM SkillsBuild

Verify: https://www.credly.com/badges/4704b309-9640-41aa-914a-db75835619da

IBM

IBM CERTIFICATIONS



In recognition of the commitment to achieve professional excellence

Journey to Cloud: Envisioning Your Solution
IBM SkillsBuild

Ranjan Raj

Has successfully satisfied the requirements for:

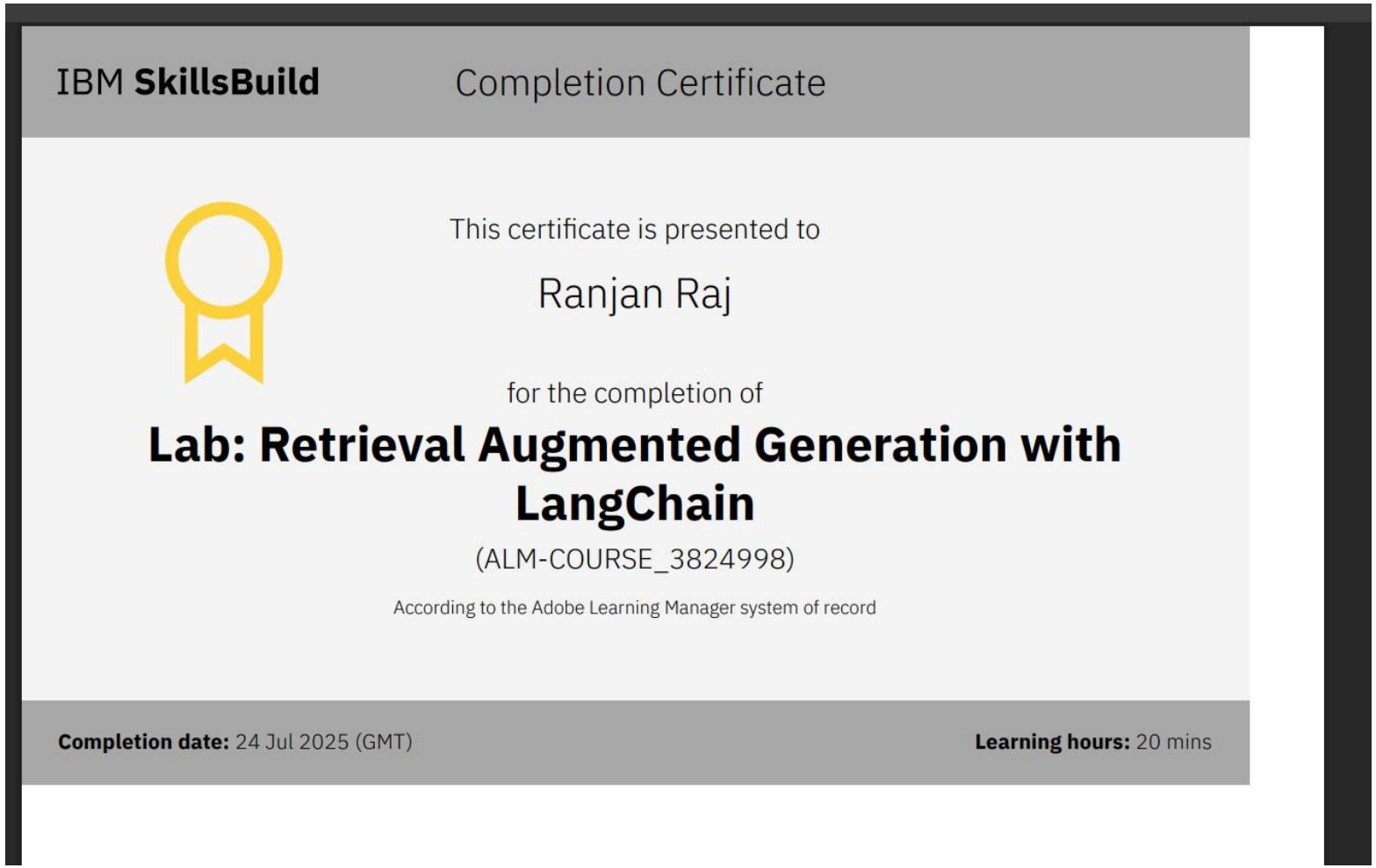
Journey to Cloud: Envisioning Your Solution

Issued on: Jul 18, 2025
Issued by: IBM SkillsBuild

Verify: https://www.credly.com/badges/5c2ec601-cc63-4b19-bf94-c4b98b0526b2

IBM

IBM CERTIFICATIONS



IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Ranjan Raj

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

edunet foundation