
CAPSTONE PROJECT

RESEARCH AGENT

Presented By:

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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)

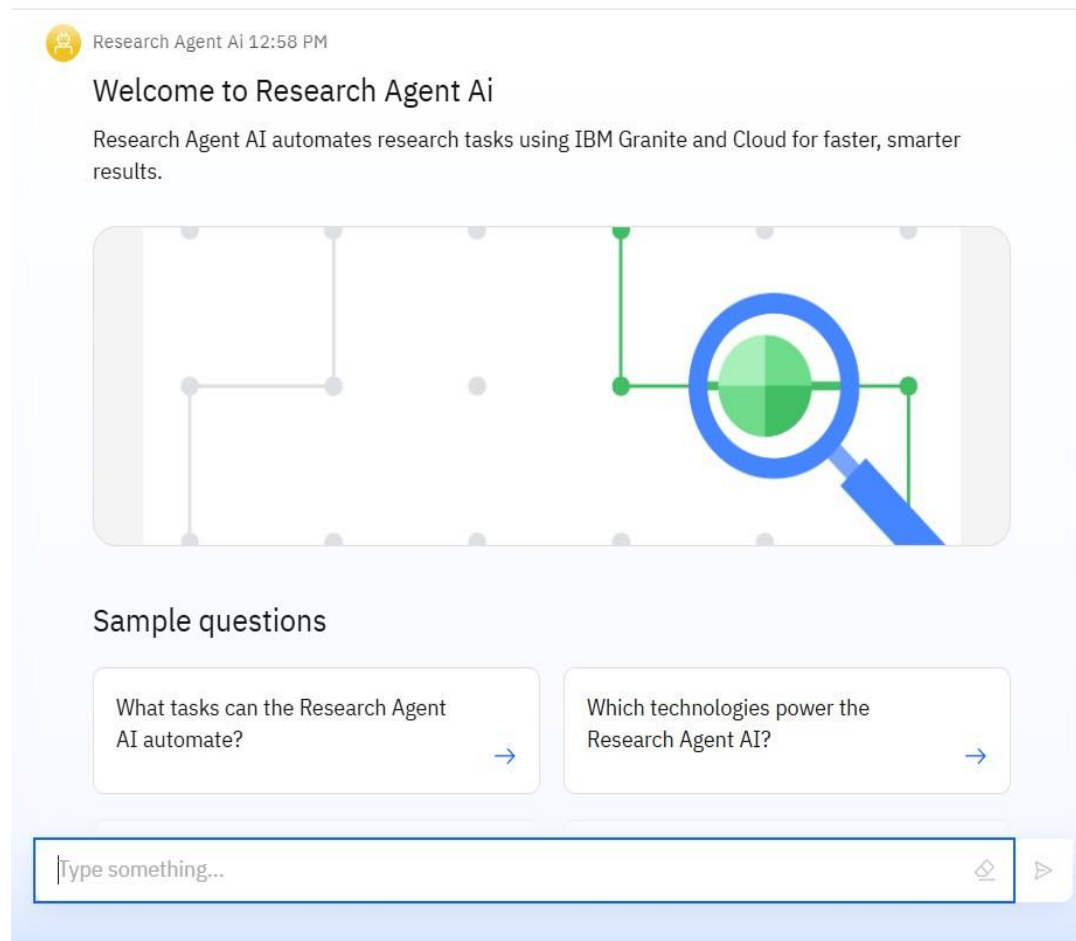
Optional: IBM Watson NLP tools, Watson Discovery

RESULT

Successfully deployed an interactive AI agent

Accepts user questions and returns research summaries

Agent preview



RESULT

Extracts answers from uploaded vector index

Integrated with IBM Granite model for reliable NLP generation

Performance tested in IBM Watsonx runtime.

Agent preview

 You: 12:59 PM

Can the agent generate research reports and citations?

 Research Agent Ai 12:59 PM

As an AI, I can certainly help summarize recent research findings on renewable energy and organize the information for report generation. However, I don't have direct access to external databases to retrieve full research papers or their citations. I can guide you on how to find these resources or provide summaries based on publicly available information. For actual retrieval of papers and citations, you would need to use academic databases or search engines like Google Scholar, JSTOR, or IEEE Xplore.

► How did I get this answer?



Type something...

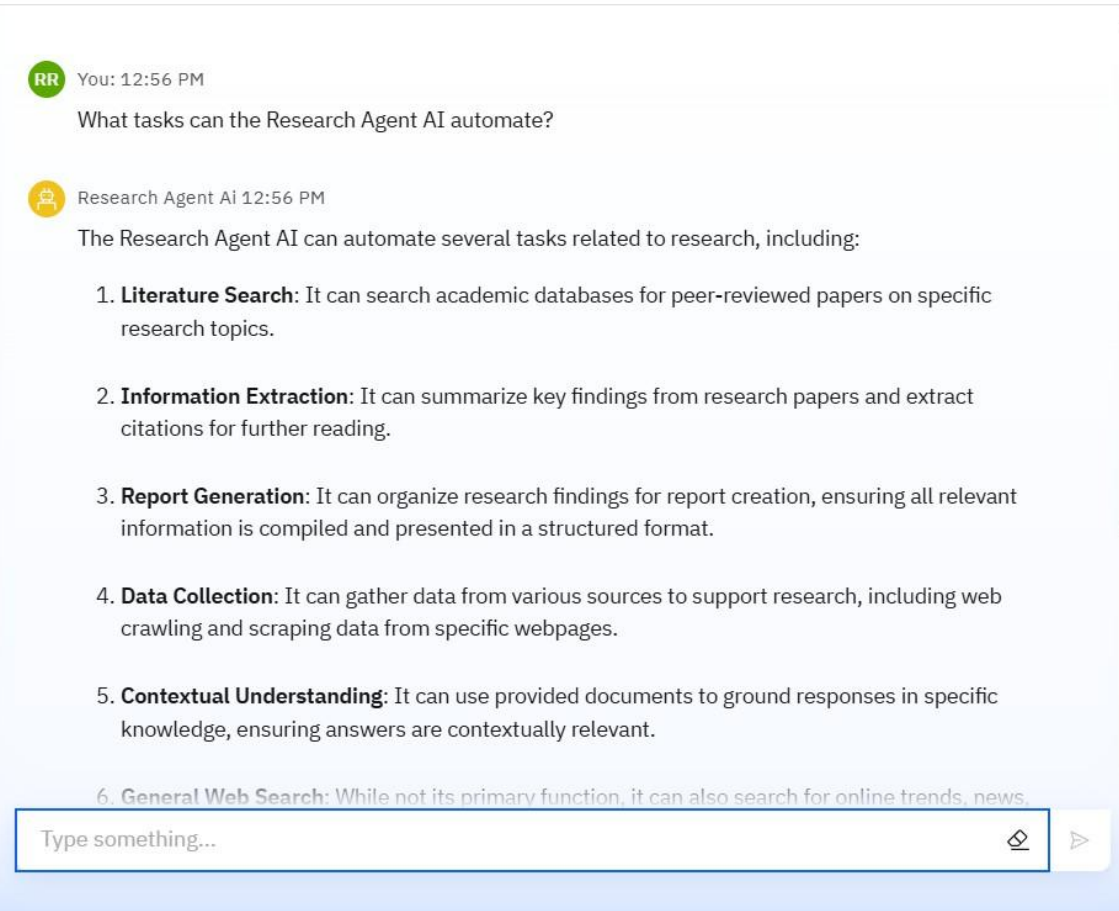


RESULT

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.

Agent preview



The screenshot shows a chat window titled "Agent preview". It contains a conversation between a user and the Research Agent AI. The user's message is "What tasks can the Research Agent AI automate?". The AI's response is a list of six tasks it can automate, each with a brief description. The tasks are: 1. Literature Search, 2. Information Extraction, 3. Report Generation, 4. Data Collection, 5. Contextual Understanding, and 6. General Web Search. At the bottom of the chat window, there is a text input field with the placeholder "Type something..." and a send button.

You: 12:56 PM
What tasks can the Research Agent AI automate?

Research Agent AI: 12:56 PM
The Research Agent AI can automate several tasks related to research, including:

- Literature Search:** It can search academic databases for peer-reviewed papers on specific research topics.
- Information Extraction:** It can summarize key findings from research papers and extract citations for further reading.
- Report Generation:** It can organize research findings for report creation, ensuring all relevant information is compiled and presented in a structured format.
- Data Collection:** It can gather data from various sources to support research, including web crawling and scraping data from specific webpages.
- Contextual Understanding:** It can use provided documents to ground responses in specific knowledge, ensuring answers are contextually relevant.
- General Web Search:** While not its primary function, it can also search for online trends, news,

Type something...

RESULT

Deployed AI Agent

IBM watsonx

Upgrade

?

Ranjan Raj's Account

Dallas

RR

Deployment spaces / reearch agent / Research Agent Ai /

Research Agent Ai

✓ Deployed

Online

API reference

Test

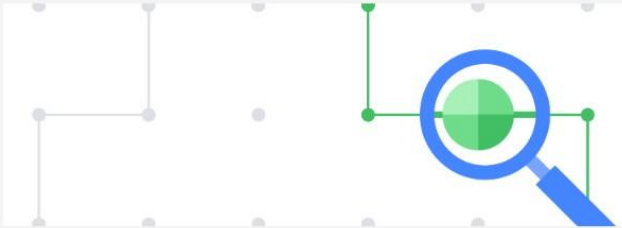
Evaluations

Preview

New chat +

Welcome to Research Agent Ai

Research Agent AI automates research tasks using IBM Granite and Cloud for faster, smarter results.



Quick start samples

What tasks can the Research Agent AI automate?

Which technologies power the Research Agent AI?

Type something...

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 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

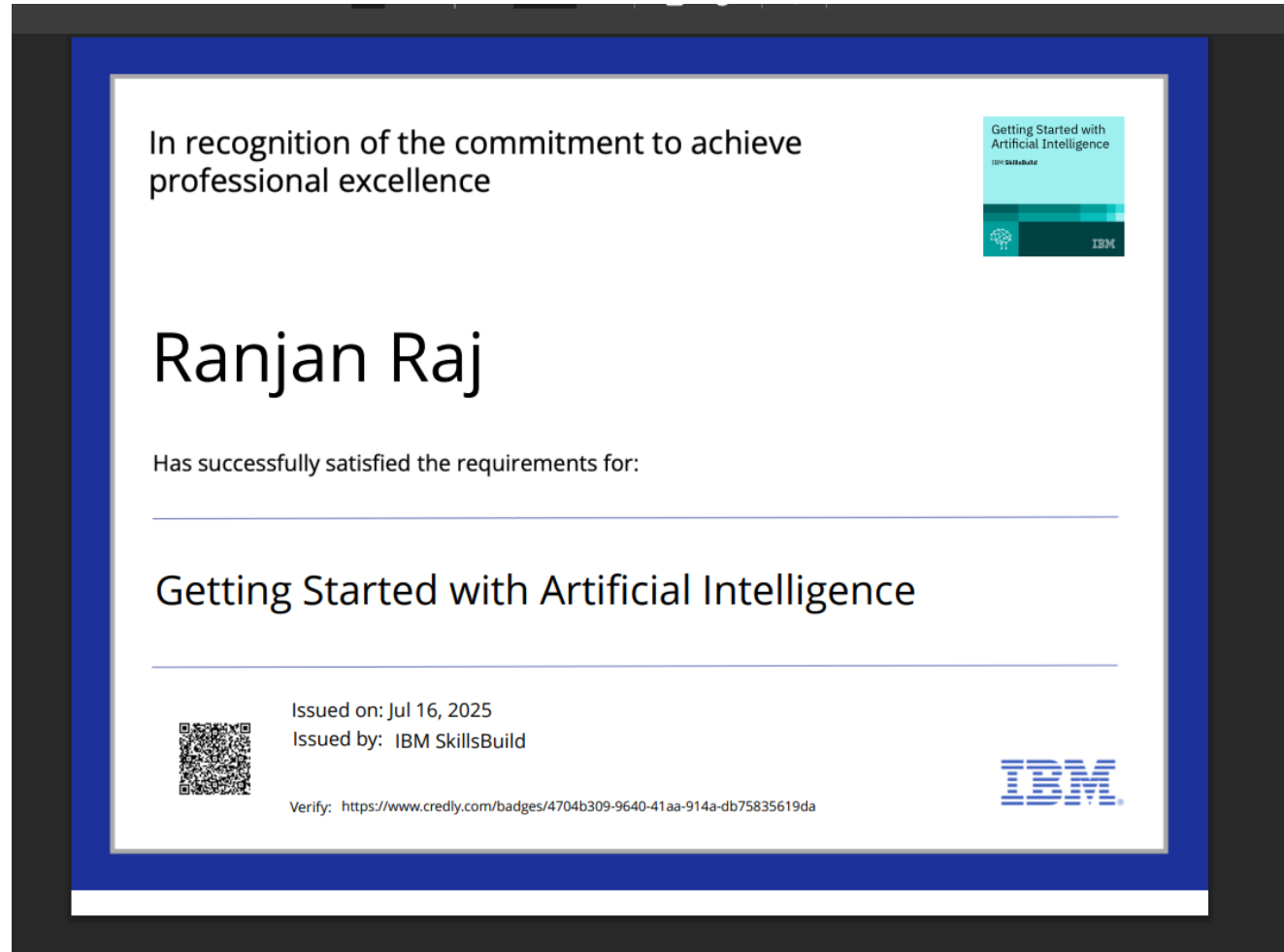
(<https://www.ibm.com/cloud/lite>)

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

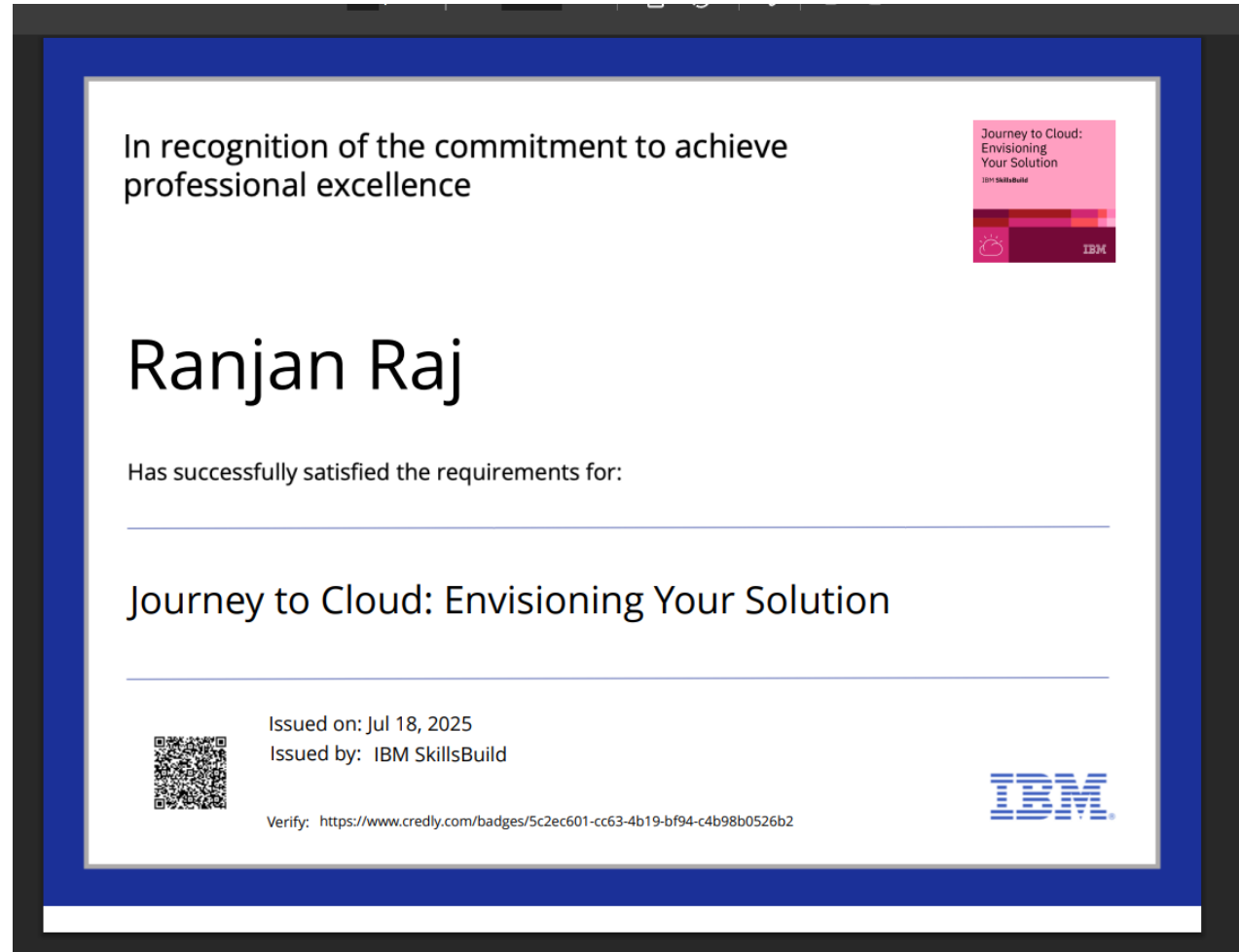
- SpaCy NLP Library Documentation

(<https://spacy.io/>)

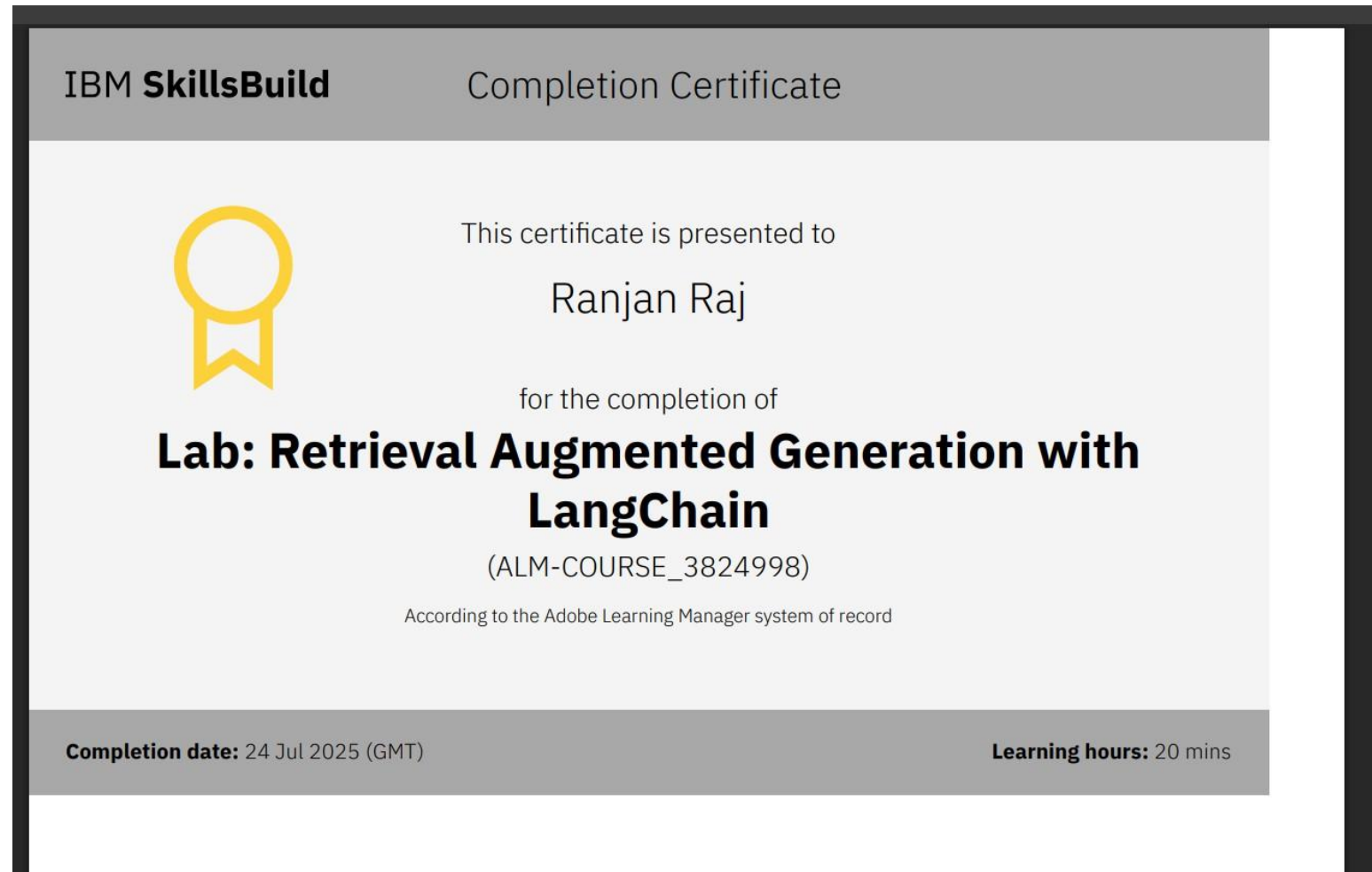
IBM CERTIFICATIONS



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THANK YOU