IBM PROJECT

PAPERPILOT - RESEARCH AI AGENT

AI-Powered Research Assistant

Using IBM Cloud Lite & IBM Granite Foundation Model

Presented By : **Amit Kumar Thakur**

College Name : **Vishveshwarya Group Of Institution**

Department ::**Bachelor of Technology (B.TECH)**

Course: **Computer science and engineering**

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OUTLINE

- Problem Statement
- Technology used
- Wow factor
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- Result
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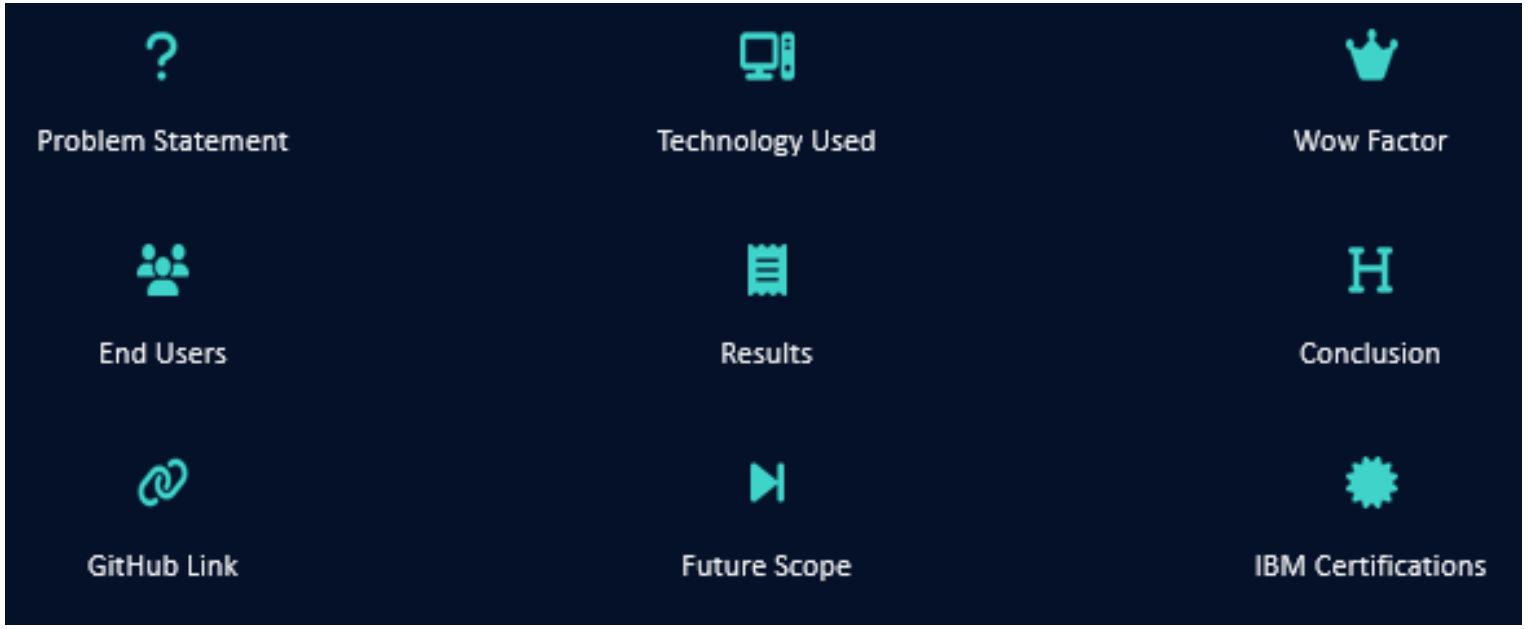
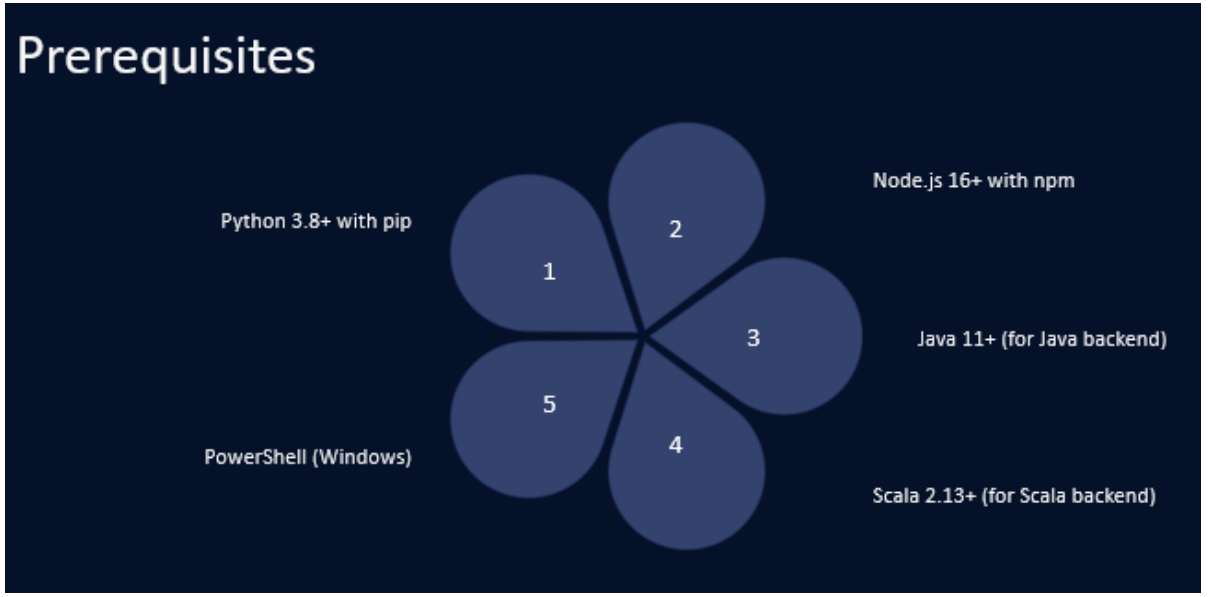
- Git-hub Link
- Future scope
- IBM Certifications





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PROBLEM STATEMENT

❓ **What's the Challenge?**

Researchers, students, and professionals often face difficulties like:

📚 Information overload when reviewing academic materials

⏳ Time-consuming manual research and literature review

🔍 Lack of centralized tools for querying across different AI services

🧠 No single intelligent assistant that understands context and evolves with user input

💡 **Our Solution**

AICademic – Watson Research Agent

An AI-powered research assistant that:

🤖 Uses IBM Granite & Watson ML for intelligent query understanding

🔄 Offers multiple backend options: Python, Node.js, Java, Scala

💬 Supports real-time chat + research modes

🎨 Has a sleek React-based UI

🔐 Provides seamless configuration and testing

🌐 Is platform-independent and mobile-friendly

TECHNOLOGY USED

IBM cloud lite services

Natural Language Processing (NLP)

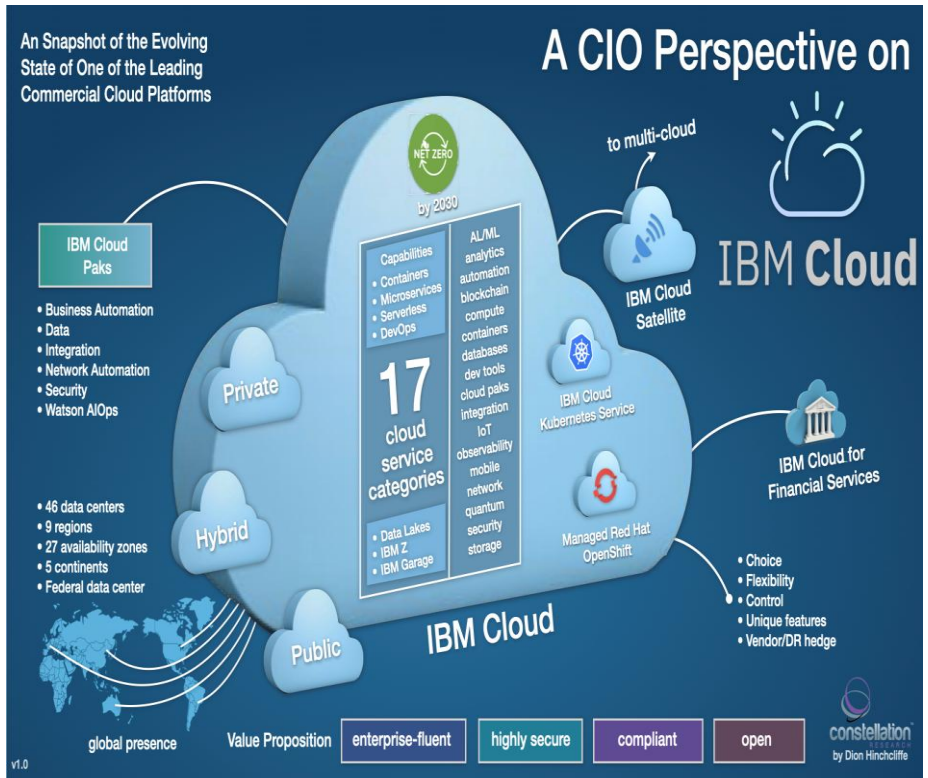
Retrieval Augmented Generation (RAG)

IBM Granite model

Feature	Benefit
Watsonx + Granite	Real-time intelligent generation
NLP + RAG	Better understanding + factual precision
Multi-Backend Support	Flexibility across Python, Node, Java, Scala
React Frontend	Sleek, fast, mobile-friendly interface

IBM CLOUD SERVICES USED

- ❑ IBM Cloud Watsonx AI Studio
- ❑ IBM Cloud Watsonx AI runtime
- ❑ IBM Cloud Agent Lab
- ❑ IBM Granite foundation model




```
ResearchAgent/
├── config.env                  # Environment variables (API keys, Watson config)
│
├── backend/                    # All backend implementations
│   ├── python_server.py        # Flask server (Python)
│   ├── node_server.js          # Express server (Node.js)
│   ├── WatsonResearchAgent.java  # Java backend
│   ├── WatsonResearchAgentScala.scala  # Scala backend
│   ├── requirements.txt        # Python dependencies
│   └── package.json            # Node.js dependencies
│
├── frontend/                   # React frontend
│   ├── public/
│   │   └── index.html
│   └── src/
│       ├── App.js              # Main UI logic
│       ├── index.js            # Entry point
│       ├── index.css           # Tailwind CSS + styling
│       └── components/         # Future component separation
│
└── scripts/                    # Dev tools and setup scripts
```

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WOW FACTORS

🔁 Multi-Backend Architecture

🐍 Python | 🟢 Node.js | ☕ Java | 🟡 Scala — One frontend, many brains

- Unique approach that supports multiple backend engines
- Flexibility for enterprise-level integration and scalability

💬 Dual Interaction Modes

Simple Q&A for quick queries + Chat Mode for conversations

- Smart chat retains history and context
- Gives a realistic research assistant feel

🌐 React Frontend + Real-time API Switching

Choose your backend in real time, test connection instantly

- Live connection
- CheckFully responsive UI (desktop + mobile)
- Clean UX with modern design system (Tailwind / Vite)

🧠 Powered by IBM Granite + RAG

Combine generation + retrieval = smarter answers

- Uses Granite Foundation Model for advanced reasoning
- Integrated Retrieval-Augmented Generation (RAG) with PDF/document knowledge
- Provides context-aware, research-grade answers

⚙️ Zero Vendor Lock-in

Can run on IBM Cloud Lite, or locally — fully open & extensible

- IBM Cloud APIs, but dev-friendly for local testing
- Configurable through .env and CLI

🚀 Bonus WOW:

- **Fully documented PowerShell scripts** to spin up each backend
- **End-to-end RESTful APIs** with health checks and custom routing
- Designed with **developer experience (DX)** in mind

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END USERS

🎓 Students

- Summarize academic papers, generate assignments, get quick topic overviews
- Perfect for research projects, thesis writing, and exam prep

👩‍🏫 Researchers & Professors

- Automate literature reviews
- Draft abstracts, related work, and research summaries
- Validate and cross-reference research findings

👨‍🔬 Data Scientists & AI Engineers

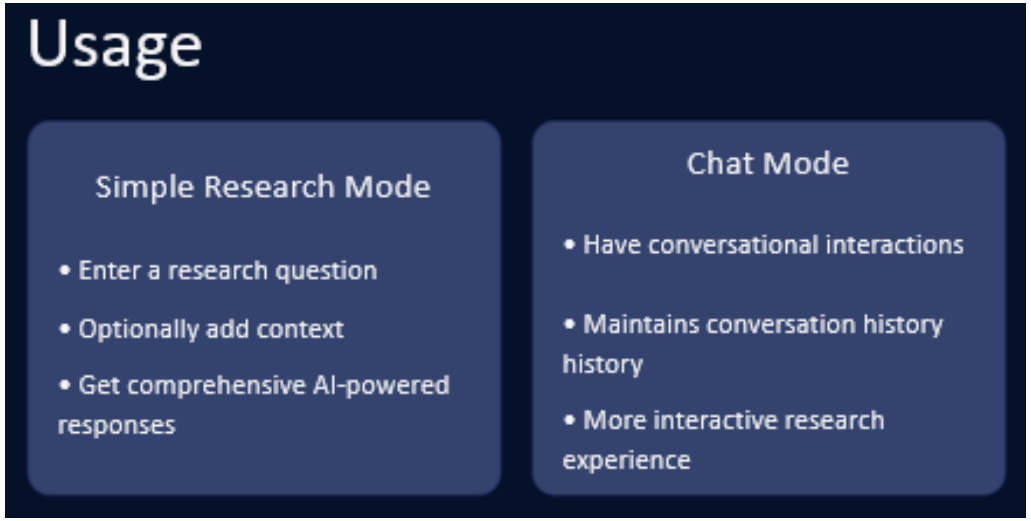
- Use as a knowledge base for AI papers, algorithms, and trends
- Explore cross-domain use cases using RAG

📚 Academic Institutions & Libraries

- Provide AI research assistant kiosks or portals
- Help students with queries on-demand
- Can be deployed across multiple departments

🧠 Content Writers & EdTech Startups

- Generate education-oriented content faster
- Integrate backend as an API for learning platforms



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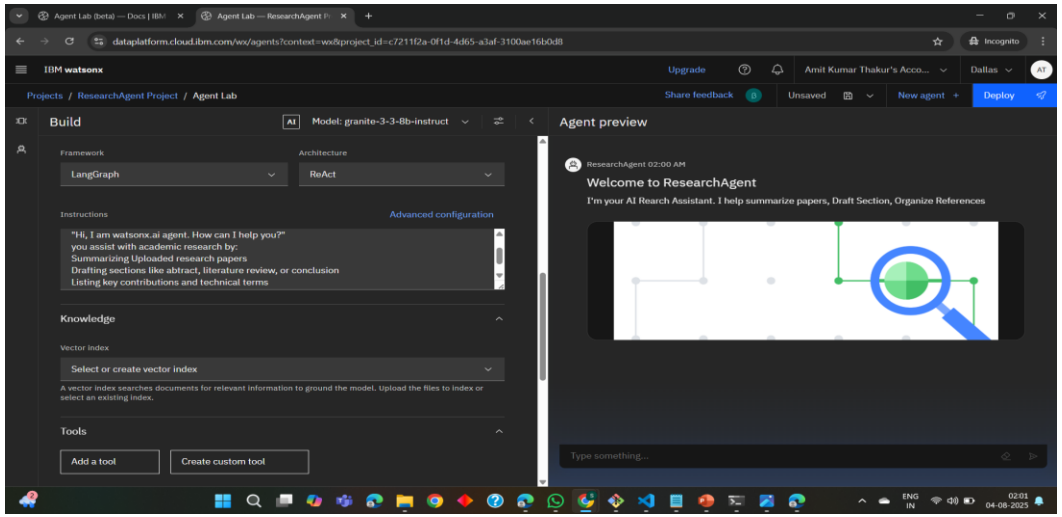
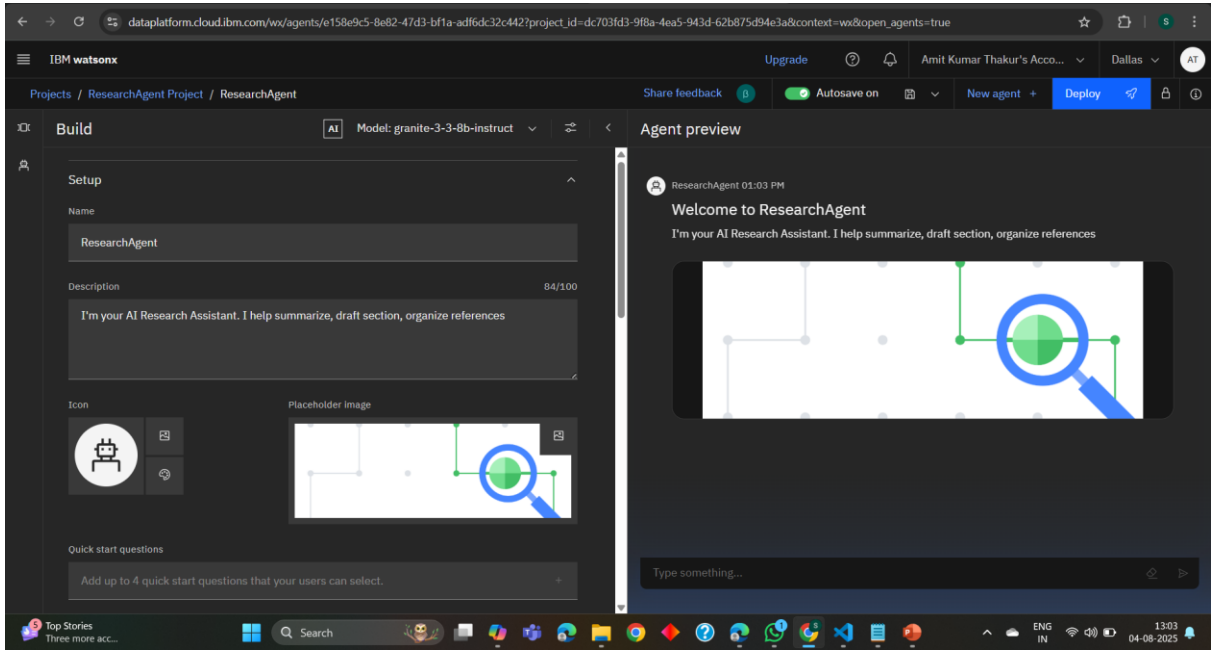
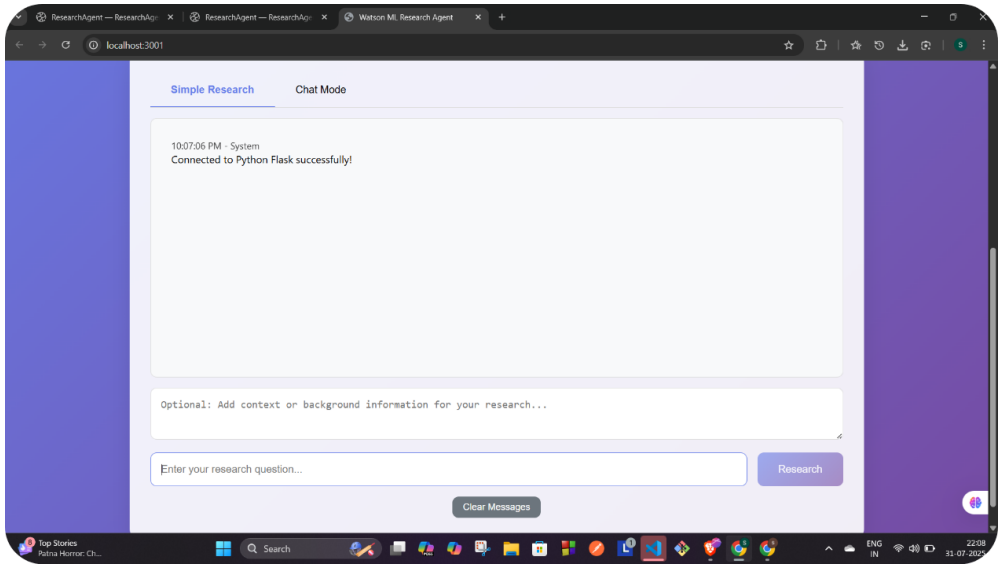
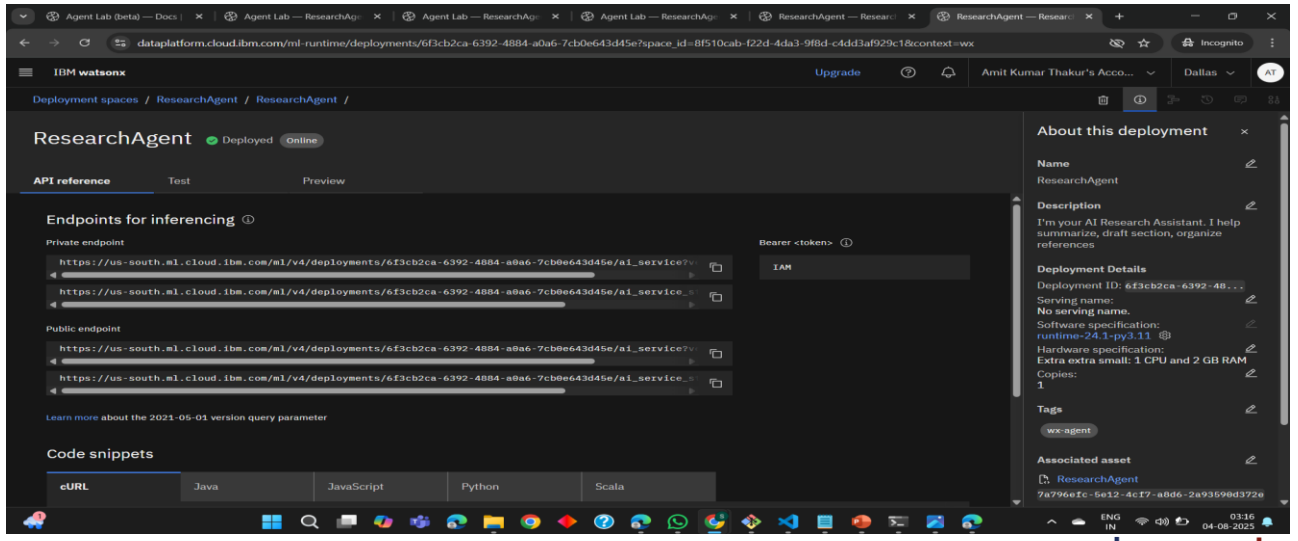
RESULTS









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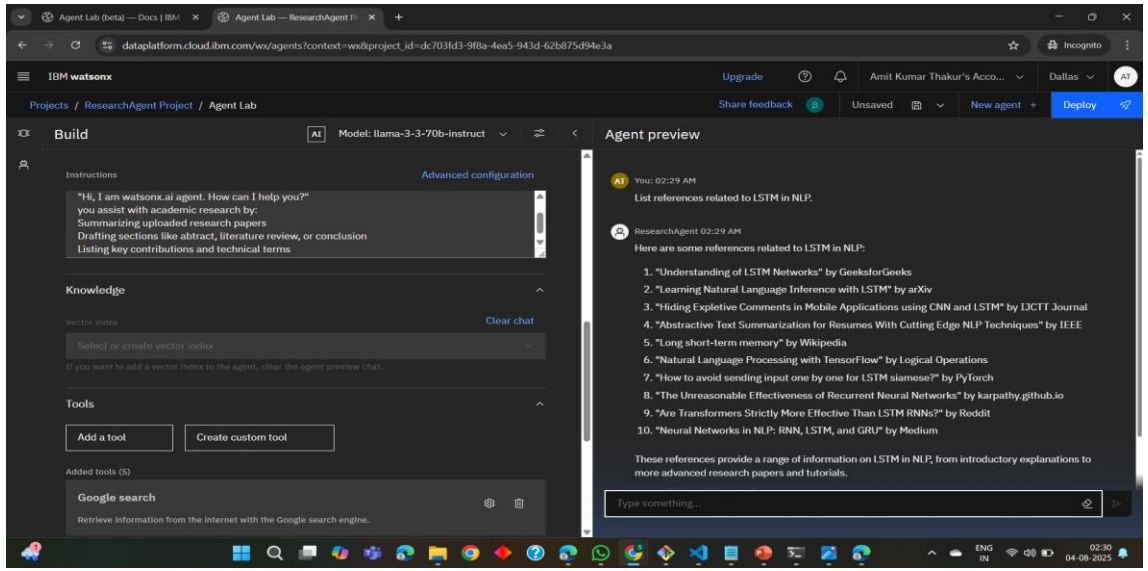
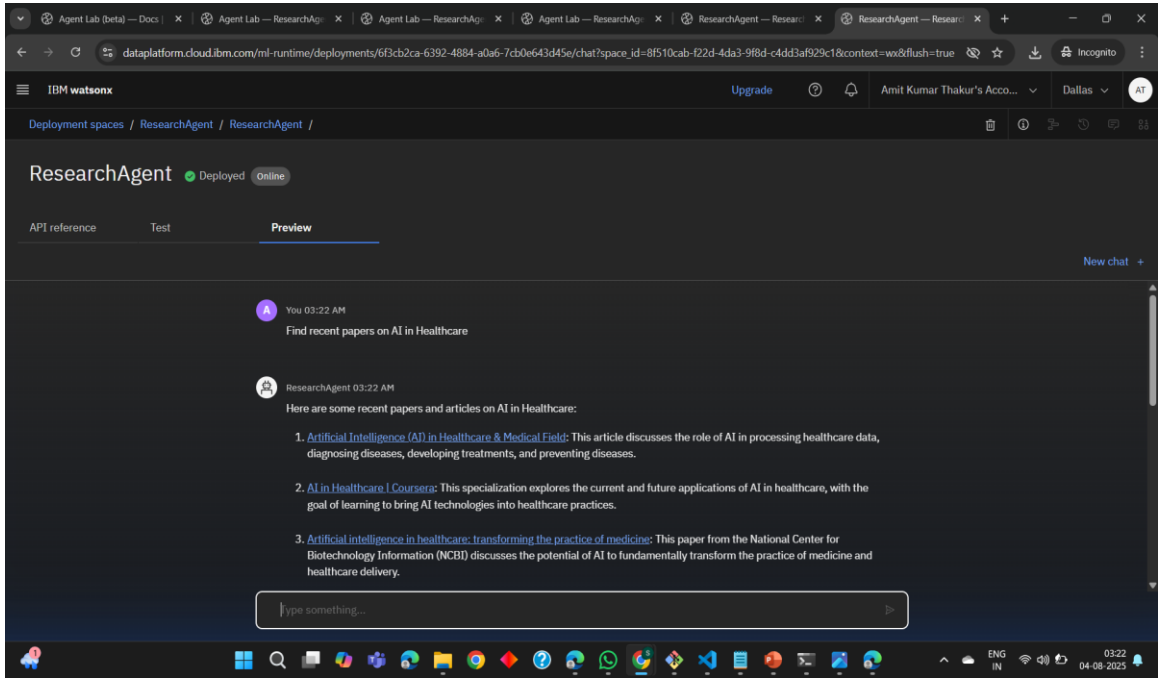
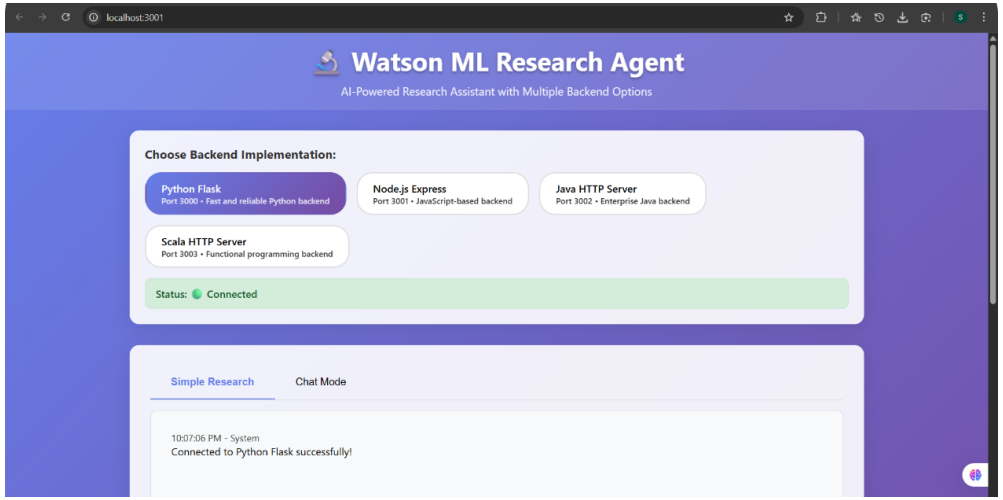
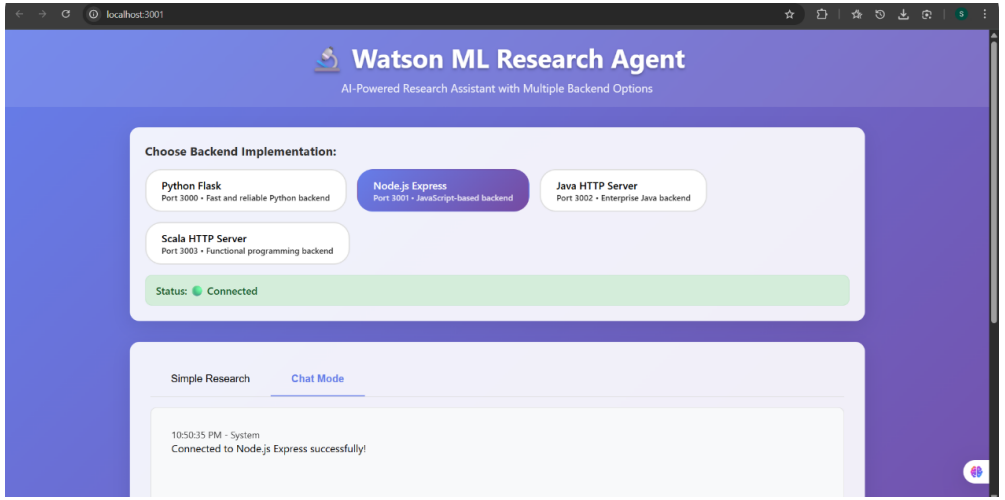
RESULTS









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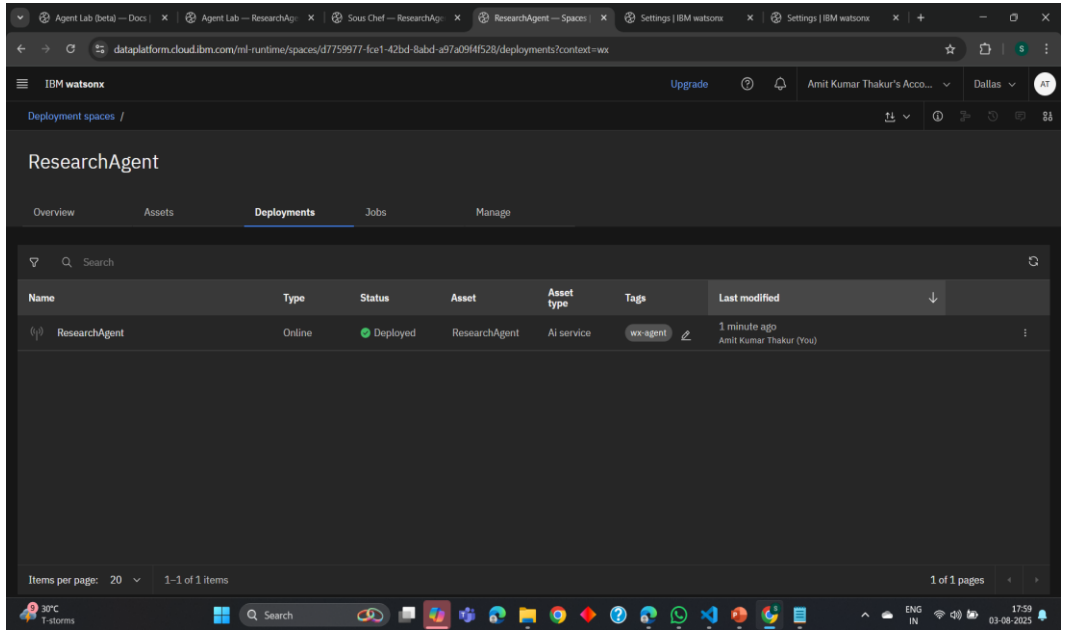
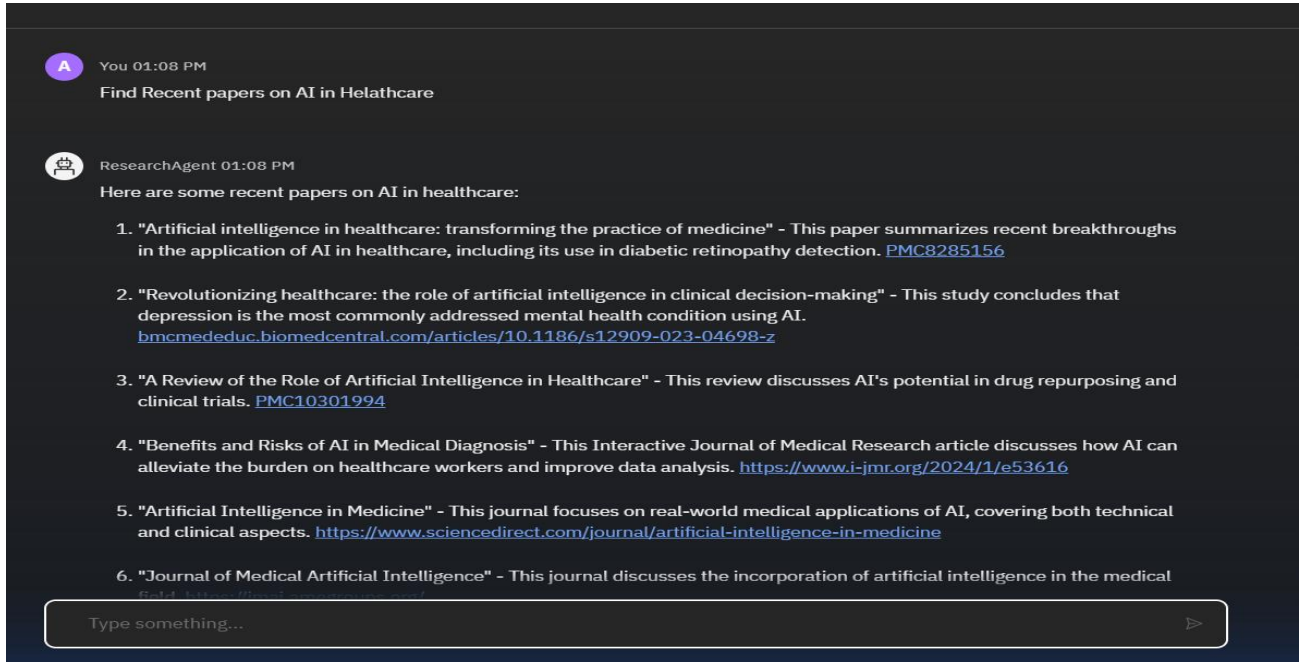
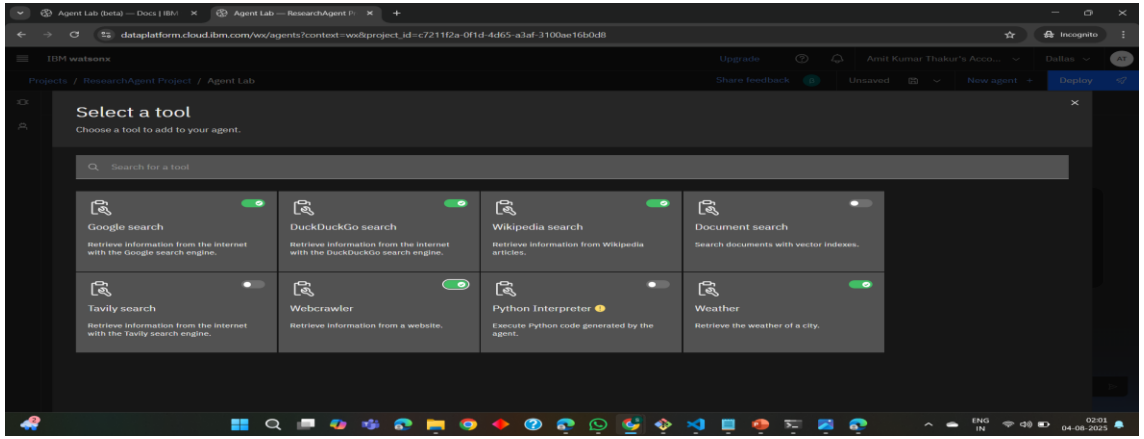
RESULTS

Deployed AI Agent







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CONCLUSION

🎯 What We Achieved

- Built an intelligent AI-powered research assistant using IBM Watsonx.ai
- Leveraged Granite foundation model with RAG and NLP to simulate a real academic assistant
- Developed a multi-backend architecture (Python, Node.js, Java, Scala) with a sleek React frontend
- Enabled dual interaction modes: Simple Research and Chat Mode
- Successfully deployed and tested using IBM Cloud Lite services

🚀 Why It Matters

- Saves time, boosts productivity, and enhances the research workflow
- Scalable for real-world academic use cases
- Flexible architecture for developers and institutions alike

💬 Final Thoughts

"We didn't just build a chatbot — we built a future-ready, open-source Research Intelligence Platform powered by IBM's AI ecosystem."

GITHUB LINK

🔗 **GitHub Repository**

🚀 Explore the full source code, backend logic, frontend UI, setup scripts, and IBM Cloud integration here: 👉 *AI_ResearchAgent*

💡 **Star it. Fork it. Use it.**

- This project is open-source and built to help students, researchers, and developers build AI-powered tools with IBM Watsonx and Granite.
- Let's reimagine academic research—powered by AI. 🌐 🤖 📚

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FUTURE SCOPE

🧠 1. Voice-Based Research Assistant

Integrate speech-to-text and text-to-speech for a hands-free academic assistant

- Helpful for visually impaired users and multitaskers
- Enables smart assistants on mobile & voice platforms

📚 2. PDF Upload + Summarization

Let users upload full research papers and receive:

- Key takeaways
- Summaries per section
- Highlight extraction with RAG

🌐 3. Multilingual Support

Expand usability across regional and global languages using:

- IBM Watson Language Translator
- Granite's multilingual understanding

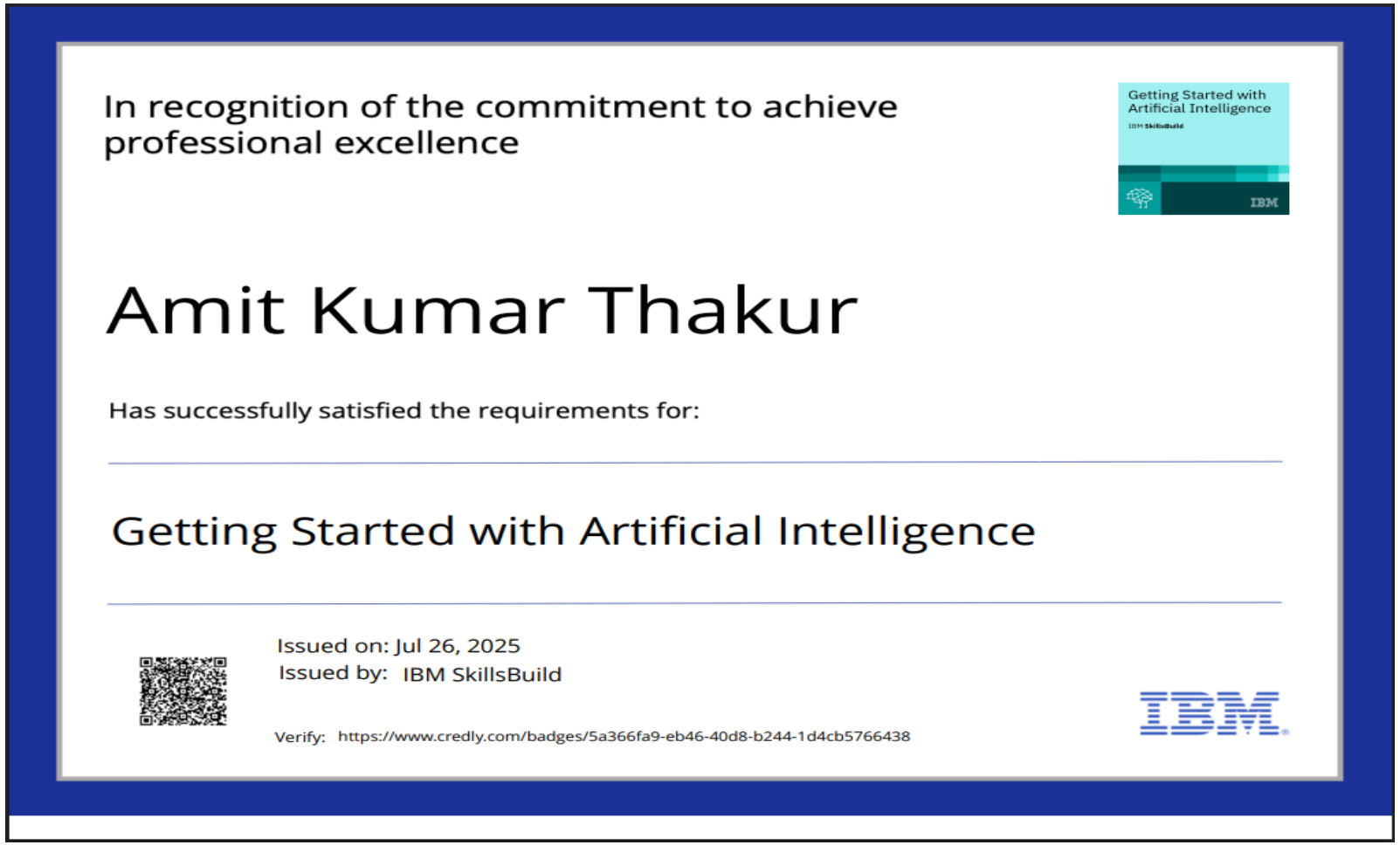
💾 4. User Profiles + History

- Enable login, personalization, and saved research threads
- Track progress, bookmarks, and export data
- Provide tailored suggestions based on history

🤝 5. Integration with Learning Platforms

- Turn the agent into a plugin or API for:
- University portals,LMS systems (like Moodle, Google Classroom),EdTech apps

IBM CERTIFICATIONS



- Screenshot/ credly certificate

(Getting started with AI)

IBM CERTIFICATIONS

- Screenshot/ credly certificate

(Journey to Cloud: Envisioning Your Solution)

IBM Certifications

IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Amit Kumar Thakur

for the completion of

Lab: Retrieval Augmented Generation with LangChain

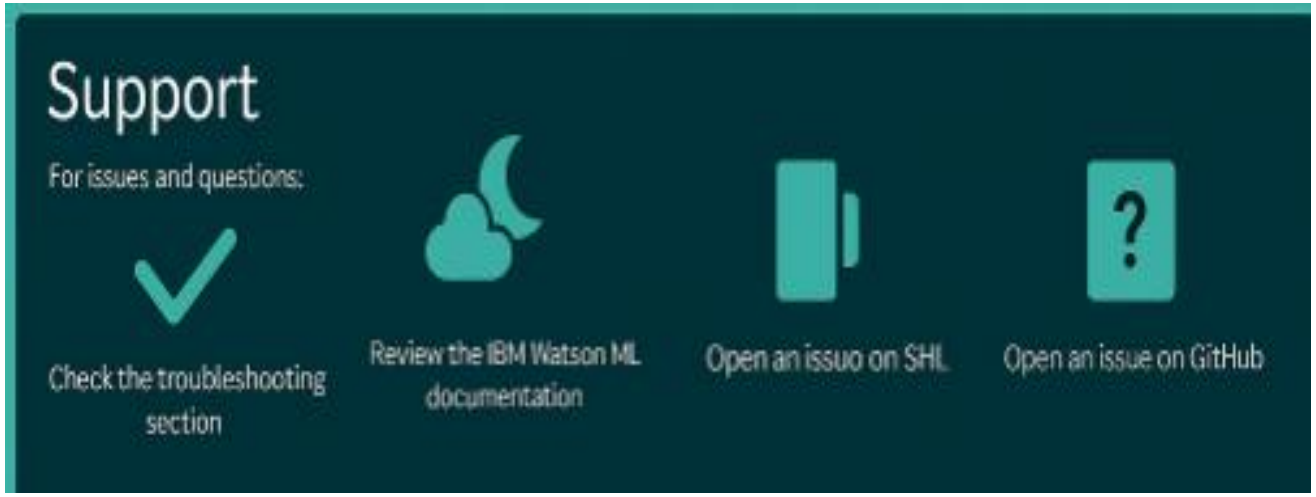
(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 27 Jul 2025 (GMT) **Learning hours:** 20 mins

- Screenshot of certificate

(Lab: Retrieval Augmented Generation with LangChain)



THANK YOU

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