
CAPSTONE PROJECT

RESEARCH AGENT

Presented By:

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OUTLINE

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PROBLEM STATEMENT

Academic research is time-consuming and complex, involving tasks like searching for literature, summarizing papers, managing references, and generating hypotheses.

Manual handling of these tasks leads to inefficiencies and delays, especially for students and researchers lacking resources or expertise.

There is a need for an AI-based solution that can assist in performing these research-related tasks accurately and efficiently.

PROPOSED SOLUTION

- The proposed system is a Research Agent — an AI-powered assistant built using IBM Watsonx and Granite models.
- It performs the following tasks:
 - ✓ Summarizes academic papers
 - ✓ Answers domain-specific research questions
 - ✓ Suggests hypotheses based on a topic
 - ✓ Organizes references and citations
- The agent is hosted entirely on IBM Cloud using Lite-tier services.

SYSTEM APPROACH

- ◆ Platform: IBM Cloud (Lite Tier)
- ◆ Backend: IBM Watsonx.ai
- ◆ Foundation Model: Granite-13b-chat
- ◆ Hosting: IBM Code Engine
- ◆ File Handling: IBM Cloud Object Storage
- ◆ Programming Language: Python (Flask or FastAPI)
- ◆ SDKs/APIs: IBM GenAI SDK, COS SDK

ALGORITHM & DEPLOYMENT

- Model Used: IBM Granite (13b-chat)
- Prompt Engineering Approach:
 - - Extract text from PDF or input query
 - - Send to Granite LLM for summarization, question answering, or hypothesis generation
 - - Format response into readable academic structure
- Deployment:
 - - Agent logic deployed via IBM Code Engine
 - - AI prompts configured in Watsonx.ai Prompt Lab
 - - Storage and input handling done through Object Storage

RESULT

The screenshot shows the IBM watsonx web interface. The top navigation bar includes the IBM watsonx logo, an 'Upgrade' button, and user account information for 'Harshit Kamboj's Account' in 'Dallas'. The main content area displays the 'ResearchAgent' deployment status as 'Deployed' and 'Online'. Below this, there are tabs for 'API reference', 'Test', and 'Preview'. The 'Preview' tab is active, showing a chat interface. The chat history includes a user query: 'What are some recent advancements in the field of quantum computing?' and the agent's response: 'Here are some recent advancements in the field of quantum computing: 1. Breakthroughs in Quantum Computing • Description: A notable achievement in this field is the demonstration of quantum communication over a subsea optical fiber cable. This development, led by ... • URL: Breakthroughs in Quantum Computing 2. The latest developments in quantum computing: A transformative ...'. A text input field at the bottom contains the placeholder 'Type something...'.

The screenshot shows the IBM watsonx web interface with the 'Build' configuration panel on the left and the 'Agent preview' on the right. The 'Build' panel includes a 'Setup' dropdown, 'Configuration' section with 'Framework' set to 'LangGraph' and 'Architecture' set to 'ReAct', 'Instructions' section with a text area containing the agent's role and tasks, and 'Tools' section with 'Add a tool' and 'Create custom tool' buttons. The 'Agent preview' panel shows a chat interface with the same user query and agent response as the previous screenshot. The chat history includes the user query: 'What are some recent advancements in the field of quantum computing?' and the agent's response: 'Here are some recent advancements in the field of quantum computing: 1. Breakthroughs in Quantum Computing • Description: A notable achievement in this field is the demonstration of quantum communication over a subsea optical fiber cable. This development, led by ... • URL: Breakthroughs in Quantum Computing 2. The latest developments in quantum computing: A transformative ... • Description: One major breakthrough involves the development of hypercube network technologies, which enhance the scalability and performance of quantum ... • URL: The latest developments in quantum computing 3. 2025 Will See Huge Advances in Quantum Computing. So What is a ...'. A text input field at the bottom contains the placeholder 'Type something...'.

CONCLUSION

- The Research Agent successfully demonstrates how AI can streamline academic tasks like summarization, citation, and hypothesis suggestion.
- By leveraging IBM's Granite LLM and cloud services, the system provides fast, accurate, and scalable research assistance to students and researchers.
- It reduces manual effort and promotes efficient academic exploration.

FUTURE SCOPE

- - Add document upload and PDF parsing from frontend
- - Integrate voice-based question answering
- - Support for multilingual research papers
- - Enhanced role-based access (Student / Researcher / Admin)
- - Integration with Zotero, Mendeley, and citation databases
- - Extend to mobile/web app for broader accessibility

REFERENCES

- - IBM Watsonx.ai Documentation
- - IBM Granite Foundation Models
- - arXiv, IEEE, and CrossRef APIs
- - OpenAI Prompt Engineering Guidelines
- - Research papers on academic AI assistants

- (Include actual URLs or DOIs if required)

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This certificate is presented to

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According to the Adobe Learning Manager system of record

Completion date: 31 Jul 2025 (GMT)

Learning hours: 20 mins



THANK YOU