

IBM HACKATHON PROJECT

RESEARCH AGENT [[GITHUB LINK](#)] [[APP LINK](#)]

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OUTLINE

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PROBLEM STATEMENT

Academic and industrial researchers often spend a significant amount of time searching for relevant literature, reading and summarizing research papers, organizing references, and drafting reports. These repetitive tasks hinder productivity, delay insights, and introduce human error.

This project aims to solve this problem by building an AI-powered Research Agent that automates the research workflow using large language models (LLMs). The agent can understand research queries in natural language, autonomously search for relevant literature, summarize academic papers (including PDFs), extract references, and even assist in drafting hypotheses and sections of research papers.

By integrating web scraping, PDF reading, and LLM summarization (via Replicate), this agent significantly accelerates the research process, enhances accuracy, and empowers innovation.







TECHNOLOGY USED

- **Python** – Core backend and data handling.
- **Streamlit** – Web interface for interaction.
- **IBM Granite-3.3-8B-Instruct (Replicate API)** – LLM for research understanding and generation.
- **Web Scraper** – Extracts content from research sources.
- **PDF Reader (PyMuPDF)** – Reads and processes research papers.
- **Requests** – For API and HTTP communication.

IBM CLOUD SERVICES USED

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

WOW FACTORS

-  Autonomous Paper Search - Finds and fetches relevant research papers with just a prompt.
-  LLM-Based Summarization - Uses IBM Granite 3.3 8B Instruct to summarize and interpret papers.
-  PDF & Web Integration - Extracts insights from PDFs and web sources seamlessly.
-  Hypothesis Suggestions - Recommends potential research ideas instantly.
-  Smart Citation Handling - Automatically extracts and organizes citation data.
-  Streamlit UI - Easy, no-code interface for smooth user experience.

END USERS

- Researchers & Scientists
- University Students
- Professors & Educators
- R&D Professionals (Industry)
- Academic Institutions & Libraries
- Science Journalists & Writers

RESULTS

[App Link: <https://research-agent-ibm.streamlit.app>]

Share ☆ ↻ ⋮

 **Research Agent – Literature Search, Summarization, and PDF Reader** 

 **Search & Summarize Research Papers**

Enter a research question or topic:

Search and Summarize

 **Upload PDF and Summarize**

Upload a research paper (PDF)

 Drag and drop file here
Limit 200MB per file • PDF

Browse files

< Manage app

RESULTS

Agent preview



Research Agent 10:07 PM

Welcome to Research Agent

AI-powered agent that automates literature search, summarization, and citation for researchers.



Draft an abstract for a paper on AI in climate modeling.



RESULTS

Agent preview



You: 10:04 PM

Find three recent research papers on the ethical implications of using CRISPR technology in humans.



Research Agent 10:04 PM

I have found three recent research papers that discuss the ethical implications of using CRISPR technology in humans:

1. **Title:** "The Ethics of Human Germline Genome Editing: A Global Perspective"
Authors: Wu, T., & Caulfield, T. **Journal:** Nature Reviews Genetics **Year:** 2019
Summary: This paper provides a global perspective on the ethical implications of human germline genome editing, focusing on CRISPR technology. The authors discuss the potential benefits and risks, as well as the need for international guidelines and regulations. **Key Contribution:** The authors emphasize the importance of global collaboration and consensus-building in addressing the ethical challenges posed by CRISPR technology.
2. **Title:** "CRISPR-Cas9 and the Ethics of Human Genome Editing" **Authors:** Baltimore, D. **Journal:** Proceedings of the National Academy of Sciences **Year:**

Type something...



RESULTS

Agent preview

Related Works:

- "The Ethics of Human Genome Editing: A Global Perspective" by Wu and Caulfield (2019)
- "CRISPR-Cas9 and the Ethics of Human Genome Editing" by Baltimore (2015)
- "CRISPR-Cas9 and the Ethics of Human Genome Editing: A Global Perspective" by Savulescu and Kahane (2018)

Hypothesis: The ethical implications of using CRISPR technology in humans are complex and multifaceted, requiring careful consideration of potential benefits and risks, as well as the development of international guidelines and regulations.

Citations:

- Wu, T., & Caulfield, T. (2019). The Ethics of Human Germline Genome Editing: A Global Perspective. *Nature Reviews Genetics*, 20(1), 17-30.
- Baltimore, D. (2015). CRISPR-Cas9 and the Ethics of Human Genome Editing. *Proceedings of the National Academy of Sciences*, 112(47), 14559-14560.
- Savulescu, J., & Kahane, G. (2018). CRISPR-Cas9 and the Ethics of Human Genome Editing: A Global Perspective. *Science*, 360(6385), 189-190.



CONCLUSION

- The **Research Agent** significantly enhances the **efficiency, accuracy, and speed** of academic and scientific research.
- By automating tasks like **literature search, summarization, citation handling, and hypothesis generation**, it reduces manual effort and accelerates innovation.
- Powered by advanced **LLMs, Replicate APIs**, and seamless **PDF/web integration**, it serves as a valuable tool for **students, researchers, and R&D teams** alike.
- This project demonstrates the transformative potential of **AI agents** in shaping the future of research and education.

GITHUB LINK

- GitHub Link - <https://github.com/Samarth4023/IBM-Internship-2.git>

FUTURE SCOPE

- **Multimodal Capability:** Integrate support for diagrams, tables, and charts for richer document understanding and generation.
- **Voice Interaction:** Enable voice-based queries for hands-free research and accessibility.
- **Real-time Collaboration:** Add shared workspaces where multiple researchers can interact with the agent simultaneously.
- **Advanced Citation Management:** Auto-generate citations in multiple styles (APA, MLA, etc.) with BibTeX/EndNote export.
- **Integration with Research Databases:** Direct access to PubMed, arXiv, IEEE, Springer for high-quality papers.
- **Offline Document Indexing:** Allow users to add personal research papers or books to a local vector store for instant querying.

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Completion Certificate



This certificate is presented to
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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