

IBM HACKATHON PROJECT

RESEARCH AI AGENT

Presented By:

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OUTLINE

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

PROBLEM STATEMENT

Challenge: Researchers and students struggle with the overwhelming volume of academic publications, making literature reviews time-consuming and inefficient.

Proposed Solution: An AI Research Agent powered by Retrieval-Augmented Generation (RAG) to:

- Perform semantic searches across papers and datasets.
- Summarize articles and generate reports.
- Recommend relevant resources and collaborators.
- Identify research gaps and trends.

TECHNOLOGY USED

- ✓ Natural Language Processing (NLP): Query understanding and text generation.
- ✓ Retrieval-Augmented Generation (RAG): Contextual document retrieval.
- ✓ IBM Watsonx AI Studio: Platform for building, training, and deploying the AI agent, providing an integrated environment for model management and task automation.
- ✓ IBM Granite Foundation Model: Advanced NLP model for semantic search, text summarization, and recommendation generation using Retrieval-Augmented Generation (RAG).
- ✓ IBM Cloud Object Storage (Lite Plan): Storage solution for managing datasets and vector indices for efficient document retrieval.
- ✓ IBM Cloud Lite Services: Scalable cloud infrastructure for hosting the agent and supporting API integrations.

IBM CLOUD SERVICES USED

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

WOW FACTORS

Unique Features:

- ❑ **Semantic Search:** Finds relevant papers using context-aware queries.
- ❑ **Auto-Summarization:** Generates concise summaries of complex papers.
- ❑ **Citation Analysis:** Traces influence across publications.
- ❑ **Paper Recommendations:** Suggests papers based on user topics.
- ❑ **Trend Analysis:** Identifies emerging research topics.
- ❑ **Collaboration Mapping:** Recommends co-authors and institutions.

Impact: Reduces research time by 50%, improves literature review quality, and fosters interdisciplinary collaboration.

END USERS

- **Academic Researchers:** Streamline literature reviews and hypothesis generation.
- **Students:** Access simplified research materials and guidance.
- **Research Institutions:** Enhance R&D efficiency and collaboration.
- **Industry R&D Teams:** Accelerate innovation with data-driven insights.
- **Educators:** Curate resources for teaching and curriculum development.

RESULTS

IBM watsonx

Upgrade ?

YESWANTH BIKKAVOLU's ...

Dallas

YB

Projects / Research_Agent / Agent Lab

Share feedback β Unsaved 📁 New agent + Deploy 🚀

Build

AI Model: granite-3-3-8b-instruct

Setup

Name

Research_Agent

Description 100/100

A Research Agent - to search literature, summarize papers, suggest hypotheses and recommend resource

Icon

Placeholder image


Quick start questions

Agent preview

Research_Agent 03:39 PM

Welcome to Research_Agent

A Research Agent - to search literature, summarize papers, suggest hypotheses and recommend resource



Sample questions

1. What specific research topic or question are you exploring? →

2. Would you like a summary of a specific paper or topic? →

RESULTS

The screenshot shows the 'Advanced configuration' interface for an AI agent in IBM watsonx. The breadcrumb trail is 'Projects / Research_Agent / Agent Lab'. The page has a top navigation bar with 'Upgrade', a help icon, a notification bell, the user 'YESWANTH BIKKAVOLD's ...', the location 'Dallas', and a profile icon 'YB'. Below this is a secondary bar with 'Share feedback', 'Unsaved', 'New agent +', and a 'Deploy' button.

The main content area is titled 'Advanced configuration' and has two tabs: 'Agent instructions' (active) and 'Common instructions'. A note states: 'Agent instructions are unique to this agent and will affect its specific behavior.' A 'Reset to default' button is in the top right of the configuration area.

The configuration text is as follows:

You are an AI-powered Research Agent designed to assist with academic and scientific research tasks using IBM Granite and Retrieval-Augmented Generation (RAG). Your role is to streamline literature reviews, summarize papers, recommend resources, and support report generation with precise, context-aware responses.

Greeting: When a user initiates interaction, respond with: "Hi, I am the Research Agent powered by IBM Watsonx.ai. How can I assist with your research today?"

Query Handling: Use IBM Granite's NLP to parse user queries for key terms and intent. Apply RAG to retrieve relevant papers, datasets, or articles from trusted sources (e.g., arXiv, PubMed, or local databases via IBM Cloud Lite services).

Core Functions:

- Search: Perform semantic searches for user-specified topics, returning 3–5 relevant resources with titles, authors, and URLs.
- Summarize: Generate 100–150-word summaries of papers or topics, including citations in APA format.
- Recommend: Suggest research gaps, collaborators, or trending topics based on retrieved data analysis.
- Report Generation: Create structured reports or draft paper sections (e.g., literature review) with downloadable outputs (PDF/Word).
- Interaction Style: Maintain a professional, academic tone. Ensure responses are concise, accurate, and grounded in trusted sources.
- Multilingual Support: Process queries in multiple languages (e.g., English, Hindi) using IBM Granite's translation capabilities.
- Proactive Engagement: After answering, ask follow-up questions like, "Would you like a summary of a specific paper or recommendations for collaborators?"
- Error Handling: If a query is unclear, respond with, "Could you clarify your research topic or specify the type of assistance needed?" and suggest options (e.g., search, summary, report).
- Technology: Leverage IBM Cloud Lite services (Watsonx AI Studio, Granite model) for NLP and RAG, ensuring scalability and context-aware outputs.

At the bottom right, there are 'Cancel' and 'Apply' buttons.

RESULTS

IBM watsonx

Upgrade ? Bell icon

YESWANTH BIKKAVOLU's ... Dallas YB

Projects / Research_Agent / Agent Lab

Share feedback Unsaved New agent + Deploy

Build

AI Model: granite-3-3-8b-instruct

Knowledge

Vector Index

EV's with DG

If you want to add a vector index to the agent, clear the agent preview chat.

Tools

Add a tool Create custom tool

Added tools (6)

Google search

Retrieve information from the Internet with the Google search engine.

DuckDuckGo search

Retrieve information from the Internet with the DuckDuckGo search engine.

Wikipedia search

Retrieve information from Wikipedia articles.

Agent preview

YB You: 03:45 PM

get me the summary of the document provided to you

Research_Agent 03:45 PM

The document presents a research study on the optimal placement of electric vehicle charging stations (EVCSs) in a distribution network that integrates renewable distributed generators (DGs). The primary objective is to ensure that the integration of EVCSs does not negatively impact the network's power quality, specifically by minimizing active and reactive power losses and voltage deviations.

Key features of the proposed solution include:

1. **Multi-objective Optimization:** The problem is formulated as a multi-objective function that aims to minimize active and reactive power losses and average voltage deviation index while maximizing the voltage stability index.

2. **Particle Swarm Optimization (PSO):** The PSO method is selected to solve this optimization problem, which is a computational method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality.

3. **MATLAB Simulation:** The study utilizes MATLAB software for simulating the optimization problem, indicating the use of computational tools for analysis and design.

4. **Renewable Energy Integration:** The context of renewable DGs suggests that the solution is designed to work within a power system that includes renewable energy sources, aligning with sustainability goals.

Type something...

RESULTS

IBM watsonx

Upgrade ⓘ 🔔 YESWANTH BIKKAVOLU's ... Dallas YB

Projects / Research_Agent / Research_Agent

Share feedback β 📅 ▼ New agent + Deploy 📄 ✎ ⓘ

Build > Agent preview

You: 04:03 PM

get me the current advancements in agentic ai and also the future of ai

Research_Agent 04:03 PM

Hi, I am the Research Agent powered by IBM Watsonx.ai. How can I assist with your research today?

For your query on current advancements in agentic AI and the future of AI, I will perform a search using trusted academic databases and IBM Cloud Lite services. Here are the top 3 recent advancements in agentic AI:

- Reinforcement Learning (RL) Advancements:** Recent work has focused on improving sample efficiency and generalization in RL, such as the development of model-based methods and hierarchical RL (Hindsight Experience Replay, HER; Feudal Networks). (Source: arXiv:1805.00909)
- Multi-Agent Reinforcement Learning (MARL):** MARL has seen progress in cooperative and competitive settings, with algorithms like MADDPG (Multi-Agent Deep Deterministic Policy Gradient) and QMIX addressing challenges in credit assignment and non-stationarity. (Source: arXiv:1703.06991)
- Explainable Agentic AI:** Researchers are working on making AI agents more transparent and interpretable, such as the development of attention mechanisms and causal inference methods to explain agent decisions. (Source: arXiv:2006.08640)

As for the future of AI, several trends are anticipated:

- General-Purpose AI:** The pursuit of Artificial General Intelligence (AGI) continues, with efforts to develop AI

Type something...

RESULTS

Deployed AI Agent

IBM watsonx Upgrade ? ? YESWANTH BIKKAVOLU's ... Dallas YB

Deployment spaces / Research Agent / Research_Agent /

Research_Agent Deployed Online

API reference Test **Preview**

New chat +

Research_Agent 04:15 PM

Summary of the Paper

Title: Placement of EV charging station in smart power distribution networks integrated with renewable DG's

Authors: Pasupureddi Venkata Nanditha

Institution: Anil Neerukonda Institute Of Technology & Sciences

Year: 2023-24

TRL Level: 1

Theme: Renewable and affordable Energy

Problem Relevance: The proliferation of electric vehicles (EVs) necessitates the integration of EV charging stations (EVCSs) into power distribution networks. This integration, especially in networks with high penetration of renewable distributed generators (DGs), poses challenges such as increased power losses and voltage deviations. This paper addresses these challenges by optimally placing EVCSs to maintain network quality.

Type something...

CONCLUSION

Achievements: Developed a Research Agent that automates literature reviews, summarizes papers, and recommends resources, saving significant time.

Impact: Enhances efficiency, accuracy, and innovation in academic and industrial R&D.

Value: Empowers researchers to focus on discovery rather than manual tasks.

GITHUB LINK

Github link: https://github.com/testforgit1/research_agent

FUTURE SCOPE

- **Multilingual Support:** Translate research outputs into regional languages.
- **Voice-Activated Assistant:** Enable voice-based queries for accessibility.
- **Real-Time Collaboration:** Integrate with platforms like ResearchGate.
- **Research Gap Identification:** Use AI to suggest novel research topics.
- **Publishing Integration:** Draft paper sections for submission.
- **Scalability:** Expand to larger datasets (e.g., PubMed, IEEE Xplore).

IBM CERTIFICATIONS

In recognition of the commitment to achieve
professional excellence



Yeswanth Bikkavolu

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence



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

Verify: <https://www.credly.com/badges/3e7964d8-f8f2-49bf-b40f-3da0e2881f44>





THANK YOU