

# **CAPSTONE PROJECT**

# **Research agent**

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**UIET KANPUR**

# OUTLINE

- ▶ **Problem Statement**
- ▶ **Technology used**
- ▶ **Wow factor**
- ▶ **End users**
- ▶ **Result**
- ▶ **Conclusion**
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- ▶ **Future scope**
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# Problem Statement

## Problem Statement No.1 - Research Agent

The Challenge- A Research Agent is an AI system designed to assist with academic and scientific research tasks. It can autonomously search for literature, summarize papers, and organize references.

Using natural language processing, it understands research questions and retrieves relevant information.

The agent can generate reports, suggest hypotheses, and even draft sections of research papers.

It saves time by automating repetitive tasks like citation management and data extraction.

Research Agents enhance efficiency, accuracy, and innovation in both academic and industrial R&D.

# Technology used

Framework : LangGraph

Architecture : ReAct

IBM cloud lite services

Natural Language Processing (NLP)

Retrieval Augmented Generation (RAG)

IBM Granite model

# IBM cloud services used

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

# Wow factors

## AI Research Assistant: Revolutionizing Academic Discovery and Collaboration

This intelligent research assistant dramatically shortens the time spent on literature reviews, elevates the quality of academic insights, and guides early-stage researchers toward promising directions. By making scholarly knowledge more discoverable, contextual, and actionable, it also encourages meaningful interdisciplinary collaboration.

## Key Features

### Semantic Search

Intuitively searches across research papers, journals, and datasets using meaning-based queries rather than simple keywords.

### Automatic Summarization

Instantly generates concise summaries of selected papers to help users grasp key findings without reading full texts.

### Citation and Influence Analysis

Tracks citations to map the influence and evolution of ideas over time.

### Smart Paper Recommendations

Suggests relevant research papers tailored to a user's current topic or area of interest.

### Trend Analysis

Analyzes historical data to uncover emerging trends, keyword growth, and shifts in research focus.

### Collaboration Mapping

Identifies potential collaborators, co-authors, or institutions working on similar topics to foster academic partnerships.

# End users

- ▶ Academic Researchers
- ▶ Research Institutions and Universities
- ▶ Industry R&D Teams
- ▶ Educators

# Results

IBM watsonx

Upgrade ⓘ ⚙️ Harshit Sharma's Account ▾ Dallas ▾ HS ⋮

Projects / ai / researchAgent

Share feedback ⓘ Autosave on ▾ New agent + Deploy ⓘ

Saved agents

From ai

**researchAgent**  
Ai buddy for study.

Build

AI Model: granite-3-3-8b-instruct ▾ ⚙️ <

Setup

Name

researchAgent

Description 19/100

Ai buddy for study.

Icon

Placeholder image

Agent preview

researchAgent 07:45 PM

Welcome to researchAgent

Ai buddy for study.

Type something...



# Results

IBM watsonx

Upgrade ⓘ 🔔 Harshit Sharma's Account ▾ Dallas ▾ HS ⋮

Projects / ai / researchAgent

Share feedback β

Autosave on

New agent +

Deploy 🔗 🔒 ⓘ

Saved agents

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Build

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

Add up to 4 quick start questions that your users can select. +

Configuration

Framework

LangGraph ▾

Architecture

ReAct ▾

Instructions

Advanced configuration

You can autonomously search for literature, summarize papers, and organize references.  
You can understand research questions and retrieves relevant information.  
Generate reports, suggest hypotheses, and even draft sections of

Knowledge ▾

Tools ▾

Add a tool

Create custom tool

Agent preview

researchAgent 07:45 PM

Welcome to researchAgent

Ai buddy for study.

Type something...

🗨️ ▶️

# Results

## Advanced configuration

### Agent instructions

### Common instructions

Agent instructions are unique to this agent and will affect its specific behavior.

[Reset to default](#)



You can autonomously search for literature, summarize papers, and organize references.  
You can understand research questions and retrieve relevant information.  
Generate reports, suggest hypotheses, and even draft sections of research papers.  
Automate repetitive tasks like citation management and data extraction.  
Act research agents enhance efficiency, accuracy, and innovation in both academic and industrial R&D.

Cancel

Apply

# Results

Advanced configuration

Agent instructions

Common instructions

Adding to agent instructions and define common behavior. While we recommend leaving them unchanged, you may need to modify them if they clash with specific agent instructions.

Reset to default

Respond to only academic questions.

Cancel

Apply

# Results

IBM watsonx

Upgrade ⓘ ⚙ Harshit Sharma's Account ▾ Dallas ▾ HS ⋮

Projects / ai / researchAgent

Share feedback ⓘ Autosave on New agent + Deploy ⓘ

Saved agents

From ai

**researchAgent**  
Ai buddy for study.

Build

AI Model: granite-3-3-8b-instruct ▾ ⚙ <

Added tools (5)

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.

Webcrawler

Retrieve information from a website.

Weather

Retrieve the weather of a city.

Agent preview

researchAgent 07:45 PM

Welcome to researchAgent

Ai buddy for study.

Type something...

# Results

IBM watsonx

Upgrade ⓘ 🔔

Harshit Sharma's Account ▾ Dallas ▾ HS ⋮

Deployment spaces / database / researchAgent

🔗 🗑️ ⓘ 🔗 ⌛ 💬 ⋮



Deployments

Code

Schema

🔍 Search


↻ New deployment 🚀

Name	Type	Status	Tags	Last modified	
 researchAgent	Online	✔️ Deployed	wx-agent 	3 minutes ago Harshit Sharma (You)	⋮


Items per page: 20 ▾ 1–1 of 1 items 1 of 1 pages ⏪ ⏩

About this asset ×

Name


researchAgent 

Description

Ai buddy for study. 


Asset Details

Type: python

AI service ID: b82407e6-3e20-4d... 

Software specification: runtime-24.1-py3.11 ⚙️

Tags

wx-agent 

Last modified

3 minutes ago by Harshit Sharma

Created on

Jul 31, 2025 by Harshit Sharma

# Results

IBM watsonx

Upgrade ⓘ 🔔 Harshit Sharma's Account ▾ Dallas ▾ HS ⋮

[Deployment spaces](#) / [database](#) / [researchAgent](#) /

researchAgent ✔ Deployed Online

< reference

Test


Preview

New chat +

researchAgent 07:48 PM

Welcome to researchAgent

Ai buddy for study.



Type something... ➤

About this deployment ×

Name

researchAgent

Description

Ai buddy for study.

Deployment Details

Deployment ID: 553aa19d-8f05-49...

Serving name: No serving name.

Software specification: runtime-24.1-py3.11 ⚙


Hardware specification: Extra extra small: 1 CPU and 2 GB RAM

Copies: 1

Tags

wx-agent

Associated asset

 researchAgent

b82407e6-3e20-4def-a282-00912de0763c

# Results

IBM watsonx

Upgrade ?

Harshit Sharma's Account

Dallas

HS

[Deployment spaces](#) / [database](#) / [researchAgent](#) /

researchAgent ✓ Deployed Online

< reference

Test

Preview

New chat +

H You 07:48 PM

hi

researchAgent 07:48 PM

1: Thinking...

Steps created by Agent

Type something...

About this deployment

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b82407e6-3e20-4def-a282-00912de0763c

# Results

## Agent preview



You 07:48 PM

What is ai



Research Agent 07:48 PM

Artificial Intelligence (AI) refers to the ability of computer systems to perform tasks that typically require human intelligence, such as learning, problem-solving, and decision-making. In essence, AI aims to create machines that can mimic human-like cognitive functions. This includes reasoning, perception, language understanding, and the capacity to learn from experience.

Type something...





# Results

## Deployed AI Agent

The screenshot displays the IBM Watsonx interface for a deployed AI agent named 'researchAgent'. The agent is shown as 'Deployed' and 'Online'. The 'Preview' tab is active, showing a chat history. The user asks: 'Give me a simple hypothesis about plants and sunlight.' The Research Agent responds with two hypotheses:

- Hypothesis: Plants grow taller when they receive more sunlight.**
  - **Independent Variable:** Amount of sunlight received.
  - **Dependent Variable:** Height of the plants.
  - **Source:** [Brainly](#)
- Hypothesis: Light helps plants grow.**
  - **Prediction:** If I put my plants in the warm sun, they will grow faster.
  - **Source:** [LinkedIn - Lukas Vermeer](#)

Below the second hypothesis, a third hypothesis is partially visible: 'Hypothesis: If plants receive more sunlight, then they will be taller than those receiving less light.'

The interface includes a top navigation bar with 'IBM watsonx', 'Upgrade', a help icon, a notification bell, 'Harshit Sharma's Account', 'Dallas', and a user profile 'HS'. The breadcrumb trail shows 'Deployment spaces / database / researchAgent /'. The chat input field at the bottom says 'Type something...'

# Conclusion

- ▶ The agent can generate reports, suggest hypotheses, and even draft sections of research papers.
- ▶ It saves time by automating repetitive tasks like citation management and data extraction.
- ▶ Research Agents enhance efficiency, accuracy, and innovation in both academic and industrial R&D.

# GitHub Link

## ZenoZeus (Harshit Sharma) · GitHub

<https://github.com/ZenoZeus/>

# FUTURE SCOPE

- ▶ Multilingual Research Support
- ▶ Voice-Activated Research Assistant
- ▶ Real-Time Collaboration Features
- ▶ Research Gap and Novel Topic Identification
- ▶ Integration with Publishing Platforms
- ▶ AI-Assisted Paper Drafting

# IBM Certifications



# IBM Certifications



IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

**Harshit Sharma**

for the completion of

**Lab: Retrieval Augmented Generation with  
LangChain**

(ALM-COURSE\_3824998)

According to the Adobe Learning Manager system of record

**Completion date:** 29 Jul 2025 (GMT)

**Learning hours:** 20 mins

**THANK YOU**