
CAPSTONE PROJECT

RESEARCH AGENT

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OUTLINE

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PROBLEM STATEMENT

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

IBM cloud lite services

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

- **1. AI That Thinks Like a Researcher**
 - Understands complex research questions just like a human expert
 - Uses **IBM Granite** for advanced language understanding & generation
- **2. Saves Months of Work in Minutes**
 - Automates literature reviews, summarization, and citation formatting
 - Reduces **50–70%** of manual research effort
- **3. End-to-End Research Support**
 - From searching academic papers → Summarizing findings → Formatting citations → Drafting sections of research papers
- **4. Multi-Domain Expertise**
 - Works for **academic, industrial R&D, and educational** purposes
 - Can adapt to multiple research fields instantly
- **5. Powered by IBM Cloud Lite Services**
 - **IBM Watson Discovery** for intelligent search
 - **IBM Watson NLU** for semantic analysis
 - **IBM Cloud Storage** for secure research data management
- **6. Next-Generation Collaboration Tool**
 - Makes research accessible for students, professors, and corporate researchers
 - Can be integrated with existing research management tools like **Zotero** or **Mendeley**
- **7. Scalable & Future-Ready**
 - Can handle **thousands of research documents** in real time
 - Learns & improves continuously with new research data

END USERS

- **Academic Researchers & Professors**
 - To speed up literature reviews, manage citations, and draft research papers.
- **PhD & Postgraduate Students**
 - To find relevant papers, summarize findings, and structure their research work.
- **Undergraduate Students**
 - To assist in preparing final-year projects and mini research reports.
- **Industry R&D Teams**
 - For patent search, competitor research, and trend analysis.
- **Corporate Analysts & Data Scientists**
 - To quickly analyze technical research and market reports.
- **Educational Institutions**
 - As a tool for guiding students in research methodology and content creation.
- **Independent Researchers & Innovators**
 - To explore new ideas and validate research hypotheses efficiently.

RESULTS

The screenshot displays the IBM Watsonx Agent Lab interface in a web browser. The browser's address bar shows the URL: `dataplatfom.cloud.ibm.com/wx/agents?context=wx&project_id=d740e42e-2548-4a6d-9ff0-094ffce056ea`. The interface is divided into two main sections: 'Build' on the left and 'Agent preview' on the right.

Build Section:

- Configuration:** The 'Framework' is set to 'LangGraph' and the 'Architecture' is set to 'ReAct'.
- Instructions:** A text box contains the instruction: "You are a helpful assistant that uses tools to answer questions in detail. When greeted, say 'Hi, I am Research Agent. How can I help you?'".
- Knowledge:** A 'Vector index' is named 'Research_Agent_Document'. A note below states: "A vector index searches documents for relevant information to ground the model. Upload the files to index or select an existing index."
- Tools:** There are two buttons: 'Add a tool' and 'Create custom tool'. Below them, a list of 'Added tools (2)' includes 'Google search' with the description: "Retrieve information from the internet with the Google search engine."

Agent preview Section:

The preview shows a chat interface with a header: "Research Agent 02:00 PM". The main message is: "Welcome to Research Agent. Welcome to the Research Agent: Your AI-powered research companion is here to help you." Below the text is a diagram of a network or graph structure with a magnifying glass icon over one of the nodes. At the bottom of the preview is a text input field with the placeholder "Type something..." and a send button.

The bottom of the image shows a Windows taskbar with various icons, including the Start button, Search, and several application icons. The system tray on the right shows the language set to 'ENG IN', the time as '15:00', and the date as '01-08-2025'.

RESULTS

The screenshot displays the IBM watsonx Agent Lab interface. The top navigation bar includes the IBM watsonx logo, a menu icon, and user account information (Satyasree Chakka's Account, Dallas). The main header shows the project path: Projects / Research_Agent / Agent Lab. The interface is split into two main sections: 'Build' on the left and 'Agent preview' on the right.

Build Section:

- Model:** granite-3-3-8b-instruct
- Configuration:**
 - Framework:** LangGraph
 - Architecture:** ReAct
- Instructions:** You are a helpful assistant that uses tools to answer questions in detail. When greeted, say "Hi, I am Research Agent. How can I help you?"
- Knowledge:** Vector index: Research_Agent_Document. A 'Clear chat' link is available.
- Tools:** Includes 'Add a tool' and 'Create custom tool' buttons. A list of added tools is shown below:

Added tools (6):

- Google search:** Retrieve information from the internet with the Google search engine.
- DuckDuckGo search:** (partially visible)

Agent preview Section:

The chat window shows a conversation between the user and the Research Agent.

User: 03:07 PM
Hi, can you say me what are the primary search related tasks

Research Agent: 03:07 PM
Hi, I am Research Agent. How can I help you?

The primary search related tasks include:

1. Google Search: This involves searching for online trends, news, current events, real-time information, or research topics.
2. DuckDuckGo Search: This is a search engine that can be used to find information on a wide range of topics.
3. Wikipedia Search: This is useful for finding detailed information on a wide range of topics, especially those that require a comprehensive overview.
4. Web Crawling: This involves extracting data from websites, which can be useful for summarizing content or gathering specific information.
5. Weather Forecast: This involves retrieving weather information for a specific location.



These tasks can be performed using the respective tools I have access to.

How did I get this answer?

The chat input field at the bottom contains the placeholder text: "Type something..."

RESULTS

Projects / Research_Agent / Agent Lab

Share feedback  Unsaved  New agent + Deploy

Build

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

Agent preview

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

Configuration

Framework: LangGraph Architecture: ReAct

Instructions: You are a helpful assistant that uses tools to answer questions in detail. When greeted, say "Hi, I am Research Agent. How can I help you?"

Knowledge: Vector index: Research_Agent_Document

Tools: Add a tool Create custom tool

Added tools (6): Google search

How did I get this answer?

You: 03:08 PM

Research Agent 03:08 PM

1. Query Understanding: Granite helps in understanding complex research queries by leveraging its natural language processing capabilities. This allows the Research Agent to accurately interpret user requests.

2. Summarization of Research Papers: Granite's summarization capabilities enable the Research Agent to condense lengthy research papers into key points, making it easier for users to grasp the main ideas without reading through the entire document.

3. Content Drafting: The model can generate drafts for various sections of a research paper, aiding in the writing process.

4. Report Generation: Granite contributes to compiling content into structured reports, ensuring that the information is organized and presented in a coherent manner.

5. Hypothesis Generation: The model can suggest potential hypotheses or research directions based on existing literature, which can be beneficial for researchers in brainstorming or refining their research focus.

6. Explainable AI: Granite's design allows for transparency in its decision-making process, which is crucial for maintaining trust and ensuring that biases can be identified and mitigated.

The Granite Foundation Model, when integrated with other technologies like IBM Watson NLP, IBM Cloud Functions, IBM Cloudant, and IBM App Connect, forms the backbone of the Research Agent, enhancing its ability to assist in various research-related tasks efficiently and accurately.

For more detailed information, you can refer to the provided architecture overview and functionality modules.

How did I get this answer?

Type something...

RESULTS

Search : The History and Evolution of Artificial Intelligence A Comprehensive Overview

The screenshot displays the 'Agent Lab' interface. The top navigation bar shows 'Projects / Research_Agent / Agent Lab'. The main area is divided into two panels. The left panel, titled 'Build', contains a 'Knowledge' section with a 'Vector Index' and a 'Research_Agent_Document'. Below this is a 'Tools' section with buttons for 'Add a tool' and 'Create custom tool'. A list of 'Added tools (6)' is shown, including 'Google search', 'DuckDuckGo search', 'Wikipedia search', 'Document search - Research_Agent_Document', 'Webcrawler', and 'Weather'. The right panel, titled 'Agent preview', shows a chat interface. A user message asks for a comprehensive overview of the history and evolution of artificial intelligence. The agent's response provides a detailed overview, starting with the definition of AI and its history, then discussing the development of expert systems, machine learning, and neural networks, and finally addressing the challenges and future of AI.

Projects / Research_Agent / Agent Lab

Share feedback | Unsaved | New agent + | Deploy

Build | AI | Model: llama-3-3-70b-instruct

Agent preview

Knowledge

Vector Index

Research_Agent_Document

Clear chat

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.

Document search - Research_Agent_Document

Search documents with vector indexes.

Webcrawler

Retrieve information from a website.

Weather

Retrieve the weather of a city.

You: 06:31 PM

Can you provide a comprehensive overview of the history and evolution of artificial intelligence?

Research Agent 06:31 PM

The history and evolution of artificial intelligence (AI) is a long and complex one, spanning several decades. The term "artificial intelligence" was first coined in 1956 by John McCarthy, a computer scientist and cognitive scientist. However, the concept of creating machines that can think and learn dates back to ancient Greece, where myths told of artificial beings created to serve human-like purposes.

In the 1950s and 1960s, the first AI programs were developed, including the Logical Theorist and the General Problem Solver. These programs were designed to simulate human problem-solving abilities and were able to solve simple problems. However, they were limited in their ability to learn and adapt to new situations.

In the 1970s and 1980s, AI research focused on developing expert systems, which were designed to mimic the decision-making abilities of human experts in specific domains. These systems were able to reason and make decisions based on a set of rules and knowledge, but they were limited in their ability to learn and adapt to new situations.

In the 1990s and 2000s, AI research focused on developing machine learning algorithms, which enabled machines to learn from data and improve their performance over time. This led to the development of neural networks, which are modeled after the human brain and are able to learn and adapt to new situations.

Today, AI is a rapidly evolving field, with applications in areas such as natural language processing, computer vision, and robotics. AI systems are being used in a wide range of industries, including healthcare, finance, and transportation, and are having a significant impact on society.

One of the key challenges in developing AI systems is creating machines that can think and learn like humans. This requires the development of algorithms and models that can simulate human cognition and decision-making abilities. Another challenge is ensuring that AI systems are transparent, explainable, and fair, and that they do not perpetuate biases and discrimination.

Despite these challenges, AI has the potential to revolutionize many areas of society, from healthcare and education to transportation and energy. As AI continues to evolve and improve, it is likely to have a significant impact on the way we live and work, and will require careful consideration and planning to ensure that its benefits are realized while minimizing its risks.

► How did I get this answer?

Type something...

RESULTS

Projects / Research_Agent / Agent Lab

Share feedback Unsaved New agent +

Build

AI Model: llama-3-3-70b-instruct

Your dedicated assistant for in-depth research and information gathering.

Icon

Placeholder image

Quick start questions

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

Can you provide a comprehensive overview of the history and evolution of artificial intelligence?

What are the newest trends in artificial intelligence development?

Configuration

Framework: LangGraph Architecture: ReAct

Instructions

You are a helpful assistant that uses tools to answer questions in detail.
When greeted, say "Hi, I am Research Agent. How can I help you?"

Agent preview

One of the key challenges in developing AI systems is creating machines that can think and learn like humans. This requires the development of algorithms and models that can simulate human cognition and decision-making abilities. Another challenge is ensuring that AI systems are transparent, explainable, and fair, and that they do not perpetuate biases and discrimination.

Despite these challenges, AI has the potential to revolutionize many areas of society, from healthcare and education to transportation and energy. As AI continues to evolve and improve, it is likely to have a significant impact on the way we live and work, and will require careful consideration and planning to ensure that its benefits are realized while minimizing its risks.

► How did I get this answer?

You: 06:32 PM
what are newest trends

Research Agent 06:32 PM
The newest trends in artificial intelligence include:

1. Intelligent Process Automation
2. A Shift Toward Cybersecurity
3. AI for Personalized Services
4. Automated Decision-Making
5. AI Reasoning
6. Custom Silicon
7. Cloud Migrations
8. Systems to Measure ROI

These trends are expected to shape innovation and ROI in 2025, with a focus on enterprises and the development of new AI frontiers. Additionally, there is a growing interest in AI for personalized services, automated decision-making, and AI reasoning.

It's worth noting that the field of AI is constantly evolving, and new trends and developments are emerging all the time. Therefore, it's important to stay up-to-date with the latest news and research in the field to stay ahead of the curve.

► How did I get this answer?

Type something...

RESULTS

Deployed AI Agent

Research Agent Deployed Online

[API reference](#) [Test](#) [Preview](#)

New chat +

You 06:48 PM

Can you provide a comprehensive overview of the history and evolution of artificial intelligence?

Research Agent 06:48 PM

The history and evolution of Artificial Intelligence (AI) is a fascinating journey that spans several decades and involves significant milestones. Here's a comprehensive overview:

- 1. Early Concepts and Theoretical Foundations (1940s-1950s):** The concept of AI can be traced back to the 1940s and 1950s when pioneers like Alan Turing and John McCarthy laid the theoretical groundwork. Turing proposed the "Turing Test" to determine if a machine could exhibit intelligent behavior indistinguishable from a human. In 1956, McCarthy coined the term "Artificial Intelligence" at the Dartmouth Conference, marking the official beginning of AI research.
- 2. Early Breakthroughs and AI Winter (1950s-1980s):** The early years saw significant progress with the development of algorithms for solving problems like the checkers-playing program by Arthur Samuel in 1959 and the General Problem Solver by Newell and Simon in 1957. However, the field faced a period of reduced funding and interest known as the "AI Winter" in the 1970s and 1980s, partly due to overpromising and underdelivering, and partly due to the lack of computational power.
- 3. Expert Systems and Machine Learning (1980s-2000s):** The 1980s saw a resurgence with the development of expert systems, which mimicked the decision-making ability of a human expert. The 1990s and 2000s marked the rise of machine learning, with algorithms improving in their ability to learn from and make decisions or predictions based on data. Notable developments include the introduction of backpropagation for training neural networks and the development of support vector machines.
- 4. Deep Learning and Modern AI (2010s-Present):** The advent of big data and increased computational power in the 2010s led to the rise of deep learning, a subset of machine learning that uses neural networks with many layers (hence "deep"). This period has seen significant advancements, including the development of convolutional neural networks for image recognition, recurrent neural networks for sequence prediction, and transformers for natural language processing.
- 5. Current Trends and Future Directions:** Today, AI is a broad field with applications in various sectors, from healthcare to

Type something...

About this deployment

Name

Research Agent

Description

Your dedicated assistant for in-depth research and information gathering.

Deployment Details

Deployment ID: 000f1110-8513-4f...

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

vo-agent

Associated asset

Research Agent

b337fa04-740e-4ae2-ac99-7f21c1cb1d1f

Last modified

3 minutes ago

Created on

Aug 1, 2025

RESULTS

Deployed AI Agent

 You 05:14 PM

Summarize the key findings of recent climate change reports.

 Research Agent 05:14 PM

▼ 1: Thinking...

Steps created by Agent

CONCLUSION

- The Research Agent is a transformative AI solution that redefines how academic and industrial research is conducted. By leveraging **IBM Cloud Lite Services** and **IBM Granite**, it automates tedious tasks like literature search, paper summarization, citation management, and research drafting — saving time, improving accuracy, and fostering innovation.
- With its ability to adapt across multiple domains and provide end-to-end research assistance, the Research Agent stands as a future-ready companion for researchers, students, and industry professionals alike. It is not just a tool — it's a **partner in discovery and knowledge creation**.

FUTURE SCOPE

- **Integration with More Research Databases**

- Connect with Scopus, Web of Science, Springer, and other global academic sources for broader literature access.

- **Voice-Based Research Assistance**

- Enable voice commands for hands-free research queries and responses.

- **Multilingual Research Support**

- Search, summarize, and draft research content in multiple languages to support global researchers.

- **Real-Time Collaboration**

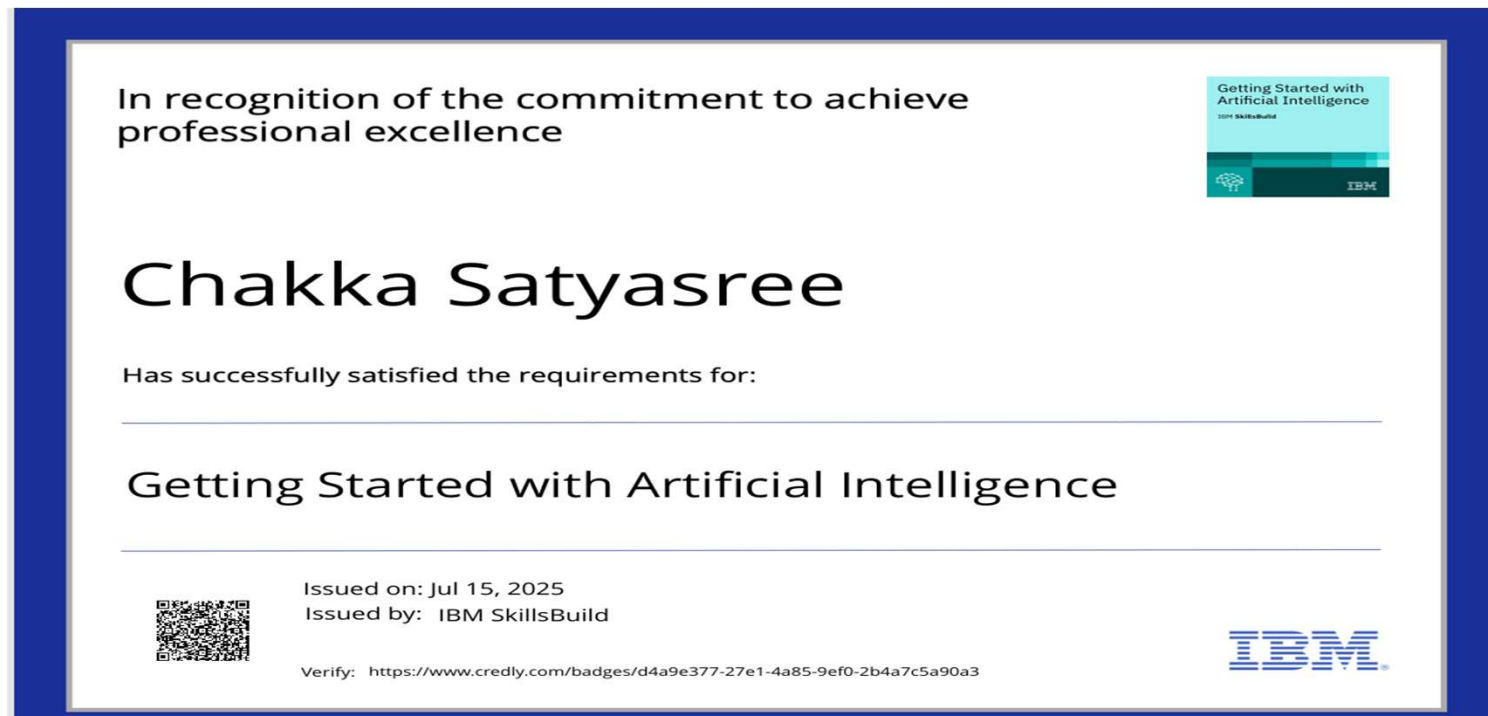
- Allow multiple researchers to work together on shared research projects inside the agent.

- **Advanced Data Visualization**

- Convert extracted research data into interactive graphs, charts, and dashboards.

IBM CERTIFICATIONS

Getting Started with Artificial Intelligence Certification



RAG Lab Certification

IBM SkillsBuild	Completion Certificate
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This certificate is presented to

Chakka Satyasree

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 17 Jul 2025 (GMT)	Learning hours: 20 mins
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Git hub link : <https://github.com/Chsatyasree3/Research-Agent>

THANK YOU