CAPSTONE PROJECT

RESEARCH AGENT

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OUTLINE

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PROBLEM STATEMENT

Manual management of growing network infrastructure is inefficient, error-prone, and time-consuming. Research engineers spend significant effort summarizing technical documents, extracting key information, and managing citations.

There is a need for an AI-based solution that automates research tasks in network automation, leveraging natural language processing to assist engineers.

PROPOSED SOLUTION

- A research agent powered by IBM Watsonx and Granite models that:
- - Summarizes network engineering documents
- - Answers domain-specific questions
- - Extracts citations and tools
- - Automates repetitive research tasks

- The system uses Watsonx.ai with a knowledge base (.docx) to simulate academic research support.

SYSTEM APPROACH

- Platform: IBM Watsonx.ai Studio (Lite Plan)
- Runtime: Granite Model
- Storage: IBM Cloud Object Storage
- Indexing: Retrieval-Augmented Generation (RAG)
- Integration: Watsonx Prompt Lab + Agent Builder
- Output: AI Agent chat interface for research queries

ALGORITHM & DEPLOYMENT

No traditional ML algorithm — instead uses RAG:

- Embeds document using vector index
- Watsonx agent uses LLM (Granite) to retrieve and generate answers
- Deployment in Watsonx agent space
- Custom instructions and behavior configured

Deployed successfully in London region with .docx uploaded as knowledge base.

RESULT

Agent preview

Research Agent 01:40 PM

Welcome to Research Agent

Watsonx-powered agent to explore, explain, and automate research in cloud and networking fields.

Type something...

Agent preview

You: 01:43 PM

What is network automation?

Research Agent 01:43 PM

What is Network Automation?

Network automation refers to the use of software to configure, manage, and optimize network infrastructure with minimal human intervention. As networks become larger, more dynamic, and more critical to daily operations, manual management becomes increasingly impractical. Automation not only reduces configuration errors but also enables rapid provisioning, policy enforcement, and performance tuning.

With the advent of artificial intelligence (AI), automation is evolving further. Large language models (LLMs), like those in IBM's Granite family, allow systems to understand complex inputs, summarize technical documents, and suggest actions based on context. This opens the door to intelligent research agents—systems that can process academic and technical literature, assist engineers, and even draft documentation.

▶ How did I get this answer?

Type something...

Agent preview

You: 01:44 PM

What are the benefits of using Watsonx in research?

Research Agent 01:44 PM

Benefits of Using Watsonx in Research

1. **Research Document Summarization**
   - Use Watsonx.ai with Granite models to automatically summarize network automation white papers, configuration guides, or standards (e.g., RFCs).
2. **Question Answering from Uploaded Documents**
   - Upload PDFs or Word files containing technical information. Use Watsonx's vector index and LLM to extract answers to custom research queries.
3. **Hypothesis Generation for Research Projects**
   - Prompt the research agent to suggest hypotheses or innovative approaches in network automation, based on existing uploaded literature.

Type something...

Deployment spaces / Research Agent Deployment / Research Agent /

Research Agent Deployed Online

API reference Test Preview

New chat +

You 02:22 PM

List the tools used in network automation.

Research Agent 02:22 PM

Here are the tools used in network automation:

1. **Ansible**: A powerful, agentless automation tool for network configuration using YAML playbooks. Widely adopted due to its simplicity and scalability.
2. **Terraform**: Enables infrastructure as code (IaC) and allows declarative provisioning of networking resources across cloud and on-prem environments.
3. **Python (Netmiko Library)**: Python scripts, combined with libraries like Netmiko, allow SSH-based automation of device configurations.
4. **Cisco DNA Center**: An enterprise SDN platform by Cisco offering centralized control, analytics, and policy-based automation.
5. **IBM Watsonx.ai and Granite Models**: Central to this project, Watsonx provides AI services powered by enterprise-

Type something...

CONCLUSION

The Watsonx-based research agent effectively automates summarization, Q&A, and citation tasks in network automation. It enhances research efficiency and supports engineers with quick, context-aware answers.

The project demonstrates practical use of IBM’s AI and cloud capabilities.

FUTURE SCOPE

1. **Multi-format Document Support**

   Expand the agent to handle PDFs, web pages, HTML reports, and JSON config files, not just DOCX.

2. **Voice-Enabled Queries**

   Integrate with speech-to-text to allow engineers to ask questions hands-free during network tasks.

3. **Real-time Monitoring Integration**

   Connect the research agent to live network dashboards (via APIs) for real-time fault detection and response suggestions.

4. **Advanced Visualization**

   Add visual outputs like network maps, diagrams, and tool usage charts in response to queries.

5. **Cross-Domain Expansion**

   Extend the agent's research capabilities to cybersecurity, cloud security, or edge computing topics.

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REFERENCES

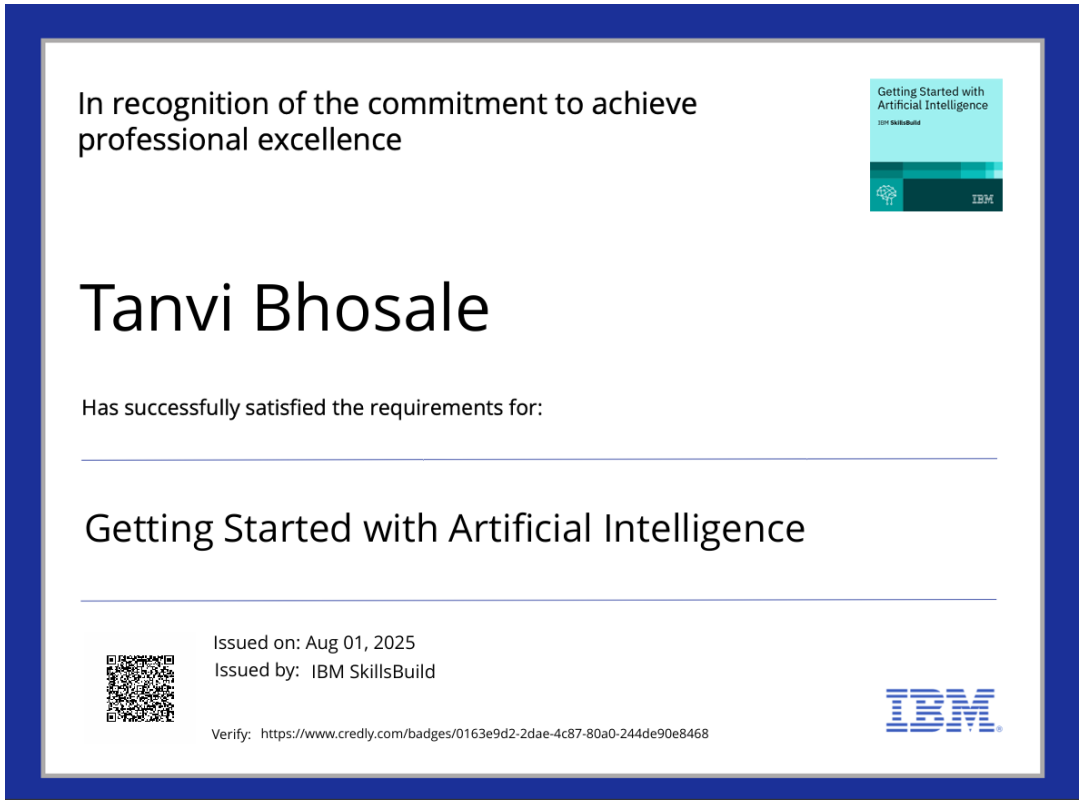
- **IBM Watsonx Overview**
https://www.ibm.com/products/watsonx

- **IBM Granite Foundation Models**
https://www.ibm.com/blog/introducing-granite-models-watsonx

- **Watsonx.ai Documentation (Prompt Lab, Agents, etc.)**
https://dataplatform.cloud.ibm.com/docs/content/wsj/analyze-data/watsonx.html

IBM CERTIFICATIONS

Getting Started with AI :-



IBM CERTIFICATIONS

Journey to Cloud :-

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RAG Lab :-

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