
CAPSTONE PROJECT

AGENTIC AI FOR PERSONALIZED COURSE PATHWAYS

Presented By:

**1. Rohitha Kavala-V.S.M College of Engineering-Computer
Science Engineering**

OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT

In today's digital learning environment, students face a major challenge in identifying the right learning path that aligns with their interests, current skill level, and long-term career goals. The abundance of unstructured online courses and lack of personalized guidance often lead to confusion, ineffective learning decisions, and low course completion rates. There is a need for an intelligent system that can interact with students, understand their preferences, and recommend a dynamic, personalized course roadmap that adapts to their evolving skills and goals over time.

PROPOSED SOLUTION

- The proposed system aims to address the challenge of guiding students through a suitable learning path that matches their interests, current skill level, and long-term goals. It involves developing an AI-powered educational assistant using Agentic AI techniques. The solution will consist of the following components:
- **User Interaction and Data Collection:**
 - The system interacts with students to understand their preferences such as Frontend Development, Cybersecurity, or UI/UX Design.
 - It collects data on their current knowledge level through input prompts or brief assessments.
- **Profile Assessment and Analysis:**
 - The AI uses natural language processing to build a structured user profile based on interests and experience.
 - This profile serves as the foundation for generating a personalized course path.
- **Course Roadmap Generation:**
 - The system recommends structured course sequences from reliable platforms like IBM SkillsBuild, Coursera, and NPTEL.
 - These recommendations are arranged from beginner to advanced levels based on the user's background.
- **Adaptive Learning Feedback Loop:**
 - As students progress, the AI updates the roadmap using their activity and learning feedback.
 - It ensures that the learning plan remains dynamic and personalized over time.
- **Deployment and Infrastructure:**
 - The solution is built using IBM Watsonx.ai and deployed via IBM Cloud Lite services.
 - IBM Granite models and Watsonx Runtime are used to deliver intelligent, real-time responses.

SYSTEM APPROACH


- Frontend Development:
 - Designed using HTML, CSS, and Bootstrap to ensure a clean, responsive user interface.
 - The interface allows students to input their interests and view personalized course roadmaps.
- Backend Integration:
 - Built using Node.js or Python (Flask), enabling interaction between the UI and the AI model.
 - Handles user session management, input processing, and API integration with the AI model.
- AI Agent Framework:
 - Utilizes IBM Watsonx.ai to create and train the agent using Agentic AI principles.
 - Uses IBM Granite large language models to power natural language interactions.
- Knowledge Retrieval:
 - Implements RAG (Retrieval-Augmented Generation) for context-aware and data-grounded responses.
 - Supports dynamic querying of course catalogs, learning resources, and feedback prompts.
- Deployment:
 - The full application is deployed using IBM Cloud Lite services.
 - IBM Watsonx Runtime is used to run the model and serve real-time agent responses.

ALGORITHM & DEPLOYMENT


- **Algorithm Selection:**
 - The system uses a Retrieval-Augmented Generation (RAG) approach combined with IBM Granite models.
 - RAG enables the agent to fetch relevant course data and generate personalized responses in natural language.
- **User Input Processing:**
 - The AI agent captures user inputs such as learning interests and self-assessed skill level.
 - It extracts key entities (e.g., “Frontend Development”, “Beginner”) for profile generation.
- **Course Mapping Logic:**
 - Based on user profile, a predefined knowledge base is queried to suggest appropriate learning paths.
 - Course pathways are ordered from beginner to advanced and mapped to learning outcomes.
- **Model Runtime Configuration:**
 - The deployed agent uses Watsonx.ai Runtime for live interactions with users.
 - Mistral or IBM Granite models are selected and configured for conversation handling.
- **Deployment Process:**
 - The AI agent is created and deployed via IBM Cloud Lite using Watsonx Studio sandbox.
 - API keys and deployment spaces are configured to host and access the agent in real time.

RESULT

- The deployed agent successfully recommends personalized course pathways based on user inputs such as interests, academic background, and career goals
- It responds in real-time, demonstrating context awareness and accuracy in suggesting relevant learning resources aligned with industry needs.
- This validates the effectiveness of Agentic AI in guiding learners toward suitable career paths.

 You 07:54 PM

I am a computer science student interested in artificial intelligence and cloud computing. What learning path do you recommend?

 watsonx Agent 07:54 PM

Based on the search results, it seems that there are various learning paths available for computer science students interested in artificial intelligence and cloud computing. Some options include:

1. Pursuing a general-purpose CS degree and focusing on courses related to databases and cloud computing.
2. Taking introductory courses in computer science and programming, followed by specialized courses in artificial intelligence and machine learning.
3. Exploring graduate programs in computer science that offer specializations in areas such as artificial intelligence, data analytics, cloud computing, and software engineering.
4. Considering online courses or certifications in cloud computing, machine learning, and artificial intelligence.

Some specific resources that may be helpful include:

- The School of Computing at Binghamton University, which offers courses in machine learning, cybersecurity, cloud computing, data science, and mobile computing.
- The Computer Science and Engineering program at Stanford University, which offers courses in artificial intelligence.

Type something...

➤

CONCLUSION

- **Summary of the Project:**

The proposed AI-based solution successfully addresses the challenge students face in choosing the right learning path by introducing a personalized, intelligent assistant. The agent engages in natural language conversations with students, understands their interests and current knowledge level, and generates a structured course roadmap tailored to their goals. This approach helps students navigate through the vast pool of online resources in a more organized and effective manner.

- **Effectiveness of the Solution:**

By leveraging IBM Watsonx.ai and Granite foundation models, the agent delivers accurate and relevant course recommendations. Its ability to adapt the learning pathway dynamically based on user feedback makes it a scalable and intelligent solution. The project demonstrates the practical application of Agentic AI in solving real educational challenges and sets a strong foundation for enhancing personalized learning in academic environments.

FUTURE SCOPE

- **Enhancements and Expansions:**

The system can be enhanced by integrating voice-based interaction using IBM Watson Speech Services to support hands-free communication with the agent. Additional features such as resume parsing and academic performance analysis can help tailor learning paths more precisely to individual user profiles. The AI can also be upgraded to recommend certifications, hands-on project modules, and internship opportunities from platforms like IBM SkillsBuild, Internshala, or NPTEL, thus aligning learning with career objectives.

- **Scalability and Inclusivity:**

To ensure broader accessibility, the system can be extended with multilingual support, enabling interaction in regional languages and improving inclusivity for diverse learners. The platform can also be implemented at the institutional level, assisting academic advisors in guiding students efficiently. Over time, this AI-driven mentor could evolve into a comprehensive, intelligent learning companion that not only recommends learning paths but also tracks progress, provides motivation, and continuously adapts to students' evolving interests and goals.

REFERENCES

- BM Watsonx.ai Documentation – <https://www.ibm.com/products/watsonx-ai>
- IBM Granite Foundation Models – <https://www.ibm.com/blogs/research/2023/05/granite-models>
- Meta AI (2020). Retrieval-Augmented Generation (RAG).
- IBM SkillsBuild Platform <https://skillsbuild.org>
- NPTEL Online Courses – <https://nptel.ac.in>
- Coursera – <https://www.coursera.org>
- Edunet Foundation. Problem Statements – IBM SkillsBuild for Academia (2025)

IBM CERTIFICATIONS

In recognition of the commitment to achieve
professional excellence



Rohitha Kavala

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence



Issued on: Jul 16, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/8cce1464-01c7-4065-9a1d-e18af4fa4b7b>



IBM CERTIFICATIONS

In recognition of the commitment to achieve
professional excellence



Rohitha Kavala

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution



Issued on: Jul 16, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/7488ae8b-c14b-4e59-b4d8-07dfe43640e4>



IBM CERTIFICATIONS

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

Rohitha Kavala

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