CAPSTONE PROJECT

PERSONALIZED COURSE AGENT

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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 have access to countless courses and resources, yet many struggle to choose the right learning path based on their interests and skill levels. This often leads to confusion, lack of direction, and wasted time. The crucial part is providing a personalized and structured course pathway tailored to each learner's background and goals. Designing an AI-based system that can recommend such learning paths dynamically becomes essential for improving student outcomes and engagement.

PROPOSED SOLUTION

- **The proposed system aims to solve the challenge of delivering personalized learning paths for students based on their interests and skill levels. This is achieved through the use of IBM Watsonx Agentic AI and large language models. The solution consists of the following components:**
- **User Input Collection:**
  - **Accepts user inputs such as learning interest (e.g., AI, Cybersecurity) and skill level (Beginner, Intermediate, Advanced).**
  - **Supports natural language queries like "I'm a beginner interested in Web Development."**
- **Prompt Engineering:**
  - **Carefully designed prompt instructs the agent to return a 4-step learning path.**
  - **Ensures each step appears on a new line with a one-line explanation**
  - **.Prevents extra text using clear constraints in the prompt.**
- **AI Model (LLM Integration):**
  - **Uses IBM Watsonx's foundation model (Mistral or Granite) to process input and generate responses.**
  - **The model follows the prompt and delivers output in structured, readable format.**
- **Deployment:**
  - **Agent is deployed through IBM Watsonx Runtime.**
  - **Deployment Space (course_pathway_1) is created on IBM Cloud for production.**
  - **Users can interact with the agent using the Preview interface.**
- **Evaluation:**
  - **Responses are manually tested for quality, clarity, and personalization.**
  - **Prompt and model performance improved based on observed output behavior.**
  - Result:

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SYSTEM APPROACH

System Requirements:

- IBM Cloud account (Lite Tier – Free)
- Internet browser (Chrome/Edge recommended)
- Watsonx.ai access with agentic lab features enabled
- Basic knowledge of prompt engineering and AI agents

Services and Tools Used:

- Watsonx.ai: To build, test, and deploy the AI agent
- Watsonx.ai Runtime: Required to run the agent and serve predictions
- IBM Deployment Space: Used to manage and preview the deployed agent

Libraries:

- json – to handle data exchange formats

ALGORITHM & DEPLOYMENT

Algorithm Selection:

- Instead of a traditional ML algorithm, this system uses a Large Language Model (LLM) such as Mistral (or IBM Granite) integrated via IBM Watsonx.ai Agentic AI Lab.The model was chosen for its ability to understand natural language input and generate contextually relevant, structured output — making it ideal for personalized learning path generation

.Data Input:

- The system does not require training data. Instead, it processes user-provided natural language input in real time. Input includes:
  - Interest area (e.g., Data Science, Cybersecurity)
  - Skill level (e.g., Beginner, Intermediate, Advanced)
- These serve as implicit features interpreted by the model during inference.

Training Process:

- The LLM is not trained by the user but guided using prompt engineering. The prompt acts as the algorithmic logic, instructing the model to:
  - Output exactly 4 learning steps
  - Use a consistent line-by-line format
  - Avoid unnecessary explanation or closing statements
- This approach removes the need for model training, hyperparameter tuning, or evaluation metrics typically used in supervised learning

Prediction Process:

- When a user enters input (e.g., “I’m a beginner interested in AI”), the model:
  - Parses the user’s intent and experience level
  - Applies the logic embedded in the prompt
  - Outputs a structured 4-step roadmap with one-line explanations
- The process is real-time, interactive, and does not rely on stored or historical data.

RESULT

- The AI agent responds with a 4-step personalized learning roadmap based on user input (interest + skill level).
- The output format is consistent and follows:
  - Step X: [Topic] – [Short explanation]
- The agent is deployed in IBM Watsonx.ai and tested using the Preview interface.
- The results are evaluated based on format accuracy, topic relevance, and consistency across domains.

Build

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

Setup

Configuration

Framework: LangGraph

Architecture: ReAct

Instructions

Advanced configuration

You are a helpful learning advisor. The user will tell you their interest and skill level .Based on that, generate a personalized 4 step learning roadmap.

Knowledge

Tools

Add a tool

Create custom tool

Added tools (3)

Agent preview

You: 11:40 PM

I'm a beginner interested in cybersecurity

watsonx Agent 11:40 PM

Here's a 4-step learning roadmap for a beginner interested in cybersecurity:

Step 1: Introduction to Cybersecurity Start with the basics of cybersecurity, including network vulnerabilities, cybersecurity, and threat analysis. Take the free online course "Introduction to Cybersecurity" by Cisco to get a comprehensive overview of the field.

Step 2: Fundamentals of Cybersecurity Learn the fundamentals of cybersecurity, including threat analysis and protection strategies. Take the course "Top Cybersecurity Courses for Beginners" on Coursera to understand the essentials of digital security.

Step 3: Practical Skills Gain practical skills in cybersecurity by learning about system administration, network engineering, incident response, and forensics. Take the course "Cybersecurity Courses For Beginners" by Cybrary to get hands-on experience in these areas.

Step 4: Specialization Specialize in a specific area of cybersecurity, such as ethical hacking or threat detection. Take the course "Cyber Security For Beginners: A Basic Guide" by Simplilearn to learn about the complex subject of cybersecurity and its various disciplines.

Remember, learning cybersecurity is a continuous process, and it's essential to stay up-to-date with the latest developments in the field. Start with the basics, build your skills, and specialize in a specific area to become a proficient cybersecurity professional.

Type something...

CONCLUSION

- The project successfully implements an Agentic AI assistant using IBM Watsonx to generate personalized 4-step learning roadmaps.
- The agent responds accurately based on user-provided interest and skill level in natural language.
- Prompt engineering played a key role in ensuring the output was well-formatted and free of extra content.
- The solution was deployed on IBM Cloud and tested using the Watsonx Preview interface.
- This no-code, LLM-powered system demonstrates the potential of Agentic AI in personalized education and career planning.

FUTURE SCOPE

- Multilingual Support: Enable the agent to respond in Indian languages (e.g., Telugu, Hindi, Tamil) for regional accessibility.
- Feedback Loop: Add a feedback mechanism to improve learning path quality based on user ratings.
- Voice Assistant Integration: Convert the agent into a chatbot with voice input/output using IBM Watson Speech APIs.
- Course Linking: Automatically attach course/video links (from Coursera, YouTube, etc.) to each learning step.
- Memory/History: Allow the agent to remember previous user inputs and progress.
- UI Integration: Connect the agent to a Streamlit or web dashboard for a richer user experience.

REFERENCES

- IBM Watsonx.ai Documentation – https://www.ibm.com/cloud/watsonx-ai
- IBM Cloud – https://cloud.ibm.com
- SB4Academia Problem Statements 2025 PDF (Problem #12)
- Prompt Engineering Best Practices – OpenAI, Hugging Face
- IBM SkillsBuild & Edunet Portal
- Screenshots and outputs from the deployed Watsonx agent

IBM CERTIFICATIONS

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Has successfully satisfied the requirements for:

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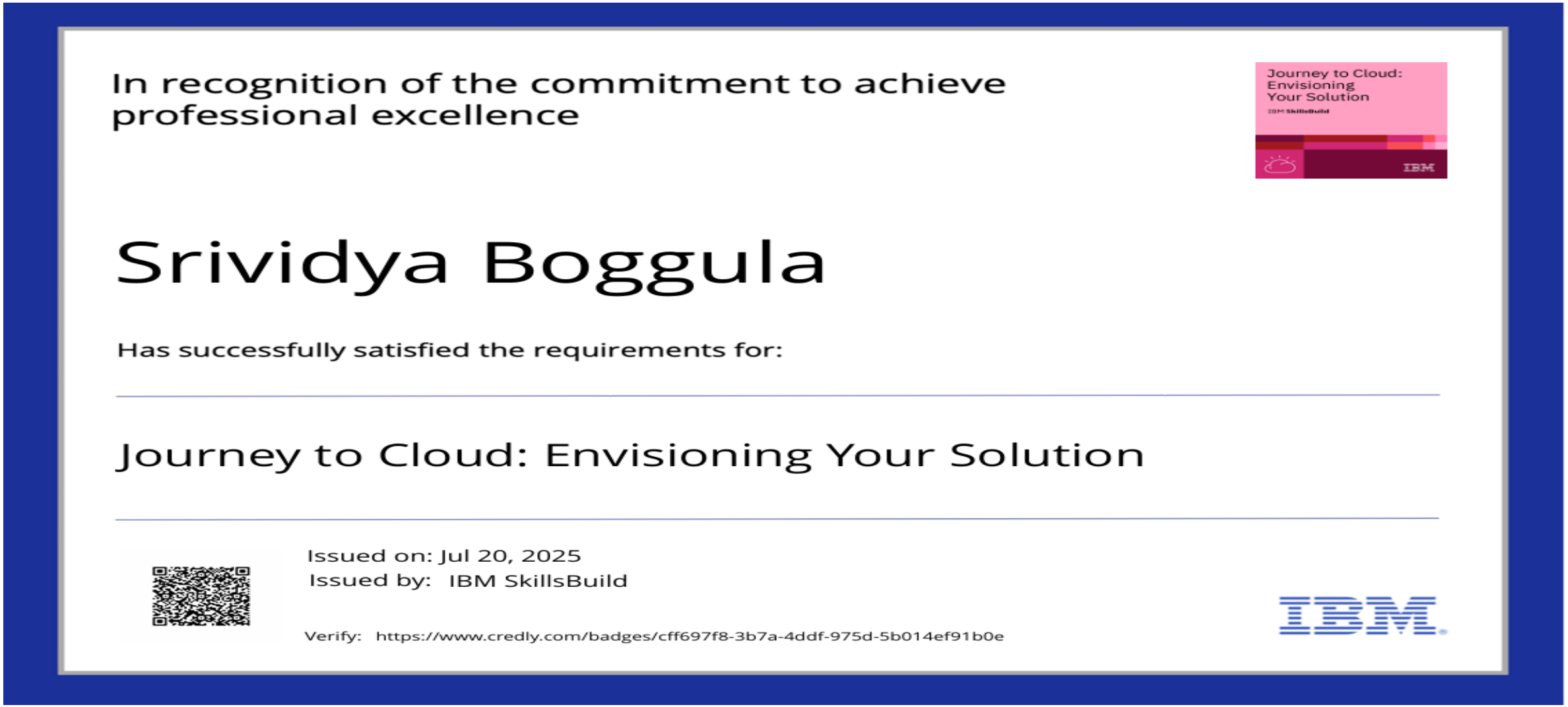

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IBM **SkillsBuild** Completion Certificate

This certificate is presented to

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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

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THANK YOU

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