CAPSTONE PROJECT

LEARNMATE - AGENTIC AI FOR PERSONALIZED COURSE PATHWAYS

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OUTLINE

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PROBLEM STATEMENT

Example: The online education space is saturated with thousands of platforms and courses, often leaving students confused and directionless. Without proper guidance, many learners pick courses that don't align with their career aspirations or current skill levels. Traditional academic counseling is limited in scalability, and learners need a modern, AI-powered solution that continuously adapts to their evolving interests and learning style.

PROPOSED SOLUTION

- LearnMate proposes an intelligent, agentic AI-based solution that acts as a dynamic course advisor for students seeking clarity in their learning paths. Unlike static recommendation engines, LearnMate operates in an interactive and adaptive fashion, using powerful large language models to:

- Engage in natural language conversations with users to understand their goals, current knowledge level, and preferred learning domains

- Generate a structured and evolving roadmap tailored to the user's career aspirations (e.g., Data Scientist, Cybersecurity Analyst, Frontend Developer)

- Recommend high-quality resources including online courses, certifications, tools, and practice platforms mapped to the learner's journey

- Continuously adapt the roadmap based on the user's progress, feedback, or shifting interests over time

- Provide monthly or milestone-based breakdowns that are digestible, practical, and goal-oriented

- Encourage certifications from recognized bodies (e.g., IBM, Google, CompTIA) that enhance job readiness

- The system relies on IBM Watsonx Granite language models for intelligent text generation and user understanding. It mimics expert human guidance by synthesizing vast knowledge from course catalogs, certification frameworks, and learning pathways into actionable study plans customized per individual.

- LearnMate offers a scalable, cloud-deployable solution that can empower educational institutions, online platforms, or self-learners with real-time, personalized AI coaching support.

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SYSTEM APPROACH

Tools and Technologies Used:

- IBM Watsonx.ai: LLM experimentation and prompt testing

- IBM Granite Model: Context-aware roadmap generation

- Python: API integration and local testing

- IBM Cloud Object Storage: To manage prompt and output assets

- GitHub: Version control, collaboration, and project documentation

Libraries Used:

- `requests`: To send prompt data to the Watsonx API

- `json`: For parsing and formatting model responses

- `dotenv`: For secure API key management (optional)

Workflow:

- Define user personas and inputs

- Develop prompt templates for varied learning domains

- Test prompt accuracy and diversity using Watsonx

- Extract structured outputs and format them into roadmap objects

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ALGORITHM & DEPLOYMENT

- **Process Flow:**

- User submits query such as "I want to become a cloud architect"

- Prompt engineered for IBM Granite instructs the model to:

  - Analyze the input

  - Select relevant domains, tools, and certifications

  - Build a progressive monthly plan

- The response includes a timeline-based learning roadmap with tools, topics, and platforms

- The generated response is returned via the Watsonx interface or consumed via Python code

- **Deployment:**

- Prompt tested and deployed via Watsonx Prompt Lab

- Output previewed in JSON format and via chat simulation

- Can be embedded into websites, learning dashboards, or Slack bots

- Future version to include API endpoints using IBM Cloud Functions or App Runtime

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RESULT

IBM watsonx

Upgrade

SUJAY SARVESH K K's Acc... ⌄   Dallas ⌄   SK

...jects / SUJAY SARVESH's sandbox / CourseAdvisorPrompt

AI guardrails off

New prompt +   Deploy

| Chat | Structured | Freeform |

AI   Model: granite-3-3-8b-instruct ⌄

SK You: 01:58 AM

Act like an AI course advisor. I am a student who is a beginner in both Artificial Intelligence and Cybersecurity. Suggest a personalized 6-month learning roadmap that can help me become job-ready. Include key topics, tools, certifications, and suggested platforms for each month.

watsonx 01:58 AM

6-Month Learning Roadmap for Beginners in AI and Cybersecurity:

Month 1-2: Foundations of AI and Cybersecurity

Topics:

- Introduction to AI: History, types, and applications
- Basic programming concepts (Python)
- Introduction to Cybersecurity: Principles, threats, and vulnerabilities

Tools:

- Python (Jupyter Notebook)
- Virtual machines (VirtualBox or VMware)

Platforms:

- Coursera: "AI For Everyone" by Andrew Ng, "Python for Everybody" by University of Michigan
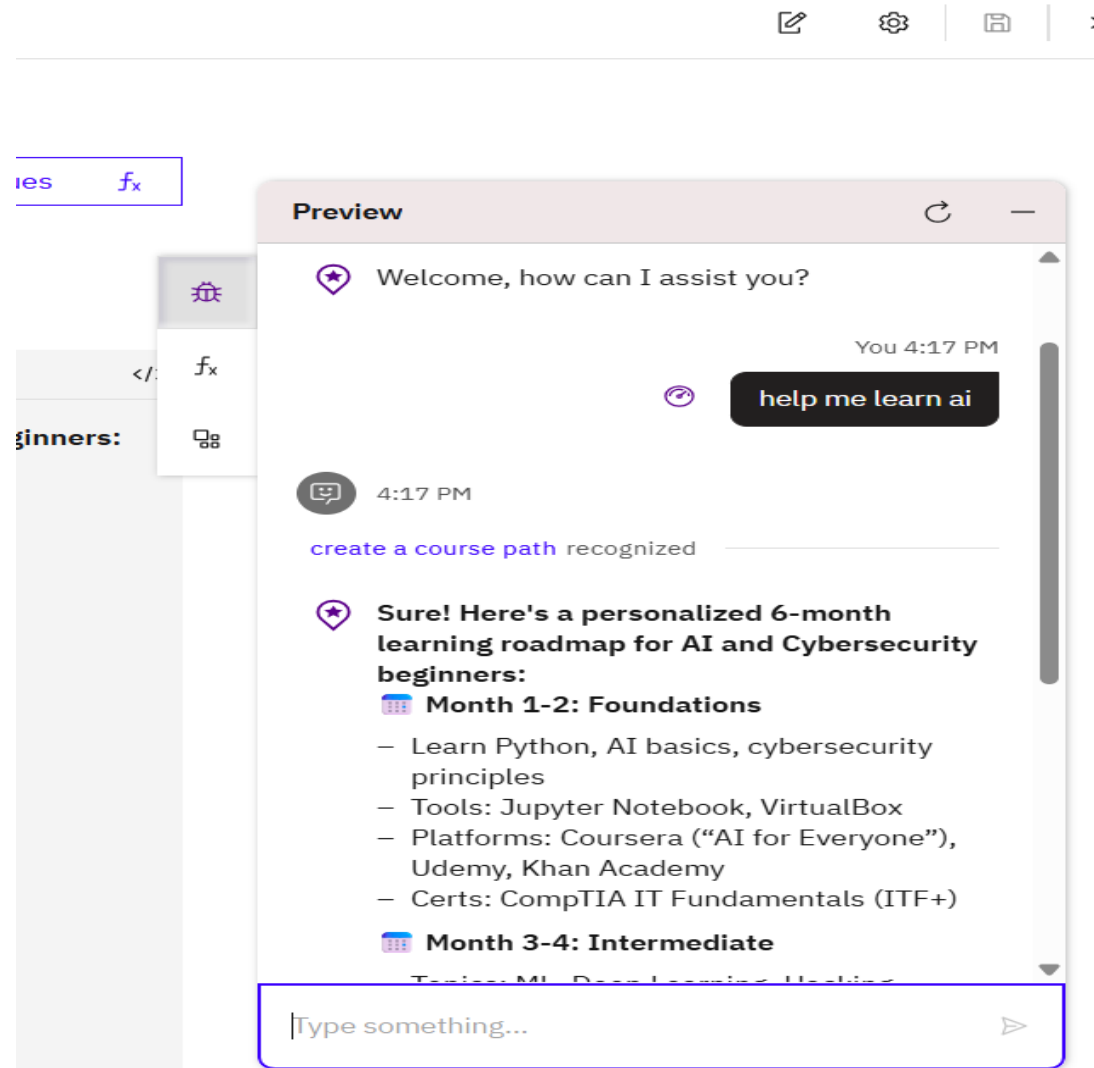
View code ⓘ

| Curl | Node.js | **Python** |

```python
import requests

url = "https://us-
south.ml.cloud.ibm.com/ml/v1/text/ch
version=2023-05-29"

body = {
    "messages":
[{"role":"user","content":
[{"type":"text","text":"Act
like an AI course advisor. I
am a student who is a
beginner in both Artificial
Intelligence and
Cybersecurity. Suggest a
personalized 6-month learning
roadmap that can help me
become job-ready. Include key
topics, tools,
certifications, and suggested
platforms for each
month."}]},
{"role":"assistant","content":"6-
Month Learning Roadmap for
Beginners in AI and
Cybersecurity:\n\n**Month 1-
2: Foundations of AI and
```

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LLM-integrated Watsonx Assistant conversation with LLM support via Granite

CONCLUSION

- LearnMate effectively showcases how an Agentic AI assistant can guide students in their learning journey with minimal manual intervention. With powerful LLMs like IBM Granite, it becomes possible to personalize learning at scale, supporting thousands of learners at once. The roadmap generation was highly contextual, meaningful, and tailored to each learning goal. The project also demonstrated prompt engineering, AI integration, and dynamic roadmap generation within a cloud-native environment.

FUTURE SCOPE

- Enable student login and session history storage

- Add skill quizzes to fine-tune roadmap difficulty

- Include milestone tracking and progress visualization

- Embed career mapping with job role matching (e.g., Road to Backend Developer)

- Add voice-to-text and chat UI for accessibility

- Integrate with external APIs such as Coursera, LinkedIn Learning, and job portals

- Enable feedback loop to retrain prompts based on user success

REFERENCES

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

- IBM Granite Model documentation

- Prompt Engineering resources from IBM

- AI research on LLMs and personalization

- Course catalogs from Coursera, edX, Udemy

- Agentic AI design principles and use cases (OpenAI, Microsoft Research)

IBM CERTIFICATIONS

Getting Started With Artificial Intelligence

In recognition of the commitment to achieve professional excellence

Getting Started with Artificial Intelligence
IBM SkillsBuild

SUJAY SARVESH K K

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence

Issued on: Jul 15, 2025
Issued by: IBM SkillsBuild

Verify: https://www.credly.com/badges/8b3795b4-3669-4954-a490-cabc774af9db

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IBM CERTIFICATIONS

Journey to cloud

In recognition of the commitment to achieve professional excellence

Journey to Cloud: Envisioning Your Solution
IBM SkillsBuild

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Has successfully satisfied the requirements for:

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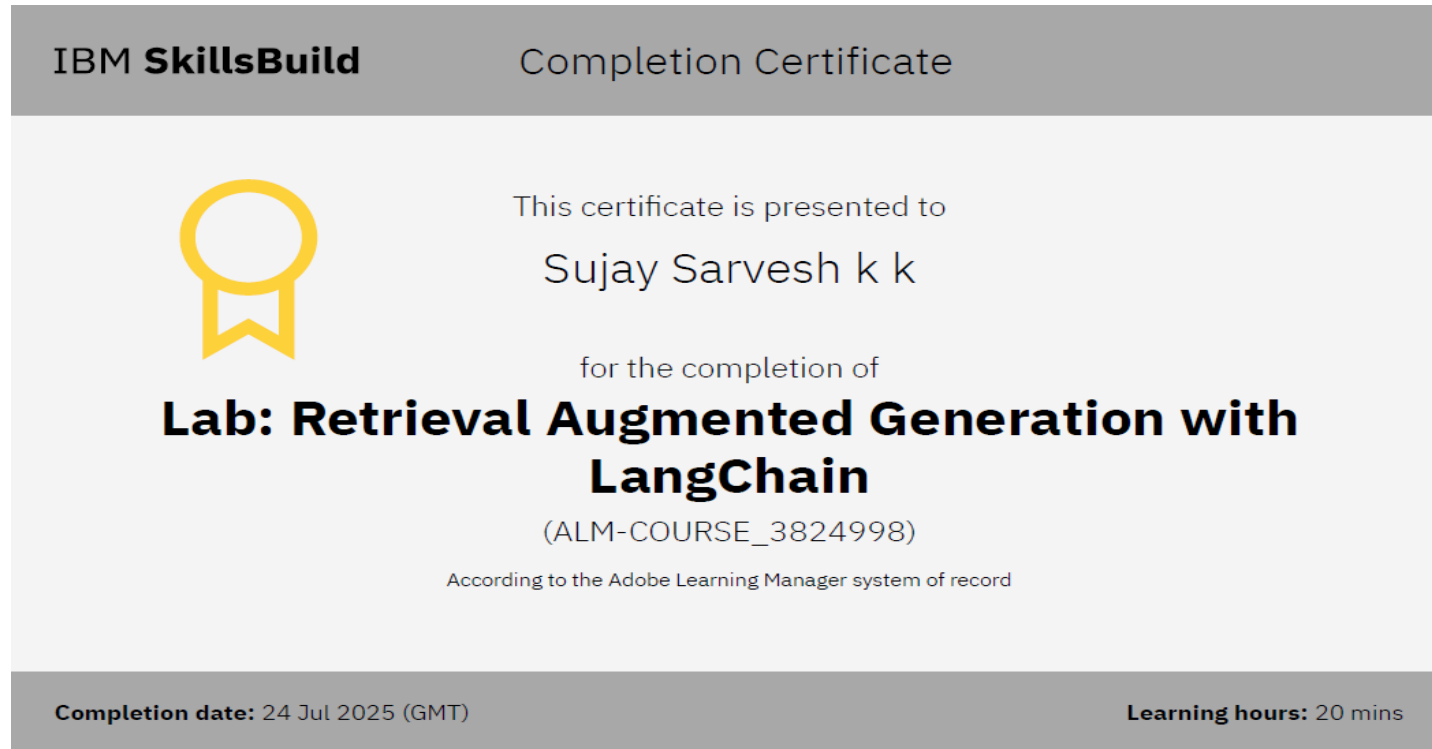Issued by: IBM SkillsBuild

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RAG LAB

THANK YOU

Let AI guide your learning journey Empowering learners with personalization, flexibility, and clarity — powered by IBM Granite.