
CAPSTONE PROJECT

LEARNMATE: AN AGENTIC AI FOR PERSONALIZED LEARNING ROADMAPS

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*A project developed during the IBM SkillBuild Internship
program in collaboration with Edunet Foundation.*

OUTLINE

- **Problem Statement**
- **Proposed System/Solution**
- **System Development Approach (Technology Used)**
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT

In today's digital age, students are overwhelmed by a vast ocean of online courses. This abundance, paradoxically, creates significant barriers:

- **Choice Paralysis:** The sheer volume of options leads to confusion and indecision.
- **Unstructured Learning:** Without clear guidance, students often jump between resources, resulting in fragmented knowledge and inefficient skill development.
- **Lack of Personalization:** Generic learning paths fail to account for an individual's unique career goals, existing skills, or learning pace, leading to disengagement and wasted effort.

PROPOSED SOLUTION

LearnMate is an intelligent agent designed to cut through the noise, acting as a personal AI learning coach.

- **How It Works:** LearnMate engages students through a simple, interactive interface to understand three key inputs:
- **Career Aspiration:** What is your target role? (e.g., *Frontend Developer*)
- **Current Proficiency:** What skills do you already possess? (e.g., *HTML, CSS*)
- **Time Commitment:** How many hours can you dedicate weekly? (e.g., *8 hours*)

Based on this, the AI generates a comprehensive, **12-week personalized roadmap** that is both actionable and realistic.

SYSTEM APPROACH

We adopted a modern, serverless architecture to ensure scalability, maintainability, and low operational overhead.

- **Frontend:** A lightweight, static web application built with **HTML, CSS, and vanilla JavaScript**. Hosted globally via **GitHub Pages** for fast, reliable access.
- **Backend (CORS Proxy):** A **Flask API** deployed as a web service on **Render.com**. Its primary role is to securely handle requests from the frontend, manage API keys, and communicate with the IBM Watsonx service, effectively bypassing browser-based CORS restrictions.
- **AI Engine:** The core intelligence is powered by **IBM Watsonx**, which provides access to state-of-the-art **Granite Foundation Models**.

AI MODEL & DEPLOYMENT STRATEGY

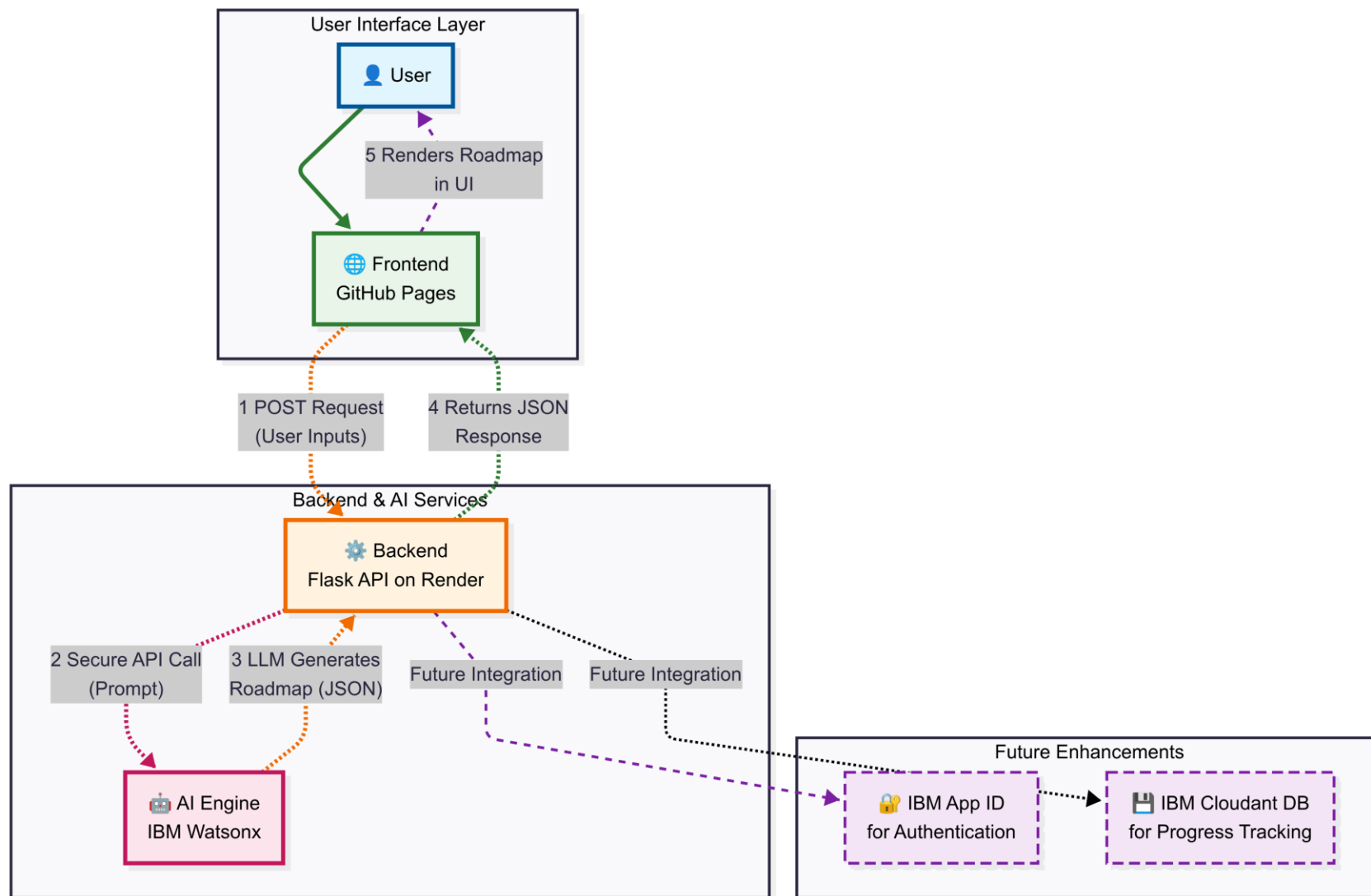
Model Selection & Prompt Engineering:

- **Model:** I utilized the **Mistral Large** model available through IBM Watsonx for its strong instruction-following capabilities and nuanced language generation.
- **Algorithm:** The system is driven by **dynamic prompt engineering**. User inputs are programmatically inserted into a carefully structured prompt template, which instructs the LLM to generate a response in a clean, predictable **JSON format**. This ensures the data can be easily parsed and rendered by the frontend.

Deployment Pipeline:

1. The Flask API is containerized and deployed on **Render**, which automatically builds and serves the application upon a git push.
2. The static frontend is deployed via **GitHub Pages**, which triggers a rebuild whenever changes are pushed to the main branch.

AI MODEL & DEPLOYMENT STRATEGY



RESULT

The system successfully generates a detailed, week-by-week learning plan tailored to the user's inputs.

- **Key Output Features:**
- **Weekly Modules:** Clear topics are assigned for each week.
- **Curated Resources:** Links to high-quality, free resources like MDN Docs, freeCodeCamp, etc.
- **Project-Based Milestones:** Actionable mini-projects to solidify learning (e.g., "Build a JavaScript To-Do List").
- **Time Allocation:** Estimated hours to complete the week's tasks, aligned with the user's availability.

Demo Video: <https://drive.google.com/file/d/1Wmqrih0biQvXc6gn8cVsubUEes883tvh/view?usp=sharing>

RESULT

IBM watsonx

Upgrade ⓘ 🔔

Mohammed Arfath Riyaz's ... ▾

Dallas ▾

MR

Projects / LearnMateAI / LearnMate

Share feedback ⓘ

Autosaved 3:52 PM

New agent +

Deploy 🔗 🔒 ⓘ

Saved agents

From LearnMateAI

 **Sous Chef**
Generating tasty recipe ideas based on the ingredients they...

Build

AI Model: mistral-large ⚠️ ▾

⚙️ ▾

Setup ▾

Configuration ▴

Framework Architecture

LangGraph ▾ ReAct ▾

Instructions [Advanced configuration](#)

Generate a 12-week personalized learning roadmap using free online resources. For each week, include:

- Topics to learn
- Specific online courses or tutorials
- A hands-on project idea

Knowledge ▾

Tools ▾

Agent preview



Sample questions

I want to become a frontend developer. I know HTML and CSS. I can study 8 hours per week. →

I want to become a cybersecurity analyst. I know Python and Linux basics. I can study 6 hours per week. →

I want to become a data scientist. I have beginner experience in statistics. I can study 8 hours per week. →

I want to become a backend engineer. I am new to coding. I can study 12 hours per week. →

Type something... 🔍 ➤

RESULT

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Deployment spaces / learnmate-deploy / LearnMate /


LearnMate Deployed Online

API reference Test **Preview**

New chat +

LearnMate 03:59 PM

Welcome to LearnMate
An AI coach that creates 12-week personalized learning roadmaps based on student goals and skills



Quick start samples

I want to become a frontend developer. I know HTML and CSS. I can study 8 hours per week. →

I want to become a cybersecurity analyst. I know Python and Linux basics. I can study 6 hours per week. →

I want to become a data scientist. I have beginner experience in statistics. I can study 8 hours per week. →

I want to become a backend engineer. I am new to coding. I can study 12 hours per week. →

Type something... →

RESULT

IBM watsonx

Upgrade

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LearnMate

Deployed

Online

API referenceTestPreview

New chat +

M

You 04:02 PM

I want to become a cybersecurity analyst. I know Python and Linux basics. I can study 6 hours per week.

LearnMate 04:02 PM

12-Week Personalized Learning Roadmap for Becoming a Cybersecurity Analyst
Week 1: Introduction to Cybersecurity


- **Topics:** Basics of Cybersecurity, Importance of Cybersecurity
- **Courses/Tutorials:**
 - [Introduction to Cybersecurity by Cisco](#)
- **Project:** Write a blog post on the importance of cybersecurity in today's world.
- **Estimated Time:** 6 hours


Week 2: Cybersecurity Fundamentals

- **Topics:** Cybersecurity Principles, Threats and Vulnerabilities
- **Courses/Tutorials:**
 - [Cybersecurity for Everyone by University of Maryland](#)
- **Project:** Create a presentation on common cybersecurity threats.


Type something...

RESULT


 **LearnMate – Your AI Course Coach**

 Career Goal:

Frontend Developer


 Known Skills:


HTML, CSS

 Study Hours per Week:

8

Generate Roadmap

 **Your Personalized Roadmap:**

 Generating your personalized roadmap...

CONCLUSION

- LearnMate successfully demonstrates the power of Agentic AI in creating truly personalized educational experiences. By integrating powerful IBM Granite LLMs with a scalable cloud architecture, this project provides a tangible solution to a common challenge faced by modern learners.
- The key achievement is not just generating a plan, but providing a **structured, motivating, and efficient pathway** that empowers students to take control of their learning journey and achieve their career goals faster.

FUTURE SCOPE

This project serves as a strong foundation for several high-impact enhancements:

- **Stateful User Profiles:** Integrate **IBM Cloudant DB** to store user roadmaps and track progress over time.
- **Secure Authentication:** Implement user login and registration using **IBM App ID** to create a persistent, secure user experience.
- **Adaptive Learning:** Allow the roadmap to dynamically update based on user feedback (e.g., "this topic was too easy" or "I need more resources on X").
- **Enhanced Functionality:** Add features like **PDF export** for offline access and expand into other learning domains like Data Science or DevOps.

REFERENCES

Technical Documentation:

- IBM Watsonx.ai Documentation
- Render.com Deployment Guides
- GitHub Pages Official Documentation
- Flask & Flask-CORS Documentation

Guidance & Opportunity:

- Edunet Foundation & The IBM SkillBuild Internship Program

IBM CERTIFICATIONS

In recognition of the commitment to achieve
professional excellence



Mohammed Arfath R

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence



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IBM CERTIFICATIONS

IBM SkillsBuild	Completion Certificate
	<p>This certificate is presented to</p> <p>Mohammed Arfath R</p> <p>for the completion of</p> <p>Lab: Retrieval Augmented Generation with LangChain</p> <p>(ALM-COURSE_3824998)</p> <p>According to the Adobe Learning Manager system of record</p>
Completion date: 21 Jul 2025 (GMT)	Learning hours: 20 mins



THANK YOU