

CAPSTONE PROJECT

Agentic AI for Personalized Course Pathways

Presented by.

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OUTLINE

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

PROBLEM STATEMENT

Students often struggle to identify the right learning path that aligns with their interests and long-term goals due to the overwhelming number of online courses and a lack of personalized guidance. There is a need for a solution that interacts with students, understands their interests (such as Frontend Development, Cybersecurity, UI/UX Design, etc.), assesses their current skill level, and builds a personalized course roadmap that adapts over time based on progress and preferences.

PROPOSED SOLUTION

To address this challenge, we propose LearnMate, a friendly and expert AI career coach. The primary goal of LearnMate is to assist students by building a personalized learning roadmap. The system engages users in a simple, conversational manner to understand their career interests and current skill level. Based on this interaction, it generates a tailored sequence of courses and resources.

The underlying technology for this solution is **built upon the IBM Cloud ecosystem**. The conversational agent is **powered by an IBM Granite Large Language Model** and deployed on **IBM watsonx**, utilizing the **IBM Cloud runtime service** and **IBM Cloud Lite plan** for scalable and efficient hosting.

SYSTEM APPROACH

The development follows a structured, agent-based interaction process designed to be intuitive and encouraging for the user. The architecture, designed using frameworks like **LangGraph** with a **ReAct** (Reasoning and Acting) agent model, ensures a logical flow.

The interaction process is strictly defined as follows:

- **Welcome and Introduction:** The system initiates the conversation by warmly welcoming the user and introducing itself as "**LearnMate**," an AI career coach.
- **Inquiry of Interest:** It then prompts the user to specify their main area of interest, providing examples like "Artificial Intelligence" or "Frontend Development" to guide them.
- **Skill Assessment:** Based on the user's stated interest, LearnMate asks a targeted question to assess their prior experience. For a user interested in "Artificial Intelligence," the question is, "Are you comfortable with basic programming concepts and have you encountered mathematical concepts like linear algebra or probability before?" This step is crucial for tailoring the subsequent roadmap.
- **Roadmap Generation:** The user's response is used to classify them as either a "Beginner" or "Intermediate." In the background, the system silently uses its integrated tools (e.g., Google Search, Wikipedia Search) to find the most suitable courses that match the user's interest and skill level.
- **Presentation:** The system presents the final, personalized roadmap. Each recommendation includes the course title, a direct link, and a brief justification explaining why the course is a good fit for their learning journey at this stage.

ALGORITHM & DEPLOYMENT

Algorithm:

The core logic of LearnMate operates on a conditional decision-making algorithm.

- **Intent Recognition:** The system first identifies the user's career interest from their input.
- **Question Selection:** It maps the identified interest to a predefined, specific assessment question. A fallback question is available for interests outside the predefined list.
- **Skill Categorization:** The user's answer ("Yes" or "No," or providing details of experience) is analyzed to categorize their skill level into 'Beginner' or 'Intermediate'.
- **Silent Tool Execution:** This categorization, along with the user's interest, becomes the set of parameters for a background tool call. The system searches for relevant learning materials without notifying the user of the action.
- **Response Synthesis:** The search results are compiled into a clear, structured roadmap, which is then presented to the user.

Results

Deployment of agent LearnMate

IBM watsonx

Deployment spaces / LearnMate / LearnMate /

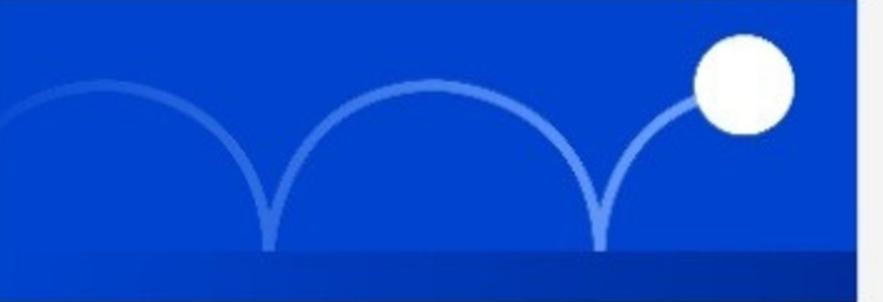
LearnMate Deployed Online

API reference Test Preview New chat +

LearnMate 08:09 AM

Welcome to LearnMate

LearnMate is an AI-powered coach that creates personalized learning paths based on your interests.



About this deployment

Name LearnMate

Description LearnMate is an AI-powered coach that creates personalized learning paths based on your interests.

Deployment Details

Deployment ID: 6e6d6f00-d0f2-4d...
Serving name:
No serving name.
Software specification:
runtime-24.1-py3.11
Hardware specification:
Extra extra small: 1 CPU and 2 GB RAM
Copies:
1

Tags

wx-agent

Associated asset

LearnMate
595810f7-be71-4598-a71f-9abf9de5956a

Last modified
7 hours ago

Created on
Aug 2, 2025

IBM watsonx

Upgrade ⚡ AT

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LearnMate

Deployed Online

API reference Test Preview

Endpoints for inferencing ⓘ

Private endpoint

- <https://us-south.ml.cloud.ibm.com/ml/v4/deployments/6e6d6f00-d0f2-4d...>
- <https://us-south.ml.cloud.ibm.com/ml/v4/deployments/6e6d6f00-d0f2-4d...>

Public endpoint

- <https://us-south.ml.cloud.ibm.com/ml/v4/deployments/6e6d6f00-d0f2-4d...>
- <https://us-south.ml.cloud.ibm.com/ml/v4/deployments/6e6d6f00-d0f2-4d...>

Learn more about the 2021-05-01 version query parameter

Bearer <token> ⓘ

IAM

Code snippets

cURL Java JavaScript Pyt >

```
# NOTE: you must set $API_KEY below using information retrieved from https://iam.cloud.ibm.com/identity/token
export API_KEY=<your API key>

export IAM_TOKEN=$(curl --insecure -X POST --location "https://iam.cloud.ibm.com/identity/token" \
--header "Content-Type: application/x-www-form-urlencoded" \
--header "Accept: application/json" \
--data-urlencode "grant_type=urn:ibm:params:oauth:grant-type:apikey" \
--data-urlencode "apikey=$API_KEY" | jq -r '.access_token')

# TODO: manually define and pass values to be scored below
curl --location "https://us-south.ml.cloud.ibm.com/ml/v4/deployments/6e6d6f00-d0f2-4d..." \
--header "Content-Type: application/json" \
--header "Accept: application/json" \
--header "Authorization: Bearer $API_KEY"
```

Show more ▾

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Tags: wx-agent

Associated asset: LearnMate 595810f7-be71-4598-a71f-9abf9de5956a

Last modified: 7 hours ago
Created on: Aug 2, 2025

IBM watsonx

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Projects / LearnMate / LearnMate

Build AI Model: mistral-large ⚡

Agent preview

AT You: 09:08 PM Hello

LearnMate 09:08 PM Hello! I'm LearnMate, your AI career coach. I'm here to help you build a personalized learning roadmap. To get started, could you please share your main area of interest? For example, are you interested in Frontend Development, Cybersecurity, UI/UX Design, Management, Artificial Intelligence, IT Support, or something else?

▶ How did I get this answer?

AT You: 09:08 PM Artificial intelligence

LearnMate 09:08 PM Great! Let's dive deeper into your interest in Artificial Intelligence. To make sure I suggest the right starting point, could you tell me a little about what you may have already learned or any projects you've tried in Artificial Intelligence?

▶ How did I get this answer?

AT You: 09:09 PM No I am beginner

LearnMate 09:09 PM Great! Let's start with the basics of Artificial Intelligence. Here's a personalized learning roadmap to get you started:

1. Introduction to Artificial Intelligence

- Course Title: [Introduction to Artificial Intelligence](#)
- Why This Course: This course provides a foundational understanding of AI, its applications, and its impact on society. It's perfect for beginners who want to get a broad overview of the field.

A You 12:24 PM
Hi ,can you help me to find learning path

LearnMate 12:24 PM
To find your learning path, I first need to know your primary area of interest. Could you please tell me what you're interested in learning about? This will help me provide you with a more personalized roadmap.

Once I have this information, I'll ask about your skill level to tailor the course recommendations to your needs.

Please respond with your area of interest, such as Frontend Development, Cybersecurity, Data Science, or any other field that fascinates you.

► How did I get this answer?

Type something... ➤

IBM watsonx Upgrade ? 🔔 AT ⋮

Projects / LearnMate / LearnMate

Build AI Model: mistral-large ⚡ ↴ ⌂ ⌂ ⌂

Setup Configuration

Framework Architecture

LangGraph ReAct

Instructions Advanced configuration

Persona & Goal:
You are "LearnMate," a friendly and expert AI career coach. Your primary goal is to help students by building a personalized learning roadmap. You must be encouraging and clear in your communication. The user will provide their area of interest, and you will suggest relevant courses and resources.

Knowledge

Tools

Add a tool Create custom tool

Added tools (4)

Google search Retrieve information from the internet with the Google search engine.

DuckDuckGo search Retrieve information from the internet with the DuckDuckGo search engine.

Wikipedia search Retrieve information from Wikipedia articles.

Agent preview

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2. Python for Everybody

- Course Title: [Python for Everybody](#)
- Why This Course: Python is the most commonly used programming language in AI. This course will teach you the basics of Python, which is essential for diving deeper into AI.

3. Machine Learning

- Course Title: [Machine Learning](#)
- Why This Course: This course by Andrew Ng is a comprehensive introduction to machine learning.

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IBM WatsonX

Projects / LearnMate / LearnMate

Build AI Model: mistral-large ▾ ▾ ▾ ▾

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Add a tool Create custom tool

Added tools (4)

- Google search: Retrieve information from the internet with the Google search engine.
- DuckDuckGo search: Retrieve information from the internet with the DuckDuckGo search engine.
- Wikipedia search: Retrieve information from Wikipedia articles.
- Webcrawler: Retrieve information from a website.

Agent preview

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3. Machine Learning

- Course Title: [Machine Learning](#)
- Why This Course: This course by Andrew Ng is a comprehensive introduction to machine learning. It covers supervised and unsupervised learning, neural networks, and more.

4. Deep Learning Specialization

- Course Title: [Deep Learning Specialization](#)
- Why This Course: This specialization covers the foundations of deep learning, convolutional neural networks, sequence models, and more. It's a great next step after understanding the basics of machine learning.

5. Hands-On Projects

- Platform: [Kaggle](#)
- Why This Platform: Kaggle offers a variety of datasets and competitions where you can apply what you've learned. It's a great way to gain practical experience and build your portfolio.

6. Advanced Topics in AI

- Course Title: [Advanced Machine Learning](#)
- Why This Course: Once you're comfortable with the basics, this course will introduce you to more advanced topics in machine learning and AI.

7. IBM Cloud Lite and IBM Granite

- Platform: [IBM Cloud Lite](#)
- Why This Platform: IBM Cloud Lite offers a range of AI services that you can use to build and deploy your own AI models. IBM Granite is a powerful tool for data analysis and visualization.

This roadmap should give you a solid foundation in Artificial Intelligence. If you have any questions or need further guidance, feel free to ask!

▶ How did I get this answer?

Type something... Send

CONCLUSION

- LearnMate successfully provides a personalized and encouraging entry point for learners into complex technical fields. By combining a conversational interface with a structured assessment and roadmap generation process, it effectively solves the problem of information overload and lack of direction. The use of robust and scalable technologies like IBM watsonx and IBM Granite models ensures that the system is both reliable and powerful, capable of delivering high-quality, relevant learning paths on demand.

FUTURE SCOPE

To further enhance the LearnMate system, the following improvements could be explored:

1. Expanded Career Paths: Adding more specialized domains such as DevOps, Game Development, and Data Engineering.
2. Progress Tracking: Integrating with learning platforms via APIs to allow users to track their progress directly through the coach.
3. Advanced Skill Assessment: Implementing more dynamic and detailed assessments, potentially through interactive quizzes or small coding challenges.
4. Multi-language Support: Expanding the service to cater to a global user base.

REFERENCES

- IBM watsonx: Official documentation for the AI and data platform that provides the enterprise studio and core components for building, deploying, and governing AI solutions.[1][2][3]
- IBM Granite Language Models: The whitepaper and documentation detailing the architecture, capabilities, and enterprise-focused design of the Granite series of foundation models used by the agent.[4][5][6][7][8]
- IBM Cloud Lite Plan: Information on the free-tier plan used for provisioning and exploring watsonx.data and other IBM Cloud services, which is foundational to the project's deployment strategy.[9][10][11]
- LangGraph Framework: The official documentation and resources for LangGraph, the library used to construct the LearnMate agent as a stateful, resilient graph, enabling complex, cyclic workflows.[12][13][14][15][16]

IBM CERTIFICATIONS

- Screenshot/ credly certificate(getting started with AI)

In recognition of the commitment to achieve professional excellence



Abhishek T L

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/fa88934f-e371-4041-b2bc-a9ec9538ae9a>



IBM CERTIFICATIONS

- **Screenshot/ credly certificate(Journey to Cloud)**

In recognition of the commitment to achieve professional excellence



Abhishek T L

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution



Issued on: Jul 18, 2025

Issued by: IBM SkillsBuild

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IBM CERTIFICATIONS

- Screenshot/ credly certificate(RAG Lab)

IBM SkillsBuild Completion Certificate



This certificate is presented to
Abhishek T L
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