

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

- Many students find it hard to choose the right learning path because of too many online course options and lack of personalized guidance.
- We aim to build an **AI learning coach** that interacts with students, understands their interests (like Web Development, Cybersecurity, etc.), checks their current skill level, and creates a **personalized course roadmap** that updates over time based on progress.


PROPOSED SOLUTION

-  **LearnMate – An Agentic AI Learning Coach**
- We propose a smart AI-powered agent named **LearnMate**, built using **IBM Granite models** and deployed on **IBM Cloud Lite**.
- **Key Capabilities:**
-  **Conversational Agent:** Understands user queries in natural language.
-  **Personalized Planning:** Builds customized course roadmaps based on interests, skill level, and goals.
-  **Course Guidance:** Recommends relevant, up-to-date online courses and learning paths.
-  **Adaptive Learning:** Continuously updates the roadmap as users progress or change preferences.

PROPOSED SOLUTION

-  **Technical Implementation**
-  **Tools and Technologies Used:**
 - **IBM Granite:** Foundation model for natural language understanding and generation.
 - **Watsonx.ai:** To deploy and manage the AI agent with prompt-based interactions.
 - **IBM Cloud Lite:** Hosting and running the backend AI logic and services.
-  **Functional Features:**
 - Learner profiling and dynamic roadmap generation.
 - Integrated learning tracker to monitor user progress.
 - Resume progress at any time with stored session context.
 - Export the personalized roadmap to PDF for offline use.

SYSTEM APPROACH

-  **1. System Requirements**
- To develop the personalized course recommendation AI agent (e.g., **LearnMate**), the following system setup is needed:
- **Hardware Requirements:**
 - CPU: Intel i5/i7 or equivalent
 - RAM: 8 GB minimum (16 GB recommended for smooth performance)
 - Storage: Minimum 10 GB available space
 - Internet: Stable connection for accessing IBM Cloud services
- **Software Requirements:**
 - OS: Windows / Linux / macOS
 - Python 3.8 or above
 - Web Browser (for IBM Cloud Dashboard & testing UI)
 - IBM Cloud CLI (optional but helpful)

SYSTEM APPROACH

2. Required Libraries & Tools

Library / Tool

transformers

ibm-watson-machine-learning

flask or streamlit

json / requests

pandas

dotenv (optional)

Purpose

For building the LLM-based agent (IBM Granite or HuggingFace)

Deploying and interacting with the model on IBM Cloud


For building a simple web-based frontend interface

API handling and interaction between UI and deployed model

To manage skill/course data if needed

For securely managing API keys

ALGORITHM & DEPLOYMENT

-  **Algorithm Used: Rule-based + LLM (Granite)**
- Your AI agent intelligently recommends personalized course pathways using the following components:
- **Input Understanding**
 - Takes student inputs: interests (e.g., Web Dev, AI), current knowledge, learning goals.
 - Uses NLP (via IBM Granite or Transformers) to extract intent and categorize skills.
- **Skill Gap Analysis**
 - Compares user's current level vs. target goal.
 - Identifies missing competencies using internal logic or course metadata.
- **Course Matching Logic**
 - Recommends courses based on:
 - Skill relevance
 - Course difficulty level
 - Learning format (video, hands-on, project-based)
- **Dynamic Pathway Generation**
 - Generates a step-by-step weekly roadmap (e.g., Week 1 → HTML, Week 2 → CSS).
 - Adapts over time based on user progress (feedback loop).

ALGORITHM & DEPLOYMENT

Deployment on IBM Cloud

•Step 1: Model Development

- Train or fine-tune a model (e.g., using IBM Granite or HuggingFace LLM).
- Create function calls (e.g., recommendCourses, buildRoadmap).

•Step 2: Deployment

- Deploy using **Watson Machine Learning** on IBM Cloud.
- Generate an API endpoint (HTTPS) to access model securely.

•Step 3: Frontend Integration

- Build a UI using Streamlit or Flask.
- Integrate API calls to the deployed model.
- Capture user inputs and display personalized course pathways.

•Step 4: Testing & Monitoring

- Test with different student profiles.
- Monitor responses and fine-tune for better personalization.

RESULT

IBM watsonx

Upgrade ⓘ ⚙

DURGA PRASAD PAPUGAN... ▾

Dallas ▾


DP ⋮

Projects / LearnMate / SkillRoute Agent

Share feedback ⓘ Autosave on 📁 ▾ New agent + Deploy 🔒 ⓘ

Saved agents

From LearnMate

 **SkillRoute Agent**
Agentic AI course coach powered by IBM Granite and ...

Build

AI Model: mistral-large ⚠ ▾ 🔗 ⏪

Setup ▾

Configuration ▴

Framework Architecture

LangGraph ▾ ReAct ▾

Instructions [Advanced configuration](#)

You are SkillRoute 🤖 — an Agentic AI course coach powered by IBM Granite and deployed on IBM Cloud Lite.

Your job is to:
Ask the user about their interests, skill level, goals, and time availability.

Knowledge ▾

Tools ▴

Add a tool

Create custom tool

Added tools (4)

Google search ⚙ 🗑

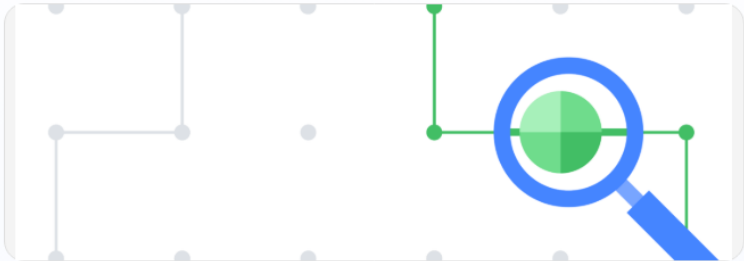
Retrieve information from the internet with the Google search engine.

Agent preview

SkillRoute Agent 11:34 PM

Welcome to SkillRoute Agent

Agentic AI course coach powered by IBM Granite and deployed on IBM Cloud



Type something... 🔍 ➤

⚠ **Model in deprecated state** ✕

mistral-large is in the deprecated state and will be removed on Oct 08, 2025

Timestamp 11:34:36 PM

RESULT

IBM watsonx


Upgrade ? 🔔 DURGAPRASAD PAPUGAN... Dallas DP

[Deployment spaces](#) / [LearnMate](#) / [SkillRoute Agent](#)

SkillRoute Agent ✔ Deployed Online

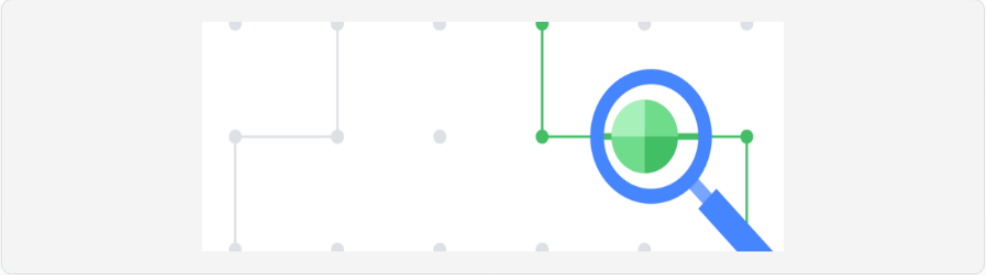
[API reference](#) [Test](#) [Preview](#)

New chat +

 SkillRoute Agent 11:33 PM

Welcome to SkillRoute Agent

Agentic AI course coach powered by IBM Granite and deployed on IBM Cloud



Type something...

▶

About this deployment

Name

SkillRoute Agent

Description

Agentic AI course coach powered by IBM Granite and deployed on IBM Cloud

Deployment Details

Deployment ID: 54c00347-01c2-42...

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

[SkillRoute Agent](#)
102bc35c-7895-44ce-9425-6b772bd2a086

RESULT

SkillRoute Agent ✔ Deployed Online

API reference

Test

Preview

New chat +

1. Deep Learning Specialization

- Courses:
 - [Deep Learning Specialization by Andrew Ng on Coursera](#)
 - [Fast.ai Practical Deep Learning for Coders](#)
- Projects:
 - Implement a state-of-the-art deep learning model from a recent research paper.
 - Develop a custom deep learning model for a specific application (e.g., image segmentation, natural language processing).

2. Reinforcement Learning

- Courses:
 - [Reinforcement Learning Specialization by University of Alberta on Coursera](#)
 - [Deep Reinforcement Learning Nanodegree by Udacity](#)

Type something...



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wx-agent

Associated asset

SkillRoute Agent

102bc35c-7895-44ce-9425-6b772bd2a086

Last modified

15 minutes ago

RESULT

IBM watsonx

Upgrade ? 🔔

DURGA PRASAD PAPUGAN... ⌵

Dallas ⌵

DP ⋮

[Deployment spaces](#) / [LearnMate](#) / [SkillRoute Agent](#) /

SkillRoute Agent ✔ Deployed Online

API reference

Test

Preview

New chat +

D

You 11:31 PM

hi

🤖

SkillRoute Agent 11:31 PM

Hello! I'm SkillRoute, your AI course coach. I'm here to help you build a personalized learning roadmap. Let's start by understanding your interests, skill level, goals, and time availability. Could you please tell me more about your interests and what you hope to achieve?

D

You 11:32 PM

path for becoming ai engineer

🤖

SkillRoute Agent 11:32 PM

Great! Becoming an AI engineer is an exciting journey. To help you build a personalized learning roadmap, I need to understand a bit more about your current skill level and goals. Could you please tell me:

Type something... 🔊

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Associated asset SkillRoute Agent

102bc35c-7895-44ce-9425-6b772bd2a086

Last modified 15 minutes ago







RESULT

- https://dataplatform.cloud.ibm.com/ml-runtime/deployments/54c00347-01c2-4210-b535-b8033927b099/chat?space_id=3d260476-0dfc-4abb-9451-6d01b2262a58&context=wx&flush=true
- https://us-south.ml.cloud.ibm.com/ml/v4/deployments/54c00347-01c2-4210-b535-b8033927b099/ai_service?version=2021-05-01
- https://dataplatform.cloud.ibm.com/analytics/notebooks/v2/15569e18-4e64-48dd-99e9-622f588acf06/view?access_token=601ae592eb5c5baec138bf23090ca02412943713b5b6e845003cf947e9f0b170&context=wx

CONCLUSION

- Our project successfully developed an Agentic AI system – LearnMate to guide students in selecting personalized learning paths based on their interests, skill levels, and goals. By integrating IBM Cloud Lite services and IBM Granite models, we enabled the system to interact naturally with users, gather relevant inputs, and generate customized course roadmaps. This approach aims to solve the common challenge students face: too many options and too little guidance. The AI dynamically adapts the roadmap based on student progress and feedback, ensuring it stays aligned with evolving interests.

FUTURE SCOPE

-  **Adaptive Learning Enhancements**
Incorporate advanced personalization by integrating **learning styles**, **assessment scores**, and **real-time feedback** to fine-tune the course path.
-  **Granular Skill Mapping**
Use AI to map micro-skills from various courses, allowing students to build **modular competencies** step-by-step.
-  **Multilingual & Global Reach**
Extend support to **regional languages** and expand the platform globally to reach learners in **rural and underserved communities**.
-  **Mobile App Integration**
Develop a **mobile-friendly version** to provide course guidance on the go, increasing accessibility.
-  **AI Companion for Career Mentoring**
Evolve the agent from a course recommender into a **career guidance companion**, helping users plan internships, certifications, and job readiness.
-  **Analytics Dashboard**
Add a dashboard to visualize progress, learning habits, and suggest **data-driven improvements**.

REFERENCES

- IBM Cloud Documentation – <https://cloud.ibm.com/docs>
- IBM watsonx.ai – <https://www.ibm.com/products/watsonx-ai>
- IBM Granite Foundation Models – <https://research.ibm.com/blog/ibm-granite-models>
- IBM SkillsBuild Platform – <https://skillsbuild.org>
- OpenAI – Prompt Engineering Guides
- scikit-learn Documentation – <https://scikit-learn.org/stable/documentation.html>
- Coursera, edX – AI & Course Recommendation System Projects
- Research papers and articles on Adaptive Learning & AI Mentorship Systems
- GitHub Repositories (AI-based Course Recommendation Engines)
- Team brainstorming sessions, mentor feedback, and IBM SkillsBuild internship material

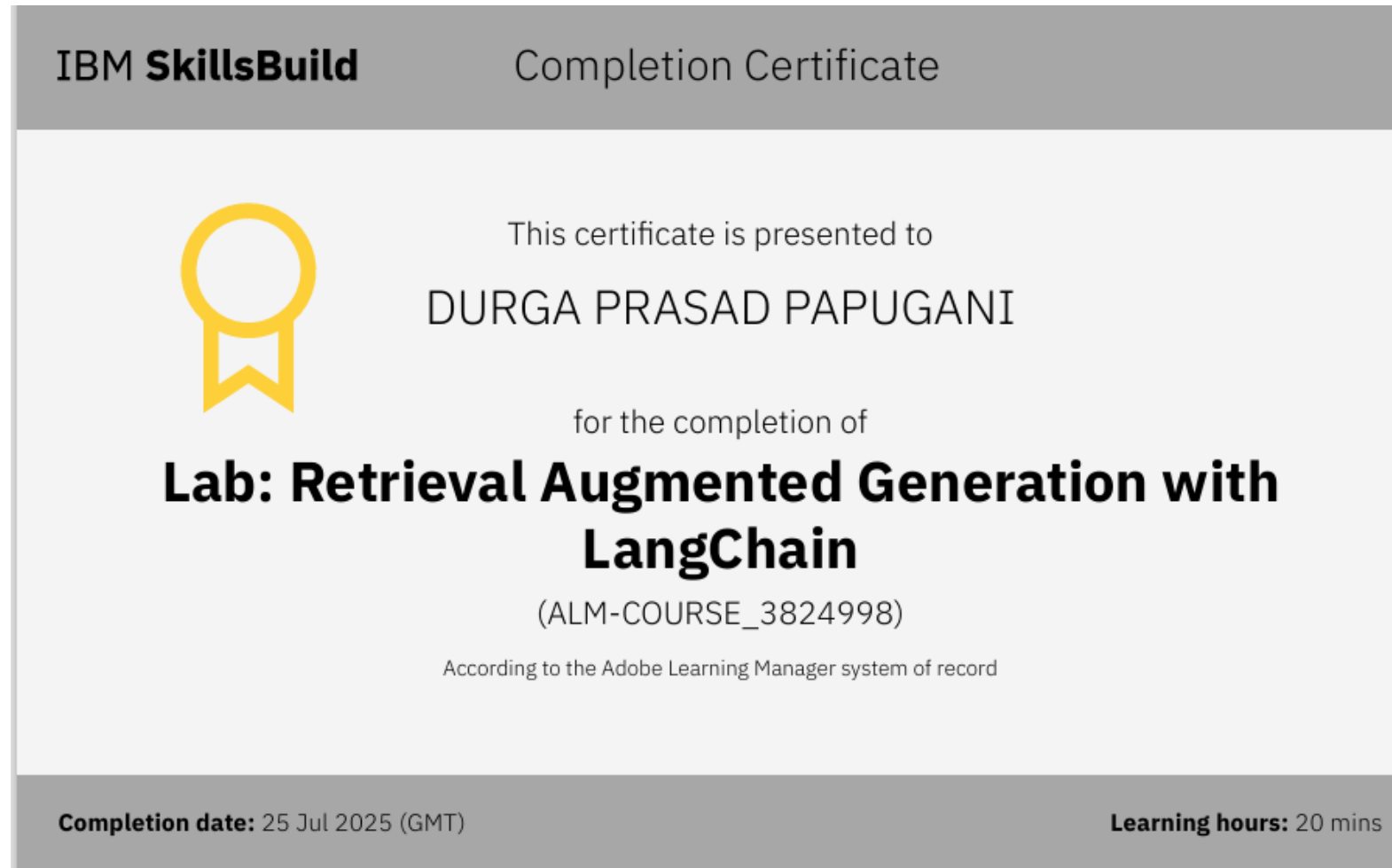
IBM CERTIFICATIONS



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THANK YOU