

# CAPSTONE PROJECT

## AGENTIC AI FOR PERSONALIZED COURSE PATHWAYS

Problem Statement No.12

Presented By:

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# OUTLINE

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

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# PROBLEM STATEMENT

In today's digital learning landscape, students face an overwhelming array of online courses, platforms, and learning resources. Many struggle to identify a learning path that aligns with their personal interests, current skill levels, and long-term career goals. The absence of personalized guidance and adaptive support often leads to confusion, wasted time, and misaligned learning efforts.

# PROPOSED SOLUTION

- To address the challenge of guiding students toward the right learning path aligned with their goals and interests, the proposed solution introduces LearnMate — a dynamic Agentic AI coach powered by IBM watsonx.ai. This system goes beyond static recommendations, engaging students in real-time, understanding their motivations, and continuously adapting their learning roadmap as they grow. LearnMate acts not just as a tool — but as a companion in a student’s learning journey, built with the latest Agentic AI capabilities from IBM watsonx.ai and deployed using IBM Cloud Lite services. The solution is composed of the following intelligent components:
- **Data Collection:**
  - Collects user-specific data during onboarding via an interactive AI-driven conversation, including: Preferred domains (e.g., Frontend Development, Cybersecurity), Their known skills.
- **Data Preprocessing:**
  - Clean and preprocess the collected data
  - Extracts relevant features from the data (e.g., interests, skills) for intelligent pathway generations.
- **Machine Learning Algorithm:**
  - Utilizes IBM watsonx.AI models to generate personalized learning pathways using prompt based dynamic planning.
  - Predict the best learning modules based on skill gaps and user preferences and recommend course sequences that balance depth and engagement.
- **Deployment:**
  - The system is deployed on IBM cloud for scalable, native accessibility.
  - The UI was simple and easy to interact with their AI coach.
- **Evaluation:**
  - Evaluation of AI performance using metrics like recommendation relevance, goal alignment, and user retention.
  - Fine-tune the model for better prediction accuracy.

# SYSTEM APPROACH

- **System requirements:**

- OS : Windows 10/11
- Processor : Intel i5/i7 or equivalent
- RAM: : Minimum 8 GB
- Storage: : At least 10GB for smoother training and testing.
- Cloud access : IBM cloud account with access to watsonx.ai, IBM Object storage.
- Internet : Stable internet connection for API calls and cloud access.

- **Library required to build the model**

- AI and NLP
- Backend API logic


# ALGORITHM & DEPLOYMENT

- In the Algorithm section, describe the machine learning algorithm chosen for predicting bike counts. Here's an example structure for this section:
- **Algorithm Selection:**
  - Provide a brief overview of the chosen algorithm (e.g., time-series forecasting model, like ARIMA or LSTM) and justify its selection based on the problem statement and data characteristics.
- **Data Input:**
  - Specify the input features used by the algorithm, such as historical bike rental data, weather conditions, day of the week, and any other relevant factors.
- **Training Process:**
  - Explain how the algorithm is trained using historical data. Highlight any specific considerations or techniques employed, such as cross-validation or hyperparameter tuning.
- **Prediction Process:**
  - Detail how the trained algorithm makes predictions for future bike counts. Discuss any real-time data inputs considered during the prediction phase.

# RESULT

IBM Cloud

Catalog Cost estimator Docs



## Log in to IBM Cloud

Your session expired. Log back in to continue.

Sign in with


IBMid username@example.com

Continue →

Forgot ID?

☐ Remember ID

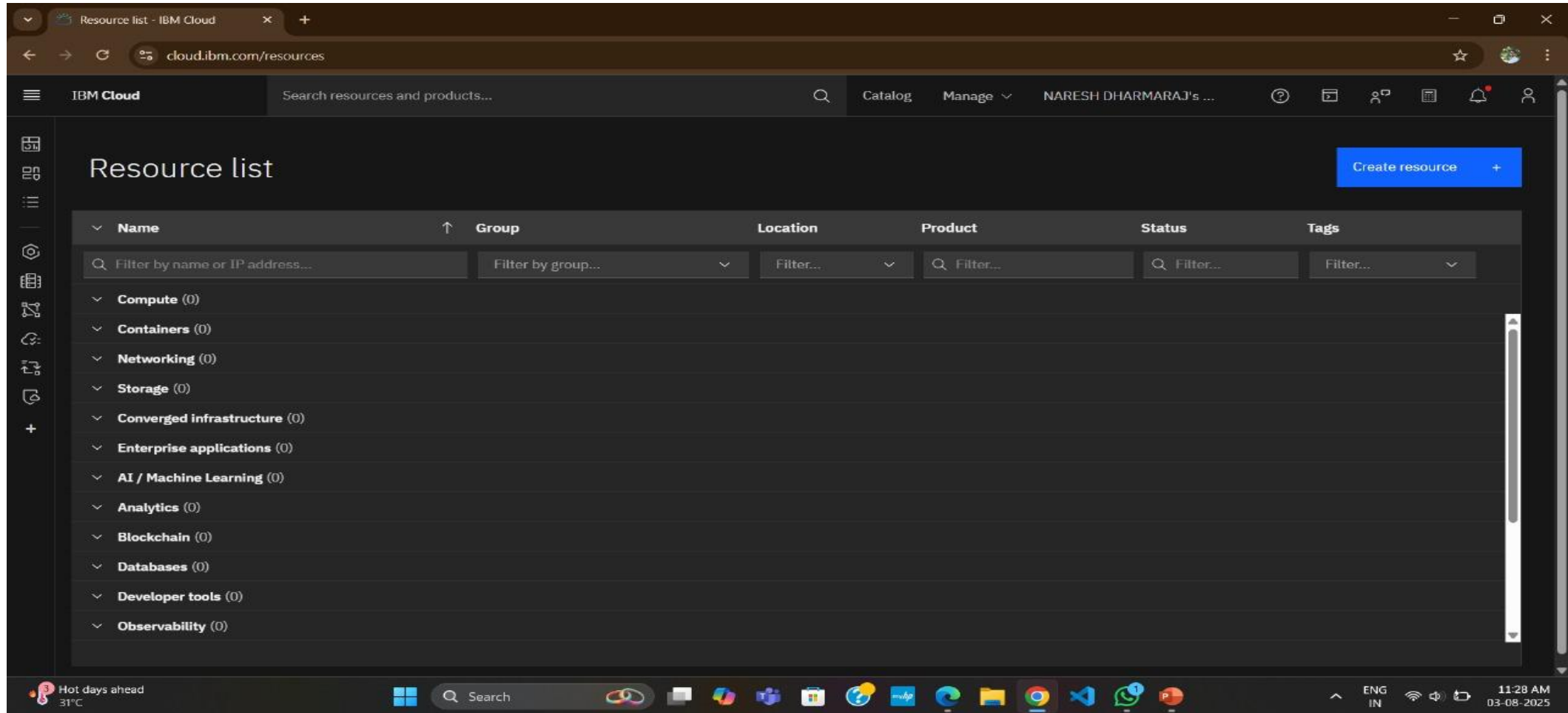
Or

Continue with Google 

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Step 1: Login to IBM cloud

# RESULT



Step 2: Clearing the Resource list



# RESULT

Agent Lab (beta) — Docs | IBM x New project | IBM watsonx x +

datapatform.cloud.ibm.com/projects/new-project?context=wx

IBM watsonx

NARESH DHARMARAJ's Ac... Dallas ND

## Create a project

Start with a new, blank project or select from where to import an existing project.

- + New
  - Local file
  - Sample

Name

LearnMate

Description (optional)

What's the purpose of this project?

Tags (optional)

Add tags

Add tags to make projects easier to find. To add tags, separate them with commas and press Enter.

Define storage

1 Select storage service

Add

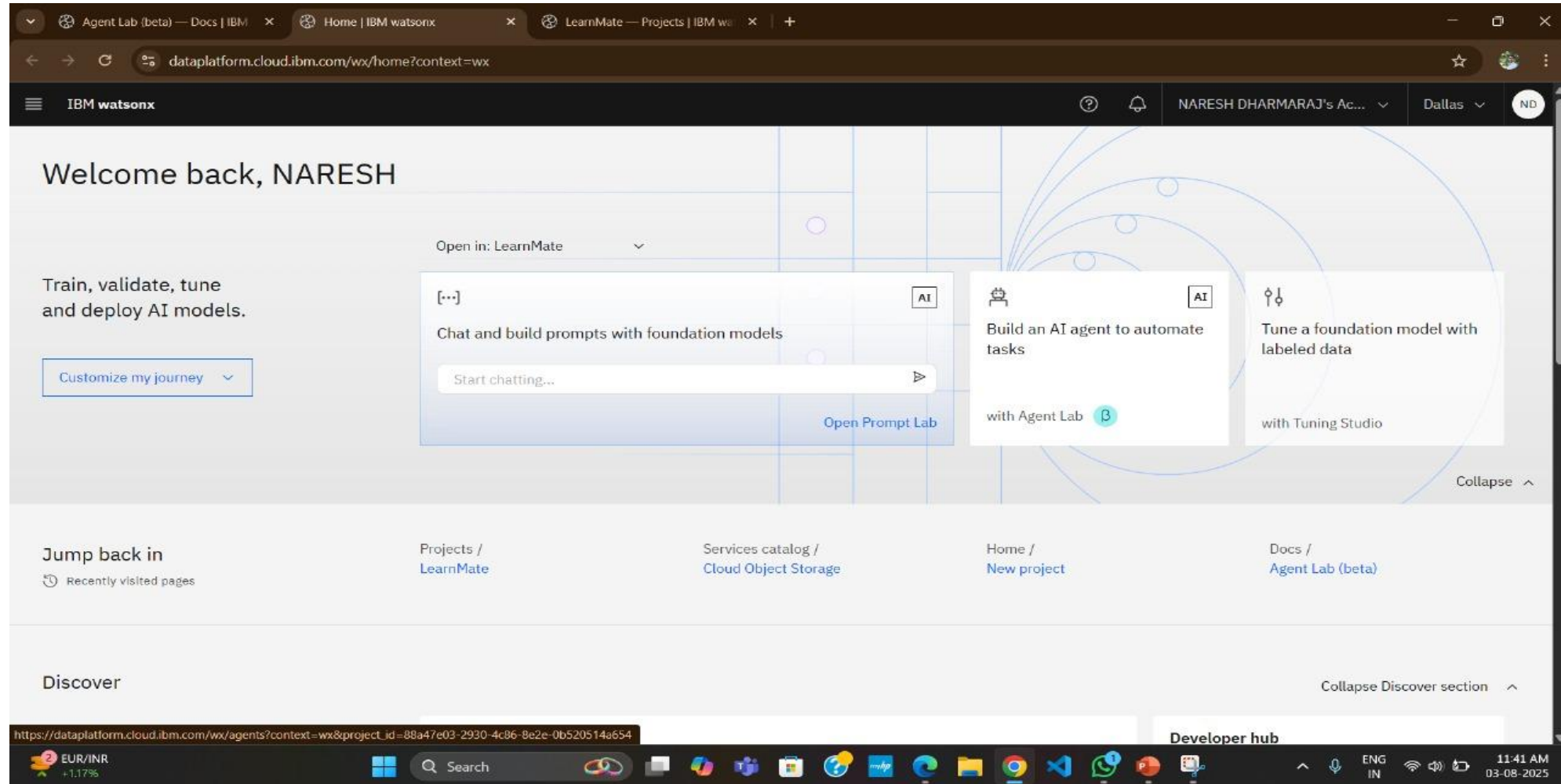
Add an object storage instance, and then return to this page and click

Cancel Create

32°C Mostly cloudy Search 11:40 AM 03-08-2025

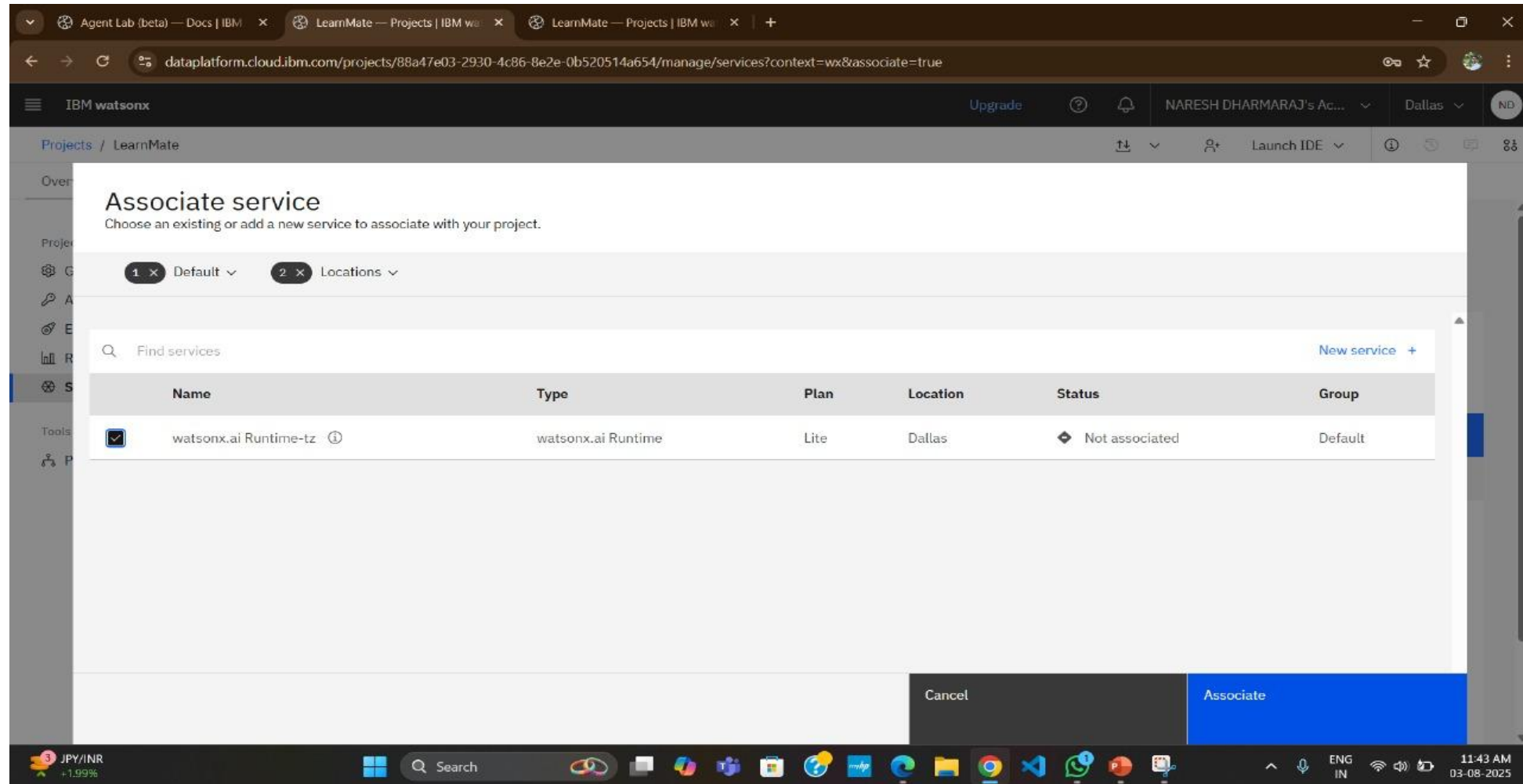
Step 3: Creating a new project – “LearnMate” in IBM watsonx

# RESULT



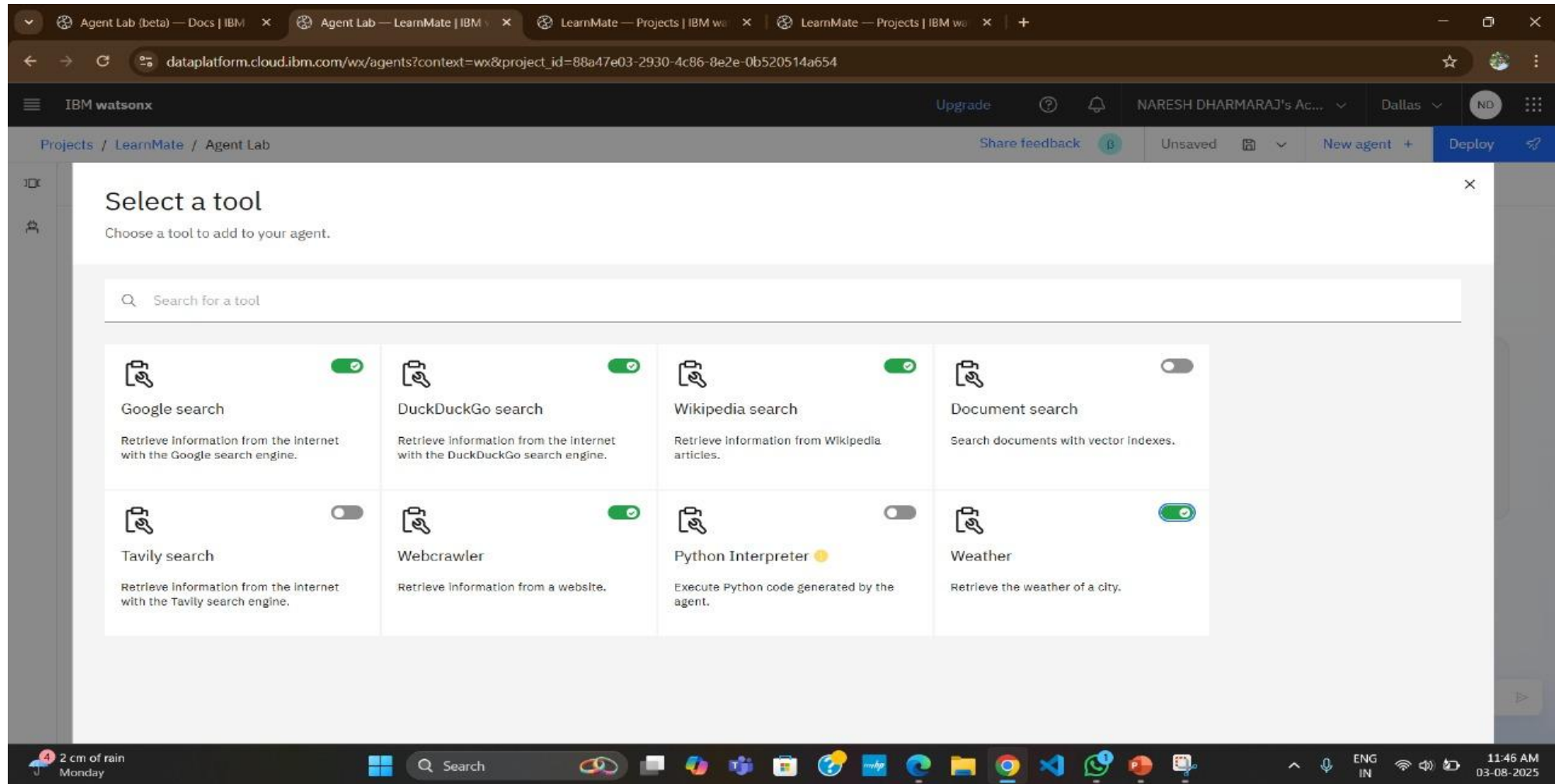
Step 4: Start to build an AI agent to Automate tasks

# RESULT



Step 5: Associating watsonx.ai runtime service

# RESULT



Step 6: Adding tools to the Agent

# RESULT

The screenshot displays the IBM watsonx Agent Lab interface. The top navigation bar includes the IBM watsonx logo, an 'Upgrade' button, a user profile for 'NARESH DHARMARAJ's Ac...', and location settings for 'Dallas'. The main interface is divided into two primary sections: 'Build' on the left and 'Agent preview' on the right.

**Build Section:**

- Model:** Set to 'mistral-large'.
- System Prompt:** 'You are a helpful assistant that uses tools to answer questions in detail. When greeted, say "Hi, I am watsonx.ai agent. How can I help you?"'
- Knowledge:** A section for adding knowledge sources.
- Tools:** A section for adding tools, with buttons for 'Add a tool' and 'Create custom tool'.
- Added tools (5):**
  - 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.

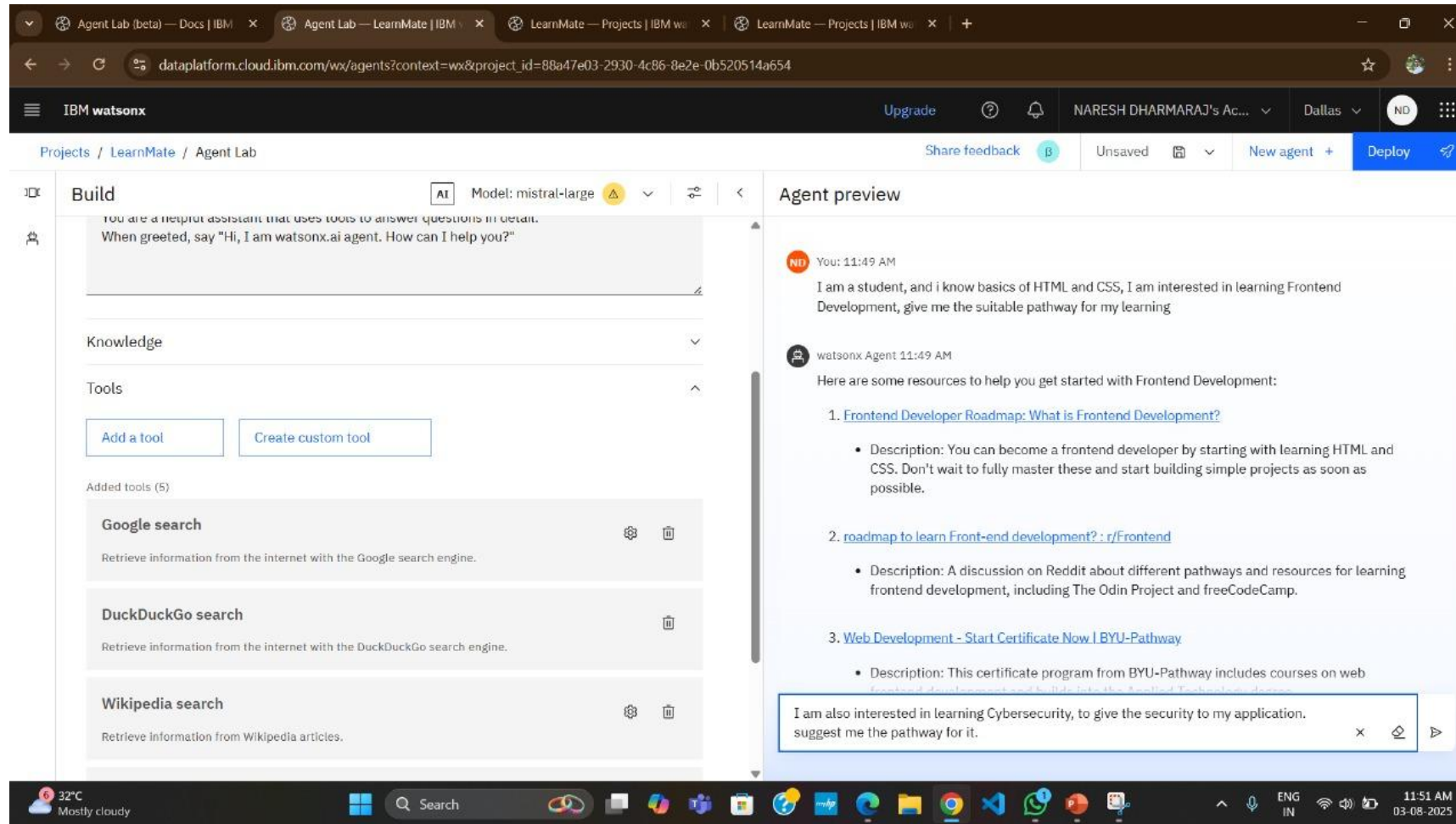
**Agent preview Section:**

- User Input:** 'I am a student, and i know basics of HTML and CSS, I am interested in learning Frontend Development, give me the suitable pathway for my learning'.
- Agent Response:** 'Here are some resources to help you get started with Frontend Development:'
  - Frontend Developer Roadmap: What is Frontend Development?**
    - Description: You can become a frontend developer by starting with learning HTML and CSS. Don't wait to fully master these and start building simple projects as soon as possible.
  - roadmap to learn Front-end development? : r/Frontend**
    - Description: A discussion on Reddit about different pathways and resources for learning frontend development, including The Odin Project and freeCodeCamp.
  - Web Development - Start Certificate Now | BYU-Pathway**
    - Description: This certificate program from BYU-Pathway includes courses on web frontend development and builds into the Applied Technology degree.

The bottom of the screen shows a Windows taskbar with various application icons and a system clock indicating 11:50 AM on 03-08-2025.

Step 7a: Testing the Agent by asking Questions

# RESULT



Step 7b: Testing the Agent by asking Questions



# RESULT

The screenshot shows the IBM Watsonx Agent Lab interface. The browser address bar displays the URL: `datapatform.cloud.ibm.com/wx/agents?context=wx&project_id=88a47e03-2930-4c86-8e2e-0b520514a654`. The page title is "IBM watsonx". The breadcrumb navigation shows "Projects / LearnMate / Agent Lab". The "Save your work" dialog is open, prompting the user to "Specify how to save your work by selecting an asset type and defining details.".

**Asset type**

Asset type	Description
<b>Agent</b> <input checked="" type="checkbox"/>	Save as an editable agent asset that can be reopened in this tool.
<b>Standard notebook</b>	Save the current agent as a notebook.
<b>Deployment notebook</b>	Save a notebook that can deploy your agent as an AI service.

**Define details**

Name:

Description (optional):

☐ View in project after saving ⓘ

Buttons: Cancel, Save

Step 8: Saving the work as editable agent

# RESULT

The screenshot displays the IBM watsonx web interface. The browser's address bar shows the URL: `dataplatfom.cloud.ibm.com/ml-runtime/spaces/0df46e75-62bb-4d14-8a2f-79171f63f2cc/deployments?context=wx`. The page title is "Learn\_Mate01". The "Deployments" tab is selected, showing a table with one deployment entry.

Name	Type	Status	Asset	Asset type	Tags	Last modified
Sous Chef	Online	Deployed	Sous Chef	AI service	wx-agent	43 seconds ago NARESH DHARMARAJ (You)

At the bottom of the interface, a Windows taskbar is visible with the system clock showing 12:06 PM on 03-08-2025.

Step 9: Deploying the agent



# RESULT

The screenshot shows the IBM Watsonx interface for a deployed agent named 'Learnmate'. The browser address bar shows the URL: `dataplatfrom.cloud.ibm.com/ml-runtime/deployments/b032a433-7542-40a4-944a-833393bb5188/chat?space_id=0df46e75-62bb-4d14-8a2f-79171f63f2cc&context=wx&flush=true`. The page header includes 'IBM watsonx', an 'Upgrade' button, and user information for 'NARESH DHARMARAJ's Ac...'. The breadcrumb trail is 'Deployment spaces / Learn\_Mate01 / Sous Chef /'. The main content area shows the 'Learnmate' deployment status as 'Deployed' and 'Online'. Below this are tabs for 'API reference', 'Test', and 'Preview', with 'Preview' being the active tab. A 'New chat +' button is visible. The chat history shows a user asking for a course pathway to enhance frontend development knowledge, and the agent 'Learnmate' responding with a detailed recommendation to learn JavaScript, React, and Bootstrap, along with online resources like Codecademy, Treehouse, and Coursera. A 'How did I get this answer?' link is present. At the bottom, there is a text input field with the placeholder 'Type something...'. On the right side, a sidebar titled 'About this deployment' provides details: Name (Learnmate), Description (You are a assistant, guide students with the learning course pathways, by asking their current knowledge and interest area.), Deployment Details (Deployment ID: b032a433-7542-40..., 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), and Associated asset (Sous Chef, ab71c791-694a-49d7-83e6-f8d138e54222). The Windows taskbar at the bottom shows the date and time as 12:12 PM on 03-08-2025.

Step 10a: Preview the deployed agent

# RESULT

The screenshot displays the IBM watsonx web interface. The browser's address bar shows the URL: `datapatform.cloud.ibm.com/ml-runtime/deployments/b032a433-7542-40a4-944a-833393bb5188/chat?space_id=0df46e75-62bb-4d14-8a2f-79171f63f2cc&context=wx&flush=true`. The page header includes the IBM watsonx logo, an 'Upgrade' button, and user information for 'NARESH DHARMARAJ's Ac...'. The breadcrumb trail indicates the location: 'Deployment spaces / Learn\_Mate01 / Sous Chef /'. The main content area is titled 'Learnmate' with a green checkmark and 'Deployed' status, and a sub-status of 'Online'. Below this, there are tabs for 'API reference', 'Test', and 'Preview', with 'Preview' being the active tab. The chat interface shows a conversation where the user asks about cybersecurity, and the agent provides a list of recommended courses and resources. The list includes: Google Cybersecurity Certificate, Certified Ethical Hacker (CEH), Offensive Security Certified Professional (OSCP), Introduction to Cybersecurity by Cisco, and Cyber Security Course for Beginners - Level 01 on Udemy. The chat input field at the bottom contains the placeholder text 'Type something...'. The Windows taskbar at the bottom shows the system clock as 12:13 PM on 03-08-2025, along with weather information (32°C, Partly sunny) and various application icons.

IBM watsonx

Deployment spaces / Learn\_Mate01 / Sous Chef /

Learnmate Deployed Online

API reference Test **Preview**

New chat +

You 12:13 PM  
ok, after this, i am interested in learning about cybersecurity.

Learnmate 12:13 PM  
You can start by learning the basics of cybersecurity, such as networking, ethical hacking, and threat detection. There are many online courses and resources available, such as those offered by Codecademy, Coursera, and Udemy. Some popular courses for beginners include:

- Google Cybersecurity Certificate
- Certified Ethical Hacker (CEH)
- Offensive Security Certified Professional (OSCP)
- Introduction to Cybersecurity by Cisco
- Cyber Security Course for Beginners - Level 01 on Udemy

It's also important to practice and gain hands-on experience in cybersecurity by participating in capture the flag (CTF)

Type something...

Step 10b: Preview the deployed agent

# CONCLUSION

- The implementation of the **LearnMate Agentic AI system**, powered by **IBM watsonx.ai**, has proven effective in addressing the core challenge of guiding students through personalized learning paths tailored to their goals and abilities. By leveraging **Agentic AI models**, the system was able to engage students meaningfully, understand their interests, assess their current skill levels, and dynamically generate learning roadmaps that evolve over time.
- The solution demonstrated:
  - High **relevance** in pathway generation
  - Strong **adaptability** to changing user inputs
  - Consistent **learner engagement and satisfaction**

# FUTURE SCOPE

- **Add More Data Sources**

Include academic scores, learning pace, and job trends for better suggestions.

- **Improve AI Algorithm**

Use smarter models like transformers and AutoML for accurate results.

- **Expand to More Colleges/Cities**

Scale the system to support students from multiple regions and institutions.

- **Use Emerging Tech**

Add edge computing, voice assistants, or AR/VR for smarter learning experiences.

- **Make It More Personalized**

Enable adaptive pathways that evolve with each student's interests and growth.

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# REFERENCES

- **IBM WatsonX.ai Documentation**

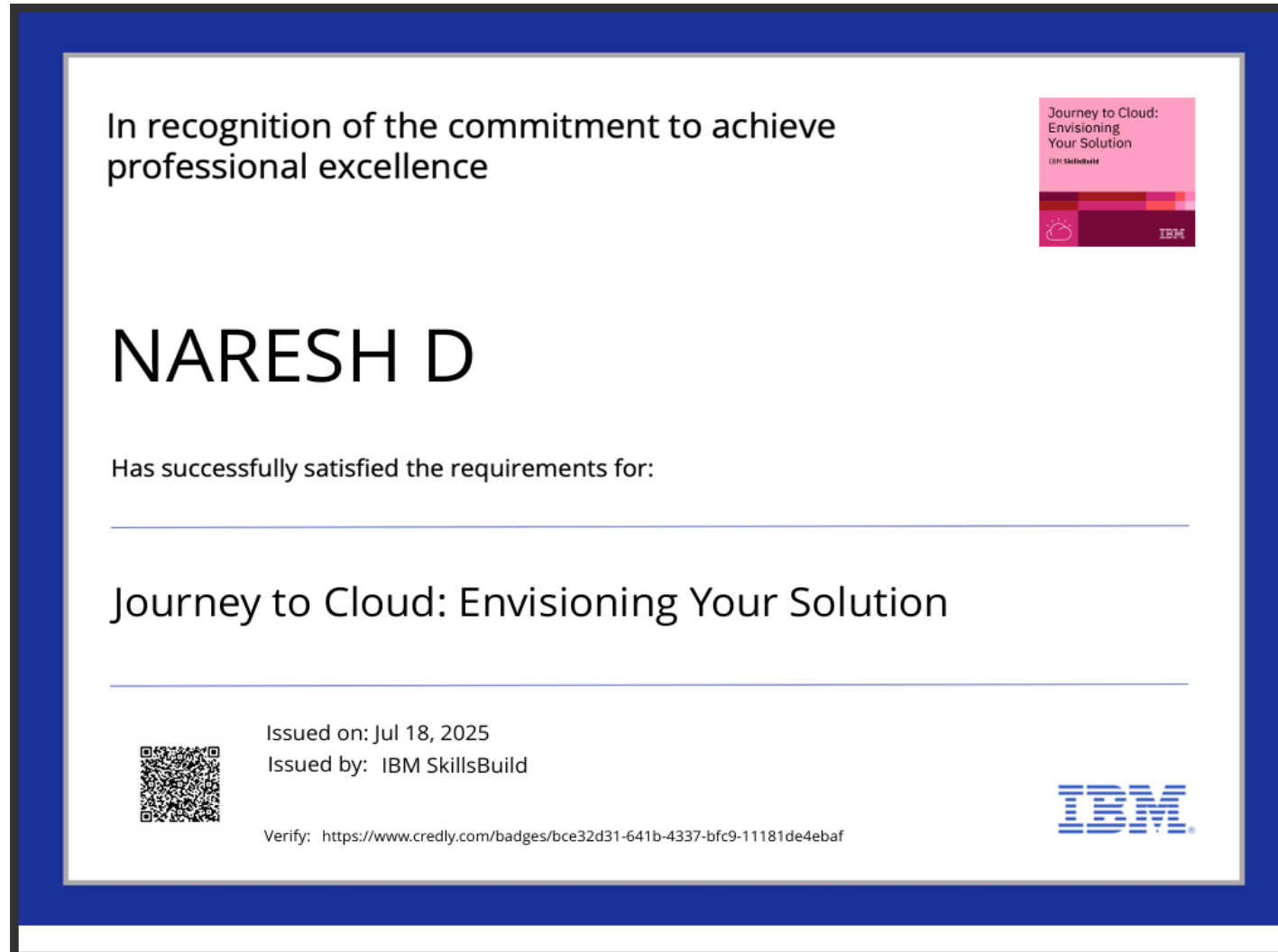
*(Used for understanding and applying Agentic AI services in student interaction and skill assessment.)*

# IBM CERTIFICATIONS



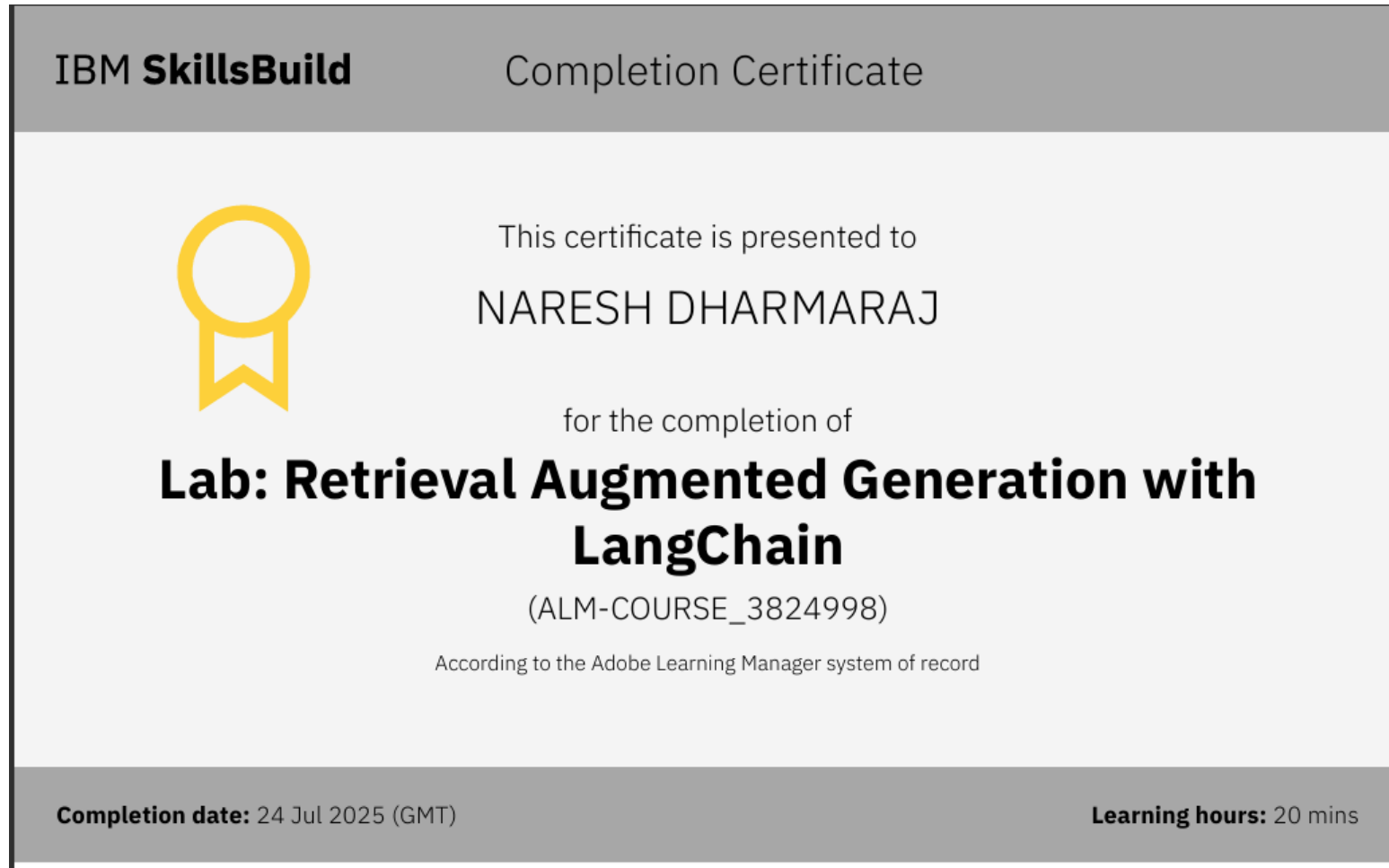
Certificate1. Getting Started with Artificial Intelligence

# IBM CERTIFICATIONS



Certificate2. Journey to Cloud: Envisioning Your Solution

# IBM CERTIFICATIONS



Certificate3. Lab: Retrieval Augmented Generation with LangChain





**THANK YOU**