CAPSTONE PROJECT

AGENTIC AI FOR PERSONALIZED COURSE PATHWAYS (LEARNMATE)

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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. **LearnMate** aims to solve this by acting as an Agentic AI coach that interacts with students, understands their interests (like Frontend Development, Cybersecurity, UI/UX Design, etc.), assesses their current skill level, and dynamically builds a personalized course roadmap that adapts over time based on progress and preferences.

PROPOSED SOLUTION

- **LearnMate** leverages Agentic AI to deliver **personalized learning pathways** through:

1. **Interest Mapping**: Understands students' interests (e.g., Frontend, Cybersecurity, UI/UX).
2. **Skill Assessment**: Evaluates current knowledge through intelligent questioning.
3. **Adaptive Roadmaps**: Dynamically builds and updates course plans based on progress, goals, and feedback.
4. **Ongoing Guidance**: Acts as a 24/7 mentor—offering curated resources, motivation, and real-time direction.

- **Outcome:** Reduced overwhelm, increased clarity, and better alignment with long-term career goals.

SYSTEM APPROACH

- **System Requirements for LearnMate AI (IBM Cloud)**
- **Model & Framework**

➢ **Model**: llama-3-3-70b-instruct
➢ **Framework:** LangGraph
➢ **Architecture**: ReAct

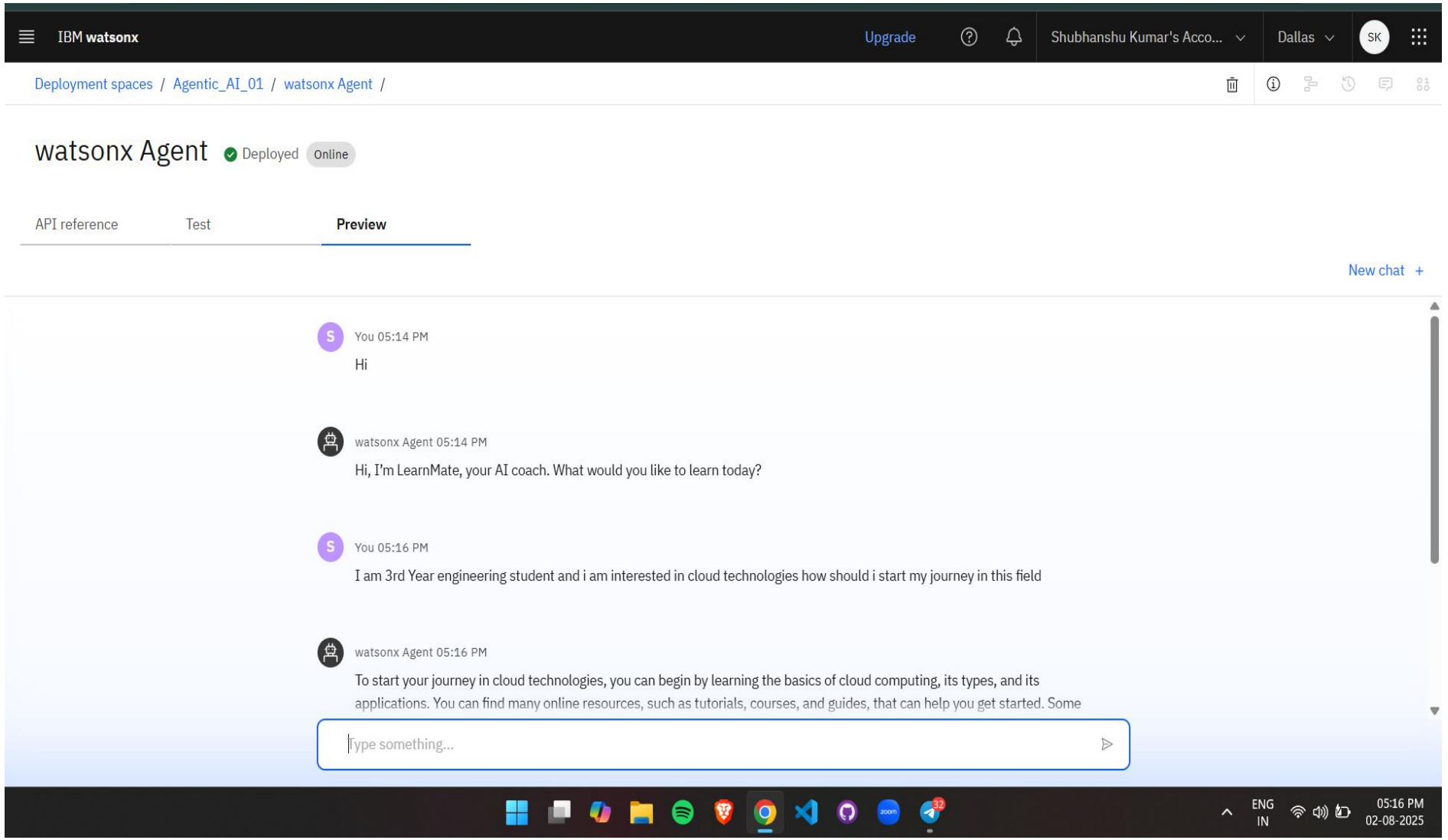
Required Libraries for LearnMate

Purpose	Libraries
LLM Interface	transformers, llama-cpp-python, openllm
Agent Framework	langgraph, react-agent, langchain
UI & Skill Assessment	streamlit, custom Python logic

ALGORITHM & DEPLOYMENT

- **Algorithm Selection**
- We use a **hybrid Agentic AI approach** combining **LLM (e.g., LLaMA 3)** with **ReAct architecture and LangGraph framework.** This design enables reasoning, tool use, and dynamic interaction — ideal for adaptive learning path generation based on user inputs and progress.
- **Data Input**
- Key inputs include:
- Student interests (e.g., Frontend Dev, Cybersecurity, UI/UX)
- Current skill level (via quizzes or self-reporting)
- Learning goals and timeline
- User progress (course completions, quiz results)
- Feedback and preferences
- **Training Process**
- We use **pre-trained LLMs** (e.g., LLaMA 3) hosted on **IBM Watsonx.**
- No task-specific training required, but behavior is customized through prompt engineering and LangGraph-based flow design.
- Fine-tuned models or embeddings (if used for resource matching) are optimized with semantic search and user feedback.
- **Prediction Process**
- The AI dynamically generates a **personalized course roadmap** based on interests, goals, and real-time user feedback.
- Recommendations adapt over time by tracking learning progress and adjusting paths using context memory (e.g., via vector stores).
- External tools (search engines, Wikipedia, web crawlers) assist in fetching up-to-date resources for each learner.

RESULT



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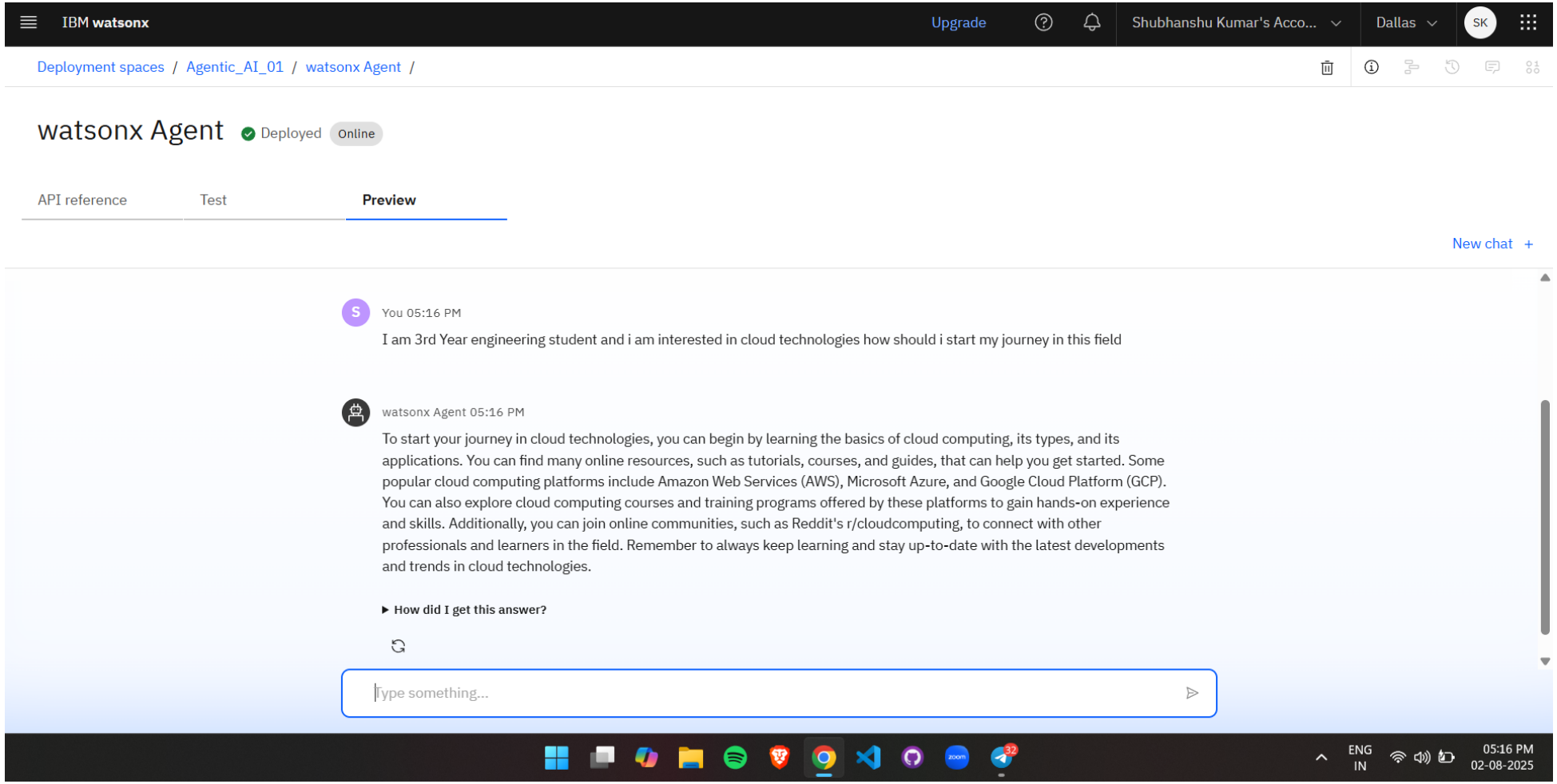
RESULT



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CONCLUSION

- LearnMate effectively tackles the challenge of personalized learning by using Agentic AI to match student interests with adaptive learning paths. It leverages LLMs, real-time tools, and user feedback to guide learners efficiently.
- Key challenges included handling vague inputs and tool integration, which were addressed through prompt tuning and structured flows.
- Future improvements include deeper personalization and expanded domain support. LearnMate offers a scalable solution to guide students with clarity and confidence in their learning journey.

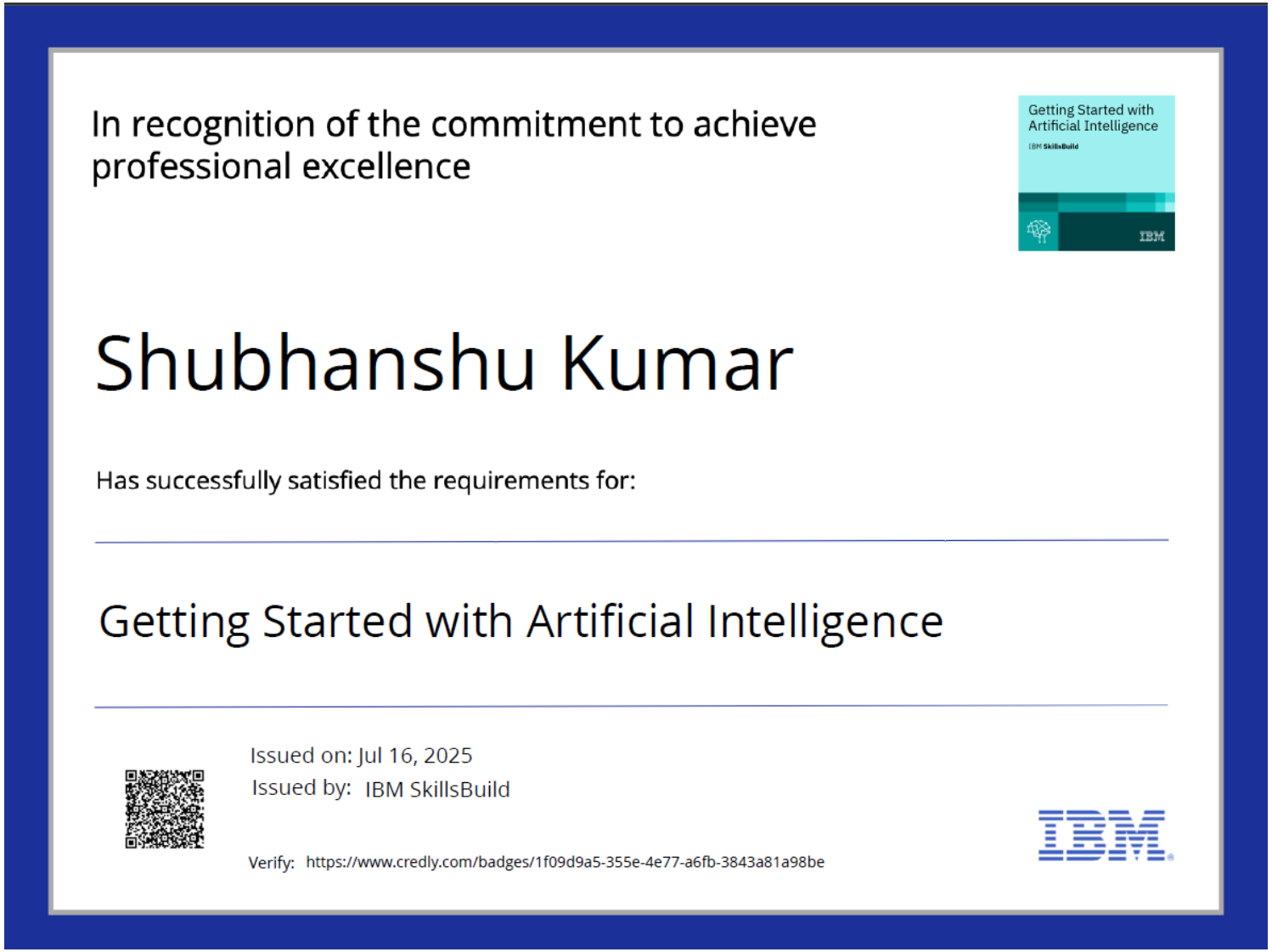
FUTURE SCOPE

- **Enhanced Data Integration**: Include behavioral analytics, learning pace, and third-party course platforms.
- **Algorithm Optimization**: Use advanced ML techniques for better skill assessment and roadmap accuracy.
- **Scalability**: Expand support for diverse domains and regional learning patterns.
- **Edge Deployment**: Enable faster, privacy-friendly recommendations using edge computing.
- **Real-Time Adaptation**: Improve responsiveness with continuous learning from user feedback.
- **Wider Deployment**: Integrate with schools, coaching centers, and online learning platforms globally.

REFERENCES

- **IBM Watsonx.ai Docs** – *Model deployment and inference on IBM Cloud*. https://www.ibm.com/cloud/watsonx
- **IBM Research – AI for Education**
  Exploring the role of AI in personalized learning environments
  https://research.ibm.com

IBM CERTIFICATIONS



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IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Shubhanshu Kumar

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 23 Jul 2025 (GMT) **Learning hours:** 20 mins

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THANK YOU

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