CAPSTONE PROJECT

LIBRARY AI AGENT

Presented By:

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OUTLINE

- **Problem Statement**
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
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PROBLEM STATEMENT

Problem Statement No.21 – Library AI Agent

The Challenge – A Library AI Agent is an intelligent system designed to assist students in finding the right learning materials based on their academic needs. It can autonomously analyze user profiles, study topics, and course syllabi to suggest relevant books and resources. Using natural language processing, it understands student queries and matches them with the most suitable books in the library database. The agent can check real-time book availability, prioritize high-demand titles, and assist with reservation or waitlist actions. It saves time by streamlining the search process and offering personalized recommendations aligned with current academic work. Library AI Agents enhance access, engagement, and resource utilization in educational environments.

Technology – Use of IBM Cloud Lite services

PROPOSED SOLUTION

The proposed system aims to address the challenge of predicting the requirements of student queries and matches them with the most suitable books in the library database. This involves natural language processing and AI Agent to assist students in finding the right learning materials based on their academic needs.

Data Collection:

- Gather historical data on student queries, borrowing records, book metadata, user profiles, and course syllabi.
- Integrate real-time data such as newly added books, current book availability, semester-wise subject trends, and student activity logs.

Data Preprocessing:

- Clean and preprocess the collected data to handle missing or outdated book records, duplicate queries, and inconsistent tagging.
- Apply feature engineering to extract useful attributes like course relevance, book popularity, and subject matching for better recommendations.

Natural Language Processing & AI Modelling:

- Implement NLP techniques to interpret free-text student queries and map them to academic topics.
- Use classification and recommendation algorithms(e.g., content-based filtering, collaborative filtering, or hybrid models) to match students with relevant books.

Deployment:

- Develop a user-friendly interface for query input and suggestions.
- Integrate with the library system to enable real-time availability and reservations.

Evaluation:

- Refine the model based on user feedback and ongoing usage data.
- Result:
  - Enhances learning access
  - Reduces search time
  - Improve library management.

SYSTEM APPROACH

- **System requirements :**

❑ Hardware Requirements:

➢ A server or cloud-based environment to host the AI model and user interface.

➢ Minimum 8 GB RAM and i5/i7 processor or equivalent for development and testing.

❑ Software Requirements:

➢ Database system (e.g., MySQL or MongoDB) to store book metadata, user profiles, and borrowing history.

➢ Or, various tools like Wikipedia search, Google search for checking the availability of the relevant book or resources.

- **Library/services required to build the model :**

➢ IBM Watsonx.ai

➢ Watsonx.ai Studio

➢ Watsonx.ai Runtime

➢ Cloud Object Storage

ALGORITHM & DEPLOYMENT

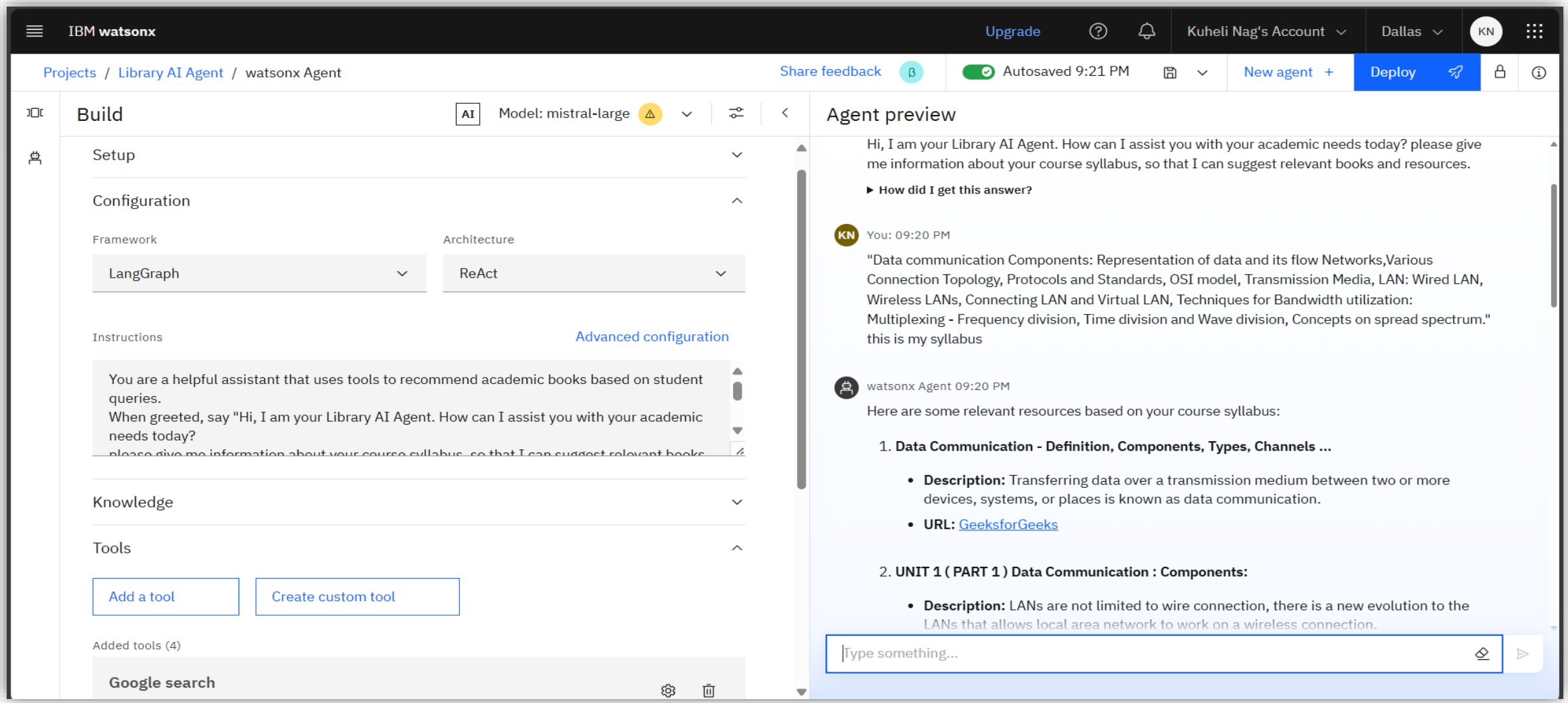
- In the Algorithm section, we describe the ai/machine learning algorithm chosen for predicting books availability & resources according to the user's queries.
- **Algorithm Selection:**
  - We use a hybrid approach combining:
  - NLP foundation models(Watsonx.ai) for understanding user queries.
  - AutoAI-generated classification or recommendation models for predicting book recommendations or availability.

  This setup suits the variety of library queries and enables intelligent, data-driven suggestions.
- **Data Input:**
  - User queries (text)
  - Book metadata (genre, author, availability)
  - Historical borrow data
  - User profile (if available)
  - Time/date (e.g., exam season patterns)
- **Training Process:**
  - Data cleaned with Data Refinery
  - AutoAI used to build and tune models
  - Text classification done via NLP
  - Models trained with cross-validation on historical data

ALGORITHM & DEPLOYMENT

- **Prediction Process:**
  - User input is processed for intent
  - for recommendations, the model uses user history + book metadata
  - For availability, real-time stock data is checked
  - Output: Recommendations or live book status
- **Deployment:**
  - Platform:
    - Deployed using Watson Machine Learning (WML) as a REST API
    - Integrated with Watsonx.ai for NLP
  - Interaction:
    - User sends a message → NLP detects intent
    - Real-time availability checked via database or API
  - Maintenance:
    - Managed in Watson Studio

RESULT



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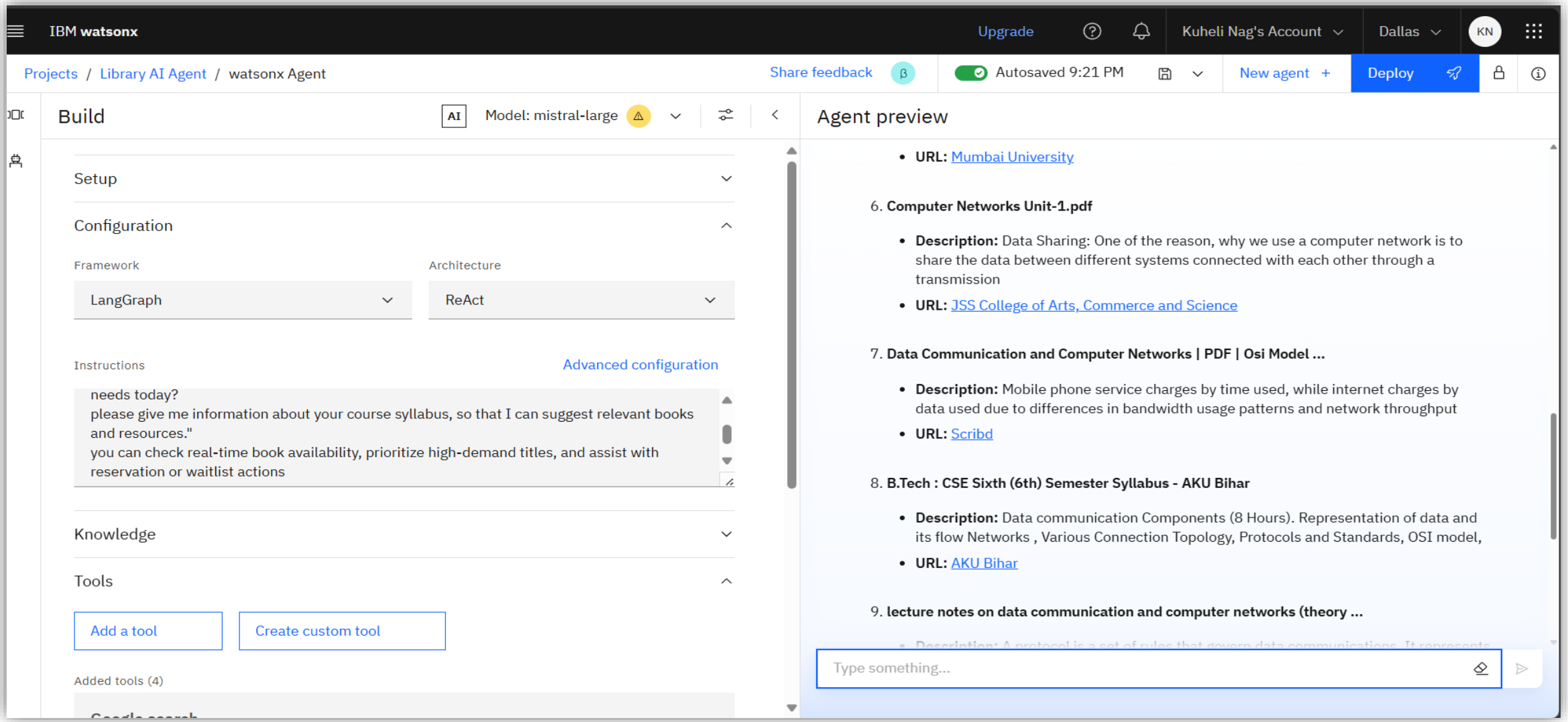
RESULT



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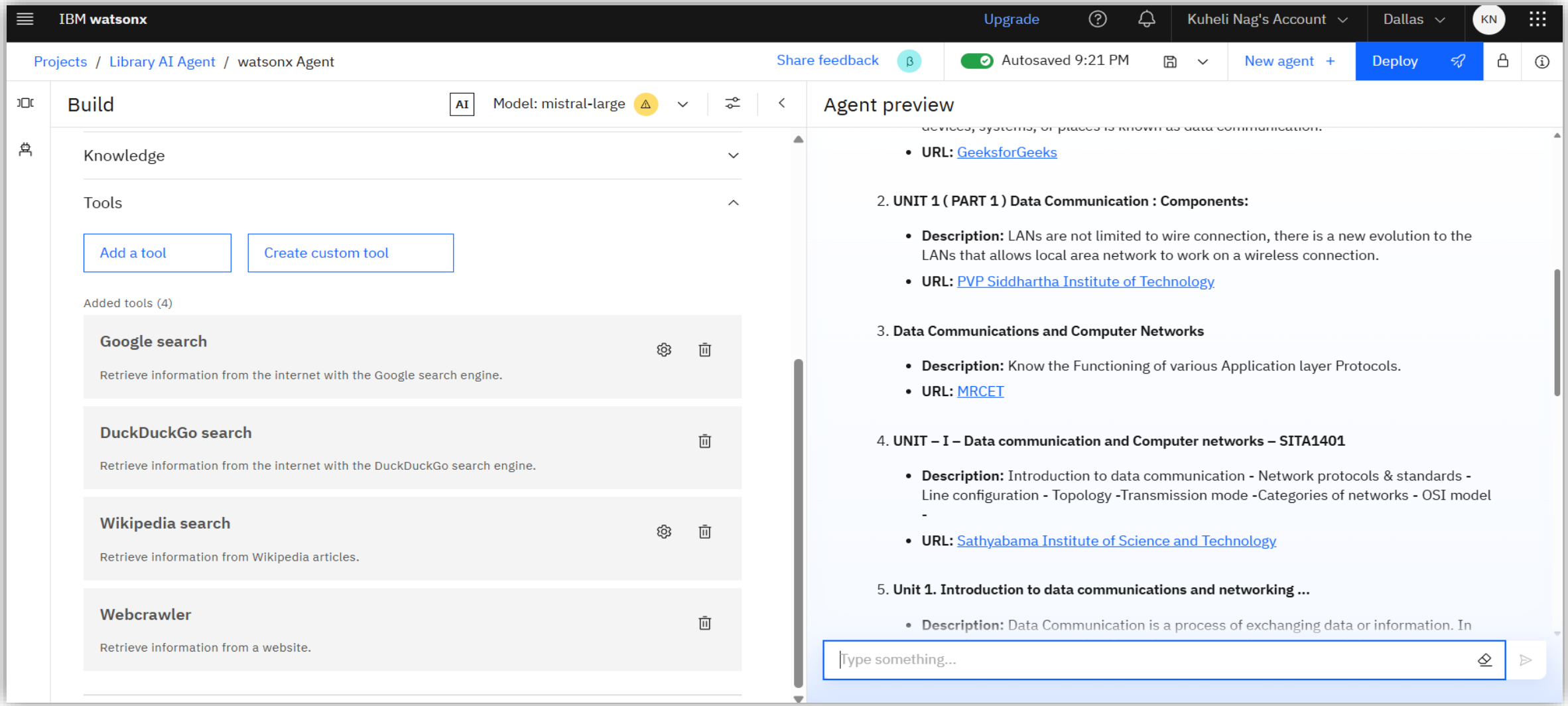
RESULT



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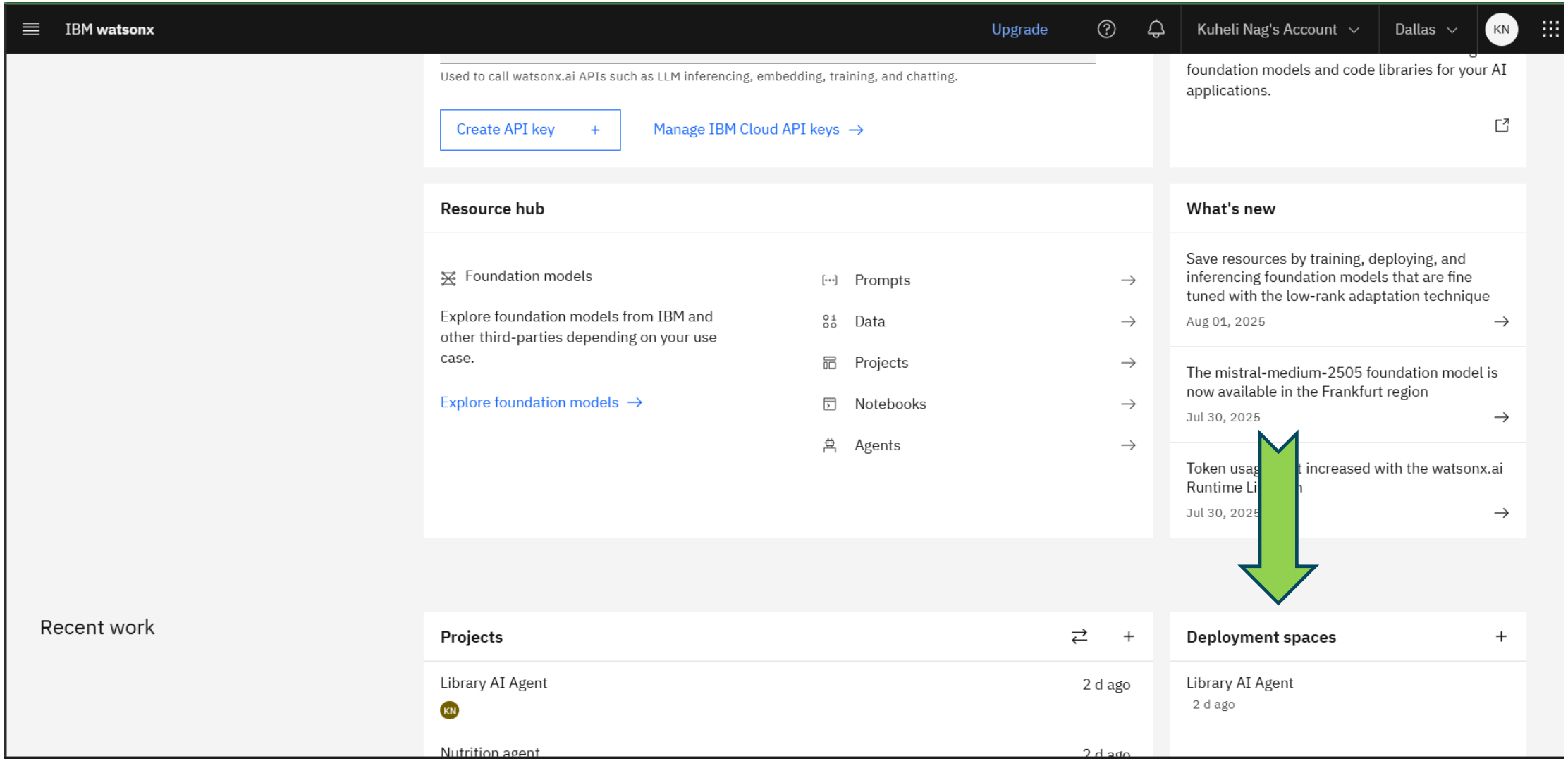
RESULT



CONCLUSION

- The proposed Library AI Agent effectively addresses the challenge of helping students find the most relevant academic resources by leveraging natural language processing and recommendation algorithms. The system demonstrates strong potential in improving search accuracy, student satisfaction, and resource utilization within academic libraries.
- Despite its promising results, challenges such as handling ambiguous queries, integrating with legacy library databases, and ensuring real-time availability updates were encountered. Future improvements may include enhancing the NLP model with larger language models, adding multilingual support, and incorporating voice-based queries.
- Accurate and intelligent recommendation systems like this play a vital role in modern education, streamlining access to knowledge, reducing search time, and supporting personalized learning paths for students.

FUTURE SCOPE

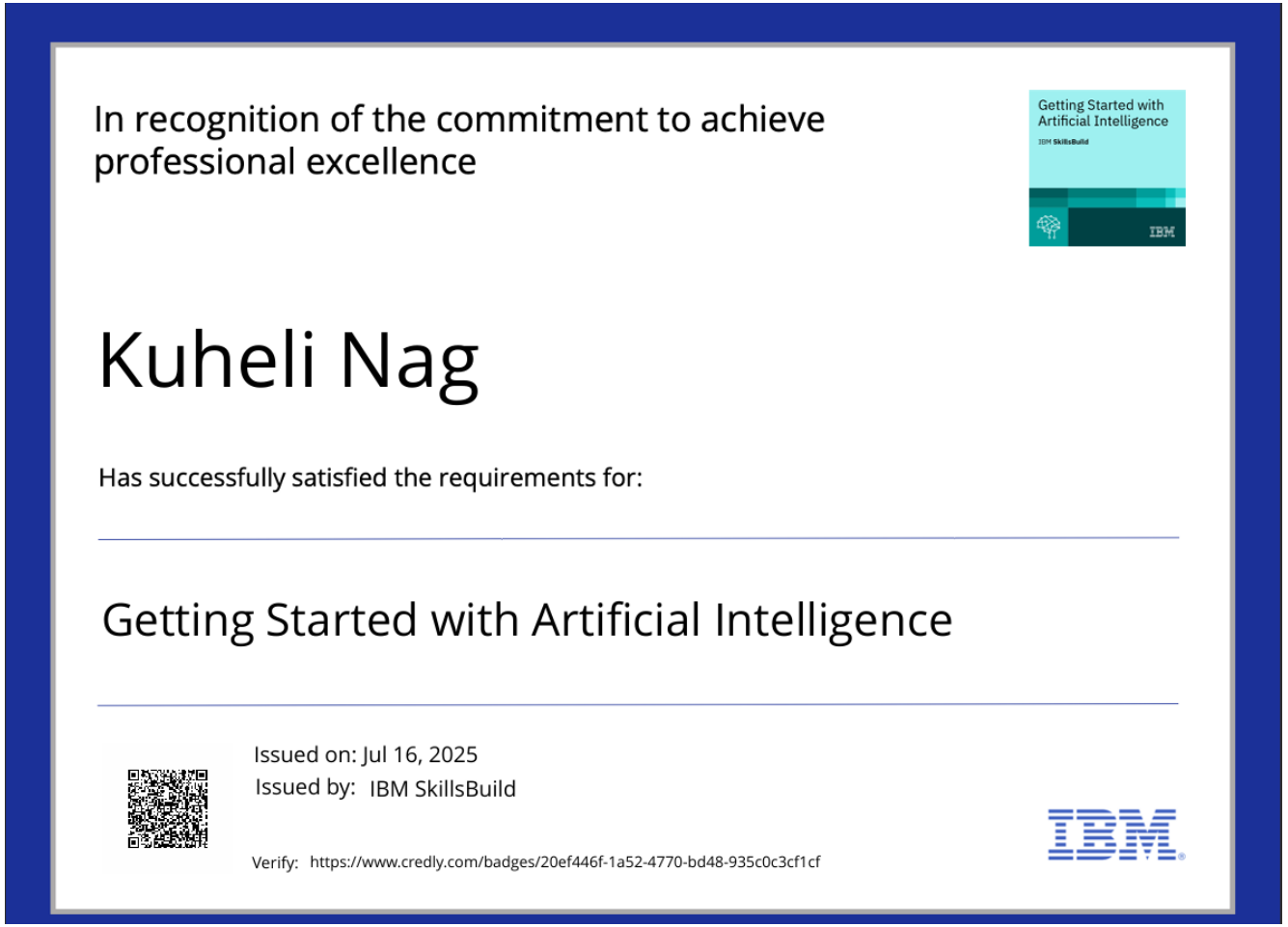
- The system can be enhanced by incorporating additional data sources, such as real-time course schedules, professor-recommended reading lists, and student academic performance data, to improve personalization and relevance.
- The algorithm can be further optimized using advanced machine learning techniques like deep learning-based recommenders, context-aware filtering, and knowledge graphs for better semantic understanding of queries.
- The system could be expanded to support multiple institutions, enabling cross-library resource sharing, inter-university recommendations, and broader access to academic materials.
- Integration with emerging technologies like edge computing can allow real-time recommendation processing in mobile or offline environments, while chatbots and voice assistants can enhance accessibility and user experience.

REFERENCES

- IBM Cloud Lite services
- Wikipedia
- Research papers and articles – Artificial Intelligence and library services by Bornali Konwar.
- Academic papers on books demand prediction.

IBM CERTIFICATIONS

- Screenshot/ credly certificate(getting started with AI)



IBM CERTIFICATIONS

- Screenshot/ credly certificate(Journey to Cloud)

IBM CERTIFICATIONS

- Screenshot/ credly certificate(RAG Lab)

THANK YOU

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