IBM HACKATHON PROJECT

AI-POWERED LATEX DIAGRAM GENERATOR FOR ACADEMIC RESEARCH

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OUTLINE

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PROBLEM STATEMENT

Researchers and academic writers often face significant challenges when creating diagrams in LaTeX, especially using the TikZ package. Writing TikZ code manually is time-consuming, requires technical expertise, and is prone to errors. This slows down the research documentation process and creates a steep learning curve for those unfamiliar with LaTeX graphics. There is a strong need for a user-friendly, intelligent tool that can simplify and automate this task.

Proposed Solution:

I propose an AI-powered intelligent agent that automatically converts natural language descriptions and sketches into professional TikZ code for LaTeX documents. This agent will support real-time feedback, accept refinement commands in plain English, and produce publication-ready diagrams, eliminating the need for manual coding and significantly enhancing productivity for academic researchers.

TECHNOLOGY USED

IBM cloud lite services

Natural Language Processing (NLP)

Retrieval Augmented Generation (RAG)

IBM Granite model

IBM CLOUD SERVICES USED

- IBM Cloud Watsonx AI Studio
- IBM Cloud Watsonx AI runtime
- IBM Cloud service
- IBM Granite (via watsonx.ai studio)
- IBM Cloud Object Storage IBM AI Tools

WOW FACTORS

Natural Language to TikZ: Generate LaTeX diagrams from plain English.

Sketch Recognition: Turn rough hand-drawn sketches into structured TikZ code.

Real-Time Refinement: Update diagrams instantly with plain English commands.

Publication-Ready: Produces clean, high-quality diagrams for academic papers.

No Coding Needed: No prior LaTeX or TikZ experience required.

Deploy Anywhere: Web, desktop, or Overleaf-integrated support.

END USERS

- **Academic Researchers**
  For thesis, paper, and journal diagram automation.

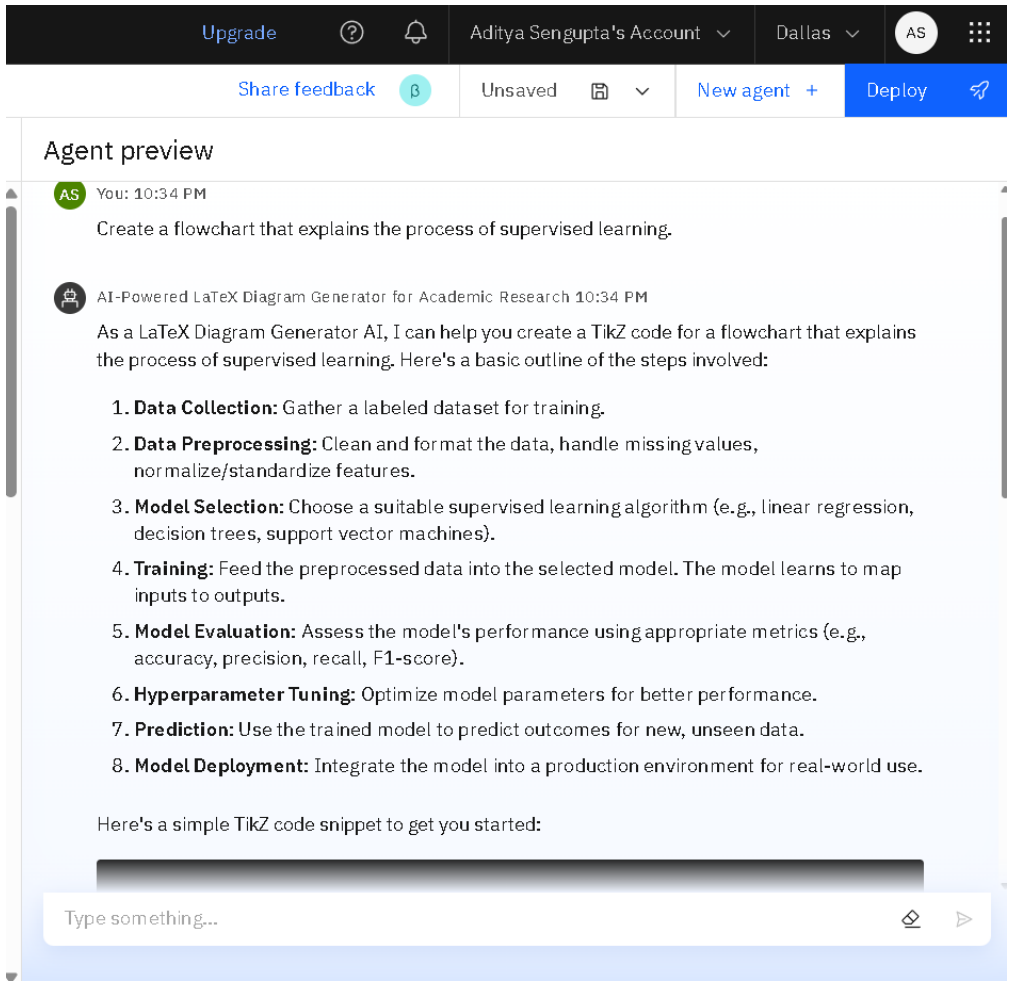
- **Professors & Educators**
  For creating lecture notes, slides, and visual explanations.

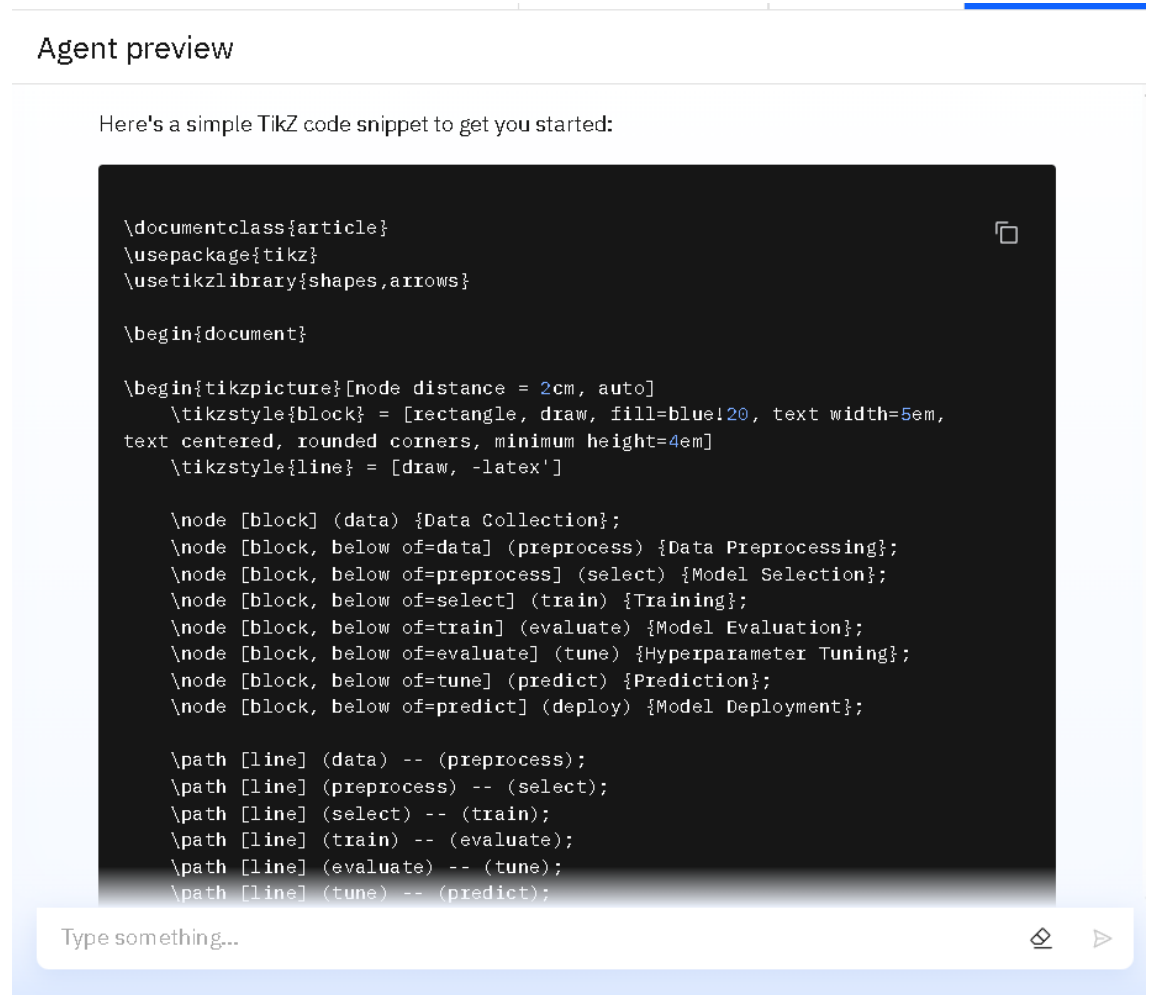
- **Students (UG/PG/PhD)**
  For simplifying LaTeX assignments and project reports.

- **Research Institutions & Universities**
  For streamlining documentation and publication workflows.

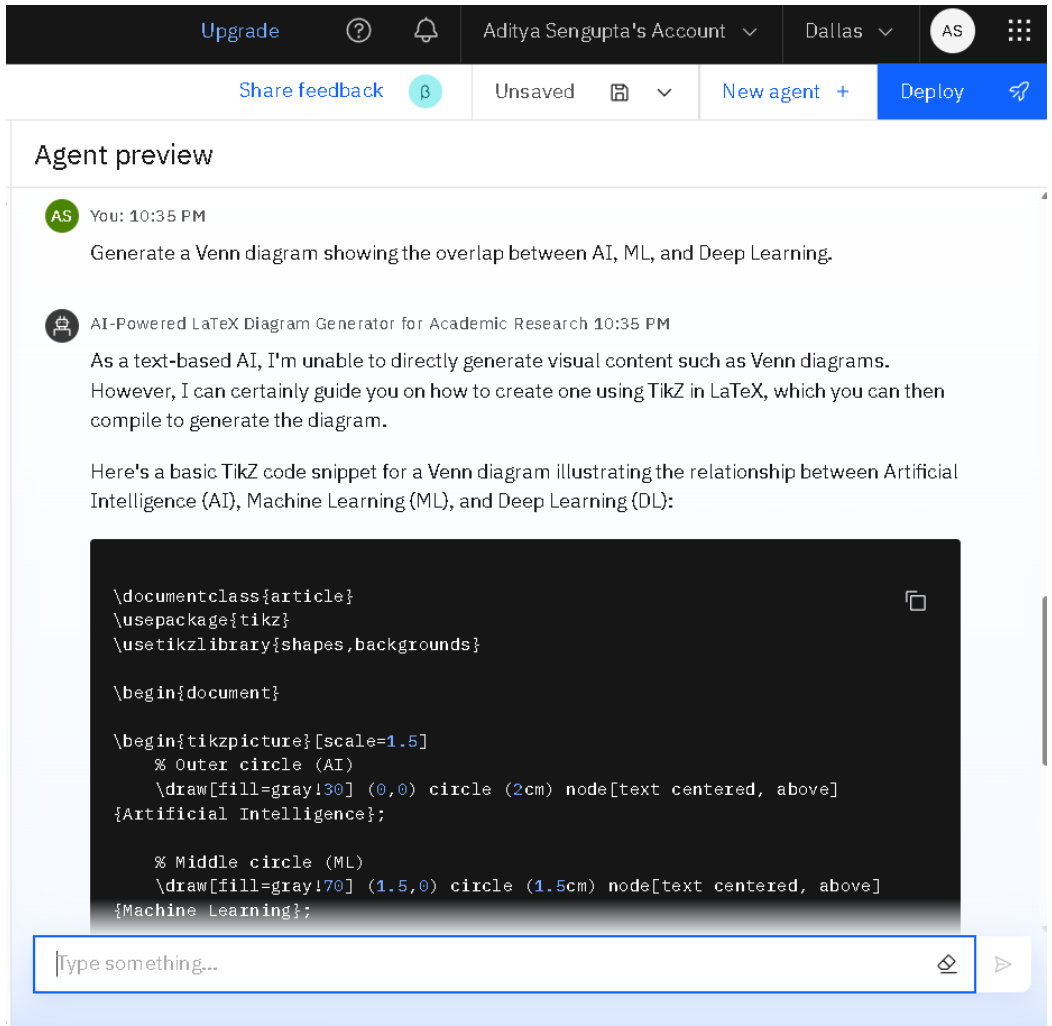
- **Technical Writers & LaTeX Enthusiasts**
  For enhancing productivity and accuracy in LaTeX graphics.

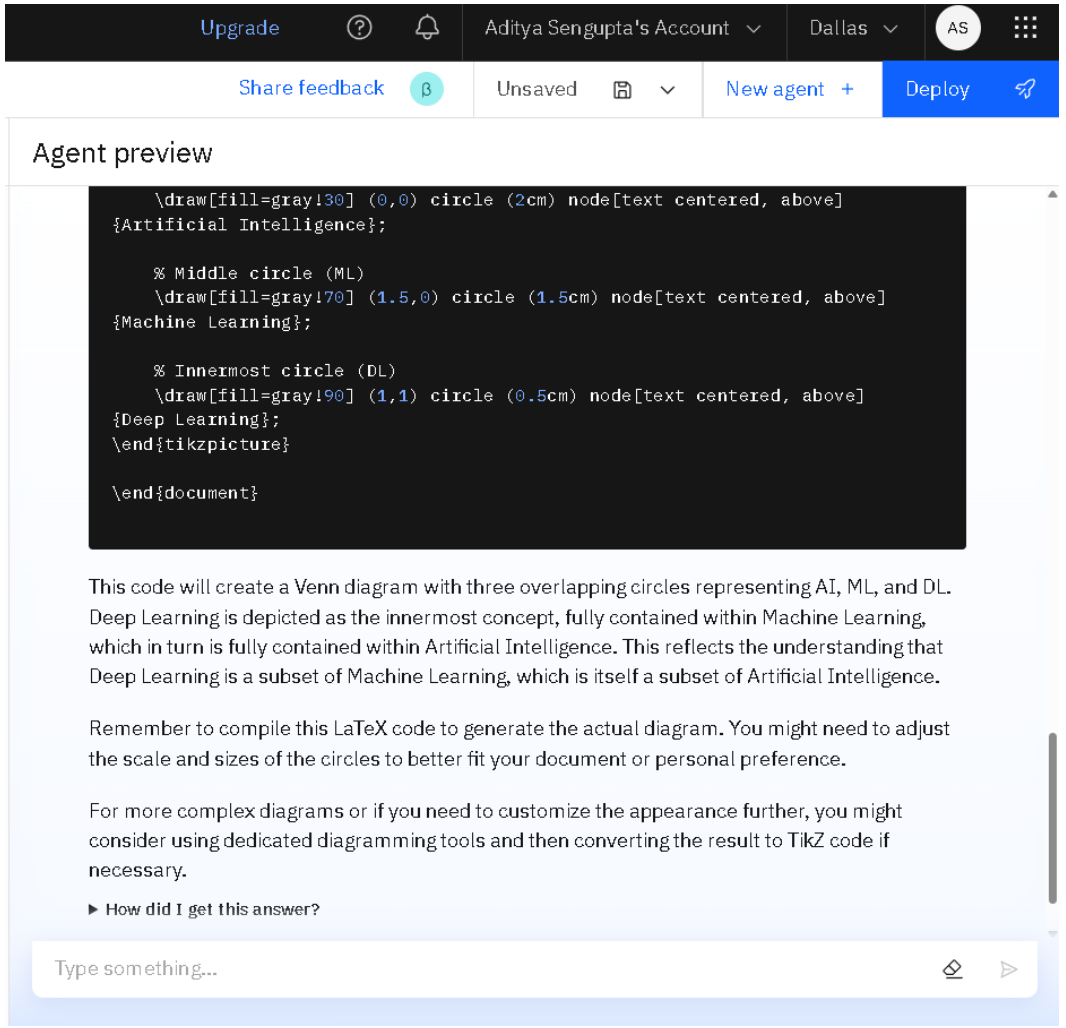
RESULTS


Upgrade
Aditya Sengupta's Account
Dallas
AS
Share feedback
β
Unsaved
New agent +
Deploy
Agent preview
AS
You: 10:34 PM
Create a flowchart that explains the process of supervised learning.
AI-Powered LaTeX Diagram Generator for Academic Research 10:34 PM
As a LaTeX Diagram Generator AI, I can help you create a TikZ code for a flowchart that explains the process of supervised learning. Here's a basic outline of the steps involved:
1. Data Collection: Gather a labeled dataset for training.
2. Data Preprocessing: Clean and format the data, handle missing values, normalize/standardize features.
3. Model Selection: Choose a suitable supervised learning algorithm (e.g., linear regression, decision trees, support vector machines).
4. Training: Feed the preprocessed data into the selected model. The model learns to map inputs to outputs.
5. Model Evaluation: Assess the model's performance using appropriate metrics (e.g., accuracy, precision, recall, F1-score).
6. Hyperparameter Tuning: Optimize model parameters for better performance.
7. Prediction: Use the trained model to predict outcomes for new, unseen data.
8. Model Deployment: Integrate the model into a production environment for real-world use.
Here's a simple TikZ code snippet to get you started:
Type something...

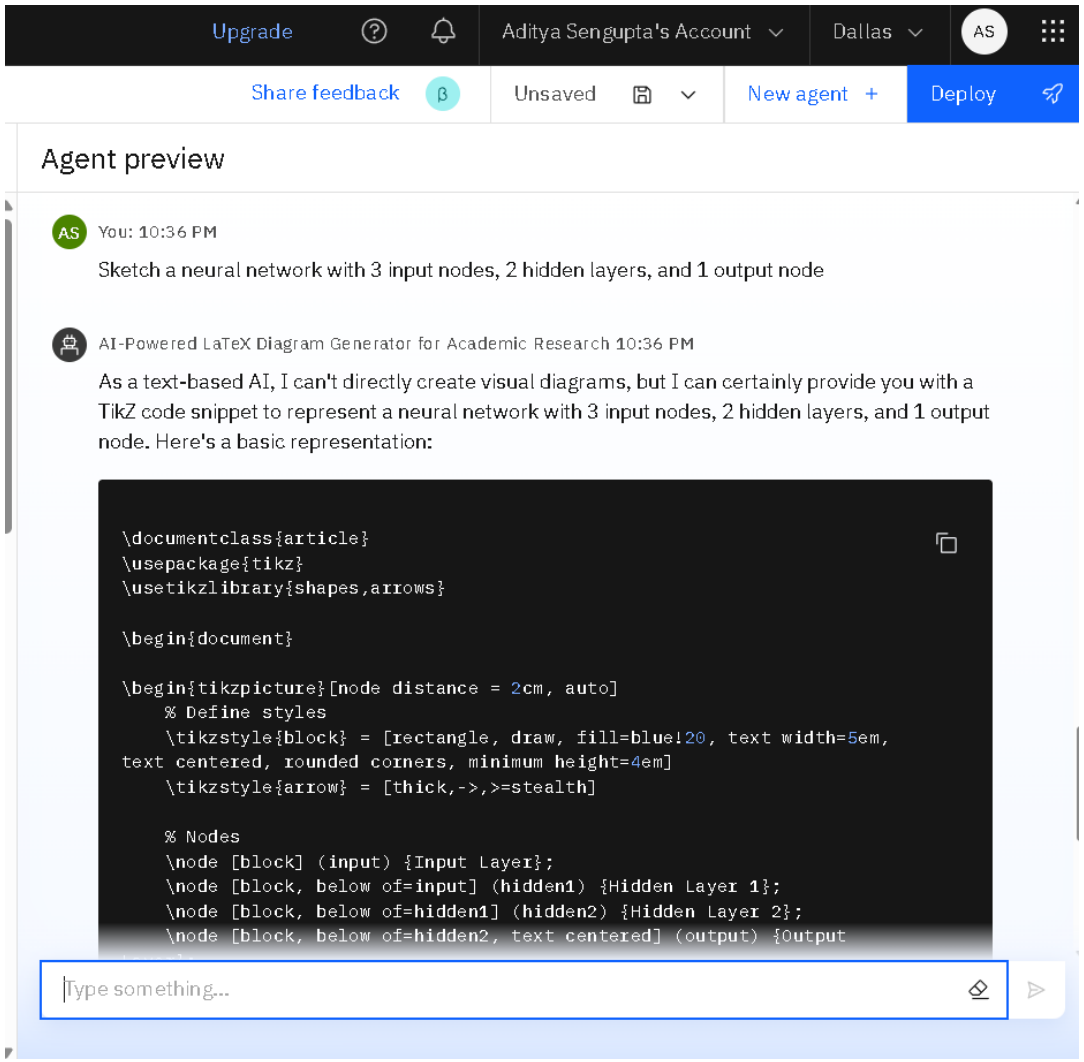

Agent preview
Here's a simple TikZ code snippet to get you started:
\documentclass{article}
\usepackage{tikz}
\usetikzlibrary{shapes,arrows}
\begin{document}
\begin{tikzpicture}[node distance = 2cm, auto]
\tikzstyle{block} = [rectangle, draw, fill=blue!20, text width=5em, text centered, rounded corners, minimum height=4em]
\tikzstyle{line} = [draw, -latex']
\node [block] (data) {Data Collection};
\node [block, below of=data] (preprocess) {Data Preprocessing};
\node [block, below of=preprocess] (select) {Model Selection};
\node [block, below of=select] (train) {Training};
\node [block, below of=train] (evaluate) {Model Evaluation};
\node [block, below of=evaluate] (tune) {Hyperparameter Tuning};
\node [block, below of=tune] (predict) {Prediction};
\node [block, below of=predict] (deploy) {Model Deployment};
\path [line] (data) -- (preprocess);
\path [line] (preprocess) -- (select);
\path [line] (select) -- (train);
\path [line] (train) -- (evaluate);
\path [line] (evaluate) -- (tune);
\path [line] (tune) -- (predict);
Type something...

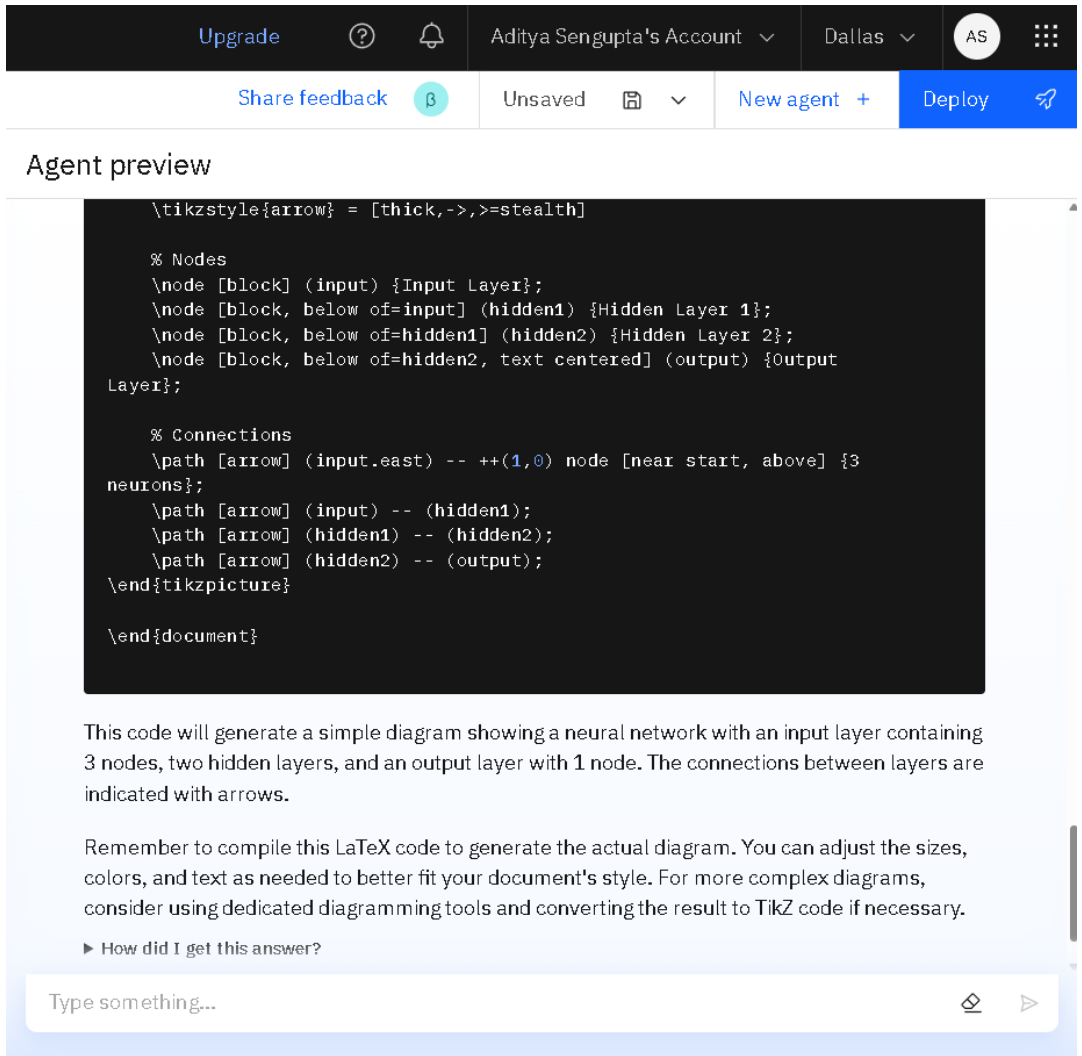
RESULTS





RESULTS





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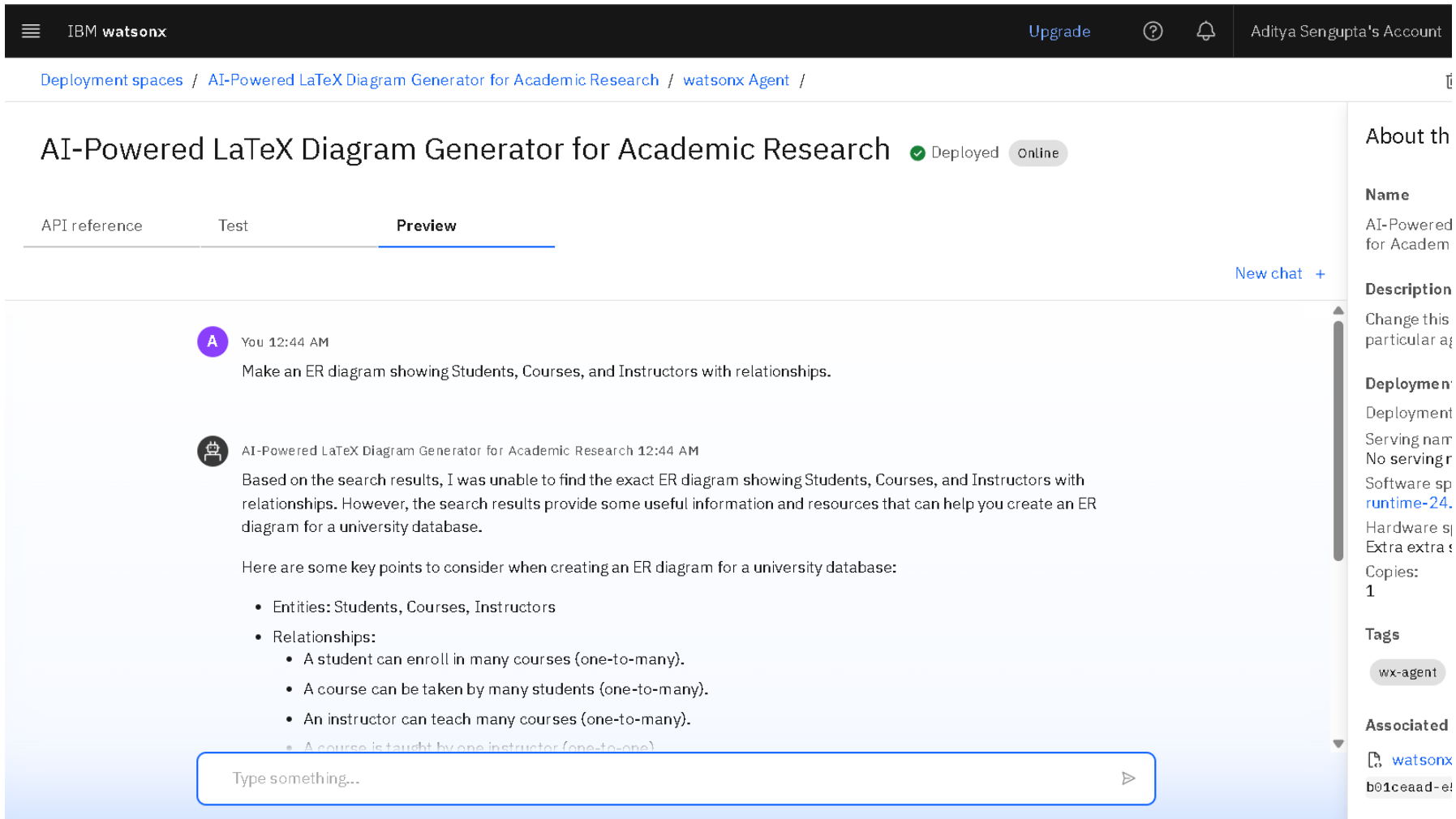
RESULTS

Deployed AI Agent



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CONCLUSION

- **Simplifies Complex Tasks**: Eliminates the need to manually write TikZ code by converting natural language or sketches into LaTeX diagrams.

- **Boosts Research Productivity**: Saves time and effort for researchers, students, and educators by automating high-quality diagram generation.

- **Enhances Accessibility**: Makes professional diagram creation accessible to non-technical users with real-time feedback and plain English commands.

GITHUB LINK

https://github.com/Adityasen-cmd/Edunet_Internship_2025.git

FUTURE SCOPE

- **Voice-to-Diagram Generation**
  Enable hands-free diagram creation using speech-to-text for accessibility and faster interaction.
- **Multilingual Support**
  Accept input and commands in multiple languages to support global researchers.
- **Overleaf Integration**
  Direct integration with Overleaf for real-time diagram preview and editing within LaTeX environments.
- **Auto-Diagram Suggestions**
  Automatically suggest diagrams based on surrounding LaTeX text or content analysis.
- **Collaborative Editing**
  Allow multiple users to co-edit and refine diagrams in real time for group research projects.
- **AI-Powered Diagram Optimization**
  Intelligent suggestions for better layout, aesthetics, and labeling of diagrams.
- **Export to Multiple Formats**
  Support PNG, SVG, and PDF exports alongside TikZ for broader use in presentations and publications.

IBM CERTIFICATIONS

Certificate of Getting Started with AI

Certificate of RAG with LangChain

THANK YOU

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