CAPSTONE PROJECT

FAULT DETECTION

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OUTLINE

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- IBM Certifications

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PROBLEM STATEMENT

- Power distribution systems are critical infrastructures that must operate reliably to ensure continuous delivery of electricity. However, these systems are prone to various types of faults, such as line-to-ground, line-to-line, or three-phase faults, which can lead to outages, equipment damage, and safety hazards. Detecting and classifying these faults quickly and accurately is essential to maintain power grid stability and prevent system failures.
- Proposed Solution:
  Develop a Machine Learning model that leverages electrical measurement data—such as voltage, current, and phasors—to automatically detect and classify different types of power system faults. The model will distinguish between normal operating conditions and various fault scenarios, enabling rapid response and proactive maintenance.
  Deployment will be done using IBM Cloud Lite services, ensuring scalability and real-time monitoring capabilities.

TECHNOLOGY USED

IBM cloud lite services

IBM Cloud auto Ai

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IBM CLOUD SERVICES USED

- IBM Cloud Watsonx AI Studio
- IBM Cloud Watsonx AI runtime
- IBM Cloud Agent Lab

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WOW FACTORS

This system will significantly enhance the reliability and resilience of power distribution networks by enabling early and accurate fault detection. It helps utilities and operators prevent outages, reduce downtime, and ensure uninterrupted power supply by enabling proactive fault management.

- Unique features:
- Real-time monitoring and detection of electrical faults using sensor data
- Automatic classification of fault types (line-to-ground, line-to-line, and three-phase faults)
- High-accuracy machine learning model trained on realistic electrical measurement data
- Fast response time reduces equipment damage and repair costs
- Cloud-based deployment using IBM Cloud Lite for scalability and remote access
- Easy integration with SCADA and other grid management systems
- Supports predictive maintenance strategies for smarter power grid operations

END USERS

- Power Utility Companies
- Grid Operators and Substation Engineers
- Smart Grid Solution Providers
- Energy Management System Developers
- Electrical Maintenance Teams
- Industrial Automation Companies
- Government Energy Departments
- Academic and Industry Researchers

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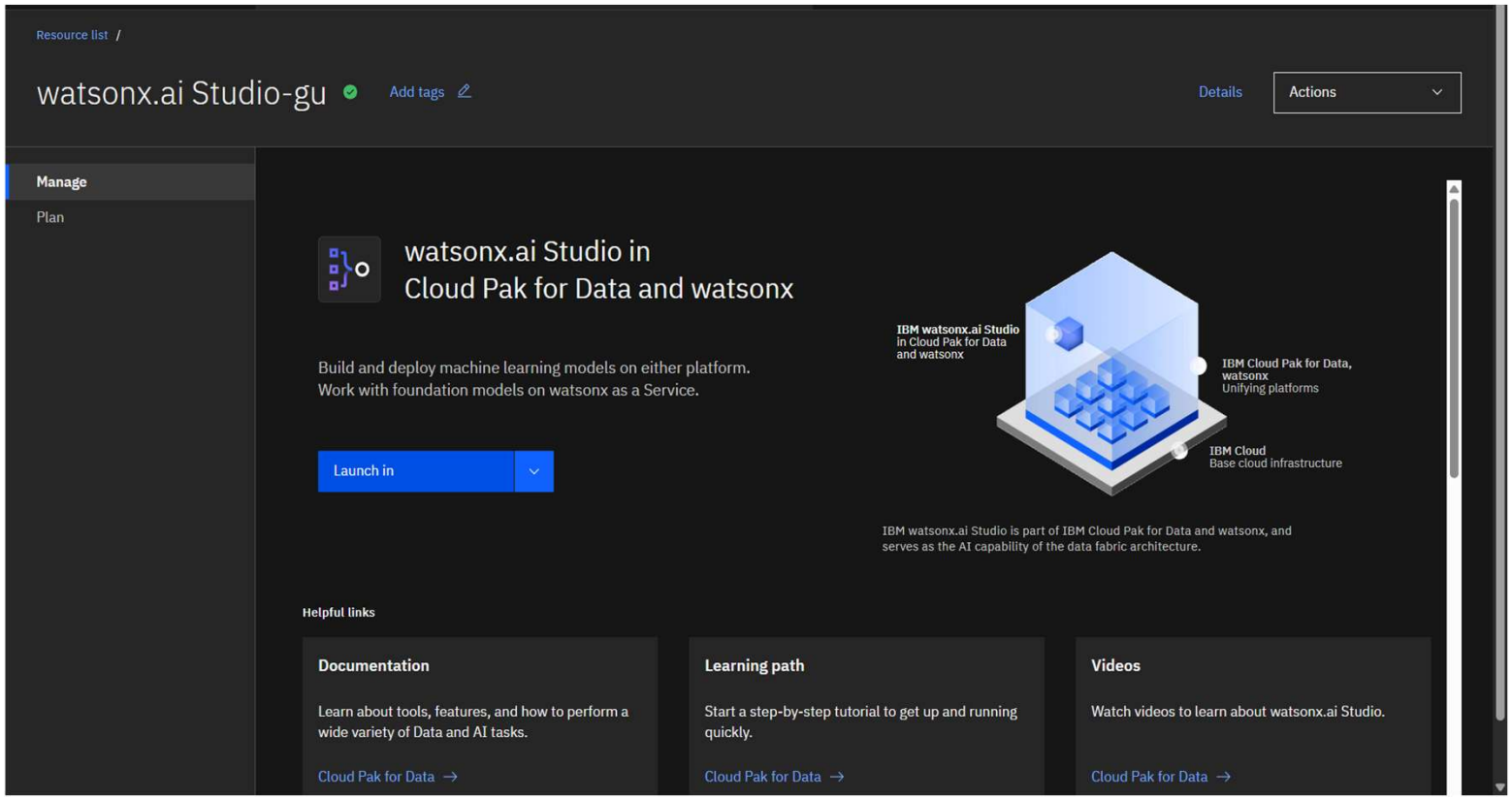
SETTING UP



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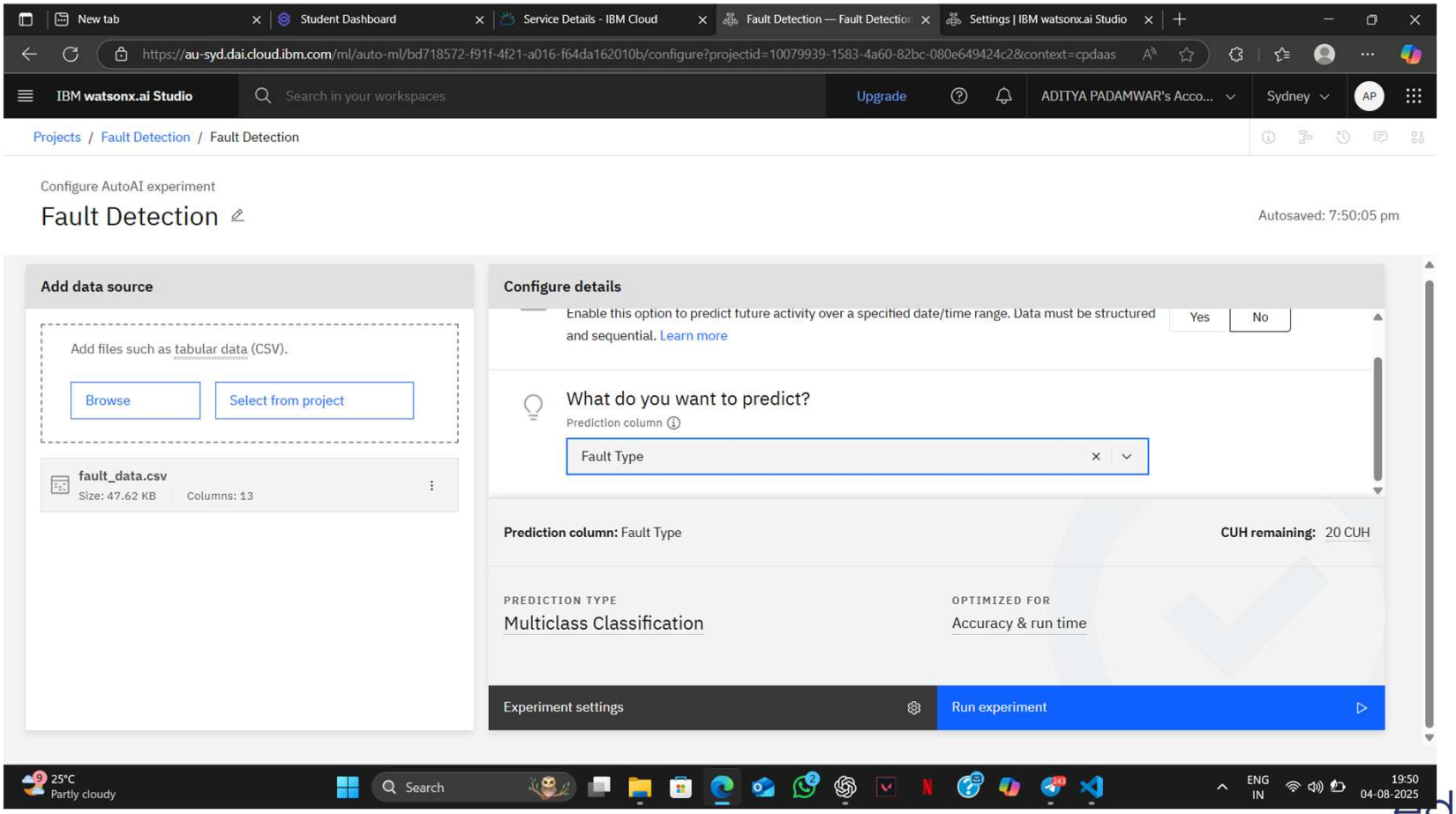
CONFIGURE AUTO AI



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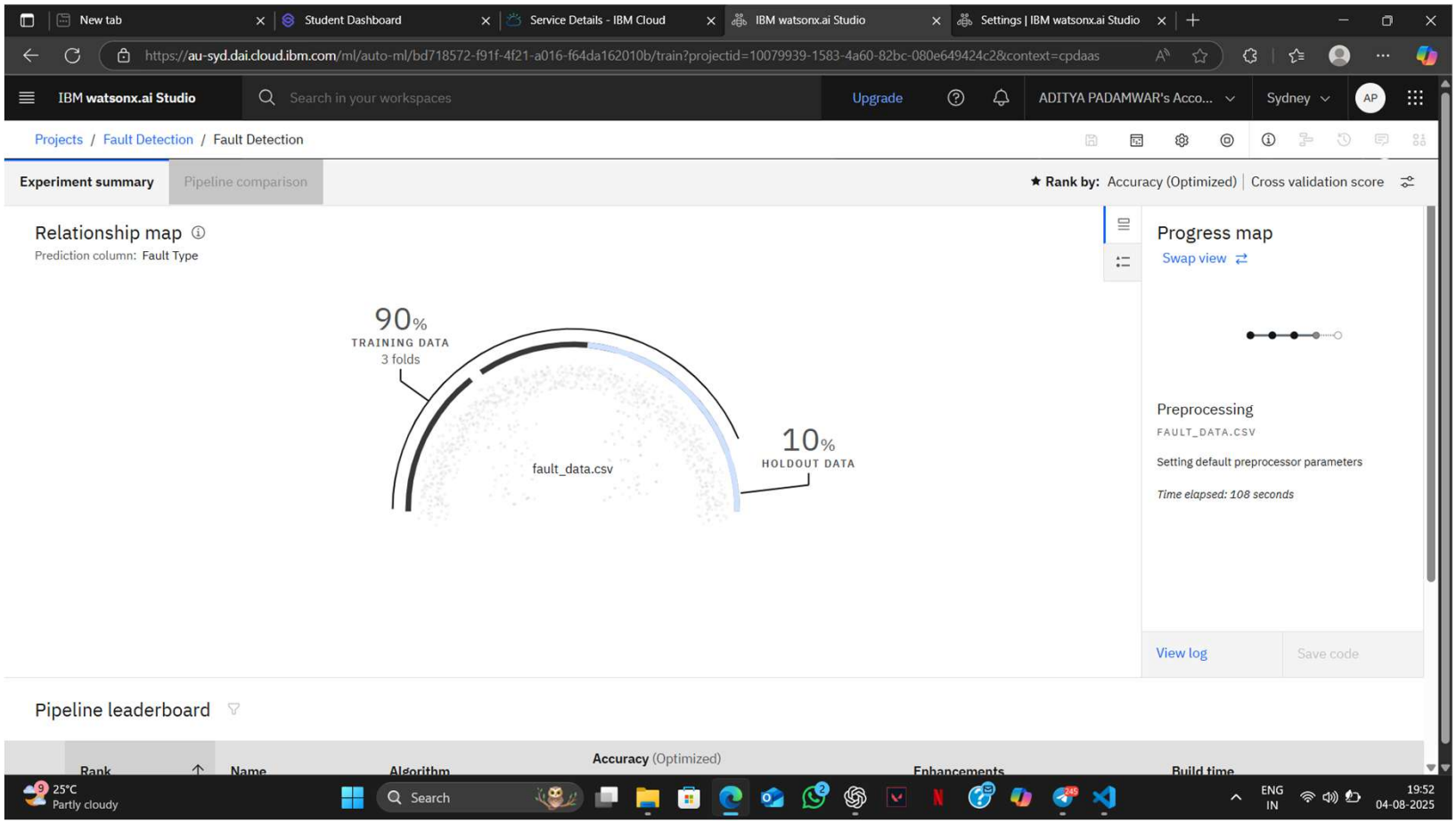
PIPELINE CREATION



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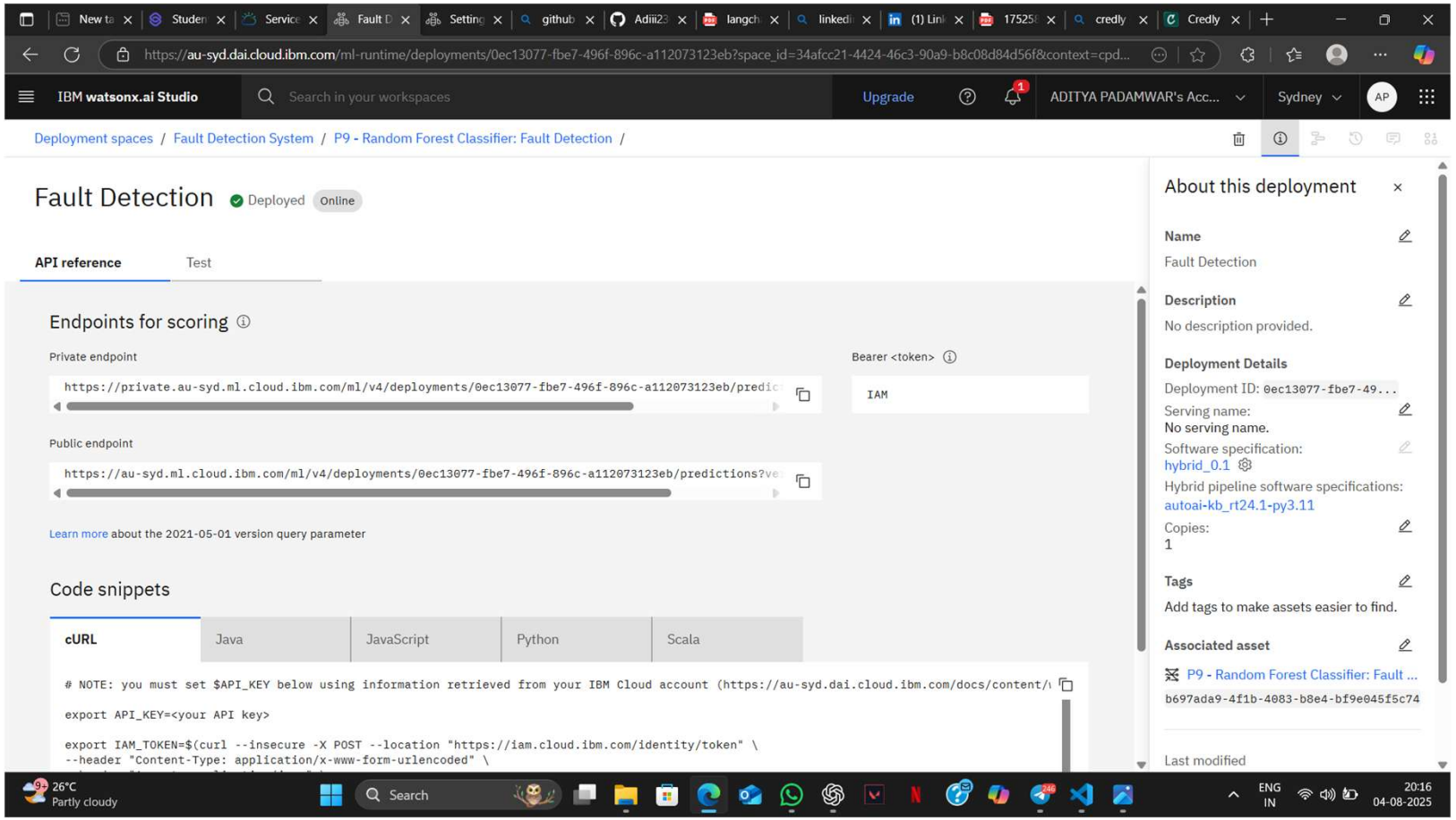
MODEL CREATED



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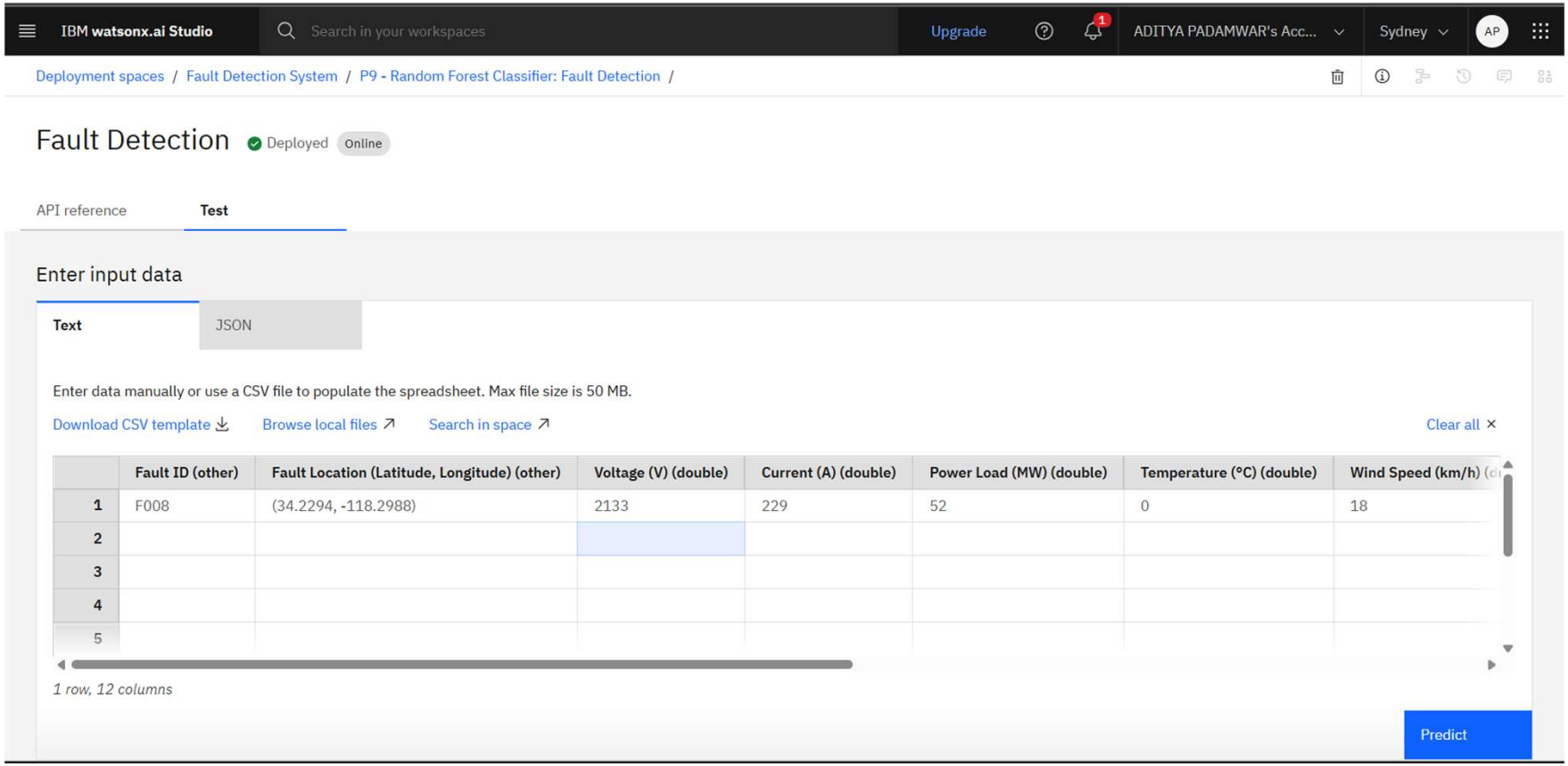
TESTING



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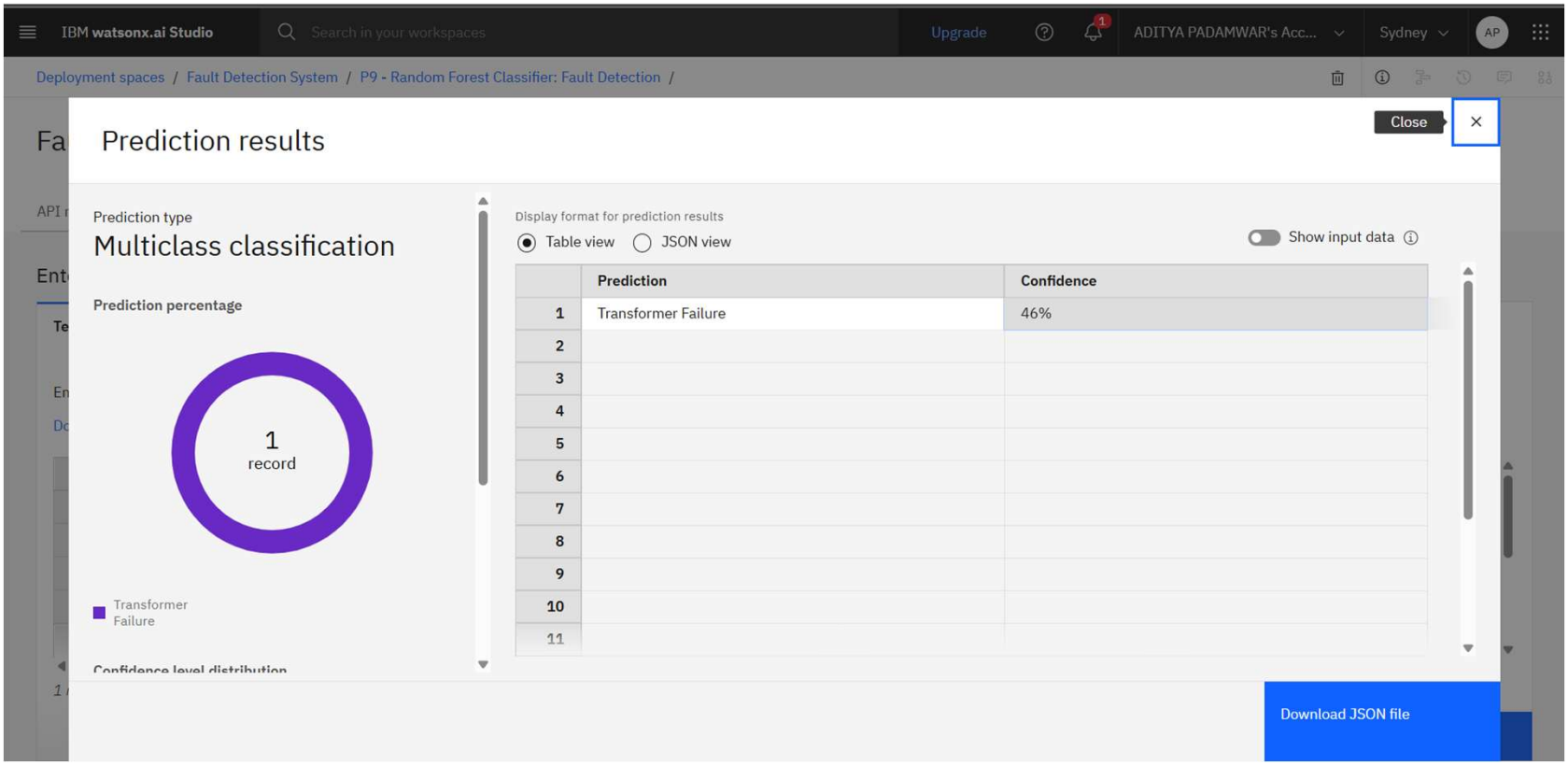
RESULTS



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CONCLUSION

- The proposed system can detect and classify electrical faults in real-time, helping utilities maintain consistent power delivery.
- It reduces downtime and equipment damage by enabling fast and accurate fault identification.
- Automating fault detection improves overall system efficiency and reliability in both industrial and utility environments.
- This ML-based solution supports the future of smart grids by integrating predictive maintenance and intelligent automation.

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FUTURE SCOPE

- Integration with IoT-enabled smart meters for edge-level fault detection
- Deployment on 5G-enabled smart grid infrastructure for ultra-fast response
- Use of Deep Learning for more complex fault pattern recognition
- Expansion to cover predictive analytics for equipment lifespan estimation
- Real-time integration with emergency response systems
- Visualization dashboards for dynamic fault mapping and analytics
- Incorporation of weather and environmental data for enhanced prediction

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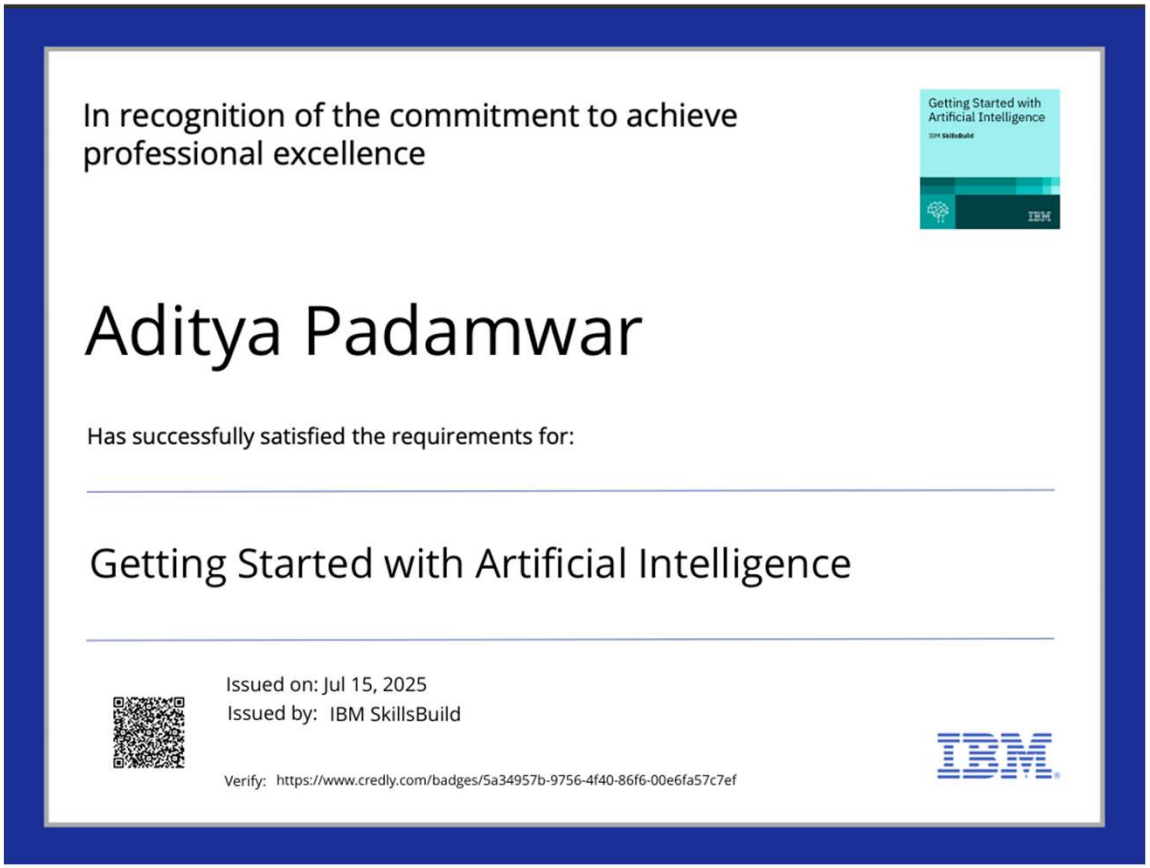
IBM CERTIFICATIONS



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IBM **SkillsBuild** Completion Certificate

This certificate is presented to

ADITYA PADAMWAR

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 21 Jul 2025 (GMT)

Learning hours: 20 mins

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GITHUB LINK

- https://github.com/Adiii230806/Fault-Detection-System.git

THANK YOU

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