CAPSTONE PROJECT

POWER SYSTEM FAULT DETECTION AND CLASSIFICATION

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OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT

Design a machine learning model to detect and classify different types of faults in a power distribution system. Using electrical measurement data (e.g., voltage and current phasors), the model should be able to distinguish between normal operating conditions and various fault conditions (such as line-to-ground, line-to-line, or three-phase faults). The objective is to enable rapid and accurate fault identification, which is crucial for maintaining power grid stability and reliability.

PROPOSED SOLUTION

- Develop a machine learning model that classifies power system faults using the dataset provided. The model will process electrical measurements to identify the type of fault rapidly and accurately. This classification will help automate fault detection and assist in quicker recovery actions, ensuring system reliability.
- Data Collection:
  - Use the Kaggle dataset on power system faults.
- Data Preprocessing:
  - Clean and preprocess the collected data to handle missing values, outliers, and inconsistencies.
- Model Training : Train a classification model (e.g.. Decision Tree, Random Forest, or SVM)
- Evaluation:
  - Validate the model using accuracy, precision, recall, and F1-score.

SYSTEM APPROACH

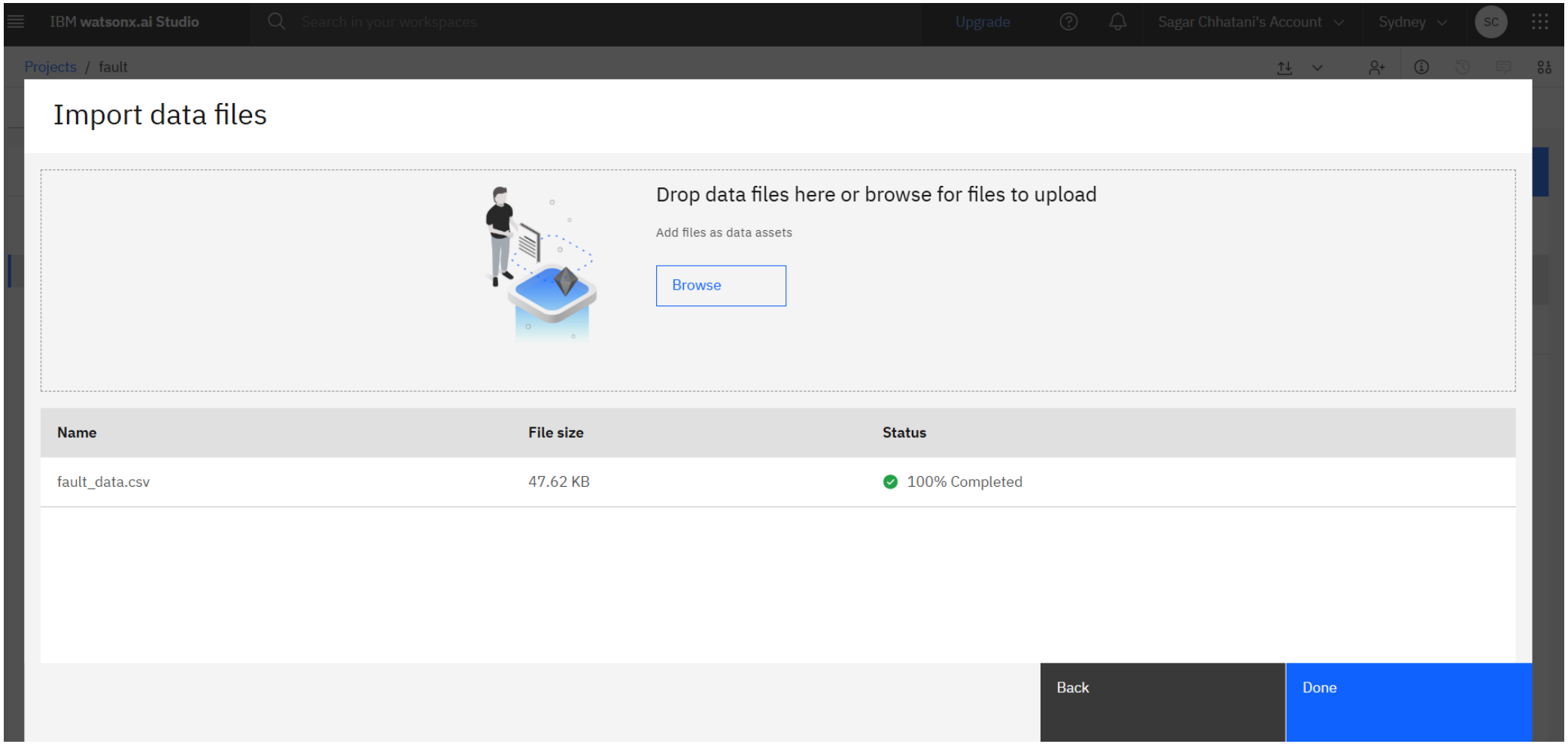
The "System Approach" section outlines the overall strategy and methodology for developing and implementing the rental bike prediction system. Here's a suggested structure for this section:

- System requirements:
  - IBM Cloud (mandatory)
  - IBM Watson Studio for model development and Deployment
  - IBM Cloud object storage for dataset handling

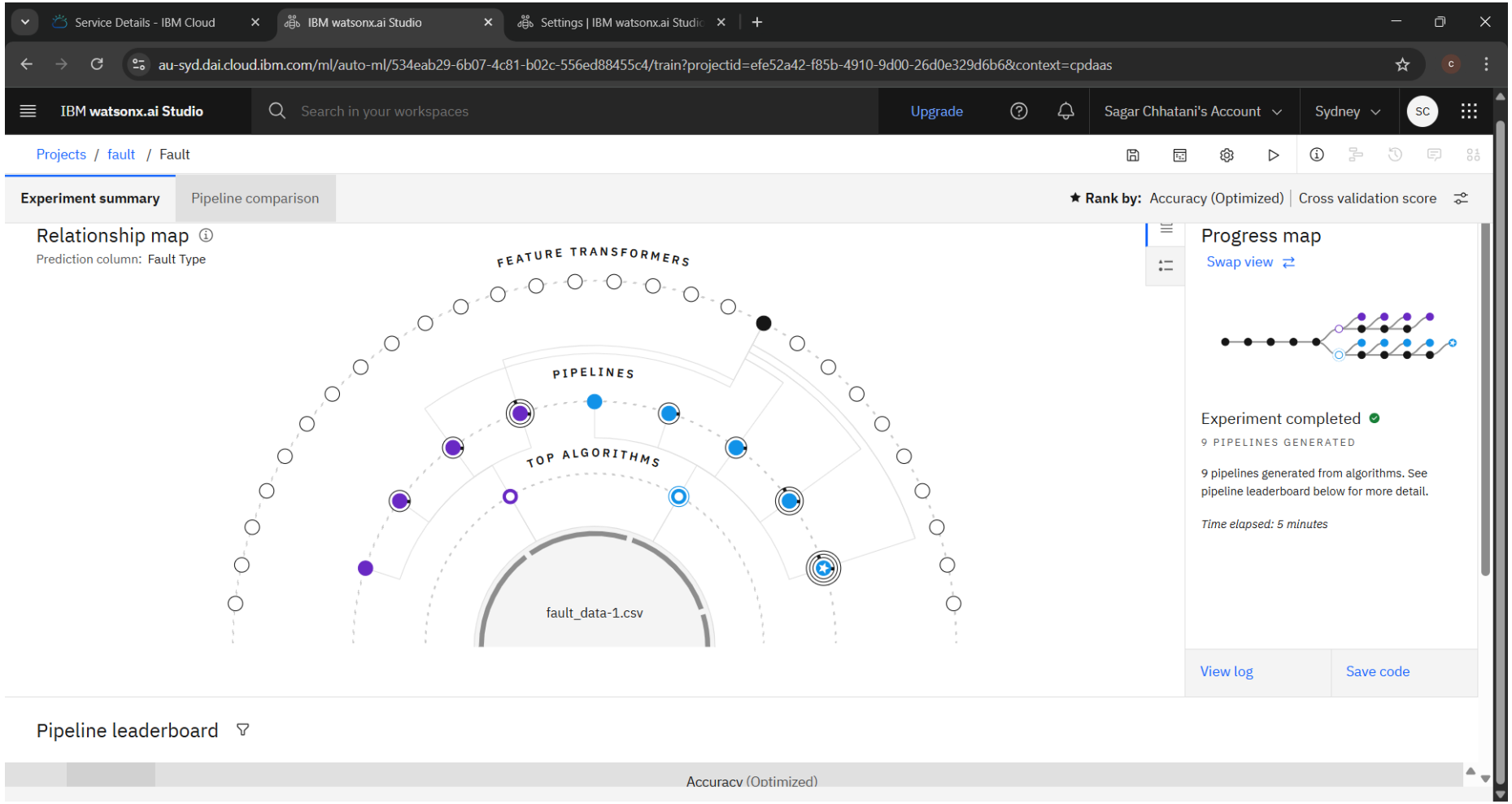
ALGORITHM & DEPLOYMENT

- In the Algorithm section, describe the machine learning algorithm chosen for predicting bike counts. Here's an example structure for this section:
- **Algorithm Selection:**
  - Batched Tree Ensemble Classifier(RFC) for better accuracy and Enhancements like HPO 1&2, FE, BATCH
- **Data Input:**
  - Voltage, Current and measurements from the dataset
- **Training Process:**
  - Supervised learning using labelled fault types
- **Prediction Process:**
  - Model deployed on IBM Watson Studio with API endpoint for real time predictions

RESULT



RESULT



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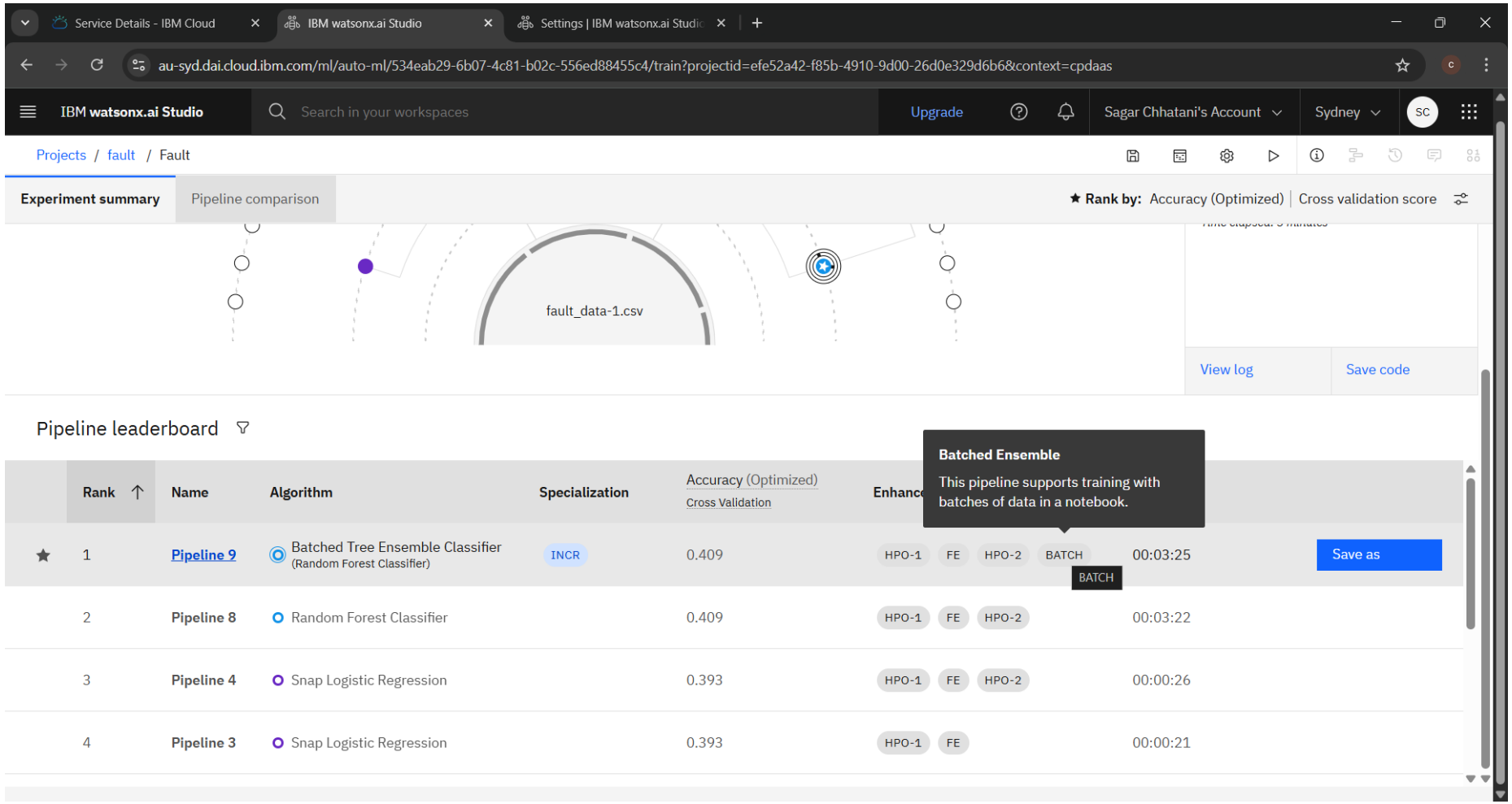
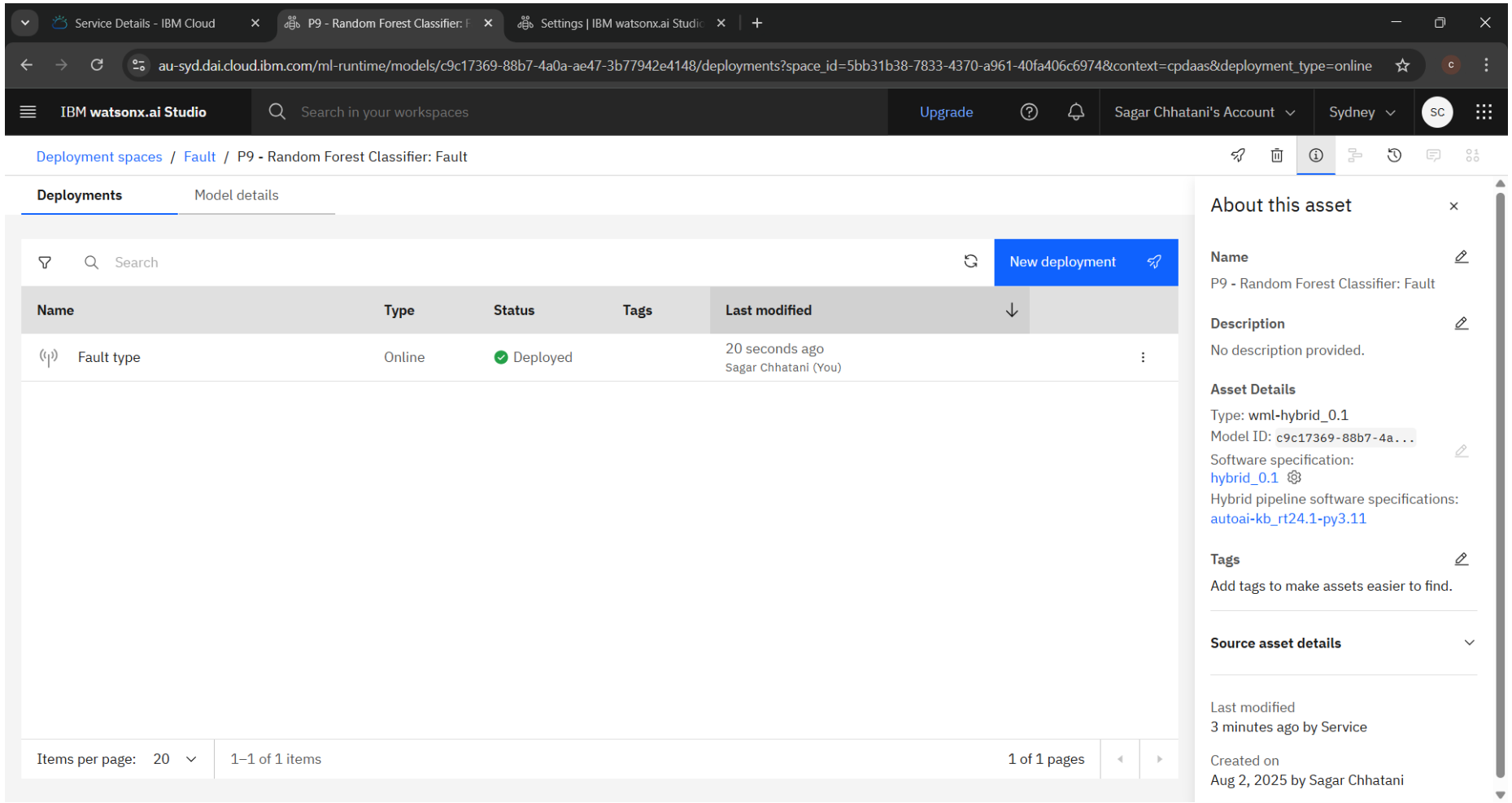
RESULT



RESULT



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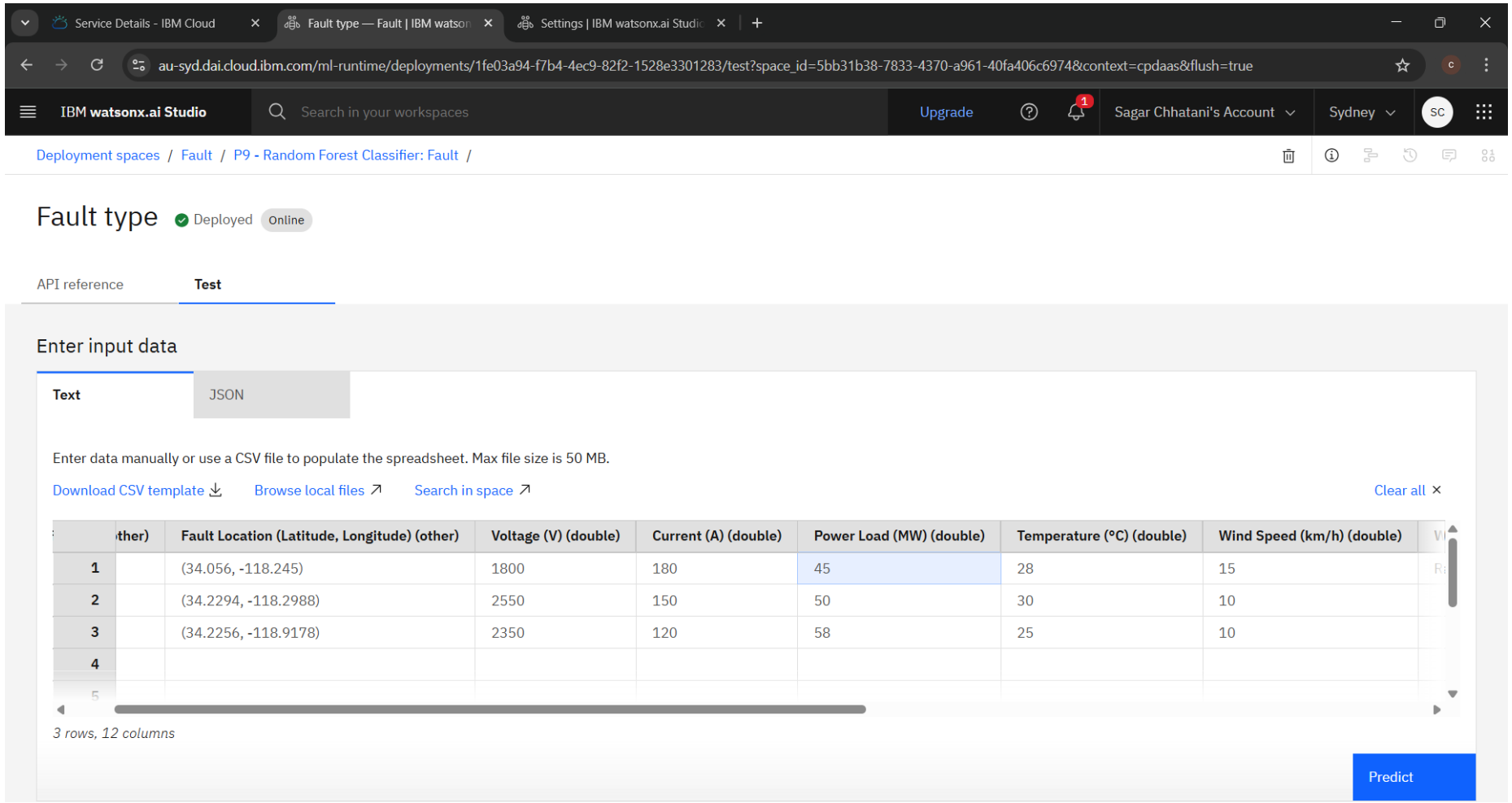
RESULT



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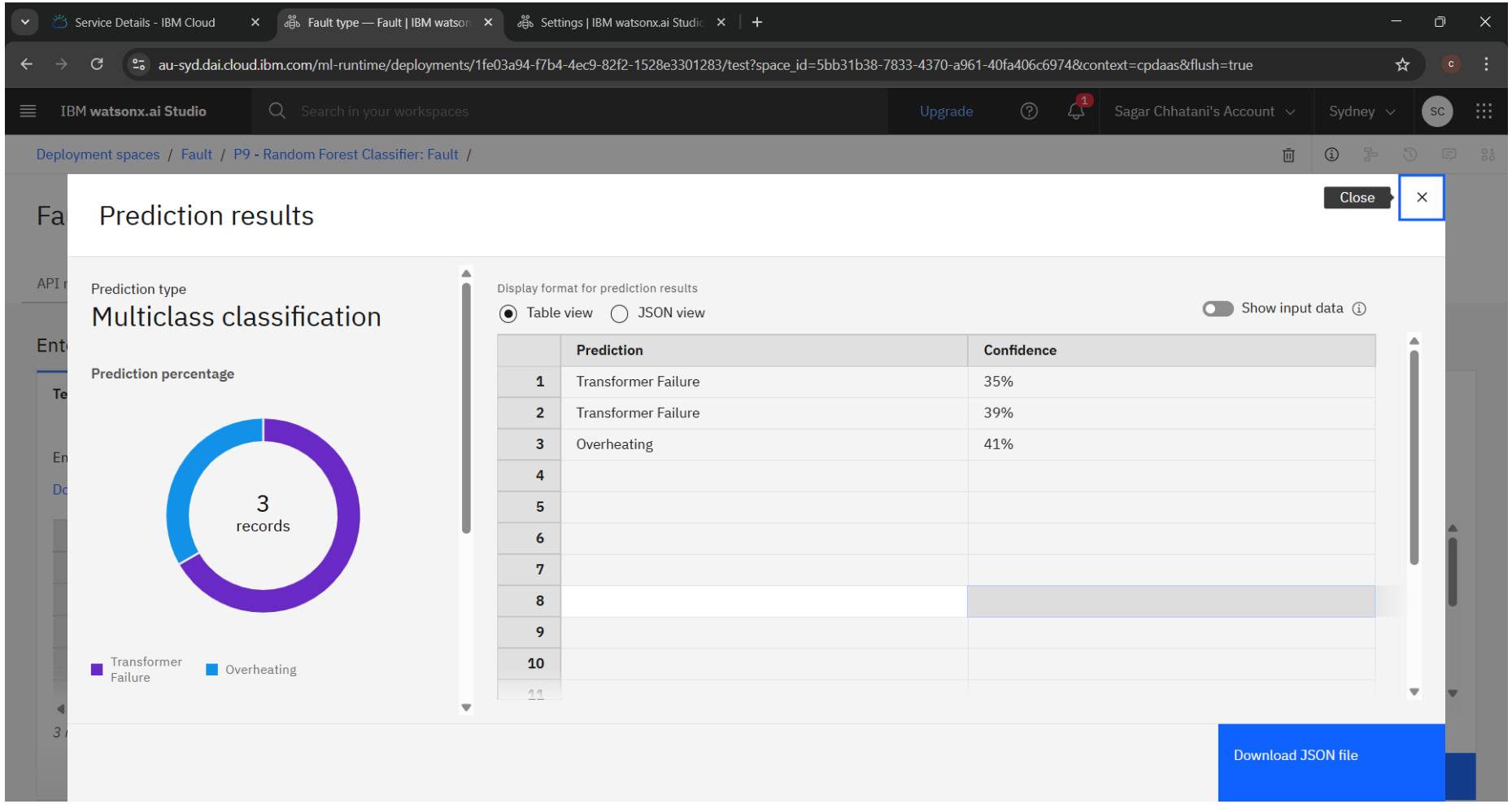
RESULT



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CONCLUSION

- The machine learning model effectively identifies and classifies power system faults, improving fault response time. This contributes to a more stable and reliable power grid.

FUTURE SCOPE

- In the future, this system can be enhanced to work in real-time using IoT sensors and cloud computing for instant fault detection. It can be integrated with automated control systems to isolate faults quickly, reducing downtime. Advanced AI techniques like deep learning can improve accuracy for complex grid conditions.

REFERENCES

- Ziya07. (2023). *Power System Faults Dataset*. Kaggle.
- Kundur, P. (1994). *Power System Stability and Control*. McGraw-Hill.
- IBM Cloud Docs – *Getting Started with IBM Watson Machine Learning*.

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