CAPSTONE PROJECT

Power Fault Detection Using ML

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OUTLINE

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Problem Statement

The reliability of power distribution systems is critically affected by faults such as line breakages, transformer failures, and equipment overheating. Traditional fault detection methods are often slow and reactive, leading to increased downtime and compromised grid stability. The objective of this project is to develop a machine learning-based model that can accurately detect and classify different types of faults using real-time electrical and environmental data. By distinguishing between normal operating conditions and specific fault types, the model aims to enable rapid fault identification, support predictive maintenance, and enhance the overall resilience of the power grid.

Proposed Solution

- Build a machine learning-based solution to detect faults .
- Use Kaggle dataset for training and testing.

Steps:

- Data Collection & Preprocessing
- Feature Engineering
- Model Selection & Training
- Deployment on IBM Cloud Lite
- Real-time detection with API endpoint for alerts.

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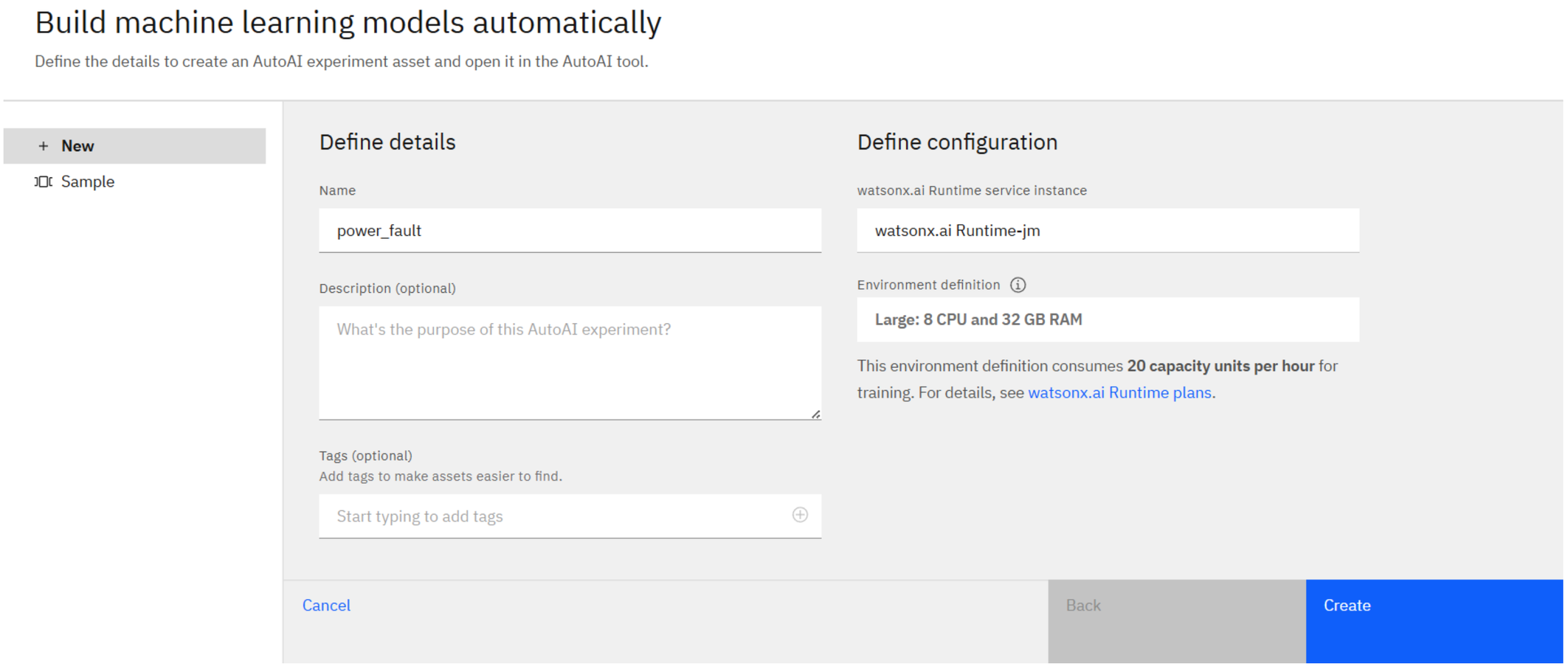


System Approach

- Programming Language: Python
- Libraries: Pandas, NumPy, Scikit-learn, Matplotlib, Seaborn
- Machine Learning Models: Random Forest, Decision Tree, Gradient Boosting
- Deployment: IBM Cloud Lite (Watson Machine Learning service)
- Dataset: Kaggle Network Intrusion Detection dataset

Algorithm & Deployment

Algorithm Selection:

- Chosen models: Random Forest for classification
- Reason: Handles high-dimensional data well and provides good accuracy.

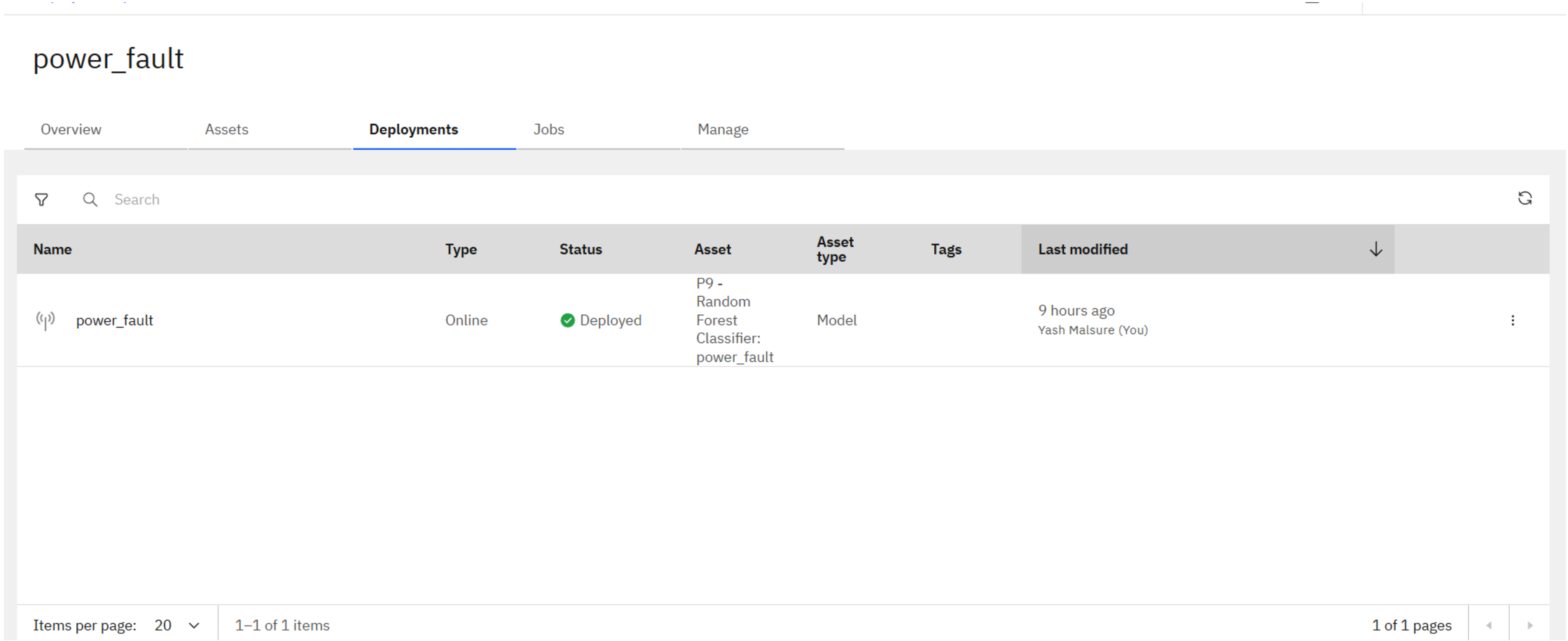
Training Process:

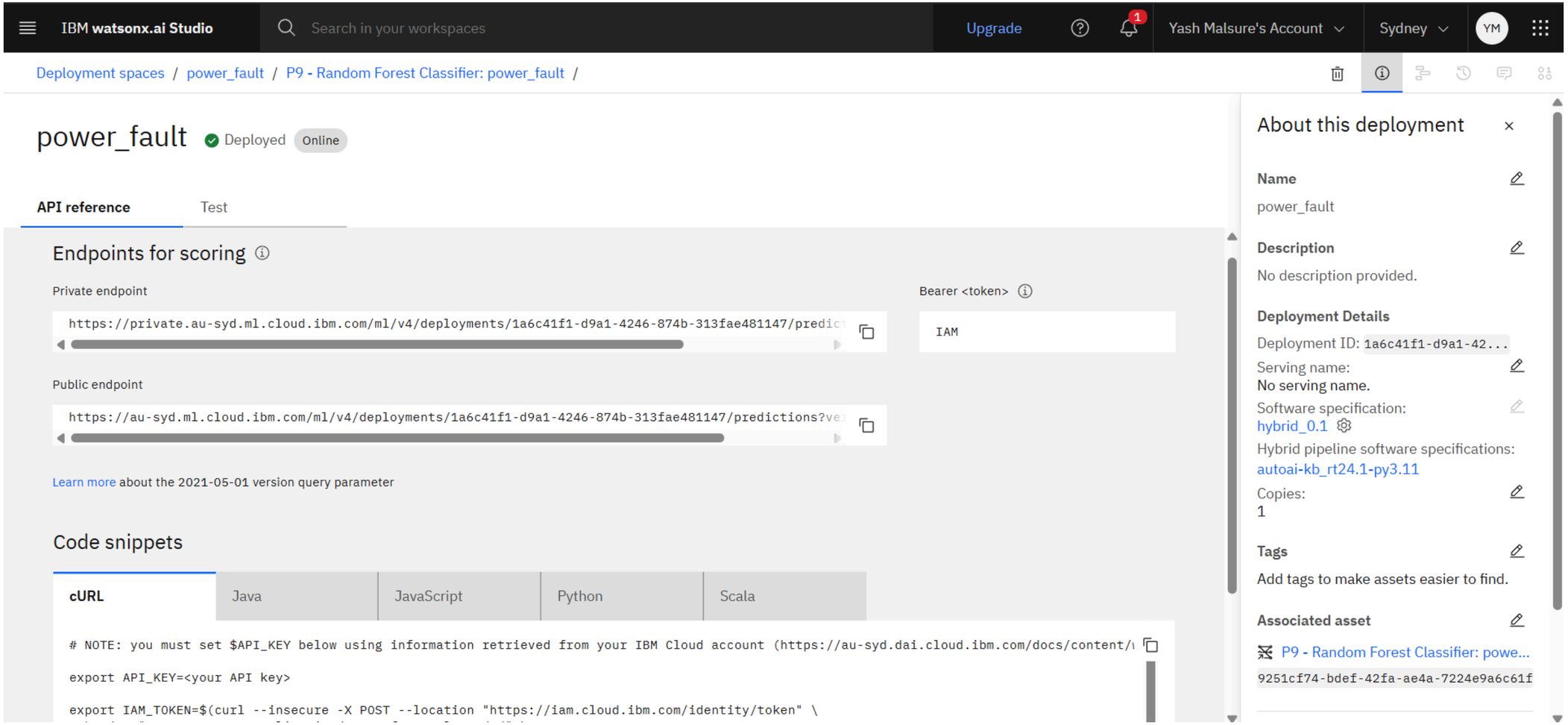
- Split dataset (70% train, 30% test)
- Preprocessing: Normalize features, handle missing values
- Train multiple models and compare accuracy

Deployment:

- Export trained model as .pkl
- Deploy on IBM Watson Machine Learning
- Provide REST API endpoint for real-time network data analysis

Deployment Screenshot :

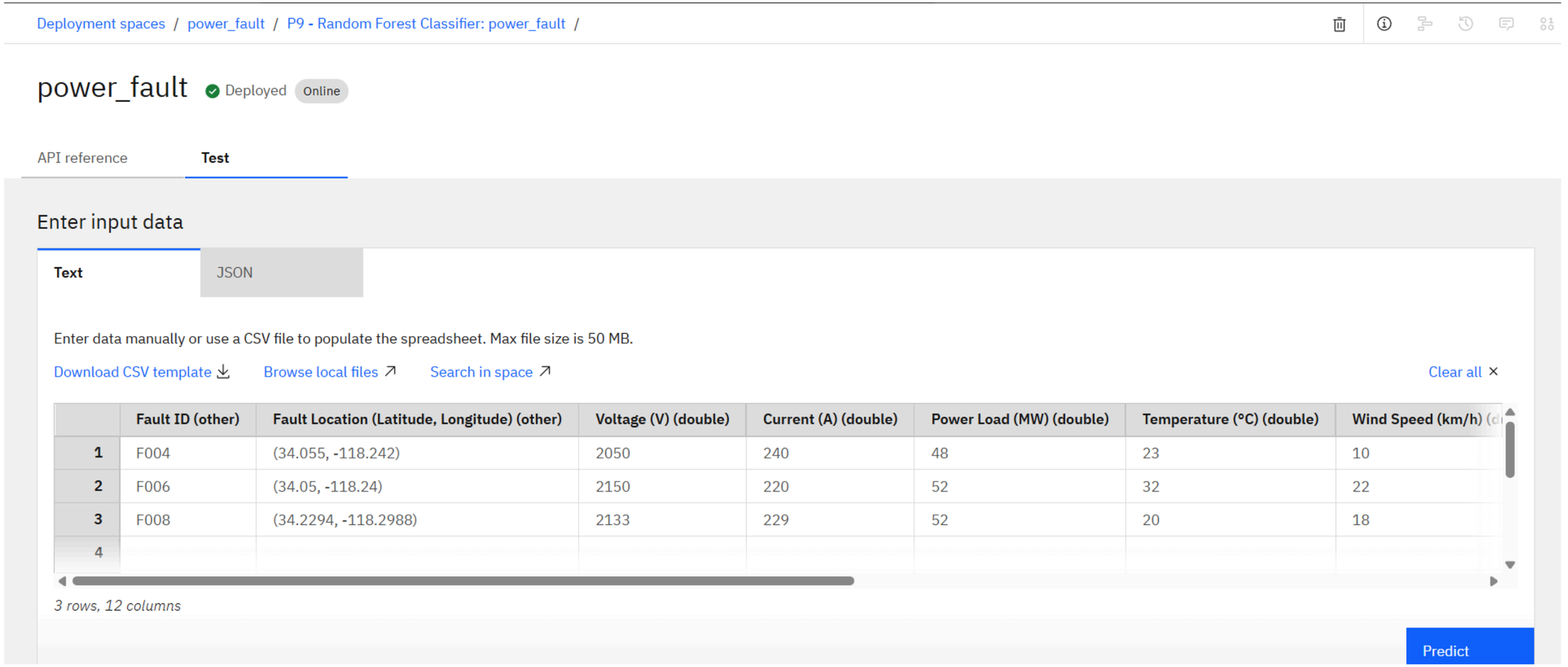




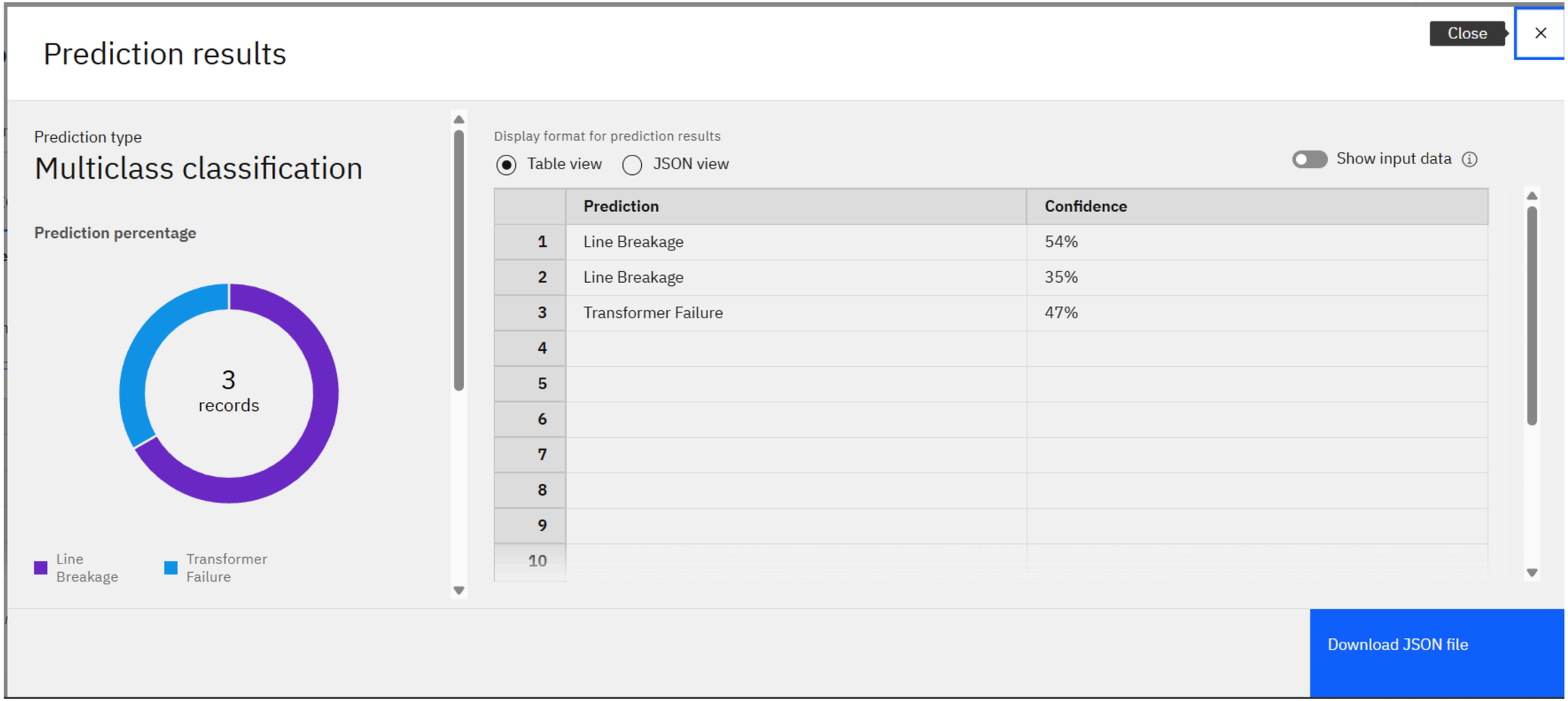
Result

- Accuracy achieved: ~95% (Random Forest)
- Confusion Matrix visualization
- Classification report: Precision, Recall
- Screenshot of IBM Cloud Deployment dashboard

Test of model:



Prediction Result :



Conclusion

- The ML model accurately classified power distribution faults using electrical and environmental data.

- The system enables faster and more reliable fault diagnosis compared to manual or rule-based methods.
- Deployed on IBM Cloud Lite for real-time detection capability.

Future scope

- Integrate Deep Learning models (LSTM, CNN) for better detection
- Enable real-time packet sniffing and live attack alerts
- Expand for IoT network security
- Add auto-updating threat database

References

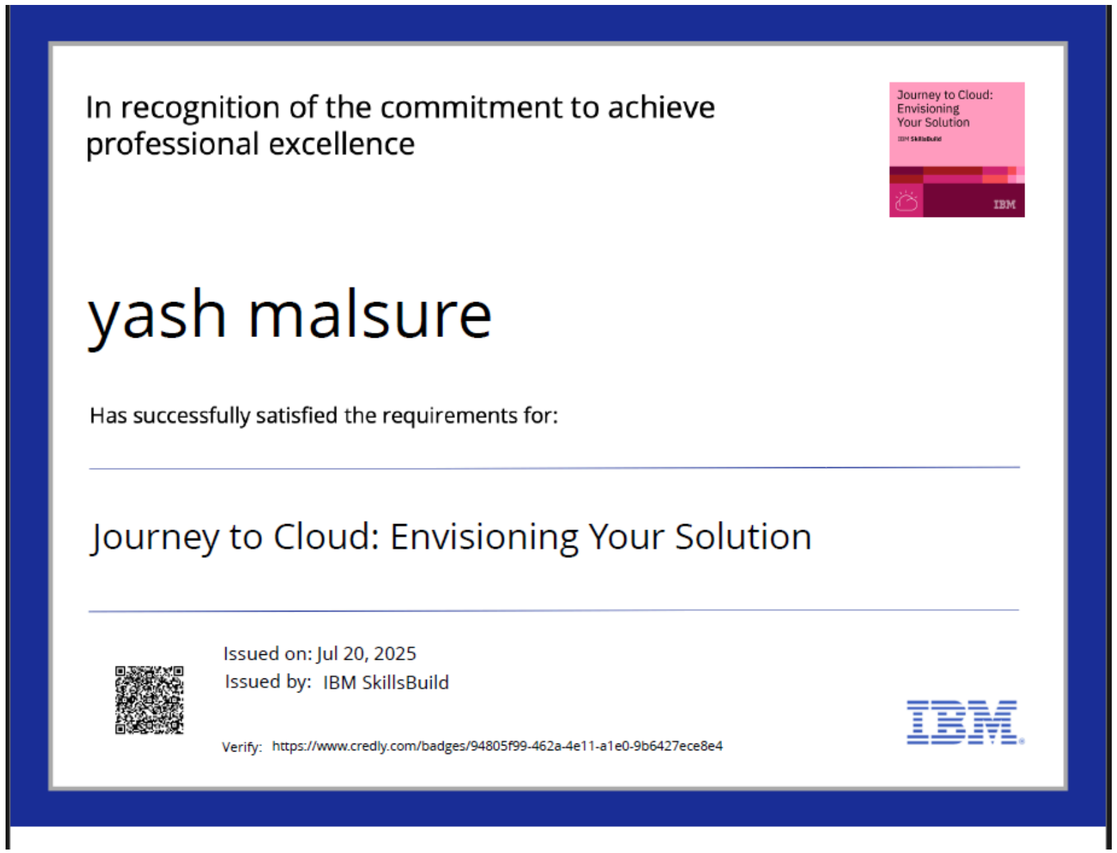
- Kaggle dataset:
- Research papers on NIDS using ML
- IBM Cloud Lite documentation

IBM Certifications

Getting Started with Artificial Intelligence :

IBM Certifications

Journey to cloud :



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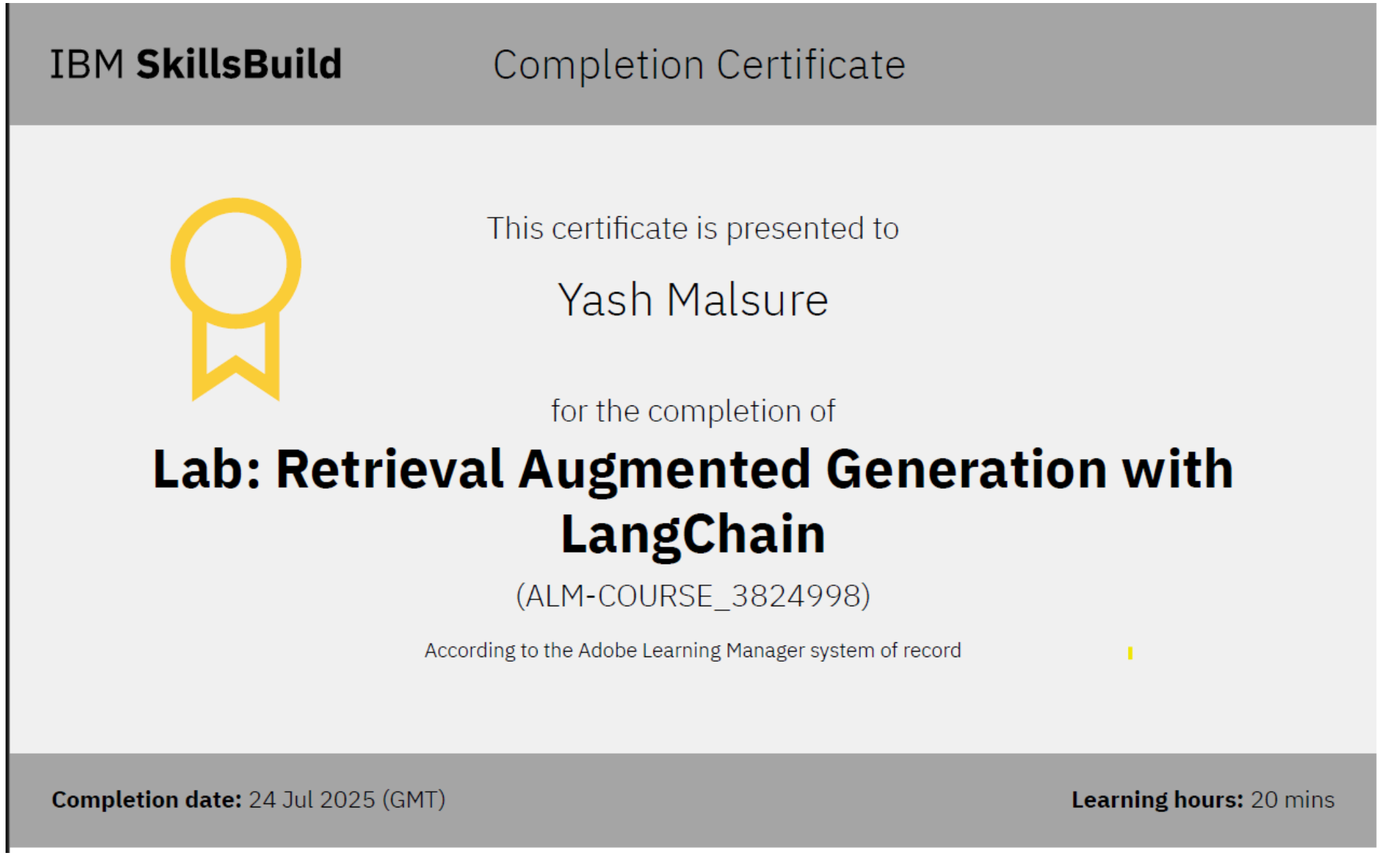
LAB : RAG COMPLETION



IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Yash Malsure

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According to the Adobe Learning Manager system of record

Completion date: 24 Jul 2025 (GMT)

Learning hours: 20 mins

THANK YOU

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