CAPSTONE PROJECT

Power System Fault Detection Classification Model

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OUTLINE

- Problem Statement
- Proposed System/Solution
- System Approach
- Algorithm & Deployment
- Result
- Conclusion
- IBM Certificates

PROBLEM STATEMENT

The Challenge:

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

- Propose a machine learning-driven solution that utilizes real-time electrical measurement data. This solution aims to ensure rapid, accurate, and automated identification of fault conditions to enhance power grid stability and reliability. The entire pipeline will be developed and deployed using **IBM Cloud Lite services**, as per the requirement.

- Components of the Proposed Solution :-

- **Data Collection**
  - Use a **Kaggle Dataset** for Power System Faults
- **Data Preprocessing**
  - Handling Missing Values and drawn valuable features for prediction.
  - Encode fault types (e.g., normal, Faulty , OverHeated)
- **Feature Engineering**
  - Extract meaningful electrical features (e.g. Voltage, Current, Duration of Fault,etc)
- **Model Development**
  - Train **ML classifiers** (Snap Logistic Regression, Random Forest Classifier).
  - Evaluate using accuracy(**cross validation**), precision, recall, and **F1-score**.
- **IBM Cloud Deployment**
  - Use **IBM Watson Studio** for training and experimentation
  - Deploy model using **IBM Watson Machine Learning (Lite Plan)**
  - Store assets in **IBM Cloud Object Storage**

SYSTEM APPROACH

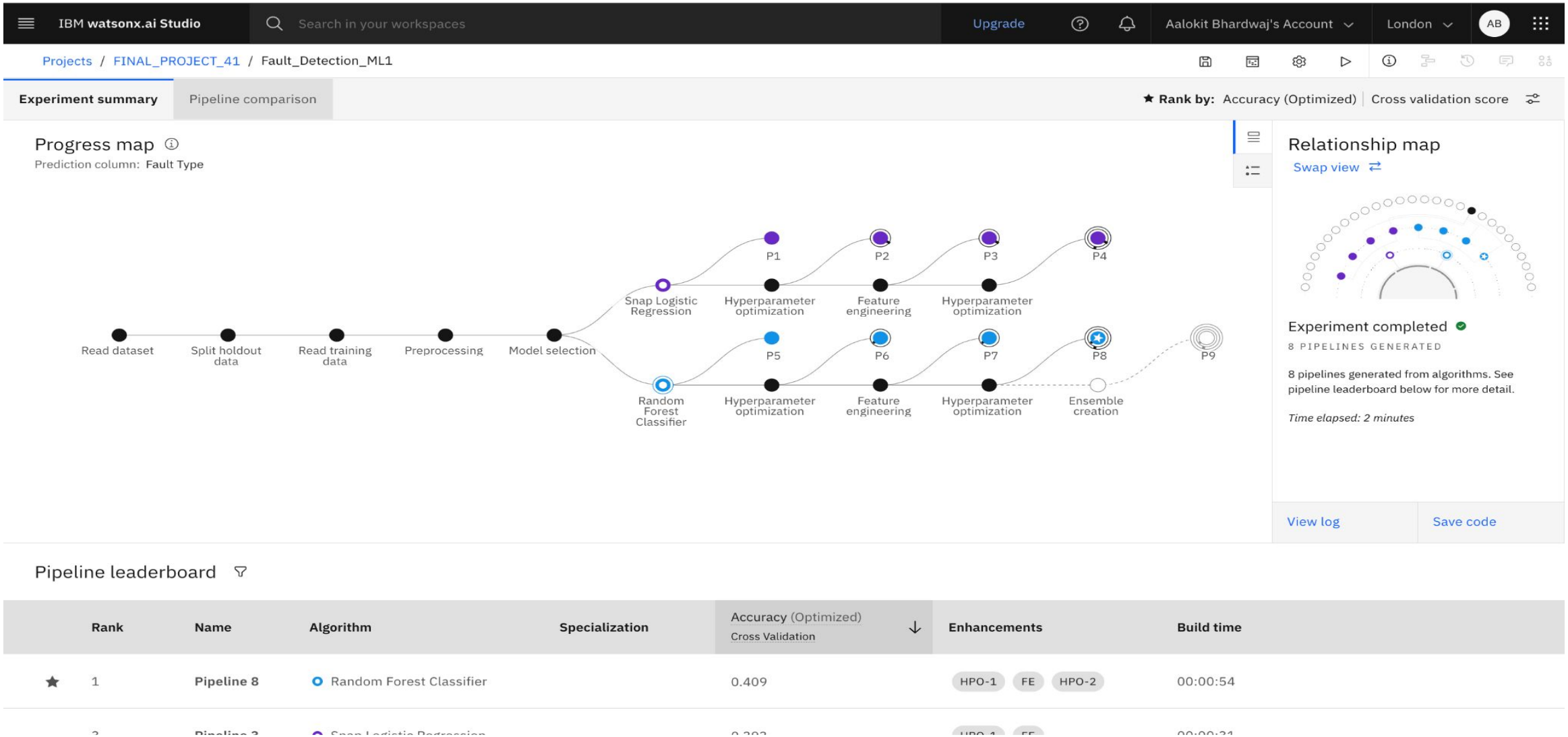
The "System Approach" section outlines the overall strategy and methodology for developing and implementing the rental bike prediction system. Here's a suggested structure for this section:

- **IBM Cloud** (Mandatory)
- **IBM Watson Studio** for Model Development and Deployment
- **IBM Cloud Object storage** for Data Handling

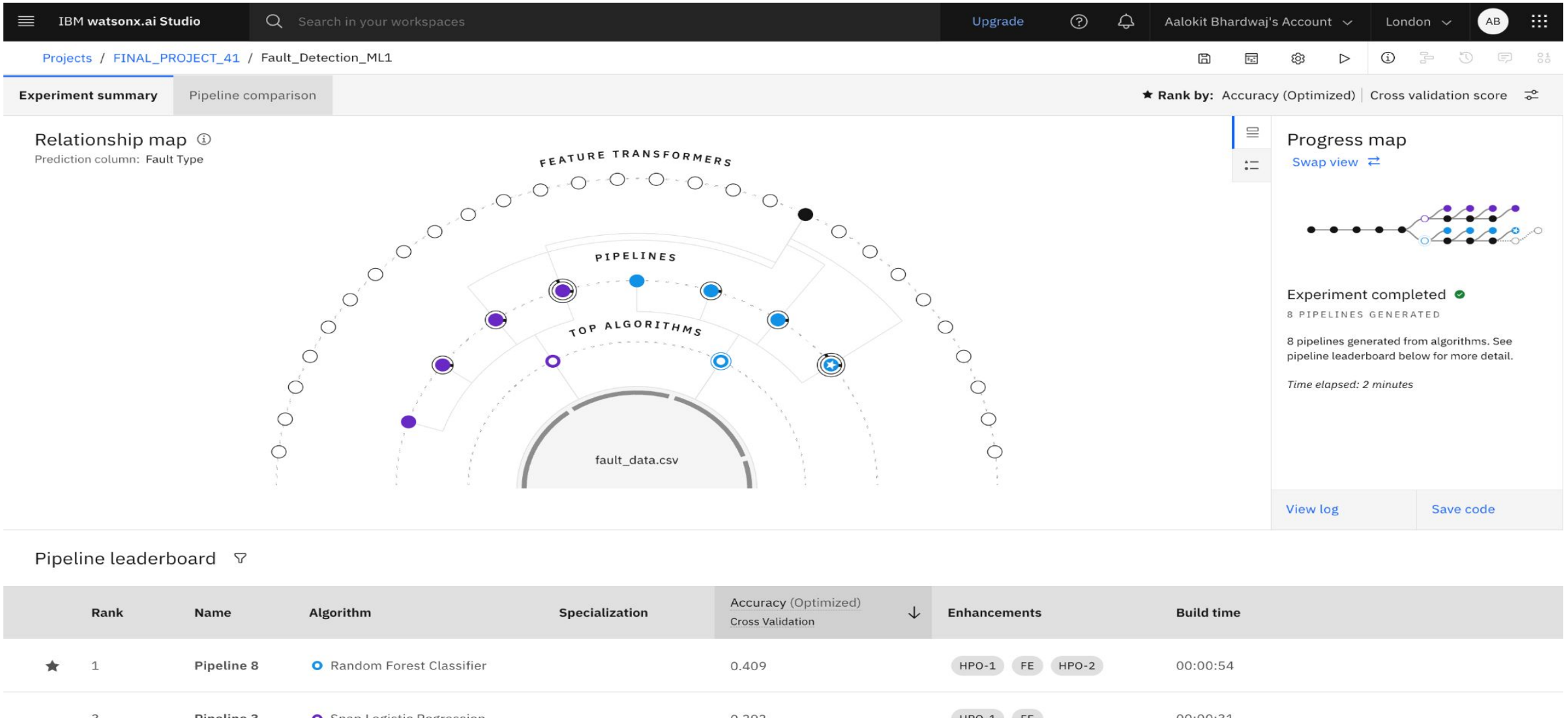
ALGORITHM & DEPLOYMENT

- **Algorithm Selection:**
  - Random Forest Classifier(or SVM based on Performance).
- **Data Input:**
  - Current , Duration of Fault , Power, etc measurements are taken from dataset.
- **Training Process:**
  - Supervised Learning using labeled Fault types.
- **Prediction Process:**
  - Model deployed on IBM Watson Studio with API Endpoints for Real Time Predictions

RESULT



RESULT



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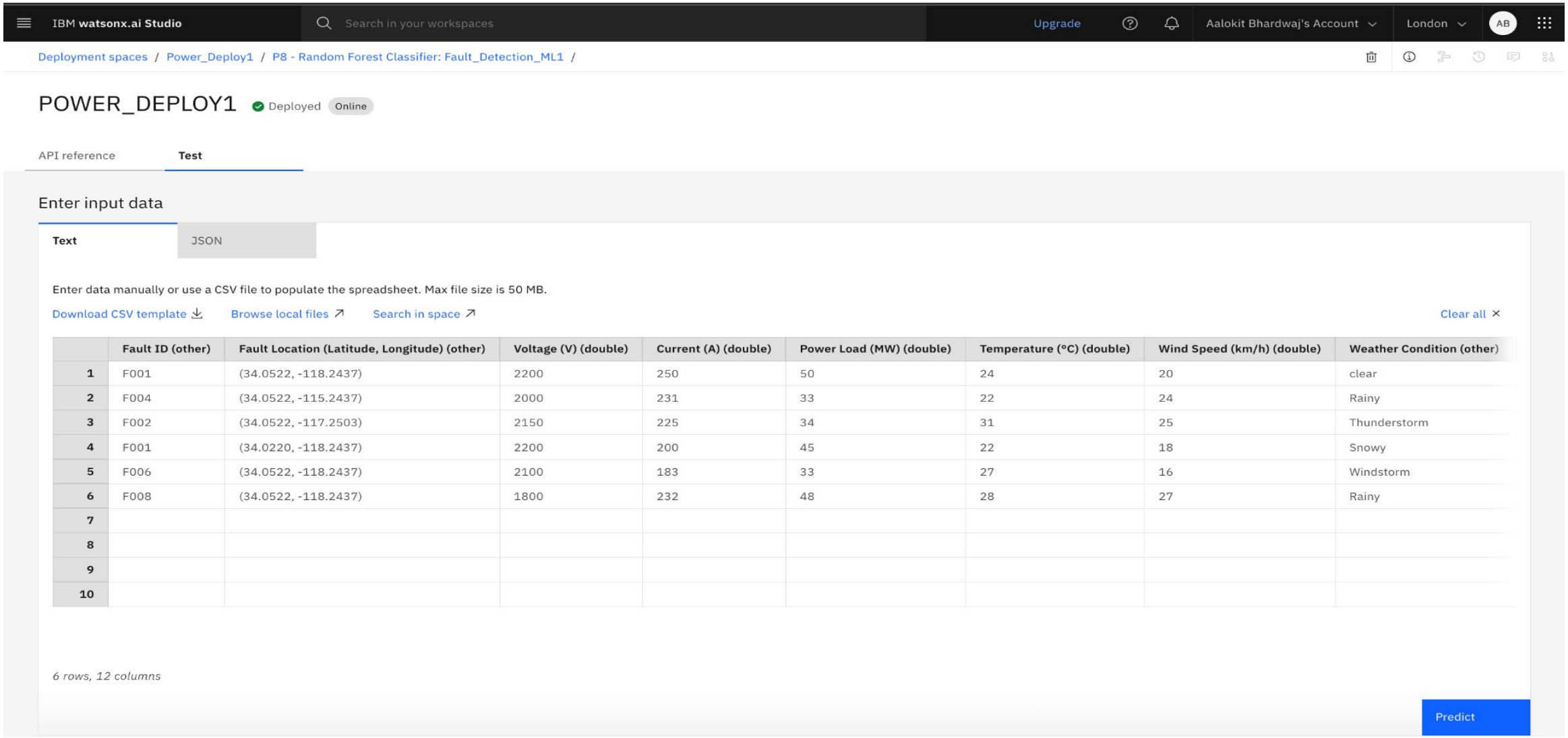
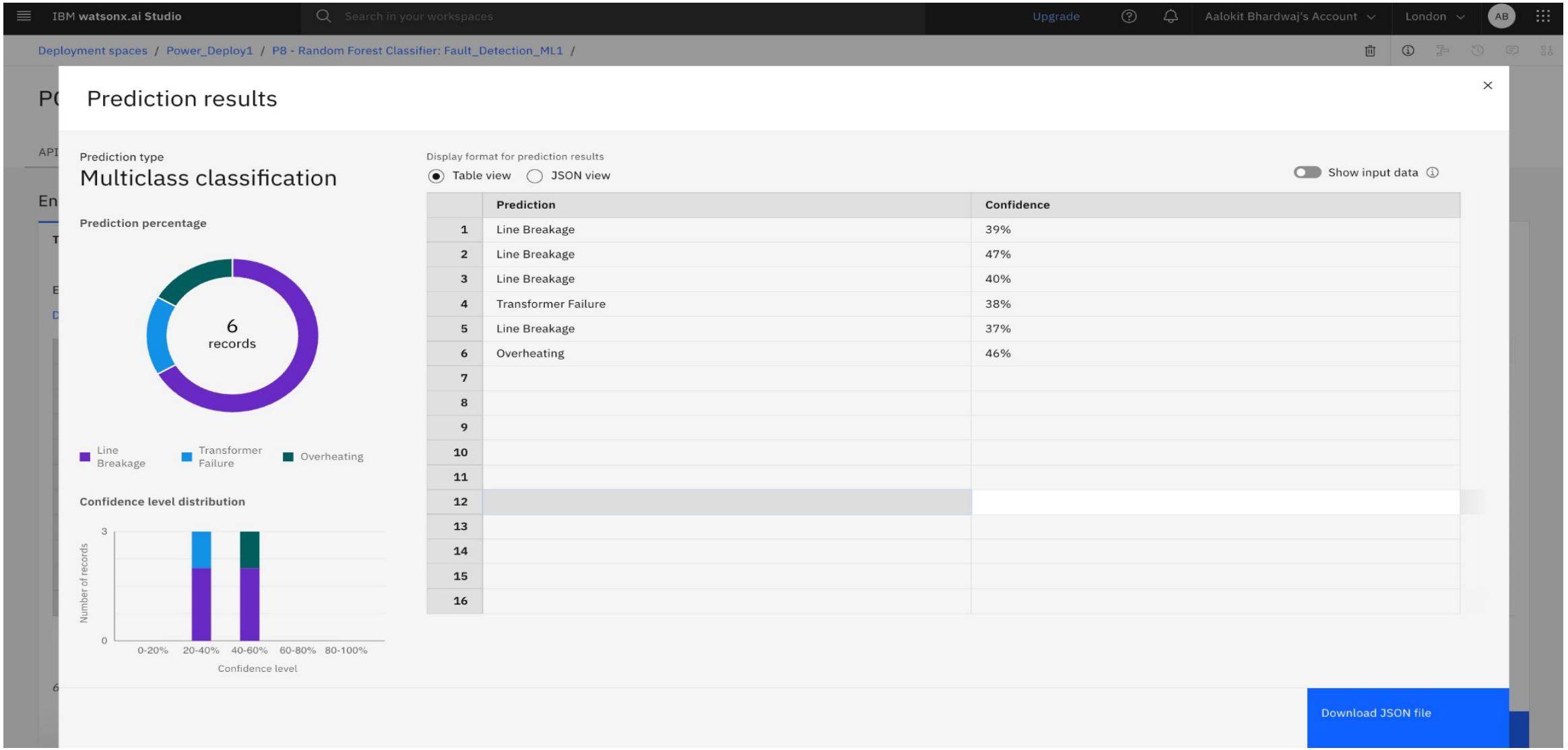
RESULT



	Fault ID (other)	Fault Location (Latitude, Longitude) (other)	Voltage (V) (double)	Current (A) (double)	Power Load (MW) (double)	Temperature (°C) (double)	Wind Speed (km/h) (double)	Weather Condition (other)
1	F001	(34.0522, -118.2437)	2200	250	50	24	20	clear
2	F004	(34.0522, -115.2437)	2000	231	33	22	24	Rainy
3	F002	(34.0522, -117.2503)	2150	225	34	31	25	Thunderstorm
4	F001	(34.0220, -118.2437)	2200	200	45	22	18	Snowy
5	F006	(34.0522, -118.2437)	2100	183	33	27	16	Windstorm
6	F008	(34.0522, -118.2437)	1800	232	48	28	27	Rainy
7								
8								
9								
10								

RESULT



	Prediction	Confidence
1	Line Breakage	39%
2	Line Breakage	47%
3	Line Breakage	40%
4	Transformer Failure	38%
5	Line Breakage	37%
6	Overheating	46%
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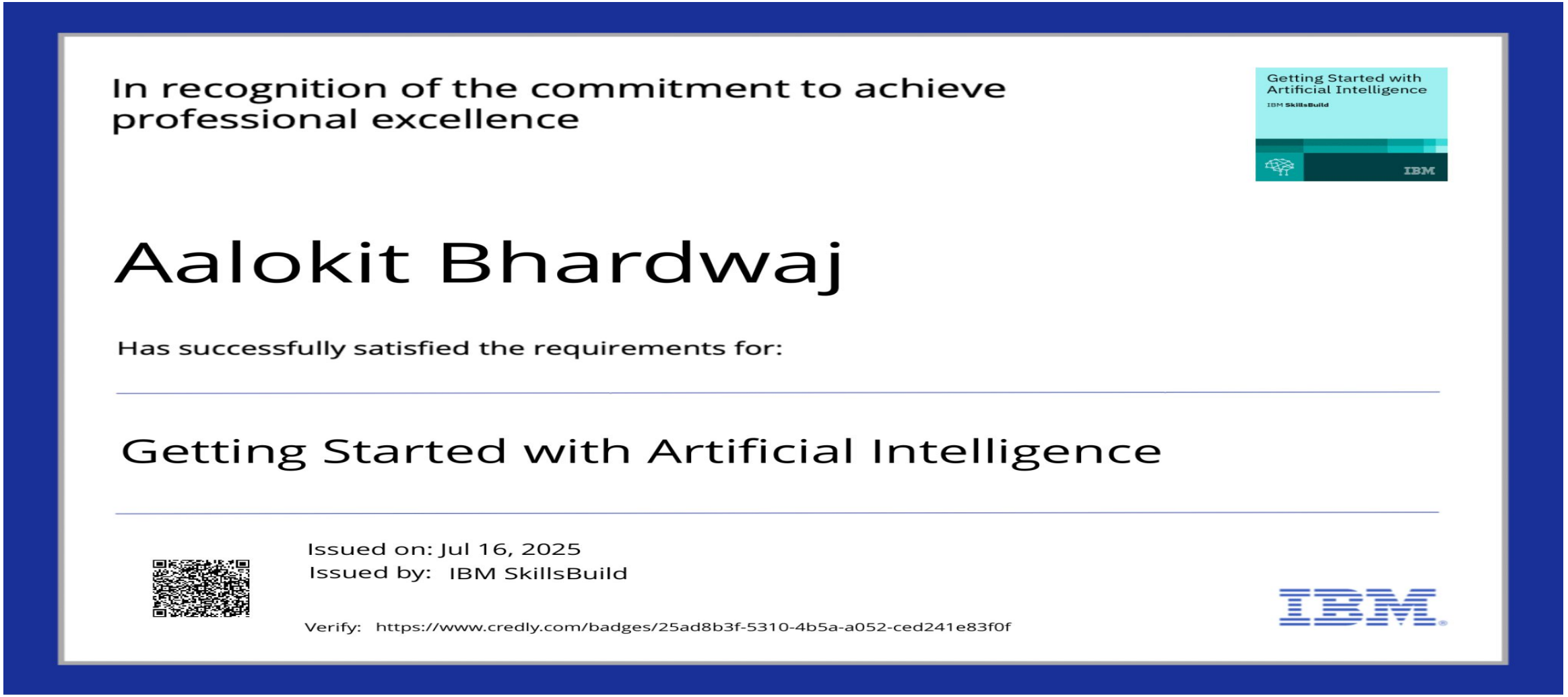
CONCLUSION

- Developed a machine learning-based solution for **automated fault detection and classification** in power distribution systems.
- Achieved reliable fault classification using models like **Random Forest** and deployed it using **IBM Cloud Lite services** (Watson Studio & Machine Learning).
- Enables **real-time, accurate, and scalable** fault detection, contributing to **enhanced grid stability and faster response times**.

IBM CERTIFICATIONS



IBM CERTIFICATIONS

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IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Aalokit Aalokit Bhardwaj

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 24 Jul 2025 (GMT)

Learning hours: 20 mins

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THANK YOU

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