
CAPSTONE PROJECT

Power System Fault Detection Classification Model

Presented By:

Aalokit Bhardwaj _ Jaipur Engineering College and Research Center _ AIML

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

Projects / FINAL_PROJECT_41 / Fault_Detection_ML1

Experiment summaryPipeline comparison

★ Rank by: Accuracy (Optimized) | Cross validation score

Progress map ⓘ
Prediction column: Fault Type

```
graph LR; A[Read dataset] --> B[Split holdout data]; B --> C[Read training data]; C --> D[Preprocessing]; D --> E[Model selection]; E --> F[Snap Logistic Regression]; E --> G[Random Forest Classifier]; F --> P1[Hyperparameter optimization]; G --> P5[Hyperparameter optimization]; P1 --> P2[Feature engineering]; P5 --> P6[Feature engineering]; P2 --> P3[Hyperparameter optimization]; P6 --> P7[Hyperparameter optimization]; P3 --> P4[Ensemble creation]; P7 --> P8[Ensemble creation]; P4 --> P9[Ensemble creation]; P8 --> P9
```

Relationship map
Swap view ↕

Experiment completed ✓
8 PIPELINES GENERATED
8 pipelines generated from algorithms. See pipeline leaderboard below for more detail.
Time elapsed: 2 minutes

View logSave code

Pipeline leaderboard ⌵

Rank	Name	Algorithm	Specialization	Accuracy (Optimized) Cross Validation	Enhancements	Build time
★ 1	Pipeline 8	Random Forest Classifier		0.409	HPO-1 FE HPO-2	00:00:54

2	Pipeline 3	Snap Logistic Regression		0.303	HPO-1 FE	00:00:31
---	------------	--------------------------	--	-------	----------	----------

RESULT

Projects / FINAL_PROJECT_41 / Fault_Detection_ML1

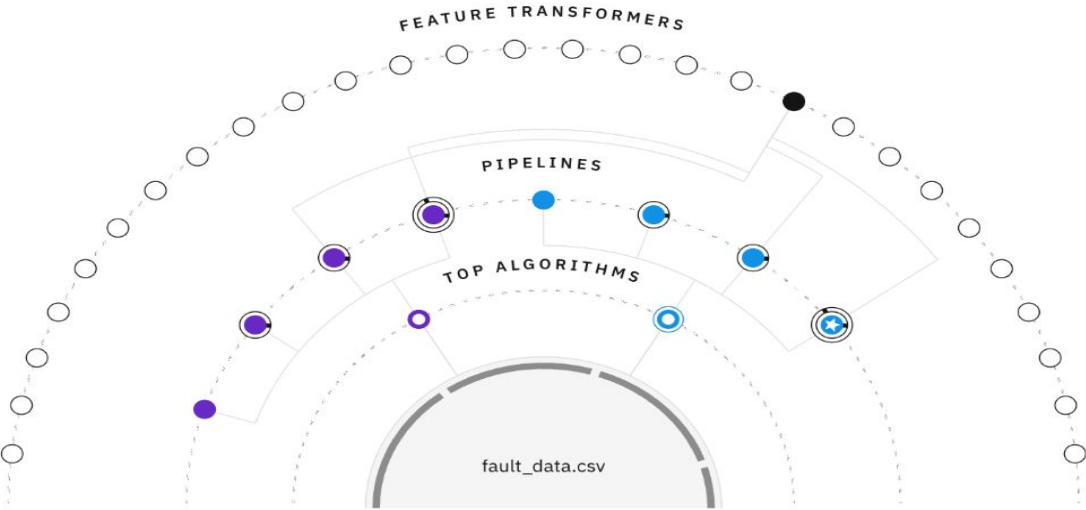
Experiment summary

Pipeline comparison

★ Rank by: Accuracy (Optimized) | Cross validation score

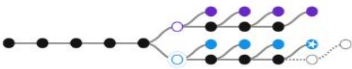
Relationship map

Prediction column: Fault Type



Progress map

Swap view



Experiment completed

8 PIPELINES GENERATED

8 pipelines generated from algorithms. See pipeline leaderboard below for more detail.

Time elapsed: 2 minutes

View log

Save code

Pipeline leaderboard

Rank	Name	Algorithm	Specialization	Accuracy (Optimized) Cross Validation	Enhancements	Build time
★ 1	Pipeline 8	Random Forest Classifier		0.409	HPO-1 FE HPO-2	00:00:54
2	Pipeline 3	Scalable Logistic Regression		0.383	HPO-1 FE	00:00:31

RESULT

POWER_DEPLOY1 ✔ Deployed Online

API reference **Test**

Enter input data

Text

JSON

Enter data manually or use a CSV file to populate the spreadsheet. Max file size is 50 MB.

[Download CSV template](#) [Browse local files](#) [Search in space](#)

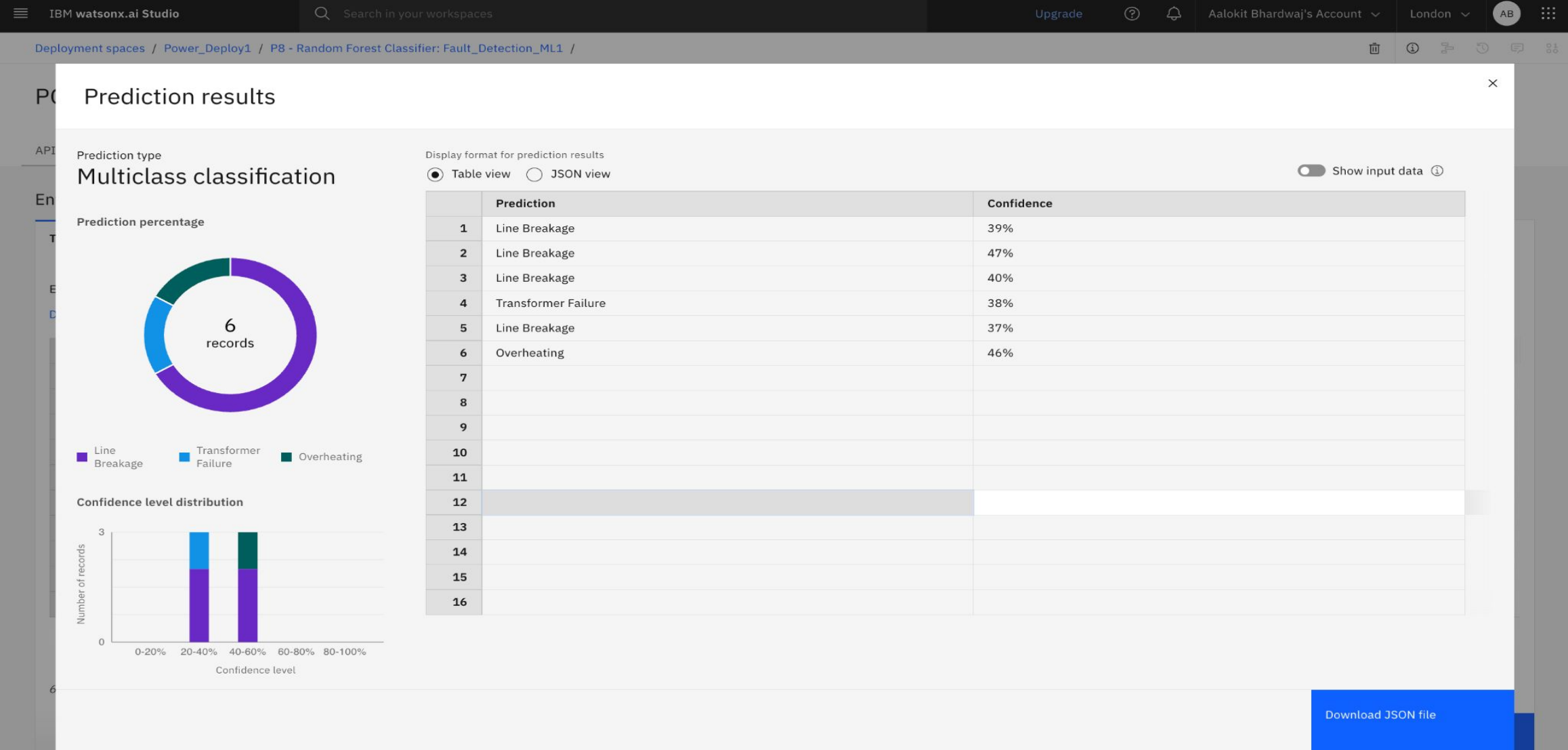
[Clear all](#) ×

	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								

6 rows, 12 columns

Predict

RESULT



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

In recognition of the commitment to achieve
professional excellence



Aalokit Bhardwaj

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence



Issued on: Jul 16, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/25ad8b3f-5310-4b5a-a052-ced241e83f0f>



IBM CERTIFICATIONS

In recognition of the commitment to achieve
professional excellence



Aalokit Bhardwaj

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution



Issued on: Jul 19, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/8614c752-d0f7-4e2f-b2b9-f46d9a0521f3>



IBM CERTIFICATIONS

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



THANK YOU