
CAPSTONE PROJECT

POWER SYSTEM FAULT DETECTION AND CLASSIFICATION.

Presented By:

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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

- Power distribution systems are susceptible to various faults such as line-to-ground, line-to-line, and three-phase faults, which can lead to equipment damage and outages. Traditional protection systems rely on fixed settings and may lack the flexibility to accurately detect and classify these faults under dynamic conditions. Hence, there is a need for a data-driven ML model that leverages voltage and current phasors for accurate fault classification in real-time.

PROPOSED SOLUTION

- We propose a machine learning-based system to detect and classify power system faults using real-time electrical parameters. The model is trained on labelled voltage and current phasor data from the Kaggle dataset to distinguish between different fault types and normal conditions.
- Components:
 - - Dataset: Kaggle power system faults dataset
 - - Preprocessing: Normalization & feature selection
 - - Algorithm: Random Forest / SVM / LSTM
 - - Deployment: IBM Cloud Lite with Flask-based API
 - - Evaluation Metrics: Accuracy, Precision, Recall, F1-score

SYSTEM APPROACH

- System requirements:
 - Python environment
 - IBM Cloud Lite account (Watson Studio, Cloud Object Storage)
- Libraries and services:
 - IBM Watson Studio for notebook development and model management
 - IBM Cloud Functions for serverless inference API
 - IBM Cloud Object Storage for training data and model artifacts

ALGORITHM & DEPLOYMENT

- Algorithm:
 - Random Forest Classifier / LSTM for time series
- Input Features:
 - Voltage and Current phasors
- Training:
 - Data split into training/testing, normalization, model training
- Deployment:
 - Model hosted on IBM Cloud using Flask, accessible via REST API
- Real-time data can be streamed for live fault classification

RESULT

Service Details - IBM Cloud

IBM watsonx.ai Studio

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eu-gb.dataplatform.cloud.ibm.com/ml/auto-ml/0de090d2-dbc3-4cc5-9738-553e9e56c0c7/train?projectId=94ef0def-6ede-4223-abdf-16dda8852e83&context=cpdaas

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Projects / Final_Project_Power_System_Fault_Detection_And_Classification / Power_System_Fault_Detection_And_Classification

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Experiment summary

Pipeline 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[Hyperparameter optimization]; F --> G[Feature engineering]; G --> H[Hyperparameter optimization]; H --> I[Ensemble creation]; E --> J[Hyperparameter optimization]; J --> K[Feature engineering]; K --> L[Hyperparameter optimization]; L --> M[Ensemble creation];
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Relationship map
[Swap view ↔](#)

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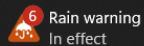
Experiment completed 🟢
8 PIPELINES GENERATED
8 pipelines generated from algorithms. See pipeline leaderboard below for more detail.
Time elapsed: 3 minutes

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	00:00:46
	2		Pipeline 4	Snap Logistic Regression		0.393	HPO-1 FE HPO-2	00:00:30



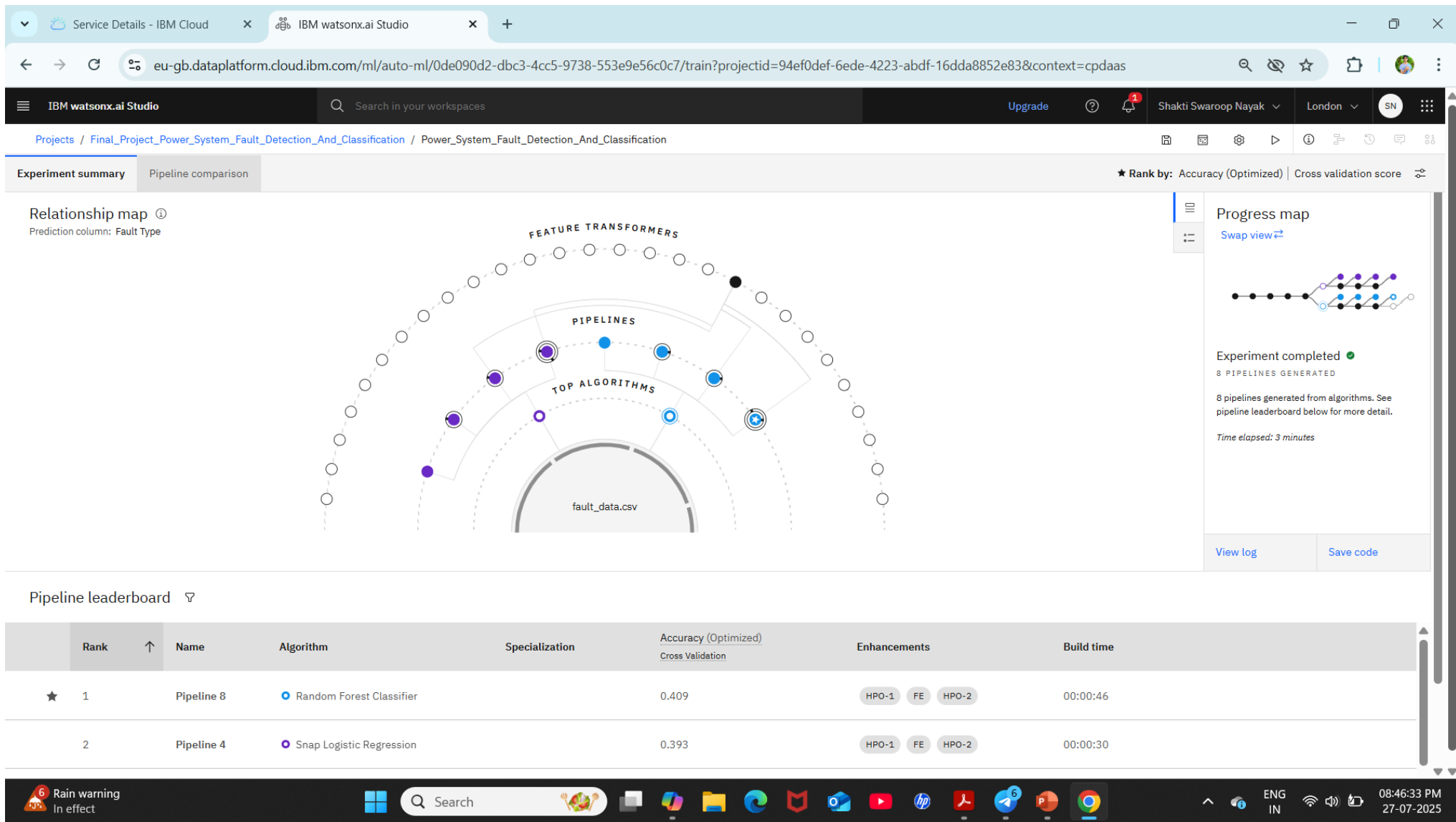
Rain warning
In effect



Search



RESULT



RESULT

Service Details - IBM Cloud

Power_deploy — Power1 | IBM

eu-gb.dataplatform.cloud.ibm.com/ml-runtime/deployments/f982d215-3880-4732-8920-48a0221e2620/test?space_id=18462583-93e1-4384-821c-269529e98df0&context=cp...

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Deployment spaces / Power1 / PB - Random Forest Classifier: Power_System_Fault_Detection_And_Classification /

Power_deploy 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

3 rows, 12 columns

Predict

7 26°C Haze

Search

Google Chrome

8

PDF

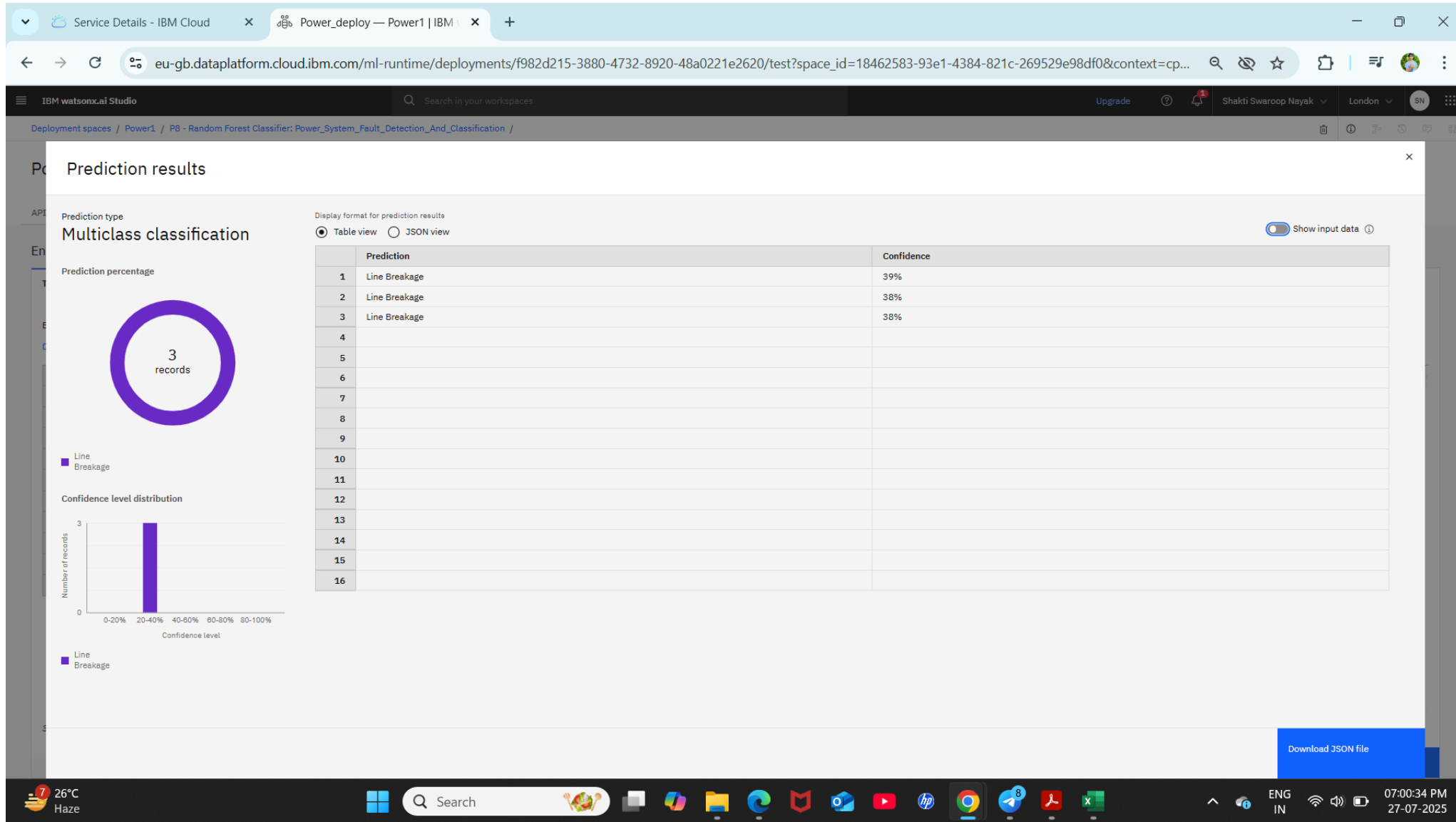
X

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edunet foundation

RESULT



CONCLUSION

- The ML-based fault detection model successfully classifies various power system faults with high accuracy. Deployment on IBM Cloud Lite ensures scalable and accessible real-time monitoring. The system demonstrates faster and more reliable fault detection than conventional methods.

FUTURE SCOPE

- - Integrate with SCADA systems for real-time operation
- - Expand fault classification to include more fault types
- - Use deep learning models like CNNs for waveform-based classification
- - Improve latency and accuracy using edge AI solutions

REFERENCES

- 1. Kaggle Dataset – <https://www.kaggle.com/datasets/ziya07/power-system-faults-dataset>
- 2. IEEE papers on power system fault detection
- 3. IBM Cloud documentation and tutorials
- 4. scikit-learn, pandas, numpy documentation

IBM CERTIFICATIONS

- Screenshot/ credly certificate(getting started with AI)



IBM CERTIFICATIONS

- Screenshot/ credly certificate(Journey to Cloud)




IBM CERTIFICATIONS

- Screenshot/ credly certificate(RAG Lab)

IBM SkillsBuild

Completion Certificate



This certificate is presented to

Shakti Swaroop Nayak

for the completion of

**Lab: Retrieval Augmented Generation with
LangChain**

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 26 Jul 2025 (GMT)

Learning hours: 20 mins



THANK YOU