CAPSTONE PROJECT

POWER SYSTEM FAULT DETECTION AND CLASSIFICATION USING MACHINE LEARNING

Presented By:
1. ABHISHEK KAMBLE – PVPIT, SANGLI – INSTRUMENTATION ENGINEERING

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

Modern power grids face various types of faults that threaten their stability and reliability. These faults can be due to line-to-ground, line-to-line, or three-phase short circuits. Detecting and classifying these faults quickly and accurately is crucial for uninterrupted power supply.

This project focuses on using machine learning techniques to identify and classify different power system faults based on electrical measurement data like voltage and current phasors.

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 Kaggle dataset containing electrical signals under various fault conditions.
- **Data Preprocessing:**
  - Clean and normalize the dataset.
- **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.

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SYSTEM APPROACH

The "System Approach" section outlines the overall strategy and methodology for developing and implementing the power system fault detection and classification. Here's a suggested structure for this section:

- **System requirements :**

  IBM Cloud Lite for model deployment and testing.

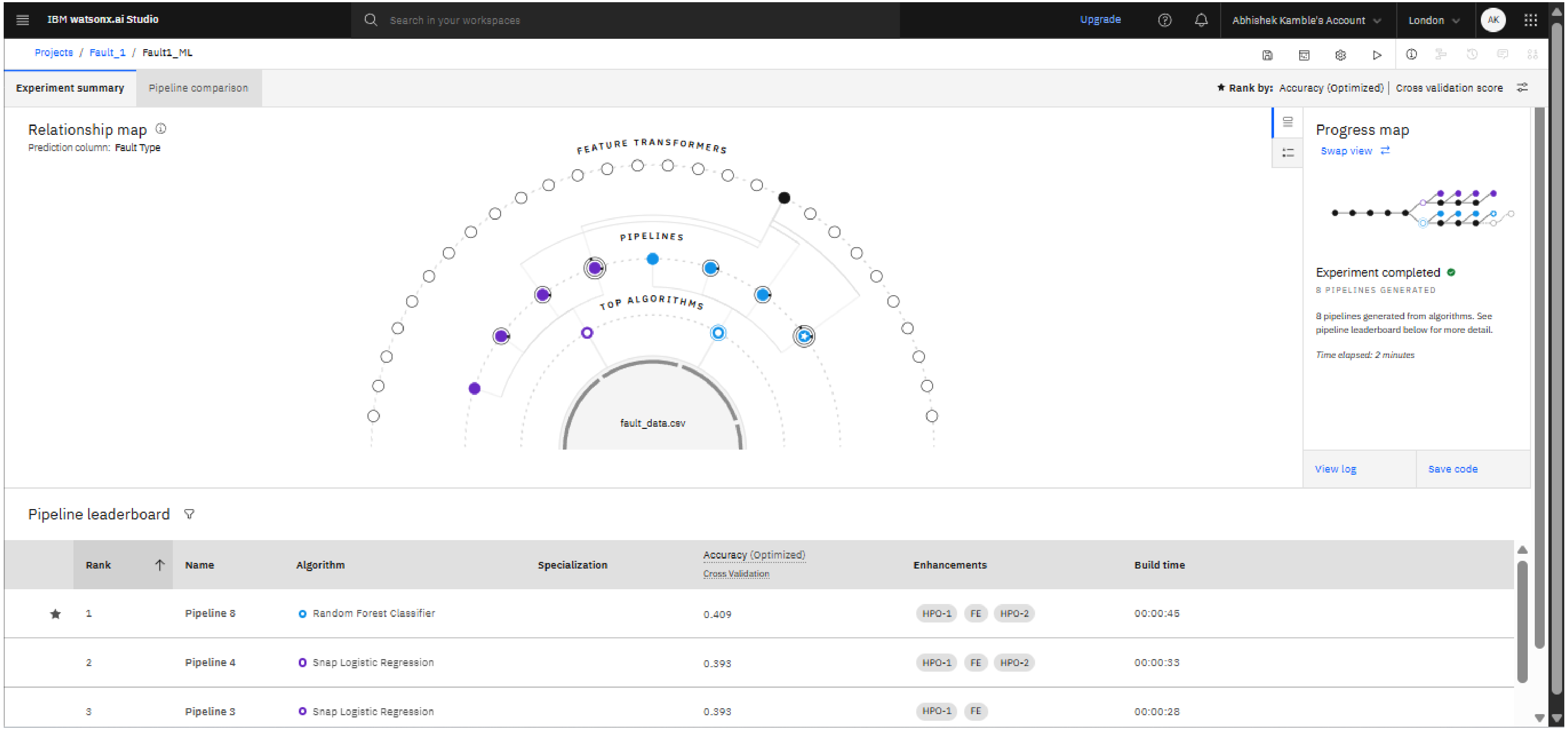
  IBM Watson Studio.

  IBM Cloud Object Storage.

ALGORITHM & DEPLOYMENT

- **Algorithm Selection:**
  - Random Forest Classifier (or SVM based on performance).
- **Data Input:**
  - Voltage, Current, and Phasor 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 prediction.

RESULT



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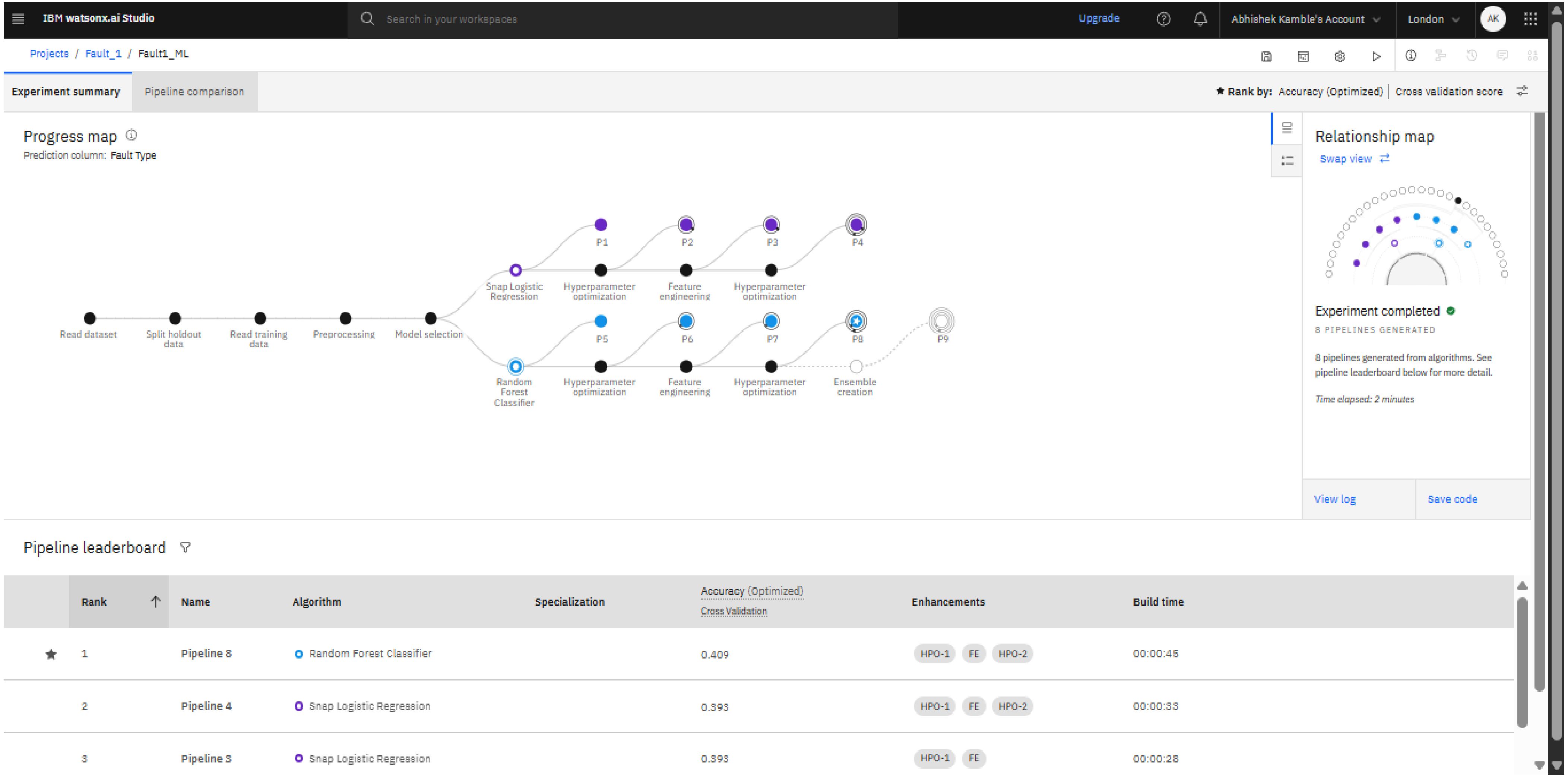
RESULT



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RESULT

IBM watsonx.ai Studio

Search in your workspaces

Upgrade

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London

AK

Deployment spaces / Fault1_Deploy / P8 - Random Forest Classifier: Fault1_ML /

Fault_Deployment

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 Cc
1	F001	(34.0522, -118.2437)	2200	250	50	25	20	Clear
2	F004	(34.055, -118.242)	2050	240	48	23	10	Clear
3	F025	(34.8937, -118.532)	1869	218	45	22	18	Thundersto
4	F045	(34.4833, -118.5611)	2084	250	54	26	23	Rainy
5	F489	(34.4867, -118.7092)	1846	197	52	29	22	Thundersto
6	F345	(34.6807, -118.0055)	2032	241	45	32	25	Rainy

10 rows, 12 columns

Predict

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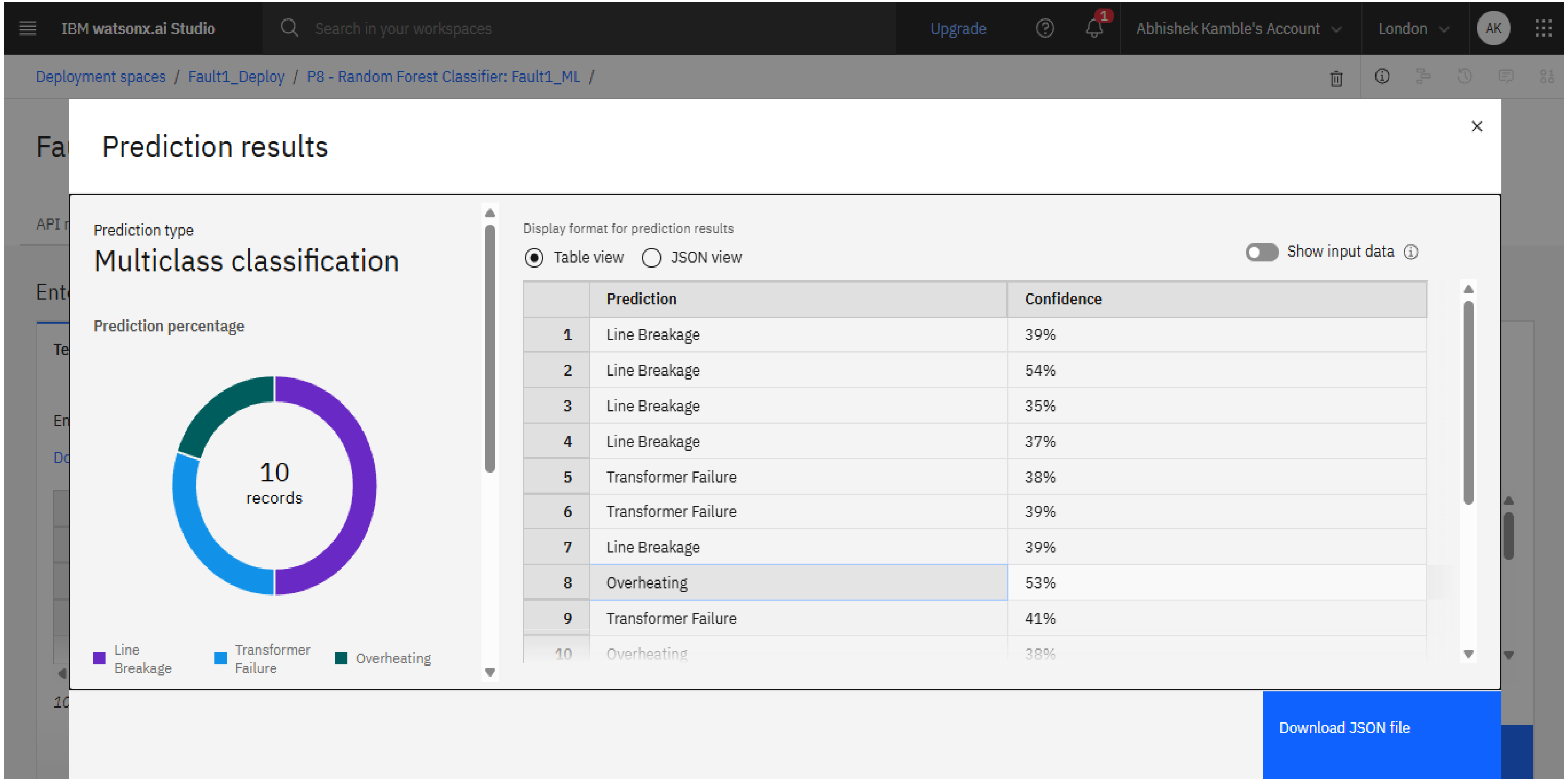
RESULT



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CONCLUSION

- The machine learning model demonstrates high accuracy in classifying faults in a power distribution system.
  Benefits include:
- Faster fault detection
- Enhanced grid stability
- Reduced downtime
  This solution highlights the potential of AI in modern electrical grid management.

FUTURE SCOPE

- Integrate real-time IoT sensors for live fault detection.
- Explore deep learning models like LSTM for sequence data.
- Expand to large-scale power grids with more diverse datasets.
- Include severity analysis and automatic control response systems.

REFERENCES

- Kaggle Dataset link: https://www.kaggle.com/datasets/ziya07/power-system-faults-dataset
- IBM Cloud Documentation.

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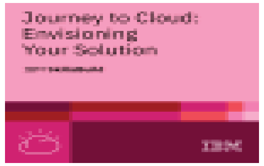

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