CAPSTONE PROJECT

POWER SYSTEM FAULT DETECTION AND CLASSIFICATION USING MACHINE LEARNING

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 System Fault Detection and classification

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.
- Key components :

- Data collection : Use the Kaggle dataset on power system faults .
- Preprocessing : Clean and normalize the dataset.
- Model training : Train a classification model (eg : Decision Tree, Random Forest, or SVM).
- Evaluation : Validate the model using accuracy , precision , recall and F1-score.

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 (manadatory)

  IBM Watsonx.ai studio for model development and deployment

  IBM Cloud object storage for dataset handling

ALGORITHM & DEPLOYMENT

- **Algorithm Selection:**

  Random Forest classifier (or SVM based on performance).

- **Data Input:**

  Voltage ,current and phasor measurement from the dataset.

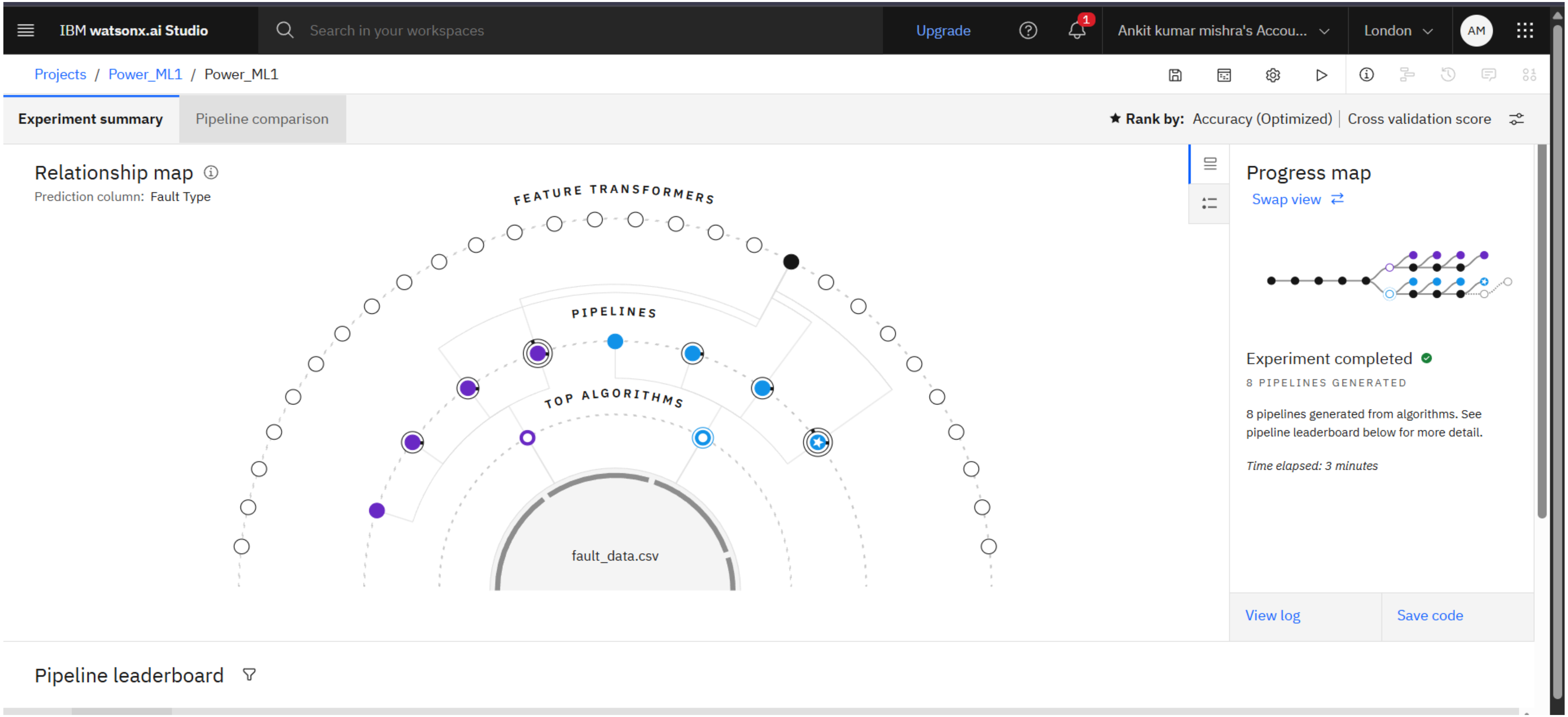
- **Training Process:**

  Supervised learning using labeled fault types.

- **Prediction Process:**

  Model deployed on IBM Watson studio with API endpoint for real-time predictions.

RESULT



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RESULT

Power_DEP2 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)	Maintenanc
1	F001	(34.0522, -118.2437)	2200	250	50	25	20	clear	Scheduled
2	F057	(34.5634, -118.1406)	2289	202	48	40	29	Windstorm	Scheduled
3	F091	(34.3032, -118.1977)	1881	199	47	33	13	Thunderstorm	Pending
4	F259	(34.1108, -118.3038)	2011	193	50	26	24	Rainy	Scheduled
5	F331	(34.8143, -118.6652)	2296	183	45	22	22	Thunderstorm	Scheduled
6	F485	(34.52, -118.3647)	1860	240	53	40	25	Thunderstorm	Scheduled
7									
8									
9									
10									

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RESULT

Prediction results

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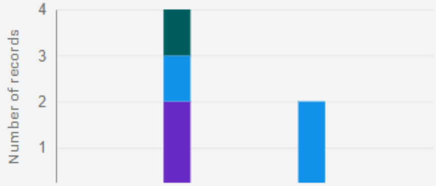
Prediction type

Multiclass classification

Prediction percentage

Confidence level distribution



Display format for prediction results

(•) Table view ( ) JSON view

Show input data ⓘ

	Prediction	Confidence
1	Line Breakage	39%
2	Overheating	67%
3	Transformer Failure	40%
4	Overheating	35%
5	Line Breakage	35%
6	Overheating	60%
7		
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13		
14		
15		
16		

Download JSON file

CONCLUSION

- This project successfully demonstrates the implementation of Power System Fault Detection and Classification using cloud-based tools and services offered by IBM Cloud Lite. By leveraging IBM Cloud's scalable and accessible environment, we deployed a fault detection system that utilizes real-time data processing and machine learning models to identify and classify various fault types in a power system—such as single line-to-ground, line-to-line, double line-to-ground, and three-phase faults.
- The use of IBM Watson Studio, Cloud Functions, and Lite-tier Machine Learning services enabled rapid development, testing, and deployment of our application without the need for local infrastructure. Data ingestion, preprocessing, model training, and inference were all efficiently handled in the cloud, highlighting the benefits of using IBM Cloud for smart grid applications.

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FUTURE SCOPE

The field of power system fault detection and classification holds vast potential for future development and innovation. Based on this project's outcomes, the following directions can be considered for future work:

- Real-Time Implementation
- Integration with Smart Grids
- Advanced Machine Learning & AI Models
- Cloud-Based Scalability
- Self-Healing Capabilities

REFERENCES

- **List and cite relevant sources, research papers, and articles that were instrumental in developing the proposed solution. This could include academic papers on power system fault detection and classification, machine learning algorithms, and best practices in data preprocessing and model evaluation.**

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IBM **SkillsBuild** Completion Certificate

This certificate is presented to

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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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