CAPSTONE PROJECT

POWER SYSTEM FAULT DETECTION AND CLASSIFICATION USING MACHINE LEARNING

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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 prone to various types of faults such as line-to-ground, line-to-line, and three-phase faults. These faults can disrupt power supply and reduce system reliability. The challenge lies in accurately detecting and classifying these faults using electrical measurement data (voltage, current, phasors) to differentiate them from normal operating conditions, thereby ensuring the stability of the power grid.

PROPOSED SOLUTION

Develop a Machine Learning that Classifies Power System Fault 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 –

1. **Data Collection :** Use the Kaggle dataset on power System faults.
2. **Preprocessing :** Clean and normalize the dataset
3. **Model Traning :** Train a Classification model (e.g, Decision Tree, Random Forest, or SVM).
4. **Evalaution :** 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 rental bike prediction system. Here's a suggested structure for this section:

- **System requirements :**
- IBM Cloud (mandatory)
- IBM Watson 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 measurements from the dataset

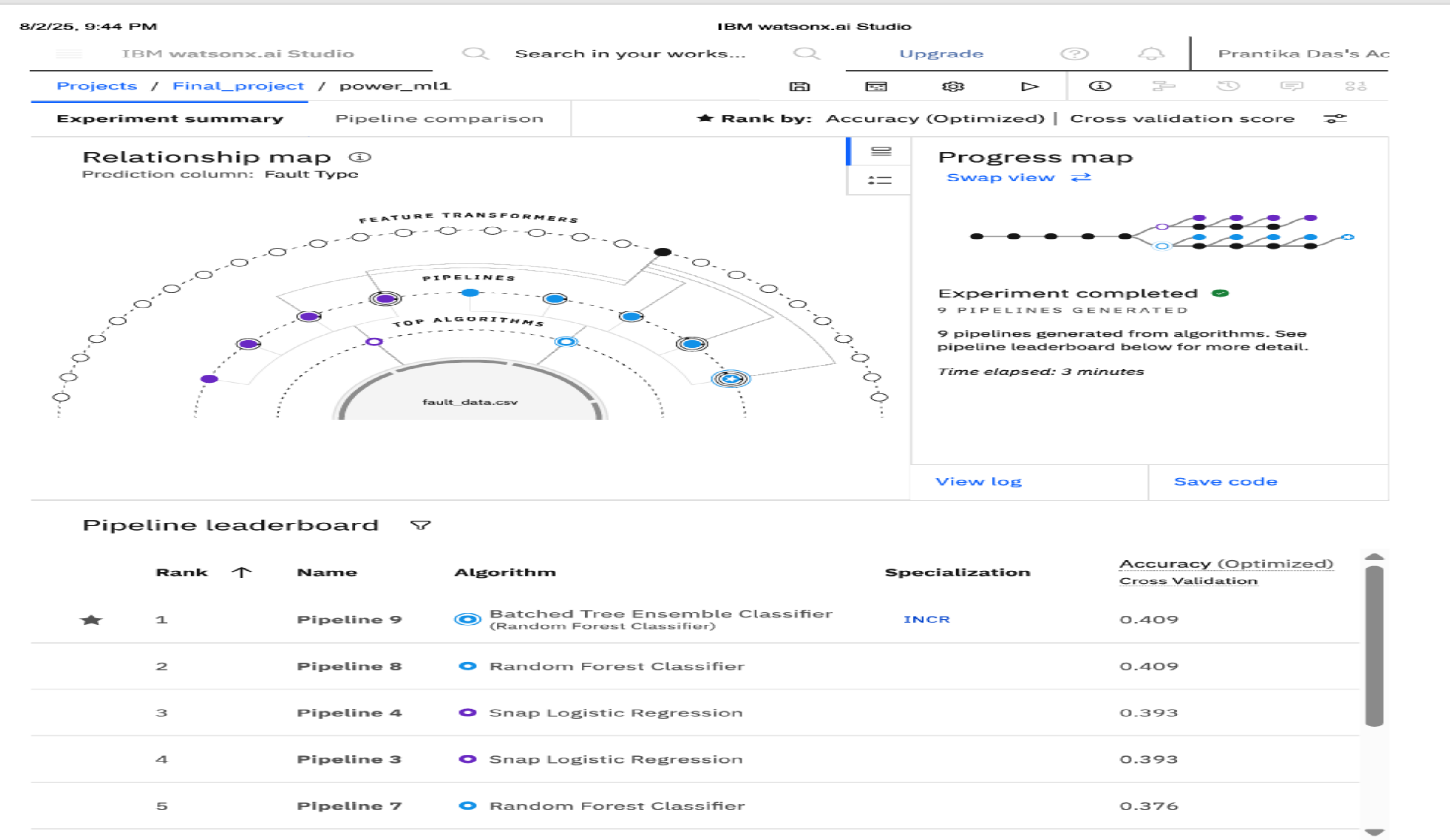
Training Process:

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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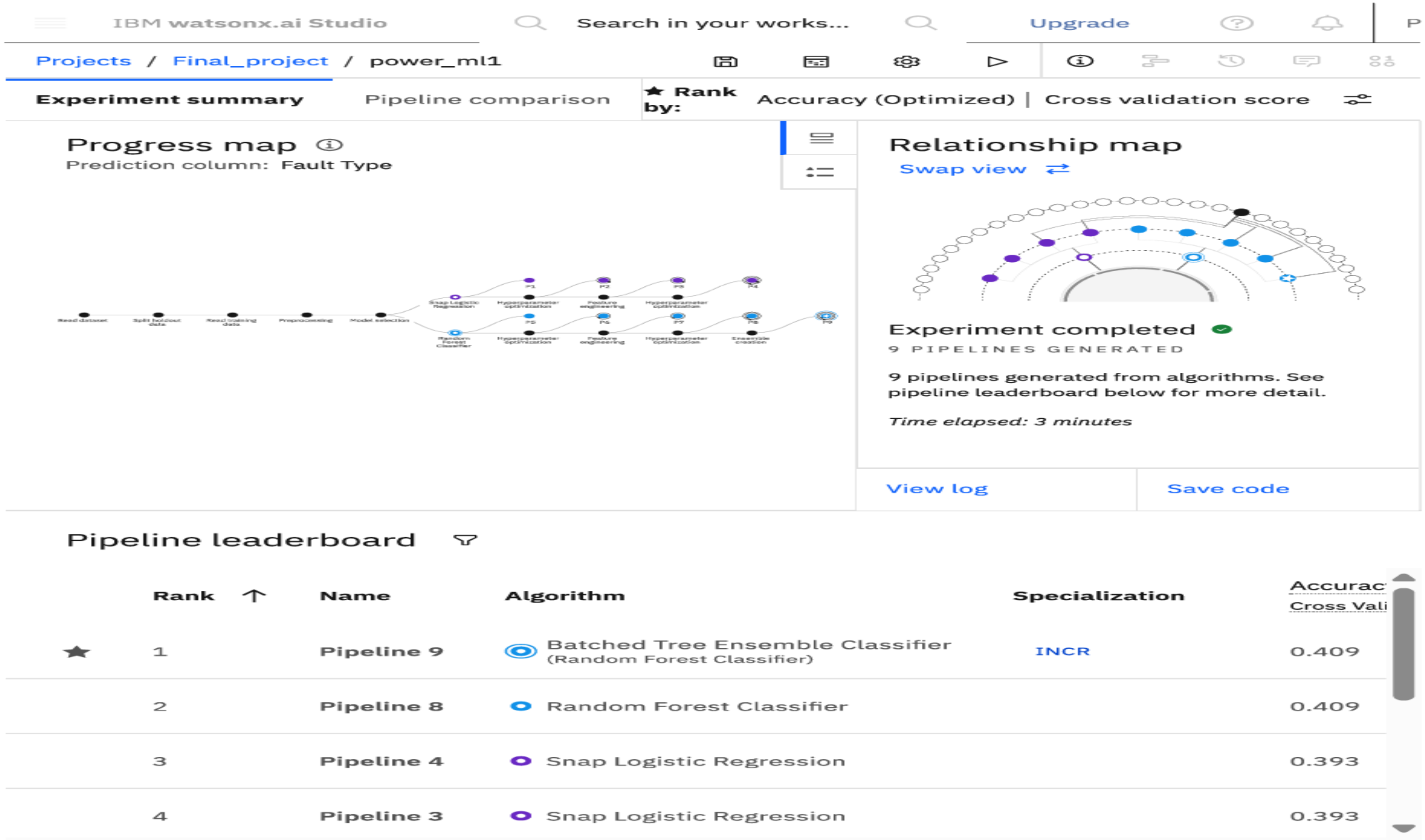
RESULT



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RESULT

8/2/25, 11:16 PM Powersystem_1 — Power_system1 | IBM watsonx.ai Studio

IBM watsonx.ai Studio Search in your works... Upgrade Prantika Das's Account London PD

Deployment spaces / Power_system1 / P9 - Random Forest Classifier: power_ml1 /

Powersystem_1

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 ×

	uble)	Wind Speed (km/h) (double)	Weather Condition (other)	Maintenance Status (other)	Component Health (other)	D
1		22	Thunderstorm	Pending	Overheated	5
2		21	Snowy	Completed	Normal	3
3		18	Snowy	Scheduled	Normal	5
4		29	Rainy	Pending	Overheated	3
5		21	Clear	Scheduled	Normal	4
6		20	Clear	Completed	Normal	4
7						
8						
9						
10						

RESULT

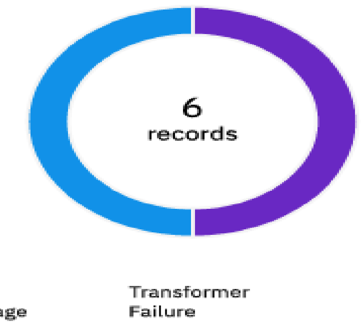
Prediction results

×

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	35%
2	Line Breakage	41%
3	Transformer Failure	47%
4	Transformer Failure	41%
5	Line Breakage	38%
6	Transformer Failure	37%
7		
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9		
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12		
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14		
15		
16		

CONCLUSION

- This project shows that machine learning can accurately detect and classify power system faults. Models like SVM and Neural Networks offer fast, reliable, and automated fault analysis, making them suitable for smart grid applications. While results are promising, future work should focus on real-time implementation and handling diverse grid conditions.

FUTURE SCOPE

- Machine learning for power system fault detection can be enhanced through real-time implementation, deep learning models, IoT integration, and testing on large-scale grids. Future work may also explore hybrid techniques and address cybersecurity challenges in smart grids.

REFERENCES

- IBM Skill Build Organization

IBM CERTIFICATIONS

IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Prantika Das

for the completion of

Getting Started with Artificial Intelligence

(PLAN-E624C2604060)

According to the Your Learning Builder - Plans system of record

Completion date: 16 Jul 2025 (GMT)

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Completion date: 17 Jul 2025 (GMT)

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THANK YOU