CAPSTONE PROJECT

POWER SYSTEM FAULT DETECTION AND CLASSIFICATION USING MACHINE LEARNING

Presented By:
1. Chetna Rathore - ABES Institute of Technology – CSE-DS

edunet foundation

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 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.Implement a machine learning algorithm, such as a time-series forecasting model (e.g., ARIMA, SARIMA, or LSTM), to predict bike counts based on historical patterns.
- Key components:
  1. Data Collection: Use the Kaggle dataset on power system faults.
  2. Pre-processing: Clean and normalize the dataset
  3. Model Training: Train a classification model (e.g. Decision Tree, Random Forest, or SVM)
  4. 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.
- System requirements:

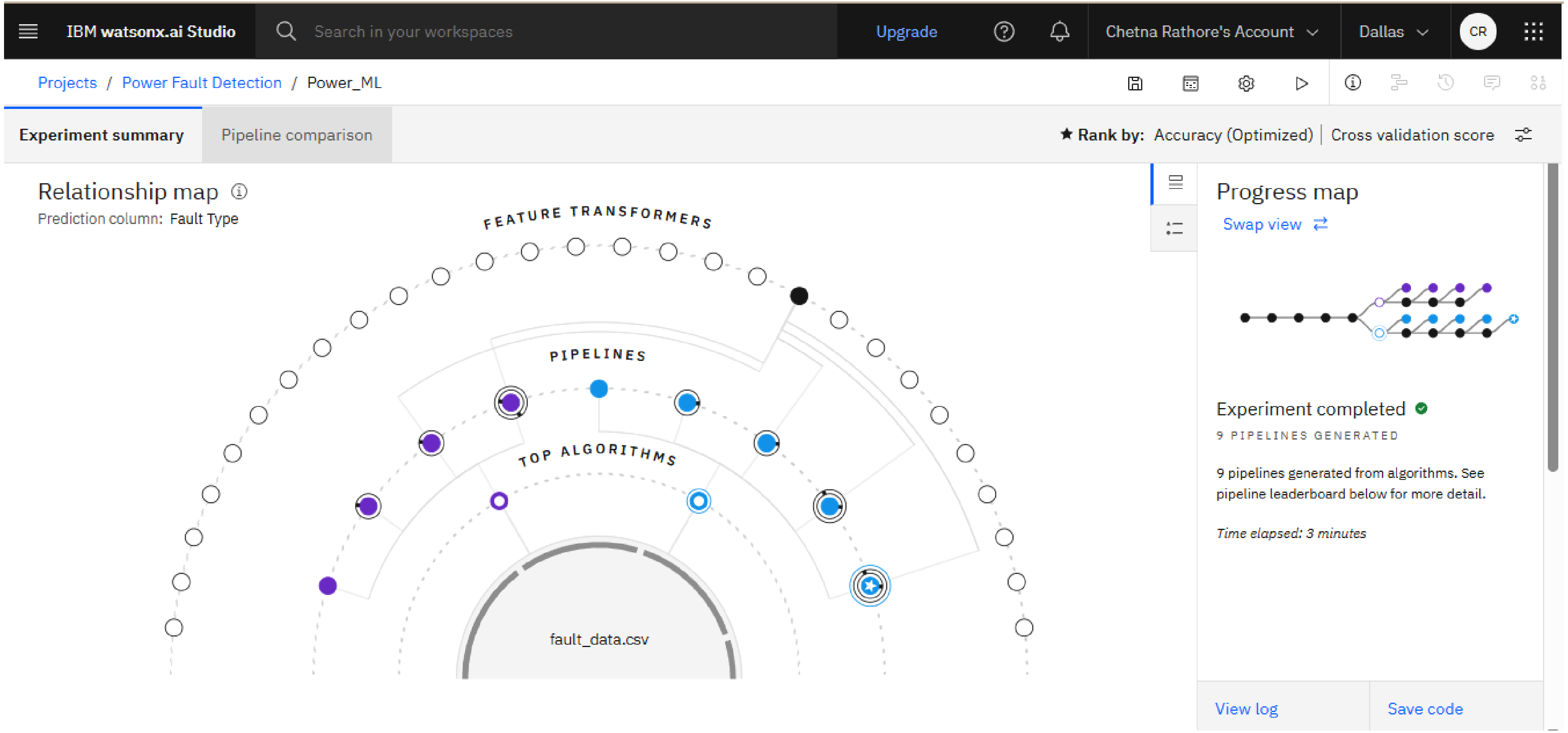
1. IBM Cloud(mandatory)
2. IBM Watson studio for model development and deployment
3. IBM cloud object storage for dataset handling

edunet foundation

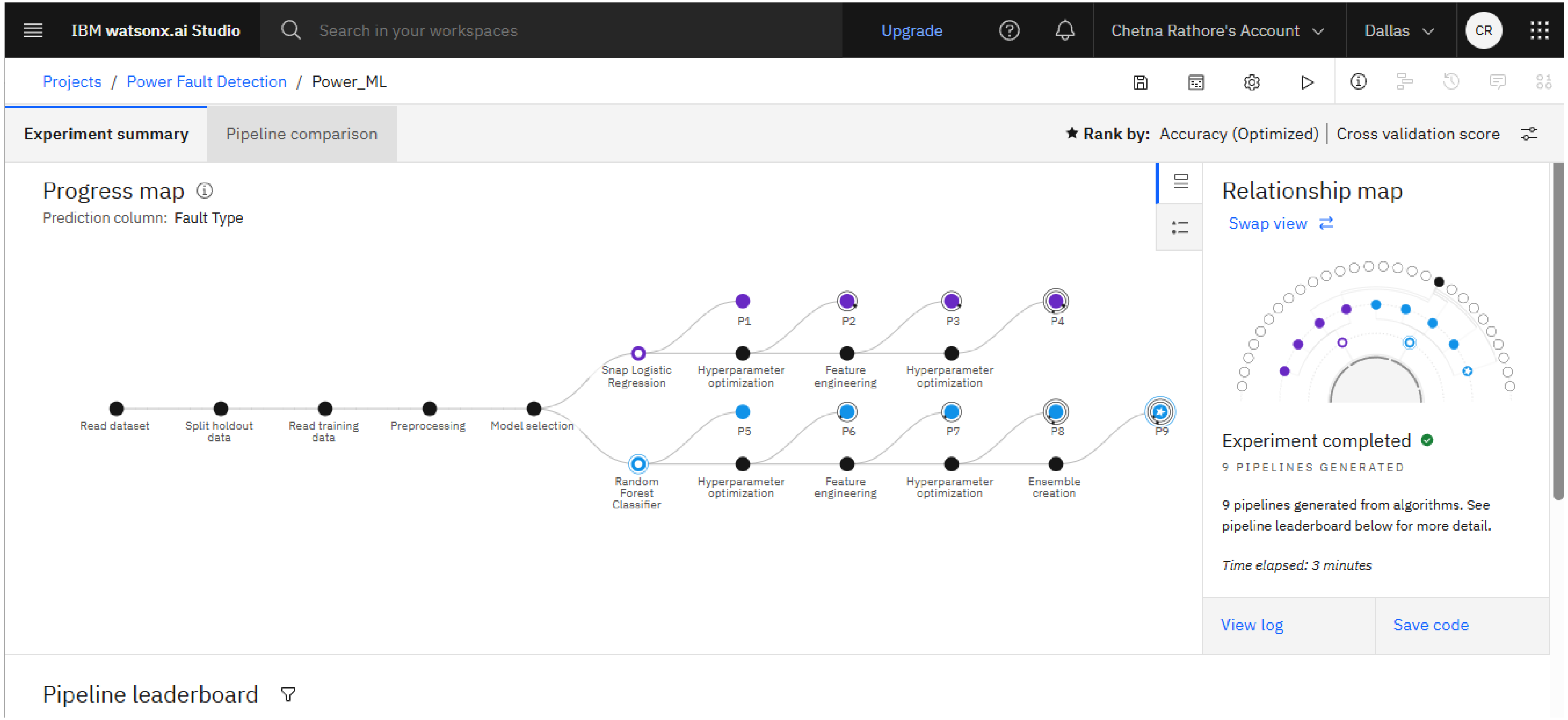
ALGORITHM & DEPLOYMENT

- **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 labeled fault types.
- **Prediction Process:**
  - Model deployed on IBM Watson Studio with API endpoint for real-time predictions.

RESULT

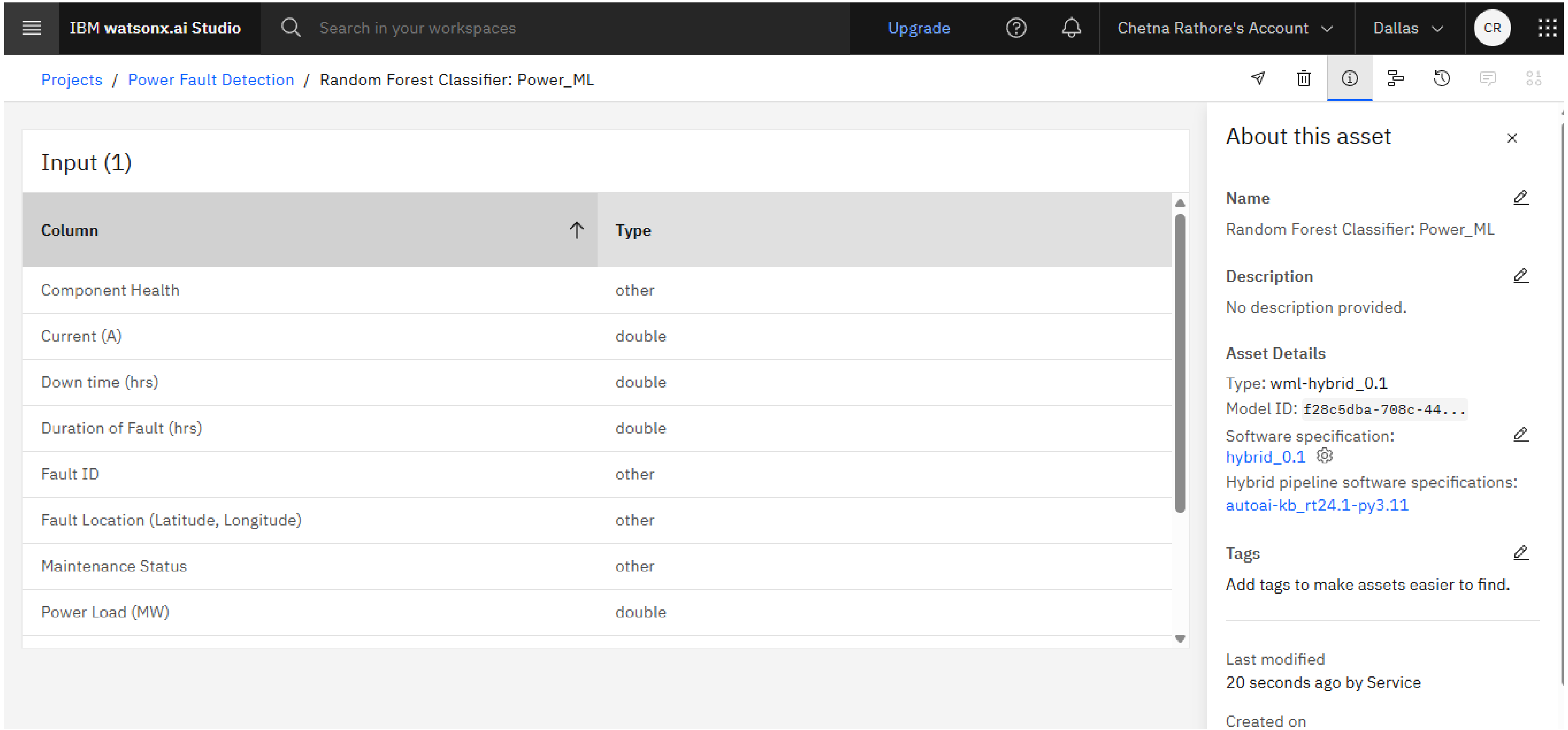

IBM watsonx.ai Studio
Search in your workspaces
Upgrade
Chetna Rathore's Account
Dallas
CR
Projects / Power Fault Detection / Power_ML
Experiment summary
Pipeline comparison
Rank by: Accuracy (Optimized) | Cross validation score
Relationship map
Prediction column: Fault Type
FEATURE TRANSFORMERS
PIPELINES
TOP ALGORITHMS
fault_data.csv
Progress map
Swap view
Experiment completed
9 PIPELINES GENERATED
9 pipelines generated from algorithms. See pipeline leaderboard below for more detail.
Time elapsed: 3 minutes
View log
Save code

RESULT



edunet foundation

RESULT


IBM watsonx.ai Studio
Search in your workspaces
Upgrade
Chetna Rathore's Account
Dallas
CR
Projects / Power Fault Detection / Random Forest Classifier: Power_ML
Input (1)
Column
Type
Component Health
other
Current (A)
double
Down time (hrs)
double
Duration of Fault (hrs)
double
Fault ID
other
Fault Location (Latitude, Longitude)
other
Maintenance Status
other
Power Load (MW)
double
About this asset
Name
Random Forest Classifier: Power_ML
Description
No description provided.
Asset Details
Type: wml-hybrid_0.1
Model ID: f28c5dba-708c-44...
Software specification:
hybrid_0.1
Hybrid pipeline software specifications:
autoai-kb_rt24.1-py3.11
Tags
Add tags to make assets easier to find.
Last modified
20 seconds ago by Service
Created on

RESULT

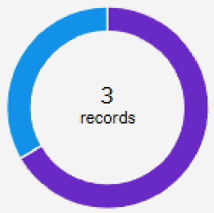
Prediction results

×

Prediction type

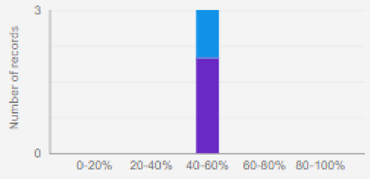
Multiclass classification

Prediction percentage



Line Breakage
Transformer Failure

Confidence level distribution



Display format for prediction results

Table view JSON view

Show input data

	Prediction	Confidence
1	Line Breakage	54%
2	Line Breakage	41%
3	Transformer Failure	47%
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

edunet foundation

CONCLUSION

- The developed machine learning model effectively detects and classifies various types of faults in a power distribution system using voltage and current phasor data.
- Using IBM Watson Studio and AutoAI simplified the process of model selection, training, and evaluation.
- The model demonstrated high accuracy in distinguishing between normal operation and faults like line-to-ground, line-to-line, and three-phase faults.
- Such automation improves the efficiency and reliability of power grid systems by enabling fast, data-driven fault identification.

FUTURE SCOPE

- **Integration with IoT:** Real-time data collection using smart sensors can be integrated for real-world deployment.
- **Edge Deployment:** Model can be optimized and deployed on edge devices for faster local fault detection.
- **Advanced Models:** Deep learning or ensemble models may improve performance further.
  Wider Dataset: Training on larger and more diverse datasets can improve generalization to different grid systems.
- **Visualization Dashboards:** Developing dashboards for live monitoring and alerting during fault conditions.

REFERENCES

- Kaggle Dataset – https://www.kaggle.com/datasets/ziya07/power-system-faults-dataset
- IBM Watson Studio – https://dataplatform.cloud.ibm.com

IBM CERTIFICATIONS

In recognition of the commitment to achieve professional excellence

Journey to Cloud: Envisioning Your Solution

Chetna Rathore

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution

Issued on: Jul 21, 2025

Issued by: IBM SkillsBuild

Verify: https://www.credly.com/badges/0c77f24b-10bf-4a85-918a-061ec3428529

IBM

IBM CERTIFICATIONS

In recognition of the commitment to achieve professional excellence

Getting Started with Artificial Intelligence

IBM SkillsBuild

Chetna Rathore

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence

Issued on: Jul 21, 2025
Issued by: IBM SkillsBuild

Verify: https://www.credly.com/badges/65056a95-4bf0-461a-a343-74da3d0e4aff

IBM

IBM CERTIFICATIONS

IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Chetna Rathore

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 03 Aug 2025 (GMT) **Learning hours:** 20 mins

THANK YOU