
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 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.
- Key components:
- . **Data Collection:** Use the Kaggle dataset on power system faults.
- . **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.

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(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 labeled fault types

- . Prediction Process:

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

RESULT

The screenshot displays the IBM Watsonx.ai Studio web interface. The browser's address bar shows the URL: `eu-gb.dataplatform.cloud.ibm.com/ml/auto-ml/5d1a46f9-55bd-4b07-b6be-a4e6aff26271/configure?projectid=471b4694-3822-491d-867b-ea6eaa6ef548&...`. The interface includes a top navigation bar with tabs for 'Service Details - IBM Cloud', 'Electric_1 — final_project | IBM', and 'Settings | IBM watsonx.ai Studio'. Below this is a search bar and a user profile section for 'JEEVA N' in 'London'. The main content area is titled 'Configure AutoAI experiment' and 'Electric_1'. On the left, a file upload section shows 'fault_data.csv' (47.62 KB, 13 columns) with 'Browse' and 'Select from project' buttons. The right panel, titled 'What do you want to predict?', shows the 'Prediction column' set to 'Fault Type'. Below this, it indicates 'Prediction type: Multiclass Classification' and 'Optimized for: Accuracy & run time'. At the bottom, there are buttons for 'Experiment settings' and 'Run experiment'.

Service Details - IBM Cloud × Electric_1 — final_project | IBM × Settings | IBM watsonx.ai Studio × +

eu-gb.dataplatform.cloud.ibm.com/ml/auto-ml/5d1a46f9-55bd-4b07-b6be-a4e6aff26271/configure?projectid=471b4694-3822-491d-867b-ea6eaa6ef548&... ☆

IBM watsonx.ai Studio Search in your workspaces Upgrade ? ⬄ JEEVA N London JN

Projects / final_project / Electric_1

Configure AutoAI experiment

Electric_1 Autosaved: 16:51:23

Add files such as tabular data (CSV).

Browse Select from project

fault_data.csv
Size: 47.62 KB Columns: 13

What do you want to predict?
Prediction column ⓘ
Fault Type

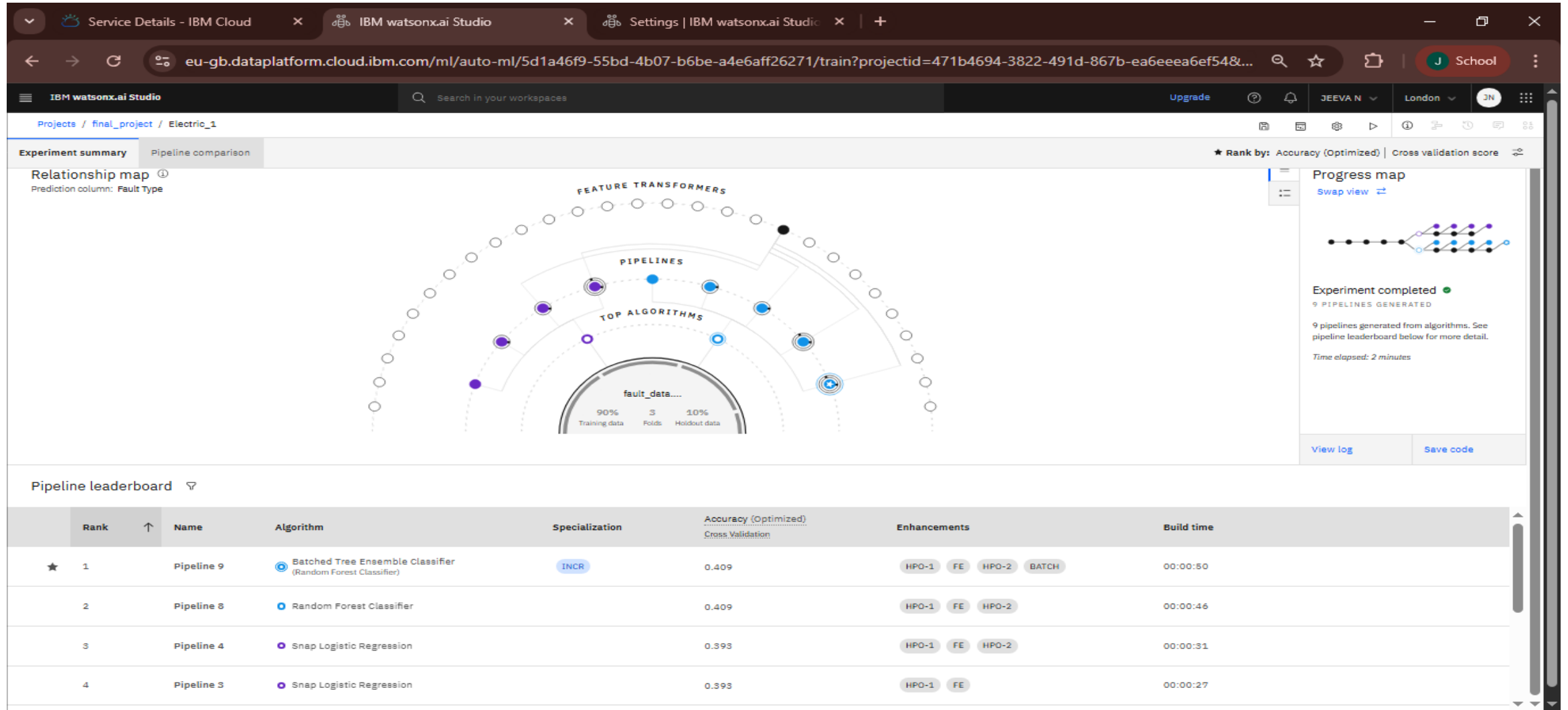
Prediction column: Fault Type CUH remaining: 20 CUH

PREDICTION TYPE
Multiclass Classification

OPTIMIZED FOR
Accuracy & run time

Experiment settings Run experiment ▶

RESULT



RESULT

The screenshot shows the IBM watsonx.ai Studio interface with a modal dialog titled "Promote to space". The dialog explains that promoting an asset allows for deployment or support. It features a dropdown menu set to "electric_d1", a checkbox for "Go to the model in the space after promoting it", and a text area for an optional description. A table on the right lists the asset "P9 - Random Forest Classifier: Elec..." as a "Model" in "Queued" status. The bottom of the dialog has "Cancel" and "Promote" buttons.

Promote to space

Promote the asset to a deployment space to deploy the asset or to support a deployment.

electric_d1

Why don't I see all of my spaces? ⓘ

☐ Go to the model in the space after promoting it

Description (Optional)

Description of assets

Find or create tags

Name	Format	Version	Status
P9 - Random Forest Classifier: Elec...	Model	C... ▼	Queued

Promoting an asset promotes dependent assets as well. For example, promoting a model also promotes the associated software specification and package extensions. You will see all promoted assets in the target space.

Cancel Promote

RESULT

The screenshot shows the IBM Watson AI Studio interface. The browser address bar displays the URL: `eu-gb.dataplatform.cloud.ibm.com/ml-runtime/deployments/a9620798-59ec-4d35-a5b1-0a1ecff2c3be/test?space_id=8193a644-40da-4d33-bbcd-37b05c1...`. The page title is "Prediction results". Below the title, there are radio buttons for "Table view" (selected) and "JSON view", and a toggle for "Show input data". The table has two columns: "prediction" and "probability". The first row shows a prediction of "Line Breakage" with a probability of `[0.3460042759167417,0.3280694101262557,0.32592631395700233]`. The table is currently empty for rows 2 through 9. A "Download JSON file" button is located at the bottom right of the table area.

Close

Display format for prediction results

☒ Table view ☐ JSON view

☐ Show input data ⓘ

	prediction	probability
1	Line Breakage	[0.3460042759167417,0.3280694101262557,0.32592631395700233]
2		
3		
4		
5		
6		
7		
8		
9		

Download JSON file

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Learning hours: 20 mins



THANK YOU