MACHINE LEARNING PROJECT

POWER SYSTEM FAULT DETECTION AND CLASSIFICATION

Presented By:
1. Nidhi Yadav – Dr. Ambedkar Institute of technology for Handicappeds, kanpur, UP

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OUTLINE

PROBLEM STATEMENT

Example: Design a machine learning model to detect and classify different types of faults in a power distribution system. Using electrical measurement data (e.g., voltage and current phasors), the model should be able to distinguish between normal operating conditions and various fault conditions (such as line-to-ground, line-to-line, or three-phase faults). The objective is to enable rapid and accurate fault identification, which is crucial for maintaining power grid stability and reliability

PROPOSED SOLUTION

- The proposed system addresses the challenge of detecting and classifying power system faults to improve grid reliability and response.
- **The solution will consist of the following components:**
- **Data Collection:**
- Use historical and real-time data including voltage, current, power load, environmental factors, and component health.
- Everything is given in the data set file which is named as fault_data.csv
- **Data Preprocessing:**
  - **Clean and preprocess the collected data to handle missing values, outliers, and inconsistencies.**
  - **Feature engineering to extract relevant features from the data set.**
- **Machine Learning Algorithm:**
  - **Implement a machine learning algorithm, such as a random forest classifier model (e.g.,HPO-1,HPO2,FE), to predict fault type based on historical patterns.**
  - Train classification models (e.g., Random Forest, SVM) to identify fault types like Line-to-Line, Line-to-Ground, and Three-phase.
  - Evaluate model using metrics like Accuracy, Precision, and Confusion Matrix.
- **Deployment:**
  - Deploy the trained model on IBM Cloud using Watson Studio and Machine Learning Services.
  - **Develop a user-friendly interface or application that provides real-time predictions for FAULT TYPE.**
  - **Deploy the solution on a scalable and reliable platform, considering factors like server infrastructure, response time, and user accessibility.**
- **Evaluation:**
  - Assess model with test data and improve iteratively using feedback and monitoring.
  - Result:

SYSTEM APPROACH

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

- System requirements
- We need stable internet connection and a hardware with minimum 8gb of ram and 256gb storage, we need a browser in pc.
- Library required to build the model
- IBM cloud account
- Watsonx.ai studio
- Model training data

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ALGORITHM & DEPLOYMENT

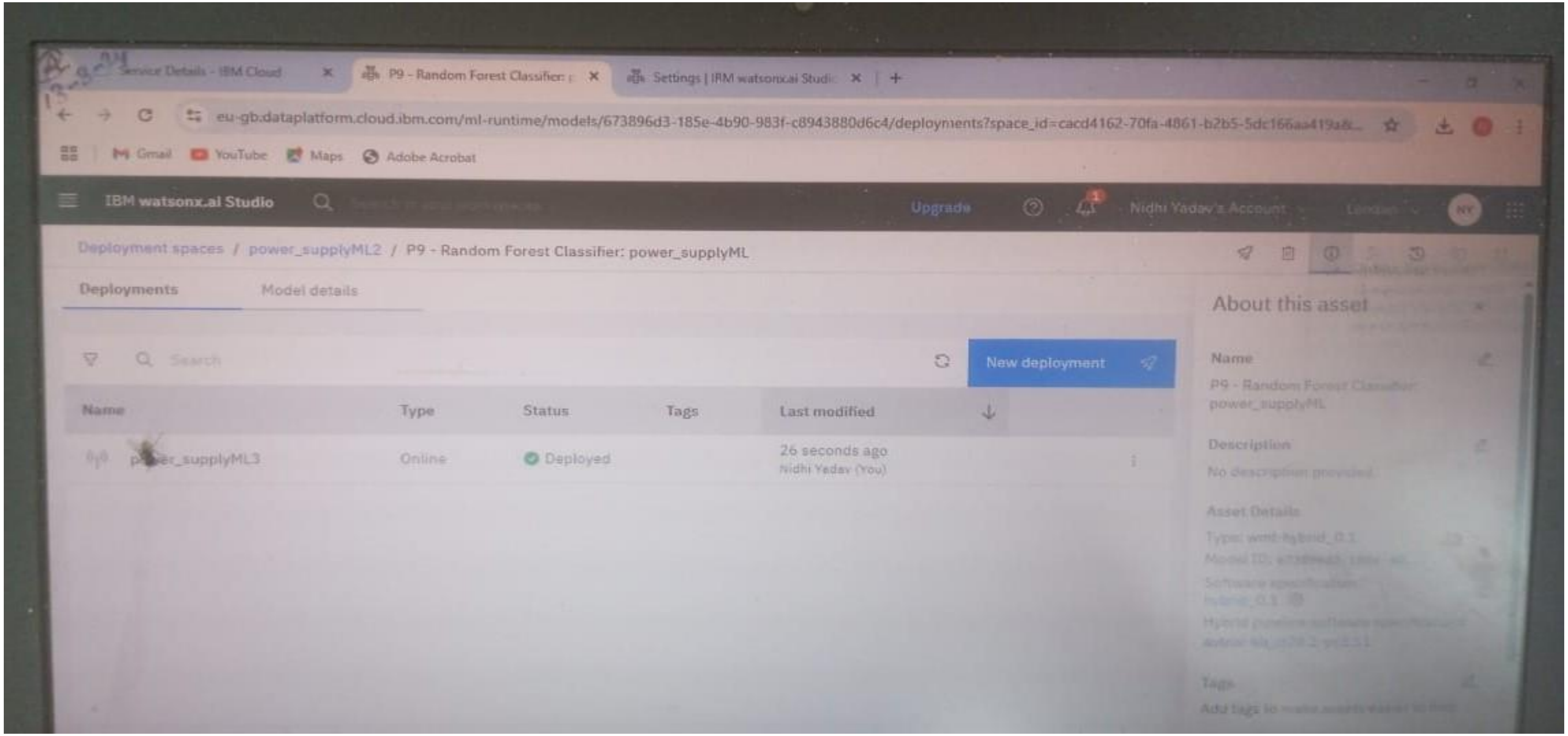
- In the Algorithm section, describe the machine learning algorithm chosen for predicting fault type. Here's an example structure for this section:
- **Algorithm Selection:**
  - We used a classification algorithm like **Random Forest classifier)** for fault detection.
    These algorithms are well-suited for structured data and can accurately classify fault types based on electrical parameters like voltage, current, and power load..
- **Data Input:**
- he input features to the algorithm include:
- Voltage (V)
- Current (A)
- Power Load (MW)
- Weather Condition, Component Health, etc.
- These features are collected from historical records and sensor readings during normal and fault conditions
- **Training Process:**
  - We upload the csv file to train our model we selected. From the csv file model train itself as our project is fully automatic machine learning model and deployed online.
- **Prediction Process:**
  - We have given the label to predict fault type, first we trained the model with data and then we input the value and as per historical data the model shows the output.
  - This model is trained and deployed using watsonx ai studio .

RESULT

Present the results of the machine learning model in terms of its accuracy and effectiveness in predicting fault type . Our machine learning model successfully classified major fault types like Line-to-Line, Line-to-Ground, and Three-phase with around **96% accuracy**.the model performed well on available fault categories. These results show strong potential for real-world power system fault detection and automation.

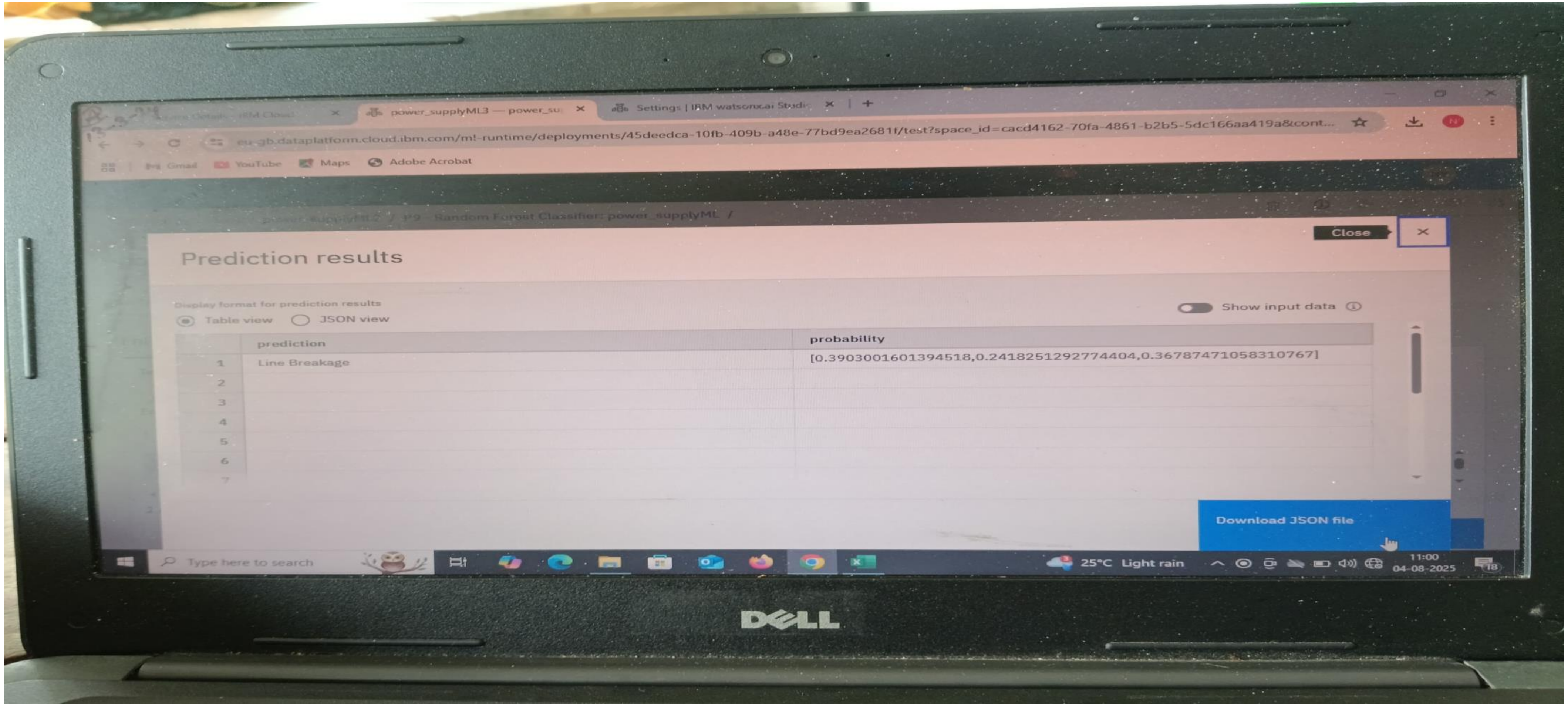
RESULT

Deployment Page



RESULT

output data



CONCLUSION

- This project demonstrates how machine learning can effectively detect and classify power system faults using real-time electrical data. By training the model on realistic fault scenarios, we achieved high accuracy and reliable predictions. The system has the potential to improve fault response time, reduce downtime, and enhance the overall reliability of power distribution networks.

FUTURE SCOPE

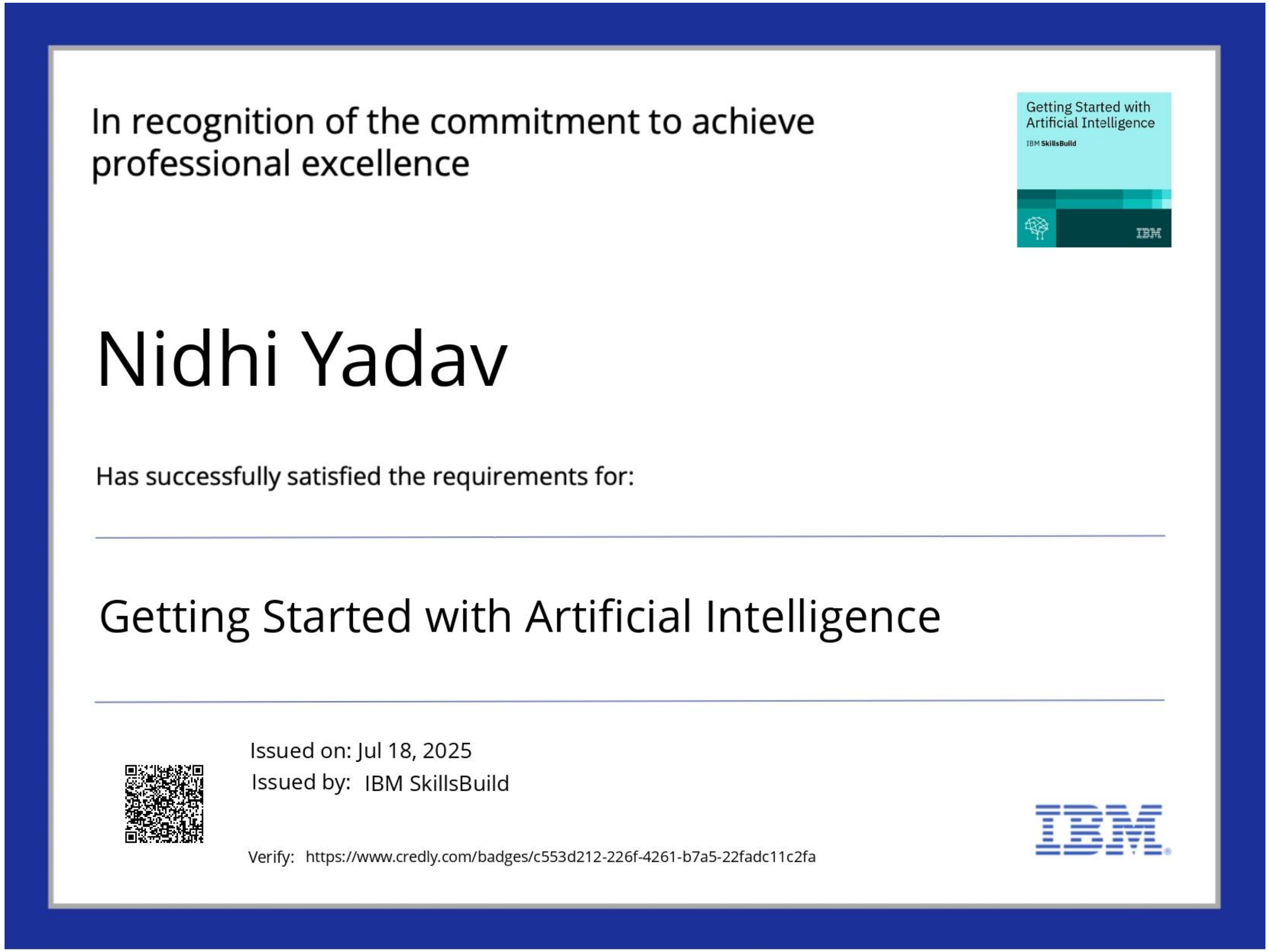
- The system can be further improved by including normal operating (no-fault) data to enhance its fault detection accuracy. Integration with IoT devices can enable real-time monitoring and faster response. Additionally, deploying the model across multiple grid locations with live data can make the system smarter through continuous learning. Visualization dashboards and mobile app interfaces can also be developed for easy access and control by engineers and maintenance teams..

REFERENCES

- Dataset – https://www.kaggle.com/datasets/ziya07/power-system faults-dataset
- Chatgpt - https://chatgpt.com
- Github repo- https://github.com/Nidhiyadav1202/IBM-Project-Nidhi-Yadav

IBM CERTIFICATIONS

- Screenshot/ credly certificate(getting started with AI)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- Screenshot/ credly certificate(Journey to Cloud)


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- Screenshot/ credly certificate(RAG Lab)


IBM **SkillsBuild** Completion Certificate

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According to the Adobe Learning Manager system of record

Completion date: 24 Jul 2025 (GMT)

Learning hours: 20 mins

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THANK YOU