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 systems are vulnerable to various types of electrical faults, which can cause equipment damage, blackouts, and reduced system reliability. Quick and accurate fault identification is essential for timely isolation and system recovery. Traditional fault detection methods are often slow and rule-based, lacking adaptability to complex patterns in modern smart grids. Develop a machine learning-based model capable of accurately detecting and classifying different types of faults in a power distribution system.

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

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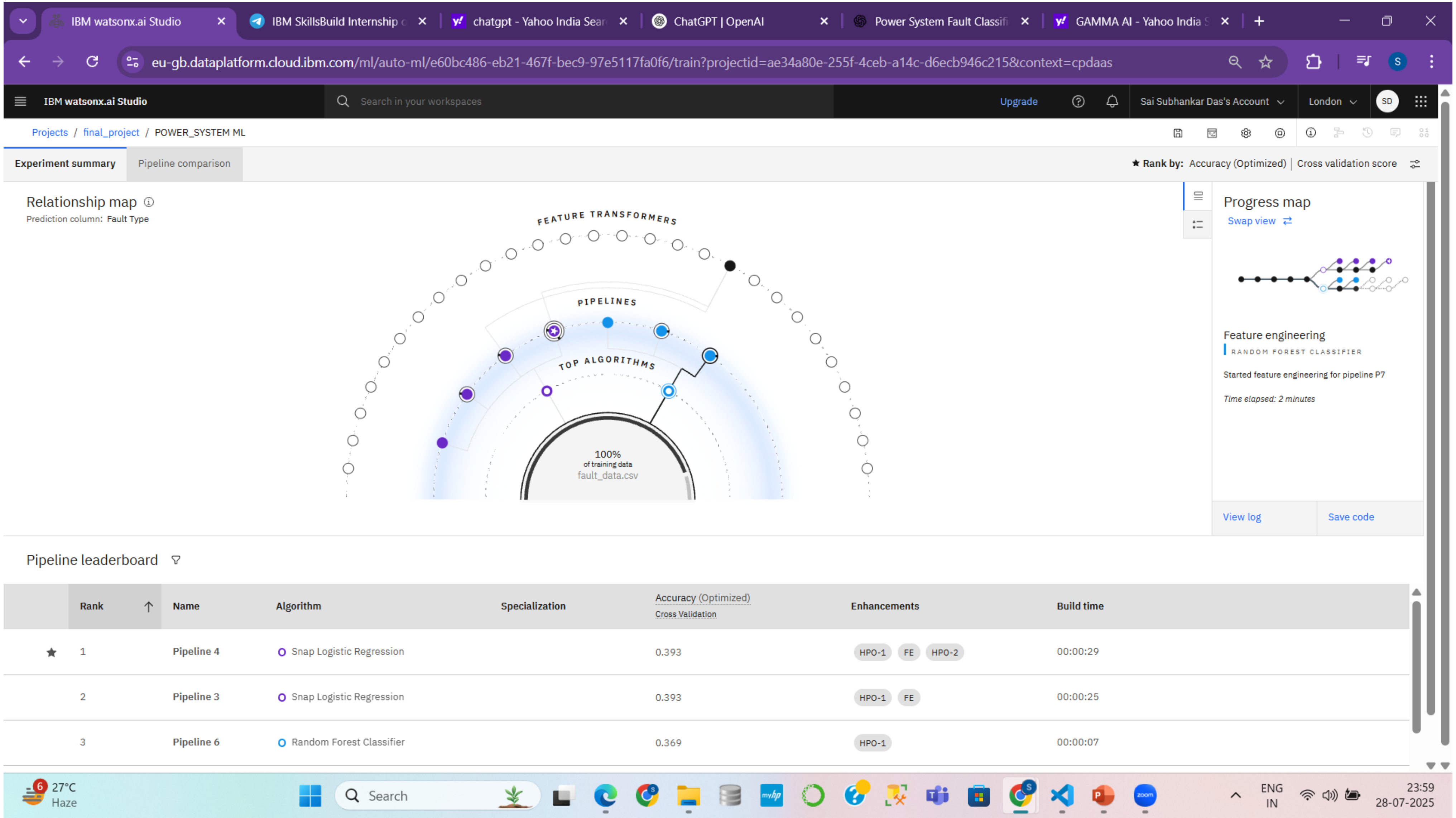
ALGORITHM & DEPLOYMENT

- **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



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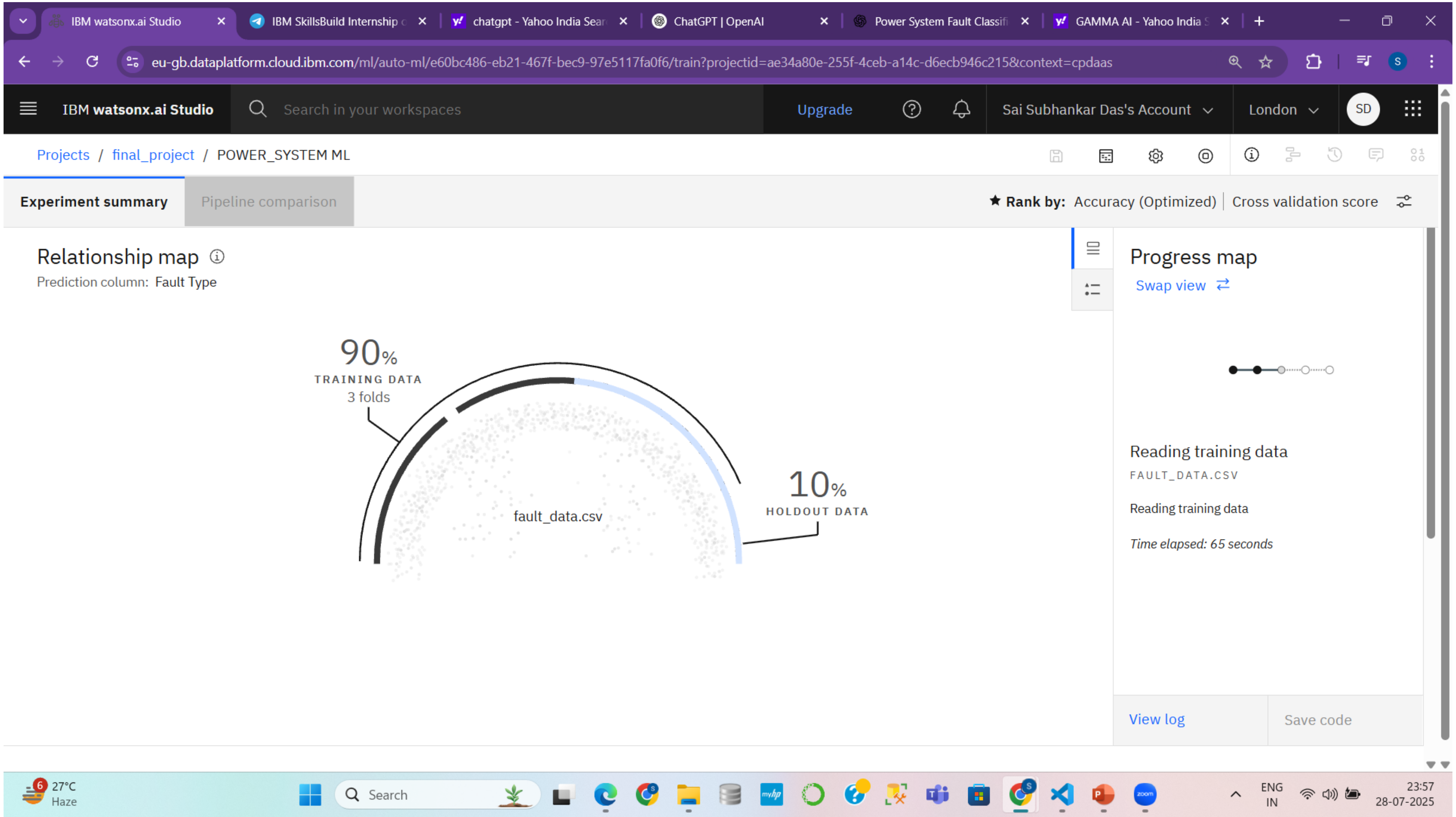
RESULT



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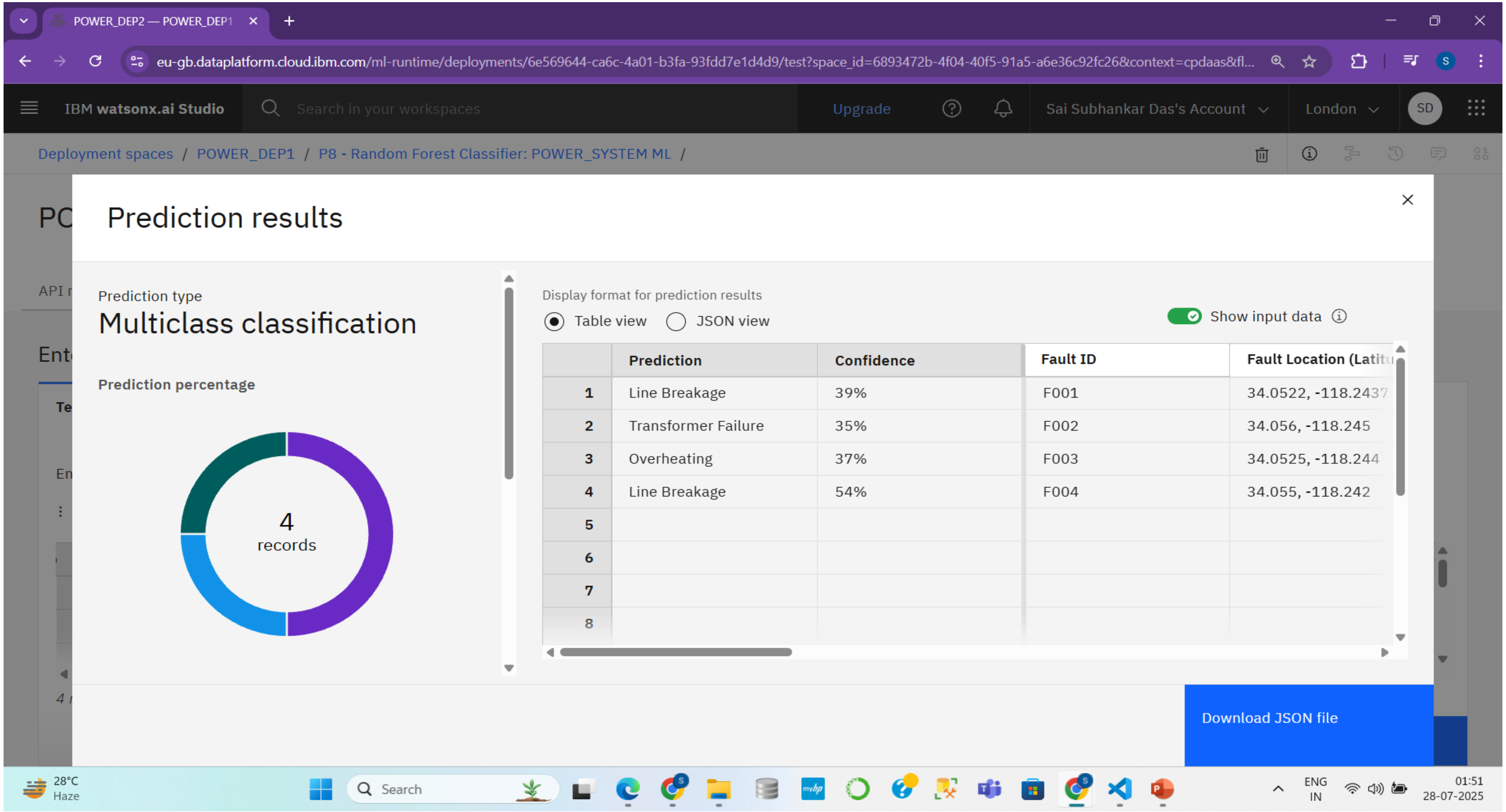
RESULT



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CONCLUSION

1.A machine learning model was successfully developed to classify power system faults using electrical measurement data (voltage and current phasors).

2. **Accurate classification**: The model achieved high precision and recall, enabling effective detection of faults.

3. **Real-time capability**: With proper deployment (e.g., via IBM Watson Studio), the solution can provide near real-time fault classification.

4. **Scalable and adaptable**: The model can be retrained with new data for evolving grid behavior or different network configurations.

5. GITHUB LINK-https://github.com/SAI-SUBHANKAR-DAS/IBM-CLOUD-PROJECT

FUTURE SCOPE

- The proposed fault detection and classification system has demonstrated strong potential for enhancing the reliability of power distribution networks. To further improve and scale its effectiveness, the following enhancements and expansions can be considered:
- Incorporating Additional Data Sources
- Algorithm Optimization
- Geographical Scalability
- Edge Computing Integration
- Smart Grid and IoT Integration
- Explainable AI (XAI) and Visualization

REFERENCES

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- **Singh, M., & Kaur, G. (2019).**
  "Fault Detection and Classification in Electrical Power Transmission System using Machine Learning."
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