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**

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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 measurements data (voltage , current , phasors) to differentiate them form normal operating conditions , thereby ensuring the stability

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

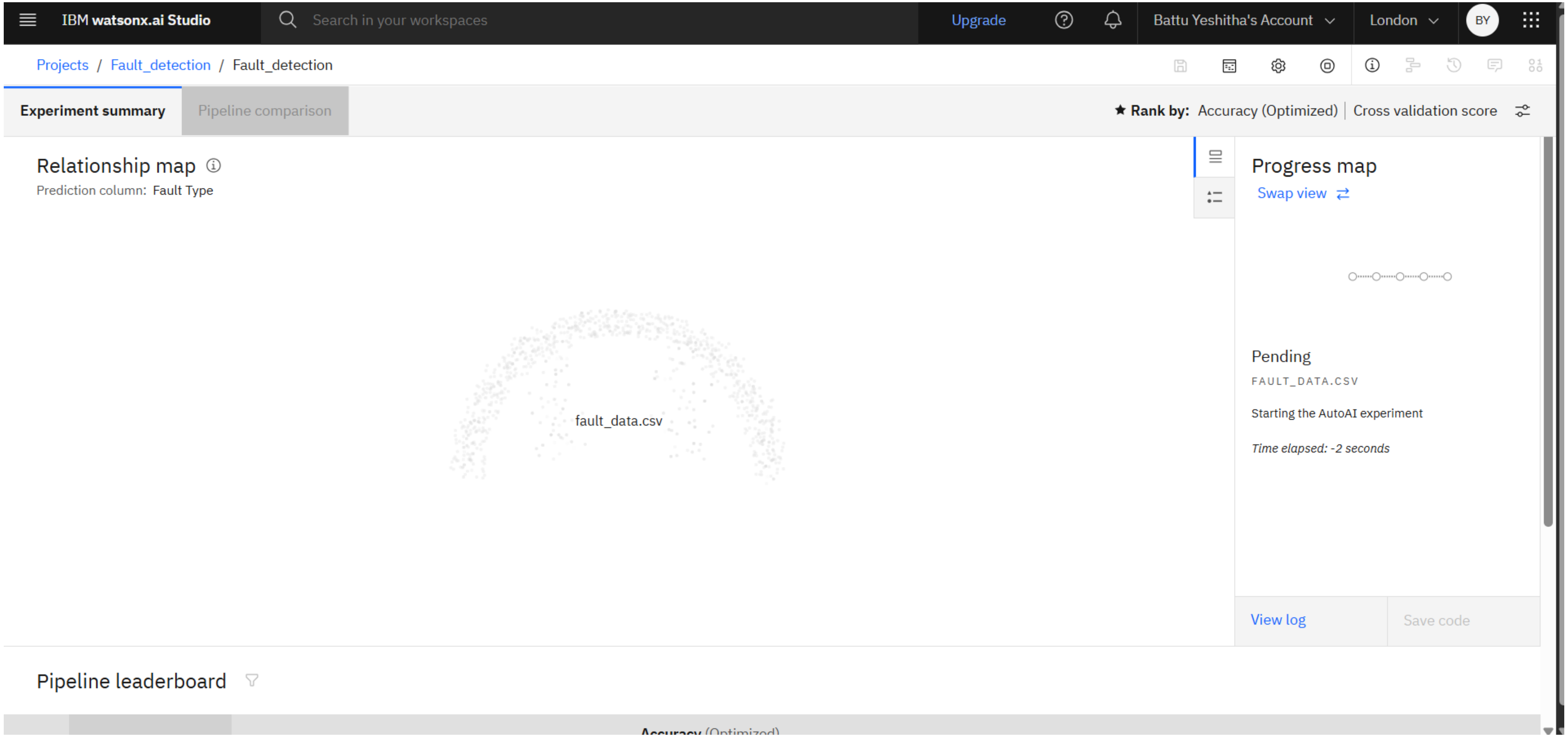
- **Training Process** :

  Supervised learning using labeled fault types

- **Prediction Process** :

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

RESULT



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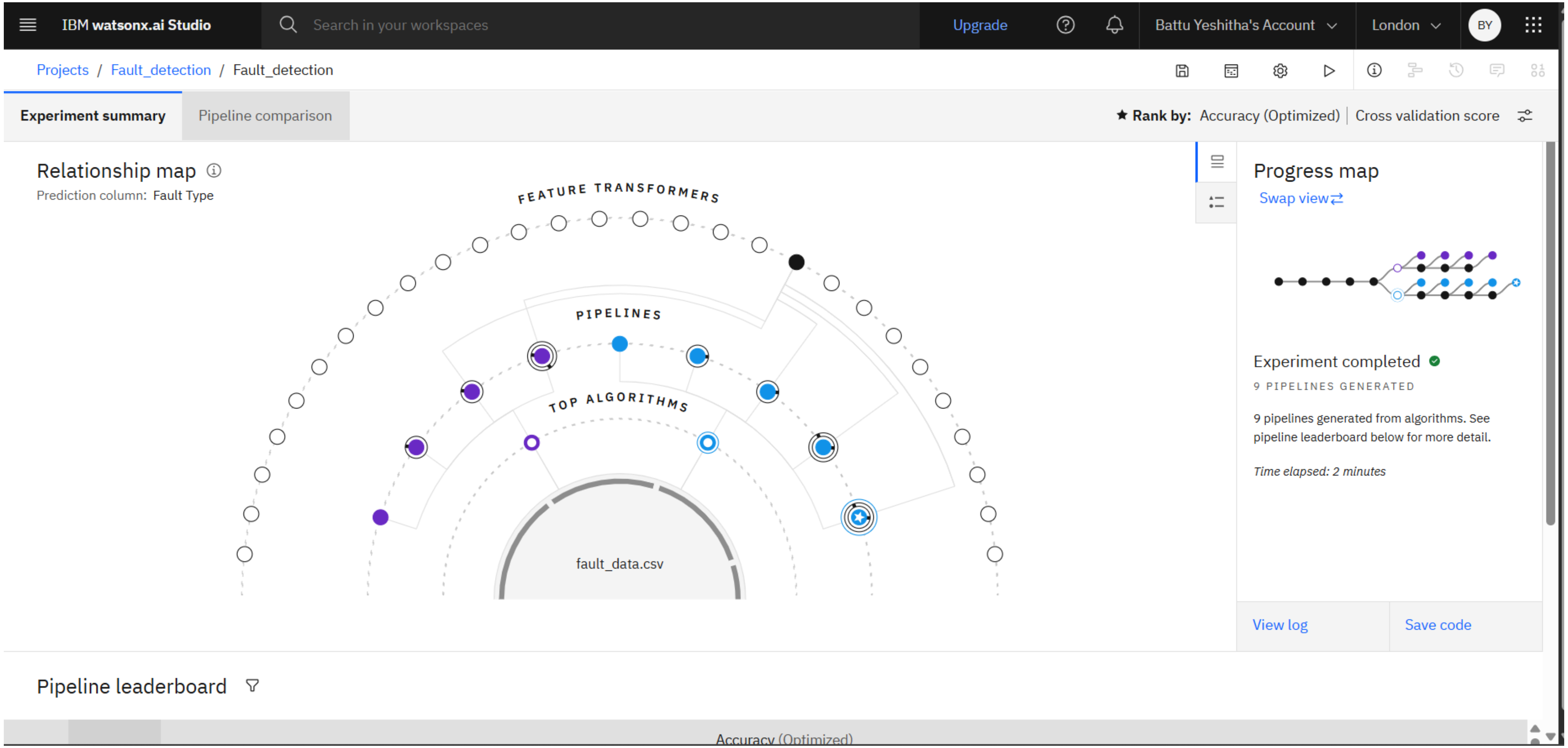
RESULT



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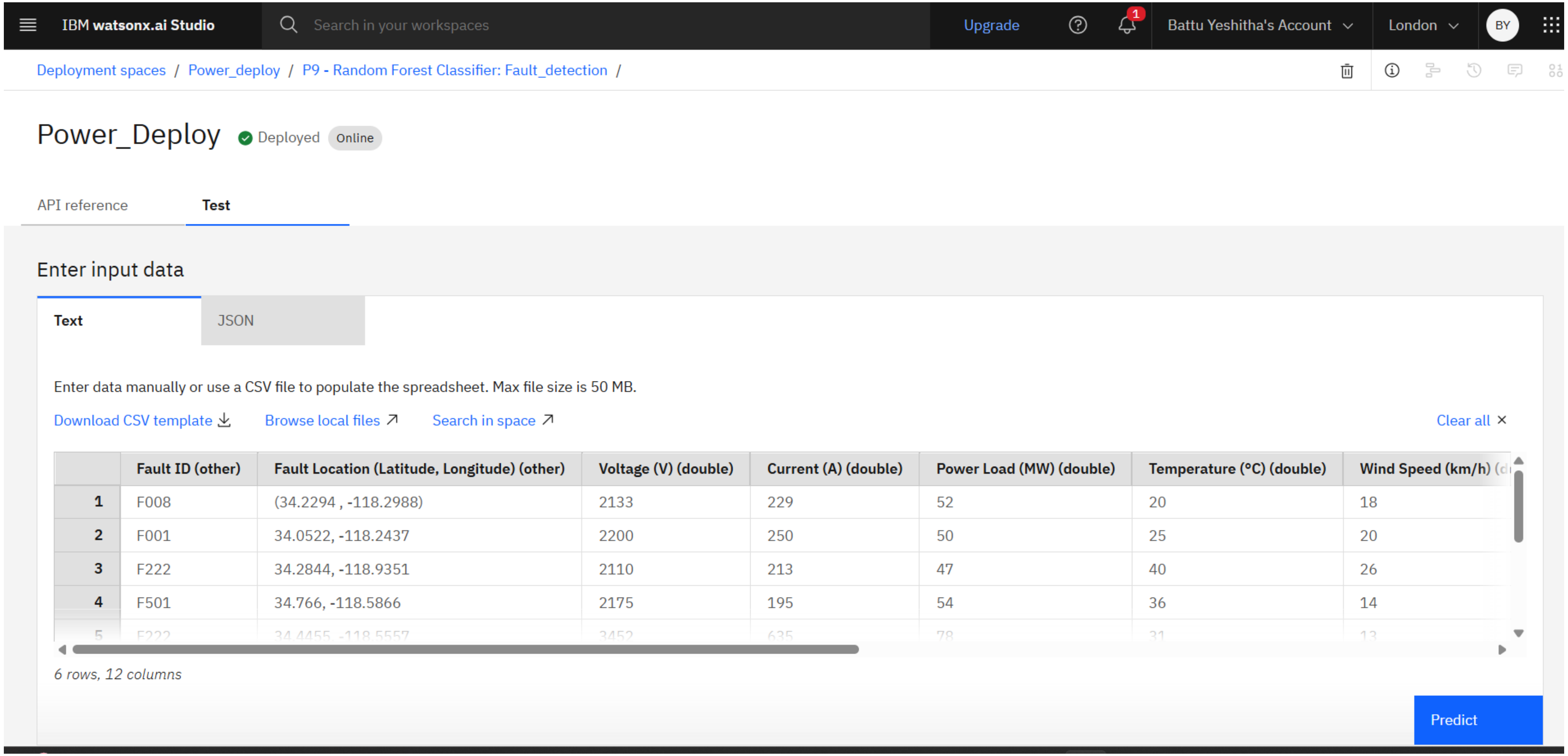
Experiment summary
Pipeline comparison
Rank by: Accuracy (Optimized) | Cross validation score
Relationship map
Prediction column: Fault Type
FEATURE TRANSFORMERS
PIPELINES
TOP ALGORITHMS
fault_data.csv
Progress map
Swap view
Experiment completed
9 PIPELINES GENERATED
9 pipelines generated from algorithms. See pipeline leaderboard below for more detail.
Time elapsed: 2 minutes
View log
Save code
Pipeline leaderboard
Accuracy (Optimized)

RESULT



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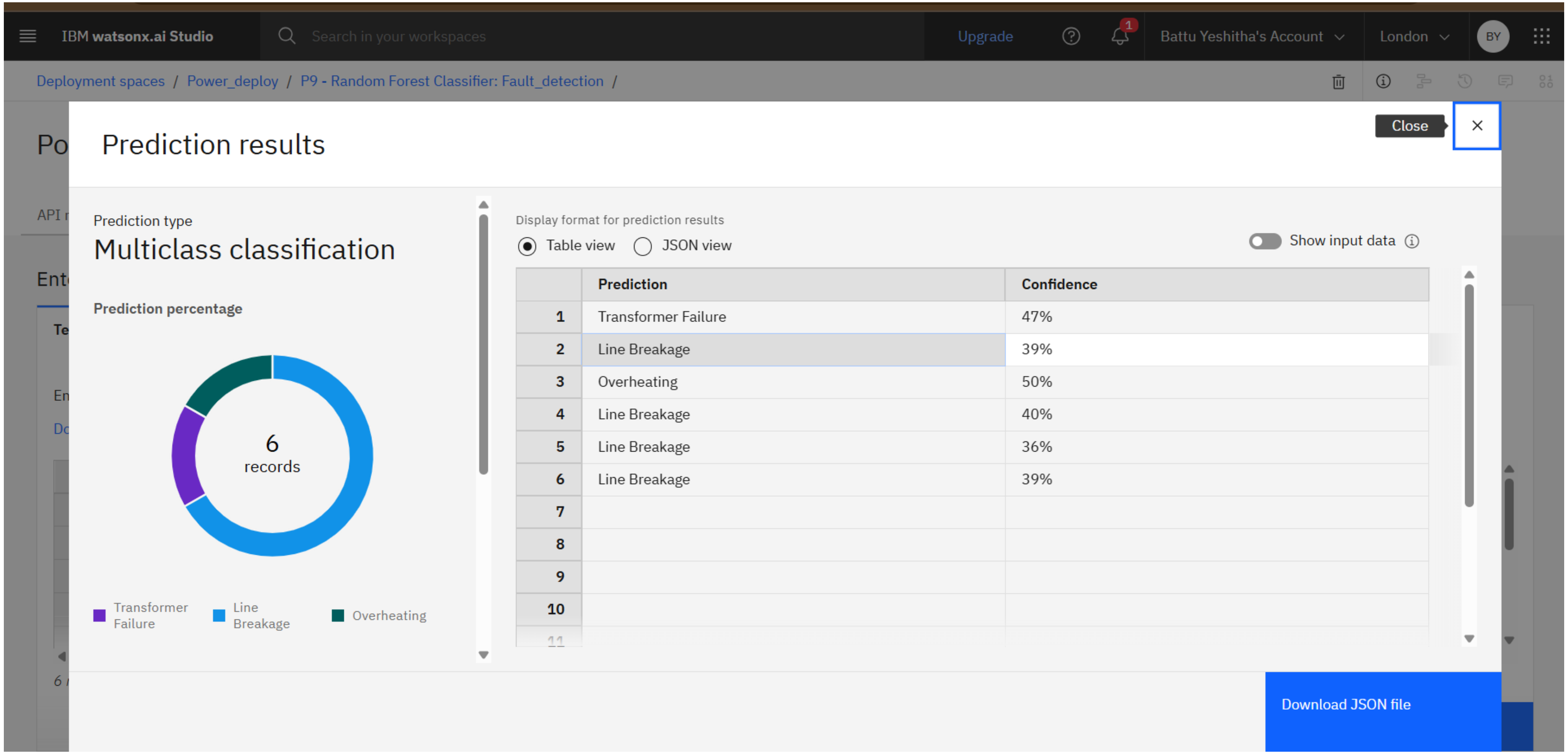
RESULT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Deployment spaces / Power_deploy / P9 - Random Forest Classifier: Fault_detection /
Close
Prediction results
Prediction type
Multiclass classification
Prediction percentage
6
records
Transformer Failure
Line Breakage
Overheating
Display format for prediction results
Table view
JSON view
Show input data
Prediction
Confidence
1 Transformer Failure 47%
2 Line Breakage 39%
3 Overheating 50%
4 Line Breakage 40%
5 Line Breakage 36%
6 Line Breakage 39%
7
8
9
10
Download JSON file

CONCLUSION

- The proposed fault detection and classification system effectively identifies various types of faults—line-to-ground, line-to-line, and three-phase—by analyzing electrical measurements such as voltage, current, and phasor data. This approach ensures enhanced reliability and minimizes power disruption in distribution networks.The use of machine learning and signal processing techniques significantly improves accuracy and responsiveness, making the system more robust in distinguishing fault conditions from normal operations.

FUTURE SCOPE

- Integration with real-time monitoring and control systems for automated grid responses.
- Expansion to include renewable energy sources and smart grid components.
- Incorporation of advanced deep learning models to improve fault classification precision.
- Development of edge computing-based fault detection for faster local decision-making.
- Use of IoT-enabled sensors for continuous grid health monitoring and predictive maintenance.

REFERENCES

- 1. IBM Cloud Docs. “Monitoring and Managing Power Systems using IBM Cloud Pak for Data.” https://cloud.ibm.com
- 2. IBM Developer. “AI for Fault Detection in Smart Grids.” https://developer.ibm.com
- 3. Kundur, P. (1994). Power System Stability and Control. McGraw-Hill.
- 4. IEEE Power & Energy Society. (2018). “Power System Fault Analysis and Protection.”
- 5. Research insights and datasets provided through IBM internship training modules.

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