CAPSTONE PROJECT

POWER SYSTEM FAULT DETECTION AND CLASSIFICATION USING MACHINE LEARNING

Presented By:
1. Swarnika-Maharshi Dayanand University-B.TECH CSE

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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 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.

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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:·

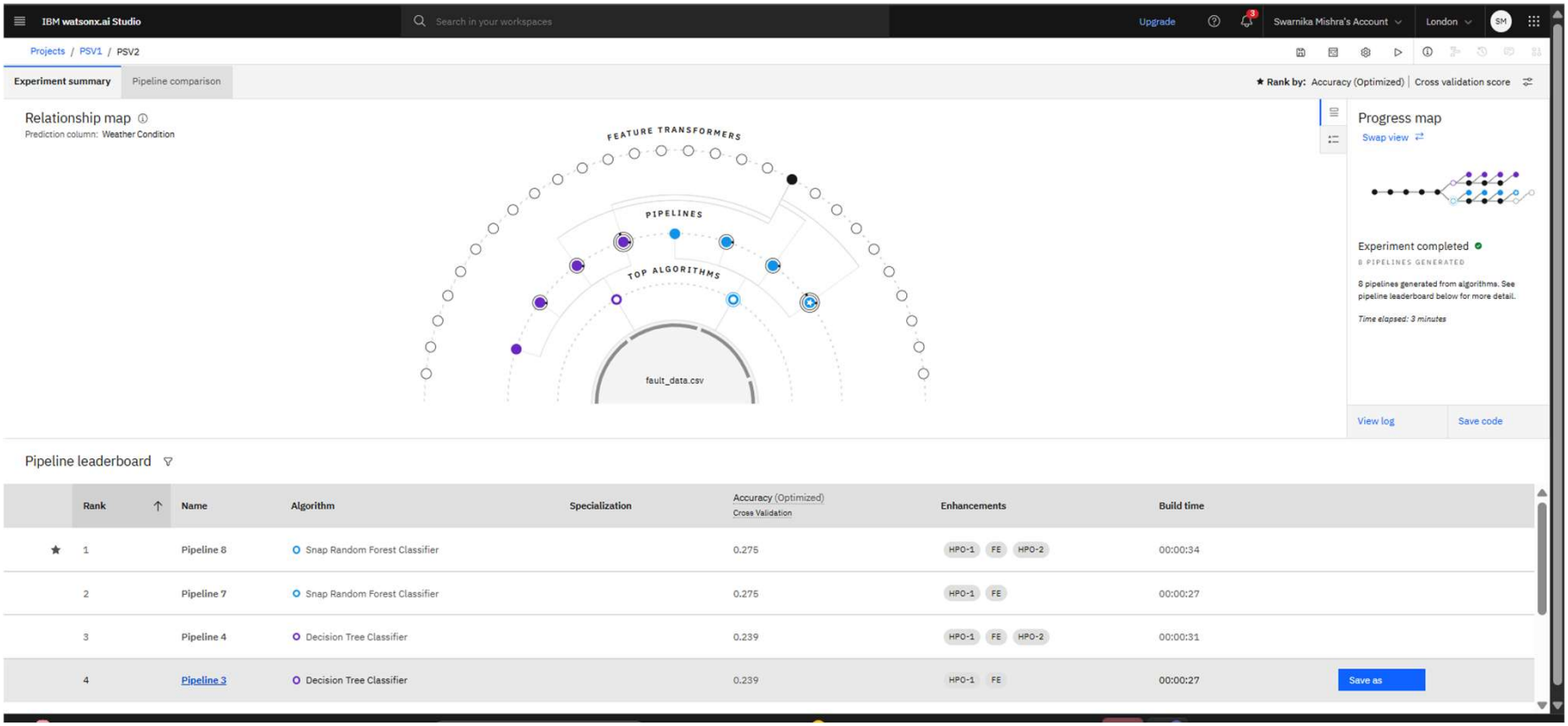
System requirements

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

ALGORITHM & DEPLOYMENT

- In the Algorithm section, describe the machine learning algorithm chosen for predicting bike counts. Here's an example structure for this section:
- 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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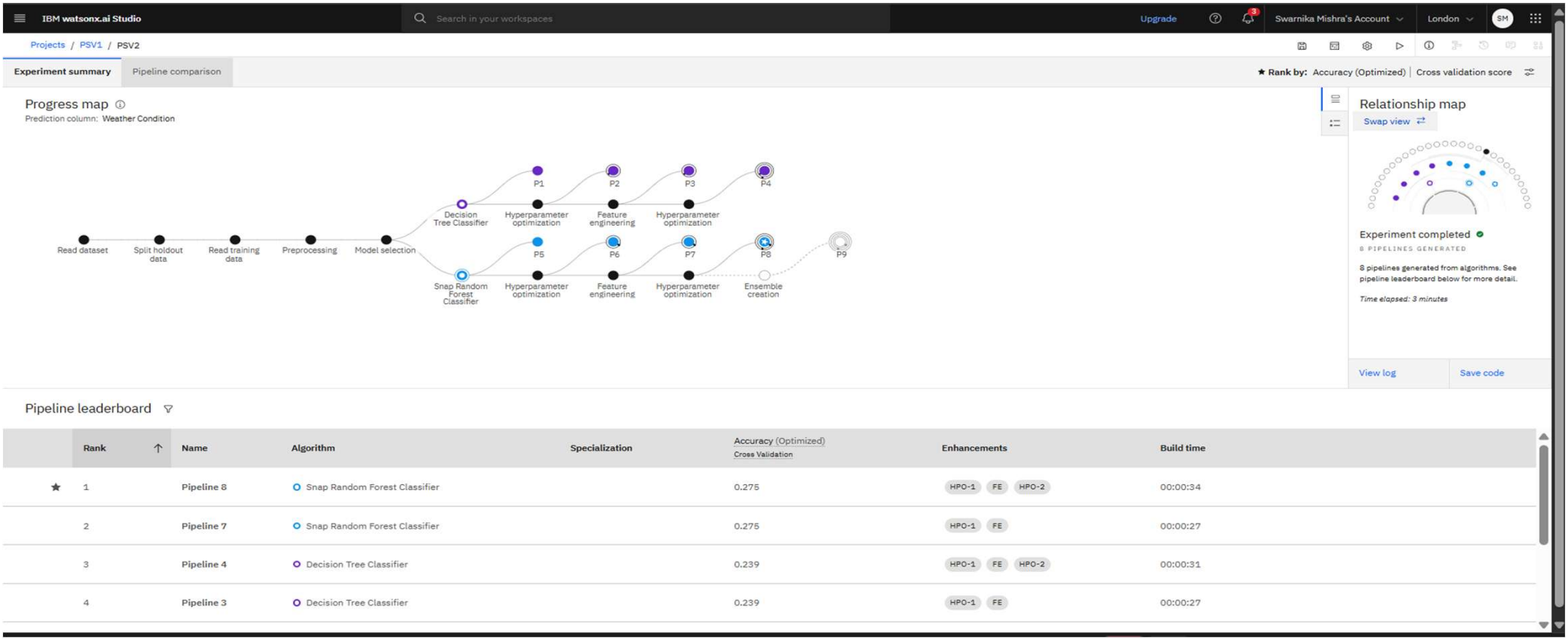
RESULT



	Rank	Name	Algorithm	Specialization	Accuracy (Optimized) Cross Validation	Enhancements	Build time
★	1	Pipeline 8	Snap Random Forest Classifier		0.275	HPO-1 FE HPO-2	00:00:34
	2	Pipeline 7	Snap Random Forest Classifier		0.275	HPO-1 FE	00:00:27
	3	Pipeline 4	Decision Tree Classifier		0.239	HPO-1 FE HPO-2	00:00:31
	4	Pipeline 3	Decision Tree Classifier		0.239	HPO-1 FE	00:00:27

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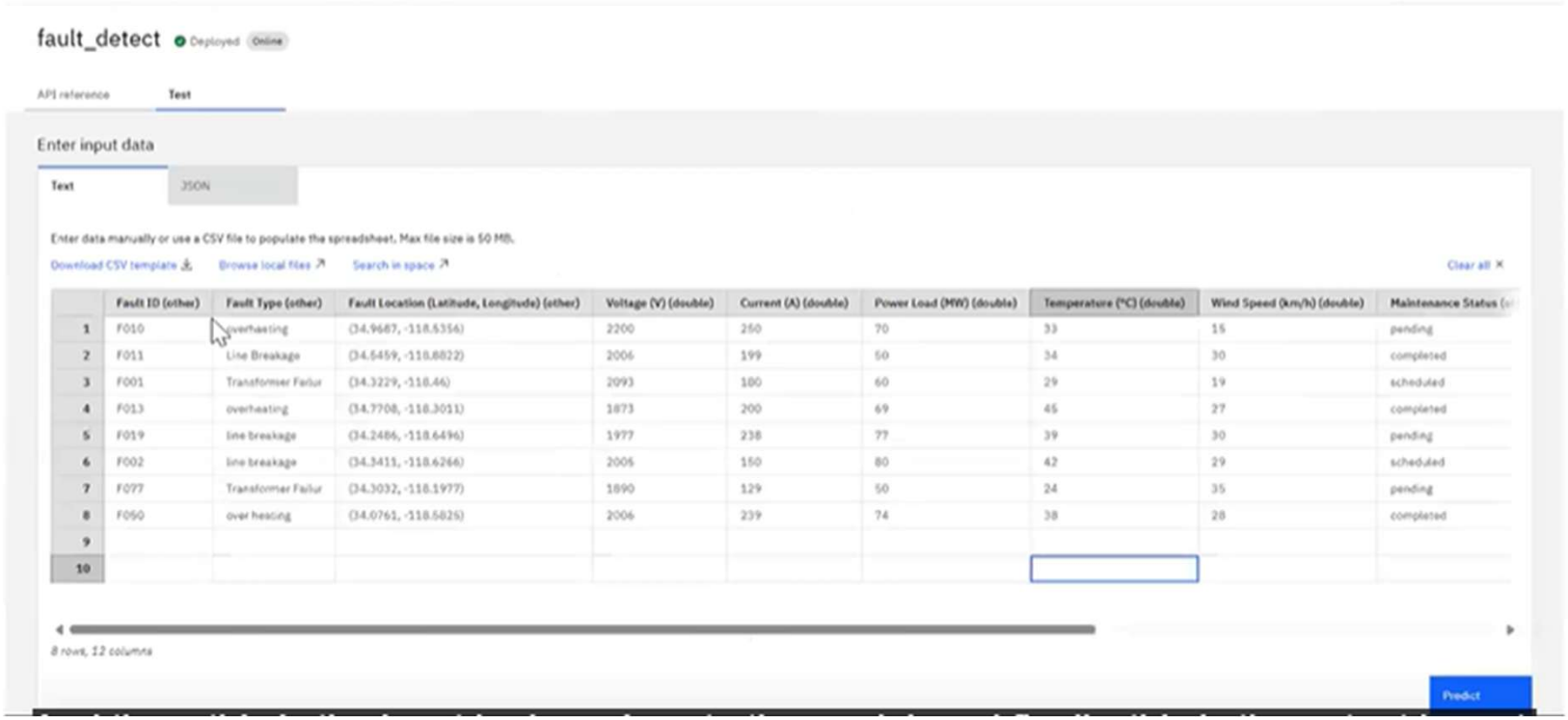

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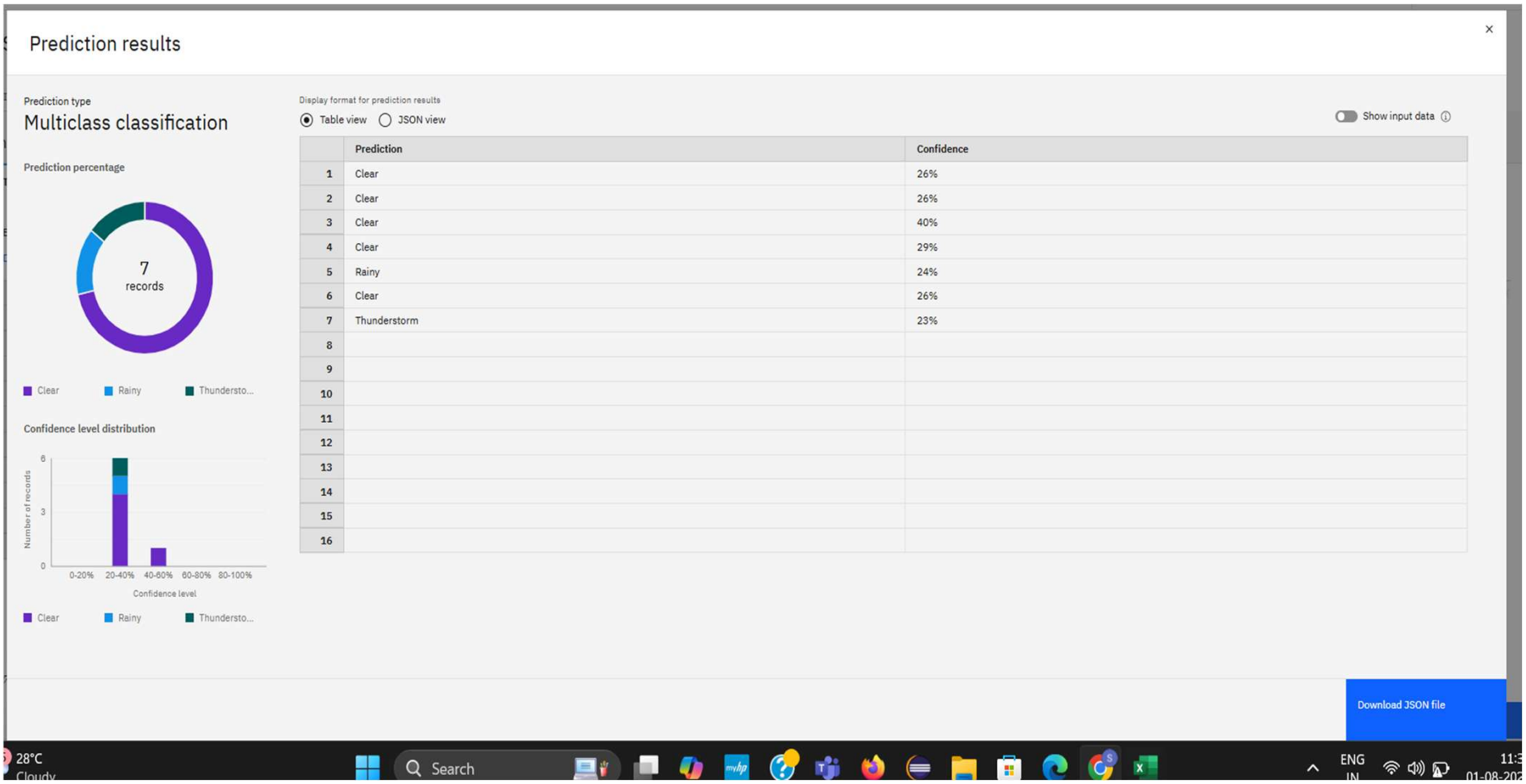

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CONCLUSION

- Design a machine learning model to detect and classify different types of faults in a power distribution system.

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FUTURE SCOPE

- 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.

REFERENCES

- https://www.kaggle.com/datasets/ziya07/power-systemfaults-dataset

- Technology – Use of IBM Cloud Lite services is mandatory. ML Project in Watsonx.ai.studio in IBM cloud

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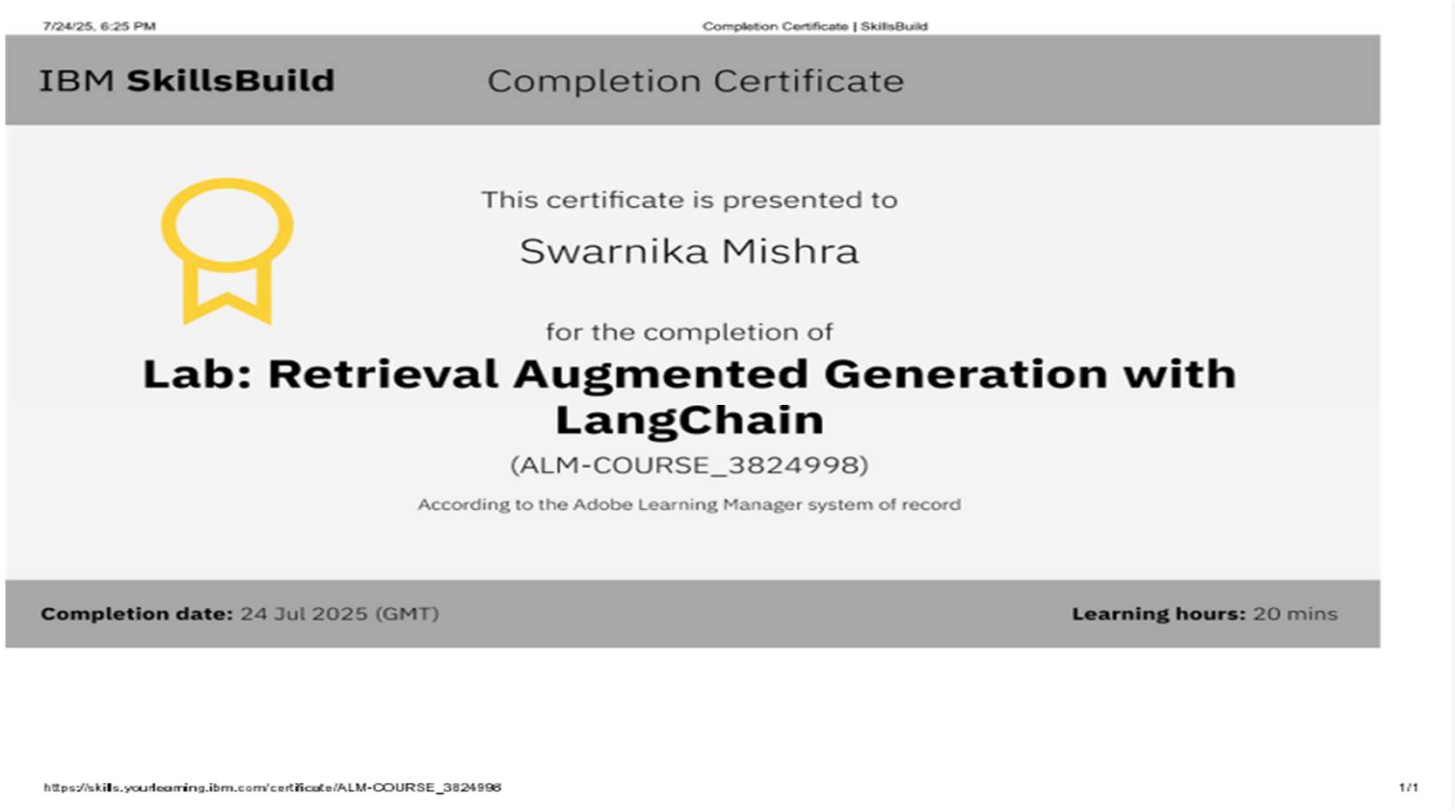

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