CAPSTONE PROJECT

POWER SYSTEM FAULT DETECTION AND CLASSIFICATION USING IBM WATSONX.AI CAPSTONE PROJECT

Presented By:
1. Mahendran D (PSG college of technology)

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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

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

We propose a machine learning-based system to detect and classify power system faults using current and voltage readings. The solution involves:

•Using the Kaggle Power Fault Dataset for training

•Employing IBM watsonx.ai AutoAI to automatically select and train models

•Deploying the trained model using IBM Watson Machine Learning

•Integrating a Python-based inference pipeline to make real-time predictions based on live or test data

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SYSTEM APPROACH

System Requirements:

IBM Cloud Account, watsonx.ai, AutoAI, Python 3, Jupyter Notebook

Libraries Used:

- pandas, numpy, requests, json, matplotlib (for result analysis)
- ibm-watson-machine-learning

ALGORITHM & DEPLOYMENT

- **Algorithm:** Ridge Regression (AutoAI-selected)
- **Data:** Features include voltage and current values across 6 buses
- **Training:** Automated in AutoAI, evaluated using F1 score
- **Deployment:** Model deployed in Sydney region on IBM Cloud as a web service
- **Inference:** REST API accessed through Python script using access tokens and deployment ID

RESULT

- Access token received ✅
- Model deployed successfully ✅
- Predictions generated using test data
- Output: Fault Type (e.g., AG, AB, ABC, No Fault)
- Accuracy (from AutoAI): ~99.5%

CONCLUSION

- This project demonstrates an effective way to classify power system faults using IBM watsonx.ai and cloud-based deployment. The use of AutoAI simplifies model development and ensures high accuracy. The integration with a Python inference pipeline allows scalable and real-time application.

FUTURE SCOPE

Expand the model to cover more fault types

Integrate SCADA-based real-time data for inference

Deploy on edge devices for faster response

Improve UI by integrating with dashboards like Node-RED or Streamlit

REFERENCES

- Power System Fault Dataset – Kaggle
- IBM watsonx.ai Documentation
- IBM Developer Tutorials

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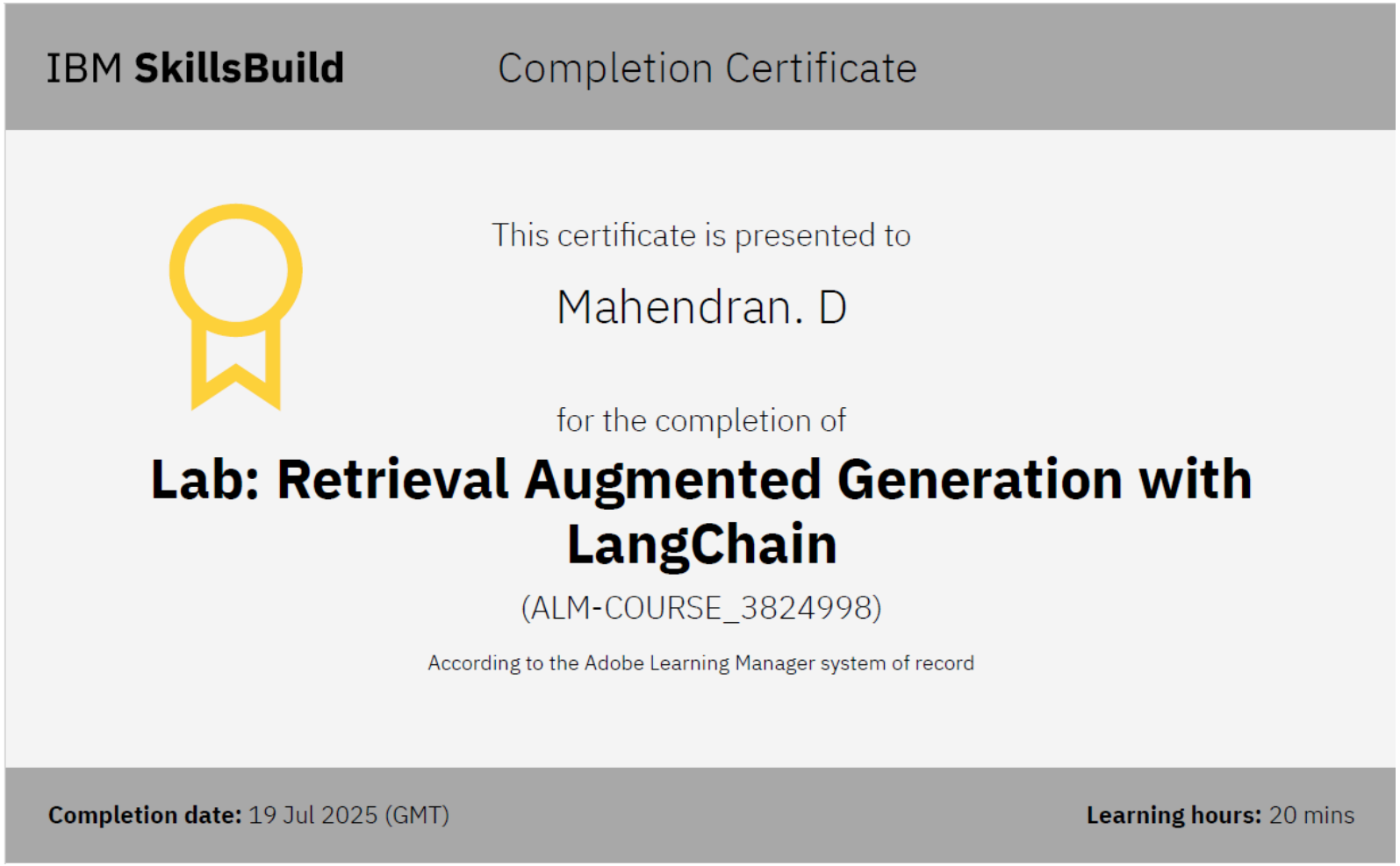

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