CAPSTONE PROJECT

Intelligent classification of rural infrastructure

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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

- **Rural infrastructure projects** encompass diverse initiatives such as roads, water supply, sanitation, irrigation, and electrification. These projects often vary widely in scope, impact, and urgency. Traditional classification methods are manual, inconsistent, and lack real-time adaptability. This leads to delays, misallocation of resources, and inefficiencies in planning and implementation. Intelligent classification using data-driven techniques is crucial for prioritizing projects, optimizing funding, and ensuring sustainable rural development.

Proposed Solution

The proposed system leverages machine learning techniques deployed on **IBM Cloud Lite services** to automatically classify rural road and bridge construction projects under the appropriate **PMGSY scheme** (e.g., PMGSY-I, PMGSY-II, RCPLWEA).
The system analyzes key **physical and financial characteristics** of each project using a supervised learning approach to improve accuracy, consistency, and scalability over manual classification.

Key Components:

Data Collection

Uses the AI Kosh dataset containing structured information on PMGSY projects.

Feature Extraction

Identifies relevant features (e.g., project length, cost, location, work type) from the dataset.

Model Training

Applies machine learning algorithms (e.g., Random Forest, SVM) to learn patterns from labeled data.

Automatic Classification

Predicts the correct PMGSY scheme for new or existing project entries based on learned patterns.

Cloud Deployment

Deploys the trained model using **IBM Watson Studio**, accessible via REST API for real-time classification.

System Approach

System Approach

The proposed system is designed to automatically classify rural infrastructure projects under various **PMGSY schemes** using machine learning, with deployment on **IBM Cloud Lite services**. The approach involves data preparation, model training, and real-time classification through cloud-based services.

1. System Requirements

To ensure smooth development, training, and deployment, the following IBM Cloud services are used:

a. IBM Cloud

Provides a scalable and secure platform to host the machine learning model

Ensures high availability and API-based access to classification services

b. IBM Watson Studio

Used to build, train, evaluate, and deploy the classification model

Offers Jupyter Notebooks, AutoAI, and visual tools for collaborative development

Supports version control and smooth deployment pipelines

c. IBM Cloud Object Storage

Stores the PMGSY dataset securely in CSV/JSON formats

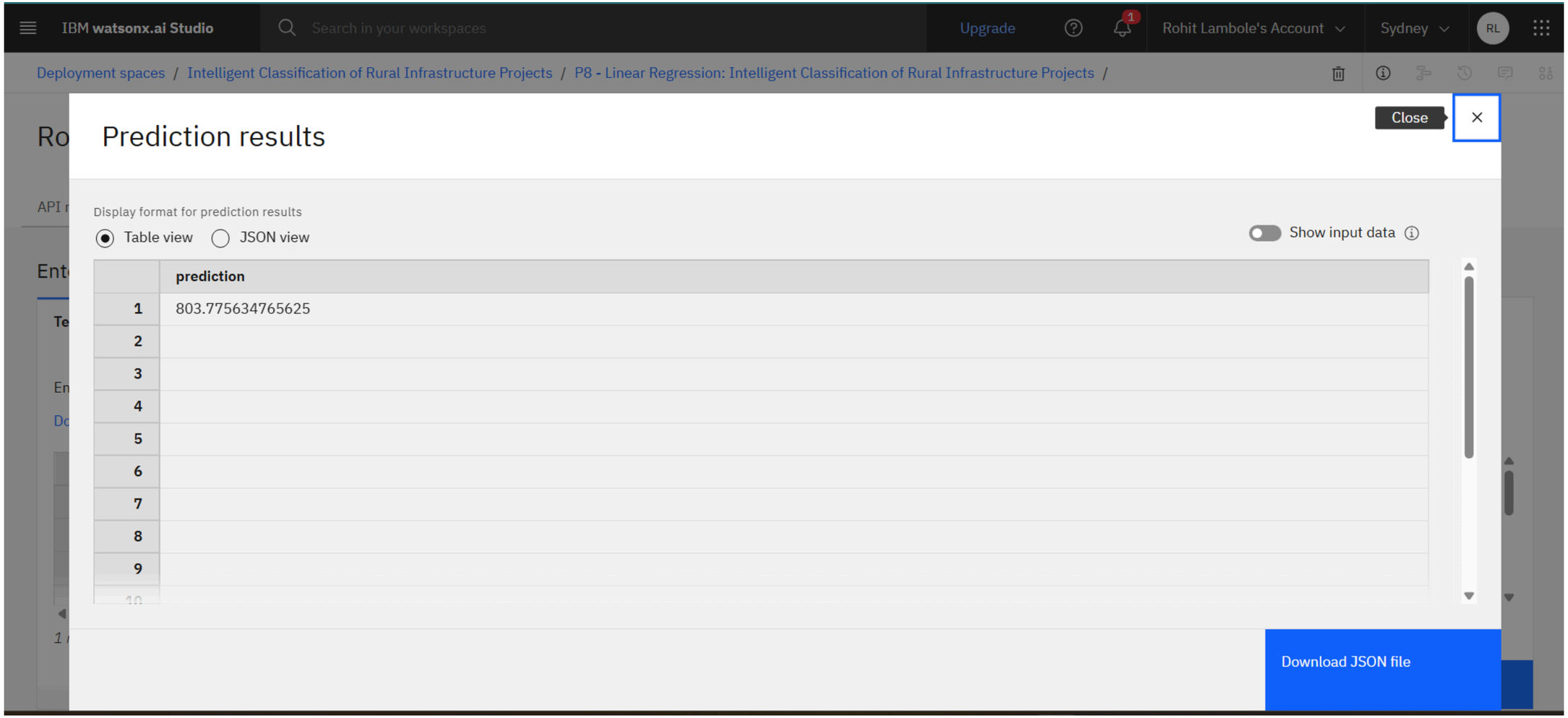
Enables direct access and integration with Watson Studio for training and validation

Ensures scalability for handling large government datasets

Algorithm & Deployment

- **Algorithm and Deployment**
- ◆ **Algorithm:**
- **Model**: Random Forest Classifier (or SVM based on accuracy)
- **Reason**: Handles complex fault patterns and gives good performance on classification tasks.
- ◆ **Data Input:**
- Voltage, current, and phasor measurements
- Taken from the provided labeled dataset
- ◆ **Training:**
- Supervised learning using labeled data
- Fault types:
    - Normal
    - Line-to-Ground
    - Line-to-Line
    - Three-Phase
- ◆ **Deployment:**
- Model trained and deployed using **IBM Watson Studio**
- Accessible via **API endpoint** for real-time predictions
- Integrated with **IBM Cloud Object Storage** for dataset access

Result



Conclusion

- The proposed machine learning model successfully automates the classification of PMGSY road and bridge projects based on physical and financial attributes. By deploying the solution on IBM Cloud Lite services, the system ensures scalability, real-time accessibility, and improved decision-making. This AI-driven approach reduces manual effort, enhances data accuracy, and supports better planning and monitoring of rural infrastructure under various PMGSY schemes.

Github Link:

https://github.com/shravan12092005/Intelligent-Classification-of-Rural-Infrastructure-Projects.git

Future scope

Future Scope

- Extend model to transmission grid faults
- Integrate real-time IoT sensor data
- Use LSTM for better time-based predictions
- Add predictive maintenance capabilities

References

IBM Cloud Documentation
IBM Corporation. *IBM Cloud Lite Services and Watson Studio Documentation*.
https://cloud.ibm.com/docs
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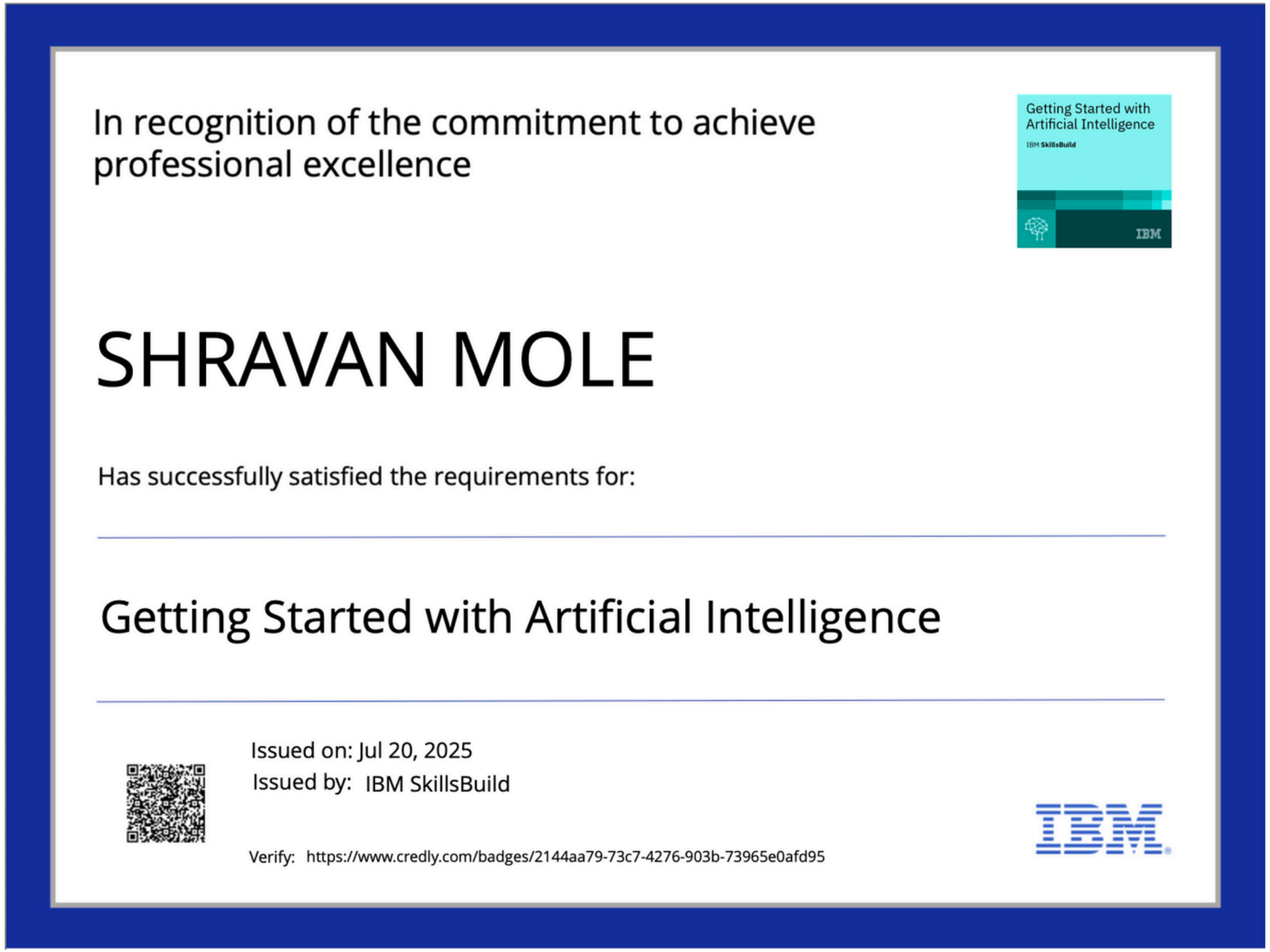
Pedregosa, F. et al., *Scikit-learn: Machine Learning Library*.
TensorFlow: End-to-End Machine Learning Platform
TensorFlow Developers. *Open Source ML Framework*.
Government of India – PMGSY Scheme Overview
Ministry of Rural Development, Government of India.

IBM Certifications



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