SMART INDIA HACKATHON 2025

Team Name: Coder Crew

Problem Statement Title: Predicting Project Costs and Timeline

Theme: Smart Automation

Organization: Power Grid Corporation of India Limited (POWERGRID)

Prototype: https://infralytics.streamlit.app/

Abstract / Summary

Infrastructure projects across India, especially those managed by POWERGRID, face persistent challenges in cost escalation and schedule delays due to complex interdependencies involving terrain, resource availability, regulatory processes, weather, and vendor performance. Traditional planning approaches rely heavily on manual estimation and reactive management, resulting in inefficiencies and poor forecasting accuracy. INFRALYTICS addresses this challenge through an AI-powered predictive analytics platform that leverages machine learning (ML) and data integration to forecast project costs and timelines. It identifies potential risk hotspots, provides early warnings, and enables proactive decision-making. Our solution integrates diverse data sources — structured, semi-structured, and unstructured — including project type, environmental conditions, historical delay patterns, vendor performance, regulatory timelines, and manpower availability. The predictive engine employs advanced ML models such as Random Forest, XGBoost, and Neural Networks to estimate cost and schedule deviations with high accuracy. The system delivers actionable insights through a user-friendly Streamlit dashboard, empowering project managers to visualize trends, analyze risks, and plan mitigations. It also incorporates continuous learning capabilities by updating models as new project data becomes available.

Idea Description

INFRALYTICS is a predictive analytics and decision-support platform powered by Machine Learning. It forecasts project cost overruns and schedule delays while pinpointing critical hotspots and influencing factors. Key Features: • Integrated Data Pipeline for structured, semi-structured, and unstructured data. • Predictive ML Engine using algorithms like Random Forest, XGBoost, and Neural Networks. • Risk Hotspot Detection for early warning of delays or cost escalations. • Streamlit-based Visualization Dashboards for interactive insights. • Scalable and Adaptable architecture for different infrastructure domains. Technical Architecture: 1. Data Integration from multiple project, vendor, and weather sources. 2. Data Preprocessing and Feature Engineering to prepare quality inputs. 3. Predictive Modeling using ensemble ML and deep learning techniques. 4. Model Validation through historical POWERGRID data. 5. Dashboard Visualization for intuitive interpretation. Impact & Benefits: • Reduces project delays and cost overruns. • Enhances decision-making accuracy. • Optimizes manpower, material, and resource utilization. • Scalable across multiple projects and adaptable to other domains. Future Scope: • Integration with IoT for real-time forecasting. • AI-assisted automatic report generation. • Predictive maintenance for asset management. • Satellite data integration for terrain mapping.

Research & References

1. Smart Delay Prediction in Construction Projects (IMCMS Journal) 2. Data-driven Decision Making in Project Management (Planisware) 3. Predictive Analysis in Infrastructure Projects (ResearchGate) 4. Machine Learning Applications in Project Forecasting (SCIRP)