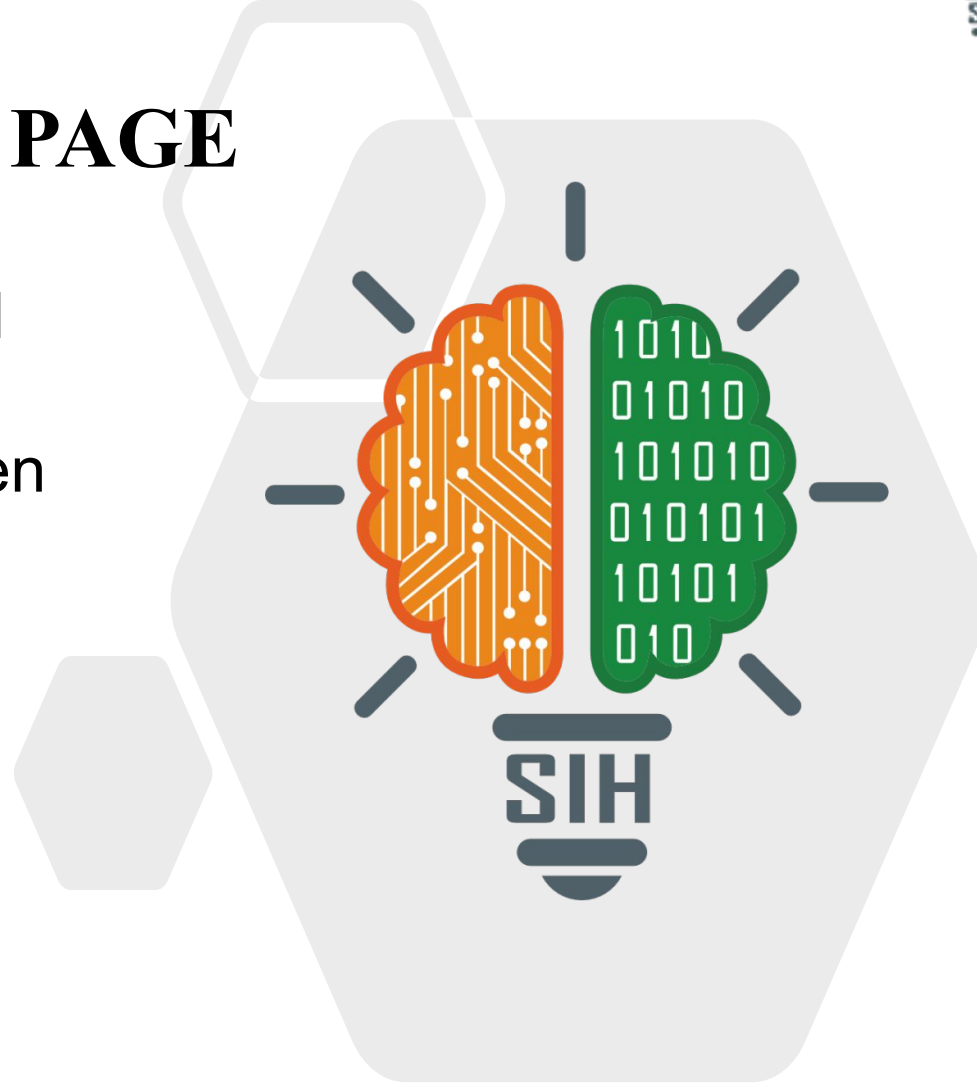


SMART INDIA HACKATHON 2025



TITLE PAGE

- **Problem Statement ID** – SIH25081
- **Problem Statement Title** - AI-Driven
Train Planning for Kochi Metro
- **Theme** - Smart Automation
- **PS Category** - Software
- **Team ID** - 109_SIH
- **Team Name (Registered on portal)** - Runtime_Rebels_RGUKTN







AI-Powered Train Induction & Scheduling System for Kochi Metro

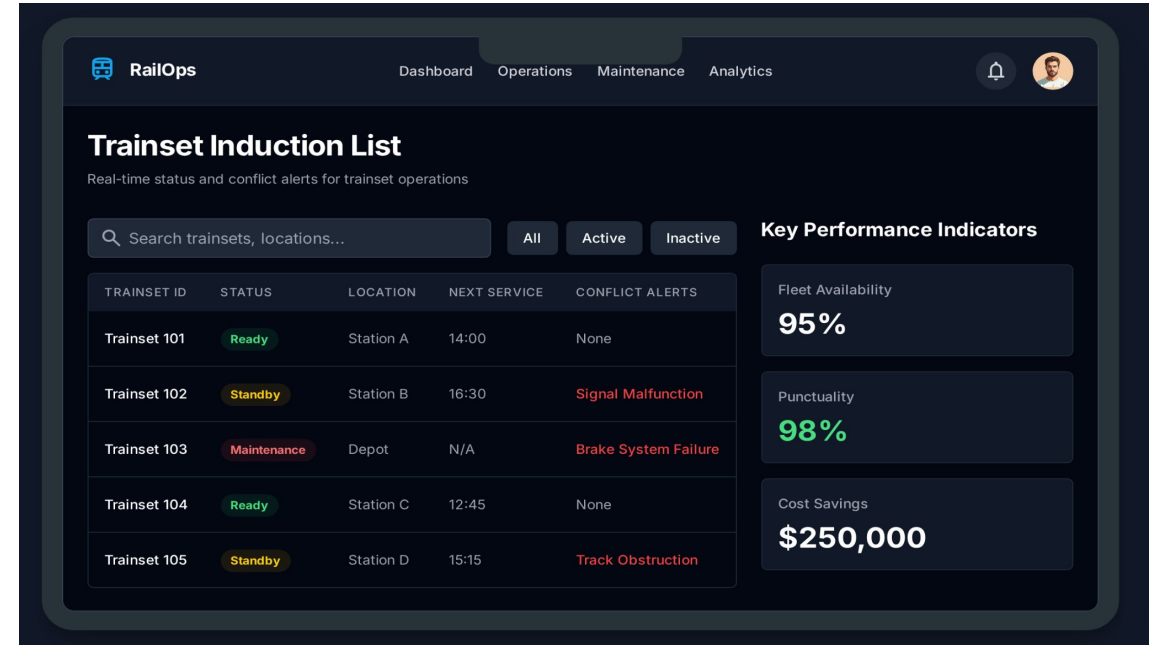
❖ Proposed Solution

Our solution introduces an **AI-powered decision-support platform** that integrates data from Maximo exports, IoT fitness sensors, maintenance logs, and depot maps through APIs and IoT connectors. After preprocessing, AI/ML models are applied: **Random Forest for risk prediction, LSTM for scheduling, and Reinforcement Learning for mileage and bay optimization**, supported by clustering models for cleaning slot allocation.

The platform delivers a **ranked induction list with explainable reasoning, conflict alerts, and dashboards**, ensuring reliable, scalable, and auditable planning. This results in **higher fleet availability, lower lifecycle cost, and improved passenger experience**, while continuously learning and improving over time.

❖ Innovation and Uniqueness

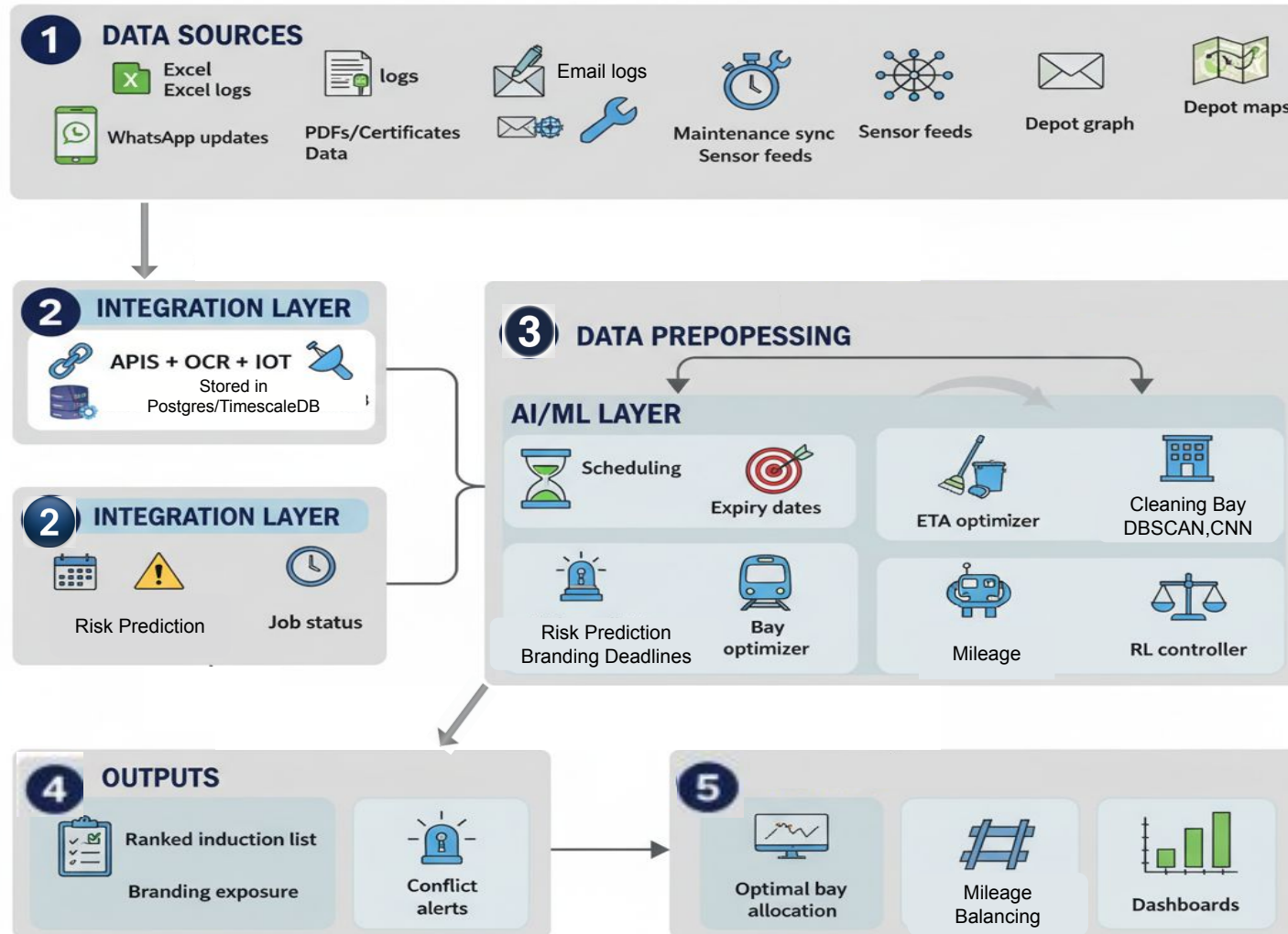
-  Algorithmic Automation
-  Wear and tear Forecasting
-  Branding Hours Forecaster
-  Real time What-if Simulation



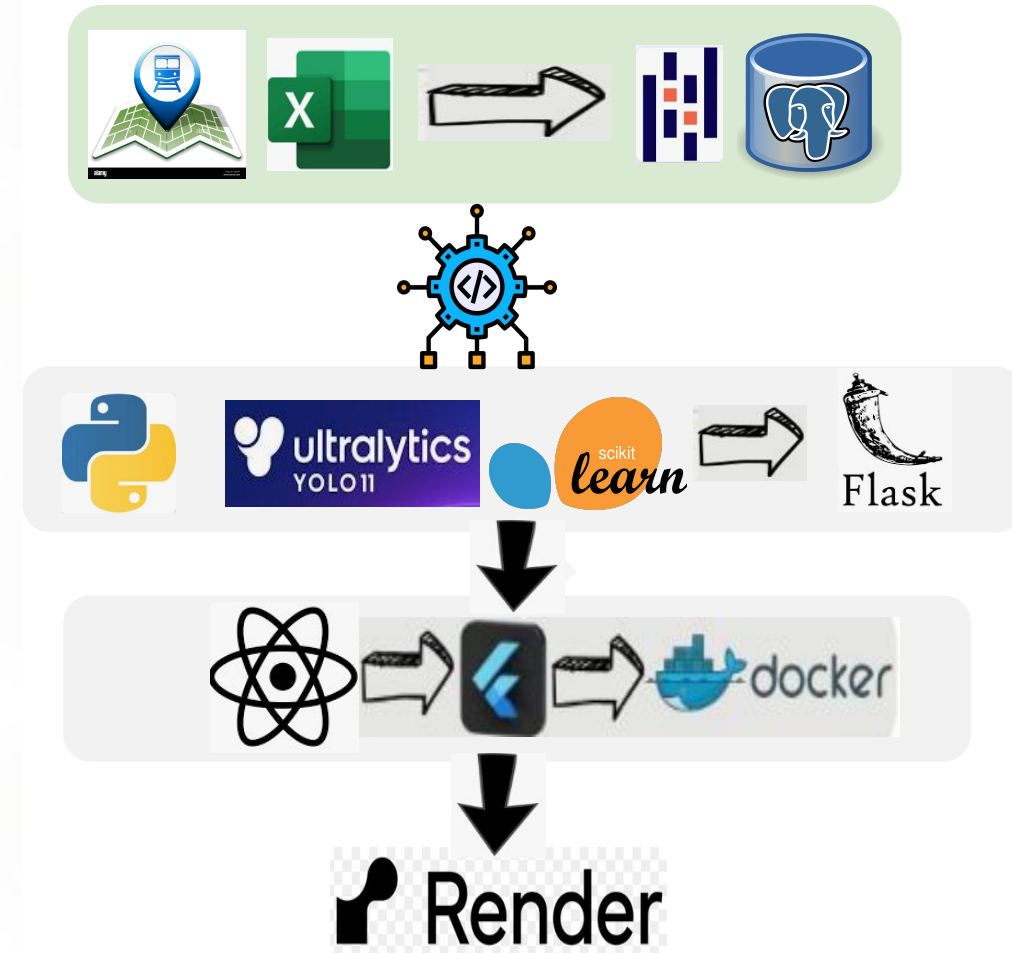
❖ How the solution Addresses the Problem :





- MCDA (Multi Criteria Decision Analysis) Scoring
- Efficient & Adaptive metro scheduling
- Automated certificate tracking & alerts
- Schedules cleaning & Detailing slots
- Automated compliance **tracking using OCR** with ML-based expiry alerts

KOCHI METRO – AI-POWERED TRAIN INDUCTION PLANNING



Tech Stack

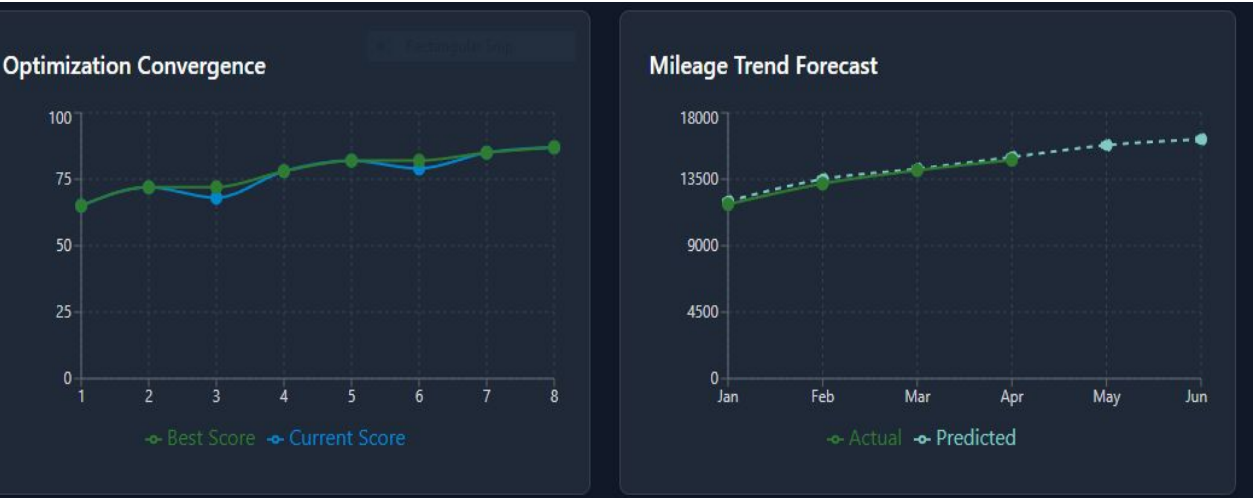


-  **Feasibility (MCDA)** – Strong technical, operational, and financial viability
-  **Challenges & Risks** – Data gaps, legacy system issues, and capacity constraints.
-  **Strategies** – **ML prediction**, API integration, mileage equalization, cybersecurity, and optimization.
-  **Technical Feasibility** – AI-based scheduling with real-time data (Maximo, IoT) and what-if simulations

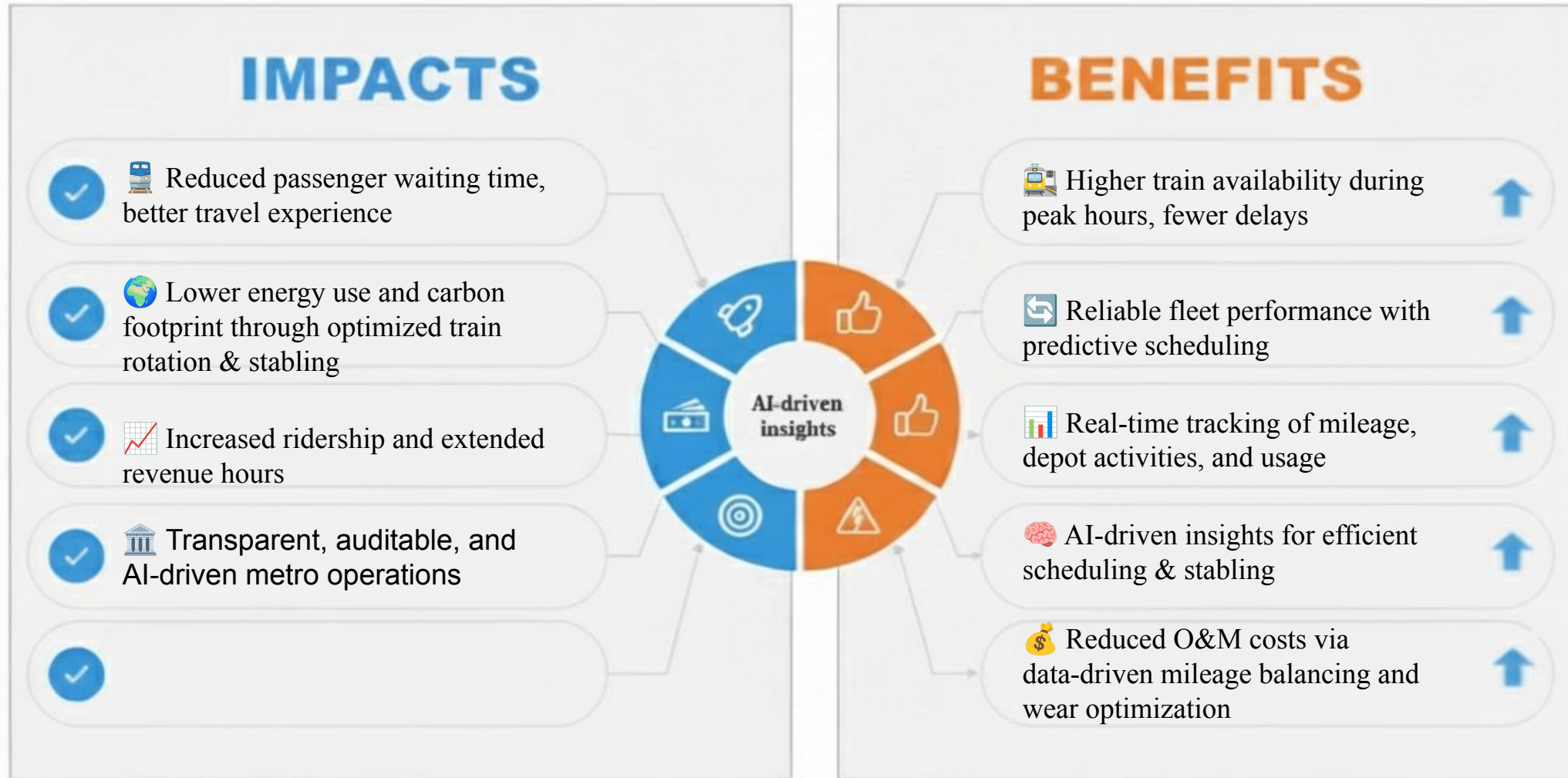
Metric	Value	Target	Status
Fleet Utilization	92%	≥85%	Met
Brand Exposure	89%	≥85%	Met
Mileage Balance	0–180 km	≤180 km	Met
Operational Score	724.5	≥700	Met

Manual Vs AI Powered

Feature	Manual Process	AI-Driven System
Centralised Data Integration	Data stored in silos, not connected	Unified platform integrating all data
Scalability & On-the-go Transfers	Difficult to scale, manual effort needed	Easily scalable with automated transfer
Branding/SLA Breaching	Manual tracking and updates	Automated scheduling and compliance
Simulation and What-if Testing	No real-time simulation possible	Supports real-time scenario testing
Optimized mileage & balance	Experience-based, reactive decisions	Data-driven balancing and predictive maintenance



IMPACTS AND BENEFITS



- ❖ **Kochi Metro Rail Limited (Official Website)** : Official updates, operations, project details, and annual reports : [click here](#)
- ❖ **Kochi Metro Rail Project – Railway Technology**: Detailed case study of Kochi Metro project, funding, design, and operations : [click here](#)
- ❖ **Train Scheduling with Deep Q-Network: A Feasibility Test - MDPI**: Optimization models for railway Traffic rescheduling and Tackle the Problem : [click here](#)
- ❖ **Data driven Predictive Maintenance Scheduling Policies for Railways** : Lopes Gerum, Pedro Cesar; Altay, Ayca; Baykal-Gürsoy, Melike, Transportation Research Part C: Emerging Technologies (2019). [click here](#)
- ❖ **Kochi Metro Project** : Railway-Technology case study with design, infrastructure, and technical features. [click here](#)