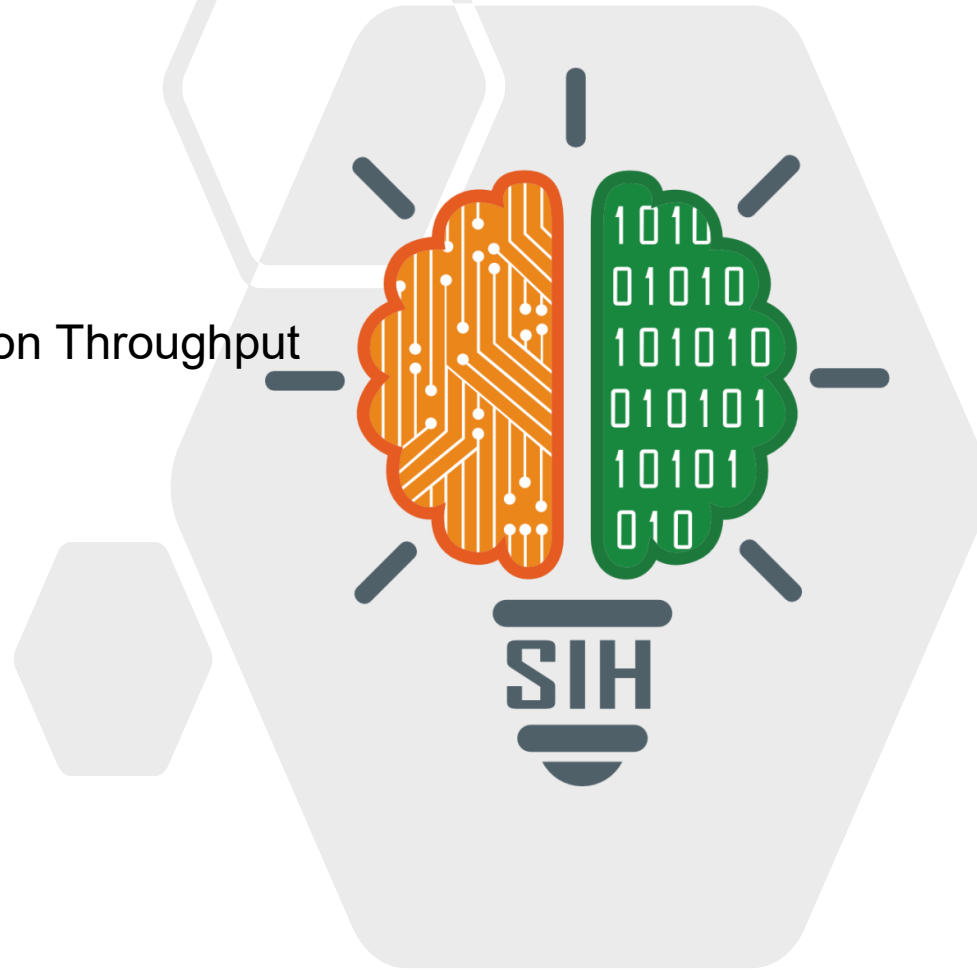# SMART INDIA HACKATHON 2025

- **Problem Statement ID –** SIH25022

- **Problem Statement Title-** Maximizing Section Throughput

  Using AI-Powered Precise Train Traffic Control

- **Theme-** Transportation & Logistics

- **PS Category-** Software

- **Team ID-**

- **Team Name (Registered on portal)**

Maximizing Section Throughput Using Al-Powered Precise Train Traffic Control

❖ Proposed Solution

An AI-powered real-time train traffic control system to maximize section throughput and optimize track utilization under dynamic operational constraints through :-
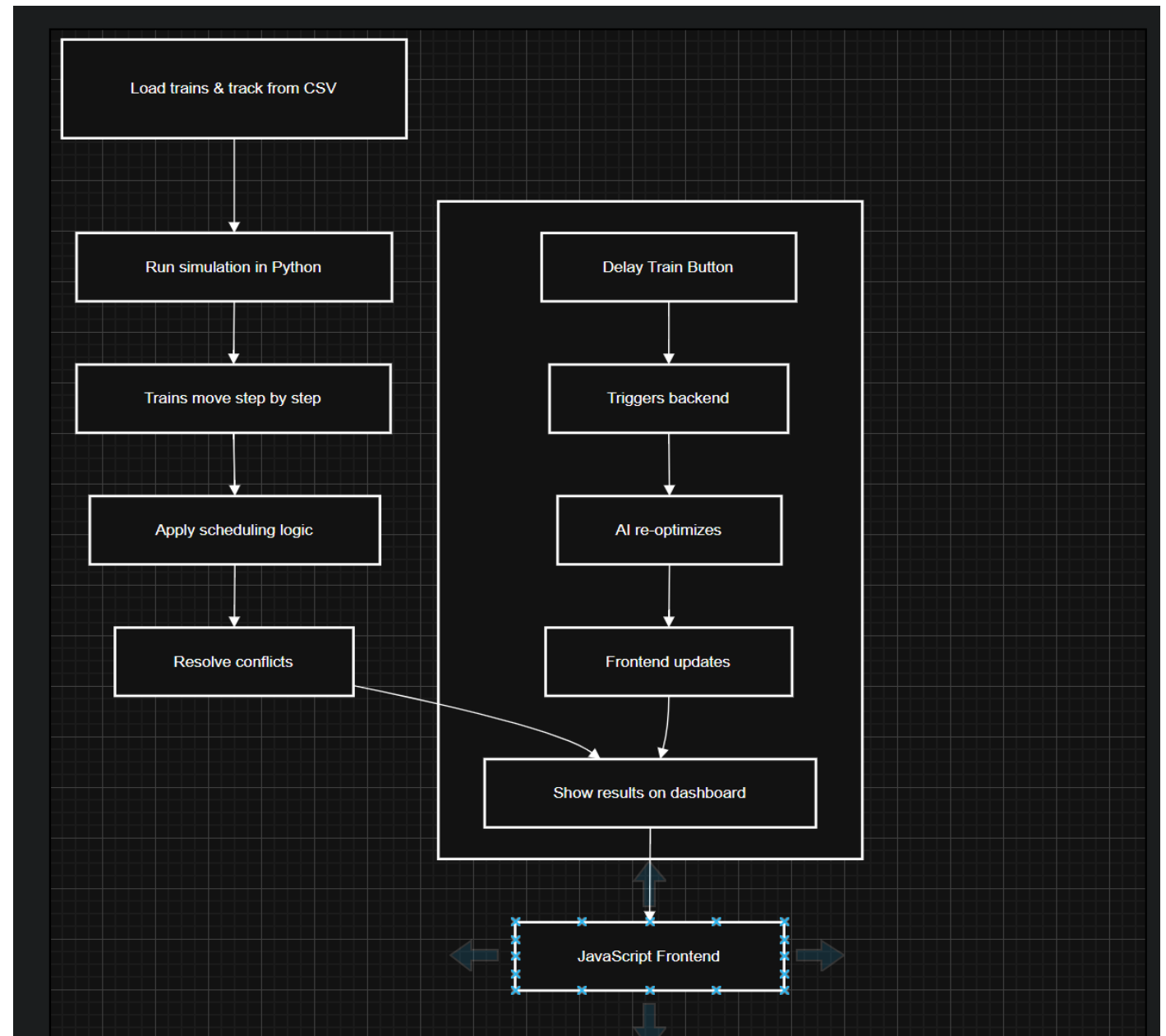1. Scheduling
2. AI Decision-making

TECHNICAL APPROACH

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- Technologies to be used

  •**Database** → CSV/JSON (through SQL)
  •**Backend** → FastAPI (Python)
  •**AI/Logic** → Python (Greedy / OR-Tools)
  •**Frontend** → HTML + JS + CSS

Methodology and process for implementation

FEASIBILITY AND VIABILITY

Feasibility

- Real-time decisions—whether a train should proceed, halt, or be rerouted
- Decision-support tool for controllers, reducing delays & maximizing track usage.

Challenges & Risks

- Rising traffic volumes and higher expectations for punctuality, safety, and efficiency, manual decision-making alone is becoming insufficient.
- Human adoption and integration with existing railway systems can be challenging which can be overcome by AI.

Strategies

- Use simulated data and hybrid (heuristic + AI) optimization for fast, feasible results.
- Start small (section-level), scale gradually, and apply rolling-horizon scheduling.
- Ensure explainable AI with clear decision reasoning to build trust among controllers.

IMPACT AND BENEFITS

- **Impact:** Improves controller efficiency and passenger experience through real-time AI decision support.

- **Benefits:** Enhances punctuality (social), optimizes costs & throughput (economic), and reduces delays/emissions (environmental).

RESEARCH AND REFERENCES

- OR-Tools (Google) – for constraint based optimization
- Indian Railways TMS system (CRIS)
- Simulation tools (SimPy, NetworkX)