PERSOFEST'25

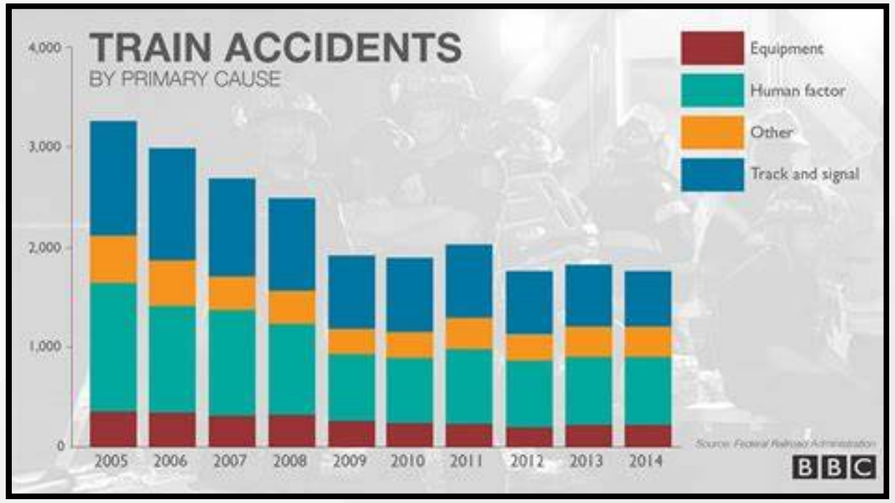
IDEA SPRINT

PROBLEM STATEMENT

Train accidents remain a persistent problem nowadays, often resulting from track failures, signal malfunction, human errors, and track obstacles. In light of recent technological advancements, propose an innovative, cost-effective, practical solution preventing train accidents and improving railway safety.

NEED FOR AN ADVANCED SOLUTION

- Growing Rail Traffic Demands Modern Solutions
- Limitations of Existing Safety Measures
- High Frequency of Train Accidents
- Need for AI & IoT-Driven Automation



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INNOVATIVE RAILWAY SAFETY SOLUTION

IDEA 1

AI-BASED OBSTACLE DETECTION SYSTEM USING DRONES & COMPUTER VISION

- AI-powered drones with high-resolution **cameras** and **LiDAR** patrol railway tracks.
- **Drones** use AI-driven computer vision to detect obstacles, track damage, and unauthorized activities in real time

WORKING

- The drone scans railway tracks and surroundings in real time.
- AI analyzes images and videos to detect hazards like fallen trees, animals, human intrusions, or obstructions.
- Instant alerts are sent to control centers for immediate action.

IDEA 2

IOT-BASED PREDICTIVE MAINTENANCE SYSTEM FOR TRACK MONITORING

- IoT sensors in tracks and trains monitor wear, cracks, and misalignments in real time.

- AI analyzes sensor data to predict failures and schedule maintenance, preventing derailments

WORKING

- **Embedded IoT sensors** detect track defects and train movement patterns, while AI-driven analytics forecast failures and optimize maintenance scheduling to enhance railway safety.

IDEA 3

AUTOMATED SIGNAL DIAGNOSTICS WITH AI ANALYTICS

- AI analyzes railway signals to detect malfunctions before accidents occur.
- Automates diagnostics and integrates with control systems .

WORKING

- AI detects signal faults, power issues, and connectivity failures in real time.
- Smart cameras at crossings monitor and identify failures.
- Automated **alerts** prevent misinterpretation and notify railway authorities

ANALYTICS

Integration with Existing Systems

- AI & IoT retrofit into existing railway infrastructure [Minimal disruption]
- Cloud-based real-time data analysis [Faster & cost-efficient insights].

Cost-Effective Deployment

- Scalable IoT solutions [Low-cost installation & maintenance].
- Automated AI inspections [Less human intervention, reduced labor costs].

Proven Effectiveness & Impact

- Japan & Europe case study: 30% signal failure reduction.
- IoT predictive maintenance: 40% track failure reduction.
- Energy-efficient tech [solar-powered sensors, low-power IoT devices]