AI- BASED DYNAMIC ROUTE OPTIMIZATION FOR LOGISTICS NETWORKS

Final Year Project

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INTRODUCTION

- In today's fast-paced world, logistics and supply chains are the backbone of global commerce.
  However, traditional route planning methods are **static** and fail to adapt to **real-time challenges** such as:
- Traffic congestion
- Sudden weather changes
- Delivery time constraints
- Vehicle load limits
- These inefficiencies lead to:
- Increased operational costs
- 👉 **Our project aims to solve these issues by developing an AI-based system** that dynamically optimizes delivery routes using live data and intelligent algorithms — making logistics faster, smarter, and more sustainable.

PROBLEM STATEMENT

- Cannot adapt to **real-time traffic or weather** conditions
- Ignores **vehicle constraints** and **delivery time windows**
- Results in **longer routes**, **higher fuel usage**, and **delayed deliveries**
- Lacks the ability to re-optimize when disruptions occur (e.g., roadblocks, last-minute orders)
- **Statement:**
- “Current logistics routing systems are not capable of dynamically optimizing delivery routes in real-time, causing inefficiencies, increased costs, poor resource utilization, and environmental impact.”

OBJECTIVE

- Optimize routes dynamically using AI
- Reduce total delivery time and distance
- Improve fuel efficiency and customer satisfaction
- **Support environmental sustainability** by lowering carbon emissions
- **Provide an intuitive dashboard** for logistics managers to monitor and interact with routes

SYSTEM ARCHITECTURE

- Frontend: React.js
- Backend: Node.js, Express
- Database: MongoDB
- APIs: Google Maps
- AI: Genetic Algorithm, Reinforcement Learning (planned)

KEY FEATURES

- Real-time route recalculation
- Traffic-aware optimization
- Constraint handling (load, time window, etc.)
- Route visualization
- Re-optimization on traffic change

TECHNOLOGIES USED

- Frontend
- React.js, Leaflet
- Backend
- Node.js, Express
- AI/Logic
- Genetic Algorithm
- Mapping
- Google Maps API
- Hosting
- Netlify

OPTIMIZATION ALGORITHM

- Genetic Algorithm
- Haversine formula for distance
- Route fitness based on total time/distance

RESULTS

- 🚗 Route distance ↓ by 15–20%
- ⏱️ Delivery time ↓ by 10–25%
- ⛽ Fuel consumption ↓ by 20%
- ⚡ Re-optimization triggered in traffic jams

LIVE DEMO

- 🔗 https://glowing-crumble-2638af.netlify.app/
- Input points
- View optimized route
- Dynamic re-routing example

FUTURE WORK

- Predictive ML traffic forecasting
- Multi-vehicle fleet optimization
- EV and sustainability integration
- Offline mode for rural delivery

THANK YOU

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  Questions?

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