**Neuro-FleetX: AI-Driven Urban Mobility Optimization**

**Project Title:** Neuro-FleetX – AI-Driven Urban Mobility Platform  
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**2. Abstract**

The rapid growth of urban populations has resulted in rising demand for efficient transportation solutions. Traditional fleet management systems are often inefficient, lack predictive intelligence, and fail to integrate AI-driven insights for optimization. Neuro-FleetX is designed as a **full-stack urban mobility platform** integrating **React (frontend), Spring Boot (backend), MySQL (database), JWT authentication (security), and AI/ML algorithms** to deliver advanced fleet optimization, real-time tracking, and decision-making support.

This project provides a **secure, scalable, and intelligent platform** to manage fleets, optimize routes, predict demand, and enhance urban mobility. The inclusion of AI/ML modules ensures smarter decisions by leveraging real-time and historical data.

**3. Introduction**

Urban mobility has become a major challenge in modern cities due to:

* Congestion and traffic bottlenecks.
* Increasing fleet sizes (public, corporate, shared mobility).
* Lack of predictive and adaptive systems.
* Security and data management concerns.

Neuro-FleetX addresses these issues by combining **software engineering best practices** with **machine learning** to create a **full-fledged smart mobility platform**.

**4. Objectives**

The project is guided by the following objectives:

1. To design a **user-friendly frontend** (React + Tailwind) for fleet administrators and users.
2. To develop a **robust backend (Spring Boot)** handling APIs, authentication, and business logic.
3. To implement **JWT-based security** for secure login and role management.
4. To use **MySQL database** for storing user, vehicle, and mobility data.
5. To integrate **AI/ML models** for:
   * Route optimization
   * Demand forecasting
   * Anomaly detection
6. To provide **real-time dashboards** for vehicle tracking and fleet performance.
7. To explore the **future integration with IoT and cloud deployment** for scalability.

**5. Literature Review**

Existing systems such as Uber, Ola, and other urban mobility platforms provide solutions but often rely on centralized systems without exposing custom APIs for enterprises. Most fleet management software lacks **AI-driven predictions** and **secure, open APIs**.

* **Uber:** Focus on ride-sharing but limited enterprise fleet support.
* **Google Maps APIs:** Provide route calculations but not custom AI optimization.
* **Traditional Fleet Software:** Provide only basic tracking and reports.

**6. Technology Stack**

**Frontend (React + Vite + Tailwind CSS)**

* Provides interactive UI.
* Authentication screens, dashboards, analytics.
* Lightweight and scalable with reusable components.

**Backend (Spring Boot)**

* RESTful APIs for communication.
* Role-based access.
* Business logic encapsulated in services.

**Database (MySQL)**

* Tables: Users, Vehicles, Routes, Payments, Logs.
* Supports relational integrity and scalability.

**Security (JWT Authentication)**

* Login generates JWT token.
* Token used for API authentication.
* Prevents unauthorized access.

**AI/ML Algorithms**

* **Route Optimization** (Dijkstra/ML models).
* **Demand Forecasting** (Regression/Time Series).
* **Anomaly Detection** (Outlier models).

**7. System Architecture**

**Layers of the system:**

1. **Frontend Layer (React UI)** → User dashboards, login, reports.
2. **Backend Layer (Spring Boot)** → APIs, services, controllers.
3. **Database Layer (MySQL)** → Persistent data storage.
4. **AI/ML Layer** → Predictive models and analytics.
5. **Security Layer** → JWT authentication flow.

(Here you can add a diagram: Frontend ↔ Backend ↔ DB ↔ AI modules)

**8. Modules & Features**

1. **User Authentication & Role Management**
   * JWT login/signup
   * Role-based access (Admin, Driver, User)
2. **Vehicle & Fleet Management**
   * Register vehicles
   * Assign drivers
   * Fleet dashboards
3. **AI/ML Modules**
   * Route optimization algorithms.
   * Predicting high-demand areas.
   * Detecting unusual driving/maintenance needs.
4. **Database Management**
   * Storing trips, payments, logs.
   * Query optimization.
5. **Admin Panel**
   * Monitor real-time fleet.
   * Analyze performance reports.

**9. Workflow (How It Works)**

1. **User Login:** User authenticates → JWT token generated.
2. **API Request:** Token used in headers for backend communication.
3. **Backend Processing:** Spring Boot validates token, processes request.
4. **Database Interaction:** Data retrieved from MySQL.
5. **AI Integration:** For route/demand predictions.
6. **Frontend Update:** React UI displays results dynamically.

**10. Future Scope**

1. **IoT Integration:** GPS sensors, vehicle health monitoring.
2. **AI Expansion:** Deep learning for traffic prediction.
3. **Blockchain:** For secure payments and contracts.
4. **Cloud Deployment:** Docker + Kubernetes for scaling.
5. **Mobile App Version:** Flutter/React Native-based mobile app.

**11. Conclusion**

Neuro-FleetX successfully demonstrates the design of a **full-stack, AI-powered mobility platform**. The integration of React, Spring Boot, MySQL, JWT, and ML ensures a **secure, scalable, and intelligent system** for urban mobility challenges. This project can serve as the foundation for real-world smart city fleet management applications.