**NeuroFleetX Urban – Project Documentation**

**1. Project Overview**

**NeuroFleetX Urban** is a web-based smart mobility project that aims to **optimize urban traffic flow and provide the best travel routes** using real-time data.  
The system integrates **React (frontend)**, **Spring Boot + MySQL (backend)**, **Google Maps API**, and optionally **AI models** to help users find efficient routes, monitor traffic, and receive live alerts.

**2. Objectives**

* Provide users with an **interactive login-based platform**.
* Allow travelers to input **Source & Destination** and get the **best traffic-optimized route**.
* Display **live maps with traffic levels** using Google Maps API.
* Store route & traffic history for future insights.
* Enable **real-time updates** (e.g., accidents, traffic jams).
* Optionally, use **AI predictions** for traffic forecasting.

**3. Technology Stack**

* **Frontend:** React.js, HTML, CSS, Google Maps API, Chart.js / ApexCharts.
* **Backend:** Java + Spring Boot (REST APIs), WebSockets.
* **Database:** MySQL (route history, users, traffic logs).
* **Authentication:** JWT (JSON Web Tokens).
* **AI (Optional):** Python Flask ML model for traffic prediction.
* **Extras:** SMTP for email alerts.

**4. Project Phases**

**🔹 Phase 1: Frontend Basics**

* Login Page (JWT-based login).
* Input fields for **Source & Destination**.
* Map component integration (Google Maps).

**🔹 Phase 2: Backend Basics**

* Build Spring Boot APIs:
  + /auth/login → JWT Authentication.
  + /route → Returns best route + traffic info.
* Connect Spring Boot with **MySQL database**.

**🔹 Phase 3: Traffic & Routes**

* Fetch and display **traffic levels** from Google Maps API.
* Store **route history** in MySQL.

**🔹 Phase 4: Charts + Live Updates**

* Display route analytics with **Charts.js/ApexCharts**:
  + Traffic level graphs.
  + Route efficiency comparisons.
* **WebSockets** for real-time notifications (e.g., "Traffic Jam Ahead 🚦").

**🔹 Phase 5: AI (Optional, Advanced)**

* Train ML model on stored traffic history.
* Predict congestion & travel time.
* Flask API → Spring Boot → React frontend.

**🔹 Phase 6: Extras**

* Email alerts (accidents, weather).
* Add more APIs (e.g., accident detection, weather updates).

**5.Database Design**

* **User** → (id, name, email, password).
* **Routes** → (id, source, destination, best\_route, traffic\_level, time\_taken, date).
* **Traffic\_Alerts** → (id, message, timestamp).

**6. Current Progress**

* ✅ Phase 1 started → Login page UI created.
* 🔄 Source/Destination form + Map integration → in progress.
* 🔜 Next step → Spring Boot APIs + Database integration.

**7. Future Scope**

* AI-powered **predictive traffic management**.
* Mobile application version (React Native).
* Integration with **IoT sensors & GPS trackers** for real-time urban traffic monitoring.

**8. Conclusion**

The **NeuroFleetX Urban Project** is a scalable urban mobility solution designed to help citizens and authorities **optimize traffic flow, reduce congestion, and improve travel efficiency**.  
By combining **frontend, backend, Google Maps API, real-time updates, and AI**, it can grow into a complete **smart city traffic management system**.