Validation and Testing Document

Project: NeuroFleetX - AI-Driven Urban Mobility Optimization Platform

This document outlines the validation and testing plan for the NeuroFleetX platform, developed using React (frontend) and Spring Boot (backend). The goal is to ensure the platform meets its functional, performance, and security requirements through rigorous testing.

Validation Strategy

Validation ensures that the developed system fulfills user needs and business requirements. For NeuroFleetX, validation covers: - Functional validation of role-based features (Admin, Manager, Driver, Customer). - AI model validation for predictive maintenance, driver behavior analysis, and route optimization. - Security validation for authentication, authorization, and data protection. - Usability validation of the React frontend.

Types of Testing

Test Type	Description
Unit Testing	Testing individual components (React UI, Spring Boot services, AI modules).
Integration Testing	Verifying communication between frontend, backend, and AI services.
System Testing	End-to-end testing of NeuroFleetX functionality with real-world scenarios.
Security Testing	Validating MFA, JWT tokens, role-based access control, and CSRF/XSS protection
Performance Testing	Measuring uptime, response time, and load handling.
User Acceptance Testing (UAT)	Validation by real users for usability and effectiveness.

Sample Test Cases

1. **Login Authentication**
- Input: Valid credentials
- Expected Result: Successful login with JWT token issued.

2. **Role-Based Access**
- Input: Manager trying to access Admin dashboard
- Expected Result: Access denied with proper error message.

3. **Predictive Maintenance Alert**
- Input: Vehicle health data crossing threshold
- Expected Result: Alert generated and sent to Manager.

4. **Route Optimization**
- Input: Driver requests route under traffic conditions
- Expected Result: Optimized route displayed in real-time.

5. **Frontend Responsiveness**
- Input: Open on mobile device
- Expected Result: UI adjusts seamlessly to screen size.

Through structured validation and rigorous testing, NeuroFleetX ensures a secure, scalable, and user-friendly solution for urban mobility optimization. This process minimizes risks, enhances reliability, and guarantees satisfaction for all stakeholders.