NeuroFleetX: Test Case

# 📌 Project Specification & Test Cases

This section defines the core specifications of the NeuroFleetX system along with initial test cases.

## Specifications:

- Develop an AI-driven platform for urban mobility optimization.  
- Provide real-time traffic analysis using Java backend and APIs.  
- Optimize fleet management for taxis, buses, and delivery vehicles.  
- Integrate IoT and GPS data for adaptive decision-making.  
- Build a dashboard frontend for monitoring and visualization.  
- Ensure scalability and cloud readiness.

## Test Cases:

1. Verify that the dashboard loads successfully.  
2. Validate that sidebar navigation links work correctly.  
3. Check that placeholder sections are visible (Traffic Overview, Fleet Optimization, Reports, Live Updates).  
4. Ensure the system can connect to sample API endpoints.  
5. Verify that fleet optimization button responds with placeholder output.  
6. Test responsiveness of dashboard layout on different screen sizes.

# ✅ Validation & Testing

Validation ensures the system meets requirements, and testing ensures its reliability. The following validation methods and testing phases are planned:

## Validation Methods:

- Requirement validation: Ensure specifications align with project goals.  
- Design validation: Verify the dashboard structure meets UI/UX requirements.  
- Data validation: Check input/output consistency with APIs and traffic datasets.  
- Performance validation: Validate response time for traffic queries and fleet operations.

## Testing Phases:

- Unit Testing: Testing individual modules (dashboard components, API calls).  
- Integration Testing: Ensuring frontend, backend, and database communicate correctly.  
- System Testing: End-to-end testing of traffic analysis and fleet optimization.  
- User Acceptance Testing (UAT): Feedback from stakeholders/mentors.

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**Use Cases – NeuroFleetX**

**Use Case 1: Traffic Congestion Prediction**

* **Actor:** City Traffic Authority / System
* **Precondition:** GPS and IoT devices are feeding live traffic data.
* **Scenario:**
  1. The system collects live vehicle movement data.
  2. AI model predicts congestion zones in the city.
  3. Dashboard shows red/yellow/green zones on the map.
* **Postcondition:** Authorities can take preventive actions (e.g., rerouting, traffic lights adjustment).

**Use Case 2: Fleet Optimization for Taxi Services**

* **Actor:** Fleet Manager
* **Precondition:** Fleet vehicles are registered with GPS tracking.
* **Scenario:**
  1. Fleet manager logs into dashboard.
  2. System analyzes idle vehicles and demand hotspots.
  3. Suggests optimized allocation (e.g., send taxis where demand is high).
* **Postcondition:** Reduced waiting time and fuel costs.

**Use Case 3: Emergency Vehicle Routing**

* **Actor:** Ambulance Driver / System
* **Precondition:** Emergency vehicle location is available.
* **Scenario:**
  1. System detects emergency route request.
  2. AI engine identifies least congested path.
  3. Dashboard displays recommended route in real-time.
* **Postcondition:** Ambulance reaches faster, saving lives.

**Use Case 4: Real-Time Reporting**

* **Actor:** City Authority / Transport Manager
* **Precondition:** System is integrated with live data sources.
* **Scenario:**
  1. Manager requests a report on today’s traffic and fleet performance.
  2. System generates report (congestion levels, average trip time, vehicle utilization).
  3. Report is exported to PDF/Excel.
* **Postcondition:** Data-driven decision-making for urban planning.

