Automated Backward Movement Identification and Logistics Optimization using OpenStreetMap

Suggested By:

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Summary:

Efficient logistics operations are crucial for businesses, but inefficiencies such as **backward movements** (unnecessary return trips) result in **higher costs, wasted fuel, increased carbon emissions, and delivery delays**. This project aims to integrate **automated backward movement detection with OpenStreetMap (OSM)**, leveraging geospatial data to optimize routes and reduce inefficiencies.

By identifying **repetitive, avoidable trips** using latitude-longitude data and optimizing routes with algorithms like *Dijkstra's and A* Search*. This project will contribute to **both the logistics industry and OSM's dataset**. As companies input their logistics data, **new location points (e.g., warehouses, local distribution hubs, private roads, and industrial zones) will be added to OSM**, **enhancing its mapping accuracy** and usability for routing applications.

Goals of the Project:

- **Detect backward movements** in logistics operations using **geospatial calculations (Spherical Law of Cosines, Haversine, etc.)**.
- **Automatically map logistics locations** (warehouses, delivery points, frequently used private roads) onto OpenStreetMap.
- **Optimize delivery routes** using *graph-based shortest path algorithms (Dijkstra, A, etc.)** integrated with OSM routing.
- **Improve OSM's database** by adding **logistics-specific locations**, currently missing from OSM.
- **Provide open-source APIs** that allow logistics firms and community mappers to contribute data to OSM in real-time.

Mandatory Skills:

- Python
- Geospatial Data Analysis
- OpenStreetMap Data Model
- Advanced Excel

Useful Skills:

- **OSM's Overpass API & Nominatim** (for querying and updating location data)
- **Routing Algorithms** (Dijkstra, A* Search, etc.)
- **Git/GitHub for collaboration**

Length:

350 hours

Difficulty:

Medium

Possible Mentors:

To be discussed with the OSM team

Notes:

- As an initial requirement, I will **set up a local OSM development environment** and explore **existing logistics mapping tools** before coding.
- I have worked with **real-world logistics teams at ITC Limited and Adani Group**, where I identified and solved inefficiencies in freight movement.
- This project will **increase OSM's data coverage** by adding **logistics-specific location points**, helping **both businesses and OSM-based navigation services**.