

## smart-logistics-vrp

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## About

Sistema de logística de última milla con optimización de rutas (VRP) y sincronización offline

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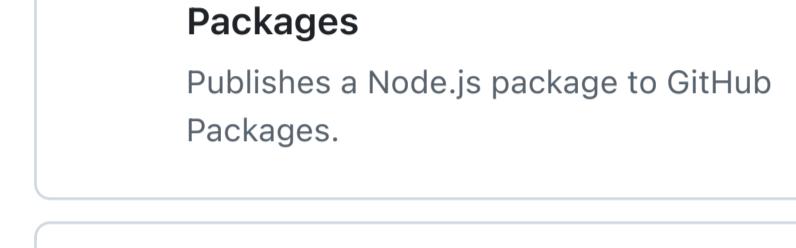
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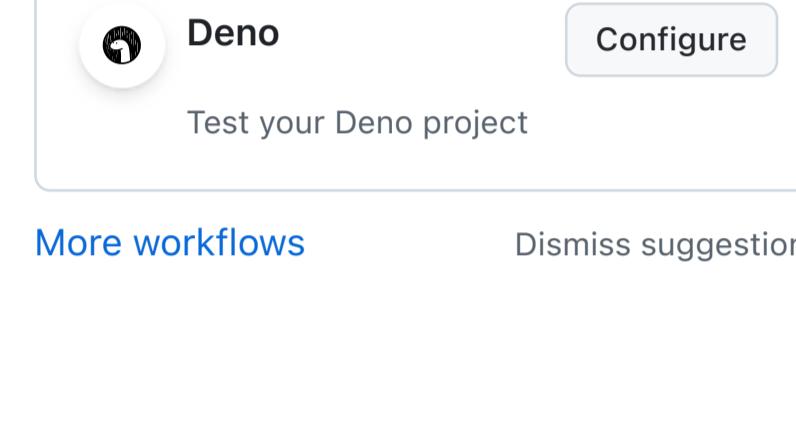
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## README

# Smart Last-Mile Logistics System (VRP Optimization)

A full-stack logistics platform designed to optimize delivery routes for small-to-medium businesses. It solves the **Vehicle Routing Problem (VRP)** with real-world constraints (security waypoints) and features an **Offline-First** mobile application for drivers.

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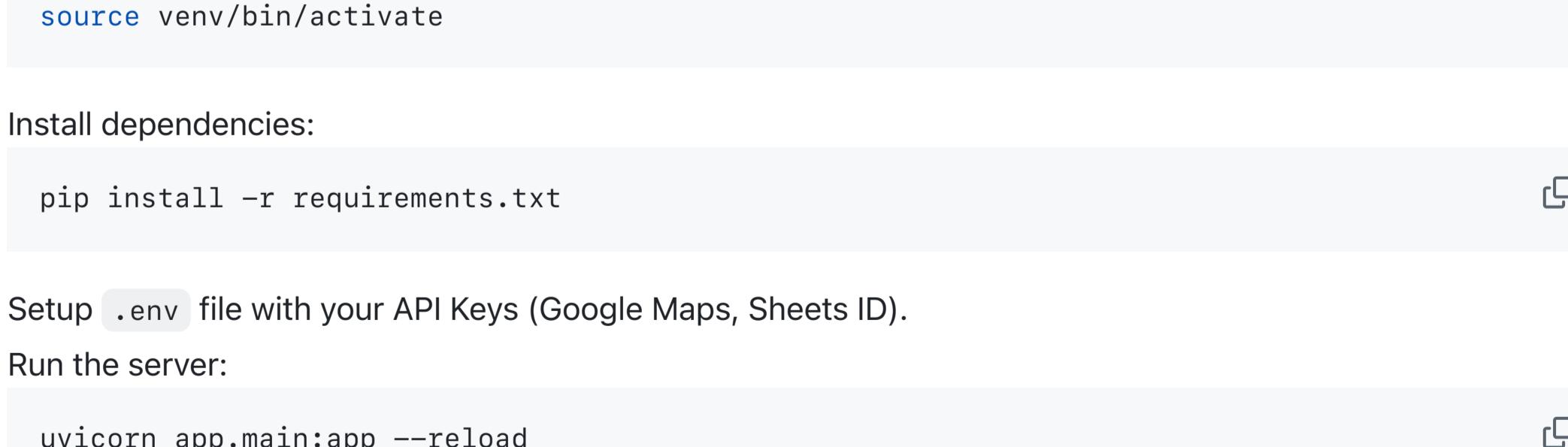
## Key Features

- Intelligent Route Optimization: Uses Google OR-Tools to calculate the most efficient delivery sequence, minimizing distance and time.
- Security Constraints: Implements hard constraints (e.g., Mandatory Security Checkpoints in high-risk zones like Huichapan) directly into the routing algorithm.
- Offline-First Mobile App: React Native app capable of syncing data seamlessly. Drivers can complete deliveries and capture proof-of-delivery even without internet access.
- Dynamic Dashboard: Real-time visualization of orders, prospects, and routes using Google Sheets as a flexible, zero-cost database.
- Automated Invoicing: Generates PDF receipts and WhatsApp logs automatically upon delivery completion.

## Technology Stack

Component	Tech	Description
Backend	Python, FastAPI	High-performance API handling VRP logic and data sync.
Optimization	Google OR-Tools	Constraint programming solver for complex routing logistics.
Mobile App	React Native (Expo)	Cross-platform driver application with background sync.
Database	Google Sheets API	Cloud-native, user-friendly database for easy client management.
Geospatial	Google Maps API	Places, Directions, and Distance Matrix for precise navigation.

## Architecture



## Installation & Setup

### Backend

1. Clone the repo and navigate to root.

2. Create a virtual environment:

```
python -m venv venv
source venv/bin/activate
```

3. Install dependencies:

```
pip install -r requirements.txt
```

4. Setup .env file with your API Keys (Google Maps, Sheets ID).

5. Run the server:

```
uvicorn app.main:app --reload
```

### Mobile

1. Navigate to /mobile.

2. Install dependencies:

```
npm install
```

3. Run on device/simulator:

```
npx expo start
```

## About the Project

Developed as a solution to modernize logistics for local distributors (e.g., Dairy/Gas industries), focusing on UX and robustness against network failures.

