

Best Bike Paths (BBP)

Road Condition Monitoring & Route Planning System

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Politecnico di Milano - Software Engineering 2

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System Overview

Architecture

Frontend - Streamlit + Folium Maps

↔ REST API

Backend - Python + FastAPI

↔

External - OSRM Routing |
OpenStreetMap

Live Demo

Cloud Deployment

<https://huxuyan-fq8a9pdhxknpmuird65kfg.streamlit.app>

Key Features

- Road condition monitoring & reporting
- Intelligent route planning with quality scores
- Community-driven weighted voting system
- Privacy-by-design (GDPR compliant)

Dashboard - Overview

Dashboard

Total Segments
0

Total Reports
0

Total Trips
0

Current Weather

Condition
Clear

Temperature
18.9C

Wind Speed
5.5 km/h

Great conditions for cycling!

Key Metrics

- Total Segments
- Total Reports
- Total Trips
- Active Users

Live Weather

- Temperature & Conditions
- Wind Speed
- Rain Chance
- Cycling recommendation

Route Planning - Input

Route Planning

Plan your cycling route with real road geometry

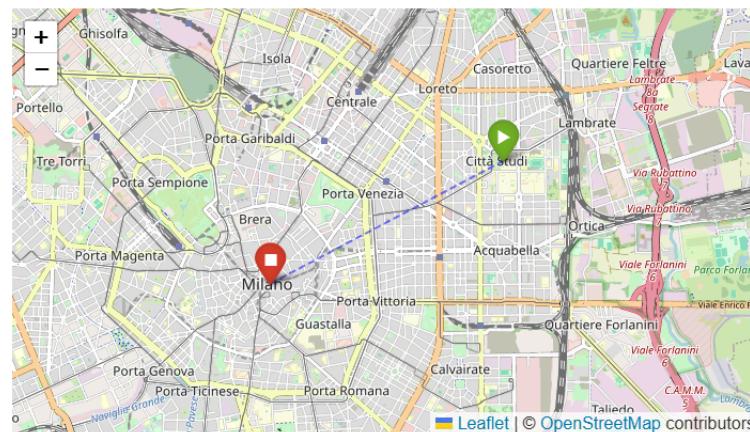
Origin

Search origin location

Search

Latitude: 45.4781, Longitude: 9.2275

Click on the map to set location, or drag the markers



Destination

Search destination

Search

Latitude: 45.4642, Longitude: 9.1900

How to Use

1. Search origin
2. Search destination
3. Select mode:
 - Safety First
 - Shortest
 - Balanced
4. Click Find Routes

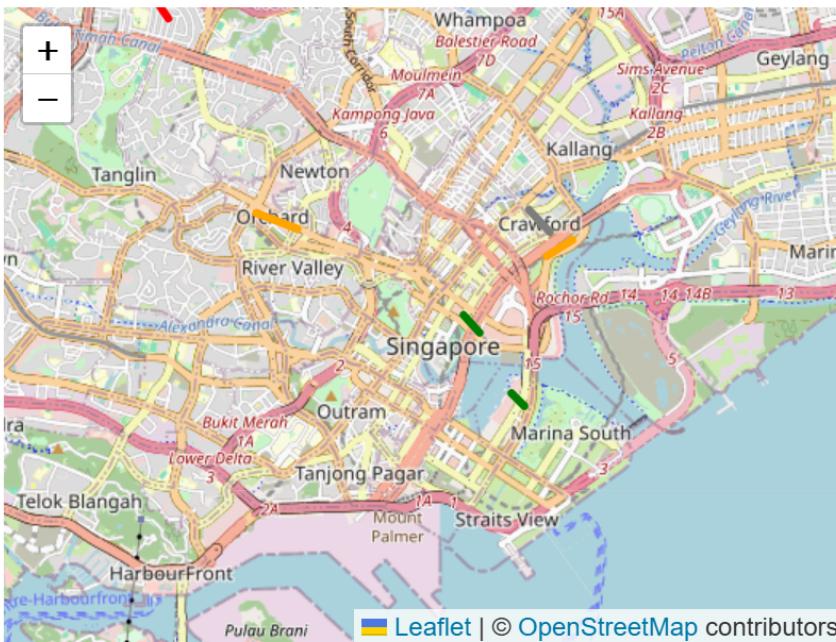
Weather

Sunny, 19.1°C

“Great for cycling!”

Road Segments - Map View

Road Segments



Segment List

Add New!

Road Name

e.g., Via Roma

Start Point

Search place

e.g., Via Roma 1

Search

45.4780, 9.2270

End Point

Search place

e.g., Via Roma 1

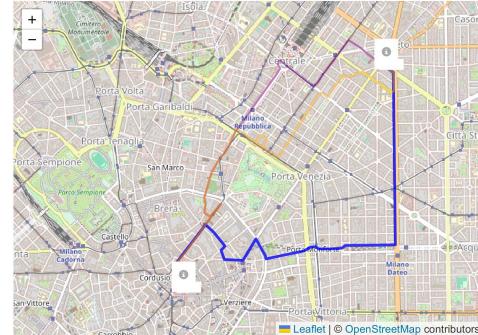
Features

- Interactive map with markers
- Create segments via search
- Track obstacles

Status Colors

●	Optimal
●	Fair
●	Poor
●	Maintenance

Route Planning - Results



Route Details

Route A: Recommended, Best Surface		
Distance	Duration	Road Quality
4.95 km	10 min	100/100
Tags: Recommended, Best Surface		
Route B: Alternative, Best Surface, Fastest		
Distance	Duration	Road Quality
4.42 km	10 min	100/100
Tags: Alternative, Best Surface, Fastest		
Route C: Alternative, Best Surface		
Distance	Duration	Road Quality
4.95 km	12 min	100/100
Tags: Alternative, Best Surface		

Route Options: Recommended · Best Surface · Fastest · Alternative

Road Segments - List View

Sign Out

NAVIGATION

- Dashboard
- Route Planning
- Segments
- Reports
- Trips
- Auto Detection
- Settings

Share



45.4780, 9.2270

End Point

Search place
e.g., Via Roma 100, Milano

Search

45.4790, 9.2280

Status
Optimal

Obstacle
e.g., pothole

Create Segment

Segment List

ID	Road Name	Status	Obstacle
0	Bayfront Avenue	Optimal	-
1	Raffles Boulevard	Optimal	-
2	Nicoll Highway	Fair	-
3	Beach Road	Under Mainten	pothole
4	East Coast Park Connector	Optimal	-
5	Orchard Road	Fair	-
6	Bukit Timah Road	Poor	rough surface
7	Tampines PCN	Optimal	-

Searchable table - ID, Road Name, Status, Obstacle Type

Condition Reports - Community Voting

The screenshot shows a navigation sidebar on the left with options like Sign Out, Dashboard, Route Planning, Segments, Reports (which is selected), Trips, Auto Detection, and Settings. The main area displays two side-by-side report forms for "Bayfront Avenue (ID: 1)". Each form includes a "Select Segment" dropdown, a "Road Condition" slider (set to "Medium"), a "Notes" text area (containing "..."), and a "Submit" button. A "Share" icon is at the top right. A "Manage a" button is visible at the bottom right.

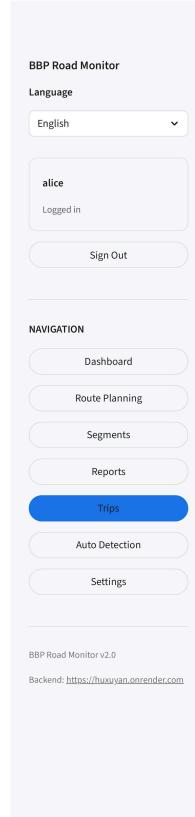
Submit Reports

1. Select segment
2. Slide condition bar
3. Add notes (optional)
4. Submit

Weighted Voting

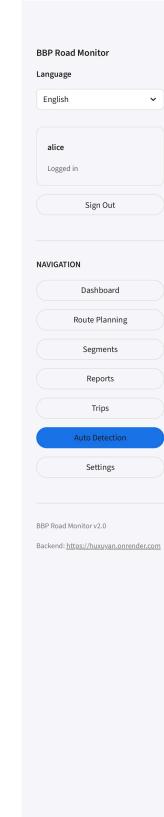
< 7 days	1.0
7-30 days	0.7
> 30 days	0.3
+Confirm	+0.2

Trips & Auto-Detection



Trip Management

Trip Management - Create trips, track cycling journeys with privacy protection ($\pm 150\text{m}$ blur)



Automatic Road Condition Detection

Auto-Detection - GPS + Accelerometer detects bumps automatically

User Settings - Personalization

The screenshot shows the 'Settings' section of a web application. On the left, there's a sidebar with 'Language' set to English, 'Logged in' as 'alice', and a 'Sign Out' button. Below that is a 'NAVIGATION' section with links to 'Dashboard', 'Route Planning', 'Segments', 'Reports', 'Trips', 'Auto Detection', and a blue-highlighted 'Settings' button. At the bottom, it says 'BBP Road Monitor v2.0' and 'Backend: <https://huxuyan.onrender.com>'. The main content area has a heading 'Settings' and sections for 'Dark Mode' (with a toggle switch), 'Notifications' (with a toggle switch), and 'User Information' (showing User ID 1, Member Since 2026-02-17, Username alice, and Account Status Active). A 'Save Settings' button is at the bottom.

Light Mode

The screenshot shows the same 'Settings' section but in Dark Mode. The background is dark, and the text is white or light gray. The 'Dark Mode' and 'Notifications' sections have their toggle switches turned on. The 'User Information' section remains the same. A 'Save Settings' button is at the bottom right.

Dark Mode

Options

- **Language:** EN / 中文 / IT
- **Theme:** Light & Dark
- **Notifications**
- **Profile** editing

Privacy

- Location blur: ±150m
- Coord truncation
- GDPR compliant

Summary & Highlights

Features

- Dashboard
- Road Segments
- Condition Reports
- Route Planning
- Trip Recording
- Auto-Detection
- User Settings

Tech Stack

- Python 3.10+
- FastAPI
- Streamlit
- OSRM Routing
- Folium/Leaflet
- OpenStreetMap

Privacy

- Location blur ±150m
- Coord truncation
- Trip sanitization
- GDPR compliant

UX Design

- 3 Languages
- Dark/Light Mode
- Mobile Ready
- Geocoding Search

Thank You!

Questions & Live Demo

Try it now: <https://huxuyan-fq8a9pdhxknpmuird65kfg.streamlit.app>

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