Roadworks signalisation

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What is Proximus Ada?

Design and develop AI secure solutions that generate value across Proximus entities and in B2B

More than 80 experts in AI and CS sharing learnings acquired in with the entire group

Establish strong collaborations and partnerships with local universities and research institutes to attract, train and retain Belgian talent

Provide support to help our Belgian society face the challenges of today and tomorrow

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Content

- Introduction to the problem

- Objective of the project

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    - Similarity measure
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- Perspectives
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    - Locations analytics on top

Context

Roadworks are unavoidable to expand and maintain our network.

Context

Making signalisation maps is time consuming.

Objective

Automating the signalisation design is too hard … ☹

→ Accelerate the design by suggesting **similar** solved cases

Inputs

- The mobility context
- The geographic context
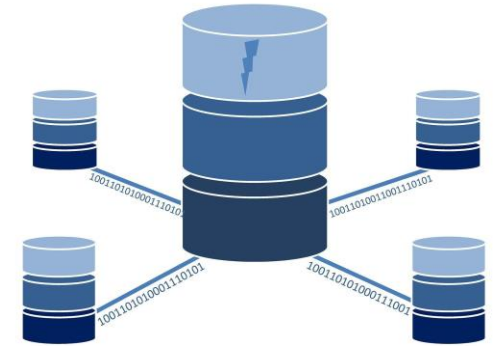- The roadwork information

Output

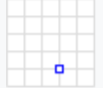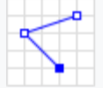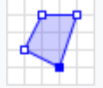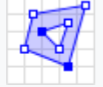- Similar previous roadworks with their associated signalisation map

Data sources

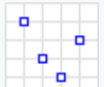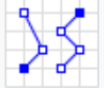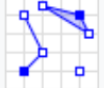**Geospatial data** is information related to a specific location.

It is generally represented using **geometric format** [1]:

Geometry primitives (2D)

Type		Examples
Point		POINT (30 10)
LineString		LINESTRING (30 10, 10 30, 40 40)
Polygon		POLYGON ((30 10, 40 40, 20 40, 10 20, 30 10))
		POLYGON ((35 10, 45 45, 15 40, 10 20, 35 10), (20 30, 35 35, 30 20, 20 30))

Multipart geometries (2D)

Type		Examples
MultiPoint		MULTIPOINT ((10 40), (40 30), (20 20), (30 10))
		MULTIPOINT (10 40, 40 30, 20 20, 30 10)
MultiLineString		MULTILINESTRING ((10 10, 20 20, 10 40), (40 40, 30 30, 40 20, 30 10))
MultiPolygon		MULTIPOLYGON (((30 20, 45 40, 10 40, 30 20)), ((15 5, 40 10, 10 20, 5 10, 15 5)))
		MULTIPOLYGON (((40 40, 20 45, 45 30, 40 40)), ((20 35, 10 30, 10 10, 30 5, 45 20, 20 35), (30 20, 20 15, 20 25, 30 20)))
GeometryCollection		GEOMETRYCOLLECTION (POINT (40 10), LINESTRING (10 10, 20 20, 10 40), POLYGON ((40 40, 20 45, 45 30, 40 40)))

[1]: https://en.wikipedia.org/wiki/Well-known_text_representation_of_geometry

Data sources – scope: Bruxelles

Type	Source	Features	Format
Mobility context	Brussels Mobility	Direction, speed and width of roads	LineString
Mobility context	Brussels Mobility	Signalization panels	Point
Mobility context	Brussels Mobility	Traffic lights	Point
Mobility context	Brussels Mobility	Cycling lanes	LineString
Mobility context	Brussels Mobility	Sidewalks	Polygon
Mobility context	Brussels Mobility	Pedestrian crossings	Polygon
Mobility context	Brussels Mobility	Ramp lines	LineString
Mobility context	Brussels Mobility	Schools, hospitals and fire stations	Point
Mobility context	Brussels Mobility	Parking, private accesses, EV charging stations	Point
Mobility context	Brussels Mobility	STIB, De lijn, TEC, cambio, collecto, taxis	Point
Geographic context	OSIRIS	Commune	/
Geographic context	OSIRIS	Police zone	/
Roadwork information	OSIRIS	Roadwork delimitation → length, width, area	Polygon
Roadwork information	OSIRIS	Roadwork type	/
Roadwork information	OSIRIS	Roadwork duration	/
Roadwork information	OSIRIS	Number of roads impacted	/

https://geoportail.wallonie.be/walonmap
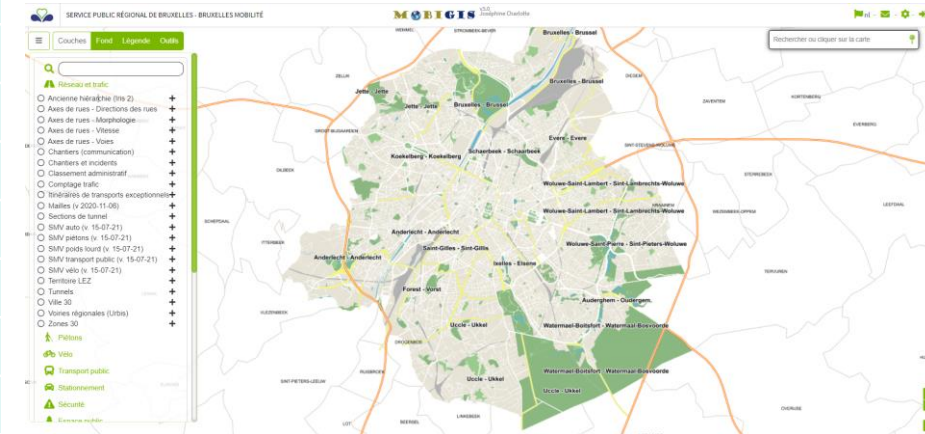
Solution

1. Build database (offline)

Previous roadworks
- Roadwork information
- Geographic information
- Signalisation maps

Mobility information

Feature extraction engine

Data → Features

Roadwork database
- Roadworks features
- Signalisation maps
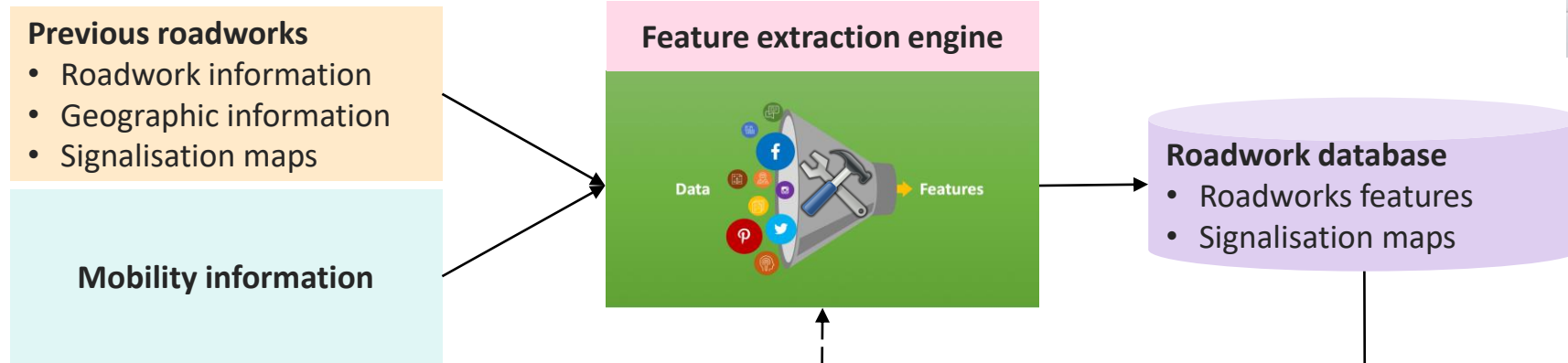
2. Find similarity (online)

New roadwork
- Roadwork information
- Geographic information

Mobility information

Feature extraction engine

Data → Features

Compute similarity

Output
- Signalisation maps of similar roadworks

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Similarity measure

New roadwork

Roadwork database

Priority 1 distance
- Roadwork length
- Overflow on the street
- Street speed

Priority 2 distance
- Roadwork area
- # impacted roads

Priority 3 distance
All the mobility data

0.7

0.2

0.1

Final distance
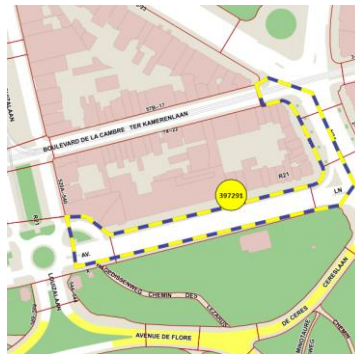Weighted sum of the distances

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Examples (distance criteria)

Queried roadwork

Similar roadwork found
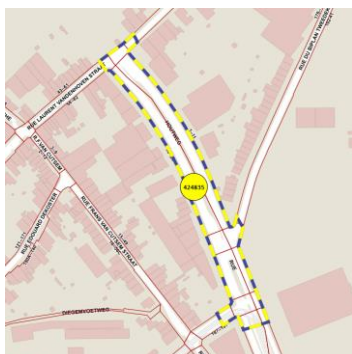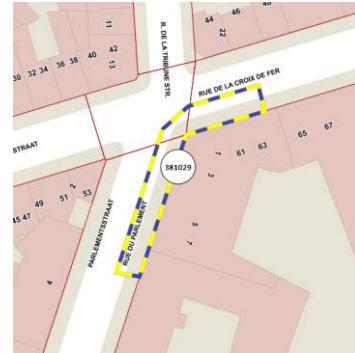
	Length	width	Road speed
Queried	23 m	1.64 m	30 km/h
Found	50 m	1.95 m	30 km/h

	Length	width	Road speed
Queried	88 m	10 m	30 km/h
Found	74 m	9.3 m	30 km/h

	Length	width	Road speed
Queried	375 m	16 m	50 km/h
Found	394 m	16 m	50 km/h

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Examples (all criteria)

Queried roadwork
ID: 285033
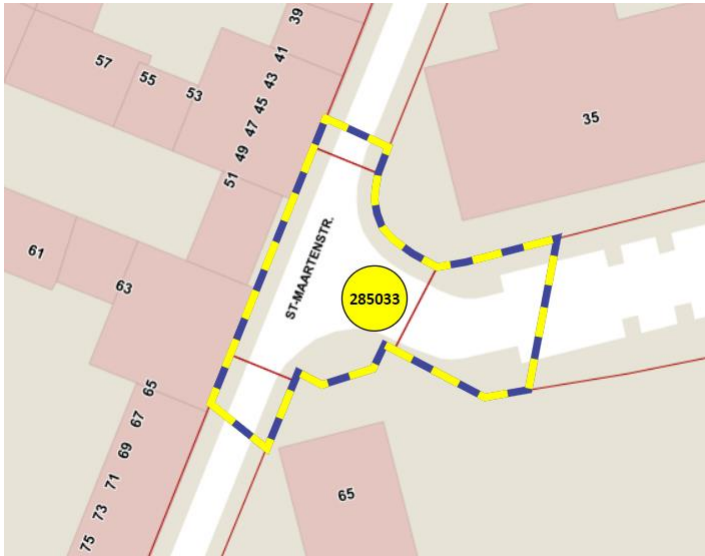
Similar roadwork found
ID: 439136
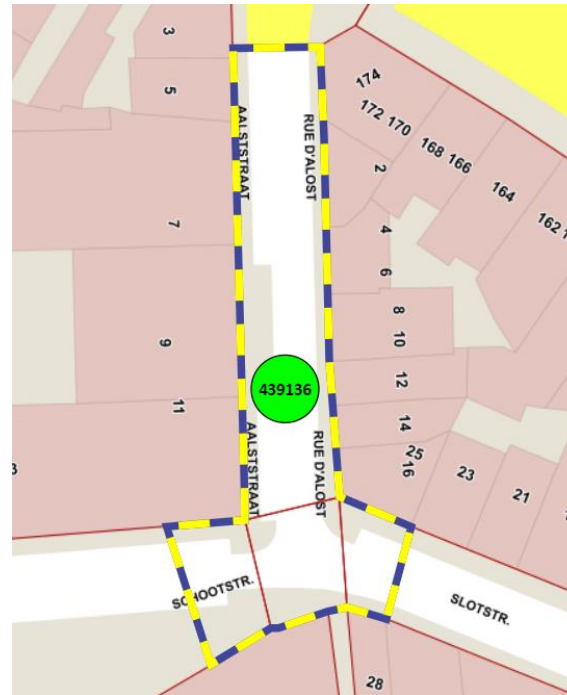
Feature	285033	439136
Roadwork length	55.79 m	73.69 m
Roadwork width	6.14 m	5.73 m
Road speed	30 km/h	30 km/h
Roadwork area	596,3 m2	721,1 m2
# impacted roads	2	2
Mobility data:	Presence of • pedestrian crossing • Signalization panels • Parking • Parking accesses	Presence of • pedestrian crossing • Signalization panels • Parking • Parking accesses

Typical output

The signalization plan corresponding to the similar case is then suggested to the operator
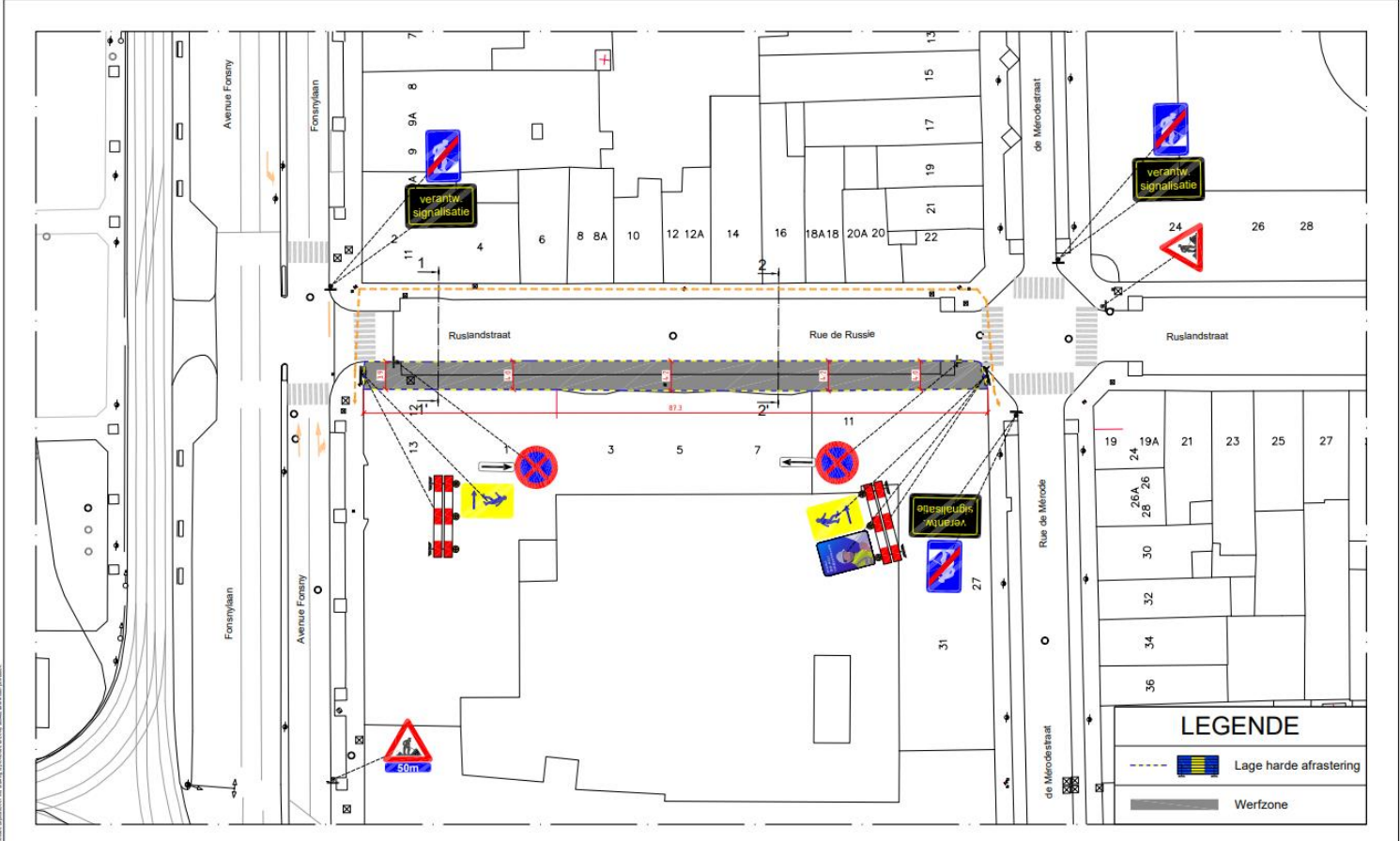
This is just the beginning …

The presented system finds similar places based on geospatial data. Depending on the available data, different use-cases are feasible:

| **Urban planning** | • Find all potential places that would benefit from a given set of urban developments. |

| **Public transport Optimization** | • Find the mobility profiles of different areas to optimize the public transport offer. |

| **Response planning** | • Identify areas with similar emergency response requirements
• Find places with similar crime/unsafety patterns to optimize the resources of the police |

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Perspective: Location Analytics

Origin/Destination based on Mobile data

What?

Mobility patterns between geographical zones (inner-city/commune -> outer-city/commune)

How?

Identification of trips between staying points

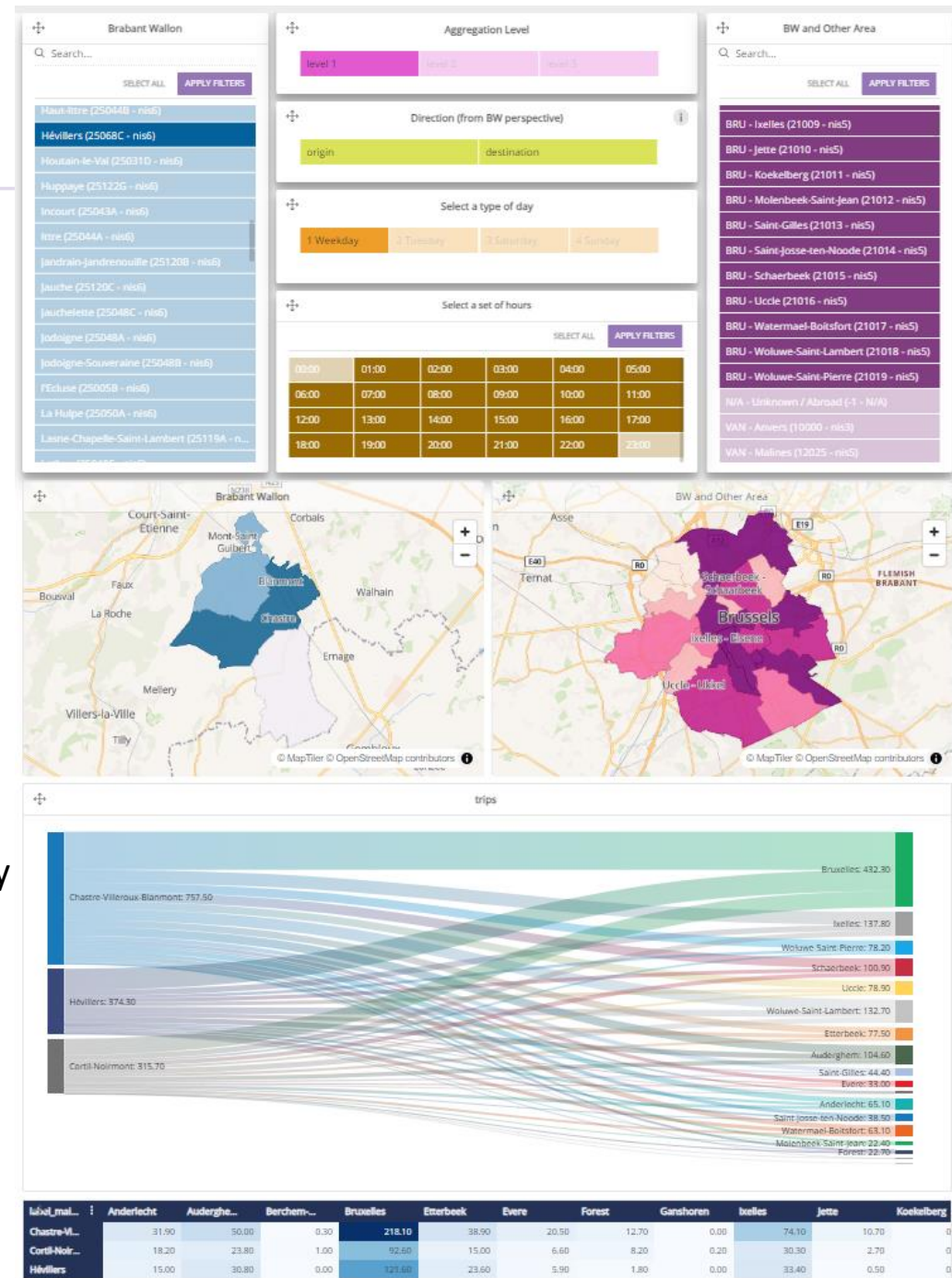Advanced algorithms

Insights:

Where do people coming to my city/commune come from and how do they get here?

How long do they travel for?

What transport mode do they use? What is the CO_2 impact?

What are the peak hours of people coming in or out ?

What is the inner-city traffic flow between sub communes or neighbourhoods?

Thank you

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Backup

Features extraction

Extract features

Roadwork attributes
- Commune
- Police zone
- # impacted roads
- Type
- Duration

Roadwork polygon

Mobility information

Measure roadwork
- Length
- Width
- Area

Overflow of roadwork
- On the street
- On the sidewalk

Compute spatial distances

For *close geometries*:
- Presence
- Number
- Specific attributes

Features

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