Enhancing Emergency Response through Optimal Placement of AEDs in Belgium

Group Project for Modern Data Analytics
Group Italy

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INTRODUCTION

Figure 1: Illustration of AED usage

Figure 2: Illustration of AED placement

BACKGROUND
- According to the American Heart Association, chances of survival of cardiac arrest victims decrease by 10% for every minute without medical intervention
- AEDs:
  - Can restore normal heart rhythm
  - Life saving devices
  - Beginner-friendly

CURRENT CHALLENGES
- Suboptimal distribution of AEDs in Belgium
- Could also benefit from enhanced emergency response tools

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OUR SOLUTION (1/2): NEW AEDs

Figure 3: Map of current AEDs in Antwerp

FOUNDATION

• Recommend locations for installation of new AEDs

METHOD

• Consider locations of historical cases of cardiac arrests, other heart-related illnesses and patients installed with pacemakers
• Identify high-risk clusters
• Propose installation of new AED if no existing AED in immediate vicinity

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OUR SOLUTION (2/2): AEDBel

Figure 4: Icon of AEDBel

FOUNDATION

- Enhance accessibility to AEDs through development of an application "AEDBel"
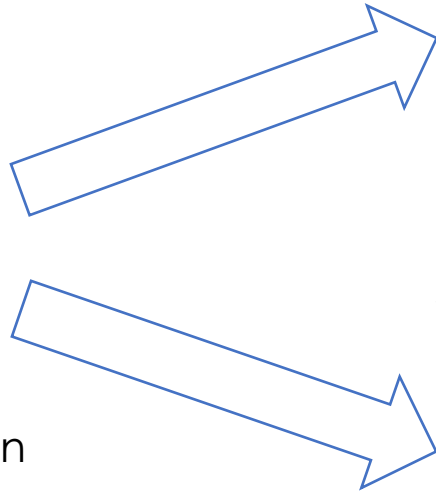
APPLICATION FEATURES
- Real-time user location tracking
- Accurate identification and guidance to nearest available AED
- Minimal, user-friendly interface for easy and stress-free use during emergencies

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DATA SETS

Data Sets

- AED locations
- Medical intervention data

- **AED locations:**
  - Text address converted to latitude/longitude coordinates
  - Text availability translated to "[8 AM – 8 PM]" format

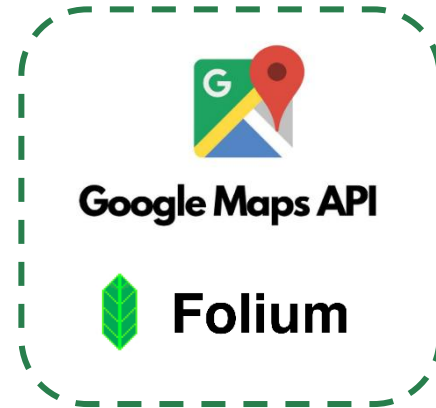- **Medical Intervention Data :**
  - Text address converted to latitude/longitude coordinates
  - Event Type Trip: **P039-003-008**

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TOOLS AND TECHNOLOGIES

Data processing and analysis

pandas

GeoPandas

Shapely

Geocoding and mapping

Google Maps API

Folium

Pipeline

scikit learn

Clustering analysis

DBSCAN Clustering

App development and deployment

Flask

plotly | Dash

HEROKU

Version control and repository

GitHub

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FINAL RESULTS (1/5): NEW AEDS - BELGIUM

Figure 5: Map of all newly proposed AEDs

Key statistics:

1.043

New AEDs installed

6,8%

Percentage of new AEDs installed

Antwerp

City with the highest number of new AEDs (97)

1,9M

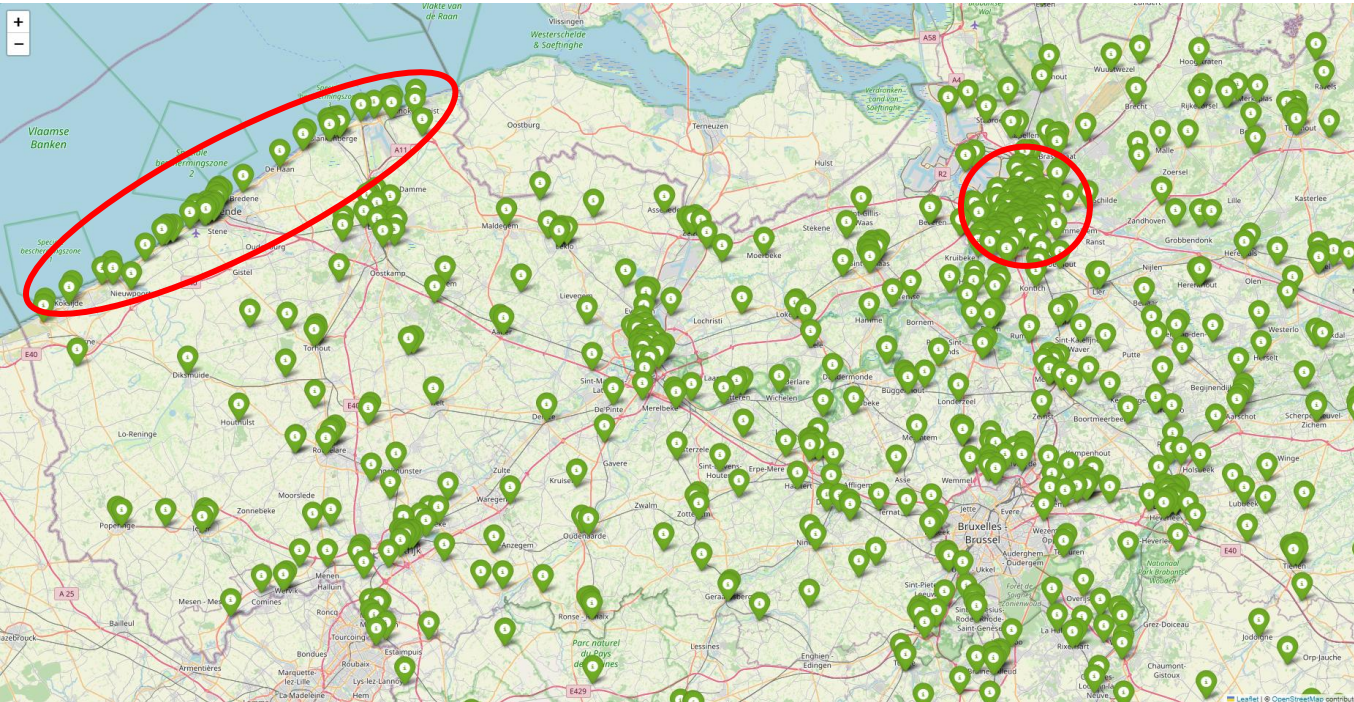Total cost for installation and maintenance for the first year

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Figure 6: Newly proposed AEDs
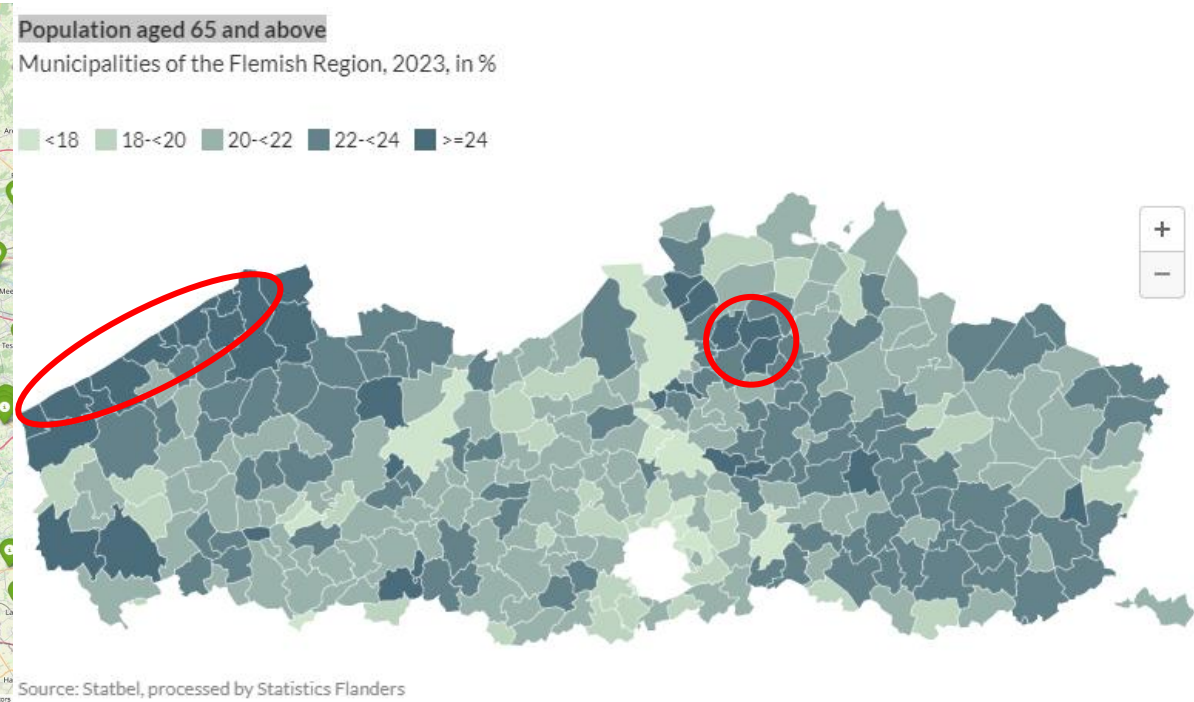
Figure 7: Population age statistics by Municipality
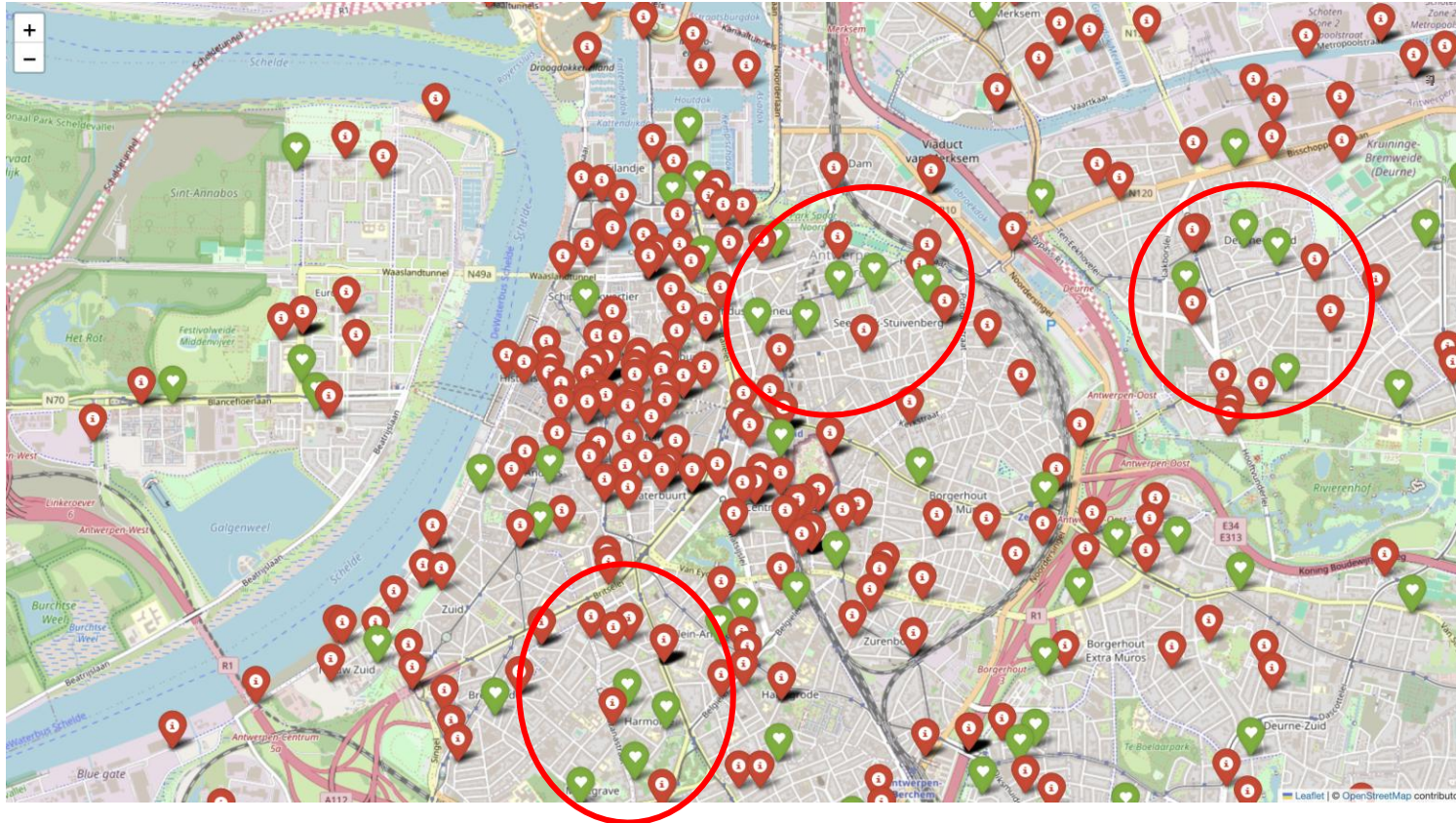
Figure 8: Newly proposed AEDs in Antwerp

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FINAL RESULTS (4/5): MAIN FUNCTION

Green: user's location

Red: nearest AED driving

Blue: nearest AED walking

Requesting location from users

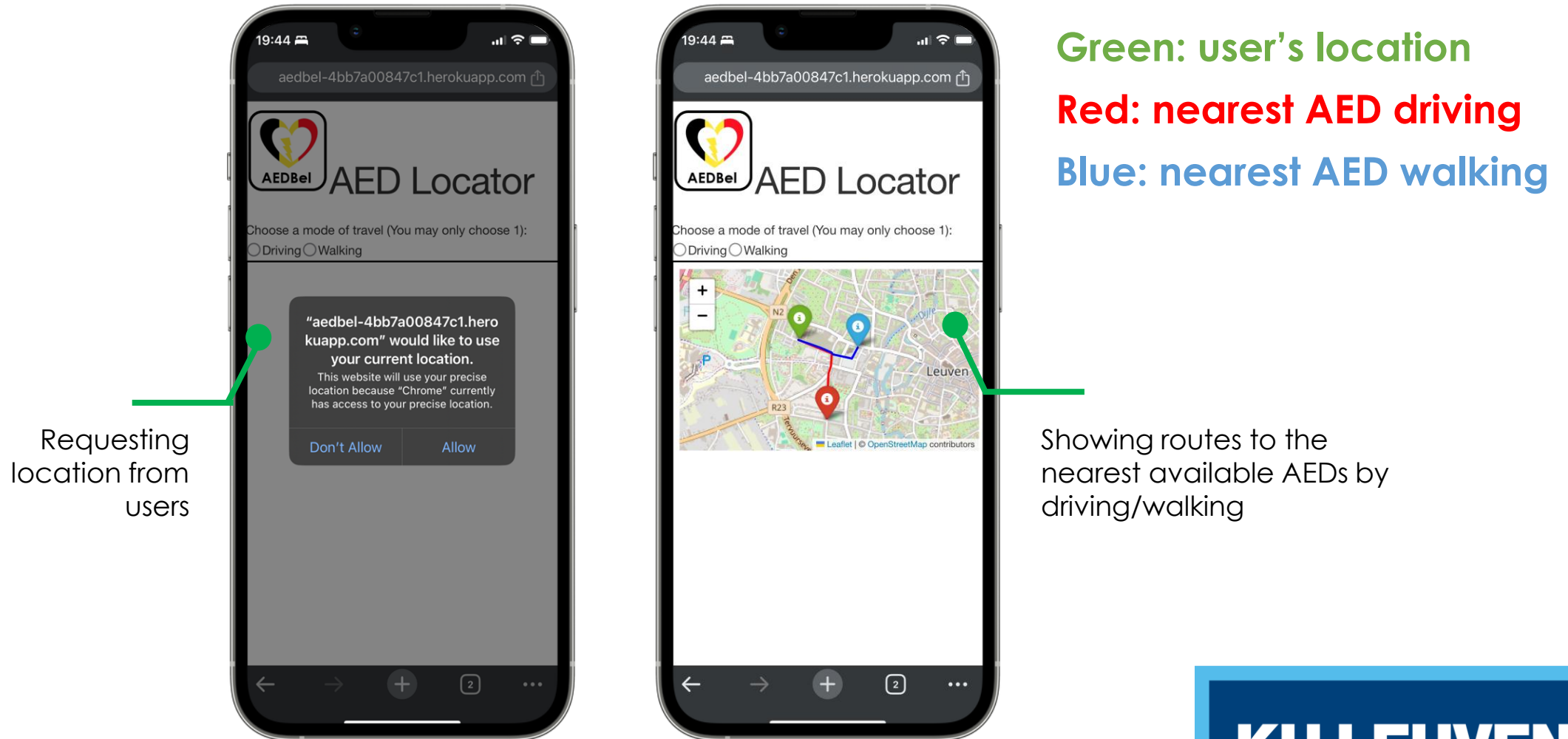Showing routes to the nearest available AEDs by driving/walking

Figure 9: AEDBel Main function

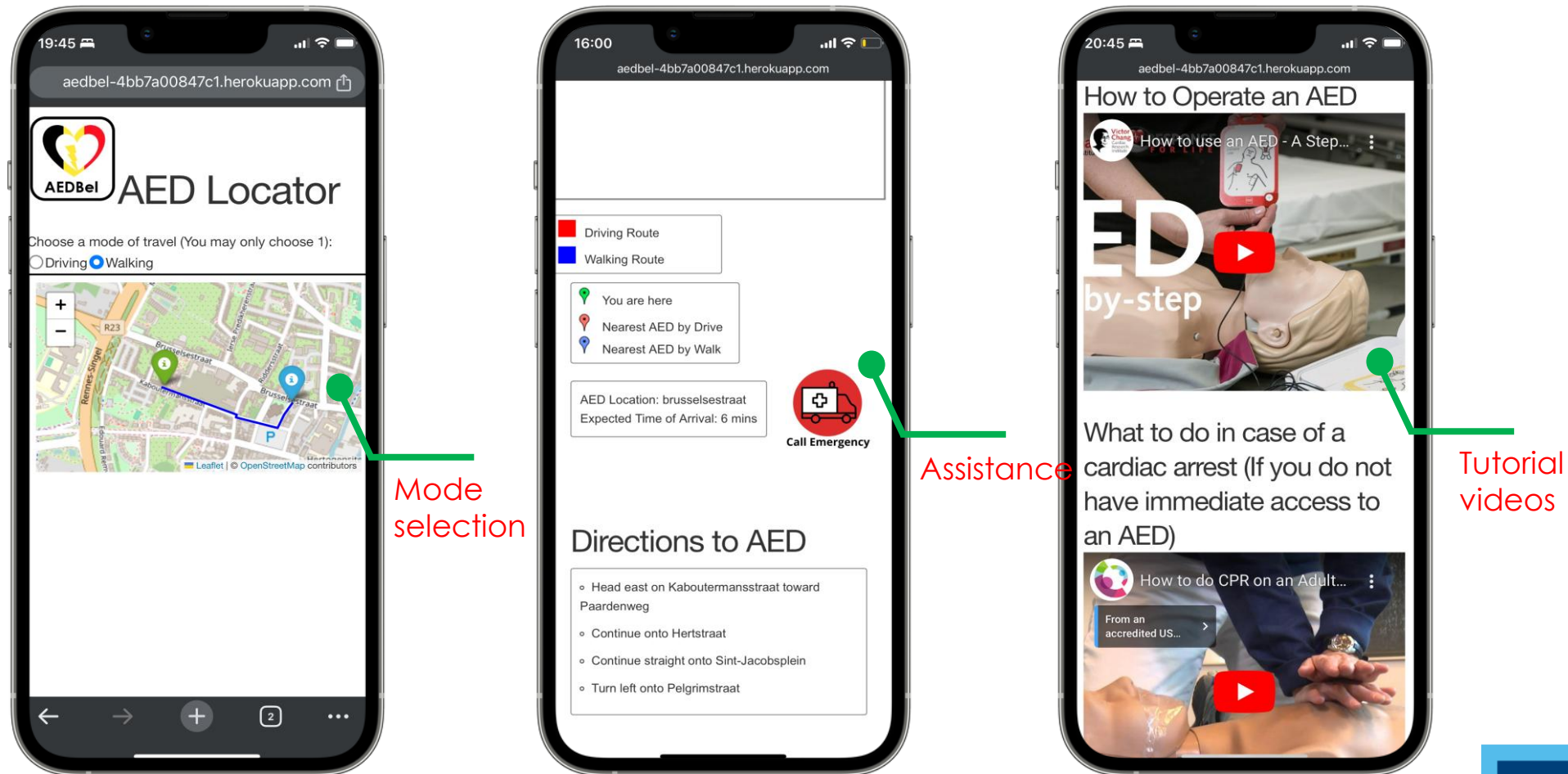KU LEUVEN

FINAL RESULTS (5/5): EXTENSIONS
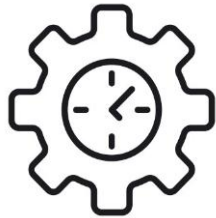

Figure 10: AEDBel Extensions

REFLECTIONS AND POTENTIAL EXTENSIONS

Reflections:

Detailed info on AEDs

User location

Function for nearby points

Map Creation

New AEDs not ensured

Data Structure

Extensions:

- Extension of the project: consider Intervention Data as well and compare performances between national public service and this model

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- Questions?