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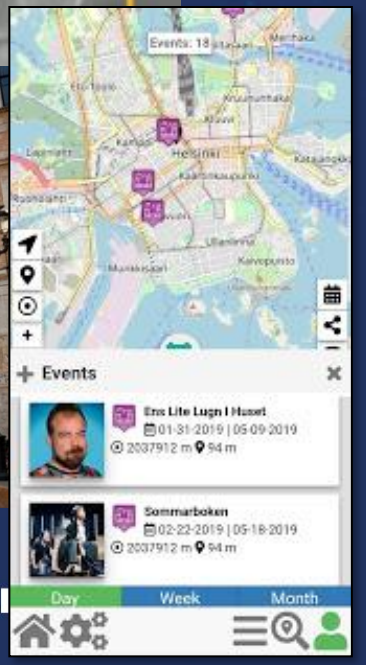
Smart Tourism Via Digital Twins



DIGITAL TWIN SOLUTIONS TO SETUP SUSTAINABLE DECISON SUPPORT SYSTEMS AND BUSINESS INTELLI

UNIVERSITÀ DEGLI STUDI FIRENZE
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THE POWER OF ARTIFICIAL INTELLIGENCE AT THE SERVICE OF YOUR OPERATION AND PLAN

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PEN Test Passed

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SNAP4 Appliances and Dockers Installations

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EØ15 digital ecosystem

NVIDIA

OPERATION AND PLAN - CONTROL ROOMS - DECISION SUPPORT SYSTEMS - WHAT-IF ANALYSIS - OPTIMIZATION - APPLICATIONS

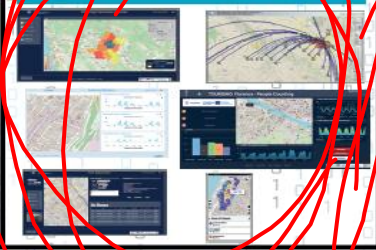
HORIZONTAL AI PLATFORM

MOBILITY AND TRANSPORT

SMART ENERGY AND SMART BUILDING

ENVIRONMENT AND WASTE MANAGEMENT

CITY USER'S SERVICES AND TOURISM MANAGEMENT

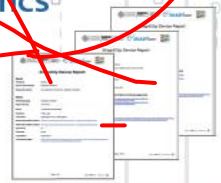


SNAPADVISOR

BUSINESS INTELLIGENCE - SIMULATIONS - VISUAL ANALYTICS - SYNOPTICS - GRAPHICAL WIDGETS - ANALYTICS

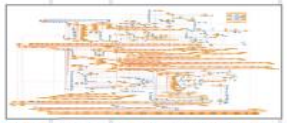
DASHBOARDS, WIDGETS
TEMPLATES

PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW - PEOPLE FLOWS - SDG
15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - MAPS - VECTOR FIELD - ETC...



API - MICROSERVICES - GIS - BPM
VIDEO - REPORTS - MAPS - 3D ...

- DEVELOMENT ENVIRONMENT AND METHODOLOGY
- VISUAL PROGRAMMING, ML, AI, HPC
- TRAINING COURSES



EXPERT SYSTEM, KNOWLEDGE BASE
SEMANTIC REASONING
SMART DATA MODEL
IOT DEVICE MODELS, DATA SPACES

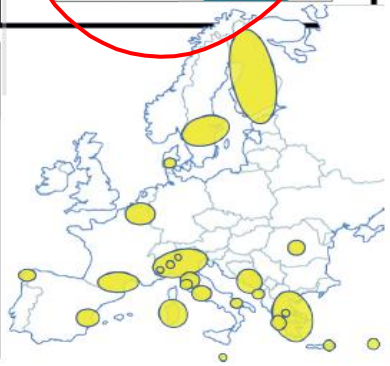
BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE
EXPLAINABLE AI, MACHINE LEARNING, GENERATIVE AI
OPERATIVE RESEARCH, STATISTICS

VISUAL PROGRAMMING, ADAPTERS
DATA FLOWS, WORKFLOWS
PARALLEL DISTRIBUTED PROCESSING
DATA DRIVEN

FULL INTEROPERABILITY, ANY: DATA, BROKERS, NETWORKS AND VERTICALS

NATIVE AND EXTERNAL APPLICATIONS

- Smart Parking
- Smart Light
- Smart Waste
- Smart Energy
- Smart Building
- Smart Tourism
- ...



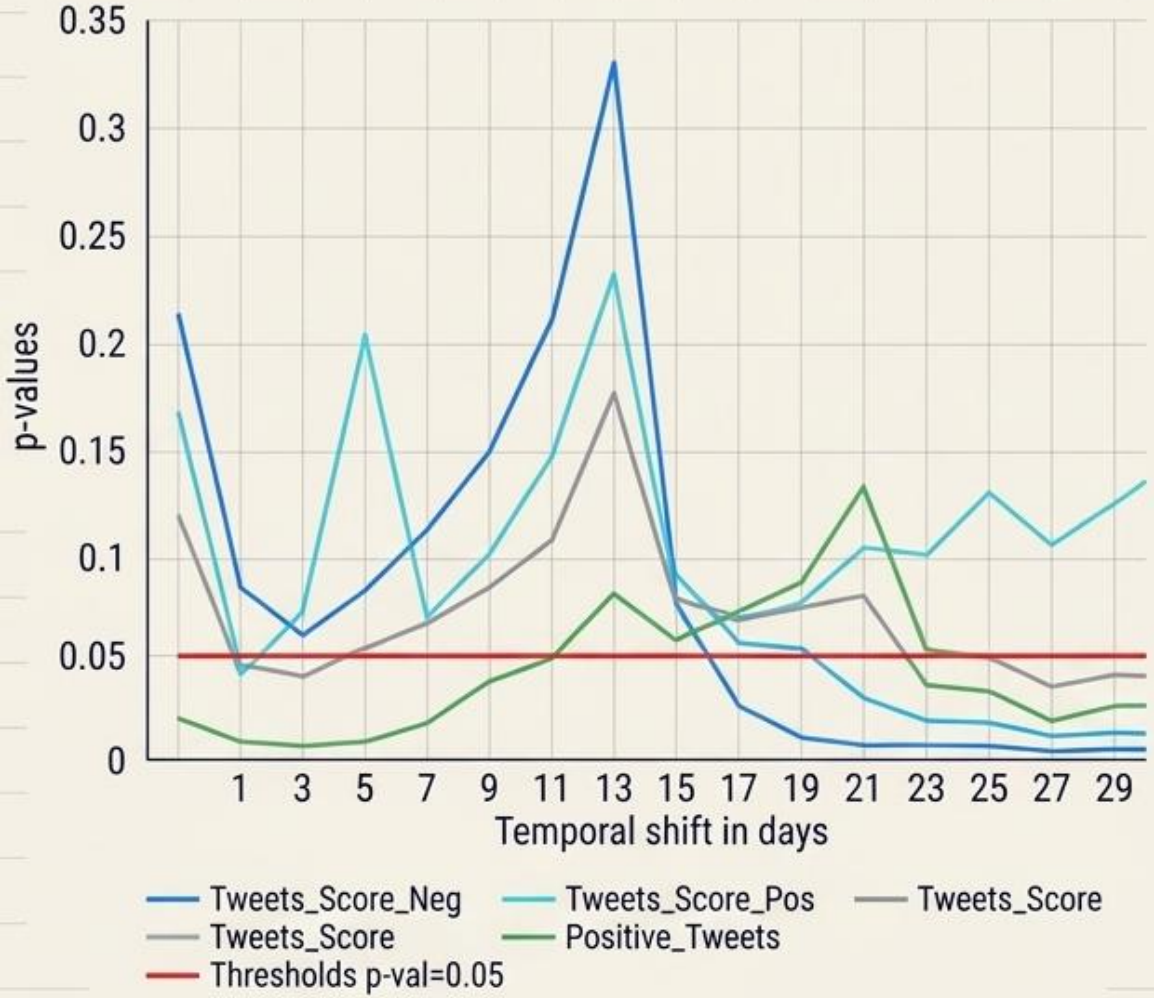
Goals

Goals	How to	technicalities
Keep under control reputation	Measuring and predicting	Multichannel collections of appreciations, AI/LLM, sentiment analysis
Predicting number of presences in advances	Measuring and predicting	Counting, tracking and computing Orig. Dest. Matrices
Controlling the overtourism	Measuring, predicting, suggesting, producing tactics and strategies	Production of suggestions, serious games, engagements, ..
Stimulating actions, stimulating the second offer	Suggesting, engaging, producing tactics and strategies	Production of suggestions, and engagements
Identification of critical conditions	Short and long terms Measuring	In deep data analysis, AI for anomaly detections
Increasing resilience	Monitoring and early warning	Strategies, dynamic routing, real time information to city users

Nessuna singola fonte dati restituisce il quadro completo

Fonte Dati	Risoluzione Spaziale	Risoluzione Temporale	Insight Principale	Gestione Privacy
Termocamere / AI Edge	Micro (Singola strada)	Tempo Reale	Conteggio preciso	Elaborazione on-device (Edge)
Wi-Fi Sniffing	Micro (Piazze/Aree)	Continuo	Traiettoria locale	MAC address anonimizzati
Dati Operatori Mobili (Telco)	Macro (Celle/Quartieri)	Ritardato (Ore/Giorni)	Domanda di mobilità	Aggregati massivi
Social Media / Recensioni	Variabile	Storico / Evento	Sentiment e Reputazione	Dati pubblici filtrati

Snap4City fonde questi vettori per calcolare matrici complesse, bilanciando precisione micro e visibilità macro senza violare la privacy.

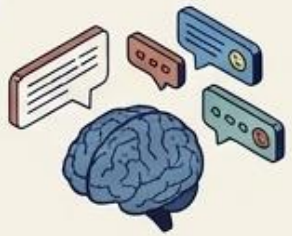


1

Raccolta Multicanale

Integrazione costante di lamentele e suggerimenti tramite App, Social Media, Info Point e QR code.

2



Comprensione Profonda (NLP)

Le reti neurali e il Deep Learning non si limitano a contare le parole. Classificano le intenzioni complesse e il reale sentiment dei 'City Users' (turisti, residenti e pendolari).

3

Il Caso Operativo

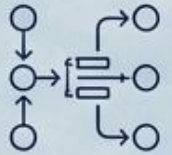
A Golden Bay, Malta, i dati qualitativi dei questionari vengono ingeriti e sintetizzati dall'Intelligenza Artificiale per generare report direzionali immediati e actionable.

Trasformare le sfide urbane in strategie guidate dai dati

L'Obiettivo (Goal)

1.  Controllare l'Overtourism
2.  Mantenere la Reputazione
3.  Aumentare la Resilienza

Il Motore (Digital Twin & AI)

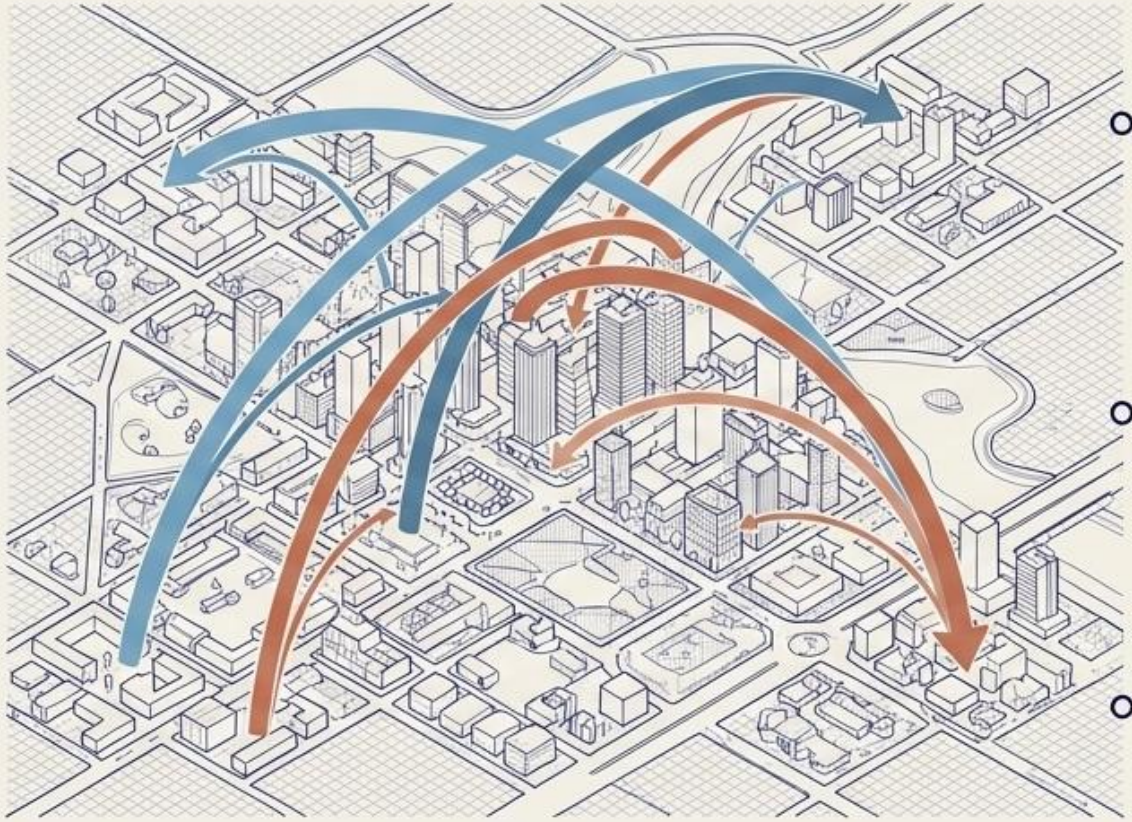
1.  Misurazione e previsione dei flussi
2.  Analisi del Sentiment (LLM/NLP)
3.  Rilevamento anomalie e Allerta Precoce

L'Azione (Outcome)

1.  Routing dinamico e suggerimenti in tempo reale
2.  Incentivazione dell'offerta secondaria (Second Offer)
3.  Strategie decisionali a breve e lungo termine

Oltre il conteggio: Decodificare le traiettorie con le Matrici Origine-Destinazione

Sapere quante persone ci sono è utile; sapere da dove vengono e dove andranno è trasformativo.

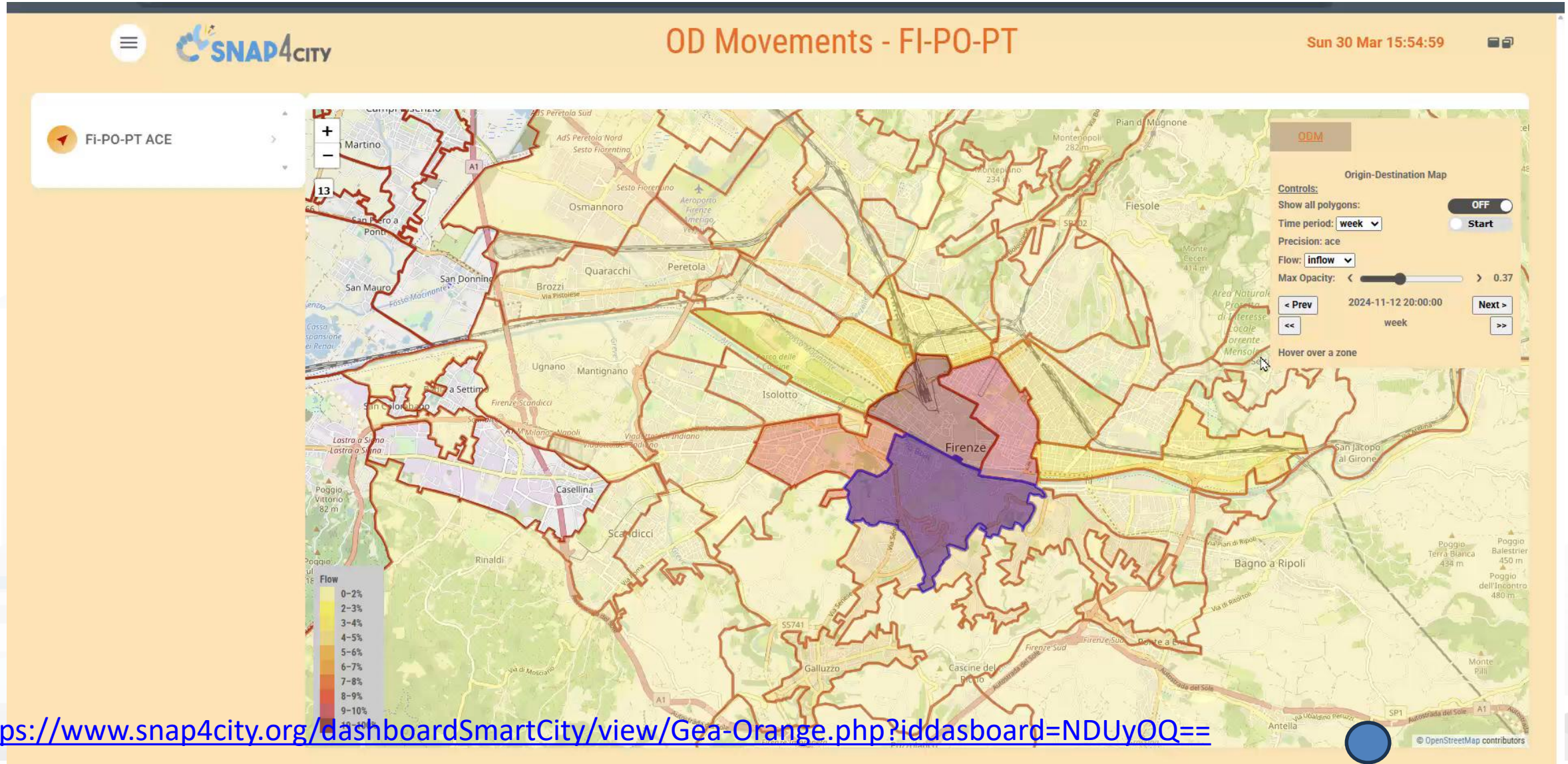


Composizione dei Dati: Fusione di dati Telco per comprendere le macro-aree e traiettorie da Mobile App per la precisione nelle micro-aree.

Risoluzione Dinamica: L'analisi è fluida su base oraria, giornaliera o mensile per calcolare la reale e mutevole Domanda di Mobilità.

Previsione: Integrazione di modelli di Intelligenza Artificiale per l'allerta precoce (Early Warning) e il rilevamento delle anomalie prima della saturazione.

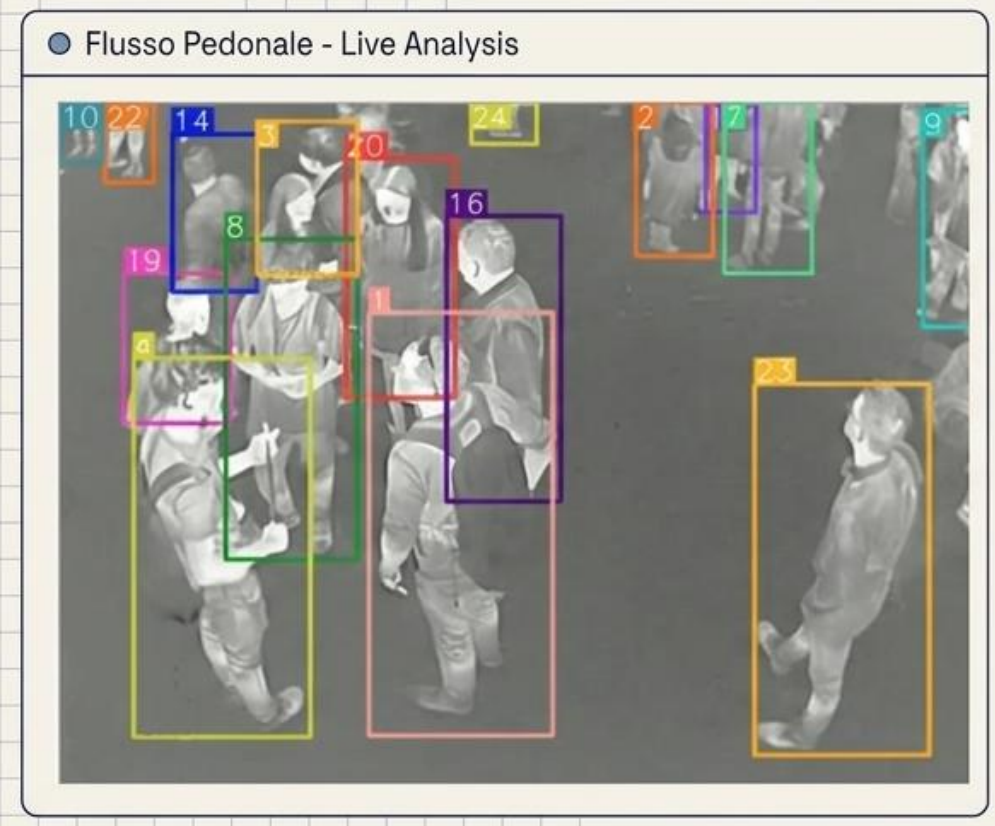
Origin Destination Matrices: Mobility Demand

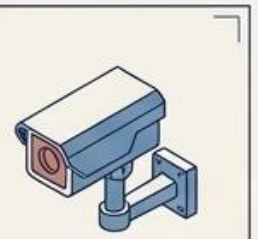


https://www.snap4city.org/dashboardSmartCity/view/Gea-Orange.php?iddasboard=NDUyOQ==

Gli Occhi della Città: Monitoraggio dei flussi in tempo reale

Il rilevamento delle presenze richiede altissima precisione negli spazi aperti e chiusi (stazioni, centri storici, musei) senza compromettere l'identità dell'utente.





Termocamere Edge AI:
Identificazione di situazioni critiche ed elaborazione del dato direttamente sulla telecamera, garantendo il pieno rispetto del GDPR.

Reti Wi-Fi e Droni:
Utilizzo di droni per conteggi dinamici in eventi speciali e sensori Wi-Fi per il tracciamento anonimo e continuo.

Tecnologie operative a:
Firenze, Genova, Cuneo, Varna.

Complains Analysis to Support Decision Making Processes

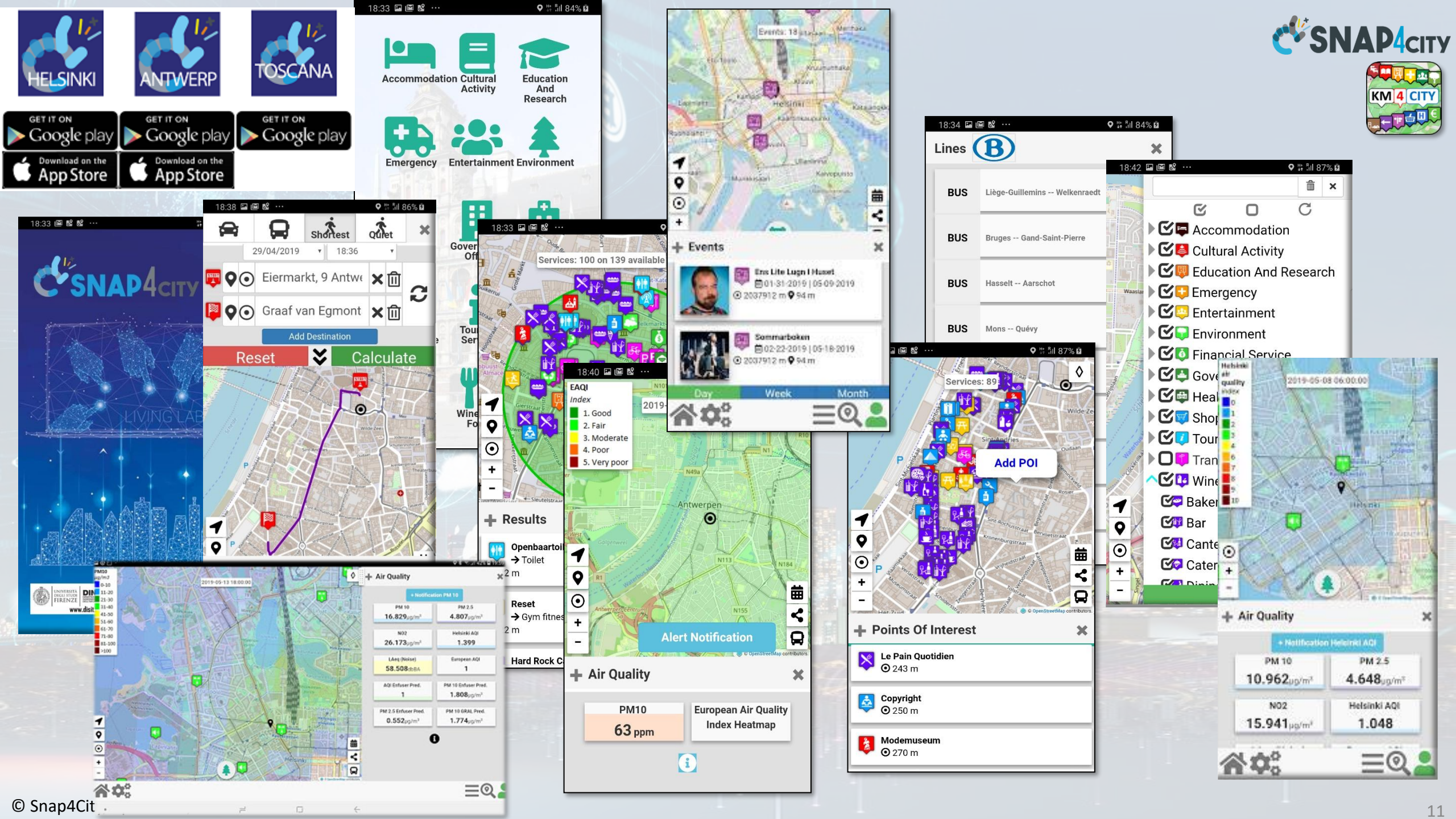
Standard data/form creation
for reputation analysis:

- Initial Sentiment Analysis/NLP by analysing questionnaires collected from QR code distribution.

Summary of Findings (June–August 2025, 36 responses received - Golden Bay, Malta) produced by a Large Language Model (LLM) based on the responses obtained from questionnaire

Average Ratings (scale -2 to +2)

Overall experience: +0.67 → slightly positive but inconsistent (range -2 to +2)
Toilets: -0.83 → strongly negative, among the worst-rated aspects.
Showers: -0.31 → generally negative.
Bins distribution: -0.33 → slightly negative, with complaints about lack of bins.
Safety & lifeguard services: +0.55 → moderately positive.
Cleanliness: -0.52 → overall negative, many complaints about cigarette butts and plastics.
Natural conditions (dunes, seawater, etc.): -0.40 → negative, issues with seagrass, water quality.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ANTWERP
TOSCANA
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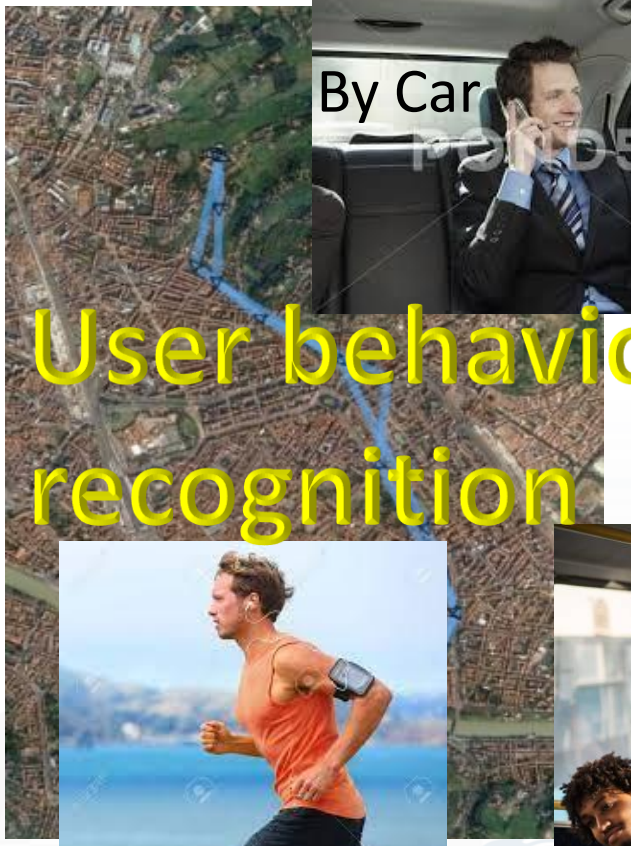
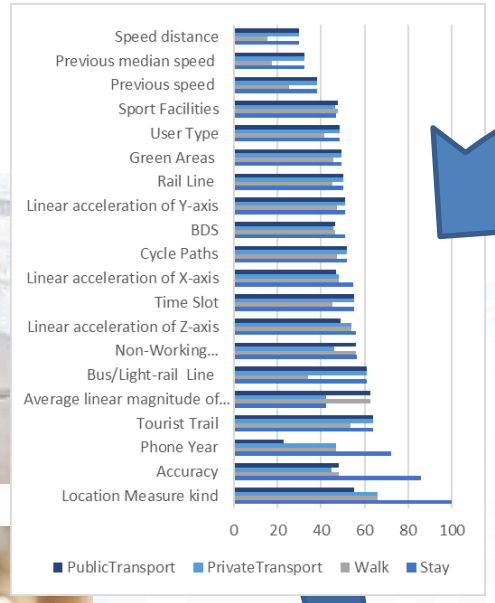
KM 4 CITY
Accommodation
Cultural Activity
Education And Research
Emergency
Entertainment
Environment
Shortest
Quiet
Add Destination
Reset
Calculate
Events
Day
Week
Month
Lines
BUS
Liège-Guillemins -- Welkenraedt
Bruges -- Gand-Saint-Pierre
Hasselt -- Aarschot
Mons -- Quévy
Services: 100 on 139 available
EAQI
Index
1. Good
2. Fair
3. Moderate
4. Poor
5. Very poor
Results
Alert Notification
Air Quality
PM10
63 ppm
European Air Quality Index Heatmap
Add POI
Points Of Interest
Le Pain Quotidien
243 m
Copyright
250 m
Modemuseum
270 m
Accommodation
Cultural Activity
Education And Research
Emergency
Entertainment
Environment
Financial Service
Bar
Air Quality
PM 10
10.962
PM 2.5
4.648
NO2
15.941
Helsinki AQI
1.048

To propose suggestions and Engage city user

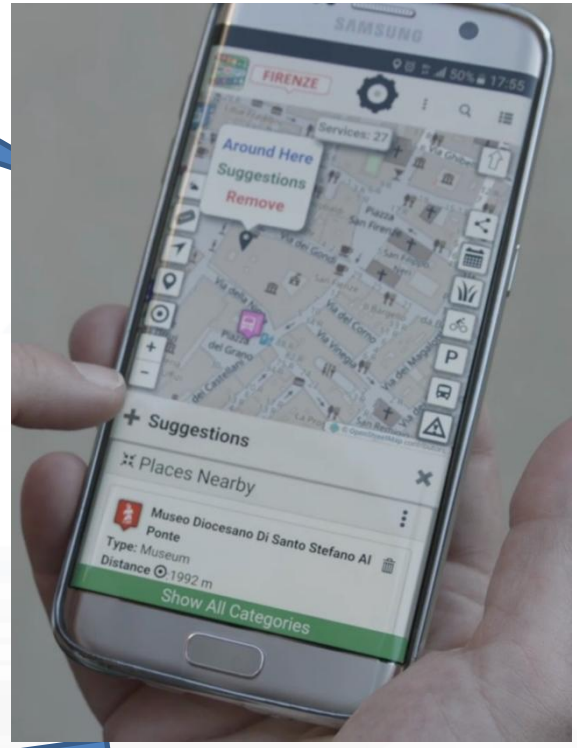
we need to know how they are moving





Artificial Intelligence Classification

Suggestions



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Logged in as:
edoardo_tester

Your Profile

Logout

SnapAssistant model:

Llama3.3

New Chat

- EdoChat1
- EdoChat2
- EdoChat3
- EdoChat4
- prova
- chatNuova
- chatTest1LLAMA
- chatTest2LLAMA
- testGianniLLAMA
- testTastoInvioPreChanges
- ChatTestPostPSWINVIO

https://www.snap4city.org/1116

SnapAdvisor

Current chat: debug0

Visualize references

Personal Advisor LLM

Come creo una dashboard?

Per creare una dashboard, puoi utilizzare la piattaforma Snap4City. La dashboard si compone di un insieme di widget grafici che possono essere impostati separatamente assegnando una serie di parametri, come origine dati, dimensioni, colori, forma, font, allarmi, relazioni con altri, ecc. (SOURCE: Snap4 City per la creazione di Smart City Control Room, SCCR). Inoltre, la piattaforma offre la possibilità di creare vere e proprie applicazioni interattive, multipagina/multidashboard, e non semplici storie monopagina da scrollare. Puoi anche condividere la dashboard con altri utenti anche fuori dalla Smart City Control Room tramite canali autenticati e protetti in HTTPS, in accordo al GDPR (SOURCE: Snap4 City per la creazione di Smart City Control Room, SCCR). Per vedere alcuni esempi di dashboard, puoi visitare il sito https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjU0Mg== (SOURCE: Snap4 City 1st Overview v4 8 annot). Tuttavia, non ho trovato informazioni dettagliate sulla procedura di creazione di una dashboard. Se hai bisogno di ulteriore assistenza, ti consiglio di contattare direttamente il team di supporto di Snap4City. Non so dirti altro in merito.

Write a message...

Il Turista Attivo: Connettere l'intelligenza urbana agli schermi personali

L'Anatomia del Turista Smart

Cosa riceve il sistema:

- Posizioni GPS anonimizzate
- Visualizzazioni di Punti di Interesse (POI) e ricerche
- Voti, immagini e recensioni qualitative

Cosa riceve il turista:

- Routing dinamico per evitare aree congestionate
- Suggerimenti per "Offerte Secondarie" (eventi o musei alternativi)
- Notifiche personalizzate e moduli di Serious Games

Key Takeaway: L'app non è solo una guida passiva; è un sensore bidirezionale che disperde l'overtourism attraverso l'incentivazione comportamentale.

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TOURISMO EURO MED

TOURism Innovative and Sustainable Management of flOws

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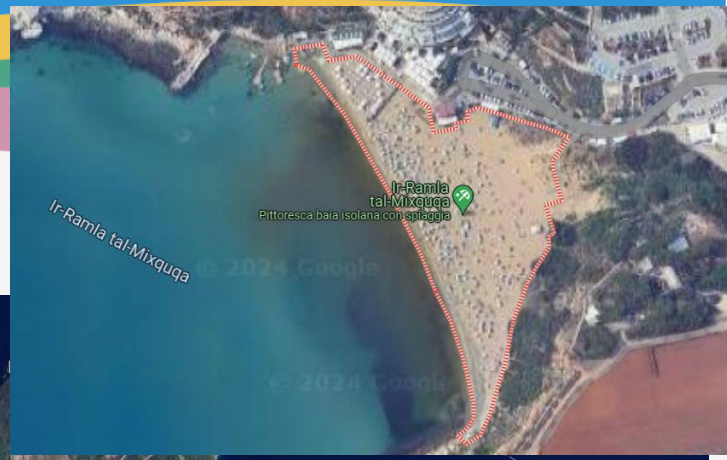
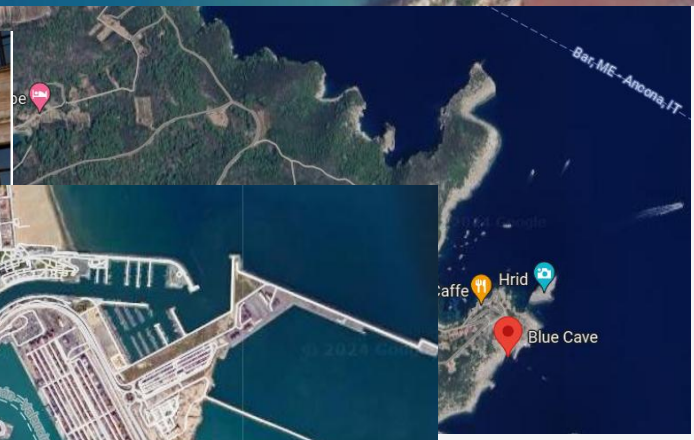
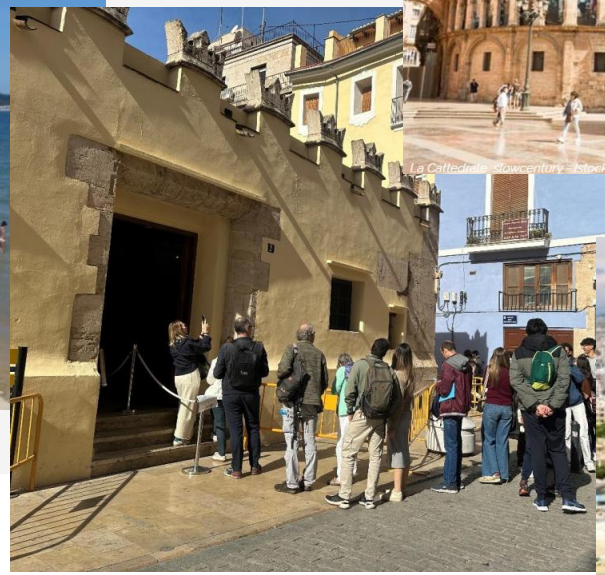
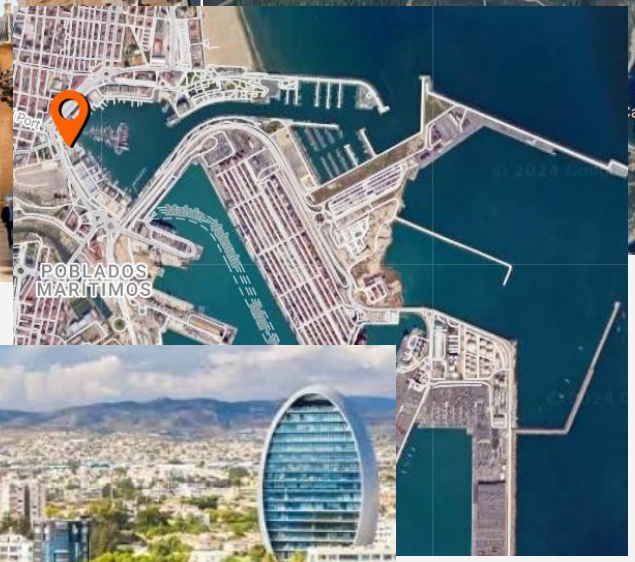
• Pilots of Snap4City on:

- Greece - READ S.A.: Rodi
- Italy – FRI, UNIFI: Firenze
- Spain – FV, FSMLR: Valencia
- Cyprus – ANELEM: Limassol
- Bulgaria – VEDA: Varna
- Croatia – RERA SD: Splitsko-dalmatinska županija
- Malta – MRDDF: La Valletta









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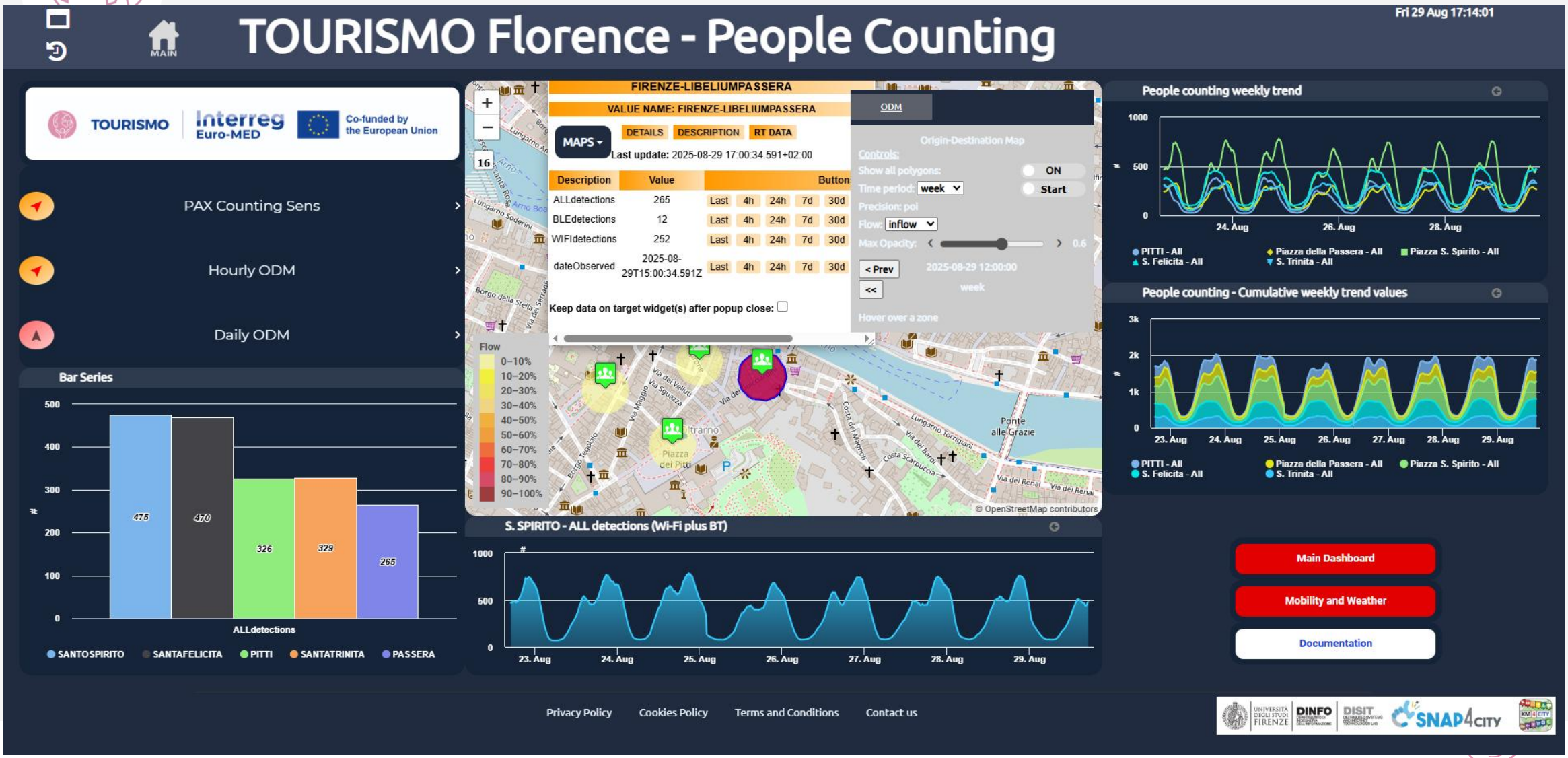
https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddasboard=NDYzNQ==



https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddasboard=NDcyMQ==

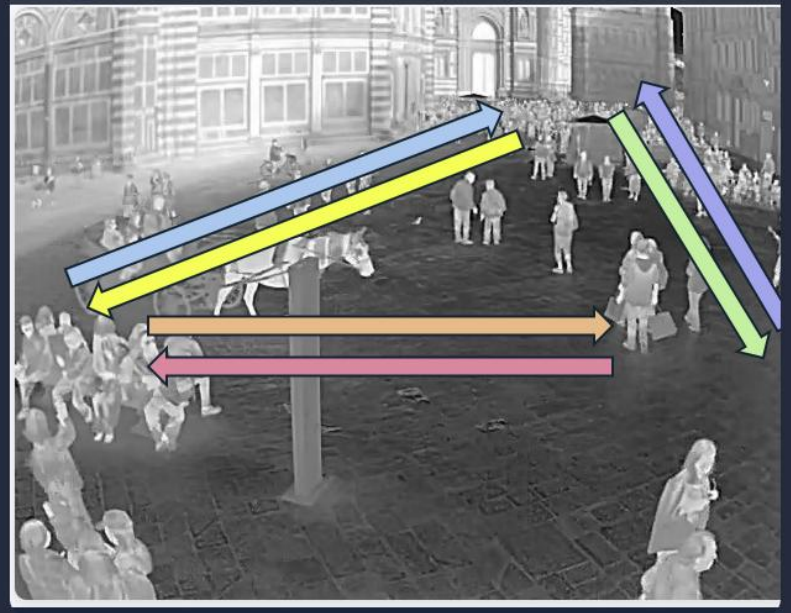
Tourismo: Dome Trajectory Analysis

Fri 10 Oct 21:48:22

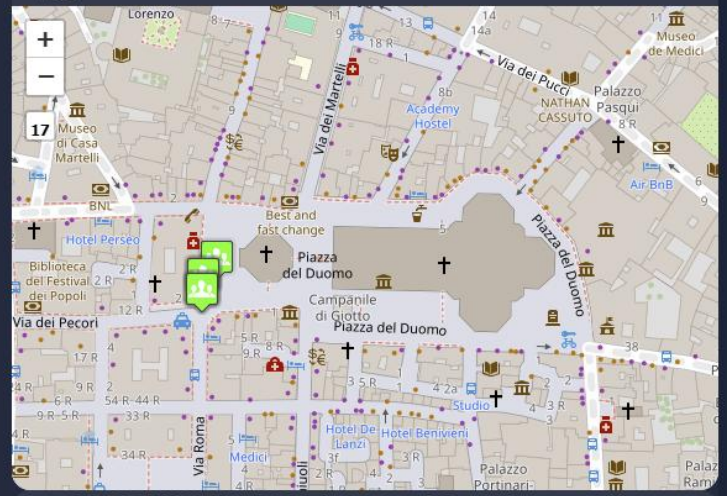
Selector

Duomo Sensors

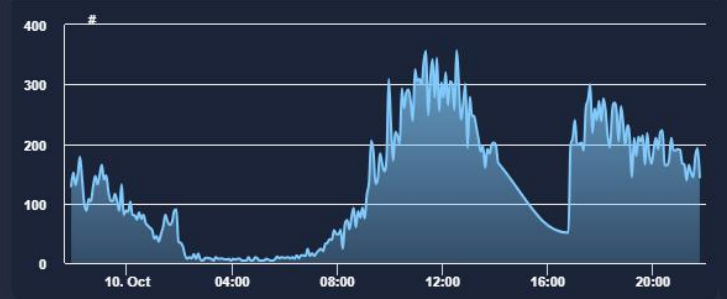
directions



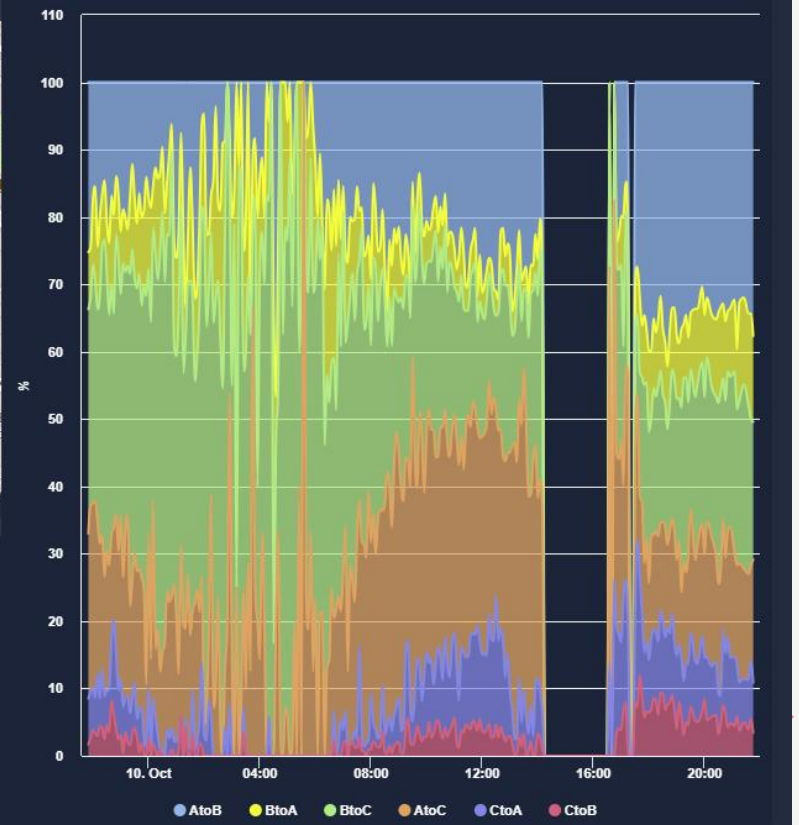
Map



FIRENZE-TCPIAZZADUOMO5minutes - peopleCounted



Percentuale distribuzione traiettorie



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Malta – Scenario: Golden Bay

Target: Visitor behaviour analysis at the Golden Bay, with the intention of proposing a carrying capacity limit during peak seasons for conservation policy recommendations.

Equipment:

2 Thermal Cameras
4 Pax counters
1 Traffic counter

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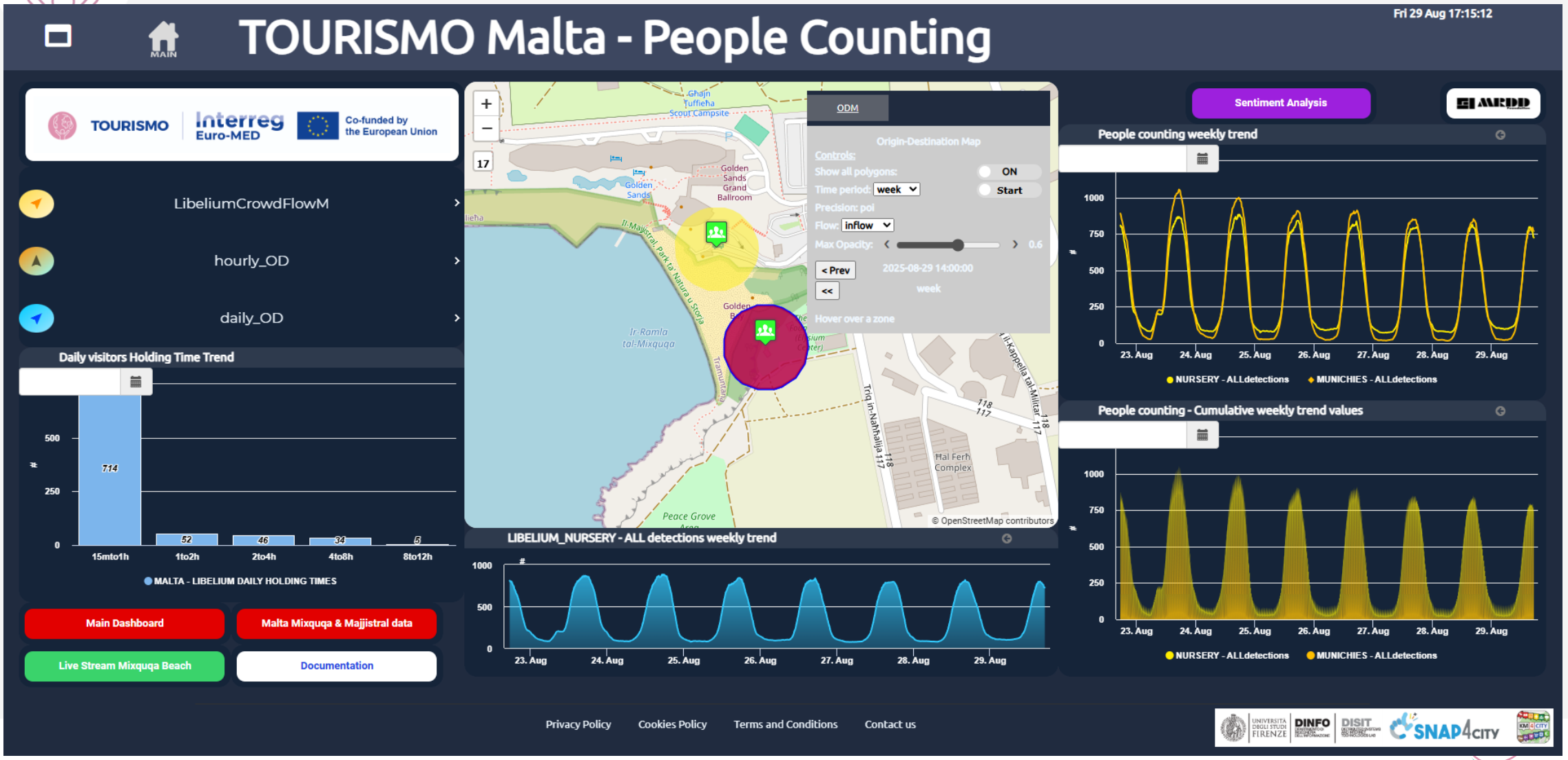

Varna (Bulgaria) – Scenario: City Centre

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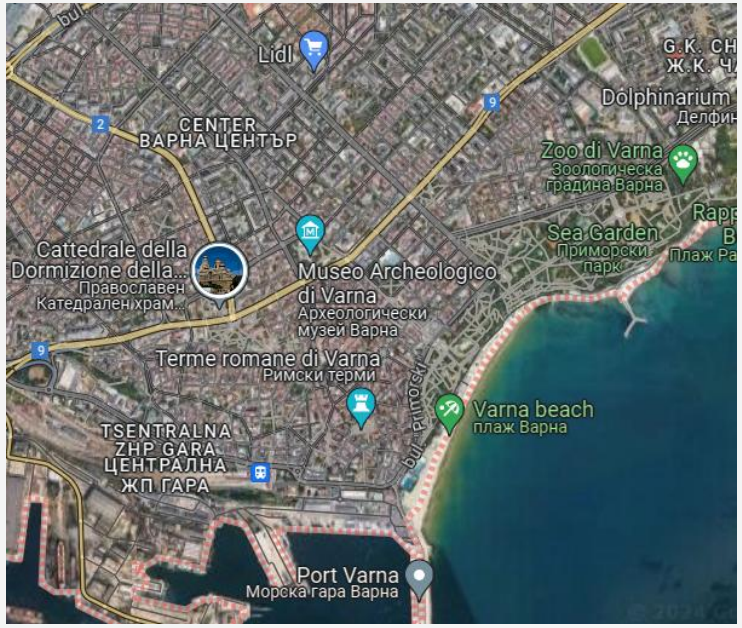
Varna (Bulgaria) – Scenario: City Centre



Target: Data collection and processing of the tourists' flows in key locations of the city of Varna to analyse crowd density and queue formations

Equipment: Drones: people flows images during the day

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Valencia (Spain) – Scenario: Valencia Port

Valencia (Spain) – Scenario: Valencia Port

Target:

Anticipate and develop methods to analyse the situation regarding the flow of cruise tourists, identify trends, and manage the tourist flows to prevent future overcrowding.

Equipment:

2 Thermal cameras

3 Pax counters

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Valencia (Spain) – Scenario: Historic City Centre

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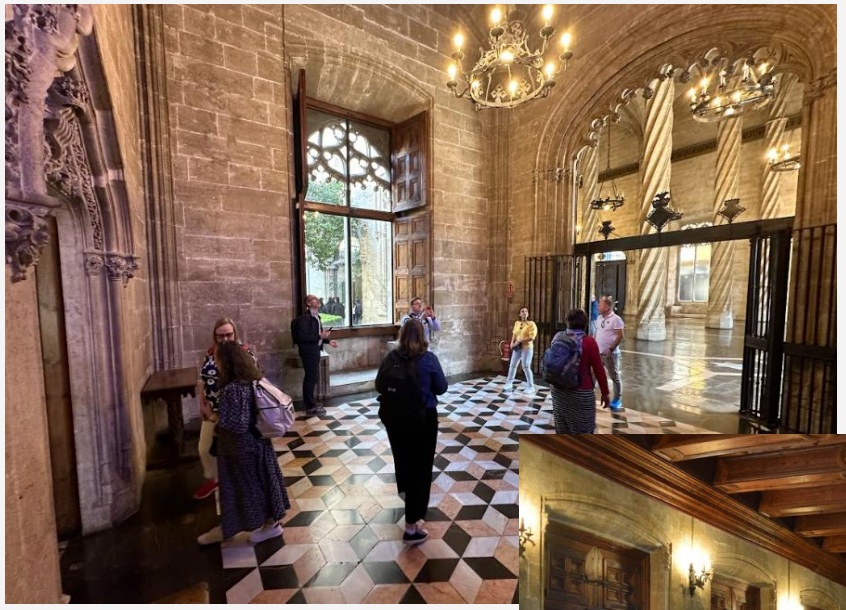
Valencia (Spain) – Scenario: Historic City Centre



Target:

Monitor the impact of tourism on the architectural heritage of Valencia's historic centre: real-time occupancy in La Lonja and in the Museum of the City (Palacio del Marqués de Campo)

Equipment:

Indoor pax counters: Entrance and exit sensors in the buildings

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Croatia – Scenario: Island of Biševo

Target: Achieve sustainable tourism on the islands of Biševo and Komiža by covering the flow of guests entering the famous ‘Blue cave’ on Biševo island.

Equipment:

2 Pax counters: sniffer counting devices

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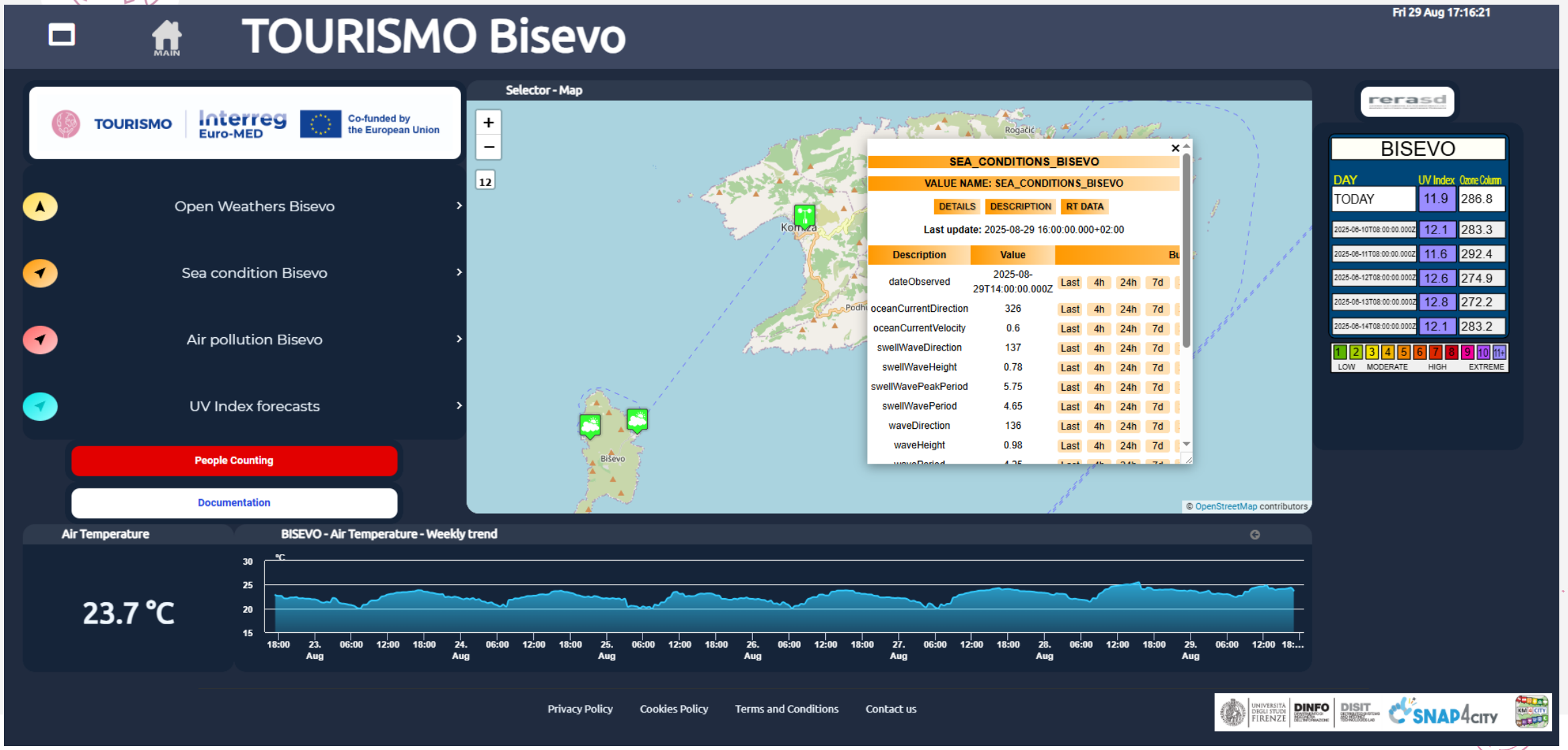
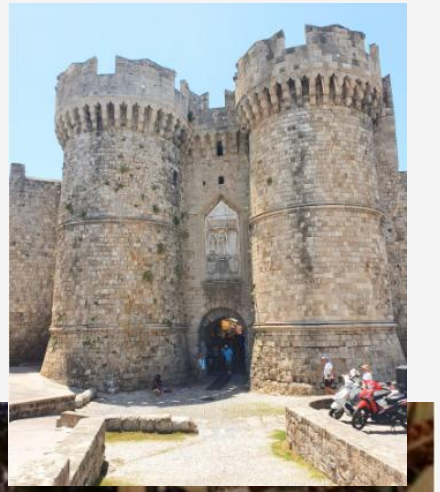
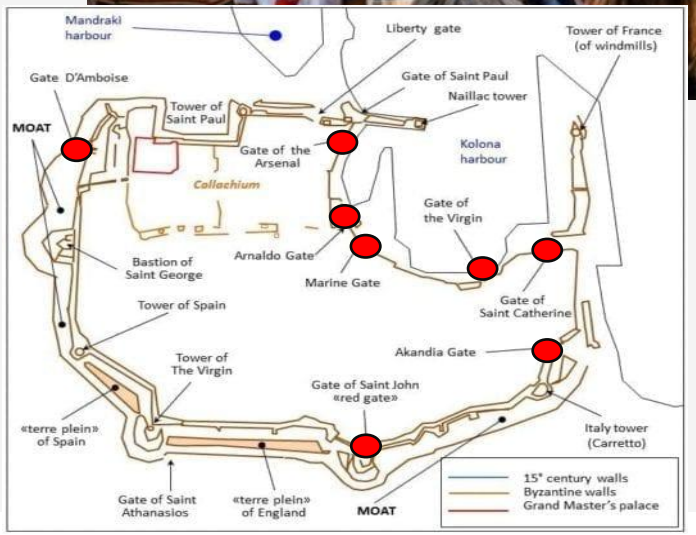


Rhodes (Greece) – Scenario: Medieval city





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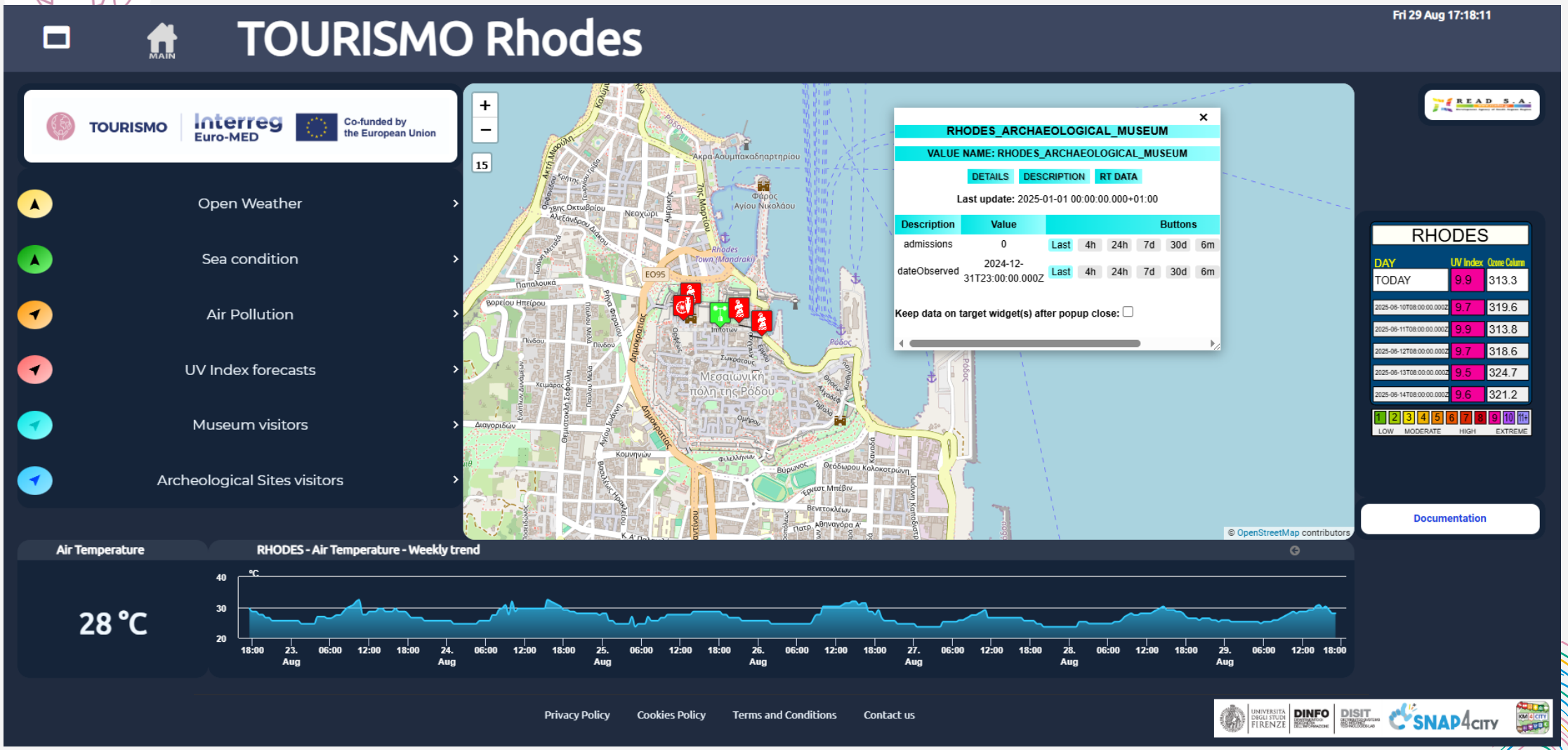
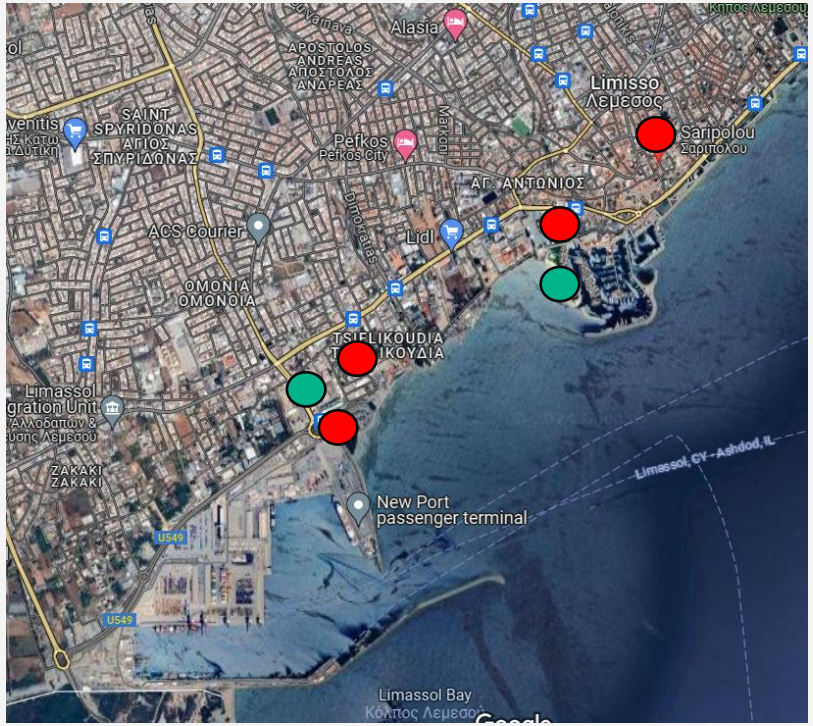


Cyprus – Scenario:
Limassol Port



Target: Measure and Analyse the Tourist flow within Old port of Limassol and Port of Limassol. Understand the patterns of tourist movement and behaviours.

Equipment:

4 Thermal cameras

10 Pax counters

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Indoor/outdoor People Analysis and Suggestions for Smart Retail

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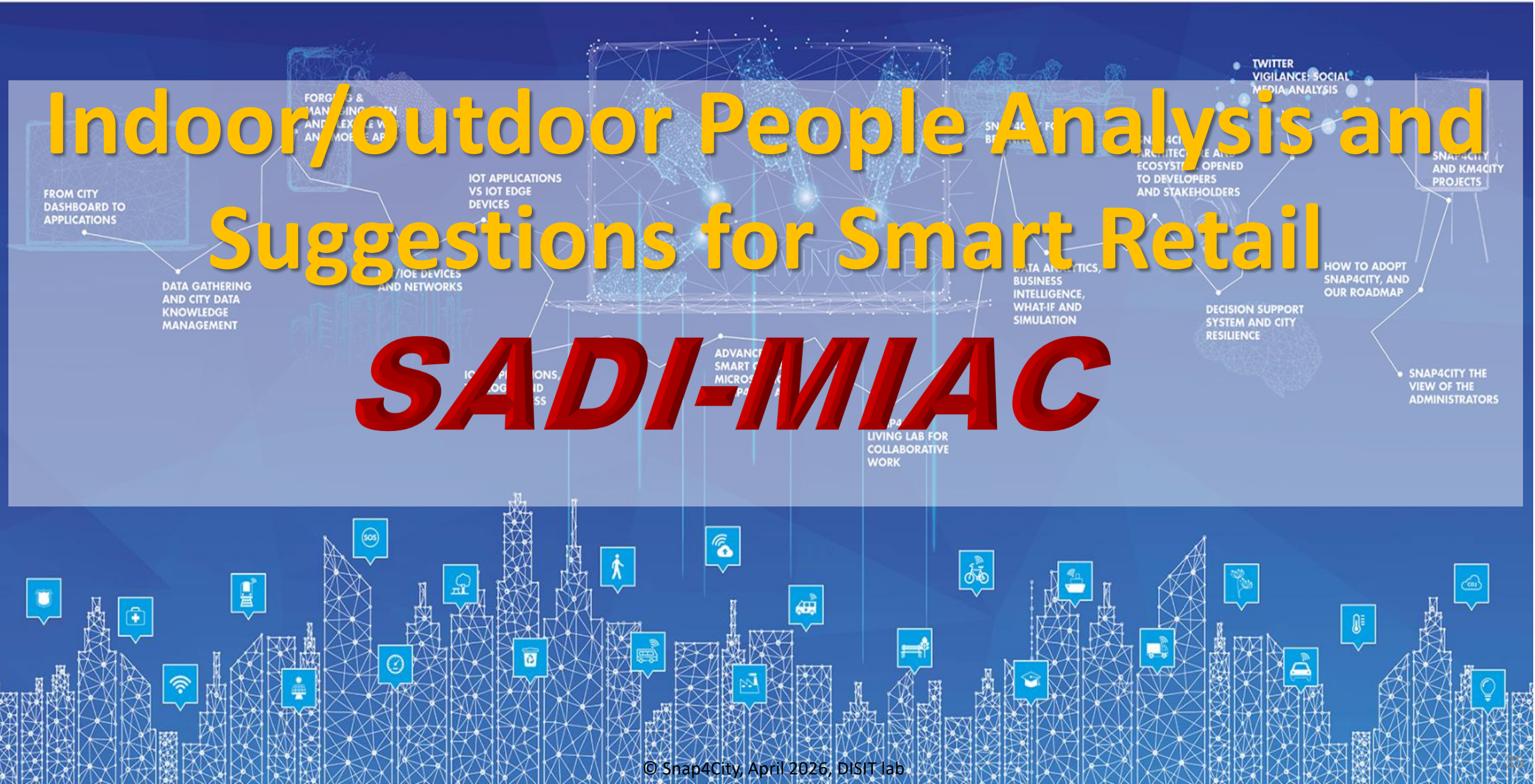

Business Intelligence for shopping areas/retails

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- Dati Locali
- Dati vendita
- Dati Contesto
- Global behavior
- Eventi, meteo
- Parcheggi, etc.
- Cross marketing
- Social media
- Feedbacks
- ...

SADI-MIAC

- DSS
- Digital Twin
- AI/XAI
- Generative AI

- Dashboard
- Predizioni
- Anomalie
- Scenari
- Strategie
- Suggerimenti
- ...

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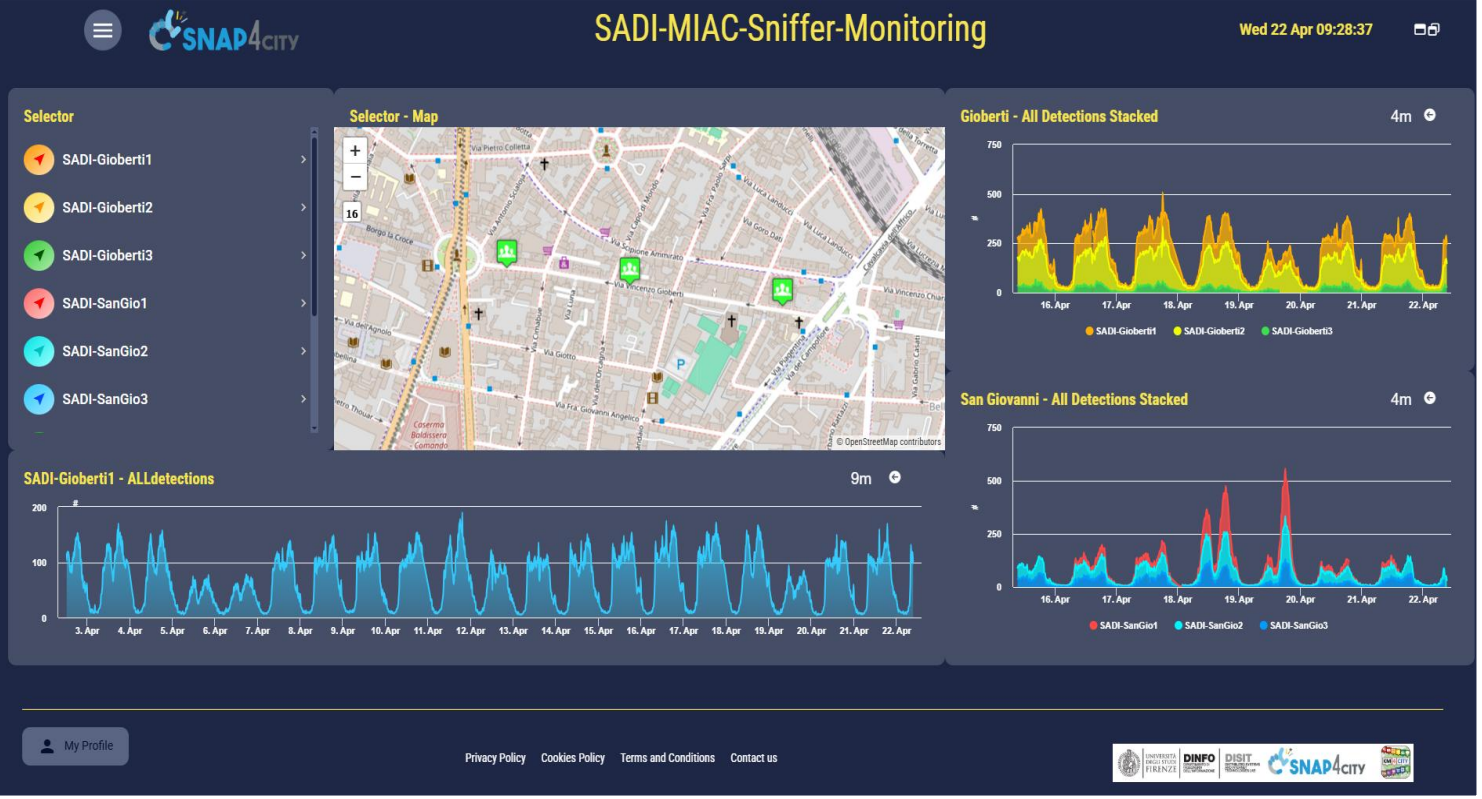
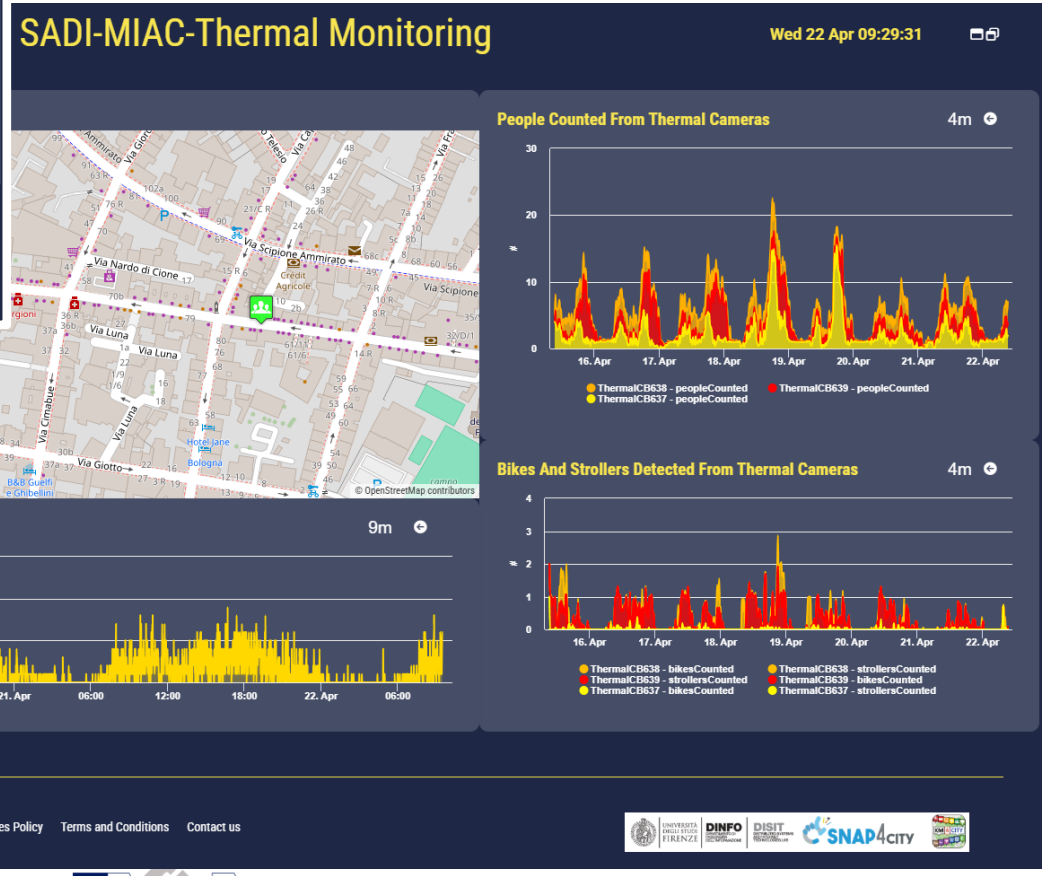
Shopping area monitoring





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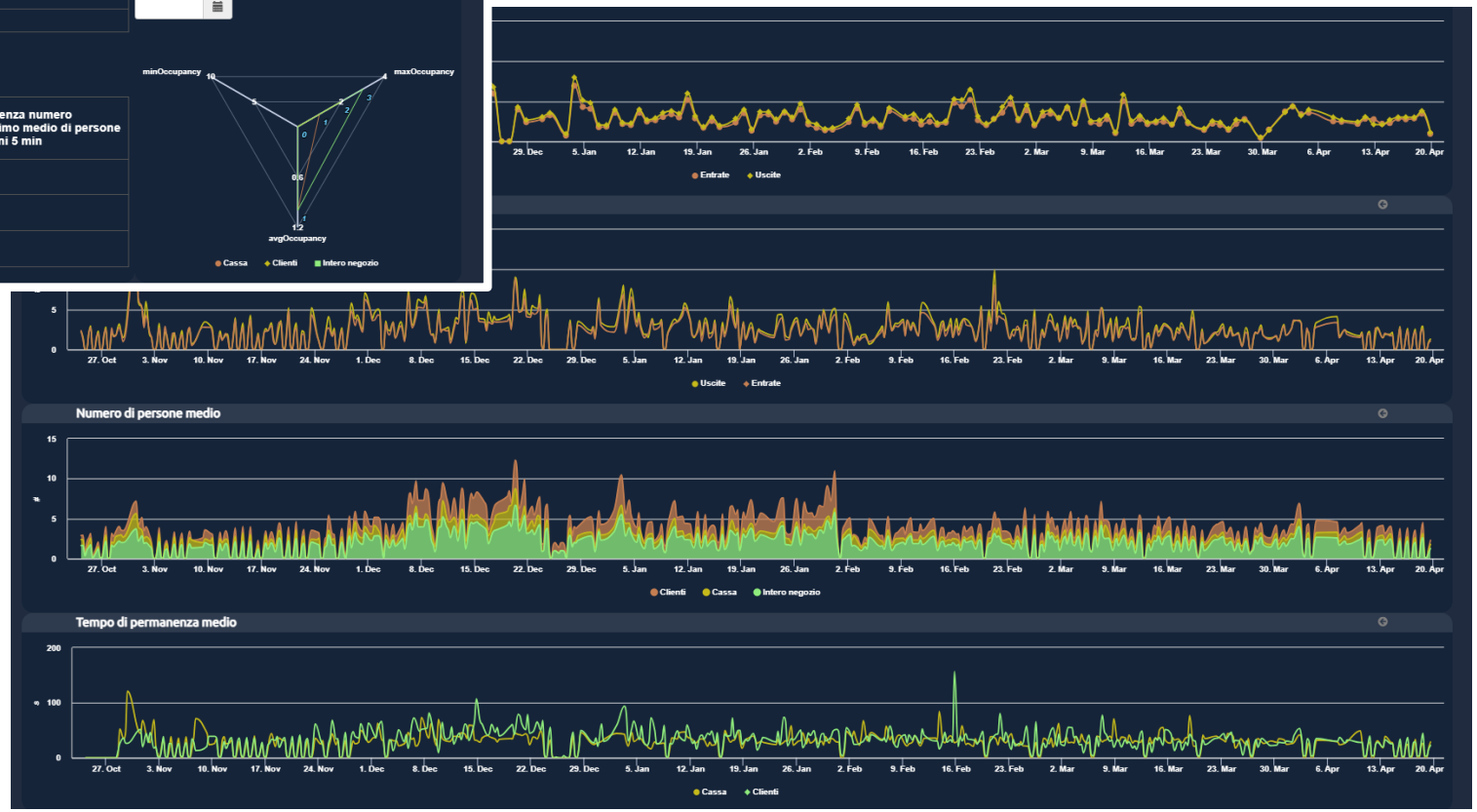
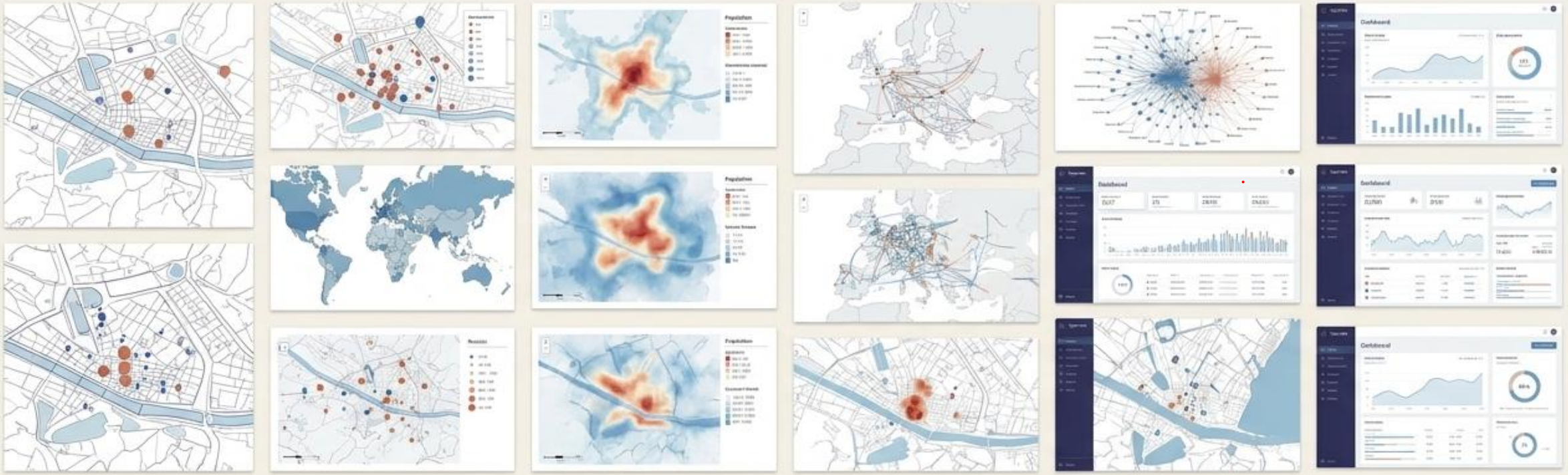
Smart Retail



Verso la Città Senziente



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- Smart City

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- Industry

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- Artificial Intelligence

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