SNAP4CITY

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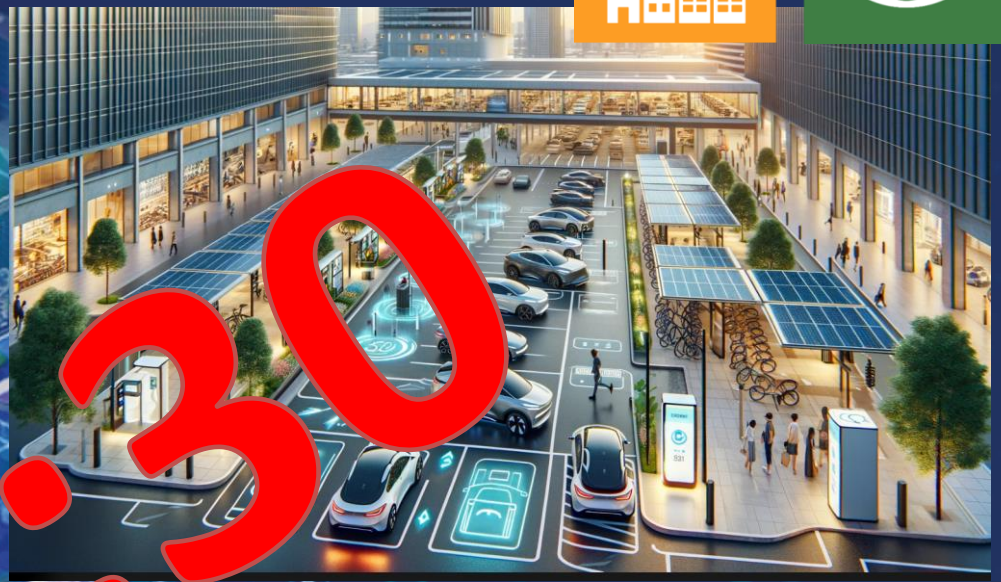
11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION



at 14:30

Snap4Parking
Smart Parking

#snap4city
#km4city
#disitlab
@snap4city

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

UNIVERSITÀ DEGLI STUDI FIRENZE
DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE
DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

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THE POWER OF ARTIFICIAL INTELLIGENCE AT THE SERVICE OF YOUR OPERATION AND PLAN

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100% OPEN SOURCE

Powered by FIWARE

FREE TRIAL

PEN Test Passed

EU GDPR COMPLIANT

SNAP4 Appliances and Dockers Installations

EUROPEAN OPEN SCIENCE CLOUD

Node-RED

JS Foundation

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

SMART CITY LIVING LAB

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

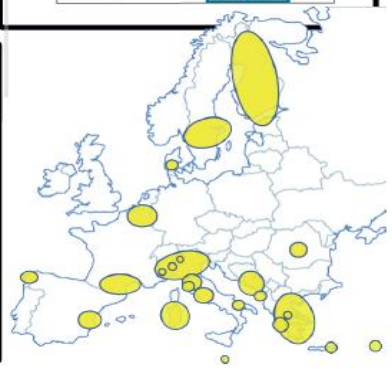
BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE
EXPLAINABLE AI, MACHINE LEARNING, GENERATIVE AI
OPERATIVE RESEARCH, STATISTICS

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
- ...



Technical Architecture

Social Media
OSM, BIM, GIS, ITS
Gateways, satellite
External Services
Web Scraping
TV CAM streams

Entity Directory:
Smart Data Models
IoT Data Models
Digital Twins

FIWARE Brokers
MQTT Brokers
Brokers

API Manager
Federation Smart City API
OpenSearch
virtuoso
storage
KB, graph
GeoServer
BIMserver.center
Entity Inspector
Data Manager
HLT Manager
Service Map

Any API

Node-RED

IoT App ProcLog.
On Edge
On Cloud
IoT App ProcLogic

Simulators' tools:
SUMO, DORAM, TFR, ..

python
R Studio
Artificial Intelligence tools:
pred., classif., optim., LLM, ...

Event Driven

Front-End

Facilities
Dashboard/View Builder & Mng.
Business Intelli-gence CSBL
Custom Themes
Synoptics & Widgets
2/3D Digital Twin

Tools
Routing, MulDyn
Heatmap Gen.
Prediction Gen.
Measure & Compare
Notification Mng.
KPI Support
Scenario, What-If

Applications
Traffic Optimiz.
Traffic Light Plan
Public Transport
Parking Mng.
Fines Mng.
Participation Mng.
Lighting Mng.
Building Mng.
Environment Mng.
Waste Mng.
Sharing/pool Mng.
Energy Mng.
Tourism Mng.
Mobile Apps

SnapAdvisor / Generative AI

A&A, RBAC, SSO, Blockchain, Resource Managers and Sharing

Sharing / Market Place

Third parties solutions

Main Apects

- **Main Features:**
  - reduce emissions by guiding drivers to free spaces;
  - support on/off-road parking;
  - Support any kind of parking slots/sensors' kinds;
  - multiple payment models for each area and couple: User-Parking Kinds;
  - Specific rules for residents, disabled users and operators;
  - Predictions for parking.
- **Architecture**:
  - events from: on-street sensors (e.g., NB-IoT), mobile apps and parking poles;
  - Smart Parking Manager with dashboards for operators;
  - Custom business logic for each municipality
    - Central solution for payments,
  - Mobile app for city users and for police operators
- **Based on Snap4City**:
  - multitenant, GDPR, Scalable, modular, interoperable, etc….

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Snap4Parking Conceptual Architecture

NB-IOT Sensor

On-Road

GW sensor collection

Off-road

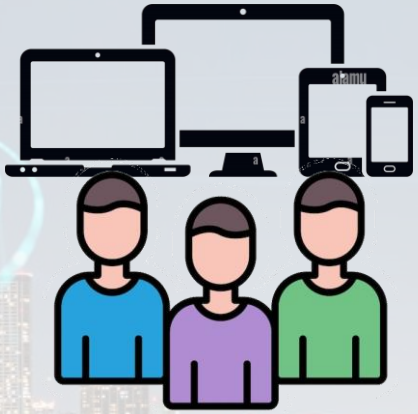
City Operators

Snap4City Platform

- User Registration
- User Mng
- Slot Gathering/Mng
- Slot Monitoring
- Payment Policies
- Area & Slot Loading
- Permissions Mng
- Participation Mng
- Alarms Mng
- KPI Estimation
- Reporting
- Fines Mng

City Users on parking and participation, mobile app

Parking Payment Pole



Final City Users on:

- Permissions
- Monitoring historical data

Police Operator for Fines

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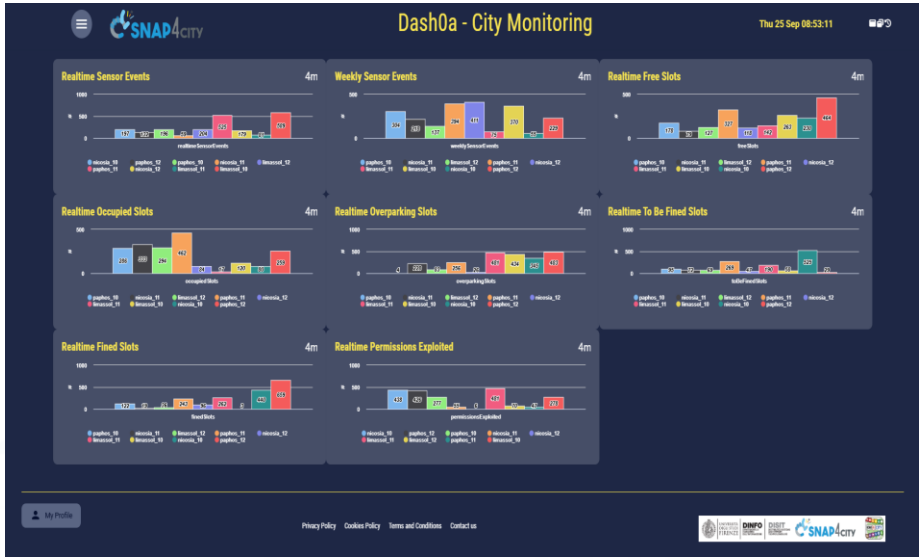
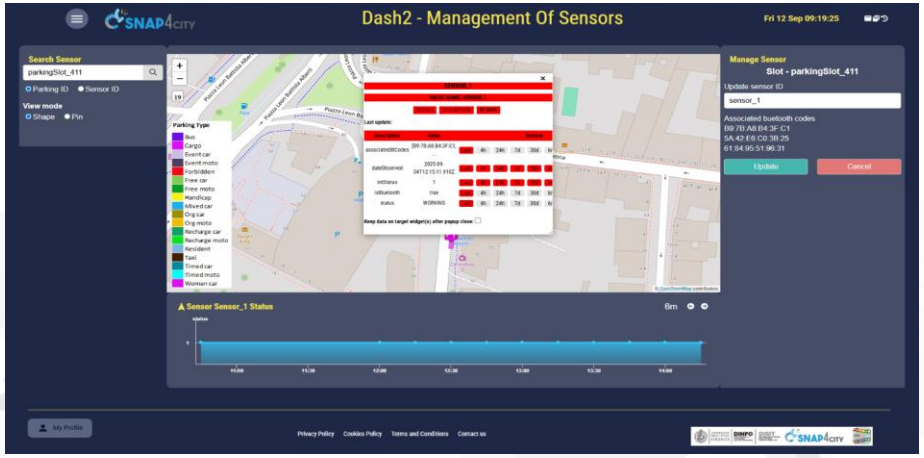
Operations Dashboards (Back Office)

- **City & Area KPIs**
  - Free, occupied, overparked, to-be-fined, fined, permissions in real time, recharging, ..
  - Counts of sensors active today / this week
- **Monitoring Parking Status**
  - Time-series KPIs (daily/weekly/monthly),
  - drill-down by area & parking kind, …
- **Management of Sensors**
  - Search by slot or sensor ID; view health & timelines; manage replacements;
  - Bluetooth associations when applicable
- **Price Policy Area Management**
  - Assign price policies by areas





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Pricing: DPP & PPP

- **Daily Price Profiles**
  - 24 values (€/min per hour) describing a day's pricing
  - Different for User-parking kind couples
- **Price Policy Profiles**
  - Rules per area per (User-Parking Kind) with validity periods and weekday/ weekend/ holiday toggles
    - Management of exceptions

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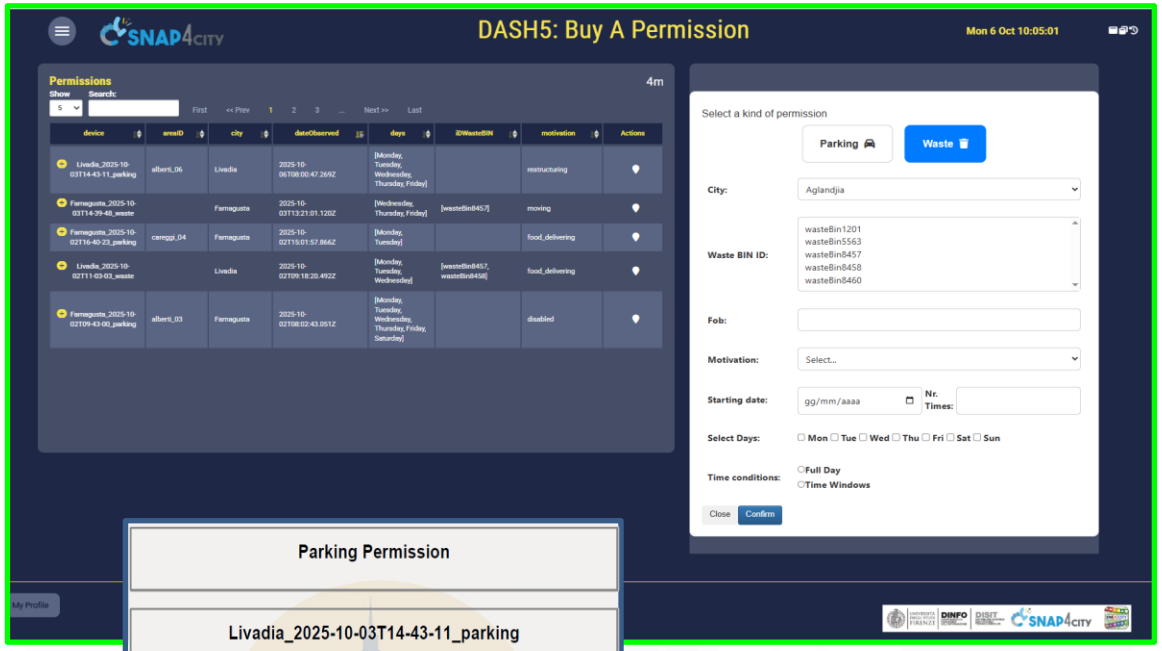
Users, Permissions & Mobile App

- **Users & Roles**
  - **External**: Visitor, Resident, Disable, ….
  - **Internal**: Operator, Policeman/Aux, Fine Operator, Participation Operator, etc.
- **Permissions workflow**
  - User requests parking/waste permission → operator approves/rejects → payment link sent → printable card issued
  - Parking, Gates, delivering, disables, etc.
- **Mobile app**
  - Search parking & Just Parking
  - Pay-per-minute for registered users;
  - prepayment for everyone
  - Pay parking and fines;
  - view permissions & notifications



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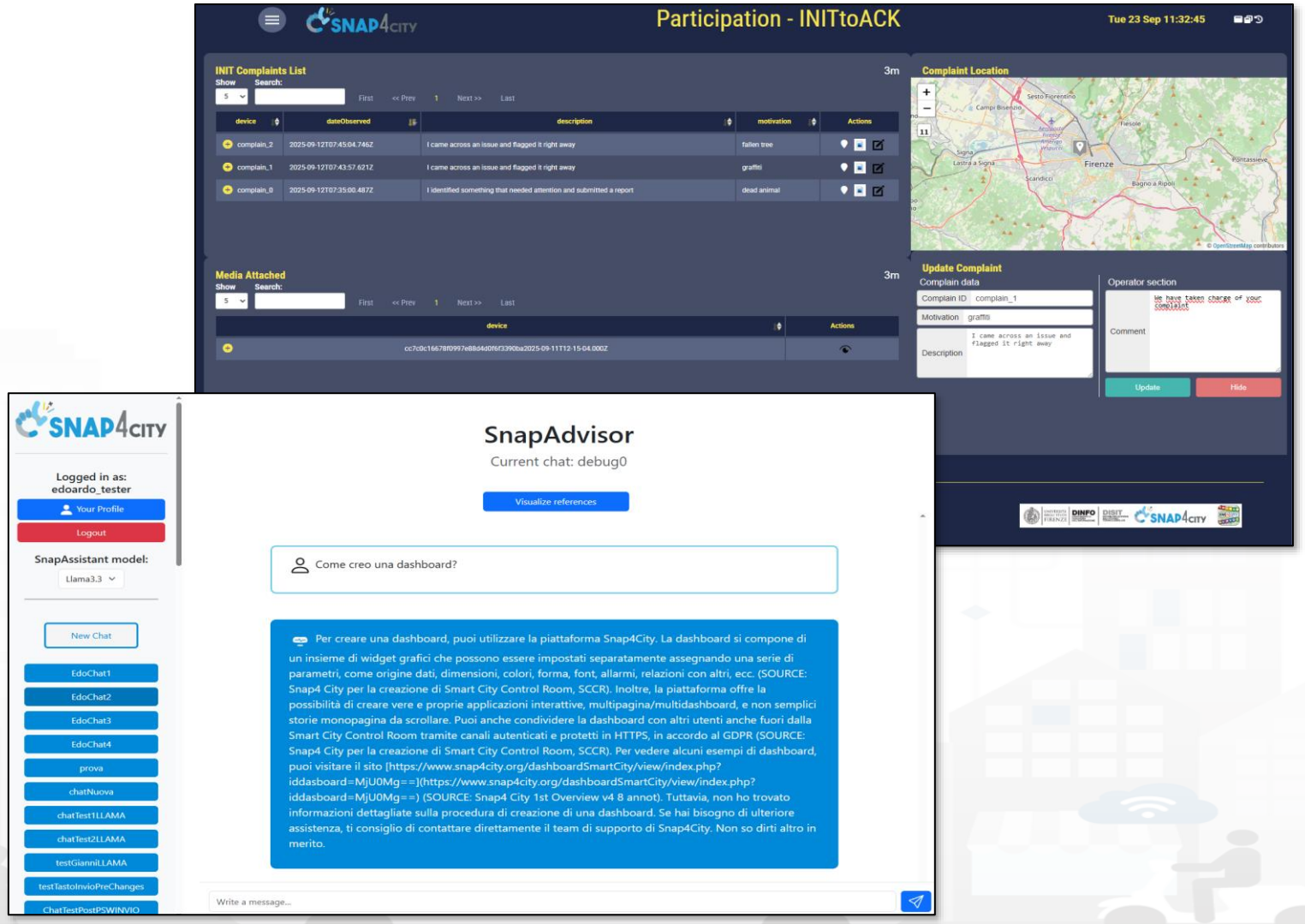
Managing customer interaction

- **Complains providing**
  - Media, Text
  - Tracking evolution
- **AI based Complain Analysis (optional)**
- **Contestation of Fines**
- **Mobile App for road operators**
- **Payments**



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Other Snap4Parking Solutions

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Road Parking

Parking Conditions Monitoring

Wed 23 Oct 16:24:41

- Status of Slots
- Types of Slots
- As Pins
- Geolocation
- Types of Parking Zones
- Fines on Parking Zones
- Parking Meters
- Recharge Stations
- Parking Structures

Management

Parking Slots

DISIT:OrionUNIFI:METRO1095 - VehicleFlow

8m

Parking KPIs

Select Group: Alberti 11

Group capacity : 26

Grouped by slot type

Event Car

Free Slots: 4/22

Busy Slots: 2/22

Busy Bluetooth Slots: 3/22

Busy Authorized Slots: 5/22

To Be Fined Slots: 5/22

Fined Slots: 1/22

Do Not Care Slots: 2/22

Event Moto

Free Slots: 0/4

Busy Slots: 1/4

Busy Authorized Slots: 0/4

To Be Fined Slots: 1/4

Fined Slots: 1/4

My Profile

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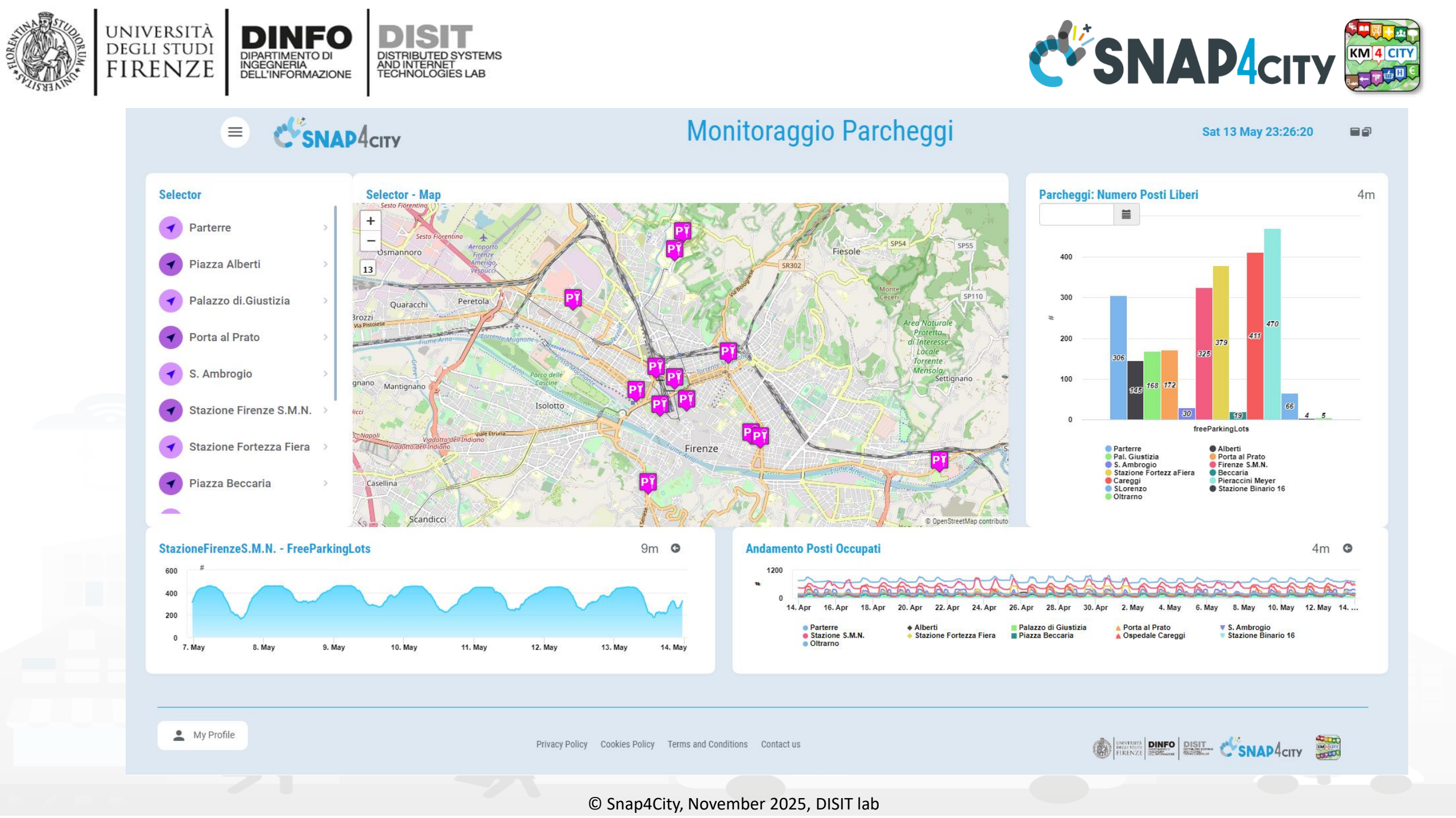

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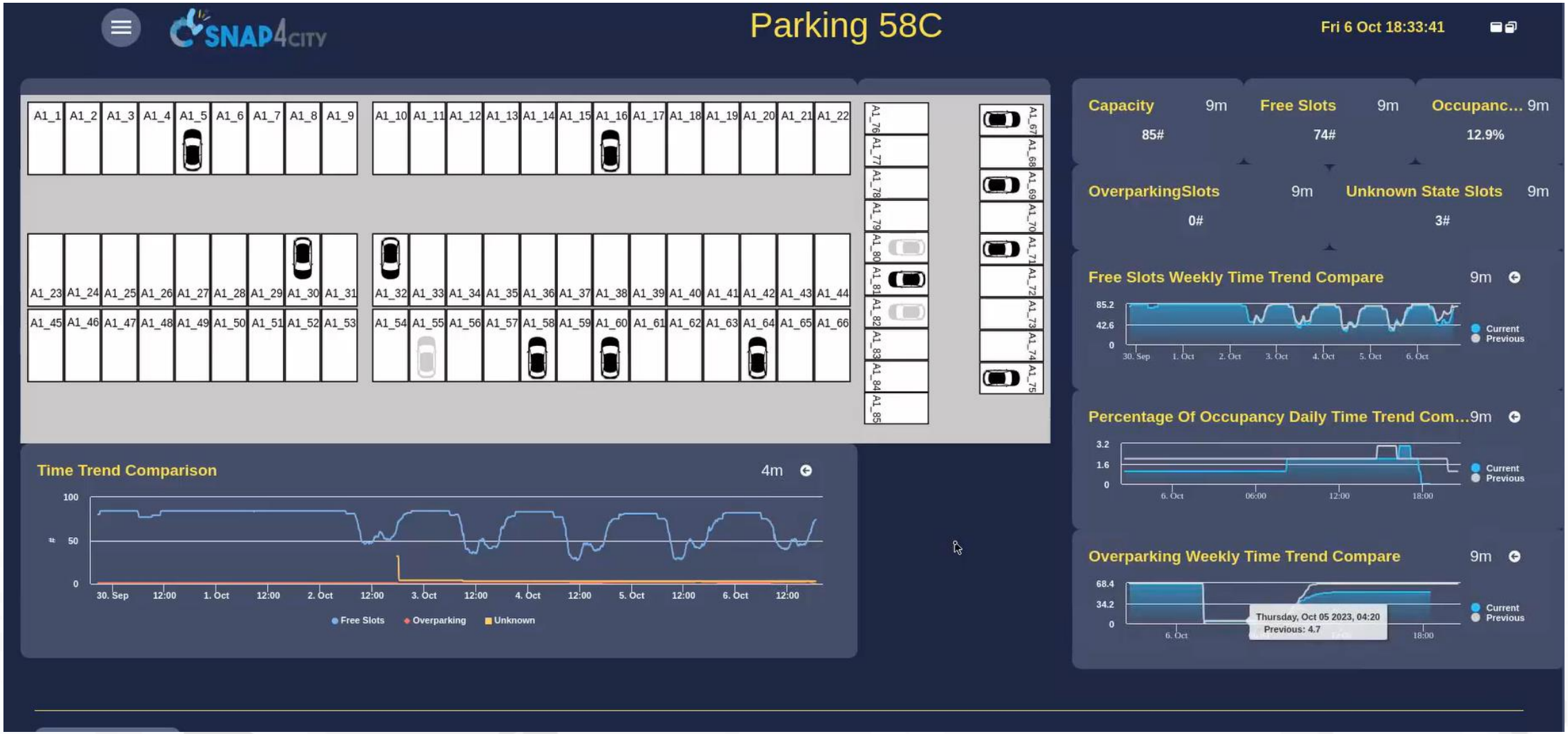
Snap4ISPRA Parking



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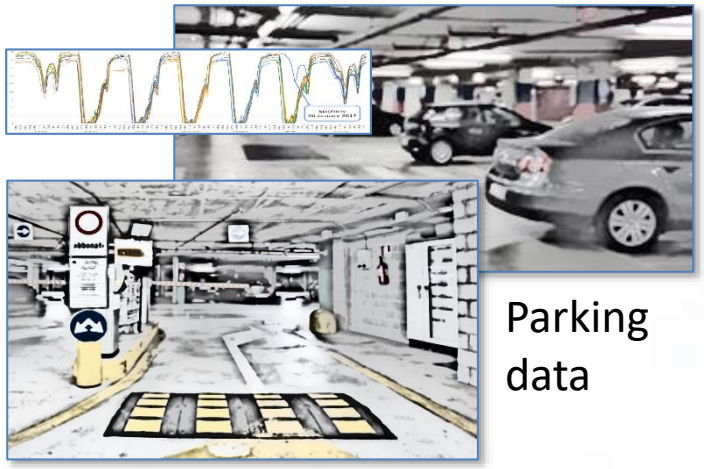
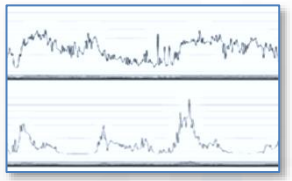
Predictions: Deep Learning AI to surely Park!

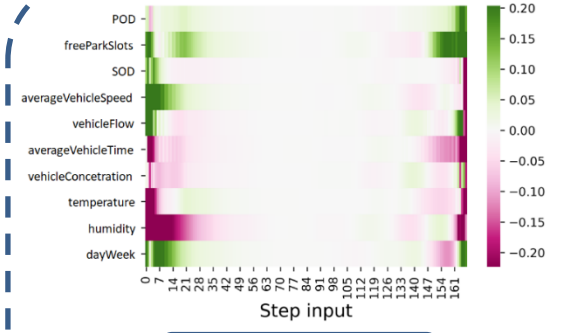


Parking data

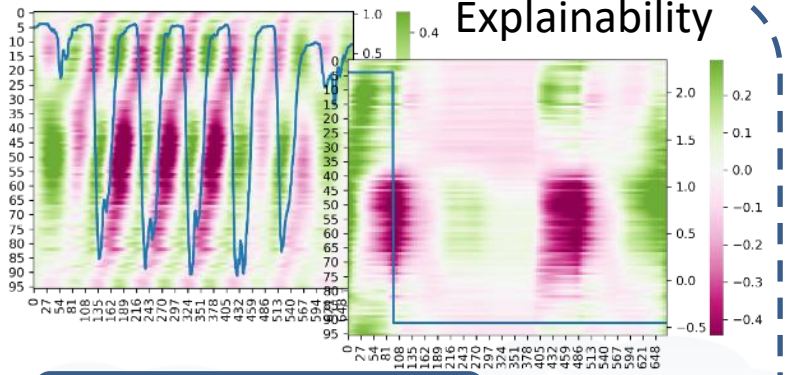
Traffic sensors data



Weather Features

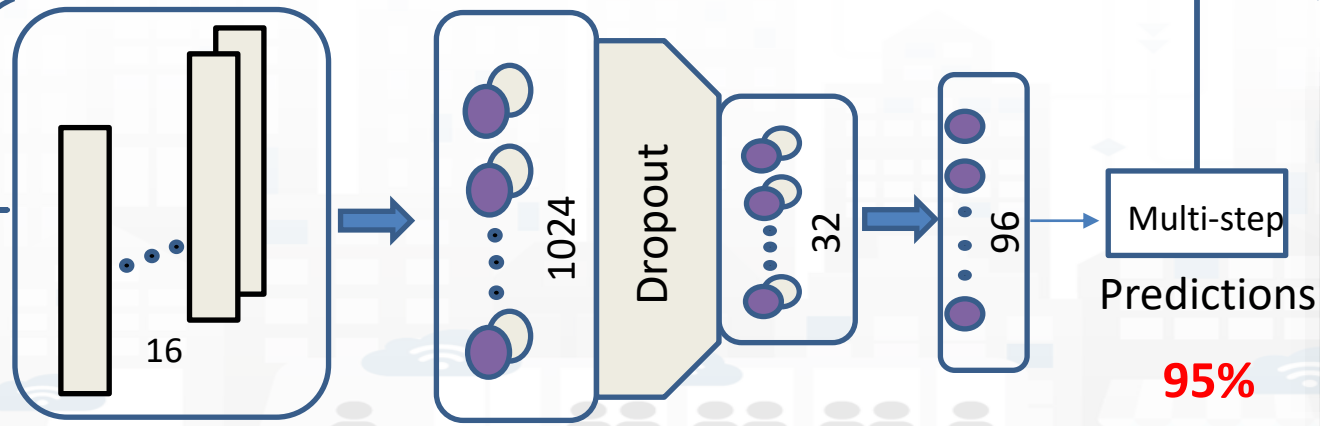


Explainability



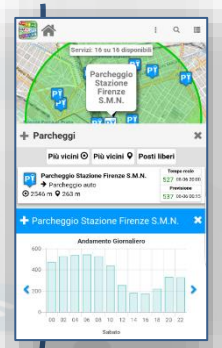
Gradient

Integrated Gradient



Multi-step Predictions

95%



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booklets

- Smart City

https://www.snap4city.org/download/video/DPL_SNAP4CITY.pdf

- Industry

https://www.snap4city.org/download/video/DPL_SNAP4INDUSTRY.pdf

- Artificial Intelligence

https://www.snap4city.org/download/video/DPL_SNAP4SOLU.pdf

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KM 4 CITY

Be smart in a SNAP!

SNAP4
Appliances and Dockers
Installations

CONTACT

DISIT Lab, DINFO: Department of Information Engineering
Università degli Studi di Firenze - School of Engineering

Via S. Marta, 3 - 50139 Firenze, ITALY
https://www.disit.org

www.snap4city.org

Email: snap4city@disit.org

Office: +39-055-2758-515 / 517
Cell: +39-335-566-86-74
Fax.: +39-055-2758570

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