

# NABLADOT

## INTRODUCTION TO THE COMPANY AND ITS SERVICES

Antonio Gomez (R&D manager)  
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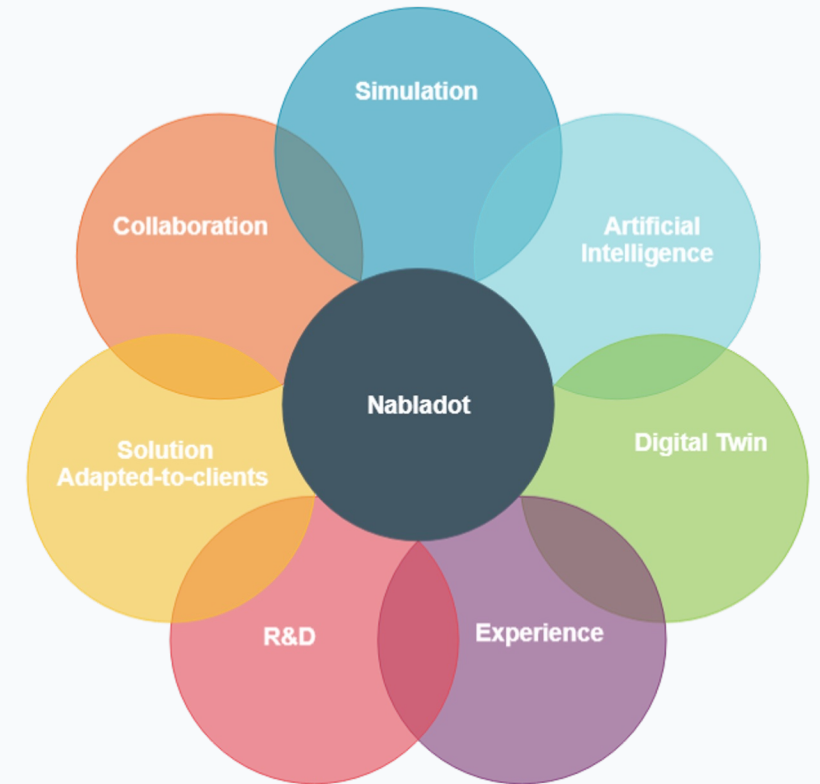
Established in 2010 by researchers specializing in **Computational Fluid Dynamics (CFD)** at the University of Zaragoza.

## Innovative Character

We actively engage in research and development projects at both national and European levels.

## Business Focus

We offer solutions tailored to the technical and economic needs of companies.



We offer a wide range of specialized services in simulation and digital innovation



Our experience covers multiple industrial sectors.

## ENERGY SECTOR

- HSGR (combined cycles)
- Biomass boilers
- Molten salts heat exchangers
- Rotary kilns

## HVAC & AIR QUALITY

- Logistic centers
- Metro station
- Tunnels
- Pharmacy clean rooms

## WATER SECTOR

- Hydraulic infrastructure
- UV water disinfection
- Aerobic reactors
- Anaerobic reactors

## FLUE GAS CLEANING

- Wet flue gas desulfurization
- NH3 stripping
- Regenerative thermal oxidizer
- Bag filter

## INDUSTRY

- Deoil tanks
- Valves
- Pneumatic transport
- Biomass rotary dryer

## HYDROGEN SECTOR

- Combustion
- Substitution of fossil fuels
- Injection in gas pipelines
- Leaks / Dispersion

## CHEMICAL SECTOR

- Pyrolysis reactor
- Fixed bed reactors
- Real-time energy audit

## SMART CITIES

- Urban wind in real time
- Integration BIM & Simulation
- Solar PV generation forecast

The quality of our work is certified by:



## Staff Training

50% of staff with a PhD in Fluid Mechanics.



## Innovative SME

Recognition by the Ministry of Science and Innovation (Spain).



PYME INNOVADORA  
Válido hasta el 26 de septiembre de 2026



## Innovative Company

Accreditation from the French Ministry of Higher Education, Research and Innovation.



## International Congresses

Active participation in the most relevant scientific events in the sector.



## Scientific Journals

Publications in prestigious international journals.

# NABLA DOT R&D COLLABORATION: RELEVANT PUBLIC FUNDED R&D PROJECTS



| Name                                                                                                                              | Year | Funding body                                             |
|-----------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------|
| CFD Desing of biomass boilers in the Cloud                                                                                        | 2016 | European Commission                                      |
| Cloud-based Micrositting of Small Wind Turbines                                                                                   | 2017 | European Commission                                      |
| Optimizing solar panel production                                                                                                 | 2018 | European Commission                                      |
| Digital Twin for Biomass Boilers                                                                                                  | 2020 | European Commission                                      |
| Development of reduced-order models and machine learning for high-resolution wind prediction                                      | 2020 | Spanish Ministry of Science, Innovation and Universities |
| Digital twin of high-efficiency heat recovery units                                                                               | 2021 | Spanish Ministry of Industry, Commerce and Tourism       |
| Digital Twin for Rotary Dryers                                                                                                    | 2021 | European Commission                                      |
| Electrification and digitization of the regenerative thermal oxidizer for the decarbonization of industry (e-RTO)                 | 2022 | Spanish Ministry of Industry, Commerce and Tourism       |
| Digital twin for the comprehensive management of ammonia emissions in pig farms.                                                  | 2022 | Spanish Ministry of Industry, Commerce and Tourism       |
| Digital Twin for cost-efficient treatments of wastewater in Anaerobic Reactors                                                    | 2023 | Eureka - Eurostars                                       |
| New technology to produce hydrogen from renewable energy sources based on AI with optimized costs for environmental applications. | 2023 | Eranet - Co-funded projects                              |
| HPC-based efficiency optimization of industrial fired preheaters                                                                  | 2024 | European Commission                                      |
| Intelligent Platform for Rapid Deployment of Scalable Digital Twins in Thermal Industrial Systems (iTWIN-TIS)                     | 2026 | Eureka - Eurostars                                       |

NABLADOT SERVICES

# NABLA DOT: SIMULATION AS A SERVICE

Advanced simulation on demand to solve engineering challenges

## What it includes



CFD & multiphysics studies



Real process and  
equipment modeling



Scenario and what-if analysis



Technical issue diagnosis



Design and operation optimization



Reports, visuals, and  
decision-ready KPIs

## Value for the client



Less technical uncertainty



Lower development cost and time



Fewer risks before implementation



Better efficiency and performance



Clear, actionable engineering insight

# NABLA DOT: SIMULATION AS SOFTWARE



Fast simulation software tailored for your design workflows

## What it includes



Reduced-Order Models (ROMs) derived from CFD or multiphysics simulations



Fast scenario evaluation without rerunning full simulations



Interactive software tools for engineering, operation or technical sales teams



Physics- and data-based predictive models



User-friendly dashboards, web apps or internal tools



Integration with sensors, databases, SCADA, IoT platforms or digital twins

## Value for the client



Turns simulation into a reusable software asset



Reduces calculation time from hours or days to seconds or minutes



Enables real-time or near-real-time decision-making



Makes advanced simulation accessible to non-expert users



Accelerates design, optimization and operational analysis



Provides a strong foundation for digital twins and predictive tools

Smart monitoring to transform operational data into reliable, actionable insight

## What it includes



### Operational data integration

Sensors, SCADA, PLCs, databases and IoT platforms



### Data reconciliation & validation

Noise reduction, consistency checks and estimation of unmeasured variables



### KPI dashboards

Real-time visualization of performance, efficiency, consumption and alarms



### Anomaly detection

Identification of deviations, abnormal behavior and performance losses



### Reference models

Comparison between actual operation and expected behavior



### Smart alerts & decision support

Prioritized insights to support operation and maintenance teams



### Historical analysis & trends

Root-cause analysis and early detection of recurring issues



### Connection with predictive models or digital twins

Integration with ROMs, physics-based models and optimization tools

## Value for the client



More reliable operational data



Better visibility of process performance



Faster detection and diagnosis of issues



Early warning of failures or efficiency losses



More stable and efficient operation



Lower downtime, energy losses and operating costs



Actionable insight for operation, maintenance and engineering teams

Connected virtual replicas that combine physics, data and real-time operation to understand, predict and optimize asset performance

## What it includes



Virtual model of the asset, equipment or process



Integration of physics-based models, ROMs and operational data



Connection with real-time data sources SCADA, PLCs, sensors, databases and IoT platforms



Continuous monitoring of KPIs and operating conditions



Scenario simulation and predictive analysis



Operation and maintenance optimization



Interactive dashboards and user-friendly interfaces



Continuous model update with new operational data

## Value for the client



Better understanding of real system behavior



Early detection of failures, deviations and performance losses



Lower operation and maintenance costs



Improved energy efficiency, productivity and stability



Reduced risk by testing decisions before implementation



Real-time or near-real-time decision support



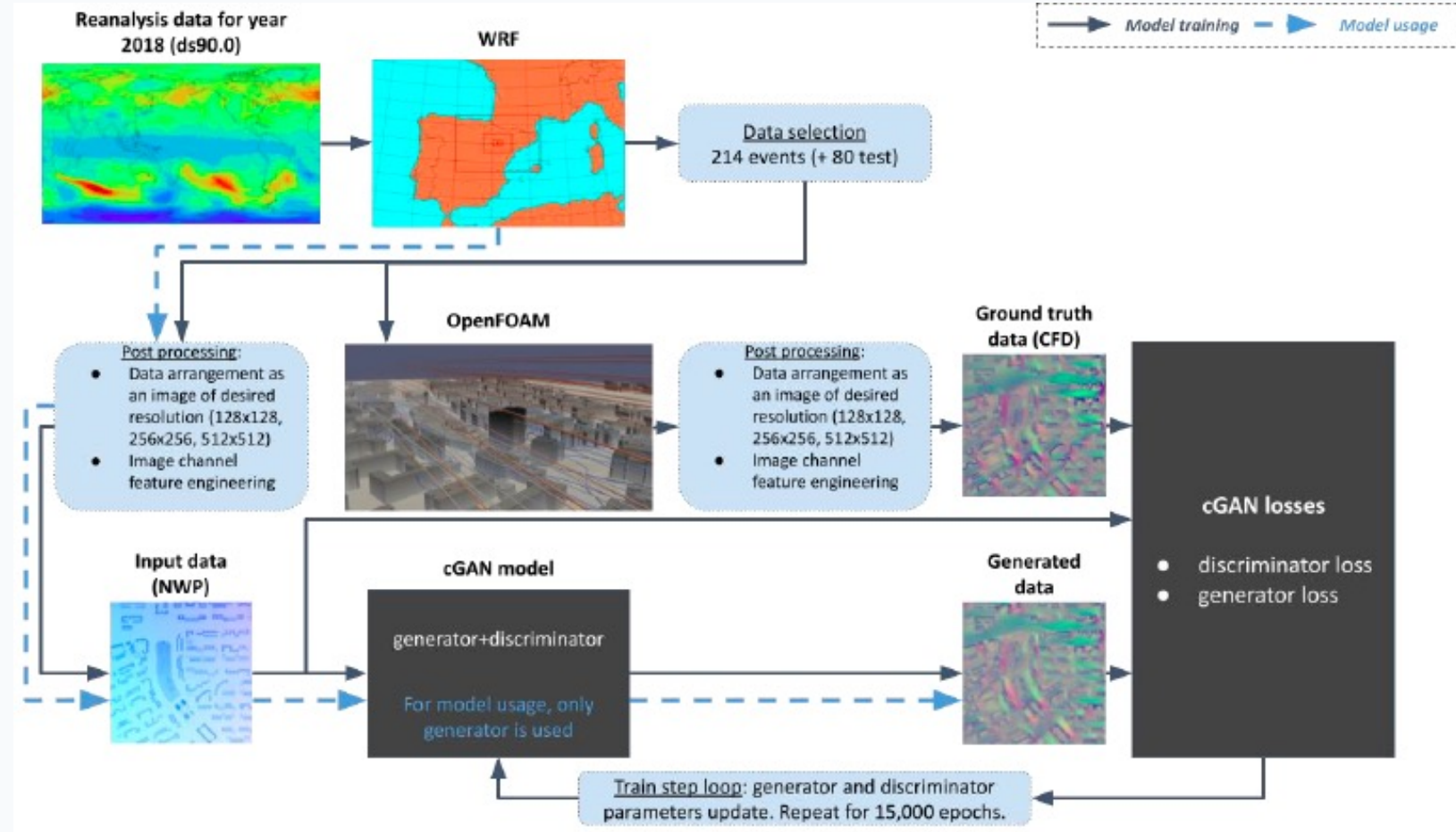
Strong foundation for predictive maintenance, optimization and advanced control

# NABLADOT — SMART CITIES

# URBAN WIND FORECAST IN REAL TIME

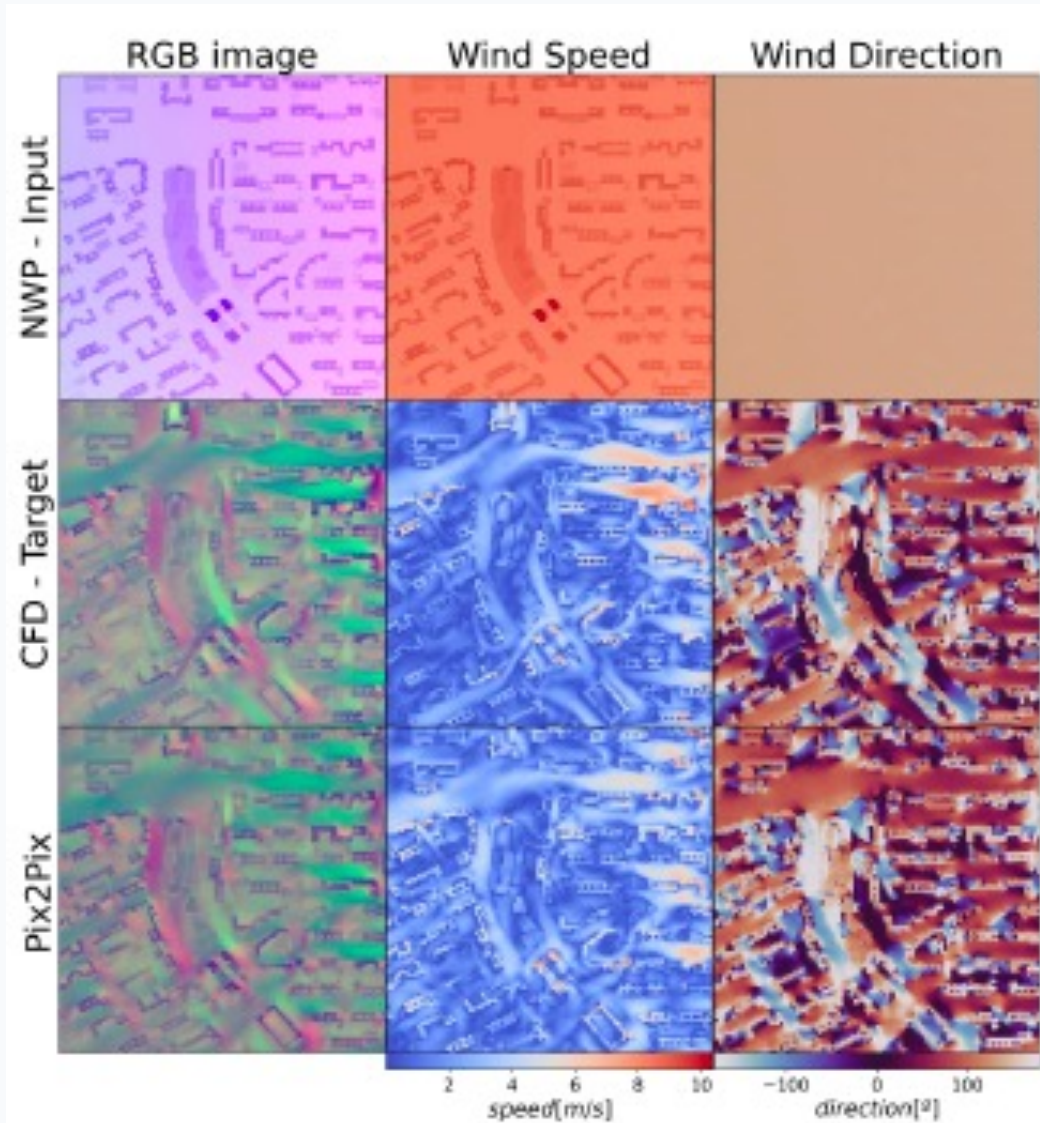
# NABLA DOT: URBAN WIND FORECAST IN REAL TIME

- + Surrogate Model Approach, using open-source tools: Numerical Weather Prediction (WRF), Computational Fluid Dynamics (OpenFoam) and machine learning techniques
- + Drastically reduces computation time: From 10-12 hours to just seconds
- + Maintains high accuracy with only minor deviations from full CFD simulations
- + Scalable: Capable of generating large datasets efficiently

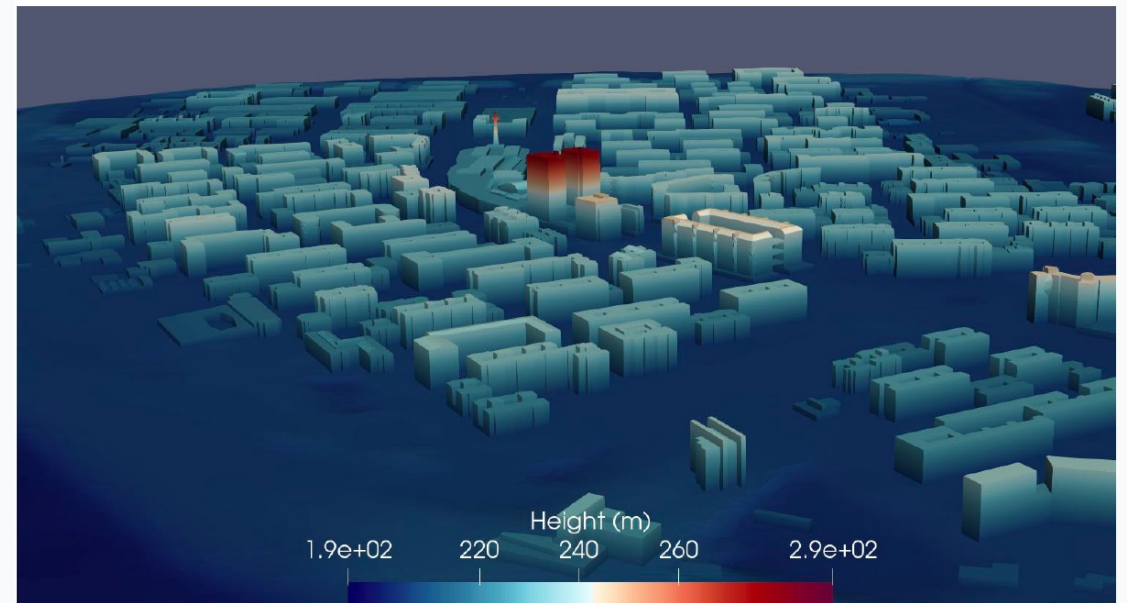


# NABLA DOT: EXAMPLES OF PROJECTS RELATED TO HEAT TRANSFER

+ Minor deviations from full CFD simulations

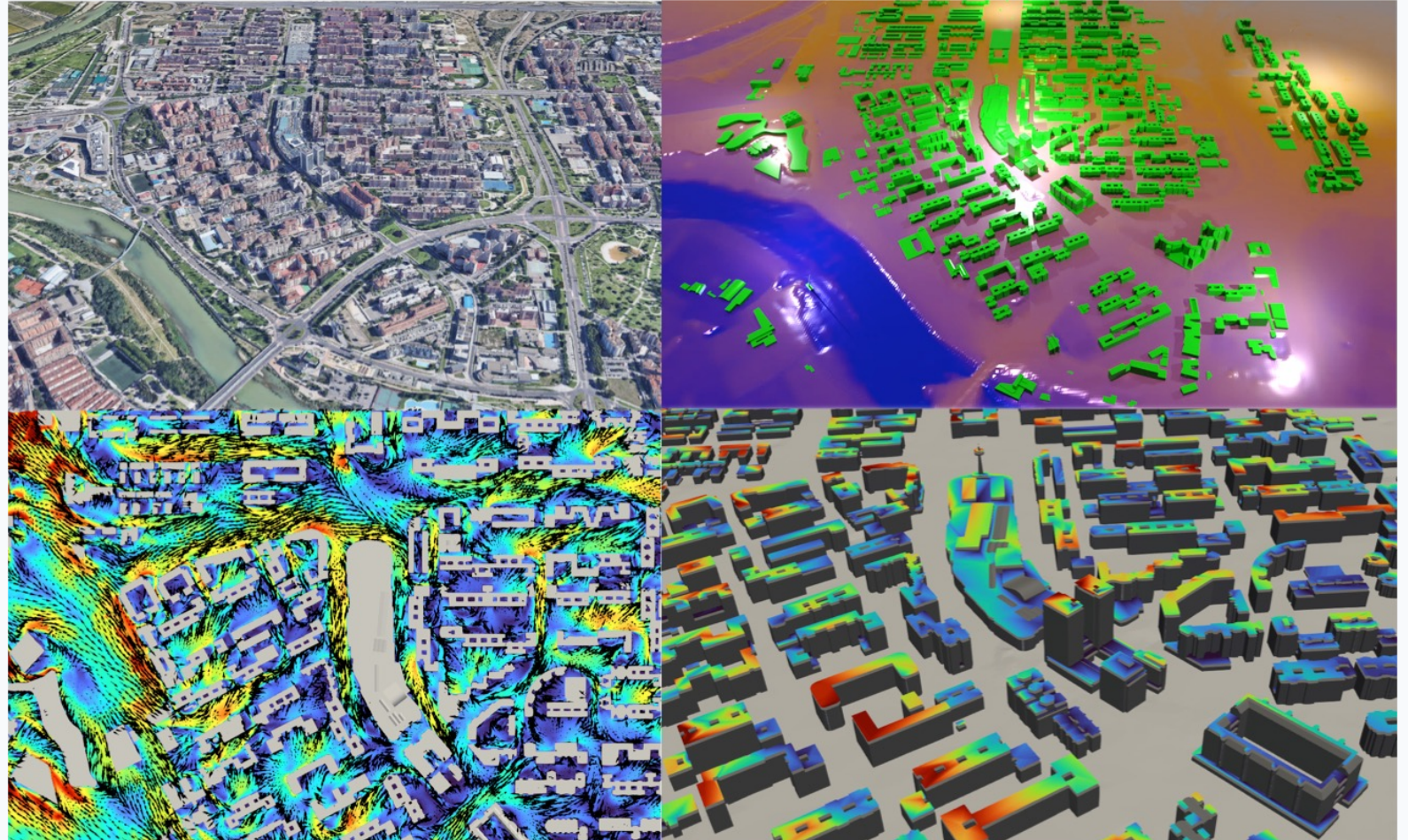


ZARAGOZA (ACTUR DISTRICT)



# NABLA DOT: URBAN WIND FORECAST IN REAL TIME

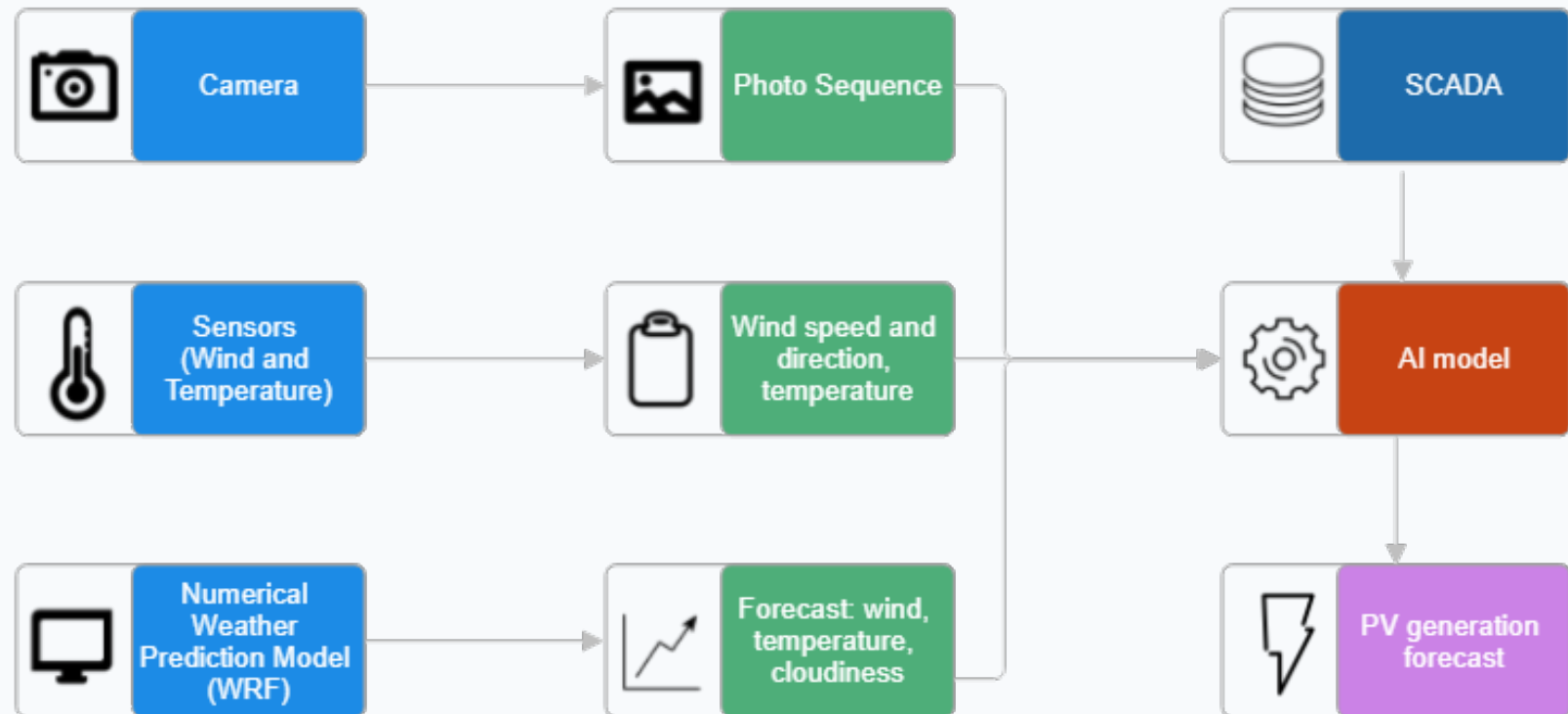
- + High resolution urban wind in real time
  - + Numerical Weather Prediction Models & CFD & AI
- + Multiple applications
  - + Small wind energy
  - + Air Quality
  - + Forecast of extreme events
  - + Pedestrian comfort
  - + PEDs design and operation



# SOLAR PV FORECAST

# NABLA DOT: SOLAR PV NOWCASTING

- + Short-term prediction of photovoltaic generation will combine:
  - + Photos of the sky (camera installation)
  - + Sensor data (temperature, wind speed and direction)
  - + Weather forecast simulations
  - + SCADA data (mainly power generation)
  - + Artificial intelligence models
  - + Edge-to-Cloud IoT Architecture



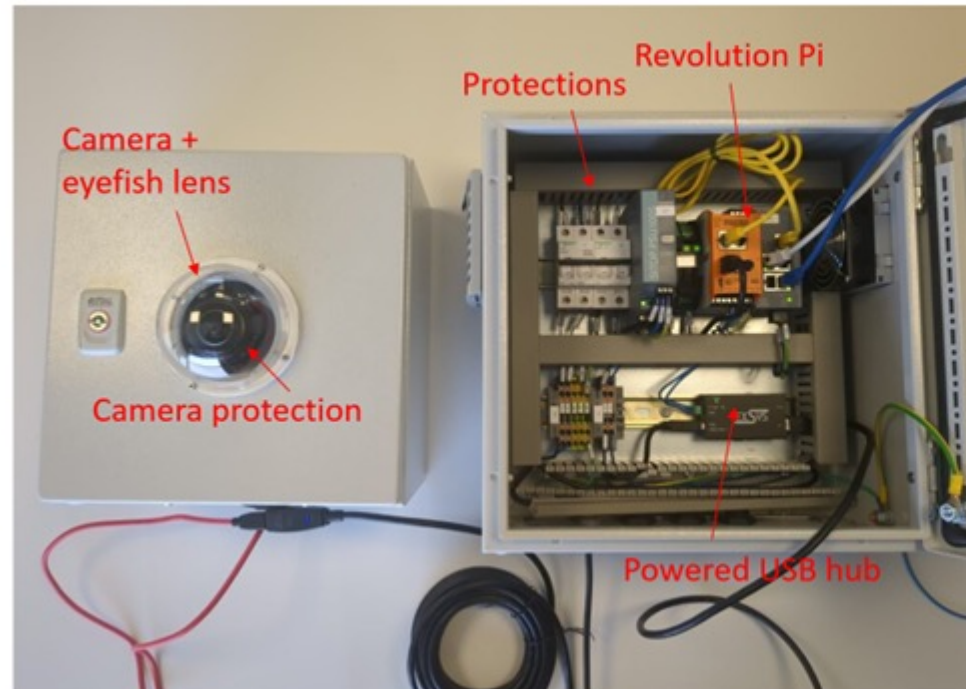
# NABLA DOT: SOLAR PV NOWCASTING

## + IoT architecture

- + Camera
- + Raspberry-Pi
- + Computer



Edge computer – Rev Pi (CONSUMER Cluster)



OTS Server (PROVIDER Server)

→ Net

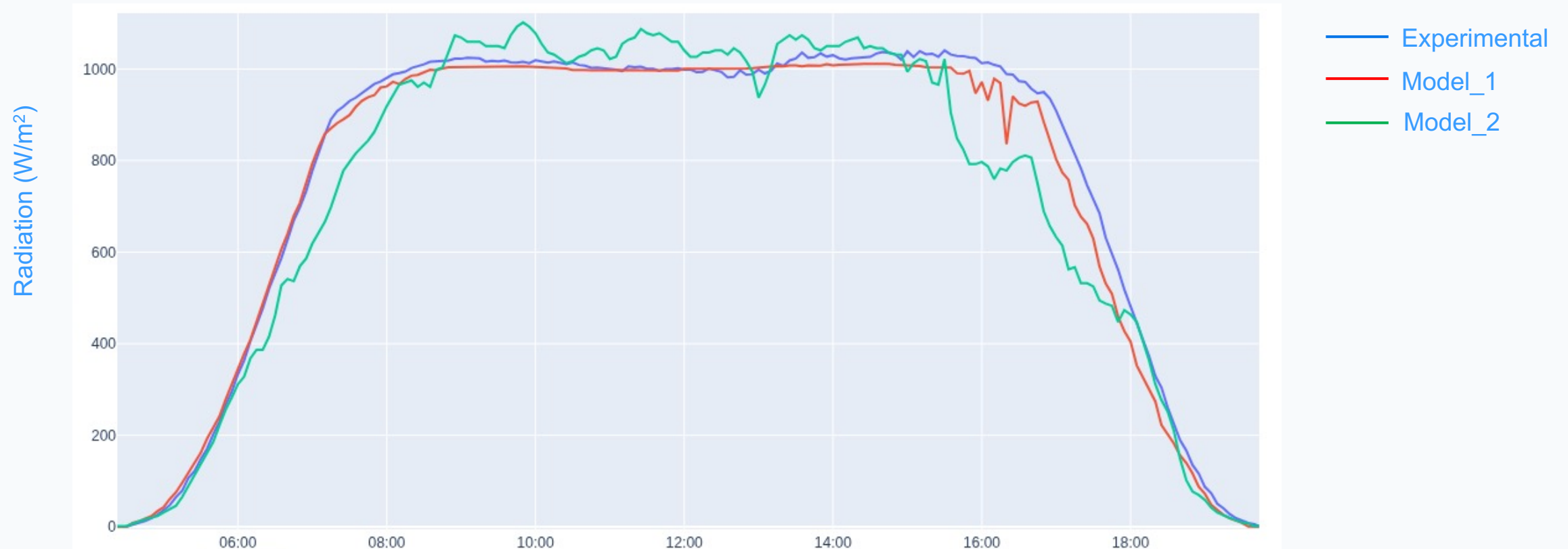


← Net



## + Applications

- + Management of solar PV generation, particularly when connected to batteries



# DISTRICT ENERGY MODELLING

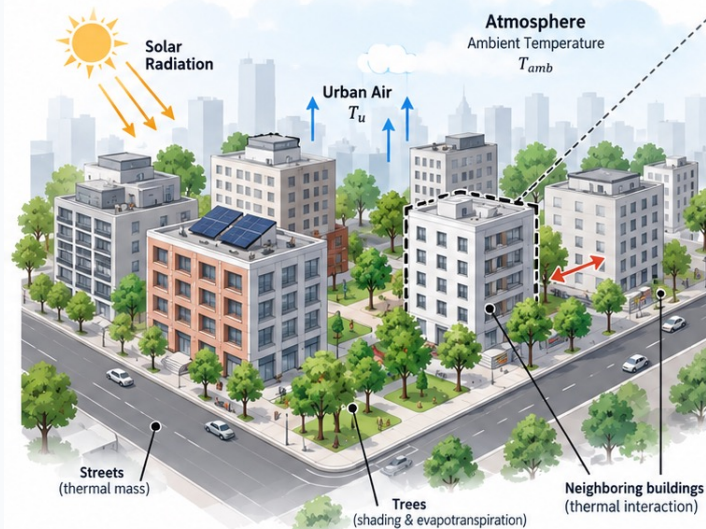
# NABLA<sup>DOT</sup>: DISTRICT ENERGY MODELLING

## + Applications

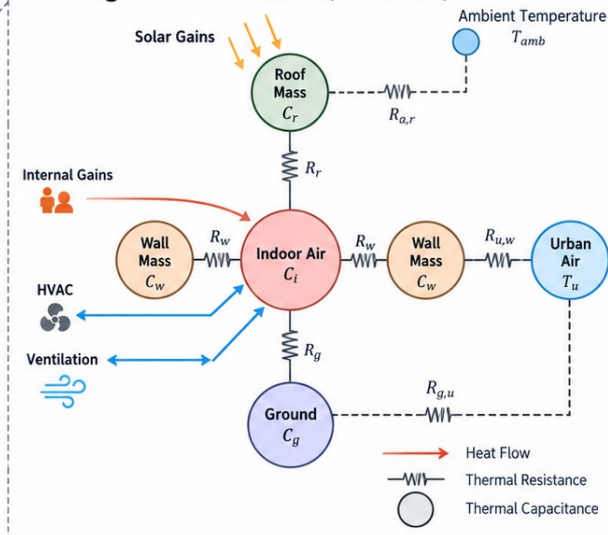
### + Impact assessment of the implementation of measures

#### Thermal Capacitance Network Model

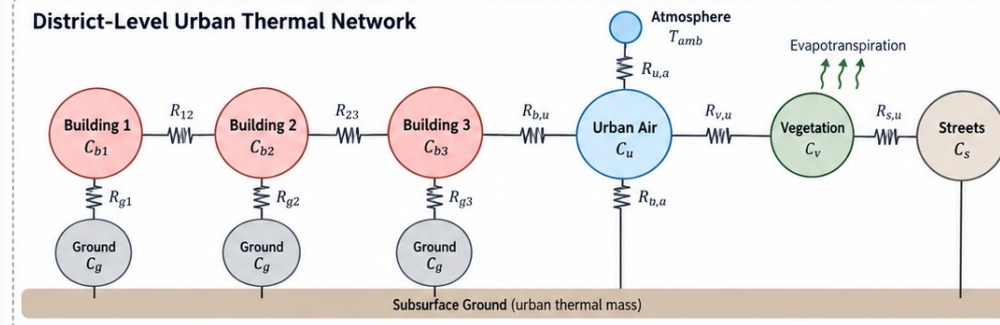
Buildings – Urban Environment – Atmosphere



#### Building Thermal Network (RC Model)



#### District-Level Urban Thermal Network



#### Key Processes

- Solar radiation (shortwave gains)
- Heat flow through walls/roof/ground
- Ventilation / infiltration
- HVAC (heating / cooling)
- Interaction between buildings
- Vegetation (shading & evapotranspiration)

From Buildings to Urban Climate



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