DAIMON

SIMULATING REALITY

Artificial Intelligence, Modelling and Big-Data for hi-tech applications

Francesco Mercuri
DAIMON Team - CNR-ISMN
Bologna, Italy

Consiglio Nazionale delle Ricerche

INNOVATION THROUGH DIGITALISATION AND DATA

Development, implementation and application of digitalisation strategies and data-driven frameworks - AI, big-data, virtual models - for energy, mobility, health, environment, sustainability

DAIMON

ABOUT **US**

Consiglio Nazionale delle **Ricerche**

We are a **multidisciplinary team** at the National Research Council (CNR, Consiglio Nazionale delle Ricerche), Bologna, Italy, with several years of experience in international and EU-funded research projects.

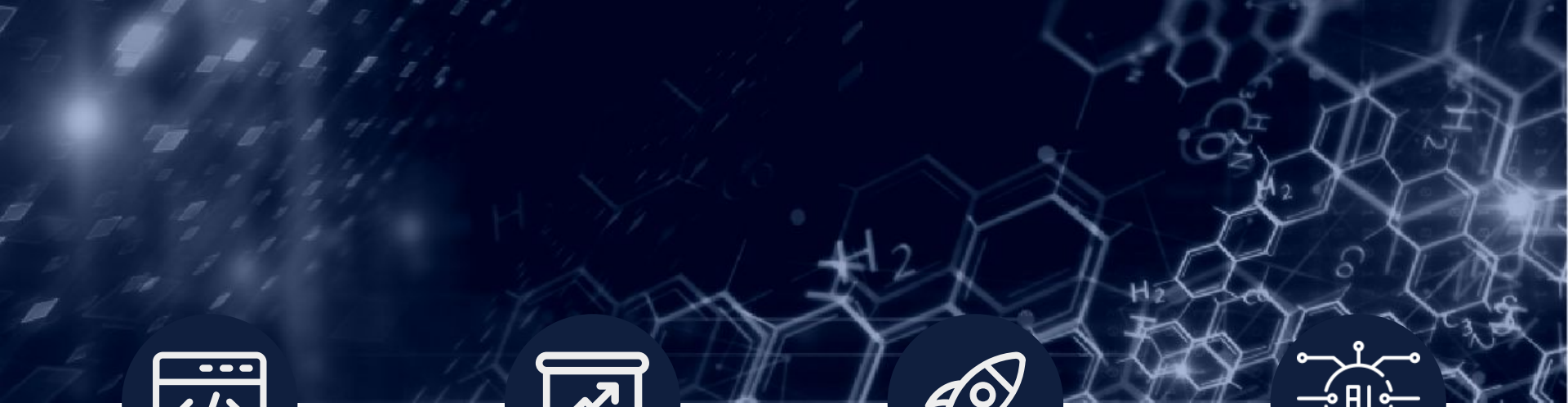
We **develop**, **implement** and **apply digitalisation, virtualization and data-driven frameworks for hi-tech applications**. We believe that digital and virtualization technologies, from **artificial intelligence and big-data** to **high-performance computing**, can boost innovation in the development of new systems and services for **smart and sustainable communities, green solutions, health, environment, manufacturing** and several others.

OUR **APPROACH**

Our activities aim at supporting **innovation strategies** for the development, implementation and uptake of **new solutions in industry, research and society** to address socio-economic challenges.

We develop **software frameworks** integrating a broad range of **digitalisation and data-driven approaches** (**multiscale and physical simulations**, **artificial intelligence**, **big-data**, **high-performance computing, cloud computing, digital twins**) to assist innovation in real-use application scenarios. Our approach is particularly relevant for the development of digitalised frameworks in complex environments.

The key feature of our approach is **interdisciplinarity**, combining different competences in the definition of new virtualization paradigms, from physical **modelling** to **data-science**.



Data-enabled frameworks

Development and deployment of **dedicated digital frameworks** based on data, fully integrated within the **specific application domain** and use-case

Application to key technologies

Digital and data-driven innovation for hi-tech applications, including **smart communities, energy, mobility and transport, sustainable technologies**, and others

High-performance computing

Specialized **hardware and software infrastructures and technologies**, including high-end cloud, and data storage systems, and advanced **software and simulation packages**

Machine learning, modelling and AI

Application of **data-driven** technologies, **deep-learning**, LLMs, GenAI and **modelling** as to develop predictive models and automated systems

DATA-DRIVEN INNOVATION **WITH AI AND MODELLING**

From real use-cases to digital models

- Development and application of **multi-level and multi-scale modelling of complex systems** (from materials for batteries and storage to microsimulation of traffic and urban environments, energy grids management, etc.).
- Leveraging on high-level and efficient implementations of **Artificial Intelligence** and **big-data technologies** integrated with **high-performance and high-throughput computing** infrastructures.
- Application of **data-driven** technologies to the development of predictive models and analytics. **Machine learning** and **neural networks** to optimize the design and development of complex systems and processes.
- Development of methods and tools for the **automatic elaboration and analysis** of integrated data, originating from different sources. Digital representation of the information and knowledge (semantic technologies) for the specific field of application considered, through advanced technologies for the optimization of automation processes.
- Development of simulation and virtualization frameworks based on **high-throughput and data-driven computational technologies**, integrating virtual and physical models of complex systems. Digital twins of complex environments.
- Development of advanced frameworks in **specific application domains**, such as **smart communities**, integrating high-end data-driven technologies in the context of the specific application.

Cooperation proposal and framework

ARTIFICIAL INTELLIGENCE, **BIG-DATA**, **MULTI-SCALE MODELLING** AND **DIGITALIZATION** FOR **SMART COMMUNITIES** APPLICATIONS

- Main expertise in the field:
  - **Multi-level physical and data-driven simulations** (multi-scale models of urban environments, batteries, BMS, energy management, traffic microsimulations, logistics and transportation, etc.; energy management systems, components for smart buildings and infrastructures; agent-based modelling)
  - Application of **data-driven technologies and infrastructures** (semantic technologies and knowledge integration, AI, machine learning, big-data, HPC, digital twins, decision support systems, full software stacks) for specific applications (advanced data analytics for policy making, urban planning, community management, energy production/demand model, environmental impacts, etc.)
  - Integration technologies (IoT-based system integration, data collection and monitoring; Digital Twins for smart communities)
  - From development to deployment (microservices, cloud services)
- Potential application fields in the development of **integrated digital frameworks for smart communities** enabled by high-performance data-driven infrastructures.

POSSIBLE **PROJECT COOPERATION** FIELDS

SMART MOBILITY AND LOGISTICS
EFFICIENT, SUSTAINABLE AND INCLUSIVE ENERGY
CIRCULAR ECONOMY
CLIMATE AND ENVIRONMENT
ICT AND DIGITALISATION
RESILIENCE
SMART BUILDING
HEALTH
SMART MANUFACTURING FOR URBAN SUSTAINABILITY

SEVERAL **CLUSTERS…**

DAIMON

SIMULATING REALITY

DAIMON Team - CNR/ISMN

Via P. Gobetti 101, 40129 Bologna, Italy

Francesco Mercuri

Team Coordinator

francesco.mercuri@cnr.it

+39 348 033 2552

www.daimoners.eu

daimoners@gmail.com

Follow us!

LinkedIn/Daimoners

Consiglio Nazionale delle Ricerche

Powered by SensoLato

www.sensolato.com