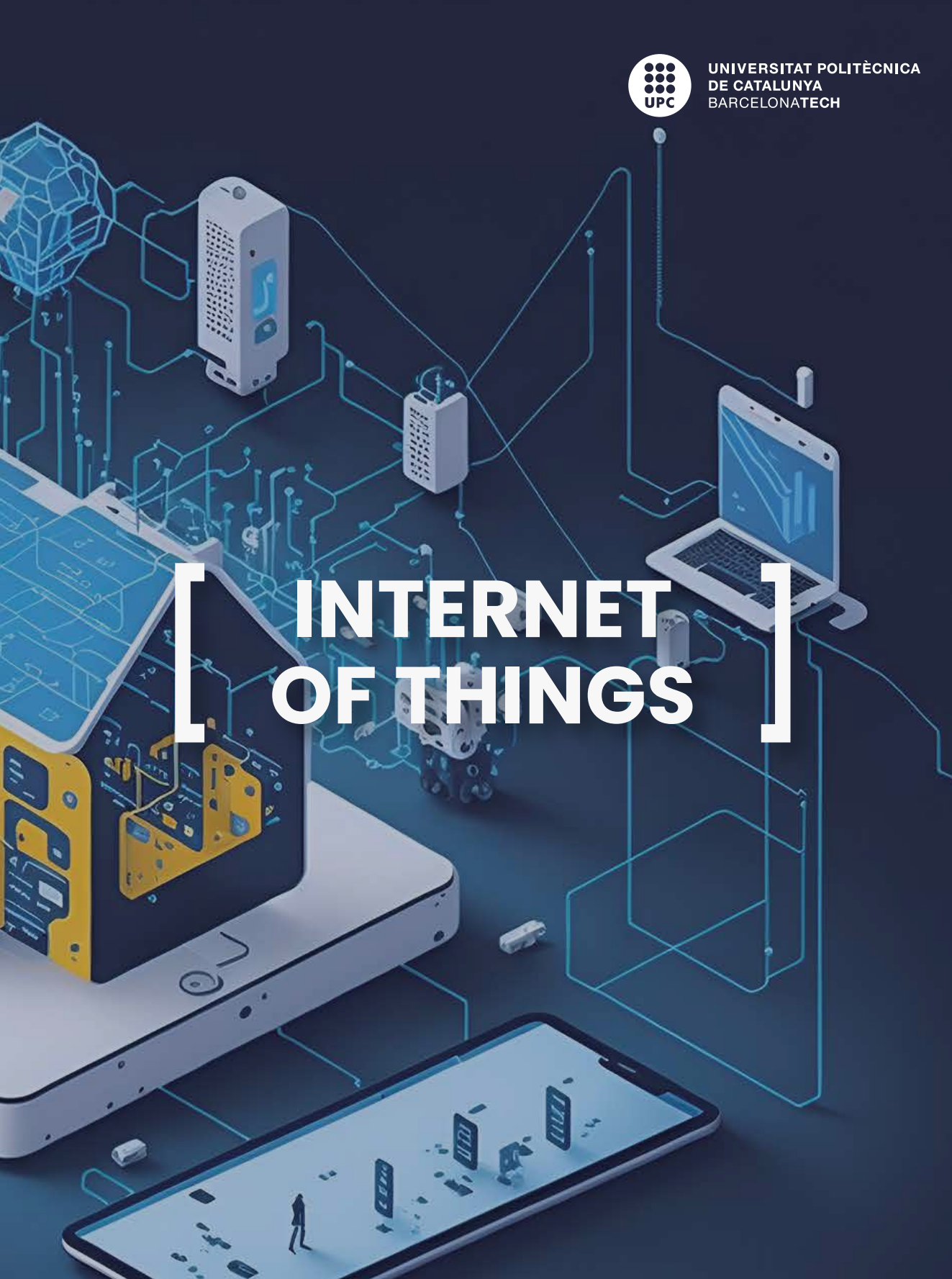
UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH



[INTERNET OF THINGS]

RESEARCH, DEVELOPMENT & INNOVATION AT THE UNIVERSITAT POLITÈCNICA DE CATALUNYA - BARCELONATECH (UPC)

The Universitat Politècnica de Catalunya - BarcelonaTech (UPC) specialises in the fields of engineering, architecture, science, and technology, including technologies applied to the Internet of Things (IoT). In this field, the main focus areas are:

- Digital Twins
- Security and cybersecurity
- Industry 4.0
- Big Data Analytics
- Smart Farming
- Robotic Process Automation
- Edge & Cloud Computing
- Mobility
- Smart Building & BIM
- Energy efficiency
- eHealth

As a result of the UPC's recognised research track record in its areas of specialisation, we can offer a wide range of services:

- R&D technology transfer projects
- Consortia for national and Horizon Europe projects
- Patents
- Technology assessment
- Specialised facilities

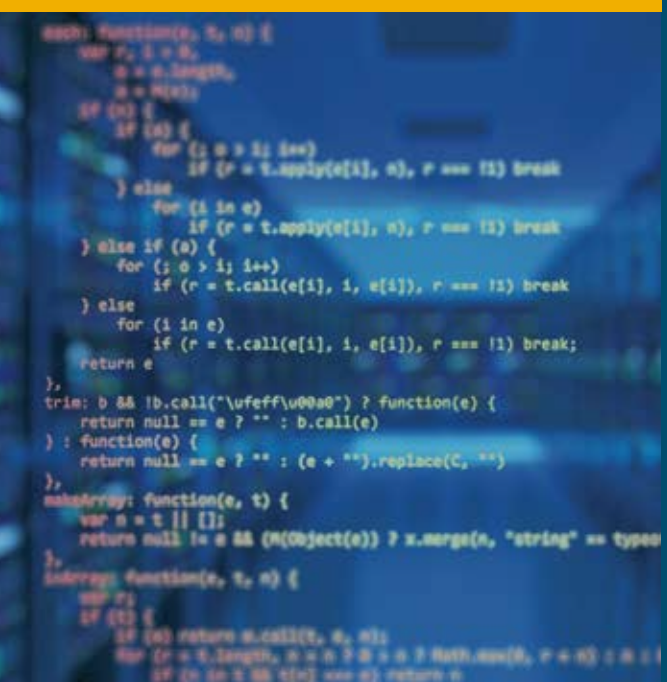
The UPC is a leading university in Spain in volume of research and technology transfer to companies, and has become one of the major hubs of knowledge in Southern Europe.

DIGITAL TWINS

- Digital twins applied to construction, mobility, the blue economy, agriculture, among others, to optimize and increase productivity, reduce costs, and provide safe working conditions.
- Open-source software to produce digital twins for edge computing.
- AI and machine learning-based platforms for the generation of digital twins.

SECURITY AND CYBERSECURITY

- Real-time response and mitigation of the effects of cyberattacks across ICT supply chains.
- Algorithms for detecting physical and cyber attacks, and response mechanisms.
- More functional and more secure integrated circuits for cybersecurity and supercomputing.
- Monitoring of intelligent fire detection systems.
- Perception systems: vision to control and guide robots.



INDUSTRY 4.0

- Advanced production using automated technologies such as adaptive models, ATP/AFP, 3D printing, profiling processes, hot stamping.
- Integration of drones with 4G and 5G mobile technologies.
- Smart management of industrial plants and infrastructure.
- Predictive maintenance of machines based on IoT platforms.
- Industrial automation and communication.
- Energy savings through intelligent monitoring.
- Flexible manufacturing processes.
- Advanced tools for decision-making for Zero Defects Manufacturing (ZDM).
- Digital control with microprocessors and DSP.
- Computer vision.
- Human-machine communication interfaces (dialog systems).

TECNOLOGÍAS

TECHNOLOGICAL CAPABILITIES

BIG DATA ANALYTICS

- Data analysis techniques to obtain high-precision information using low-cost sensors.
- Ability to connect and transform data coming from the Internet of Things (IoT) or the Internet of People (IoP) into reliable and usable information.
- Efficient and adaptable management of large amounts of data in network devices and infrastructures.
- Communication protocols with limited latency, high reliability and energy efficiency.
- LoRa Mesher.
- Alert management system with different input channels.
- Decentralized computing and network systems infrastructures based on cooperative resource coordination models.
- Adaptable, resilient and scalable software systems that exploit edge networks and resources for communication and computing infrastructures (cloud).

SMART FARMING

- Agriculture 4.0: image capture, image processing and telecommunications systems based on data science.
- Application of digital twins for irrigated agriculture.
- Automation and mechanization of production processes in smart agriculture.
- Development of measurement and data communication systems with lower energy consumption.
- Remote sensing for outdoor crops using drones and satellites.
- Productivity improvement with mobile robots.
- Design of agricultural machinery and sensorized equipment.
- Livestock monitoring and disease detection using biometric sensors.

ROBOTIC PROCESS AUTOMATION

- Advanced robotic manipulation systems.
- Collaborative robots, human-machine interfaces (HMI).
- Automation of complex processes using artificial intelligence and machine learning to improve robot decision-making.
- Intelligent robotic exoskeletons.
- Voice recognition and response systems allowing verbal interaction and command of robots.

EDGE & CLOUD COMPUTING

- Efficiency and optimization of artificial intelligence systems.
- Efficient artificial intelligence for cloud computing.
- Digital energy transition based on the exchange of intelligence and data.

MOBILITY

- Autonomous delivery devices for last-mile operations.
- Drones for large-scale use.
- IoT platforms for autonomous cars.
- Multimodal image sensors for autonomous vehicles.
- Interconnected and safe mobility using remote sensing and optical communication systems, RADAR and LiDAR sensors.
- Autonomous underwater vehicles with sensors to detect and map the environment.
- Passenger demand prediction and social trends based on learning systems and decision-making.
- New mobility services for public transport.

SMART BUILDING & BIM

- Advanced optimization to monitor errors in smart infrastructures.
- IoT platforms with deep learning applied to smart homes.
- Modular sensors to identify bridge structures under quasi-static loads.
- 3D printing of insulating compounds useful in construction.
- Energy information in digital administration.

ENERGY EFFICIENCY

- Internet architectures with open software and hardware protocols aimed at energy efficiency.
- Smart, modular and scalable batteries using big data analysis, artificial intelligence, and IoT.
- Energy management in smart factories.
- Light energy harvesting for autonomous sensors.

eHEALTH

- Surgical robots.
- Virtual reality and augmented reality for telerehabilitation.
- Low-cost devices for remote cardiovascular monitoring.
- Image processing for diagnosing injuries.
- Differential diagnosis in patients with Parkinson's disease using biomechanical tests.
- Advanced non-intrusive remote health assessment.
- IoT medical devices and smart devices (wearables).
- Biophotonics.
- Biosensors.
- Human body motion modeling.
- Instrumentation. Biomedical signal processing.

CIT UPC
Ed. K2M (Office106)
C/Jordi Girona 1-3
08034 Barcelona - Spain
Tel. +34 93 405 44 03
info.cit@upc.edu

www.cit.upc.edu

EUROPEAN UNION
European Regional Development Fund

Generalitat de Catalunya
Departament de Recerca i Universitats
Secretaria General