CIT UPC

TECHNOLOGY CENTER

UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH

TECHNOLOGY MADE REAL

ANNUAL REPORT 2018.

ANNUAL REPORT **2018**

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SUMMARY

1 LETTER FROM THE CHAIRMAN

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Once again, the annual report by CIT UPC underlines some of the knowledge transfer activities that are carried out in our research centres and that showcase UPC technology.

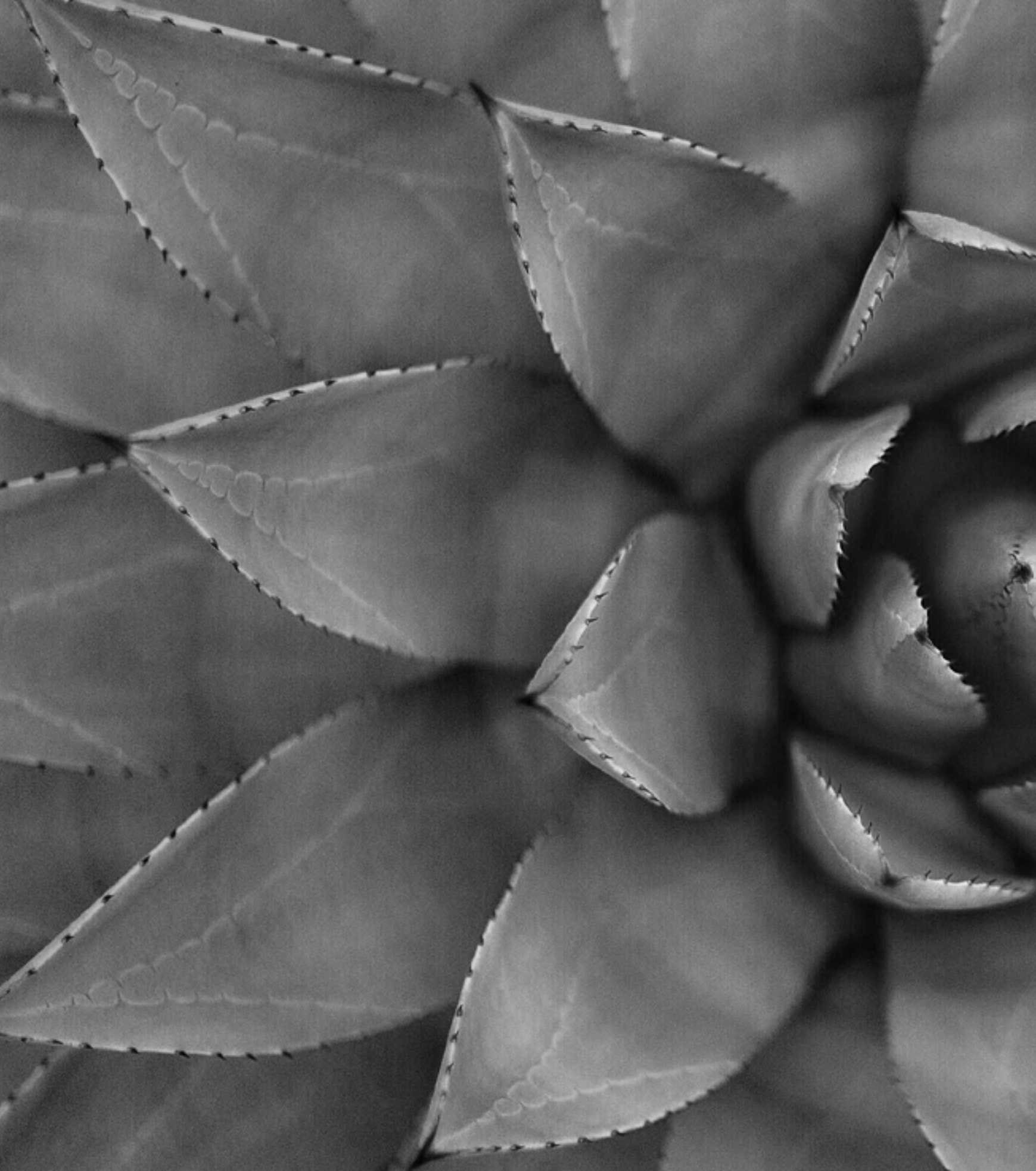
Our university's transfer model has been strengthened ever since the Governing Council entrusted CIT UPC in 2018 with managing promotion, sales, marketing and communication services for the technologies developed by all our research centres. This is a new model for a new era, in which the University needs to go one step further in highlighting what we do and how this connects with the production sector. The UPC thus honours its commitment to knowledge transfer once again by seeking to have an impact on society and to improve the lives of people.

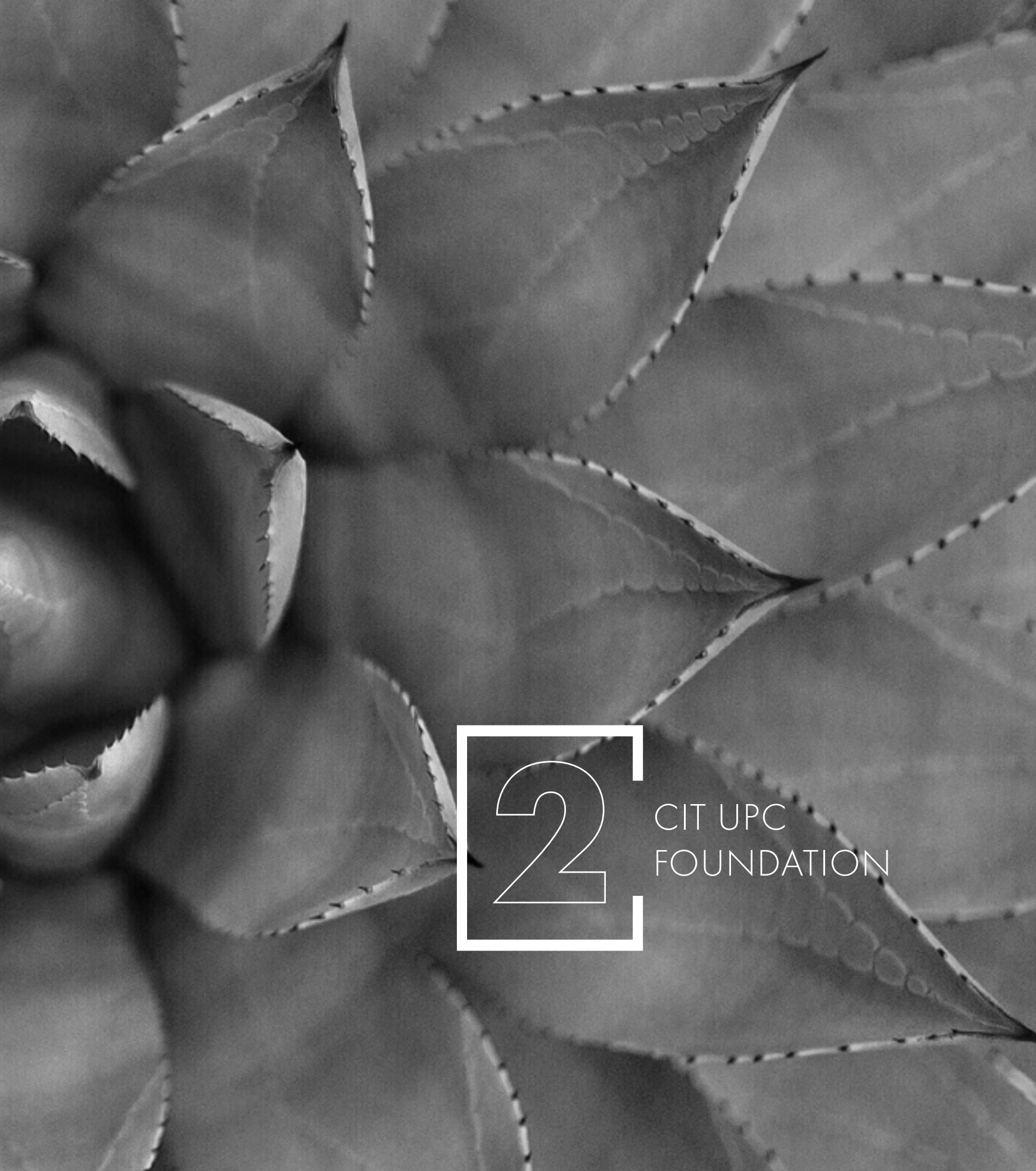
A university like ours, that is young, dynamic and driven by a community of first-class teachers, students and technical staff, must stress the development of technologies that help to build a more competitive country through innovation—and not just more competitive, but also fairer. Creating opportunities and benefits for companies and employees is also one of our missions, and we should never give up on it.

Research and development, the results of which give rise to innovation, also have a direct impact on the education of our undergraduate and postgraduate students. We give them the chance to engage in these processes, which enhance their learning experience and bring them into contact with companies and external organisations.

Thus, we close the virtuous circle that connects teaching, research and innovation and that gives meaning to our university and our work.

Prof. Francesc Torres
Rector of the UPC and chairman of CIT UPC





2 CIT UPC FOUNDATION

THE UPC AND TECHNOLOGY TRANSFER

The UPC is one of the leading technology universities in southern Europe in the fields of engineering, architecture and sciences. Just after its foundation, the UPC made an institutional commitment to technology transfer and subsequently to spin-offs and patents. As a result, the UPC made a strategic commitment to founding the UPC Technology Centre, following in the footsteps of the world's top technical universities.

This commitment over time explains why the UPC is a leading university in Spain in the area of innovation and technology development and the top technical university in Spain according to the World University Rankings 2020.

The research model followed by the UPC is that of creating science-based technology, so that knowledge-based technological solutions can be provided for the production system.

CIT UPC'S OBJECTIVES

CIT UPC is **a foundation** that brings together **UPC research and technology transfer centres.** The centres carry out excellent research and, as a result, they are highly active in technology transfer to companies and seek to provide technology solutions.

UPC research centres' capacity for technology transfer is not only due to a strong stock of technology and practical experience; they can also provide innovative solutions based on scientific output and frontier research.

Building on this situation and these strengths, the UPC aims to contribute to the economic and social growth of Catalonia through knowledge transfer, which **is the bridge between science in general and companies' technology needs.** Given the available critical mass, and the capacity and range of innovative knowledge provided by CIT UPC research centres, we can provide **solutions to complex technical problems that require a cross-cutting approach.**

We are focused on becoming a cornerstone of southern European technology centres. CIT UPC is now the main technology centre in Catalonia in terms of research, technology and knowledge transfer, that is, in terms of **innovation.**

A technology centre that can do this job is clearly one that can provide the greatest added value and help to increase the competitiveness of the companies that put their trust in it. We are committed to bringing more and better technology to the market by transforming knowledge into marketable technologies.

MISSION, VISION AND VALUES

MISSION

CIT UPC helps to build business competitiveness through the generation, development and application of exceptional technological knowledge to business. This process is carried out in the UPC's research and development centres.

CIT UPC furthers the goals of the UPC by fostering research and innovation, while helping to bring new developments to the wider world and providing scientific and technological services to companies.

CIT UPC promotes the stimulation, identification, transfer and valorisation of technologies and research results generated by its member centres for companies, to contribute to increasing the competitiveness of the Catalan business sector, in particular, and of Spanish and international enterprises in a global environment.

VISION

CIT UPC aims to become a global leader in research excellence, technology transfer and innovation and in technological areas that have an impact on companies and economic growth.

VALUES

CIT UPC bases its activity on **efficiency and sustainability** in order to bolster **its credibility and trustworthiness,** while at the same time **meeting the needs and expectations of its various stakeholders** and complying with current regulations, in particular those related to environmental protection and occupational health and safety.

CIT UPC is dedicated to collaborating and cooperating with third parties and to actively participating, by means of the most appropriate legal model in each case, in initiatives that further the fulfilment of its mission.

The collective values of CIT UPC include the following:

- Commitment to our clients.
- Participation and cooperation.
- Independence, prestige and social outreach.
- Sustainable development.
- Commitment to health and safety.

ORGANISATION

BOARD

CHAIRMAIN	Dr. Francesc Torres Rector of the Universitat Politècnica de Catalunya (UPC)
DEPUTY PRESIDENT	Sr. Ramon Carbonell Chair of the Board of Trustees of the Universitat Politècnica de Catalunya (UPC)
SECRETARY (nonboard member)	Sra. Anna Serra Secretary of the Board of Trustees ofthe UPC
BOARD MEMBERS	Dr. Jordi Berenguer Vice-rector for Knowledge Transfer and Innovation
	Dr. Santiago Silvestre Vice-rector for Assessment and Quality
	Dr. Gabriel Bugeda Vice-rector for Science Policy
	Sr. Xavier Massó Pérez General Manager
	Dr. Santiago Royo Director of CD6 UPC
	Sr. David Marin Member of the Board of Trustees of the UPC and Inaccés CEO
	Sr. Carles Sumarroca Appointed by the Board of Trustees of the UPC, COMSA Corporación de Infraestructuras

INDUSTRIAL BOARD

The Industrial Board facilitates the active participation of 13 leading technology companies that help to guide university business strategy to promote business innovation.

3 KEY FIGURES

3 KEY FIGURES

2018 UPC TECHNOLOGY RESEARCH AND TRANSFER FIGURES

57,7M€
revenue

- 62 % competitive
- 38 % not competitive

654
New research agreements and projects

206
research groups

31
spin-offs with UPC funding

15
registered patents

14
companies created

- 9 spin-offs
- 5 start-ups

2.240
research staff

62 %
doctors

1.492
administrative and service staff (PAS)

2.778
teaching and research staff (PDI)

14
international networks

4.480
students involved in education cooperation agreements

INDICATORS OF SCIENTIFIC AND RESEARCH ACTIVITY

157
awards

19
industrial and
intellectual property

259
theses supervised
at the UPC

1.563
papers in
journals JCR

439
other papers
in journals

2.376
scientific
publications

300
book chapters

74
books

29
architecture
competitions

35
organisation of conferences
and exhibitions

66
book publishing


4
PROJECTS

SMART MONITORING OF METALLURGY PLANTS IN THE CELSA GROUP

The Motion Control and Industrial Applications Center (MCIA UPC), in collaboration with IThinkUPC, has developed a smart monitoring system for metallurgy plants in the CELSA Group based on an industrial internet of things (IIoT) platform.

An Industry 4.0 programme has been developed on NEXIONA's MIMETIQ IIoT platform, called Data-Driven Steel 4.0. This programme can gather and centralize information generated in the systems of various production plants of the CELSA Group. It can implement data-based models for real-time diagnosis and prognosis of faults in production processes, using artificial intelligence algorithms. It can also determine the impact of these faults, to facilitate and speed up the decisions of engineers or plant supervisors through interfaces for the visualisation of algorithm results that facilitate interpretation. Finally, this system can be used for advanced analytical projects with different objectives and suppliers, as part of a continuous improvement process. Therefore, the new system centralises, relates and integrates the processes of different plants and information systems.

To develop the project, this shared IIoT platform was introduced in four of the group's production plants (two in Barcelona and two in Santander). The platforms were complemented for each area of business, using specific multivariable smart monitoring applications that resolve problems identified by the groups for the internal improvement of each of these plants.

This system has contributed to increasing the competitiveness of the plants, as it has helped to cut costs (through energy savings and waste reduction), increase the quality of manufactured products and increase knowledge of the functioning of production processes.

REDUCTION IN WATER AND ENERGY CONSUMPTION IN DAIRY PROCESSES

The specific research centre CS2AC UPC has participated in EnReMilk, a European project to minimise the consumption of water and energy in a multiproduct dairy process.

The dairy industry is an important sector in the food industry with sales of 124.3 billion euros and an added value of 17.4 billion euros. It has high energy and water consumption, both in overall production and per unit produced: up to 6.47 MWh (5.55 MWhth and 0.92 MWhel) and 60 m^3 of water per tonne of transformed milk. A total of 98% of the freshwater that is used is drinking water and 80% of the energy is consumed in the operations of heating, pasteurisation, sterilisation, drying and cleaning.

The EnReMilk project has achieved savings of up to 20% in energy and 30% in water throughout the entire supply chain in two representative cases in the milk industry: the production of mozzarella and the production of powdered milk.

Initially, patterns of water and energy consumption were identified throughout the respective processing chains. In a second step, through monitoring and real-time management techniques to reduce the consumption of water and energy, these processes were modelled (that is, technological scenarios were established to identify potential savings) and microbial stabilisation techniques, heating, texturisation and drying were applied. The resulting parameters were assessed to establish the resource use strategy, the treatment of effluent from the process and the technologies of water reuse to ensure the quality and safety of the food. The results have been validated in pilot tests under industrial conditions during a three-month period.

The project, which is part of 7PM, received 5.1 million euros of funding and lasted 4 years. The consortium, which is led by the Fraunhofer Institute for Interfacial Engineering and Biotechnology, was formed by 15 members from 6 countries, including the specific research centre CS2AC, which was responsible for monitoring tasks and real-time management to minimise water and energy consumption.

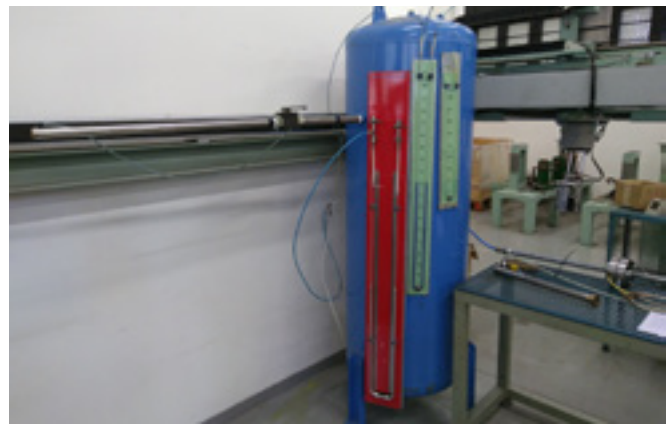
OPTIMISATION OF VACUUM EJECTORS FOR AR

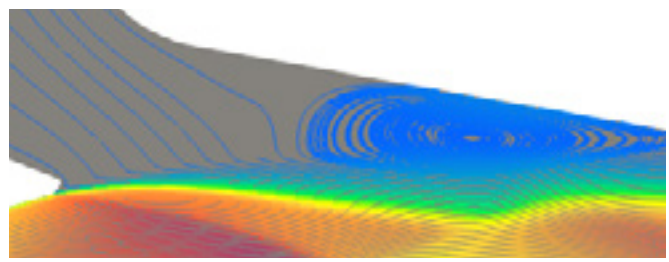
The Fluid Power Systems Laboratory (LABSON UPC) collaborated with AR TECHNOLOGY to develop suitable experimentation techniques for its industrial vacuum devices and undertake simulations via computational fluid dynamic techniques (CFD) and subsequent optimisation.

Using OpenFOAM software, simulations are carried out in which meshes are created that optimise the future design of ejector nozzles. Subsequently, the simulations are validated in a test bank to assess the vacuum achieved by the ejectors and the aspiration and consumption flows.

This project is being developed as part of the industrial doctorate, with the support of the Catalan Agency for Management of University and Research Grants (AGAUR).

AR is a leading company that manufactures components and complete high-performance industrial vacuum systems specialised in solutions for the handing, automatisation and transport of materials such as hoppers or silos.





INDUSTRY 4.0: SMART MONITORING AT LOIRE GESTAMP

The Motion Control and Industrial Electronics Centre (MCIA UPC), together with the company IThinkUPC, have collaborated with Loire-Gestamp in a project for early fault detection in the operation of hydraulic hot stamping presses. If faults are detected early, press operation can be optimised, and effective predictive maintenance strategies can be applied.

The diagnosis and monitoring system that was developed was based on procedures for analysing accessible variables of the machinery. These procedures are supported by advanced signal processing and artificial intelligence techniques. The resulting application implements the algorithms that are developed. These are based on the analysis of hundreds of thousands of production cycles, to characterise the current state of operation of the pump and detect and identify patterns of faults that have a negative impact on the efficiency of the installations, the quality of the production and unplanned shut-down of equipment. The analysis of anomalous cycles and the probable cause of the problems can be identified in real time and retrospectively.

Through an application that implements the algorithms of analysis and enables the results to be visualised, the press operators, the plant supervisors, the teams that prepare the presses and the plant engineers can quickly detect faults in the functioning of the machines, regardless of the item that is being manufactured and the press that is being monitored.

ALGORITHMS TO ACHIEVE SUSTAINABLE GROWTH IN THE LEISURE MARINE SECTOR

Logistics and Mobility

The Centre Data Management Group (DAMA UPC) has collaborated with its spin-off Sparsity to develop MaSSy (Mobile collaborative systems for the improvement of services and business development in the yachting industry) for the promotion of innovation in water management.

Within the framework of the Neptune Plan, MaSSy has developed an innovative system for managing reservations and journey planning for yachts in marinas. The new services reduce yacht movements to find a space to dock. This reduces fuel consumption, total distance travelled and contamination in general. The main benefits are improvement in marina infrastructure management and activity, expansion of services for the community of yacht users, strengthening of ties with local towns for tourism and minimisation of the impact of these activities on water quality.

DAMA UPC has contributed its technology and graph-based knowledge to the development of algorithms that optimise maritime routes and tourist itineraries.

The aim of Neptune is to stimulate sustainable growth in the marine and maritime sectors through projects led by small and medium-sized companies. Neptune has awarded over 1.3 million euros to 18 innovative projects (including MaSSy, which received 120,000 euros), chosen from over 80 candidates and led by SMEs from around Europe. The projects are focused on improving water management in rural and urban environments, port logistics, river and maritime transport, renewable marine energies and marine environments.

The Neptune Plan, which lasted 30 months, was funded by the European Union as part of "Blue Growth". Blue Growth is designed to strengthen sustainable growth in the marine industry for 2020.

NEW OMNIDIRECTIONAL ROTATION SYSTEM

The Industrial Equipment Design Centre (CDEI UPC) has developed a new system for omnidirectional movement that can move forwards, backwards, sideways and diagonally, with independent rotation and great accuracy. One of its main advantages is that it reduces the space needed to perform the desired trajectory, increases the ability to adapt to different environments and facilitates interaction with different machines.

Another innovation is the introduction of standard wheels, rather than the special ones that have been used to date. This gives the platform better load capacity and mechanical simplicity, with the resulting lower need for maintenance. In addition, due to the conventional wheels, it can be adapted to circulate on any surface.

The robotics platform could be used by automation engineering companies and in automated lines in factories or warehouses, as a component that facilitates transport of products from one point to another. The platform can also be used by robotics companies as a base on which to mount their robots, so that they have the highest level of manoeuvrability and robustness, and the capacity to circulate on irregular ground.

The system was patented by the CDEI UPC and the spin-off Steering Machines SL has been licenced for industrial environments.

ATTE: APPLICATION OF TECHNOLOGY TO SPECIAL TRANSPORT

inLab FIB UPC has designed and developed a new system for the Special Transport Service, in collaboration with the Municipal Institute for People with Disability of Barcelona (IMPD).

The Municipal Special Transport Service of Barcelona is composed of two types of services that support different needs of users. Fixed services are repeated in hours, origins and destinations, and can be easily programmed in advance. Sporadic services are not repeated in hours, or in origins or in destinations and cannot be easily programmed in advance.

The services are provided with minibuses and taxis, which can be adapted or not depending on the needs of the users. This service provision covers the territorial area of Barcelona, Badalona, Esplugues de Llobregat, Sant Adrià del Besós and Santa Coloma de Gramenet.

The new system developed by inLab FIB UPC enables people with a white card (residents in Barcelona who have a disability certificate with a recognised scale of reduced mobility who are registered with the IMPD) to reserve transport services through an app on a management website that is offered to call centre staff and provides IMPD staff with statistics and data on the use of the system. The management of shared fleets and the optimum allocation of users to these routes is carried out using optimisation algorithms developed specially for this service.

The IMPD is an autonomous body of the Barcelona City Council whose mission is to promote activities, programmes and services for people with disabilities and functional diversity in Barcelona. IMPD and the Metropolitan Area of Barcelona (AMB) have a Special Public Transport Service, a complementary service to regular public transport aimed at people with reduced mobility (PMR). This service is managed by IMPD, AMB and AMB information (CETRAMSA).

A PIONEERING TECHNOLOGY TO IMPROVE DRIVING ASSISTANCE SYSTEMS

ICT

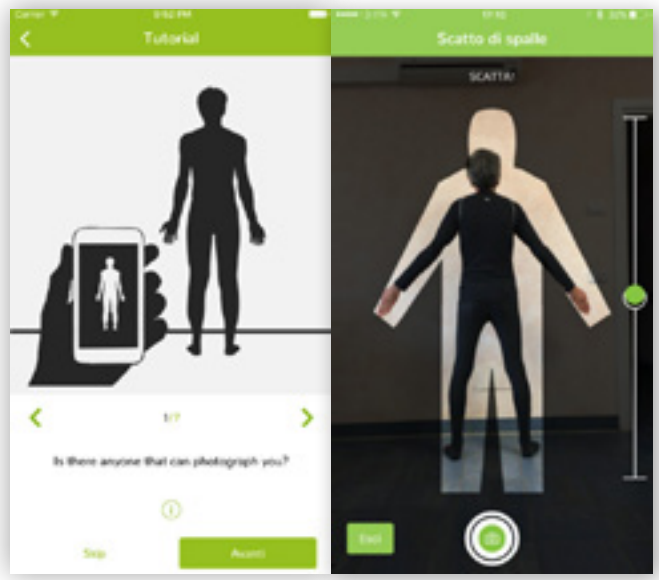
The Institute of Robotics and Industrial Informatics (IRI), a joint CSIC-UPC centre and a María de Maeztu unit of excellence, has participated in the design of a technological system to calibrate fish-eye cameras for use in vehicles, and the development of a software module that will be used to assemble calibration stations for these cameras, in collaboration with the company FICOSA ADAS.

In recent years, with the main objectives of improving safety, reducing risks and running more efficient vehicles, cameras and sensors have gradually been introduced in the automotive industry. The design and development of this new calibration method provides a safer, more efficient and more comfortable driving experience, as it incorporates the estimation of parameters associated with the optomechanics of the camera. This pioneering solution enables the development of robust driving assistance systems in adverse climate conditions that correct and reduce distortions in the images, which provides a better representation of the environment for the driver.

A VIRTUAL 'TAILOR' THAT TELLS YOU YOUR SIZE WHEN YOU PURCHASE CLOTHES ONLINE

ICT

INTEXTER coordinates the MORPHEOS European project, in which it has developed a new system that will significantly reduce e-commerce returns in the fashion industry. Based on two photographs that the buyer takes, the application ISizeYou determines with 100% objectivity the most suitable size for internet clothes purchases. This computerised system constructed from algorithms, generates a database with the various morphotypes of the body, thus establishing typological differences so that the brand or online clothes shop can advise customers on models that match their exact, objective size.



In sectors such as technology, 50% of sales are already carried out online. However, in the fashion industry this percentage has not yet reached 15%. One of the main reasons for this difference is the difficulty that big brands and shops have in guaranteeing customers that the clothes they have bought online are the best size of the models they have chosen from the catalogue. Currently, the percentage of returns in the European fashion sector is 40%. The consequences of this high volume of returns are added costs, loss of sales and emissions of tonnes of CO^2 generated by the transport of returned goods.

The new system is in a test phase for iPhones on the website of the Italian shop Piacenza. Since the incorporation of the MORPHEOS system and the application of ISizeYou, this shop, specialised in quality items made from cashmere, has noted a significant increase in sales.

The MORPHEOS project is funded by the European Union's Horizon 2020 programme with one million euros. Five partners are involved, including institutions and companies as well as INTEXTER: iDeal and Holonix, the Italian clothes shop Piacenza, the Technical University of Munich and the Technological Institute of Metalworking of Valencia (AIDIMME).

MANAGEMENT OF SOFTWARE VULNERABILITIES IN ORGANISATIONS

inLab FIB UPC- esCERT has developed a platform for monitoring an organisation's operating systems, software and devices, and notifying the system administrator of any new vulnerabilities that emerge to help to prevent intrusions in their computer systems.

The platform, called GUAITA, has an extensive, safe database (identifiable data are encrypted). The database contains the software inventory and its vulnerabilities and is updated daily to include any new common vulnerabilities and exposures (CVEs) registered by NIST, a repository that contains a database of all existing vulnerabilities since 2002.

All alerts published on GUAITA provide in-depth information about each vulnerability, the impact or damage that it could cause, and measures that can be taken to update affected systems.

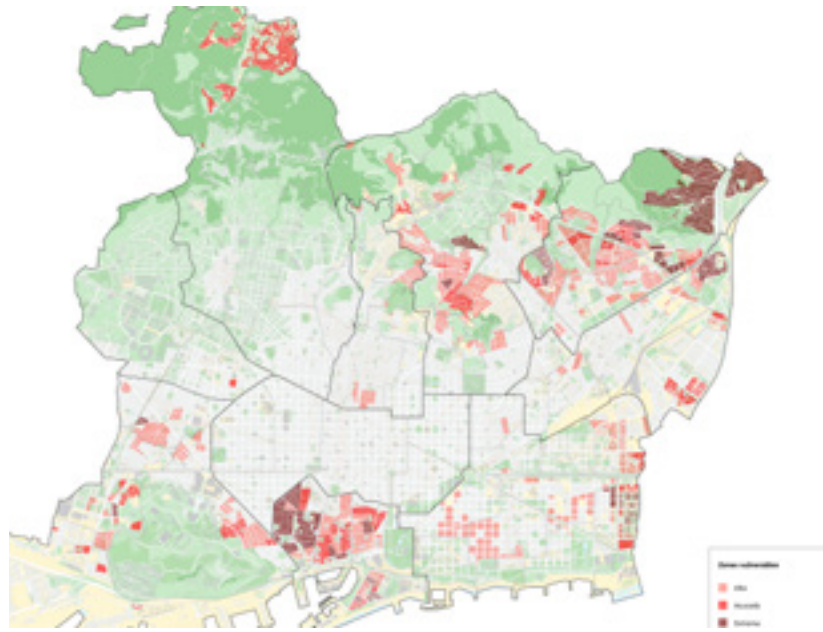
GUAITA provides system administrators with a personalised panel that meets their needs and from which they can manage their servers and associated services/products, review and validate vulnerability alerts that affect them, and generate reports and statistics on the evolution of alerts and vulnerabilities.

STUDY AND DETECTION OF AREAS OF RESIDENTIAL VULNERABILITY IN BARCELONA

Virtual Innovation in Modelling the Architecture and the City Lab (VIMAC) has developed through GIS technology a system of georeferenced indicators that respond to the sociodemographic and socioeconomic characteristics of the urban and residential space in neighbourhoods of Barcelona. The aim is to establish conditions of risk, fragility and disadvantage resulting from a combination of social, labour and residential exclusion. These conditions lead to a critical situation of damage or vulnerability.

The multicriteria methodology is based on over 150 indicators, of which the forty most representative are selected and grouped into four areas: socioeconomic, sociospatial, urban development and socio-urban development. For these four areas, a measure of differentiation is established relating to the degree of residential vulnerability of some neighbourhoods compared to others.

The results enable, for the first time, the identification of sectors of Barcelona that struggle to meet conditions of habitability, maintenance and restoration of dwellings. The data were used in the Programme for restoration of highly complex buildings as a criterion to establish priorities in the intervention of management teams in Barcelona City Council's Neighbourhood Plan, in initial stages of information and assessment.



NEW TECHNOLOGIES FOR MORE EFFICIENT, ENVIRONMENTALLY FRIENDLY BUILDINGS

Renewable Electrical Energy Systems (SEER UPC) is participating in the Sudoket project, to boost key Enabling Technologies (KETs) for the construction of innovative buildings.

KETs can be applied in the construction sector to design and build innovative buildings that are more environmentally friendly, efficient and competitive, with new and better features to enhance quality of life. However, despite current regulations and technological advances, the construction sector still uses mainly conventional methods and technologies.

SUDOKET has four pilot projects to construct buildings in France, Spain and Portugal. The aim is to validate experimentally the advanced technological features used to construct innovative buildings, and to demonstrate the feasibility of using these features under real operating conditions.

In addition, SUDOKET promotes the research and development of new KET-based solutions in universities and research centres. Online collaborative information systems are developed such as KETpedia, to disseminate the state of the art in KETs, and KETcluster, an initiative designed to promote collaboration between agents (builders, manufacturers, designers and technologists) by creating connections and synergies that help to improve the quality and competitiveness of the sector.

SUDOKET will contribute to boosting growth and Europe's technological leadership of the innovative building sector. This will be achieved through a transnational, cutting-edge approach to the promotion of new technologies and the interaction between key agents in the value chain.

The project, with a budget of 2 million euros, will last 37 months and end in February 2021. Twelve other participants in addition to SEER UPC are involved, including the Heat and Mass Transfer Technological Centre (CTTC UPC), which is also a CIT UPC member.

The construction sector represents 10% of GDP in the EU and generates 20 million jobs. Buildings are responsible for 40% of energy consumption and 36% of CO^2 emissions in Europe.

ARCHITECTURAL MODEL OF THE SAGRADA FAMILIA'S NATIVITY FACADE IN 3D

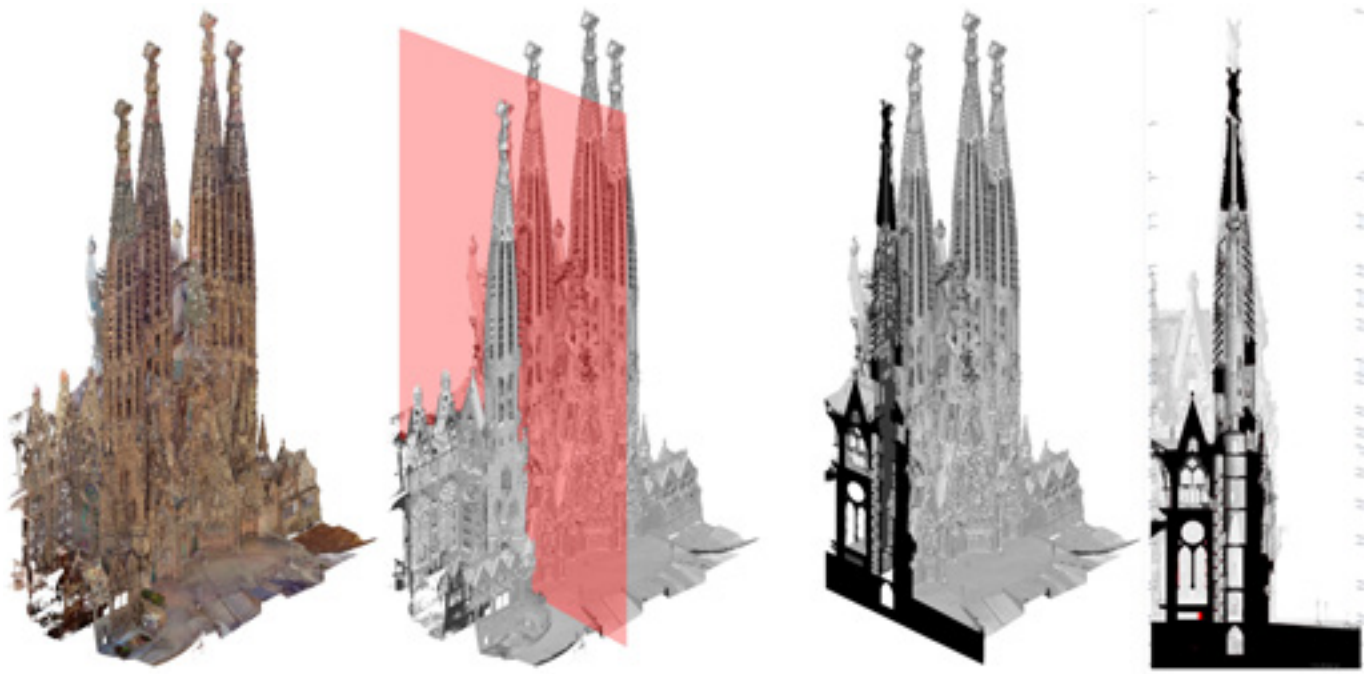
The UPC's Virtual Innovation in Modelling Architecture and the City Laboratory (VIMAC) has created a highly accurate 3D model of the Sagrada Família's Nativity Facade. The aim of the project was to document the architectural geometry, obtain evidence of the current state of conservation and provide documentary support. The data are of use for plans and designs to complete the building that is still under construction. They can also be applied to work relating to the conservation, restoration, maintenance, alterations and dissemination of information about the building.

The project was commissioned by the Junta Constructora del Temple Expiatori de la Sagrada Família (Construction Board of the Sagrada Família), and covers 95% of the surfaces of the facades, reaching resolutions of 2 mm for the entire building, including the spires at a height of 100 m. To develop the model, three advanced, complementary capture techniques were used: topography, terrestrial laser scanning and photogrammetry.

The singularity and complexity of the building required specific additional instruments such as aerial work platforms of 22 and 26 metres, a pneumatic mast of 6 m, marking anchored to the facade and tools designed specifically for this project.

The resulting database, which is scientifically and technologically rigorous, goes beyond the specifications required initially in the basis of the project. The general results can be considered exceptional.

The project of modelling the Nativity Facade took twenty-seven months (January 2016 to March 2018).

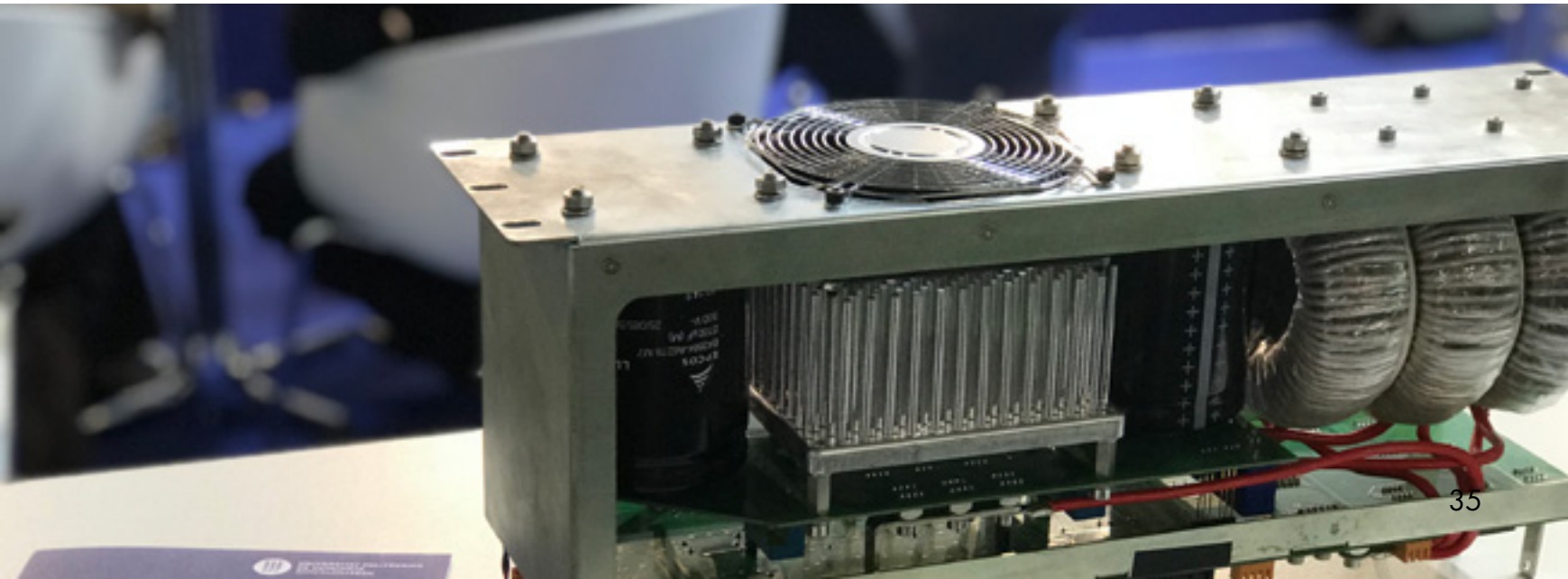


A MORE VERSATILE CONVERTER FOR SMART GRIDS

CITCEA UPC has developed a 25-kVA power module for converters with silicon carbide technology to manage energy bidirectionally with switching frequencies of up to 30 kHz (equipment currently reaches 15/20 kHz).

Due to this high frequency, new functionalities and applications can be introduced into the convertor, making it more versatile. The size of the equipment can also be reduced. The power control unit is scalable and modular (to take advantage of space) and can therefore be configured in various ways for different types of converter equipment. The greater frequency also leads to better response times, which is why a more complex control system is required such as the new module.

Silicon carbide technology (SiC) could double the response speed of device control, while the modularity/scalability means that it can be installed in all converter configurations.



SMART GRIDS: IMPROVE THE EFFICIENCY OF GRIDS

CITCEA UPC has begun to participate in RESOLVD (Renewable penetration Levered by Efficient Low Voltage Distribution grids), a European project designed to facilitate the integration of renewable generation into the low voltage grid and improve the management of the grid and energy flows. To achieve this, a new advanced power electronics device with integrated storage management capabilities will be developed. This will be connected to the grid and release energy when consumer demand is high. It could balance and compensate for variation in grid voltage, to provide a better quality of supply. This will facilitate local consumption of renewable energy, avoid the transport of energy generated in large power stations far from the site of consumption, and contribute to improving the system's efficiency.

Based on the artificial intelligence algorithms with which it was developed, the device will be able to predict demand and energy generation at critical points of the grid in the short-term. In this way, uncertainty in grid operation can be reduced, and efficiency increased. At the same time, software and hardware technologies are proposed to improve monitoring of the low voltage network, and to detect and automatically isolate faults.

The project is based on the smart grid concept and is designed to make current grids safer and much more efficient, as an essential measure to tackle the energy transition towards a sustainable model based on renewable generation.

The project is part of the Horizon 2020 programme and will last 36 months. Other participants in the project consortium are the University of Girona (coordinators), Estabanell Energia, Joanneum Research (Austria), Intracom (Greece), Comsensus (Slovenia) and Smart Innovation Norway. The total budget is €3.8 M.

SMART MONITORING OF A HYDROELECTRIC PLANT

The Centre for Industrial Diagnostics and Fluid Dynamics (CDIF UPC) has worked on the impact of turbine operation in the MICA hydroelectric plant by carrying out smart monitoring that can detect incipient faults, cut maintenance costs and estimate effects on machinery in each operating area in terms of wear, erosion or fatigue, which will help in decision-making.

Hydroelectric turbines function in optimum conditions when they work around their design point. Outside of these power ranges and at extreme operating points such as low part load or overload, complex flow phenomena appear with high turbulence and cavitation, which produce extremely high dynamic forces on the machinery. Under these operating conditions, deformation and strains are produced in rotors, as well as vibrations that could cause damage or considerably reduce useful life.

As part of the European HYPERBOLE project, CDIF UPC has worked on the impact of this operation on turbines of the MICA hydroelectric plant, located 135 km from Revelstoke, in the area of British Columbia (Canada). MICA is operated by BCHydro and can generate 2,805 MW from its six turbines.

One part of the project involved installing a monitoring system; the other part was comprised of experimental measurements of one of the power station's turbines that can generate almost 500 MW at maximum power. Over 70 channels of vibrations, movement, strain, stress on the rotor, coupled fluctuations in the axis, noise and power were measured simultaneously to study behaviour under various operating conditions. In addition, a numerical model was created to study the dynamic behaviour of the group when the dynamic forces of the fluid are applied to the turbine structure, to simulate the deformation and vibrations that are produced. This numerical model was compared with experimental tests carried out with machinery in operation.

Based on these data and the model, an improvement was made in the turbine's monitoring system, with remote access. These data were then used to calculate control parameters and "indices of health" for the machine, which indicate for each area of operation the effects on the rotor (stresses), erosive cavitation, wear on bearings and the early detection of unstable phenomena that could cause fluctuations in the power supplied to the grid.

ANYWHERE PROJECT: A RESPONSE TO EXTREME METEOROLOGICAL AND CLIMATE EVENTS

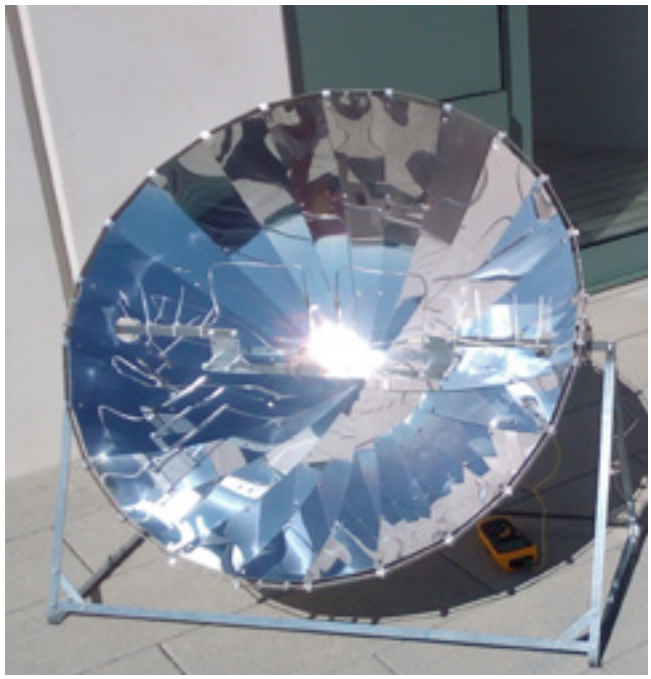
The Centre of Applied Research in Hydrometeorology (CRAHI UPC) is coordinating the ANYWHERE project, aimed at establishing a multi-hazard platform for faster analysis and anticipation of weather-induced risks prior to event occurrence. It will also improve response management in emergency situations and help avert loss of life in exposed populations, damage to infrastructure and associated economic losses. For the first time in Europe, the initial outcomes of the tools developed in the project will be presented this week in Barcelona.

Within the framework of the ANYWHERE project, an operational platform to support decision-making processes (A4EU) has been developed and implemented in the Public Protection and Disaster Relief (PPDR) control centres of six pilot sites representing climate scenarios around Europe: Catalonia (Spain), Liguria (Italy), South Savo (Finland), Bern Canton (Swiss Alps), Rogaland (Norway) and Corsica (France), as well as a national version at Spanish level in the National Emergency Monitoring and Coordination Centre (CENEM) of the General Directorate of Civil Protection and Emergencies (DGPCE). Since October 2018, and over a year, the tool is being tested and validated operationally in the Civil Protection command centres of pilot sites. Additionally, the tools developed for municipal use will be rolled out to municipalities during 2019.

In Catalonia, CRAHI UPC and the Government of Catalonia's Civil Protection department have developed the A4CAT tool (Anywhere for Catalonia), deployed in the Operational Coordination Centre of Catalonia (CECAT). A4CAT facilitates monitoring of meteorological phenomena and foresees their impact on the territory, identifying vulnerable points at risk of effects at least two hours in advance, allowing management and a proactive response to the emergency. This is achieved by automatically combining the results of ANYWHERE's high resolution impact forecast products with the regional layers of vulnerable areas and critical elements (flood zones, schools, hospitals, transportation infrastructure, etc.), together with integration of data on the territory available to Civil Protection in real time.

The ANYWHERE (Enhancing emergency management and response to extreme weather and climate events) project started in 2016 and is due to end in 2019. It is funded by the European Union's Horizon 2020 research and innovation programme with a budget of over €12 million. The Consortium is made up of 34 organisations from 11 European countries, combining world representatives of universities and research centres, developers of forecasting techniques, national, regional and local emergency management authorities, and companies in the sector. This is a user-driven innovation action that not only focuses on scientific achievements but will also reach a pre-commercial stage.

PRODUCTION OF HYDROGEN WITH SOLAR LIGHT



The Nanoengineering of Materials Applied to Energy (NEMEN UPC) group has developed a photocatalyst that can produce hydrogen with solar light from contaminated water. The photocatalyst, which contains a titanium oxide semiconductor and small clusters of metals, has been developed through the Single-Atom Catalysts for Hydrogen Photogeneration (CMIRA) cooperation project, together with IRCELYON.

This technology enables us to obtain hydrogen in a renewable way with solar light at a low cost, as the process takes place in environmental conditions. The technology has been tested at pilot scale using solar concentrators. Its use has been studied in residential buildings in which the hydrogen that is generated can be mixed with the natural gas that fuels hot water and heating boilers, to reduce the consumption of natural gas and cut atmospheric emissions. In addition to the development of the photocatalyst, the NEMEN group has designed a photoreactor with microchannels for this application.

INNOVATIVE DEVICES TO IMPROVE OBSERVATION AND MONITORING SYSTEMS FOR SEA CURRENTS

Energy and Environmental

The Technological Development Centre of Remote Acquisition and Data Processing Systems (SARTI UPC) is participating in the Multi-Sensor Extra Light Oceanography Apparatus (MELOA) project. As part of the Horizon 2020 European programme, the aim of this project is to find an effective, low-cost solution to control and monitor surface sea currents and their dynamic characteristics.

The MELOA project is focused on the development of floating devices, called WAVY drifters, which improve current observation and monitoring systems in the ocean and can be used in various maritime environments, from the open sea to coastal areas, river banks and water sports areas. In the form of a small-sized buoy, WAVY drifters incorporate accelerometers and temperature and pressure sensors, and are designed to be partially submerged to reduce the effect of direct wind. The devices are also equipped with GPS, so that the data that are gathered can be monitored in real-time remotely.

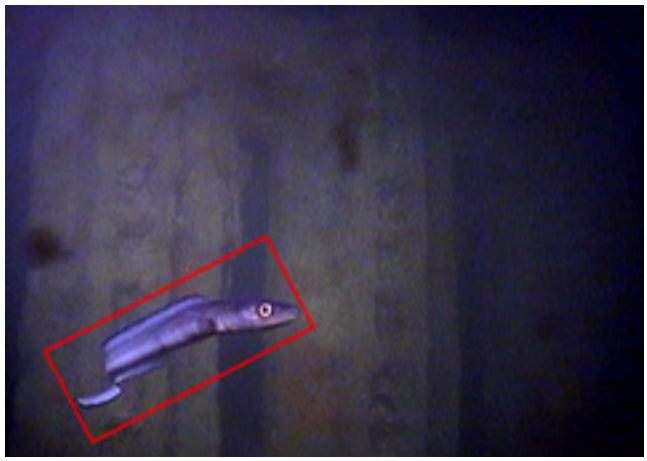
Control of surface sea currents and their dynamic characteristics is important to identify places in which rip currents often occur and measure the hazards that these represent to bathers. With the use of WAVY drifters, lifeguards can determine which areas of the coast are most dangerous and raise the community's awareness of the risks involved.

In addition, the data that these devices provide during test campaigns in the open sea can be used to calibrate and validate terrestrial observation satellite systems. This is the case of the GEOSS or Copernicus programmes, which study currents and sea surface temperatures based on satellite measurements and require in situ measurement data to validate their results.

The devices are currently being assessed and developed, particularly with respect to improvement in systems for harnessing wave power, which could be incorporated into a new generation of WAVY drifters.

The project started in 2017 and ends in 2021. The consortium includes 9 other partners and the budget is 4.7 million euros.

THE MOST UNIQUE MARINE OBSERVATORIES, NOW MORE ACCESSIBLE



The UPC, through the Obsea observatory, which is the responsibility of the Technological Development Centre of Remote Acquisition and Data Processing Systems (SARTI UPC), is a member of the European research consortium European Multidisciplinary Seafloor and Water Column Observatory-European Research Infrastructure Consortium (EMSO-ERIC). As a result, the UPC has participated in two European projects to develop the ERIC organically and functionally. The two projects are called EMSOdev and EMSO-Link. Notably, the project will develop the EMSO-EGIM (EMSO Generic Instrument Module), which will enable standardisation in Europe of how ocean observations are undertaken in different locations.

Due to the participation of SARTI UPC in the JericoNext project, requests to use of the Obsea marine observatory (on the seabed off the coast of Vilanova i la Geltrú, Barcelona province) have been centralised for the duration of the project.

The various projects that are undertaken are part of the calls: Automatic Data and Video Acquisition for Underwater Monitoring across Coastal Environments (ADVANCE), Fouling Protection for Marine Optical Systems (FOULSTOP) and Long-term Underwater Evaluation Localisation in Extreme Conditions (EVOLUL).

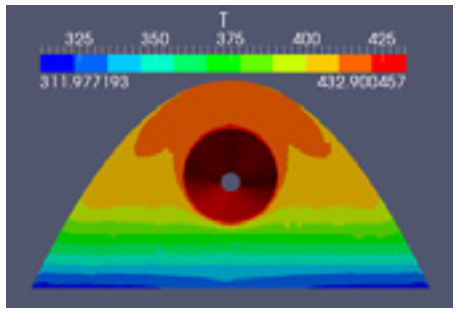
CIRCULAR ECONOMY: RECOVERY OF VALUABLE METALS FROM ELECTRONIC WASTE

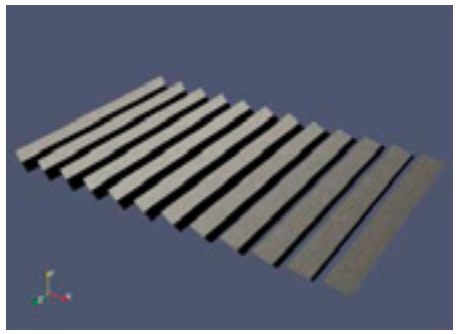
Energy and Environmental

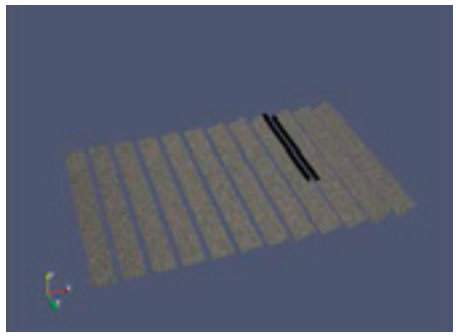
Researchers at the Smart Sustainable Resources (SSR-UPC) research centre have developed technology for economically efficient and environmentally sustainable recovery of valuable metals from electronic waste. The main objective of the project "Economic and sustainable recovery of electronic waste" is to apply basic research on the recovery of valuable metals from disused electronic material using biotechnology techniques. The proposed solution consists of taking advantage of the metabolic activity of certain microorganisms (mainly bacteria) to regenerate agents responsible for extracting metals from the matrix in which they are immobilised at the end of the useful life of the electronic apparatus that contains them (waste). The process is feasible as it significantly reduces energy costs and the use of aggressive reagents compared to conventional processes that are carried out in highly specific centres, which must treat high volumes of waste to make the process of recovery profitable.

The project was funded through the LLAVOR grant programme of the Government of Catalonia's Agency for Management of University and Research Grants (AGAUR).

A NEW SOLAR GENERATOR BASED ON THE FRESNEL CONCENTRATING SYSTEM







The Heat and Mass Transfer Technological Centre (CTTC UPC) has participated in SIROCCO, a European project to create a solar heat generator based on the Fresnel concentrating system (a way of concentrating thermal solar energy).

Through a Fresnel solar field and thermocline thermal storage, a solution for industrial heat production has been developed based on renewable energies. The advantage of this solution lies in the use of technologies with low greenhouse gas emissions. The aim of this project was to implement a low-cost solution with a small carbon footprint based on an innovative solar field and thermal storage with beds of stone. The generator has been designed according to criteria of simplicity, thermal efficiency, mechanical resistance and integration of available materials.

CTTC UPC has worked intensely to study, optimise and design the receptor, heliostat and accumulator of thermal energy, as well as on the thermal and fluid dynamic analysis of systems under real conditions.

This new generator will be used to dry products within the food industry, to replace the fossil fuels that are currently used.

SIROCCO has been developed as part of the MAGHRENOV project, in which KIC Innoenergy participates along with five other international partners.

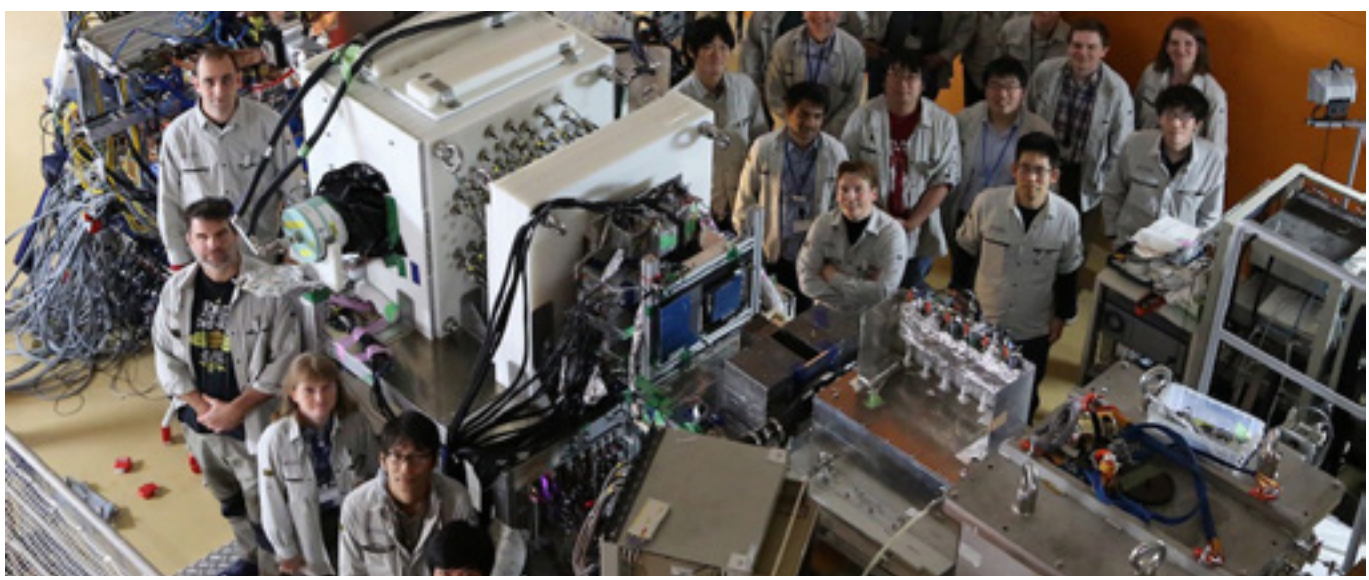
BRIKEN: AN EXPERIMENT TO FIND OUT HOW HEAVY ELEMENTS ARE FORMED IN THE UNIVERSE

The Institute of Energy Technologies (INTE) worked on the BRIKEN project: an initiative to develop the largest-of-its-kind detector in the world for measurement of beta-delayed neutron emission probabilities in the Radioactive Isotope Beam Factory of the RIKEN-Nishina centre in Japan.

Beta-delayed neutrons are produced after beta decay in radioactive and neutron-rich nuclei; these nuclei are generally known as exotic nuclei. At present, it has been possible to experimentally measure about 50% of the emission probabilities of more than 600 nuclei identified as neutron emitters.

BRIKEN, in its stage of scientific exploitation, will provide between 150-200 new measurements of neutron emitters and will improve the accuracy of previous measurements. The measurements made in BRIKEN are of astrophysical interest since they will allow, in the long-term, improvements in our understanding of the processes associated with the synthesis of elements in the universe that are heavier than iron. In addition, this type of measurement will make it possible to expand our knowledge of the nuclear structure and of certain nuclei of interest in energy technology.

The development and launch of this detector was led by researchers from INTE, together with researchers from the Institute of Corpuscular Physics (IFIC) of Valencia. Other researchers from Europe, the United States and Japan also participated.



INTEGRATION OF NEW METHODOLOGIES FOR PLANNING AND ENVIRONMENTAL ANALYSIS OF OILFIELDS

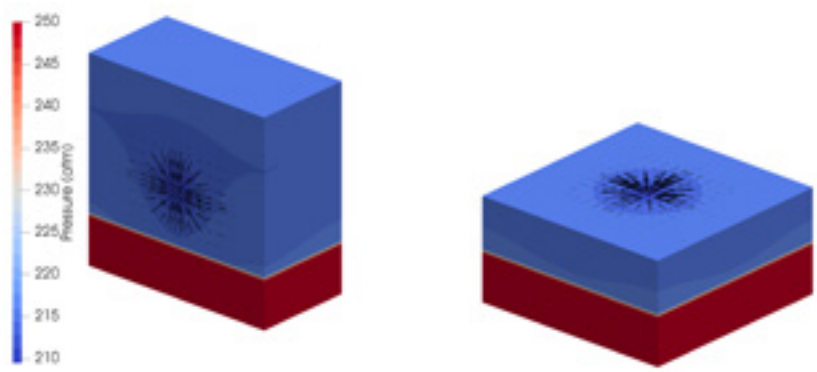
The Mathematical and Computational Modelling (LaCàN) centre has developed new numerical methodology for efficient, reliable simulation of the behaviour of oilfields. The new simulation environment improves the analysis of realistic scenarios, increases the reliability of results and reduces computational costs. Thus, we can analyse a greater number of configurations, increase complexity and increase the applicability and utility of simulations.

One key aspect in the management, planning and analysis of the environmental impact of oilfield exploitation is the reliable prediction of behaviour. Computational models have two basic elements. The first is advanced algorithms to generate high order meshes that accurately represent the complex geometry of the oilfield (definition of boundaries, localisation of faults, cavities and strata, injection and extraction wells, etc.). The second is robust, efficient numerical methods to predict the behaviour of the oilfield highly accurately in terms of time and space.

The new numerical techniques developed by LaCàN resolve the difficulties of the physical models that are currently used that can lead to inconsistencies or considerable precision errors. For example, near extraction wells and around faults, there are large gradients of pressure which give rise to larger changes in velocity. In order to correctly capture these abrupt variations, which may significantly affect the reliability of results, commercial software tends to generate excessively fine meshes, because they rely on first order methods. This leads to (often prohibitively) high computational costs to obtain predictions with the required precision.

The high-order hybridisable discontinuous Galerkin method (HDG) is designed to overcome these issues. First, the new numerical technique improves the discrete representation of the oilfield through a new algorithm for generating high order 3D meshes of high quality to discretize the geometric model of an oilfield. Second, the physical model is resolved through a formulation that combines a high-order hybridisable discontinuous Galerkin (HDG) method with schema of temporal integration that are also high order. This combination enables an increase in precision of flow simulations for an oilfield.

The project is supported by the Catalan Institute for Energy Research (IREC) and PetroSoft, as observing promoting entities (EPO), and has received funding from the Spanish Ministry of Economy and Competitiveness.



SOCIAL INNOVATION: A SOCIAL MEDIA PLATFORM FOR RAISING AWARENESS OF RARE PEDIATRIC DISEASES

The Bioinformatics and Biomedical Signals Laboratory of the Research Centre for Biomedical Engineering (CREB UPC) is taking part in the development of an awareness-raising platform to connect patients, relatives, researchers, health professionals, volunteers and public representatives involved in the area of rare diseases (RD).

A space for debate and co-creation will be promoted. Research will be fostered through shared data and a focus on the patient, to improve quality of life, ensure better management of this type of diseases and generate scientific knowledge through shared data.

The new platform will be based on experience gained during the management of the Rare Commons (RC) research platform, which includes nine rare diseases. S4R will improve the response to this previous experience in relation to two challenges. First, users will be given more power within the platform, using a tool based on a patient-centred, bottom-up model. Second, an innovative approach to research in rare diseases will be offered, since groups of pathologies will be studied instead of individual diseases.

The pilot of this new platform addresses two groups of paediatric rare diseases: neuromuscular disorders and rare tumours.

In addition to the UPC and the Sant Joan de Déu Hospital, which is the project leader, two patient organisations are part of the consortium: the World Duchenne Organisation (UPPMD) and the Melanoma Patient Network Europe (MPNE). Other members are: Ò Interactive, the Synergist, the University of Newcastle and Asserta.

The project Share4Rare has received funding from the European Commission, through call H2020-ICT-11-2017. It has also received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 780262.

Share4Rare

ARTIFICIAL INTELLIGENCE TO IDENTIFY ALZHEIMER'S PATIENTS IN THE EARLY STAGES OF THE DISEASE

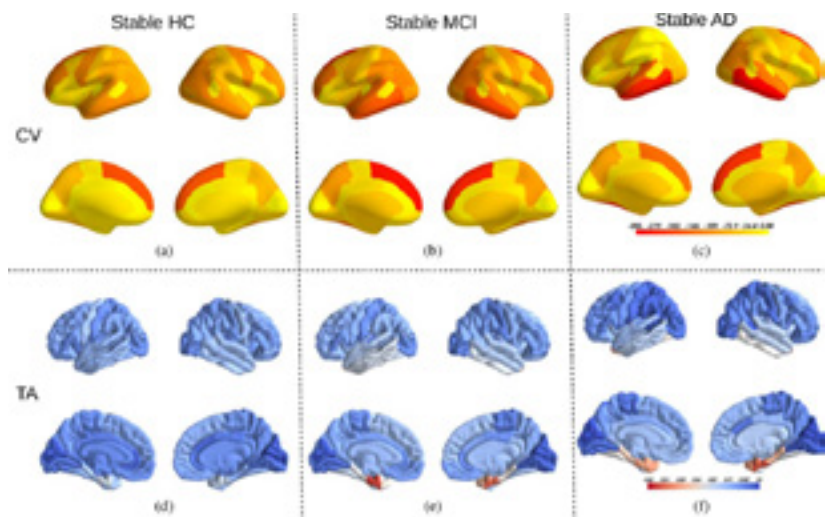
The Bioinformatics and Biomedical Signals Laboratory of the Research Centre for Biomedical Engineering (CREB UPC) has developed an early detection system for Alzheimer's disease through identification and characterisation of cortical and subcortical areas of the brain in healthy adults.

The characterisation and identification of these key areas through statistical learning methods has led to the development of models that can predict a current diagnosis with over 90% accuracy and predict a future diagnosis of progression to Alzheimer's disease up to 1.85 years in advance.

Alzheimer's is a neurodegenerative disease characterised by pathological changes in the brain that start several years before the first clinical symptoms appear. We know that elderly people's brains are more susceptible than those of young people. However, this study has identified that the brains of healthy elderly people and those of subjects in the intermediate phase of mild cognitive impairment (MCI) also present morphological changes in regions relating to Alzheimer's disease and follow a frontotemporal pattern.

This study is based on longitudinal biomarkers of neurodegeneration obtained from the magnetic resonance images of approximately 800 participants in the multinational Alzheimer's Disease Neuroimaging Initiative study. The study population includes participants who were initially classified as healthy (or controls), others with mild cognitive impairment due to Alzheimer's disease, and others with advanced Alzheimer's disease. The biomarkers, together with other psychological and sociodemographic characteristics such as age, sex and level of education, were observed during exhaustive monitoring over five years.

Based on the characterisation of the biomarkers in the study groups and the differences that were observed, artificial intelligence models were designed that could discriminate normal residuals from residuals with an intrinsic pathological factor, which are indicators of the presence of early-stage disease.



NEW TECHNIQUE TO DETERMINE THE EXTENT OF SCARRING AFTER A MYOCARDIAL INFARCTION

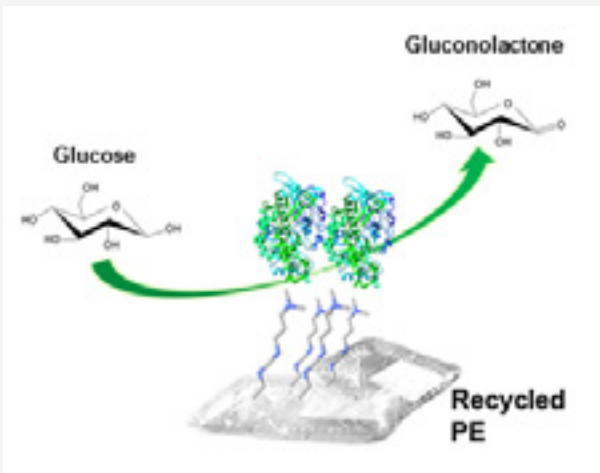
Health

Researchers in the Instrumentation and e-Health area of the Research Centre for Biomedical Engineering (CREB UPC), together with researchers from the Biomedical Research Networking Centre on Cardiovascular Diseases (CIBERCV) of the Hospital de la Santa Creu i Sant Pau, Barcelona, have created a new technique for identifying scar areas in patients who have had a myocardial infarction.

The study was carried out by the Research Centre for Biomedical Engineering (CREB UPC), and researchers from the Hospital de Sant Pau. In a porcine model of chronic myocardial infarction, it was found that the new technique detected areas of postinfarction fibrosis and was an improvement on the current technique of measuring the voltage of local electrograms.

This study is the first of its kind to analyse the capacity to identify myocardial scar areas by means of an innovative approach based on measuring electrical impedance with a catheter. Electrical impedance is a property of the heart that is affected by the intrinsic structural characteristics of the tissue. Previous research has revealed that impedance is lower in the myocardial scar than in normal myocardium, which enables identification of the necrotic area.

A MORE EFFICIENT, SUSTAINABLE ELECTROCHEMICAL BIOSENSOR FOR DETECTING GLUCOSE IN SWEAT



The Innovation in Materials and Molecular Engineering (IMEM) group has adapted an electrochemical biosensor based on polyethylene treated with plasma to increase its sensitivity to glucose in sweat. In addition, they have replaced new polyethylene with recycled polyethylene, which gives the material added technological value. This contributes significantly to sustainability, as polyethylene is the most reused plastic in the world. In addition, they have reduced the cost of the sensor by reducing the concentration of the enzyme that it contains and increasing efficiency.

The new material has led to a patent for industrial use that will be implemented by OnaLabs Inno-Hub, SL.

AN APPLICATION FOR MEASURING IONISING RADIATION

Health

The Dosimetry, Computer Graphics and Robotics Areas of the Biomedical Engineering Research Centre (CREB UPC) are participating in PODIUM (Personal Online Dosimetry Using Computational Methods), a project that will improve the dosimetry monitoring of people exposed to ionising radiation.

The aim of the project is to improve occupational dosimetry in an innovative approach based on an application that can be used to calculate the dose extremely rapidly, to provide real-time data (online). The application will calculate dosimetry values of interest, as well as the dose in specific organs that are particularly exposed (lens, brain and limbs), without having to use physical dosimeters. The technology is based on automatically identifying and monitoring the position of workers with respect to the bundle of radiation through depth cameras, and the use of Monte Carlo simulation codes for transport of the radiation to calculate the dose received in each situation.

The project results could help to resolve problems associated with passive and electronic detectors and improve dose determination in neutron radiation or in photon radiation when part of the body is protected and another part is not, as occurs in the area of interventional radiology (angiography, etc.). This solution can also prevent errors in determinations due to bad positioning of the detectors, or a lack of results if a personal dosimeter is lost.

The individualised monitoring of workers exposed to external ionising radiation is essential to apply the ALARA (As Low as Reasonably Achievable) safety principle, to ensure that legal exposure limits are not surpassed. In addition, the new focus will increase workers' awareness of protection against radiation and will be used to optimise ALARA in routine practices.

The Project is funded by the "European Joint Programme for the Integration of Radiation Protection Research" and will last 24 months (2018-2020). The total budget is 1,399,930 euros. Seven European organisations form part of the programme, and the coordinator is the Belgium Research Centre SCK-CEN.

ANALYSIS OF MOLECULAR SIMULATIONS WITH 2D AND 3D VISUALISATIONS

Molecular dynamic simulations are computer simulations of the physical movements of atoms and molecules and the interactions between them. They are used in various areas such as physics, chemistry, material sciences and modelling of biomolecules.

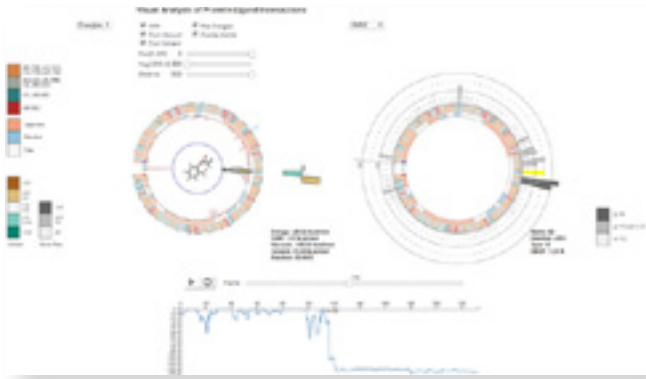
In drug design, simulations of the molecular dynamic predict the type of bond and the affinity of the combination of a small molecule (the drug) with a biomolecule (protein). The result, if successful, is a drug that has therapeutic benefits for the patient.

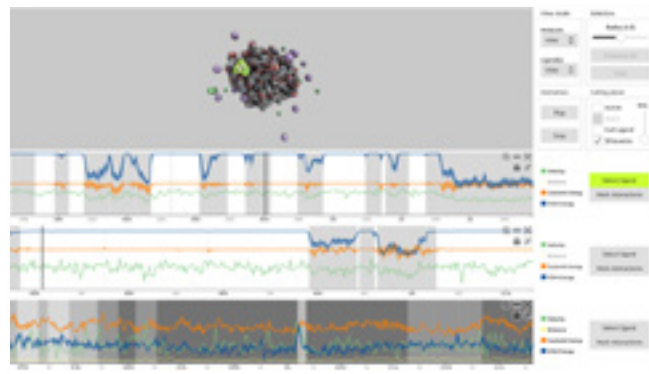
The ViRVIG group has worked on molecular visualisation to address various aspects, such as the generation of realistic lighting in models of very large molecules or the visualisation of extremely long simulations of molecular dynamics. To meet these objectives, the group has developed tools for visual exploration of molecular simulations, which has facilitated the analysis and saved time, particularly in the visualisation of trajectories.

An example of applications are compact molecular simulations that abstract a 3D structure into a 2D design. Based on a web application that offers rapid, intuitive exploration of complete simulations, many physical properties are represented such as energy, index of flow of waste products or hydrogen bridges, among others.

A second example tackles the challenge of exploring extremely large molecular trajectories (of hundreds of thousands of steps). To achieve this, simulation data are analysed automatically, and relevant characteristics are extracted. Subsequently, through a set of coordinated views in 2D and 3D, an application is obtained that facilitates the progressive exploration of molecular simulation in a very efficient, intuitive way. The result is a graphic application that could be executed on a PC with a graphics card.

The developments have been made in collaboration with the Barcelona Supercomuting Center (BSC), the University of Ulm, Masaryk University, the Czech Republic and the Laboratory of Loschmidt in Masaryk University.





Health

SENTISIM: A SURGERY TRAINING PLATFORM

The Robotics and Vision area of CREB UPC has developed a training platform called SENTISIM in conjunction with the Clinical Management of Dermatology Unit at the Virgen Macarena University Hospital, Seville.

SENTISIM is a hybrid device that combines physical apparatus emulating the anatomy of the surgical field with the IT support that is used in real surgery. Training, as a step prior to performing surgery, helps to improve the quality of surgery and consequently the safety of patients with melanomas, as dermatologists acquire and maintain skills prior to operating on patients.

The UPC research team that participates in the project is comprised of Albert Hernansanz, Tomàs Pieras and Alícia Casals, who are members of CREB UPC and the research group Intelligent Robots and Systems (GRINS).

From 7–9 June, the SENTISIM training platform was presented at the second edition of the MelaTx conference on the surgical treatment of advanced locoregional melanoma, which was held at the Virgen Macarena University Hospital. The device was included as an innovation in a workshop on surgical simulation of selective sentinel lymph node biopsy.

DEVELOPMENT OF A PREDICTIVE APPLICATION FOR MACHINING METAL PARTS WITHOUT DEFECTS

The Structural Integrity and Materials Reliability Centre (CIEFMA UPC) is taking part in the AVINT project to increase the efficiency and competitiveness of machining processes by developing an application for predicting the roughness of parts before they are produced, to achieve optimum surface integrity of the pieces, and avoid the production of defective material. This will result in parts with greater added value, which will help to increase companies' competitiveness.

CIEFMA UPC will use its knowledge to characterise the machining tools that are used. Eurecat-CTM, the project coordinator, will characterise the parts and the experimental results, and CIMNE will develop specific numerical models for the machining processes and various laboratory tests to relate the effect of machining factors on the generation of roughness.

The companies Industrias Teixidó, Mecanitzats Privat, and GUTMAR will present several models of problem pieces that are difficult to machine, to define production and manufacturing parameters that affect roughness and surface integrity, and the predictive application of roughness. With this aim, IMCAR, Flubetech and FUCHS will develop new products, such as cutting tools, coatings, lubricants and coolants, so that they can be tested during the experiments. In addition, these companies will provide information on technologies and knowledge to determine and improve the surface characteristics of the processes.

The AVINT project consortium is formed of ten partners who cover the entire value chain of the machining process, including agents of research, development and innovation (CIEFMA UPC, CIMNE and Eurecat-CTM), companies in the sector such as Industrias Teixidó, Mecanitzats Privat and GUTMAR, and the companies IMCAR, Flubetech and FUCHS, which provide services and technology.

The AVINT project will take three years. It is part of the Industries of the Future RIS3CAT Community to optimise machining processes, which is a key, cross-cutting sector for the production of components used in many applications. The project budget is 2,316,720 euros, of which 752,523 euros correspond to the grant that has been awarded.

ACCELERATION OF PHOTONICS PROJECTS FOR COMPANIES

The Centre for Sensors, Instruments and Systems Development (CD6 UPC) is participating as a partner in the European project ACTPHAST4.0 (Accelerating Photonics Innovation for SMEs: a one stop-shop-incubator). ACTPHAST4.0 is a platform that supports innovative projects based on the commercial potential of applied photonics. The initiative is open to all European companies and provides direct access to the expertise, state-of-the-art and infrastructure of leading European technology centres.

ACTPHAST4.0 operates as an open call to all European companies, although it is focused on SMEs, to support innovation processes that impact a wide range of industrial sectors. The main areas of application are advanced production (Industry 4.0), the automotive industry, the aerospace industry, energy and the environment, life sciences and health, security, metrology and sensors, and visualisation and displays.

Experts and technology partners available on ACTPHAST4.0 can be accessed through submission of proposals for innovative projects to be undertaken in relatively short periods (between 6 and 9 months).

ACTPHAST4.0 contributes to reducing the risk of innovative projects, as it has its own funding instrument. Financial support is based on funding the tasks that the ACTPHAST4.0 partners undertake for a company.

Additionally, the technological support provided by ACTPHAST4.0 is complemented with experts in the area of business and finances to help ensure that innovation activities have a strong market orientation.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5 HIGHLIGHTS

INTERCLUSTERS SYMPOSIUM: "UNLOCKING HEALTH BENEFITS FROM RAILWAY MOBILITY"

18 January

CIT UPC participated in the symposium "Unlocking Health Benefits from Railway Mobility", organized by the Health Tech and Railgrup clusters, in collaboration with ACCIÓ. The session was held as part of the Health and Rail intercluster project, whose aim is to identify health technologies that can be applied to rail mobility.

During the session, over twenty aspects were discussed that had previously been identified as areas in which health technologies could provide answers to some of the needs of rail agents. At the start of the symposium, Pere Clavet, director of the *Union Internationale des Transports Publics* (UITP), presented his perspective of the importance and potential impact of applying linked technologies in both sectors.

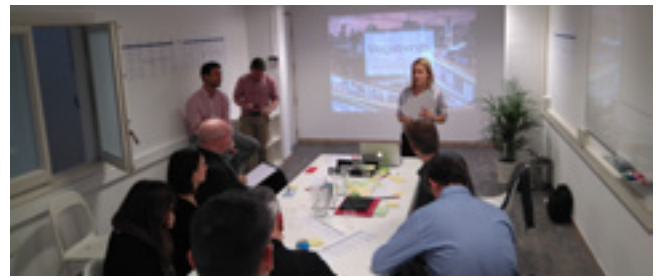
CIT UPC PARTICIPATES IN THE "UNIVERSITY TO INDUSTRY TECHNOLOGY TRANSFER" WORKSHOP

25 January

CIT UPC took part in the "University to industry technology transfer" workshop, organised by Bax & Company and Innoget. The aim of this practical session was to improve the functioning of platforms for open innovation and online technology and knowledge transfer. The workshop is part of Pilot 7 (Open Innovation Marketplace), one of the eight pilots in Science2Society (S2S), a European project to improve the efficiency of the European innovation system by drawing up good practices for technology transfer and generating and disseminating information for stakeholders to improve their processes. CIT UPC contributed considerably to S2S by leading Pilot 2 on Co-location (Establishing industry innovation labs within universities).

During the workshop, the Design Thinking method and an in-depth analysis of the Innoget tool (Open Innovation Marketplace) were used to explore improvements that could optimize these kinds of platforms.

S2S has 18 members including major companies such as FIAT, Atos or CA Technologies, and leading European research entities such as KU Leuven, Karlsruhe Institute of Technology, Aalto University or Fraunhofer.



SECOND MEETING OF EUROPEAN DIGITAL HUBS

22 February

In Brussels, the second meeting was held in a series planned as part of the Digital Innovation Hubs Working Group, whose members include the CIT UPC and the Data Management Group (DAMA UPC) research centre.

The aim of this meeting was to bring Digital Innovation Hubs (DIHs) that are included in the European Catalogue closer together, to discuss how to fund DIHs, and to improve access to funding for SMEs. During the session, Josep Lluís Larriba, director of the Data Management Group, presented the CIT UPC Technology Center to the rest of the digital hubs.

CIT UPC DAY: PROVIDING INNOVATION TO CREATE VALUE

20 March

The CIT UPC day "Providing Innovation to Create Value" was held with the support of ACCIÓ. At the event, some of the technological capabilities of UPC TECNIO centres were described.

The session was focused on presenting technological capacities in four areas: smart data applied to industrial maintenance, the design of industrial equipment using sustainability and life-cycle criteria, electronics and energy efficiency, and photonics and optical engineering for the industrial sector. In the closing session, the main funding tools for R&D projects were presented by representatives of TECNIO/ACCIÓ.

INDUSTRIAL LAUNDRY TECHNOLOGY: RENEWAL OF THE GIRBAU GROUP CHAIR AT THE UPC

6 April

The UPC and the company Girbau have extended for a further three years the Girbau Group Chair in research and innovation in industrial laundry technology, to promote research, innovation, technology transfer and training activities.

The renewal of this Chair, which was created in February 2012, consolidates collaboration between Girbau and the UPC in research, development and innovation activities and technology transfer associated with industrial laundry, particularly through the Industrial Equipment Design Centre (CDEI UPC). The Chair is housed in this technology innovation centre, specialized in machine engineering, and is led by Jordi-Ramon Martínez who is also director of the CDEI UPC.

The Chair promotes research projects in technology applied to equipment, particularly those associated with innovation and product development processes in the field of industry laundry. Other task are the identification of proposals for improvement and innovation in technologies for this sector, advice and collaboration on business innovation projects, and teaching and training activities such as the organization of seminars, the incorporation of UPC students on placements in the company, supervision of master's degree projects and proposals for industrial doctorates.

PARTICIPATION IN THE SMART ENERGY CONGRESS 2018

11-12 April

CIT UPC took part as a collaborating entity in the Smart Energy Congress 2018 "Digital Transformation, Leading Energy Efficiency", organized by the EnerTIC Platform.

The Smart Energy Congress is the annual European event at which leading consultants, energy companies, leaders in the technology industry and heads of major projects, among others, share their views and discuss trends, challenges and opportunities to improve energy efficiency in areas such as cities (SmartCities), industries (Industry 4.0) or data centres (SmartDataCenters).

This meeting was a unique occasion to detect opportunities and establish relationships with stakeholders and to innovate together and share experiences. It also provided an opportunity to learn about the latest trends in Smart Industry 4.0, Smart Cities, Smart Energy, Smart Data Center and Smart Energy Startups.

WORKSHOP "IMPROVING TECHNOLOGY TRANSFER IN EUROPE"

8 June

CIT UPC jointly organized a workshop entitled "Improving Technology Transfer in Europe" as part of the Science2Society (S2S) European project.

During the workshop, initial results were presented for the three pilot studies associated with the Science2Society project: Co-location (Establishing industry innovation labs within universities) led by the UPC and CA Technologies; Big Research Data Transfer led by Aalto University and Atos; and Open Innovation Marketplace, led by Innoget.

The Vice Chancellor of Transfer of Knowledge and Innovation at the UPC, Jordi Berenguer, opened the event. Josep M. Piqué, president of the International Association of Science Parks and Areas of Innovation (IASP), shared his experience on success factors in technology transfer. The Workshop (attended by over forty people) ended with a session for attendees to participate in relation to the content that had been presented, led by Bax & Company.

Science2Society is a European Project designed to improve the efficiency of the European innovation system by compiling good practices on technology transfer and generating and disseminating information so that stakeholders can optimize these processes. S2S evaluates collaboration mechanisms between universities, research organizations, society and industry, to improve innovation processes and their impact on society.

S2S is comprised of 18 partners, including large companies such as FIAT, Atos or CA Technologies, and leading European research entities like KU Leuven, Karlsruhe Institute of Technology, Aalto University and Fraunhofer.

THE UPC AND SEIDOR SIGN AN AGREEMENT TO PROMOTE TECHNOLOGICAL INNOVATION

1 October

The UPC and the multinational Seidor, a consultancy company specialised in management software and ICT value-added services, have signed an agreement to promote technological innovation, particularly initiatives related to cloud, blockchain and 5G technology.

As part of the four-year agreement, the two partners aim to launch at least ten or twelve projects relating to applying cloud technology to educational tools for the classroom, the use of blockchain in public administration and the creation of disruptive applications facilitated by 5G technology.

inLab FIB UPC will participate in the development of the initiatives and will provide advice on ICT innovation, through the formation of working teams that meet Seidor's needs.

THE UPC AND SIEMENS JOIN FORCES TO PROMOTE DIGITALISATION IN THE ENERGY SECTOR

26 October

The Rector of the Universitat Politècnica de Catalunya (UPC), Francesc Torres, and the general director of the Power & Gas and Power Services divisions of Siemens Spain, Olivier Bècle, signed a collaboration agreement to meet future digitalization needs in the energy sector, to promote innovation and research activities in the fields of data analysis and artificial intelligence in this sector. The agreement is also designed to encourage research and collaboration between the company and the university in these areas.

It will enable strategic partnerships to be established between the company and the university, to strengthen the digitalisation of the energy generation sector. Activities will include joint research and innovation projects based on use cases; the organisation of workshops, seminars, and creative labs; and the search for public and private funding to promote research projects in these fields.

The agreement is also focused on strengthening the activity of the MindSphere Application Center (MAC), Siemens' innovation hub in Cornellà de Lloblegat. This technology centre promotes the development of digital solutions for the energy sector, including the use of Mindsphere, the company's cloud platform for industrial IoT.

CIT UPC JOINS THE ADVANCED MATERIALS CLUSTER

5 December

The UPC Technology Center (CIT UPC) has officially joined the Advanced Materials Cluster (CMAV), a non-profit association whose main aim is to promote and contribute to the competitiveness of companies and entities in the value chain of the Catalan advanced materials sector.

The cluster brings together companies and associated entities that promote advanced materials business initiatives by fostering and taking advantage of synergies between members and related sectors. CMAV provides strategic and technological information for its members, to enhance competitiveness and boost opportunities for collaboration, and generates proposals for all companies in the cluster.

By joining the cluster, the UPC strengthens collaboration with companies in the sector and contributes its expert knowledge and specialisation in advanced materials technologies, at the level of characterisation and development of production processes, to foster innovation.

The creation of the CMAV of Catalonia was promoted by the Government of Catalonia through ACCIÓ, the Catalan Agency for Business Competitiveness.

THE UPC AND PIMEC STRENGTHEN COMPANIES' INNOVATION AND COMPETITIVENESS

5 December

The Universitat Politècnica de Catalunya (UPC) and PIMEC (an employers' association that represents micro, small and medium-sized enterprises and the self-employed in Catalonia) signed an agreement to establish a framework of collaboration. The aim is to promote knowledge and technology transfer from the university to the production sectors, and thus boost innovation, competitiveness, and economic growth. In this context, both entities will coordinate scientific research, technology development and training activities. The actions will be focused on research and transfer, energy, business accelerators and teaching.

CIT UPC will participate actively in defining and following-up actions. It will focus particularly on actions designed to facilitate innovation and technology development, including detection of technology needs, diagnosis, advice on implementation of solutions via R&D projects and the definition and execution of collaboration projects at Spanish and international level.

From its position of leadership in Industry 4.0 and the energy transition, the UPC wishes to help Catalan SMEs with the increasingly demanding transition to work in a global, competitive market. The University is setting up an Observatory for Technology Foresight for the sector. Data from the Observatory will be used to draw up reports and help guide the work of research centres and groups to anticipate market demand and enhance the position of Catalan companies.

NEW DIRECTOR OF CIEFMA UPC AND CDEI UPC

January

Dr. Luis Llanes Pitarch is the new director of the Structural Integrity and Materials Reliability Centre (CIEFMA UPC). He takes over from Dr. Marc Anglada, who had been the Centre's director since its Foundation in 1993.

Luis Llanes is a full professor in the UPC Department of Materials Science and Metallurgy (CMEM). He holds a degree in Materials Engineering (Simón Bolívar University, Venezuela) and a Doctoral Degree in Materials Science and Engineering (University of Pennsylvania, USA), and has been employed by the UPC since 1992. His research is focused on mechanical properties (particularly fracture and fatigue) of engineering materials: metals, ceramics and inorganic matrix composites. For over 15 years, his activity has centred on hard materials in layers or with volume. Examples are cemented carbides, polycrystalline diamond, compounds with particles of cubic boron nitride and multilayer ceramics. Notably, in this area he has studied the development of protocols to optimise the microstructural design of these materials based on improvements in their mechanical integrity, reliability and damage tolerance. In the academic arena, he has supervised ten doctoral theses, published over a hundred papers in journals of recognised international prestige and led over twenty-five research projects. At international level, he has been Chairman or Co-Chairman of the last four International Conferences on the Science of Hard Materials (ICSHM).

Dr. Jordi Martínez is the new director of the Center for Industrial Equipment Design (CDEI UPC). He takes over from Dr. Carles Riba Romeva, who founded the Center and has been its director since 1999. Dr. Riba's leadership and expertise has helped to make the CDEI UPC a leading innovator in the design and development of equipment, goods and products.

Jordi Martínez holds a PhD in industrial engineering awarded by the UPC in October 1987 and has been an associate professor of the university in the Department of Mechanical Engineering since December 1988. He was secretary of this department and is currently its deputy director. He has taught in the areas of mechanics, theory of machines and mechanisms, and since 1997 in the area of calculation, design and testing of machines. He also teaches on the master's degree in Automotive Engineering at the ETSEIB. His research activity has been mainly focused on the analysis of vibrations and simulation of vibratory systems, particularly in the railroad field.

Currently, he is also working with the Institute of Industrial and Control Engineering on the design of platforms for mobile robots.

THE RECERCAIXA PROGRAMME RECOGNISES THE LINDAFIX PROJECT FOR FIGHTING POVERTY AND SOCIAL EXCLUSION

21 February

The RecerCaixa program, which aims to promote research of excellence in Catalonia, increase social and economic progress and improve people's well-being, has delivered twenty new grants to selected projects from the 2017 call.

The project selected in the area of public policies was LinDaFIX (Linked Data for Fighting Inequality in Complex Societies) by María Ribera Sancho and Ernest Teniente, both researchers at inLab FIB UPC, and Maria Cristina Marinescu from the Barcelona Supercomputing Center-Centro Nacional de Supercomputación. The project received close to eighty-two thousand euros.

It seeks to tackle the increasing number of cases of poverty and social exclusion and its main aims are to correctly identify at-risk individuals, to discover patterns that predict inequality and to develop a set of indicators of vulnerability. The proposed approach is based on semantic technologies, automated reasoning, machine learning, and natural language processing techniques to cross data and discover relationships that could indicate which individuals are at risk. In the short term, the aim of the project is to detect hidden cases of vulnerability and, at a deeper level, help change the way society sees individuals who are affected by poverty and exclusion.

A Universitat Politècnica de Catalunya (UPC) project entitled "Ethics for the robots who care for us" also received a grant from the RecerCaixa programme. This project is led by the researcher Miquel Domènech, from the Autonomous University of Barcelona (UAB). Participants include a researcher from the Automatic Control Department at the UPC, Cecilio Angulo, the Hospital Sant Joan de Déu in Barcelona and the Università degli Studi di Sassari (Italy). The project is in the area of humanities and culture and received a grant of close to 75.5 thousand euros.

The project will provide an ethical framework for the design and use of social robots in the field of care and health from an interdisciplinary perspective, emphasizing the opportunities and risks that these new forms of relationship can entail.

MARIA PAU GINEBRA SELECTED AS A FINALIST FOR THE EU PRIZE FOR WOMEN INNOVATORS

13 March

Researcher Maria Pau Ginebra was selected as one of twelve finalists for the 2018 EU Prize for Women Innovators.

The 2018 Prize for Women Innovators is awarded by the European Union in the framework of the Horizon 2020 programme, to raise awareness of the need to innovate and encourage more women to become entrepreneurs. Each finalist must have founded or co-founded a successful company based on innovative ideas or projects that have reached the market. As well as being a CREB researcher, Maria Pau Ginebra is the founder of Mimetis Biomaterials, a spin-off of the Biomaterials, Biomechanics and Tissue Engineering Group that focuses on the design and manufacture of new synthetic biomaterials for bone regeneration and orthopaedic applications.

The area researched by Maria Pau Ginebra, director of the Department of Materials Science and Metallurgy and professor at the Barcelona East School of Engineering (EEEBE), is the design of new biomaterials for regenerative medicine and controlled release of drugs, especially in the field of bone regeneration. She has received several awards, including from the Government of Catalonia's ICREA Academia programme in the field of technology and engineering in 2014 and a Narcís Monturiol Medal for scientific and technological merit in 2012.

The finalists were selected by a jury of independent experts from the academic, business, venture capital and entrepreneurship spheres. The call received submissions from 122 women from all EU member states and countries associated with the Horizon 2020 programme. The companies created by the candidates are based on innovative ideas in a wide range of sectors, including health, biotechnology and social innovation.

SAFEPRES: WINNING PROJECT IN THE FACTORIES OF THE FUTURE AWARDS

14 March

The SAFEPRES (System of Analysis of Faults for the Specific Supervision of the Pump of Auxiliary Pressure) project, carried out by Motion Control & Industrial Applications (MCIA UPC) in collaboration with IThinkUPC for the company Loire Gestamp, won the Best innovation project category in the Factories of the Future Awards organised by Advanced Factories Expo & Congress.

The Factories of the Future Awards were part of the second edition of the innovation, automation and industry 4.0 fair called Advanced Factories 2018, held on 13–15 March in the CCIB, Barcelona. At this fair, the latest advances in machine-tools, robotics, industrial automation and all industry 4.0 technologies were presented.

CARNET: 2018 URBAN TRAFFIC AWARD

17 April

The CARNET (Future Mobility Research Hub) initiative received the ITS 2018 award in the Urban Traffic category for the Virtual Mobility Lab project. The award ceremony was held as part of the Seventeenth Spanish Conference on Intelligent Transport Systems, organized by ITS Spain and held in the headquarters of the Spanish Association of Civil Engineers (CICCP), Madrid.

The aim of the Virtual Mobility Lab (VML) is to develop new tools for urban planning. VML, which was developed with the collaboration of SEAT, PTV IBERIA and Kineo, can analyse and assess the impact of smart mobility projects in Barcelona, and its results can be extrapolated before a pilot test is undertaken. Dr Lídia Montero, a researcher with inLab FIB UPC and head of the project, presented the main results, including the first detailed, multimodal model of the Inner Ring of the Barcelona Metropolitan Area that covers all available modes of public transport, private vehicles and the updated demand for mobility.

ITS is an acronym used by organizations whose activity is focused on the development, promotion and implementation of Intelligent Transport Systems. The activities of ITS Spain include the introduction of intelligence into transport of people and goods to make it safer, more efficient (in terms of comfort, speed and accessible, regular information for users) and cleaner, that is, with the least possible impact on the environment.

MANEL XIFRA I BOADA AWARD FOR THE CIT UPC TECHNOLOGY CENTER

1 June

The College of Industrial Engineers of Girona (CETIG) and Comexi recognised the work of the UPC Technology Center in the thirteenth edition of the Manel Xifra i Boada Awards, presented on 1 June.

The UPC Technology Center received the Manel Xifra i Boada Award in the category of applied research group or technology centre. The UPC Rector, Francesc Torres, was given the award during a ceremony organised by the College of Industrial Engineers of Girona (CETIG) and Comexi and held in La Mercè Auditorium, Girona.

The Awards are held annually in memory of Manel Xifra i Boada (1928–2005), a technical engineer who devoted his working life to the industrial sector. The Awards recognise the work of those who have contributed to the dissemination, consolidation and distinction of the technical engineering professional.

AWARD TO DATA-DRIVEN STEEL 4.0 PROGRAM

1 June

On Friday 1 June, the Data-Driven Steel 4.0 project program won second prize in the Industry Award 4.0, presented at the Industry Forum 4.0 organized by the Engineers of Catalonia's Industry Commission 4.0. The forum was held in Barcelona's Espacio Endesa.

Data-Driven Steel 4.0 is a smart monitoring program for metallurgy plants in the CELSA Group. It was developed by Motion Control and Industrial Applications (MCIA UPC), in collaboration with IThinkUPC, by means of an Industrial Internet of Things (IIoT) platform based on MIIMETIQ technology by NEXIONA.

The representative who received the prize was Òscar Cubiñá, director of the Celsa Barcelona steel mill, together with Juan Antonio Ortega, director of MCIA UPC; Mauricio Echeverría, Industry 4.0 solutions manager for IThinkUPC; Jesús Adolfo Cariño, María Quiles, and Daniel Zurita, MCIA UPC researchers; and Julian Junge, director of technical operations at NEXIONA.

The aim of the Industry Award 4.0 is to recognise the contribution of companies like the CELSA Group that are carrying out pioneering initiatives and innovative projects in this area.

RESEARCH BY JOSEP MARIA FONT RECOGNIZED WITH A LEONARDO GRANT

18 July

Awards

The BBVA Foundation has recognised with a Leonardo Grant the research of Josep Maria Font, from the Biomedical Engineering Research Centre (CREB UPC), who is working on a personalised robotic exoskeleton to help people with spinal injuries to walk again.

The ABLE exoskeleton is designed and developed in the Biomechanical Engineering Lab (BIOMEC) of the UPC. It enables people with spinal injuries to gain the mobility they need to walk. It uses only essential mechanisms and sensors to facilitate the functional recovery of walking in patients with spinal injuries and has three modular components: a knee actuator system that acts as artificial muscle, a sensor situated in the tibia region that detects the user's intention and a rucksack containing the electronics and the battery. Josep Maria Font, who is a member of the UPC Biomedical Engineering Research Centre, received a Leonardo Grant to give new impetus to the project.

Leonardo Grants are awarded by the BBVA Foundation to directly support the work of researchers and cultural creators aged 30 to 45 who, at an intermediate stage in their career, develop an innovative project in one of eleven specialised fields or activities covered by the call for applications. In the 2018 edition, which received 1,521 applications, a total of 64 grants were awarded, each for 40,000 euros.

PROJECT ON A NEW SYSTEM FOR CONTROLLING VIBRATIONS IN BARCELONA METRO: FINALIST IN THE ERCI INNOVATION AWARDS 2018

19 September

The project Dynamic Vibration Absorbers to Reduce Ground-Borne Vibrations from Underground Railways by the Laboratory of Acoustics and Mechanical Engineering (LEAM UPC) and AVEnginyers, a spin-off of the centre, was a finalist in the ERCI Innovation Awards 2018.

This is a system for controlling the vibrations generated by passing trains, based on the application of dynamic vibration absorbers (DVA). These elements are easy to maintain, have a basic design and high reliability and consume vibration energy in the system to which they are connected. They are passive elements that do not need maintenance or an energy source and are optimised for a specific range of frequencies. Their main advantage is lower costs and easier installation than any other existing strategy for controlling train vibrations. Although the principle behind DVA is known, it application in a train tunnel is pioneering, as it required the development of specific, innovative modelling tools for this environment. This new system will reduce train vibrations by 6–8 dB, depending on the conditions in each case.

The devices have been installed experimentally in Barcelona Metro since February 2019.

The ERCI Innovation Awards are organised by clusters that are members of the ERCI. They are given to European companies that offer products, systems, technologies, processes or services with innovative, tested characteristics. The competitition is organised in the European area. The winners are selected by a European jury of independent experts that represent industry, research and public authorities.

Awards

CARNET, NATIONAL RESEARCH AWARD FOR PUBLIC-PRIVATE PARTNERSHIP IN R&I

15 October

On 15 October, the research and innovation hub Future Mobility Research Hub (CARNET), promoted by the UPC, the Volkswagen Group Research and SEAT and focused on the automotive sector and future urban mobility, will receive the National Research Award for Public-Private Partnership in Research and Innovation 2017.

The National Research Awards, organised by the Government of Catalonia and the Catalan Foundation for Research and Innovation (FCRI), promote social recognition of science and the activity of researchers, sponsors, businesses and communicators. The award ceremony presided over by Quim Torra, president of the Government of Catalonia, will be held in the Teatre Nacional de Catalunya, Barcelona.

CARNET is the first platform for knowledge and collaboration between industry and university that uses Barcelona as a testing ground to try out new technological solutions that could improve people's quality of life in the area of mobility. It is open to the participation of institutions and companies that wish to respond to urban mobility challenges. The initiative, which is coordinated by the CIT UPC, is supported by other corporate partners, such as Altran, Applus+ Idiada, the Automotive Industry Cluster of Catalonia (CIAC),ELISAVA, Kineo, Ficosa, the PTV Group, the RACC and Rucker Lypsa, with the collaboration of Barcelona City Council.

BARCELONA, EUROPEAN CAPITAL OF URBAN MOBILITY, WITH THE UPC AS ONE OF THE KEY TECHNOLOGY PARTNERS

13 December

MOBILus is the new knowledge innovation community (KIC) of the European Institute of Innovation and Technology (EIT), a network that has positioned Barcelona as the European Capital of urban mobility. The candidature for this platform, formed of 48 partners from 15 countries that include cities, companies, universities and research centres, was promoted by the UPC. The University has been working on this initiative for various years, from the research and innovation in urban mobility hub CARNET, which was created with SEAT and Volkswagen Group Research. CARNET is coordinated by the CIT UPC and is a member of the KIC.

With this designation, MOBILus, which from January 2019 will be called EIT Urban Mobility, joins Europe's largest innovation network as the eighth KIC community. These communities are dynamic and creative entities that take advantage of European innovation and entrepreneurial spirit to find solutions to social challenges in areas with high innovation potential, such as urban mobility.

The EIT Urban Mobility is formed as a public and private, multinational European platform that is dedicated to research and the application of solutions that improve the collective use of urban spaces, to ensure multimodal, accessible, comfortable, safe, efficient and sustainable mobility with an integrated approach, provide solutions for the new modes of transport that are emerging in cities and support local communities, which will stimulate the economy. It will remain in place for 7 to 15 years, with expected funding that could reach 400 million euros provided by the European Union and up to 1.2 billion provided by members. The headquarters will be in Barcelona and it will be have four other centres in Copenhaguen (Denmark), Prague (Czech republic), Munich (Germany) and Helmond (the Netherlands).

On 13 December, the first general assembly of the EIT Urban Mobility Barcelona was held after it had been designated as European headquarters of the KIC. The meeting was held in the facilities of Barcelona Activa, the city's local development agency.

The 48 members of MOBILus are 13 cities, 17 companies and 18 universities, among which the only Spanish university is the UPC, from Belgium, France, Hungary, Denmark, Germany, the Czech Republic, Italy, Israel, Turkey, the United Kingdom, Sweden, Switzerland, the Netherlands, Finland and Spain.

In addition to Barcelona, the new KIC of the EIT in sustainable urban mobility is comprised of the cities of Amsterdam, Copenhaguen, Eindhoven, Hamburg, Helmond, Helsinki, Istambul, Milan, Munich, Prague, Stockhom and Tel Aviv.

UPC TECHNOLOGY AT THE SECOND EDITION OF THE VIRTUAL REALITY MARKET BCN 360º

27-28 April

Through the CIT UPC Technology Center, the UPC demonstrated its technology capabilities and some of the projects developed in the virtual reality field at the second edition of the Virtual Reality Market BCN 360º, held at the Design Museum of Barcelona (DHUB).

The technological capabilities of the UPC in this field include virtual and augmented reality and immersive interaction, crowds and virtual human animation, geometry processing and procedural modelling, high-precision recording of georeferenced virtual objects in the real world, optical systems for virtual reality, augmented reality and mixed reality, and knowledge on the usability of applications and video games and on modelling and animation in 2D and 3D with a high level of realism.

In these areas, the Virtual Innovation in Modelling the Architecture and the City Lab (VIMAC) develops innovative projects using digital systems of geo information, digital mapping, topography, terrestrial laser scanner (TLS) surveys and photogrammetry. With these techniques, it creates highly complex 3D models and interactive applications. Some examples are the survey of the Palau Reial Major heritage site in the Plaça del Rei, Barcelona, or modelling and 3D printing in high resolution of architectural elements such as the Porta del Drac in the Pavelló Güell.

The ViRVIG UPC group works on modeling and real-time visualization of complex scenes of urban, rural or cultural heritage elements. It has undertaken projects for the National Museum of Catalonia (MNAC) and the Sagrada Familia Foundation, among others. ViRVIG has also done crowd simulations that are used to study mobility or to analyze evacuation methods in emergency situations in urban settings.

In this field, Professor Ernest Redondo, from the Department of Architectural Representation, develops virtual urban scenarios from point clouds or 3D models with a high level of realism.

In the health sector, gamification for patient rehabilitation has been incorporated through serious games and a virtual tool for use in surgery, clinical psychology and the training of patients and professionals. Part of ViRVIG's research focuses on modeling and real-time visualization of medical and protein data, which support clinical diagnosis and teaching practice.

In industrial environments, VR techniques applied to the design, maintenance or control of industrial plants play a key role in the optimization of products and processes.

Projects were also presented that the Computer Applications Center has developed for the Representation of Architecture and Territory (CAIRAT), the Center for Multimedia Image and Technology (CITM) and the Center for Biomedical Engineering Research (CREB UPC). Another project that was presented was the application of augmented reality to record referenced objects, researched by Dolors Royo, a professor in the Computer Architecture Department.

PARTICIPATION IN ENISA'S ANNUAL PRIVACY FORUM 2018 IN BARCELONA

13-14 June

Through esCERT, a member of inLab-FIB, the UPC participated in the organisation of the Annual Privacy Forum (APF) 2018 along with ENISA, the European Commission's DG Connect and Telefónica. The event called on international experts in the privacy and data protection field to share progress in research and development, new challenges at political and legislative level, and privacy and data protection solutions that should be adopted.

In parallel with the conference sessions, in the exhibition area the UPC presented ongoing or completed projects by research teams relating to privacy and data protection (such as Live-FOR, TRUESSSEC and C-ROADS). It also presented its technological capacities in cybersecurity applied to privacy and data protection, cloud and big data, infrastructure security, business continuity plans, forensic and risk analysis consultancy, security auditing, trust services and blockchain.

THE UPC AT THE IOT SOLUTIONS WORLD CONGRESS

16-18 October

On behalf of the UPC, the CIT UPC had a stand in the Government of Catalonia's pavillion during the edition of the IoT Solutions World Congress held in Barcelona in the Fira de Barcelona's Gran Vía venue.

Fairs

One of the projects presented was Cardiovascular Scale, developed by the Instrumentation, Sensors and Interfaces (ISI UPC) research group. In this system, scales not only measure body weight and composition, but also monitor a person's cardiovascular system in a few seconds.

The new system, developed in the Government of Catalonia's Product Programme and jointly financed by the European Regional Development Fund (ERDF), is user-friendly, low cost and can be used outside of the hospital environment. The data on each parameter can be transmitted from the scales to any device with wireless technology.

In addition, TEMPS (Time-domain EMI Measurement and Processing System) was presented. This is a new electromagnetic interference (EMI) receptor based on measurement and processing in the time domain. The equipment, which combines commonly used oscilloscopes and specific software for post-processing of measurements, can be used to determine compliance with provisions in the European electromagnetic compatibility directive more rapidly and at a lower cost than existing options in the market.

Third, a smart monitoring system was presented for predictive maintenance in the rail sector. The system is being developed with technologies based on acoustic emissions that enable early detection, localization and assessment of cracks in critical elements of the bogie, such as the axles and wheels.

Another event at the Congress was the Industria 4.0 Energy Efficiency and Sustainability Forum, in which Luis Romeral, director of Motion Control and Industrial Applications (MCIA UPC), chaired a round table entitled "Technologies applied to energy efficiency: blockchain, IoT, robotics, augmented reality and artificial intelligence".

Jordi Martín, from the CIT UPC, gave a talk entitled "From Innovation to Digital Transformation" as part of a symposium on "Digital transformation in the capital goods industry", organised by the CEQUIP Foundation.

inLab FIB took part as organiser of the IoT Interoperability Hackathon, held at the same venue.

The Motion Control and Industrial Applications (MCIA UPC) centre and IThinkUPC, with the project Data-Driven Steel 4.0: IIoT deployment for Intelligent Monitoring of Meltshop & Rolling Mill process, carried out one of the testbeds (experimentation platforms) selected for this edition of the Congress.

THE UPC PARTICIPATES IN THE FIRST CYBERSECURITY & ETHICAL HACKING CONGRESS

17-18 October

With the support of CIT UPC, inLab FIB UPC was at Cyber Ethical Days, the First Cybersecurity and Ethical Hacking Congress held as part of Barcelona Industry Week on 17–18 October. Through inLab FIB UPC, the UPC presented its technological capacities and cybersecurity projects on a stand in the exhibition area.

The event consisted of two full days of conferences, workshops and networking on topics such as industrial cybersecurity 24/7, critical infrastructure, health sector protection and financial cybercrime.

Manel Medina, cybersecurity expert and director of esCERT, which is part of inLab FIB, moderated the presentation "Fostering Security for IoT and Smart Health" by Christina Skouloudi, director of Networks and Information Security at ENISA, and the keynote speech by Enrique Redondo, head of industrial cybersecurity at INCIBE.

CIT UPC AT THE MAIN WORLD CONGRESS ON SMART CITIES

13-15 November

The UPC presented various technology prototypes at Smart City Expo World Congress, a leading event in the smart cities industry, held at the Fira de Barcelona's Gran Vía site.

Through its Technology Center, the UPC has presented A4EU, a multi-risk platform for early detection in Europe of hazards due to extreme weather and climate events. The technology, which was developed as part of the ANYWHERE European project led by the Center of Applied Research in Hydrometeorology (CRAHI UPC), helps to improve the coordination of teams acting in emergency situations and populations exposed to the risks.

At the fair, the UPC share a stand with the Echord ++ European project in which the Institute of Robotics and Industrial Informatics (CSIC-UPC) is involved. One of the other prototypes displayed by the UPC is a sensor created for the European project CAPTOR. These devices have been used to measure air quality (particularly tropospheric ozone) in pilot projects in Spain, Italy and Austria.

Other items on the UPC stand were a omnidirectional rotation system, designed by the Industrial Equipment Design Centre (CDEI), which can rotate 360 degrees and is based on the incorporation of standard wheels. The design can be used in sectors such as logistics, hospitals, mobility, and transport. In addition, a scalable power module will be exhibited, which was designed by the Centre of Technological Innovation in Static Converters and Drives (CITCEA). The module can be configured in different ways for convertor equipment, so that energy can be manged bidirectionally (for chargers of electrical vehicles, among other applications).

Other projects that the UPC is working on in the area of smart cities was presented at the Congress: PaperChain, a circular economy model for transforming paper waste into secondary raw materials; Incover, a system for producing bioproducts and bioenergy from microalgae cultivated in waste water; and Optima, an initiative focused on the development of smart equipment for the application of plant protection products to improve food quality. In addition, a mobile application that was exhibited called Dosaviña, which was designed for grape producers to calculate the ideal amount of pesticide to distribute in trellis vines. Biometallum, Metro Haul and Slicenet are other products that were highlighted at the Congress.

In addition to these projects and technology prototypes created by research centres and groups, the University demonstrated its technological capacities in the field of smart cities, which cover smart mobility, electric vehicles, urban planning, data science, smart grids, emergency management, robotics, waste management, renewable energies, communications, eHealth, precision agriculture, biodegradable packaging and bioprocesses.

DATTIUM TECHNOLOGY: SMART MONITORING IN INDUSTRY 4.0

November

The Motion Control and Industrial Applications centre (MCIA UPC) has created the spin-off Dattium Technology, which is specialised in the development of smart monitoring systems for industrial applications. Dattium brings together the research centre's accumulated expertise in predictive maintenance, industry 4.0 and industrial electronics. The new company's entrepreneurial team is comprised of the MCIA UPC researchers Maria Quiles, Jesus Adolfo Cariño, Daniel Zurita and Juan Antonio Ortega (codirector of MCIA UPC).

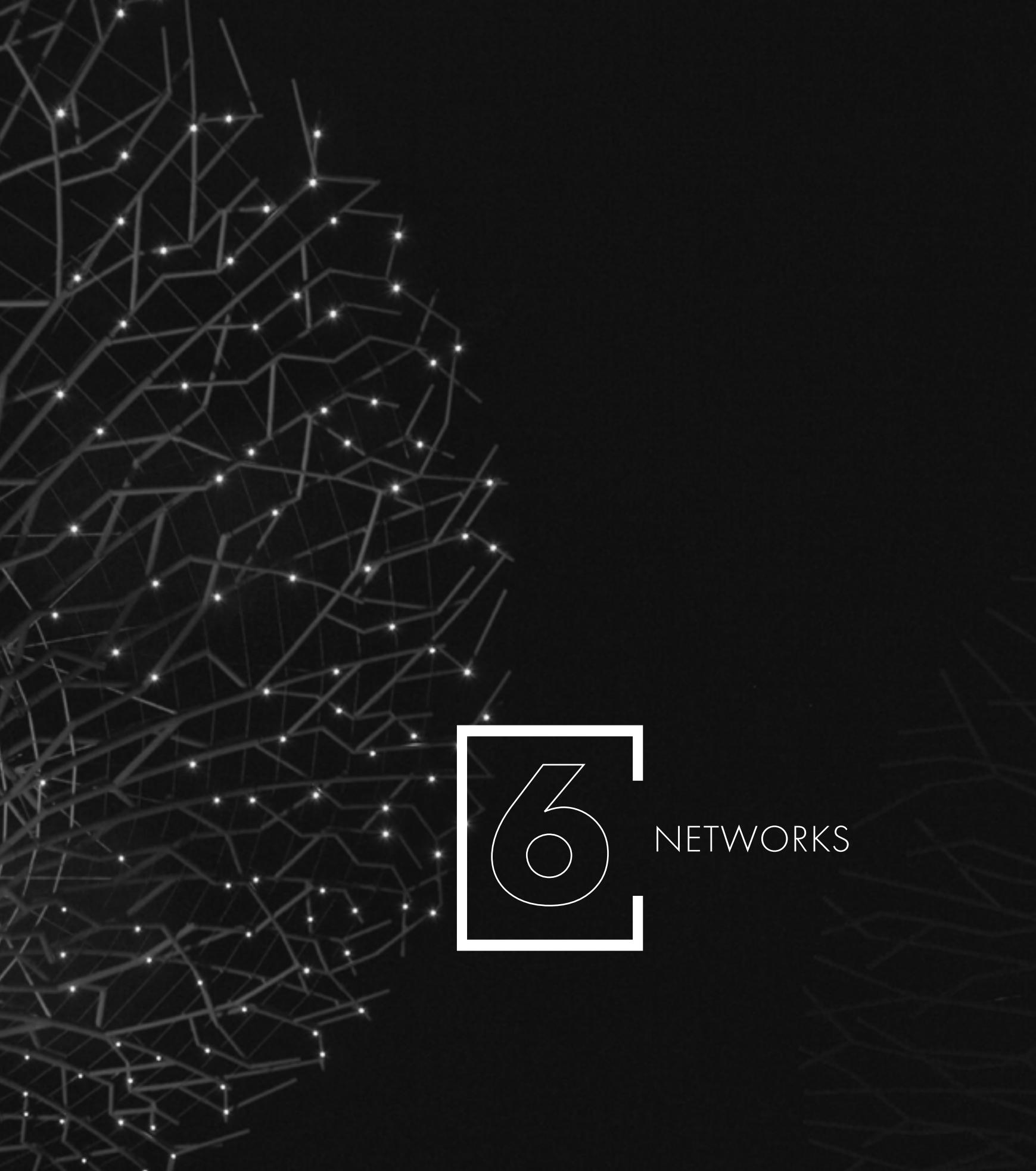
Dattium Technology will market data analysis solutions for production control based on smart monitoring systems that can determine and assess in real time the general behaviour of an industrial plant. The system can be used to assess the quality of a manufactured product or in predictive maintenance of machinery.

Through powerful artificial intelligence algorithms and machine learning methods, the large amount of data generated during manufacturing processes becomes useful information for decision-making. A system of graphic interfaces ensures a fast, simple display of analytical results, including deviations from optimum plant operation, fault detection and defects caused by other factors.

The solutions offered by Dattium Technology can be applied in the metal, chemical or automobile sectors, among others.

Dattium Technology is the result of collaboration with IThink UPC. Both IThink UPC and the UPC hold shares in the spin-off.

DATTIUM
Industrial Data Analytics



6 NETWORKS

Catalan Coordinator of Foundations (CCF)

Automotive Cluster of Catalonia

Spanish Federation of Innovation
and Technology Centres (FEDIT)

The Advanced Materials Cluster of Catalonia

ASTP - PROTON

Cluster Moto

Railgrup

7 DISSEMINATION IN THE MEDIA

PUBLICATIONS

For our science and technology activities to achieve good results, they must be disseminated to society. In particular, we need excellent communication with companies, entities and business organisations. We use various channels to disseminate information about our member centres' projects, such as examples of business-university collaboration and the results and developments they have achieved, which are available for application.

NEWSLETTER

We publish a monthly newsletter in three languages.

BLOG

We publish a technology blog to share experiences and provide information on knowledge, technology and innovation. The blog is open to participation and aims to bring companies and the University into contact.

SOCIAL NETWORKS

PRESS CLIPPINGS


DEL LABORATORIO AL PACIENTE
El programa Cmash Barcelona acelera la llegada al mercado de soluciones tecnológicas en salud
La UPC aprovecha los campos magnéticos para la eficiencia de los coches eléctricos
J. A. | 25.05.2018 | 17:21
El futuro del coche eléctrico es evidente
...para continuar leyendo, hazte SUSCRIPTOR
Ampliar
Barcelona gestionará 1.600 millones en movilidad
LA VANGUARDIA | Barcelona
Barcelona será la capital europea de la movilidad urbana
• La ciudad supera a otros aspirantes y liderará una gran comunidad internacional de innovación
LA VANGUARDIA
La música de las estrellas
• La astrofísica Nanda Rea aplica en la ciencia el rigor y la creatividad que apr
sus estudios de flauta y canto
N SOCIAL

CROSS-TECHNOLOGICAL APPROACH


SMART CITY TECHNOLOGIES
INFORMATION & COMMUNICATION TECHNOLOGIES
CYBERSECURITY
CIT UPC
TECHNOLOGY CENTER
ENERGY AND ENVIRONMENTAL TECHNOLOGIES
VIRTUAL AND AUGMENTED REALITY
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