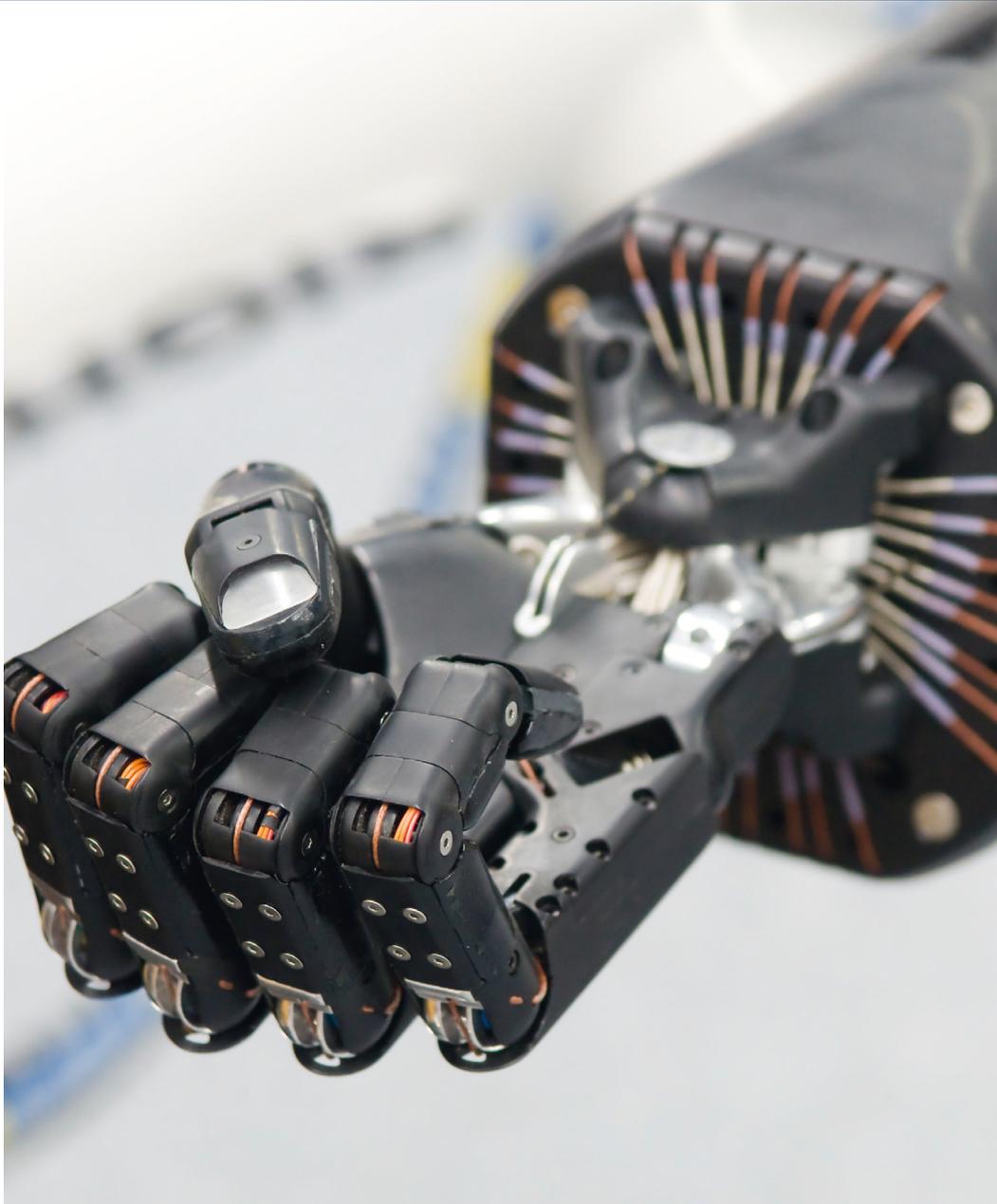




# UC3M R&D FOR INNOVATING Industry 4.0

IDENTIFICATION OF THE RESEARCH ACTIVITY,  
TECHNOLOGIES, PATENTS, INFRASTRUCTURES AND OTHER  
UC3M CAPABILITIES FOR INDUSTRY 4.0

**uc3m** | Universidad **Carlos III** de Madrid  
Vicerrectorado de Política Científica  
Servicio de Apoyo al Emprendimiento y la Innovación



The Entrepreneurship and Innovation Service Supportz SEI of the Universidad Carlos III de Madrid wants to present the potential of the university in this "knowledge map" through the research areas developed in the frame of R&D projects, both national and international, patents and other results of UC3M investigators, in the Industry 4.0 Area.

The global knowledge obtained, the experience of collaborating with the industry, the existence of infrastructures and proper laboratories and, above all, the multidisciplinary nature of UC3M are characteristics that provide an added value so that our support towards the innovation of institutions, big companies and SMEs has an integral quality.

We invite you to deepen the knowledge of the UC3M and to collaborate in new R&D and innovation projects.

**Entrepreneurship and Innovation Service Support  
Universidad Carlos III de Madrid**

**Contact:**  
[comercializacion@uc3m.es](mailto:comercializacion@uc3m.es)

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december 2019

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - PHYSICS			
<p><u>Remote Detection, Sensors, and Infrared Imaging Laboratory (LIR-InfraRed LAB)</u></p> <p><b>PI: Fernando López</b></p>	<ul style="list-style-type: none"> <li>• Spectral analysis</li> <li>• Thermography and radiometry</li> <li>• Non-invasive analysis</li> <li>• Gas leak detection and visualisation</li> <li>• Simulation and design</li> <li>• Temperature measurement in complex scenarios</li> </ul> <p>The LIR-InfraRed LAB has a long history of collaboration with companies, demonstrating great versatility and innovative capacity in the face of unexpected technical complications at all times.</p>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• EMPRESS: Enhancing process efficiency through improved temperature measurement The project envisages performing various tests in different manufacturing processes and thereby documenting and solving manufacturing problems</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in advanced sensors for infrared multispectral imaging</li> <li>• Advanced multispectral infrared sensor research, innovation, and development line</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Characterisation of thermo-mechanical behaviour of composite materials in fire and empirical determination of their properties</li> <li>• SENSIA Chair for advanced studies in applied optics and infrared sensors. R&amp;D collaboration line with SENSIA (<a href="http://www.sensia-solutions.com">www.sensia-solutions.com</a>)</li> </ul>	<p><b>Experience and Capabilities:</b></p> <ul style="list-style-type: none"> <li>• Spectral analysis <ul style="list-style-type: none"> <li>· Threat detection in complex environments</li> <li>· Remote detection and analysis of gas species</li> <li>· Infrared visualisation of gases</li> <li>· Atmospheric measurements</li> </ul> </li> <li>• Thermography and Radiometry <ul style="list-style-type: none"> <li>· Energy efficiency</li> <li>· Precise remote temperature measurement</li> <li>· Process monitoring</li> <li>· Radiometric scenario simulation</li> <li>· Remote IR detection</li> </ul> </li> <li>• Non-invasive analysis <ul style="list-style-type: none"> <li>· Preventive analysis of anomalies</li> <li>· Experimental data-based behavioural models</li> <li>· Health monitoring</li> <li>· Experimental data-based behavioural models</li> </ul> </li> </ul> <p><b>Equipment:</b></p> <ul style="list-style-type: none"> <li>• IR Cameras: MIR, LWIR, and VIS/NIR</li> <li>• FTIR Spectrophotometer and spectroradiometry</li> <li>• High-resolution hyperspectral imaging system</li> <li>• Calibration black bodies</li> <li>• IR detectors and electronic instruments for the manufacture of prototypes</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><b>Computer, Communications, and Systems Architecture (ARCOS)</b></p> <hr/> <p><b>PI: Jesús Carretero</b></p>	<ul style="list-style-type: none"> <li>• High-performance computing:               <ul style="list-style-type: none"> <li>· Scalable massive data management</li> <li>· High-performance cloud computing</li> <li>· Semi-automatic application parallelisation and optimisation</li> </ul> </li> <li>• Distributed and parallel systems:               <ul style="list-style-type: none"> <li>· High-performance data retrieval and transmission system</li> <li>· Social networks data analysis</li> <li>· Peer to peer systems</li> </ul> </li> <li>• Real time systems:               <ul style="list-style-type: none"> <li>· Real time system simulation</li> <li>· Wireless sensor networks</li> <li>· Remote system monitoring</li> </ul> </li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• Network for Sustainable Ultrascale Computing (NESUS)</li> <li>• Cross-Layer Abstractions and Run-time for I/OR Software Stack of Extreme-scale systems (CLARISSE)</li> <li>• Scalable data management techniques for high-end computing systems (REPHRASE)</li> <li>• Reengineering and Enabling Performance and power of Applications (REPARA)</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Scalable data management techniques for high-end computing systems (SDAMATECHS)</li> <li>• Optimisation techniques for high performance computing</li> <li>• R&amp;D Regional Plan Projects (Community of Madrid)</li> <li>• Strategic action in computer architecture and very high-performance systems (high-end computing systems)</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Railway infrastructure design and simulation</li> <li>• A self-adaptive, scalable framework for heterogeneous systems in Smart Cities (ADAPCITY)</li> <li>• Processing Extreme Data (ProceED)</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The main objective of the ARCOS group is to perform research relating to hardware and software systems and to develop said systems in the fields of real time and built-in systems, high-performance computing, high-throughput computing (Cloud and Grid), storage systems, and systems and reliable systems.</p> <p>ARCOS research focuses on tools and methods for software development, high-performance computing, and data utilisation and management.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Development of parallel applications for the management and storage of large volumes of data</li> <li>• Energy efficient data management mechanisms</li> <li>• Semi-automatic parallelisation of computer applications</li> <li>• Traffic and power consumption simulation in transportation systems</li> </ul>

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HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><b>COSEC</b> <b>(Computer Security Lab)</b></p> <hr/> <p><b>PI: Arturo Ribagorda, Juan E. Tapiador</b></p>	<ul style="list-style-type: none"> <li>• Cyberdefence systems</li> <li>• Security in the Internet of Things (RFID, implantable medical devices, controllers, etc.)</li> <li>• Smartphone security</li> <li>• Malware analysis</li> <li>• Applied cryptography</li> <li>• Data leak prevention (DLP)</li> <li>• Security in vehicular ad-hoc networks (VANET)</li> <li>• Security in localisation-based systems (LBS)</li> <li>• Hardware security</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• ARVI: Runtime Verification beyond Monitoring</li> <li>• Cryptography for Secure Digital Interaction</li> <li>• Trustworthy Manufacturing and Use of Secure Devices</li> <li>• THESEUS: Terminal at High Speed for European Stock Exchange Users</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• SMOG-DEV: Security Mechanism for fog cOMputinG aDvanced sEcurity for dEVices</li> <li>• SPINY - Security and Privacy in the Internet-of-You</li> <li>• Advance simulator for organized cyberdefense (SACO)</li> <li>• E-SAVE: Evidence-based Security Architecture for Vehicular Environments</li> <li>• SEGUR@: Security and Trust in the Information Society</li> <li>• SECURITY2020: Digital Identity Management for Digital Environments</li> <li>• CERTILOC: Digital CERTification service for LOCation information</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• EVADIR: A Methodology for Evasion Attacks on Network Intrusion Detection Systems</li> <li>• PRECIOUS: Responsible privacy in vehicle circulation</li> <li>• CIBERDINE: Cybersecurity, data, information, and risk</li> </ul>	<p><b>Experience and Capabilities:</b></p> <ul style="list-style-type: none"> <li>• Solution for security problems (networks, authentication, data leak, encryption solutions, and digital signature, etc.) in public and private entities</li> <li>• Development of solutions, provision of comprehensive R&amp;D services, consultation, audits, training, and high-level guidance in the field of system security and information technologies</li> </ul> <p><b>Patents:</b></p> <ul style="list-style-type: none"> <li>• <i>Procedimiento y sistema de acreditación de autorizaciones para vehículos en circulación</i> (Method and system for checking the permits of vehicles being driven) (Patent ES2537829)</li> </ul> <p><b>Software Registrations:</b></p> <ul style="list-style-type: none"> <li>• Answer2Pass Pro-e-learning software platform integrated in Facebook based on quizzes (M-004894/2015)</li> <li>• SETiChat - A secure Android chat (M-003681/2014)</li> <li>• Alterdroid - Tool for analyzing obfuscated software in Android (M-003190/2014)</li> <li>• Targetdroid - Tool for analyzing targeted malware in Android (M-008457/2014)</li> <li>• E-RETO: E-mail usage pattern analyzer (M-007044/2014)</li> <li>• eStorePasss: Password manager that works with chip cards (M-003999/2012)</li> </ul>

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HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><u>COSEC</u> (Computer Security Lab)</p> <hr/> <p>PI: Arturo Ribagorda, Juan E. Tapiador</p>		<p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• INDRA Chair on cybersecurity</li> <li>• Collaborative system to fill and submit European accident statements using smartphones</li> <li>• Predictive Analytics for Cybersecurity Operations Centers</li> </ul>	<ul style="list-style-type: none"> <li>• MONOCLE Plug-in for extracting trails applied in BOX storage (M-008330/2015)</li> <li>• MONOCLE Plug-in for extracting data applied in i-Cloud storage (M-008333/2015)</li> <li>• AKARI-1 and AKARI 2 Pseudorandom number generator for lightweight devices (M-000945/2016 and M-000947/2016)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><b><u>Evolutionary Computation and Neural Networks Group (EVANNAI)</u></b></p> <p><b>PI: Pedro Isasi</b></p>	<ul style="list-style-type: none"> <li>• Bioinspired computation: Genetic algorithms, evolution strategies, genetic programming, particle swarms, among others</li> <li>• Multi-objective optimisation</li> <li>• Machine learning/data mining</li> <li>• Artificial neural networks</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Multi-objective metaheuristic and multidiscipline applications (MSTAR)</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• Bioinspired computation for data mining</li> <li>• Evolutionary computation for classification tasks in data mining</li> <li>• Machine learning for brain-computer interface (ML-BCI))</li> <li>• Bioinspired computation for data mining (CibMin)</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in bioinspired learning</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>EVANNAI has extensive experience in the following applied areas:</p> <ul style="list-style-type: none"> <li>• Data structure</li> <li>• Robotics</li> <li>• Brain-computer interface</li> </ul> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• System for the efficient control of power and chemical plants</li> <li>• Consumption market segmentation tool.</li> <li>• Artificial intelligence software for data optimisation, prediction and analysis</li> </ul>

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HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><b><u>Advanced Databases Group (LABDA)</u></b></p> <p><b>PI: Paloma Martínez</b></p>	<ul style="list-style-type: none"> <li>• Extraction and retrieval of information from large volumes of texts in the biomedical and health domain, particularly in pharmacovigilance</li> <li>• Algorithms based on the combination of machine learning and specific domain resources for entity recognition and relationship extraction</li> <li>• Application of natural language processing (NLP) technologies for processing clinical notes.</li> <li>• Application of NLP technologies for monitoring social media</li> <li>• Methodological frameworks for the development of accessible web applications</li> <li>• Accessible user interfaces</li> <li>• Accessibility in the educational environment</li> <li>• Accessibility in electronic administration services</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• eGovernAbility: Model-based framework for the development of accessible services in e-Administration (<a href="https://egovernability.wordpress.com/">https://egovernability.wordpress.com/</a>)</li> <li>• TrendMiner: Large-scale, Cross-lingual Trend Mining and Summarisation of Real-time Media Streams</li> <li>• BUSCAMEDIA: Towards a semantic adaptation of multinetwork-multiterminal digital media</li> <li>• ISSE: Semantic-based interoperability for e-health</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Line of research in natural language databases and processing</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>LABDA works on R&amp;D projects relating to natural language processing (NLP) technologies, information retrieval and extraction in various domains, and user interface accessibility.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Design and development of solutions for the processing and exploitation of structured and non-structured information in health domain</li> <li>• Text analytics</li> <li>• User interface and web accessibility consultation</li> </ul>

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HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><b>Applied Artificial Intelligence Group (GIAA)</b></p> <p><b>PI: Jesús García Herrero, José Manuel Molina</b></p>	<ul style="list-style-type: none"> <li>• Machine learning and data mining techniques</li> <li>• Evolutionary computation and multi-objective optimisation</li> <li>• Agents and multi-agent systems: Web, information retrieval, recommendation, e-commerce, sensor management</li> <li>• Computer vision</li> <li>• Augmented reality</li> <li>• Internet of Things</li> <li>• Contextual information and data fusion systems</li> <li>• Surveillance systems</li> <li>• Indoor localisation systems</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• European Concerted Research Action designated as COST Action IC1406: High-Performance Modelling and Simulation for Big Data Applications (cHiPSet)</li> <li>• Research on Ambient Intelligence</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Integration of fusion and interpretation techniques for the development of services based on activity estimation in smart spaces</li> <li>• Activity estimation techniques for services in smart spaces</li> <li>• Sensor fusion techniques and rationale for services based on location and context: AAL Application (LOCATIL)</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• Concepts and technologies for the development of contextualised services (CONTEXT)</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in data fusion, ambient intelligence, and privacy</li> <li>• CONMADE: Collaborative Navigation and Mobile Manipulation in Dynamic Environments</li> <li>• Line of research in applied artificial intelligence</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>GIAA provides solutions to engineering problems by incorporating state-of-the-art artificial intelligence techniques: machine learning, evolutionary computation, data analysis, multi-objective optimisation, fuzzy systems, and intelligent agents.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Data optimisation, prediction, and analysis software</li> <li>• Extraction of behaviours from intelligent data analysis</li> <li>• Design of data mining tools using intelligent data retrieval techniques</li> <li>• Camera-based surveillance system</li> <li>• System of software agents for surveillance</li> <li>• Multi-sensor fusion platform for monitoring systems</li> <li>• Distributed sensor management platform</li> <li>• System for providing recommendation based on reputation of subjective personal opinions</li> <li>• Automated reputation management process which customises recommendations in e-commerce processes</li> </ul>

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HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><u>Applied Artificial Intelligence Group (GIAA)</u></p> <hr/> <p>PI: Jesús García Herrero, José Manuel Molina</p>		<p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• SOLERA Chair - Intelligence applied to the world of automobiles</li> <li>• Intelligent transport of intermodal freight (TIMI)</li> </ul>	<p><b>Patents:</b></p> <ul style="list-style-type: none"> <li>• <i>Procedimiento para la captura y seguimiento de objetos y dispositivos para llevar a cabo dicho procedimiento</i> (Method for the capture and tracking of objects and device for carrying out said method) (ES2372830)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><b>Knowledge Reusing</b></p> <p>PI: Juan Llorens</p>	<ul style="list-style-type: none"> <li>• Knowledge networks:               <ul style="list-style-type: none"> <li>· Universal representation Information (digitalisation and integration)</li> <li>· Retrieval</li> <li>· Reusing</li> </ul> </li> <li>• Engineering methods:               <ul style="list-style-type: none"> <li>· Requirements engineering</li> <li>· <i>Model-based Systems Engineering</i></li> <li>· <i>Product Lifecycle Management</i></li> <li>· <i>Variability Management</i></li> </ul> </li> <li>• Application to processes of:               <ul style="list-style-type: none"> <li>· Analysis and design of complex critical systems</li> <li>· Traceability</li> <li>· Quality assurance and management</li> <li>· Evidence and certification</li> <li>· Supply (provision) chains</li> </ul> </li> <li>• Interoperable data and knowledge ("smart data") management platforms for:               <ul style="list-style-type: none"> <li>· Engineering artefacts reusing</li> <li>· Continuous quality</li> <li>· <i>Continuos and collaborative engineering</i></li> <li>· Business intelligence, processing large amounts of data and knowledge interference</li> <li>· "Internet of Tools"</li> <li>· "Industrial Internet"</li> </ul> </li> <li>• Industry: Aerospace, automotive, railway, and health</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• AMASS - Architecture-driven, Multi-concern and Seamless Assurance and Certification of Cyber-Physical Systems</li> <li>• CRYSTAL – Critical Systems Engineering Acceleration</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Development of a conceptual retrieval system by means of semantic levels in metadata scheme representation</li> </ul> <p><b>Others:</b></p> <ul style="list-style-type: none"> <li>• Radio Televisión Española (RTVE) and UC3M Chair: Information management, big data, linked data, and the application thereof in the audiovisual field</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The area of interest of Knowledge Reusing group lies in knowledge representation, identification, retrieval, and reusing.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Automatic knowledge discovery and extraction techniques</li> <li>• Traceability identification systems</li> <li>• Knowledge quality measuring algorithms</li> <li>• Knowledge visualisation</li> <li>• Standard-based interoperable platforms</li> <li>• Technology and standardisation consultation               <ul style="list-style-type: none"> <li>· Members of the BoD (Board of Directors) of <i>Asociación Española de Ingeniería de Sistemas</i> (Spanish Association of System Engineering) (Official chapter of INCOSE)</li> <li>· Members of OMG and OSLC</li> </ul> </li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><u>Control Learning and System Optimisation Laboratory (CAOS)</u></p> <hr/> <p>PI: Araceli Sanchis</p>	<ul style="list-style-type: none"> <li>• Artificial intelligence</li> <li>• Machine learning</li> <li>• Intelligent data analysis</li> <li>• Artificial neural networks</li> <li>• Pattern recognition</li> <li>• Evolutionary computation</li> <li>• Agent modelling</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Intelligent Agent-Based Driver Decision Support (i-Support)</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• Data fusion by means of classifier set for detecting moving objects in dynamic environments (TOSCLA)</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in artificial intelligence applied to system control</li> <li>• Line of research in artificial intelligence</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Development of the "process simulator" software</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The Control Learning and System Optimisation (CAOS) Laboratory is formed by a team of professionals whose expertise lies in the prediction, optimisation, and control of business services, processes, and decisions based on data analysis, using to that end advanced artificial intelligence technologies.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Application of artificial intelligence techniques for solving business problems</li> <li>• Trend prediction and process optimisation based on intelligent data analysis</li> <li>• Design of intelligent data retrieval systems - data mining based on state-of-the-art technology</li> <li>• Representation of an explicit mode of key processes and knowledge of complex organisations</li> <li>• Time series prediction by means of machine learning techniques</li> <li>• Time series prediction by means of artificial neural networks and evolutionary computation</li> <li>• Activity recognition: Algorithms for individual/agent activity recognition</li> <li>• Advanced tool for automatic market data analysis</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><b><u>Planning and Learning (PLG)</u></b></p> <p><b>PI: Daniel Borrajo</b></p>	<ul style="list-style-type: none"> <li>• Artificial intelligence</li> <li>• Task planning</li> <li>• Cognitive robotics</li> <li>• Machine learning</li> <li>• Problem solving</li> <li>• Heuristic optimisation</li> <li>• Decision support systems</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• GOTCHA (European Space Agency). Task planning for Mars rovers</li> <li>• CCI (European Space Agency). Estimation of costs, risk, and quality in large-scale projects</li> <li>• SSA-DCII (European Space Agency). Planning for the observation of objects in space</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Goal management for long-term autonomy in smart cities (GLASS)</li> <li>• Lifelong learning technologies in social robots and smart homes (LifeBots)</li> <li>• Multiagent interaction for planning (PLANINTERACTION)</li> <li>• Intelligent planning system for collective transport with optimised route generation (PLICOGOR)</li> <li>• Intelligent transport of intermodal freight (TIMI)</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Knowledge modelling and planning technique analysis for automating data mining processes</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The Planning and Learning Group (PLG) is formed by a consolidated team of experts skilled in the development of effective and innovative software solutions for automating planning tasks and data analysis by means of advanced artificial intelligence technologies. PLG is one of the first Spanish groups to delve into task planning and machine learning technologies, winning various international accolades with its ground-breaking technology.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Automating dynamic planning and decision making processes</li> <li>• Process optimisation based on intelligent data analysis and trend or risk prediction</li> <li>• Task planning in social or scientific robots</li> <li>• Application of artificial intelligence techniques for solving business problems (business intelligence)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><b>Interactive Systems (DEI)</b></p> <hr/> <p><b>PI: Paloma Díaz</b></p>	<ul style="list-style-type: none"> <li>• Design of interactive systems</li> <li>• Virtual, augmented, and mixed reality</li> <li>• Complex data visualisation</li> <li>• Ubiquitous and social computing</li> <li>• Educational and learning environments</li> <li>• Educational games and simulations</li> <li>• ICT in emergency and crisis management</li> <li>• Digital culture</li> <li>• Collaboration technologies</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• NOTRE: Network for sOcial compuTing Research</li> <li>• meSch: Material Encounters with Digital Cultural Heritage</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Civic engagement in emergency management</li> <li>• End-User Development for creating augmented experiences in archaeological sites</li> <li>• Pervasive and Affordable technologies for Civic Engagement</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in web information systems</li> <li>• COLLIIDE: COLLaborative Immersive Environment for the IDEation, Implementation, Validation and Exploitation of Creative Projects</li> <li>• Improvements and expansion of integrated media management system during emergencies</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The Interactive Systems (DEI) Laboratory has spent over 20 years conducting research relating to the opportunities presented by successive technological advancements in the area of human-computer interaction. Their research has been applied to the development of innovative solutions which effectively and efficient support work, learning, or communication in different environments.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Tools for co-designing and prototyping games, virtual and augmented environments, and development by end users</li> <li>• Design and development of interactive mobile, social, and multiplatform applications</li> <li>• Design and development of virtual, augmented, and mixed experiences</li> <li>• Design and development of platforms for education and learning</li> <li>• Design and development of information systems for emergency management</li> <li>• Design and development of complex data visualisation platforms</li> <li>• Performing usability and accessibility studies</li> <li>• Ontology definition and development</li> <li>• Guidance in UX, codesign, and participatory design projects</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - COMPUTER SCIENCE			
<p><b>SoftLab</b></p> <hr/> <p><b>PI: Ángel García Crespo</b></p>	<ul style="list-style-type: none"> <li>• Semantic Web Technologies</li> <li>• Social Web 2.0</li> <li>• Linked Data</li> <li>• Software-as-a Service &amp; Cloud Computing Environments</li> <li>• Soft Computing in Corporate Information Systems</li> <li>• Business processes integration</li> <li>• Software Engineering</li> <li>• Distributed and Global Software Development</li> <li>• ITC Project Management</li> <li>• Business information systems</li> <li>• IT Government</li> <li>• People Issues in Software Development</li> <li>• Audiovisual Accessibility</li> <li>• Biometry</li> <li>• Natural Language Processing</li> <li>• Natural Interaction Systems</li> <li>• HCI and Accessibility</li> <li>• App development</li> </ul>	<p><b>R&amp;D National Plans:</b></p> <ul style="list-style-type: none"> <li>• Platform for the creation of cultural training systems with augmented reality in smart cities</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in semantic, ontological, and artificial intelligence technologies for the analysis of social networks and open innovation</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Guidance for the development of a linked data technology-based platform for the mass analysis and tracking of information generated through social networks</li> <li>• Extractment 2.0: Api streaming-based tweets extraction system</li> <li>• Twittiment: Corpus management system for sentiment analysis in Twitter</li> <li>• Mobile device data exchange prototype</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The works of the Softlab group relate to:</p> <ul style="list-style-type: none"> <li>• Effective system integration by means of concurrent engineering, artificial intelligence, and information management systems</li> <li>• System analysis, modelling, and design using principles of incremental development</li> <li>• Design and creation of tools by means of rapid prototyping systems</li> <li>• Design and development of mobile applications in high productivity environments</li> <li>• Integration of client-server architecture-based systems by using Internet as the development platform</li> <li>• Development of accessible multimodal interfaces</li> </ul> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Social network corpus generating system</li> <li>• Social network analysis and tracking tool</li> <li>• Analysis system for obtaining product recommendations from non-structured data</li> <li>• Analysis system for obtaining predictions from non-structured data</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - MECHANICAL ENGINEERING			
<p><b>Organisation Engineering</b></p> <hr/> <p><b>PI: Gil Gutiérrez, Alfonso Durán, Bernardo Prida</b></p>	<ul style="list-style-type: none"> <li>• Sourcing and supply chain management</li> <li>• Product and process innovation</li> <li>• Technological innovation and organisational changes</li> <li>• Industrial logistics</li> <li>• People with disabilities: Universal design, modelling, and analysis</li> <li>• Integral evaluation (social-technical-economic) of alternative designs for complex systems</li> <li>• Modelling and simulation</li> <li>• Strategic information system planning</li> <li>• Production planning, programming, and control systems</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• ICARUS: Innovative Changes in Air transport Research for Universally designed Services</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in organisational engineering research</li> <li>• Line of research in organisational engineering and logistics</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Analysis of information relating to RFID technology and practical cases of implementation in the automotive sector</li> <li>• Studies of the application of RFID (Radio Frequency Identification) technology in designing a system for managing finished vehicle stocks in a vehicle manufacturing plant</li> <li>• Analysis for the redesign of the production planning and control system in the Space Division of EADS – CASA</li> <li>• Development of systems for supply chain integration</li> <li>• Action techniques and methodologies for adopting the “lean manufacturing” approach in the EADS/CASA Eurofighter aircraft right wing assembly line</li> <li>• Guidance and technical assistance in environmental management and energy efficiency</li> </ul>	

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
<b>HIGHER POLYTECHNIC SCHOOL - MECHANICAL ENGINEERING</b>			
<p><b><u>MAQLAB:</u></b>  <b><u>Machine</u></b>  <b><u>Laboratory</u></b></p> <hr/> <p><b>PI: Juan Carlos García Prada, Cristina Castejón</b></p>	<ul style="list-style-type: none"> <li>• Kinematic and dynamic synthesis and analysis of machines and mechanisms</li> <li>• Vibrations and noise in machines and mechanisms, defectology</li> <li>• Magnetomechanics and nanomechanics</li> <li>• Instrumentation and experimental methods</li> <li>• Rheology, tribology, and interface mechanics</li> <li>• Plant biomechanics</li> <li>• Security</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Integral monitoring system of critical mechanical assemblies for improving transport maintenance</li> <li>• Integrated computer-assisted mechatronics design system intended for automatically optimising service robot structures (SIDEMAR)</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• Optimal design methodology for service robots (MADBOT)</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in advanced machine and mechanism industrial engineering research</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• AEGI DEVELOPMENTS Chair</li> <li>• ROCA Chair</li> <li>• Computer simulation and analysis of mechanical systems: Application to lifting and vertical transport systems</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The MAQLAB group conducts R&amp;D&amp;I activities that are comprised in the field of mechanical engineering, including research projects applied to industry, vehicles, transport, security, and defence relating to advanced mechanisms, special mechanisms, magnetomechanics, applied tribology, biomechanics, and monitoring and measuring techniques.</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - MECHANICAL ENGINEERING			
<p><b><u>MECATRAN:</u></b> <b><u>Experimental Mechanics, Calculation, and Transports</u></b></p> <p><b>PI: Vicente Díaz, José Luis San Román</b></p>	<ul style="list-style-type: none"> <li>• Advanced simulation techniques in mechanical engineering</li> <li>• Machine calculation, construction, and testing</li> <li>• Machine testing and measuring techniques</li> <li>• Industrial safety and maintenance</li> <li>• Biomechanics</li> <li>• Applications of artificial intelligence in the field of mechanics</li> <li>• Vehicle's dynamics</li> <li>• Active/semi-active systems in motor vehicles</li> <li>• Intelligent vehicles</li> <li>• Intelligent transport systems</li> <li>• Environmental studies, recycling and waste management</li> <li>• Graphical engineering, simulation, and virtual reality</li> <li>• CAD/CAE/CAM</li> <li>• Acoustics and vibrations</li> <li>• Metrology for test and model validation</li> </ul>	<p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Development of Mapics tools for manufacture</li> <li>• Optimised industrial parcel classification machine production design. Quality Control according to EN-ISO 9001 standard</li> <li>• Technical services and studies of structures by means of simulation</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The MECATRAN Group masters the main commercial Software and Hardware tools related with dynamic simulation and virtual reality applied to the technological fields of mechanical engineering.</p> <p>They following stands out among the applications available from the group:</p> <ul style="list-style-type: none"> <li>• Computer Aided Design (CAD) Software</li> <li>• Data Acquisition and Treatment Software</li> <li>• Mechanical Systems Dynamic Simulation Software</li> <li>• Finite Elements Analysis Software</li> <li>• Experimental Modal Analysis Software</li> <li>• Traffic Simulation Software</li> <li>• Vehicle dynamic simulation software (CarSIM, TruckSim, Simpack)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - MECHANICAL ENGINEERING			
<p><b><u>Simulation and Mechanical Optimisation Group (SiOMec)</u></b></p> <p><b>PI: María Belén Muñoz Abella, Lourdes Rubio Ruiz de Aguirre</b></p>	<ul style="list-style-type: none"> <li>• Identification of defects in mechanical elements. Health Monitoring</li> <li>• Fracture and fatigue of mechanical components</li> <li>• Service behaviour of mechanical components in fatigue and fracture</li> <li>• Mechanical problems: Direct and inverse approach</li> <li>• Mechanical system simulation</li> <li>• Computer-aided modelling and engineering</li> <li>• Biomechanics</li> <li>• Optimisation techniques applied to mechanical engineering</li> <li>• Small mechanical and biomechanical devices design and prototyping</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• VIBROCRACK: Crack identification in one-dimensional mechanical elements by means of non-linearity detection methods</li> <li>• PROFISEJE: Propagation of fatigue cracks in rotating shafts</li> <li>• SHAFTCRACK: Detection and identification of fatigue cracks in rotating shafts by means of genetic algorithms</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• Development of a non-destructive method for detecting and identifying cracks in non-rotating shafts</li> </ul>	<p><b>Experience and Capabilities:</b></p> <ul style="list-style-type: none"> <li>• Group skilled in finite element modelling of standard and non- standard mechanical components and in the study of their behaviour under service conditions</li> <li>• Experience in the use of conventional optimisation methods and methods such as neural networks and genetic algorithms for solving inverse problems in mechanical engineering</li> <li>• Development of research projects in the field of fracture, developing numerical and experimental models of cracked elements. These models are used for crack detection and identification</li> </ul> <p><b>Equipment:</b></p> <ul style="list-style-type: none"> <li>• High-performance computer equipment</li> <li>• Rotodynamic test bench</li> <li>• Machine for generating cracks by resonance</li> <li>• Shaft and beam static test bench</li> <li>• Shaft and beam dynamic test bench</li> <li>• Vibration data acquisition equipment</li> <li>• 2-axis contactless measuring microscope (Kestrel Elite)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - MECHANICAL ENGINEERING			
<p><b><u>Mechanical and Biomechanical Component Manufacture and Design Technologies (FABDIS)</u></b></p> <p><b>PI: Henar Miguélez</b></p>	<ul style="list-style-type: none"> <li>• Machining:               <ul style="list-style-type: none"> <li>· Numerical modelling of machining processes</li> <li>· Process definition and optimisation</li> <li>· Machinability tests</li> <li>· Machining of prototypes</li> <li>· Study on the machining of special materials</li> <li>· Ecological machining</li> </ul> </li> <li>• Manufacture-oriented design</li> <li>• Processes for shaping by plastic deformation:               <ul style="list-style-type: none"> <li>· Numerical modelling of plastic deformation processes</li> <li>· Process definition and optimisation</li> <li>· High-temperature folding</li> </ul> </li> <li>• Computer-aided design, manufacturing, and engineering: CAD, CAM, CAE</li> <li>• Application of heuristic techniques for the modelling of manufacturing processes and design of mechanical components:               <ul style="list-style-type: none"> <li>· Neural networks</li> <li>· Genetic algorithms</li> </ul> </li> <li>• Detection of defects in mechanical systems (health monitoring)</li> <li>• Application of mechanical component simulation techniques</li> <li>• Inverse problems in mechanical engineering</li> <li>• Design of biomechanical components</li> <li>• Statistical analysis of manufacturing processes:               <ul style="list-style-type: none"> <li>· Statistical control of processes</li> <li>· Statistical simulation of defects</li> <li>· Capacity analysis</li> <li>· Statistical design of tolerances</li> </ul> </li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Carbon fibre composite material drilling process modelling</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in advanced manufacturing technologies</li> <li>• DATES: Interaction and damage of the system of n deformable bodies of different nature</li> <li>• HSREMNI: Analysis of high speed removal processes of in alloys</li> <li>• Line of research in prototype machining and manufacturing modelling</li> <li>• Theoretical and experimental approaches for dynamic industrial processes</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Drilling Processes Improvement for Multi Material CFRP-AL-TI Stacks</li> <li>• Cryogenic treatment for sustainable integral production in the machining of hardened metal parts</li> </ul>	<p><b>Experience and Capabilities:</b></p> <ul style="list-style-type: none"> <li>• Manufacturing systems and processes</li> <li>• Design of mechanical components</li> <li>• Detection of defects (health monitoring)</li> <li>• Biomechanics</li> </ul> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Technologies for manufacturing components for the aeronautical industry</li> <li>• Techniques for the detection of defects in mechanical systems</li> <li>• Experimental techniques for the study of mechanical system behaviour</li> </ul> <p><b>Equipment:</b></p> <ul style="list-style-type: none"> <li>• Workstations and PCs with finite element numerical simulation software (ABAQUS)</li> <li>• Machining centre</li> <li>• Numerical control lathe</li> <li>• Extensometer equipment</li> <li>• Data acquisition systems with different sampling ranges</li> <li>• Surface analysis equipment</li> <li>• Systems for measuring forces, displacements, and deformations</li> <li>• Testing device for rotating mechanical elements</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TELEMATIC ENGINEERING			
<p><b>Telematic Applications and Services Group (GAST)</b></p> <hr/> <p><b>PI: Carlos Delgado Kloos</b></p>	<ul style="list-style-type: none"> <li>• Security and ubiquitous computing</li> <li>• Web technologies</li> <li>• E-learning</li> </ul> <p><b>Real-time distributed systems (Marisol García Valls):</b></p> <ul style="list-style-type: none"> <li>• Trustworthy distributed and parallel high-performance systems</li> <li>• Real-time middleware (DDS) and distribution of critical software systems</li> <li>• Modelling of real time software systems</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Development of middleware for real time reconfiguration of distributed surveillance video systems</li> <li>• Healthy and Efficient Routes in Massive Open-Data Based Smart Cities: Smart Driving and Semantic Data Handling "Hermes-Smartdriver"</li> <li>• Monitoring incidents in smart communities (INRISCO): Safety and mobility</li> <li>• Open and dynamic physical cyber systems</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in telematic applications and services: smart environments</li> <li>• Strategic action in ubiquitous computing</li> <li>• Strategic action in physical cyber systems: Large-scale distributed real-time systems (CPS)</li> <li>• Strategic action in web and big data technologies</li> <li>• ADMIVERARe: Applied Data Mining and Interactive Visualizations for Enhancing Reflection, Adaptation and Recommendations in e-Learning</li> <li>• CARTEL: Creativity with Augmented-Reality Tablet enhanced learning</li> <li>• CityCin: A Cyber physical event-based communication platform for Critical infrastructure monitoring and protection systems</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Motorcycle Simulator Dynamics in Unity-3D</li> </ul>	<p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Scalable data analysis and visualisation</li> <li>• Identity, confidence, and reputation management systems for distributed services</li> <li>• <b>Real time system laboratory:</b> <ul style="list-style-type: none"> <li>· Real-time middleware for secure execution in hot reconfigurable systems</li> <li>· Partitioned architectures</li> </ul> </li> </ul> <p><b>Software Registrations:</b></p> <ul style="list-style-type: none"> <li>• Client-server application for WiFi-based indoor geo-localisation for Android devices (M-008750/2014)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TELEMATIC ENGINEERING			
<p><b>NETCOM</b> <b>(Networks and Communication Technologies)</b></p> <hr/> <p><b>PI: Arturo Azcorra</b></p>	<ul style="list-style-type: none"> <li>• Telematic networks and services</li> <li>• Network architecture</li> <li>• Distributed services</li> <li>• Communication protocols</li> <li>• Vehicle and mobile networks</li> <li>• Wireless networks</li> <li>• Peer-to-Peer systems</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• Flex5Gware: Flexible and efficient hardware/software platforms for 5G network elements and devices</li> <li>• METRICS: Measurement for Europe: Training and Research for Internet Communications Science</li> <li>• NOTRE: Network for sOcial compuTing REsearch</li> <li>• TEAM: Technologies for information and communications Europe - east Asia Mobilities</li> <li>• 5G Exchange</li> <li>• 5G-Crosshaul: The 5G Integrated fronthaul/backhaul</li> <li>• 5G NORMA: 5G NOvel Radio Multiservice adaptive network Architecture</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Dronext: Quick deployment of a multiservice communications infrastructure for protection, security, and defence</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• BRADE: Brain Inspired Data Engineering</li> <li>• TIGRE5-CM. Integrated technologies for management and operation of 5G networks</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in 5G virtual communications</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Communications network configuration</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The NETCOM Group collaborates with IMDEA Networks International Research Institute in various research projects and scientific activities. Both groups conduct complementary research in the areas of architecture of networks, communication protocols, wireless and mobile networks, peer-to-peer systems, and distributed services.</p> <p><b>Patents:</b></p> <ul style="list-style-type: none"> <li>• Ethernet frames encapsulation within CPRI basic frames (PCT/EP2015/077395)</li> <li>• <i>Procedimiento y dispositivo de gestión de movilidad IP localizada basada en la red, red de acceso y dispositivo de pasarela de acceso fijos y móviles a dominios con movilidad IP localizada</i> (Method for managing localised IP mobility based on network, access network, and fixed and mobile gateway devices with access to domains with localised IP mobility (ES2360678))</li> <li>• <i>Procedimiento y sistema para gestionar la transferencia de usuarios asignados, entre elementos de redes IMS</i> (Method and system for managing the transfer of assigned users between INM networks elements) (ES2572535, WO2016087695)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TELEMATIC ENGINEERING			
<p><b>ADSCOM</b> <b>(Advanced Switching and Communication Systems)</b></p> <hr/> <p><b>PI: David Larrabeiti</b></p>	<ul style="list-style-type: none"> <li>• Design of networks for real time multimedia data transport (RTP/RTCP)</li> <li>• Traffic modelling for efficient bandwidth- and delay communications</li> <li>• Application of data mining and web mining techniques in telematic networks</li> <li>• Real-time analysis of large data sets applied to sensor networks (Internet of Things)</li> <li>• Network and critical infrastructure system security</li> <li>• Security in Internet of Things</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Metro optical-integrated access network architecture</li> <li>• Elastic Networks: New paradigms of elastic networks for a world based radically on cloud and fog computing</li> <li>• Statistical mechanics for "Big Data": acquisition, analysis, and modelling</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• TIGRE5-CM. Integrated technologies for management and operation of 5G networks</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in advanced telematic services, switching, and networks</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Applications of Big Data Analytics in security: Comparative analysis of antivirus engines</li> <li>• Big Data analytics applied to the Android apps: Characterisation and early detection of Android Malware</li> <li>• Energy efficient concentrator - server communication protocol for an Internet of Things scenario</li> </ul>	<ul style="list-style-type: none"> <li>• Telecommunication network optimisation</li> <li>• Big Data and privacy: Analysis of the value of private data for large online companies</li> <li>• Design of distributed web crawlers, collection and analysis of data from social networks and web data platforms</li> <li>• Processing of large volumes of data with Apache Hadoop and Spark ecosystems</li> <li>• Traffic analysis in networks and massive data capture analysis in lawful interception</li> <li>• Cluster optimisation and parallelisation for analysing large volumes of data</li> <li>• Deployment and design of emergency networks</li> <li>• Use of big data techniques for detecting malware and criminal activity</li> </ul> <p><b>Patents:</b></p> <ul style="list-style-type: none"> <li>• <i>Mecanismo de conexión para redes entre pares energéticamente eficientes</i> (Connection mechanism for energy-efficient peer-to-peer networks) (ES2537722)</li> <li>• <i>Método y dispositivo para control de acceso de escritura a un recurso en una red RELOAD</i> (Method and device for controlling write access to a resource in a RELOAD network) (ES2552707)</li> <li>• <i>Procedimiento y aparato para la comunicación con un dispositivo de Internet restringido</i> (Method and apparatus for communication with a restricted Internet device) (P201590024)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
<b>HIGHER POLYTECHNIC SCHOOL - THERMAL AND FLUID ENGINEERING</b>			
<p><b><u>Thermal Engineering, Energy, and Atmosphere (ITEA)</u></b></p> <hr/> <p><b>PI: Antonio Lecuona, Pedro A. Rodríguez Aumente</b></p>	<ul style="list-style-type: none"> <li>• Efficient energy and thermal systems of low environmental impact</li> <li>• Technology for energy assessment, for sustainable energy, and the use of renewable energy. Solar energy</li> <li>• Energy optimisation audits, diagnosis, and studies for buildings and systems, particularly embedded electronics, and in closed enclosures. Thermal and humidity control</li> <li>• Advanced techniques for characterising flows of industrial interest. LDV, PIV, PDPA. Two-phase flows</li> <li>• Clean combustion</li> <li>• Absorption machines</li> <li>• Thermal energy storage</li> <li>• Environmental acoustics and aeroacoustics. Detection of sources and minimisation of sound emission</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• HOT: Characterisation and optimisation of humidity and mist in aircraft cabins (Clean Sky Programme)</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Solar cooling integrating advanced absorption with electricity</li> <li>• Thermal-solar energy technologies and low- and mid-temperature residual heat harnessing technologies integrated in the power grid</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• Solar climate control with flat-plate vacuum solar collectors</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in thermal engineering, energy, and atmosphere</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The ITEA Group is formed by a group of technology-oriented experts with vast experience in scientific disciplines, innovation, development, and engineering studies. Pooling together their extensive knowledge and experience, the members of the group share a common purpose of offering effective services in a wide-ranging technological spectrum. Furthermore, they work with collaborators having expertise in fundamental analytical and numerical techniques, giving the group internationally proven strength.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Human and technical resources capable of providing real, practical solutions to problems of industrial interest in various sectors.</li> <li>• Ability to work as a group, acting as an office for R&amp;D, consultation, and technological and environmental guidance in the atmospheric field</li> <li>• Prototype development</li> <li>• Design engineering projects</li> <li>• Custom specialised training</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - SYSTEMS AND AUTOMATIC ENGINEERING			
<p><b>Robotics Lab</b></p> <hr/> <p><b>PI: Miguel A. Salichs, Carlos Balaguer, Luis Moreno</b></p>	<ul style="list-style-type: none"> <li>• Actuators/Control</li> <li>• Software architectures</li> <li>• Industrial automation</li> <li>• Control of mobile manipulators</li> <li>• Computer-aided mechatronics design</li> <li>• 2D/3D modelling</li> <li>• Multimodal human-robot interaction</li> <li>• Remote human-robot interaction</li> <li>• Visual human-robot interaction</li> <li>• Remote manipulation</li> <li>• Dynamic modelling of mobile manipulators</li> <li>• Autonomous platforms</li> <li>• Object recognition</li> <li>• Humanoid robots</li> <li>• Topological navigation</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• MANUBUILD: Open Building Manufacturing</li> <li>• ROBOT@CWE - Advanced robotic systems in future collaborative working environments</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Learning and skilled planning techniques for mobile manipulators</li> <li>• Human-robot peer-to-peer interaction</li> <li>• TEAM-UP: Supporting Human-Robot Teams in Dynamic and Challenging Environments</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in robotics and automation</li> <li>• AUREA: Augmenting personal capabilities through a human-centred portable robotic system with advanced learning skills</li> <li>• Line of research in mobile manipulators and robotics</li> <li>• Advanced sensors and Continuous infrastructure monitoring</li> <li>• Supporting human-robot teams in dynamic and challenging environments: Towards working with the machines</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• WRG Robots and Technology Chair</li> <li>• Lean-Based Construction Simulation</li> <li>• Autonomous or collaborative robots (ROBAUCO)</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The group's main areas of work encompass robotics (humanoid robots, social robots, and assistive robots), industrial automation, robotics and automation in construction, mobile manipulators, and aerospace applications.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Automation and robotisation of industrial processes</li> <li>• Design and development of robots</li> <li>• Development of sensory perception systems</li> <li>• Development of process simulators</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - SYSTEMS AND AUTOMATIC ENGINEERING			
<p><b><u>Intelligent Systems Laboratory (LSI)</u></b></p> <p><b>PI: Arturo de la Escalera, José María Armingol, Francisco José Rodríguez</b></p>	<ul style="list-style-type: none"> <li>• Intelligent transport systems</li> <li>• Computer vision</li> <li>• Computer-integrated manufacturing</li> <li>• System modelling and simulation</li> <li>• Microrobotics</li> <li>• 2D and 3D camera surveillance systems</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• FUSION: Fusion of Multidisciplinary Components for Service Pervasive Robot Development</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• ANCE: Autonomous Navigation in Challenging Environments</li> <li>• Line of Research in intelligent systems</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Industrial robotics courses</li> <li>• Maintenance robotics courses</li> <li>• Automated panel manufacturing factory for architectural concrete façades</li> <li>• VISION: New generation video communications</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The Intelligent Systems Laboratory has extensive experience in providing innovative solutions to companies from wide-ranging sectors, such as the automotive sector, construction sector, automation and control sector, among others, for the automation, control, and optimisation of their manufacturing systems.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Analysis of the suitability of changing or redesigning production systems by means of computer techniques for modelling, simulation and optimisation of processes</li> <li>• Design and development of solutions for automating production processes</li> <li>• Design and development of industrial computer vision applications</li> <li>• Design of perception systems for security and surveillance activities</li> <li>• Design and development of surveillance systems based on autonomous aerial and land vehicles</li> <li>• Control systems for motorised optics with variable focal length</li> <li>• These systems have multiple applications: Security and surveillance activities, automated visual inspection for quality control, remote operation of robotised systems and teleconferences, among others</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TECHNOLOGY ELECTRONIC			
<p><b>Microelectronic Design and Applications (DMA)</b></p> <p><b>PI: Luis Entrena, Luis Hernández</b></p>	<ul style="list-style-type: none"> <li>• Analogue microelectronics</li> <li>• Design with FPGAs and applications. Acceleration Hardware</li> <li>• Design for low consumption</li> <li>• CAD tools for electronic design (EDA)</li> <li>• A/D and D/A Conversion. Sigma-Delta modulation</li> <li>• Fault Tolerant Circuits. Validation of fault tolerance through simulation and emulation</li> <li>• Reconfigurable computation</li> <li>• Smartcards and applications</li> <li>• Biometric and cryptographic identification systems</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• SIMIC: Silicon Microphone</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Design and verification of nano-scale electronic circuits for space and land applications in radiation environments</li> <li>• Time-referenced data acquisition interfaces for sensors, medical imaging, and communications</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in microelectronic circuits for advanced data acquisition interfaces</li> <li>• Strategic action in A/D data converters connected to an analogue capacitive sensor reading interface in MEMS technology using low-voltage CMOS circuits with time code</li> <li>• Strategic action in scalable oversampled data converters in technology for communications, sensing, and biomedical imaging applications</li> <li>• Strategic action in the design of radiation tolerant circuits</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The group's scientific-technical activity is related to the design of digital electronic circuits, both application-specific integrated circuits (ASICs) and circuits implemented by means of programmable hardware (FPGA, CPLD).</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Electronic data acquisition systems in communications and sensing, with IP generation at the system and microelectronics level</li> <li>• Acceleration hardware for biometry and cryptography</li> </ul>

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TECHNOLOGY ELECTRONIC			
<p><u>Microelectronic Design and Applications (DMA)</u></p> <hr/> <p>PI: Luis Entrena, Luis Hernández</p>		<p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Design of data converters for a digital microphone and environmental sensors</li> <li>• Design and characterisation of main building blocks for medical instruments ADCs</li> <li>• High-resolution ADCs for high dynamic range audio applications</li> <li>• Read-out analogue circuits for high SNR pressure sensors</li> </ul>	

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TECHNOLOGY ELECTRONIC			
<p><u>Displays and Photonic Applications Group (GDAF)</u></p> <p>PI: José Manuel Sánchez Pena, Carmen Vázquez</p>	<ul style="list-style-type: none"> <li>• Electro-optic devices and applications</li> <li>• Advanced instrumentation and sensors</li> <li>• Photonic devices for optical networks</li> <li>• Augmented reality and virtual reality</li> </ul>	<ul style="list-style-type: none"> <li>• BONE. Building the Future Optical Network in Europe</li> <li>• COST Action IC1208: Integrating Devices And Materials: A Challenge For New Instruments In ICT</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Self-Referenced Fibre Optic Intensity Configurations for Single and Multi-Sensors</li> <li>• A new generation of photonic devices based on self-organising materials: Characterisation</li> <li>• New switching and sensing techniques in optical networks</li> <li>• FOTOCOMIN: Photonic devices for networks with wavelength multiplexing for communications and instrumentation</li> <li>• GREENFIBER: Sustainable technologies for sensing and communications based on optical fibres in the area of transport and biomedicine</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• Applied photonics for the creation of optical technologies and the transfer thereof to companies in Madrid (FACTOTEM I-II)</li> <li>• SINFOTON: Sensors and instrumentation in photonic technologies</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Unmanned systems with zero environmental impact</li> <li>• SAFE-OF: Systems for managing tanks containing flammable liquids with optical control</li> </ul>	<p><b>Experience and Capabilities:</b></p> <ul style="list-style-type: none"> <li>• Capability in the development of instrumentation systems which allow monitoring to be performed at several points by means of developing optical fibre-based quasi-distributed systems</li> <li>• Capability in the development of optical fibre-based sensors for measuring temperature, level, and deformations in different environments</li> <li>• System for monitoring WDM-PON optical access networks and self-referencing techniques</li> <li>• Contactless temperature measurement in industrial environments in hard-to-access regions</li> <li>• Remote supply with fibre for supplying low-consumption sensor networks</li> </ul> <p><b>Patents:</b></p> <ul style="list-style-type: none"> <li>• <i>Método y sistema de generación de un flujo de transporte corregido a partir de un flujo de transporte original de televisión digital</i> (Method and system for generating a corrected transport flow from an original transport flow of a digital television) (ES2358145)</li> <li>• <i>Interfaz receptora de televisión</i> (Television receiver interface) (ES2358144)</li> <li>• <i>Dispositivo de señalización de vehículos</i> (Vehicle signalling device ) (ES2284399)</li> <li>• <i>Sensor óptico para control de nivel de líquidos</i> (Optical sensor for controlling a liquid level) (ES2146546)</li> </ul>

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HIGHER POLYTECHNIC SCHOOL - TECHNOLOGY ELECTRONIC			
<p><u>Displays and Photonic Applications Group (GDAF)</u></p> <hr/> <p>PI: José Manuel Sánchez Pena, Carmen Vázquez</p>			<ul style="list-style-type: none"> <li>• <i>Método y sistema para la monitorización de redes de fibra óptica</i> (Method and system for monitoring optical fibre networks) (P201530018)</li> <li>• <i>Pirómetro de fibra óptica a dos colores</i> (Two-colour fibre optic pyrometer) (P201530546, PCT/ES2016/070269)</li> <li>• <i>Sistema de medición de nivel de combustibles en ultraligeros</i> (System for measuring fuel level in ultralight vehicles) (ES2339205)</li> <li>• <i>Sistema sensor óptico para medida de nivel en entornos críticos</i> (Optical sensor system for level measurement in critical environments) (ES2213411)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TECHNOLOGY ELECTRONIC			
<p><b>University Technological Identification Group (GUTI)</b></p> <p><b>PI: Raúl Sánchez Reillo</b></p>	<ul style="list-style-type: none"> <li>• Identification systems and their applications</li> <li>• Identification solutions in mobility (smart phones, tablets, netbooks, etc.)</li> <li>• Identification devices (especially smartcards and RFID)</li> <li>• Security and cryptographic instruments (both secret and public key)</li> <li>• Biometric identification systems:               <ul style="list-style-type: none"> <li>· Biometric modalities: Iris, hand geometry, vascular systems, handwritten signature and fingerprint</li> <li>· Multibiometrics: Multimodal, multisensor, multi-algorithm</li> <li>· Integration of biometrics in smartcards and tokens</li> <li>· Biometrics protection: in process, storage, communications, etc.</li> </ul> </li> <li>• Testing methodology: Both in performance and in security</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• EKSISTENZ: Harmonized framework allowing a sustainable and robust identity for European Citizens</li> <li>• MobilePass: A secure, modular and distributed mobile border control solution for European land border crossing points</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Universal access by means of biometric recognition in mobile environments</li> <li>• Secure, user-friendly authentication in mobile environments based on voice biometrics</li> <li>• Voice biometrics for assuring the security of business applications - SecuVoice</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in identification systems and their applications</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Biometrics platform for the secure signing of agreements</li> <li>• Telebiometric authentication technologies using ECG</li> </ul>	<p><b>Experience and Capabilities:</b></p> <ul style="list-style-type: none"> <li>• Functional identification systems evaluation               <ul style="list-style-type: none"> <li>· Biometrics</li> <li>· Smartcards</li> </ul> </li> <li>• Security evaluation according to common criteria               <ul style="list-style-type: none"> <li>· Preparing protection profiles</li> </ul> </li> <li>• Creating evaluation methodology</li> <li>• Consultancy, research, and development in identification systems</li> <li>• National and international standardisation</li> </ul> <p><b>Registro software:</b></p> <ul style="list-style-type: none"> <li>• Handwritten signature toolbox (M-005590/2014)</li> <li>• Tool for the forensic analysis of dynamic biometric signatures made with electronic devices (M-005589/2014)</li> <li>• Multiplatform user authentication system for secure printing of documents (M-006233/2013)</li> <li>• Automatic Remote Evaluation System (ARES) (M-006232/2013)</li> <li>• System for human recognition by means of the vascular structure of the wrist with homogenous lighting (M-006231/2013)</li> <li>• Object-oriented biometric application development interface based on BioAPI (ISO/IEC 19784-1) and implemented in C# (M-006230/2013)</li> </ul>

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TECHNOLOGY ELECTRONIC			
<p><u>University Technological Identification Group (GUTI)</u></p> <hr/> <p>PI: Raúl Sánchez Reillo</p>			<ul style="list-style-type: none"> <li>• Iris recognition library with a low computational cost and fraud control (M-006229/2013)</li> <li>• Motor for the biometric recognition of handwritten signature with web service development support and security mechanisms (M-008725/2012)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TECHNOLOGY ELECTRONIC			
<p><b>Electronic Power Systems Group (GSEP)</b></p> <hr/> <p><b>PI: Andrés Barrado, Emilio Olías</b></p>	<ul style="list-style-type: none"> <li>• Electronic power system analysis, design and optimisation</li> <li>• Magnetic component analysis, design and optimisation</li> <li>• Photovoltaic and hybrid energy system design and optimisation</li> <li>• Electromagnetic interference measurement and correction in equipment and systems. Electromagnetic compatibility</li> </ul>	<p><b>R&amp;D National Plans:</b></p> <ul style="list-style-type: none"> <li>• Thermoplastic material welding processes</li> </ul> <p><b>Regional R&amp;D Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• New generation of photovoltaic strategies, materials, and devices for improved utilisation of solar energy</li> </ul> <p><b>- In-house Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in electronic energy conversion, control, and distribution systems</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The Electronic Power Systems (GSEP) group provides comprehensive services in the consultation, analysis, custom design, and optimisation of electronic power systems and magnetic components, as well as photovoltaic and hybrid energy systems, and electromagnetic compatibility.</p> <ul style="list-style-type: none"> <li>• <b>Energy conversion systems</b> <ul style="list-style-type: none"> <li>· Converter design, modeling, and optimisation</li> <li>· Design of prototypes</li> <li>· Modeling of DC supply systems, including a behavioural model of converters and stability analysis.</li> <li>· CAD tools for electronic power system and equipment design</li> </ul> </li> <li>• <b>Magnetic components</b> <ul style="list-style-type: none"> <li>· Design of magnetic components</li> <li>· Optimisation of magnetic component volume, losses, and temperature</li> <li>· Finite element-based analytical models of high-frequency magnetic components</li> <li>· Contactless power supply systems</li> </ul> </li> <li>• <b>Photovoltaic and hybrid energy systems</b> <ul style="list-style-type: none"> <li>· Optimisation of power electronics in photovoltaic systems</li> <li>· Design of energy control, regulation, and conditioning systems for autonomous and networking systems</li> <li>· Hybrid systems</li> </ul> </li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TECHNOLOGY ELECTRONIC			
<p><u>Electronic Power Systems Group (GSEP)</u></p> <hr/> <p>PI: Andrés Barrado, Emilio Olías</p>			<ul style="list-style-type: none"> <li>• <b>Equipment electromagnetic compatibility</b> <ul style="list-style-type: none"> <li>· Pre-certification testing of equipment electromagnetic compatibility</li> <li>· Development of EMI filters</li> <li>· Evaluation of environmental radiation level</li> </ul> </li> <li>• <b>Training courses</b></li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - TECHNOLOGY ELECTRONIC			
<p><b><u>Optoelectronics and Laser Technology (GOTL)</u></b></p> <p><b>PI: Horacio Lamela</b></p>	<ul style="list-style-type: none"> <li>• Laser techniques and systems and optoelectronic sensors</li> <li>• Optical generation of millimetric and terahertz (THZ) signals</li> <li>• Experimental design, modelling, and characterisation of high-speed semiconductor laser diodes</li> <li>• Interferometric instrumentation systems with high sensitivity optical fibres for the measurement of vibrations, temperatures, and acoustic signals</li> <li>• Design and implementation of transmitters and receivers for optical communications systems</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• FIWIN5G: Fiber-Wireless Integrated Networks for 5th Generation delivery</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Application of photonic integrated circuits in the development of ultra-high data rate wireless links and sensors</li> <li>• DiDaCTIC: Development of an ultra-high data rate wireless integrated communications system in the THz range</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in photonic integrated circuits and their applications</li> <li>• Strategic action in optoelectronics and laser technology</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>Development of telemetry and 2D and 3D vision systems for robotics. Development, characterisation, and modelling of laterally coupled lasers. Development of optical sensors and optoelectronic instrumentation, optical communications, laser interferometry, and high-speed communications systems.</p> <p><b>Patents:</b></p> <ul style="list-style-type: none"> <li>• <i>Sistema de visión 3D con procesamiento de hardware de la señal de video</i> (3D vision system with hardware processing of a video signal) (ES2152171)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - SIGNAL AND COMMUNICATIONS THEORY			
<p><b>Communications</b></p> <hr/> <p><b>PI: Ana García Armada</b></p>	<ul style="list-style-type: none"> <li>• Multi-antenna systems (MIMO) for broadband communication</li> <li>• Multi-carrier modulation OFDM</li> <li>• Ultra-wideband techniques</li> <li>• Signal processing in digital communications</li> <li>• Communication system simulation and modelling</li> <li>• Cognitive radio</li> <li>• Application of the aforementioned techniques to local/metropolitan wireless networks (WLAN, WMAN), next generation mobile systems (5G), and communication systems via satellite</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• CIES: Wireless communications in security and emergency environments</li> <li>• COMONSENS: Foundations and Methodologies for Future Communication and Sensor Networks</li> <li>• General Radio concepts for ENergy cogNizant mobile communications: Aspects on the system level</li> <li>• LTEXTREME, Optimisation of multi-user and multimedia services over LTE and LTE-Advanced</li> <li>• MACHINE: Massive wireless communications between machines</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in broadband communications</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Design of a demodulator for wireless Internet access through the light from public light fixtures</li> <li>• Smart Li-fi: Wireless Internet access through the light from public light fixtures</li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>The Communications Group has extensive experience in the analysis, design, and evaluation of fixed and mobile communications systems, which allows providing alternatives for optimising the applications and services supported in said systems.</p> <p><b>Patents:</b></p> <ul style="list-style-type: none"> <li>• <i>Método y dispositivo para la inhibición de señales de telefonía móvil</i> (Method and device for inhibiting mobile telephone signals) (ES2455067)</li> <li>• <i>Método de transmisión conjunta</i> (Combined transmission method) (ES2360039)</li> <li>• <i>Método para optimizar la asignación de potencia de flujos de usuario transmitidos desde estaciones base en sistemas de transmisión de estación base coordinada</i> (Method to optimise the power assignment of user streams transmitted from base stations in coordinated base station transmission systems) (ES2425468)</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - SIGNAL AND COMMUNICATIONS THEORY			
<p><b>Multimedia Processing</b></p> <hr/> <p><b>PI: Fernando Díaz de María</b></p>	<ul style="list-style-type: none"> <li>• Computer vision</li> <li>• Voice, audio, image, and processing</li> <li>• People, location, or object recognition</li> <li>• Object/people tracking in video</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Robust computer vision techniques and their application in intelligent transport systems for improving road safety, mobility, and traffic management</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in the applications of voice, audio, image, and video processing</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Context-aware automatic speech recognition under cognitive stress aided by multimodal biometric detection</li> <li>• Developments of computer vision algorithms for road safety and other applications</li> </ul>	<p><b>Experience and Capabilities:</b></p> <ul style="list-style-type: none"> <li>• Applications of computer vision in safety: Video analytics, event detection, anomaly detection, road incident detection, etc.</li> <li>• Applications of computer vision in the health sector: Systems for aiding in diagnosis, brain tumour classification, disease follow-up, etc.</li> <li>• Voice, audio, image, and video processing</li> <li>• Object recognition and tracking in images/video</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - SIGNAL AND COMMUNICATIONS THEORY			
<p><u>Signal Processing and Learning Group (GTSA)</u></p> <p>PI: Antonio Artés</p>	<ul style="list-style-type: none"> <li>• Detection and estimation in sensor networks</li> <li>• Advanced signal and image processing techniques</li> <li>• Detection and classification of signals</li> <li>• Information theory: Wireless system performance limits, channel coding, and data compression</li> </ul>	<p><b>European Projects:</b></p> <ul style="list-style-type: none"> <li>• Towards an efficient mobile Internet</li> <li>• Information theory for low-latency Wireless communications</li> </ul> <p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Foundations and Methodologies for Future Communications and Sensor Networks</li> <li>• Advanced Bayesian computational methods for estimation, prediction, and control in complex multisensor systems</li> <li>• Overhead-throughput-optimal signalling schemes for next-generation wireless networks</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• Concepts and applications of intelligent systems</li> </ul> <p><b>Private funding:</b></p> <ul style="list-style-type: none"> <li>• Deep learning for predicting client terminal change</li> <li>• Stress level assessment with non-intrusive sensors</li> </ul>	<p><b>Experience and Capabilities:</b></p> <ul style="list-style-type: none"> <li>• Intelligent monitoring systems based on sensor networks with military, environmental, home automation, security, and tracking applications</li> <li>• Communications system analysis</li> </ul> <p><b>Equipment:</b></p> <ul style="list-style-type: none"> <li>• Computer cluster: 1280 cores, 15 sustained Tflops, 80 TB storage (40 internal + 40 external)</li> <li>• Computing services for online access (11 servers, 4 of them with Intel Xeon Phi co-processors)</li> <li>• Two GPU NVIDIA Tesla K20c</li> <li>• Wearable monitoring sensors, systems, and devices</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
HIGHER POLYTECHNIC SCHOOL - SIGNAL AND COMMUNICATIONS THEORY			
<p><b><u>Machine Learning for Data Science (ML4DS)</u></b></p> <hr/> <p><b>PI: Jerónimo Arenas</b></p>	<ul style="list-style-type: none"> <li>• Adaptive systems for machine learning</li> <li>• Signal processing</li> <li>• Smart Grid</li> <li>• Sensor networks</li> <li>• Internet as a data source</li> </ul>	<p><b>R&amp;D National Plan Projects:</b></p> <ul style="list-style-type: none"> <li>• Machine learning of characteristics and metrics that can be interpreted for computational intelligence</li> <li>• Distributed learning in energy efficient adaptive sensor networks</li> <li>• Advanced adaptive filtering techniques: Application in sensors networks and dispersed systems</li> </ul> <p><b>R&amp;D Regional Plan Projects (Community of Madrid):</b></p> <ul style="list-style-type: none"> <li>• Smart grid programme in the Community of Madrid</li> </ul> <p><b>Internal Projects (UC3M funding):</b></p> <ul style="list-style-type: none"> <li>• Strategic action in machine learning methods and their applications in signal processing, communications, and data analysis</li> <li>• Strategic action in adaptive and distributed systems for machine learning</li> </ul>	<p><b>Experience and Capabilities:</b></p> <ul style="list-style-type: none"> <li>• Machine learning for mass data analysis on web domains and large databases</li> <li>• Machine learning for big data</li> <li>• Internally developed algorithm for adaptive estimation in distributed networks based on diffusion</li> <li>• Ad-hoc algorithm designs for machine learning: Classification, regression, clustering, topic modelling, and novelty detection</li> <li>• Intelligent website crawling</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
FACULTY OF SOCIAL SCIENCES AND LAW - STATISTICS			
<p><b>Statistics Department</b></p> <hr/> <p><b>Person in charge: Rosa Elvira Lillo Rodríguez</b></p>	<p><b>Operations Research Group</b> <i>PI: Francisco Javier Nogales Martín</i></p> <ul style="list-style-type: none"> <li>• Optimisation of dynamic and stochastic systems via mathematical programming methods</li> <li>• Stochastic programming</li> <li>• Non-linear optimisation in very large scale problems</li> <li>• Stochastic combinatorial optimisation</li> </ul> <p><b>Statistical Modelling and Data Analysis Group</b> <i>PI: Rosa Elvira Lillo Rodríguez, Daniel Peña Sánchez de Rivera, Ismael Sánchez Rodríguez-Morcillo</i></p> <ul style="list-style-type: none"> <li>• Functional data analysis</li> <li>• Regression analysis</li> <li>• Multivariate analysis</li> <li>• Reliability</li> <li>• Stochastic optimisation</li> <li>• Stochastic processes</li> <li>• Time series</li> <li>• Re-sampling techniques</li> <li>• Semi-parametric techniques</li> </ul> <p><b>Macroeconomic and Financial Forecast and Analysis Group</b> <i>PI: Antoni Espasa Terrades</i></p> <p>This group specialises particularly in macroeconomic prediction and analysis, especially for the purpose of prediction and diagnosis</p>	<p><b>Operations Research Group:</b></p> <ul style="list-style-type: none"> <li>• Regularised optimisation: New models and methods in big data analysis <i>Funding: R&amp;D National Plan</i></li> </ul> <p><b>Statistical Modelling and Data Analysis Group</b></p> <ul style="list-style-type: none"> <li>• Advanced statistical methods for complex data <i>Funding: R&amp;D National Plan</i></li> <li>• Knowledge-based statistical decision methods <i>Funding: R&amp;D National Plan</i></li> <li>• Robust methods for the statistical analysis of data with a complex structure <i>Funding: R&amp;D National Plan</i></li> <li>• Stochastic models for the statistical processing of complex data and risk measurement <i>Funding: Community of Madrid</i></li> <li>• Statistical methods based on functional data and high-dimension data with applications in finances and biostatistics <i>Funding: Community of Madrid-UC3M</i></li> </ul> <p><b>Macroeconomic and Financial Forecast and Analysis Group:</b></p> <ul style="list-style-type: none"> <li>• Electric energy distribution and consumption forecast and analysis <i>Private funding</i></li> <li>• Macroeconomic forecasts and analyses <i>Private funding</i></li> </ul>	<p><b>Experience and Capabilities:</b></p> <p>A multidisciplinary team made up of over 40 PhD holders in the areas of statistics, econometrics, and operations research.</p> <p>They use the most advanced methodologies and the most appropriate computational tools to solve modelling, forecast, data analysis and optimisation problems.</p> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Analysis with statistical Data Mining techniques including internally developed techniques for pattern recognition and problem classification</li> <li>• Engineering system reliability analysis</li> <li>• Competition analysis in regional and local markets</li> <li>• Intensive computing including the design of internal Bootstrap-type re-sampling methodologies with application in time series, or Bayesian techniques with a particular emphasis on the use of Gibbs-type sampling or MCMC techniques.</li> <li>• Development of optimisation models and methods under uncertainty for financial decision-making</li> <li>• Development and resolution of operations research models for optimising decisions in different areas of application (networks, logistics, finance, energy, etc.)</li> <li>• Design of dynamic protocols for operating complex probabilistic systems (communication networks, sensor networks, production/inventory systems, etc.) while optimising their performance</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
FACULTY OF SOCIAL SCIENCES AND LAW - STATISTICS			
<p><u>Statistics Department</u></p> <p>Person in charge: Rosa Elvira Lillo Rodríguez</p>	<p><b>Non-parametric and Intensive Computing Techniques in Statistics Group</b>  <i>PI: Juan J. Romo Urroz</i></p> <ul style="list-style-type: none"> <li>• Functional data</li> <li>• Time series</li> <li>• Re-sampling techniques</li> <li>• Finances</li> </ul>	<p><b>Non-parametric and Intensive Computing Techniques in Statistics Group:</b></p> <ul style="list-style-type: none"> <li>• Very high-dimension data analysis in economy and business  <i>Funding: R&amp;D National Plan</i></li> <li>• Statistical techniques for very complex data in business and finances  <i>Funding: R&amp;D National Plan</i></li> <li>• Non-parametric and intensive computing techniques in statistics  <i>Funding: Community of Madrid</i></li> </ul>	<ul style="list-style-type: none"> <li>• Efficient management of industrial orders which adapt in real time to the national and local economic climate</li> <li>• Daily and hourly data modelling</li> <li>• Modelling all the calendar effects present in a time series, as well as multiple seasonal pattern, trend and seasonal break, control mechanism-generated restriction modelling, etc.</li> <li>• Statistical models and data analysis in high dimensional problems: experience in processing data from microarrays, bibliometric databases, economic/ financial databases, and image databases</li> <li>• Optimisation of the performance of logistic systems</li> </ul>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
AIRBUS – UC3M CENTRE FOR THE INTEGRATION OF AEROSPACE SYSTEMS			
<p><b>Computer Security Laboratory (EVALUES)</b></p> <hr/> <p>PI: José María Sierra</p>	<ul style="list-style-type: none"> <li>• Design and implementation of security solutions               <ul style="list-style-type: none"> <li>· Based on the establishment of Virtual Private Networks (IPSEC)</li> <li>· User authentication (mobile devices and smartcards)</li> <li>· Risk analysis and management (Magerit v2)</li> <li>· Easing of security protocols and architectures for mobile devices (AdaptCrypt)</li> <li>· Drawing up secure guidelines for network system configuration</li> </ul> </li> <li>• Evaluation of architectures and protocols               <ul style="list-style-type: none"> <li>· Analysis of compliance and performance in security protocols (IPSEC and SSL)</li> <li>· Controlled analysis of the effects of denial-of-service attacks</li> <li>· External remote system security audit</li> <li>· Interoperability studies for networked systems</li> </ul> </li> </ul>	<p><b>Description:</b></p> <p>The Networking and Computer Security Laboratory (EVALUES) is formed by a team of professionals who are experts in the design and implementation of security solutions and security assessment.</p>	<p><b>Scientific-Technical Services:</b></p> <ul style="list-style-type: none"> <li>• DESIGN AND IMPLEMENTATION OF SECURITY SOLUTIONS:               <ul style="list-style-type: none"> <li>· Based on the establishment of Virtual Private Networks (IPSEC)</li> <li>· User authentication (mobile devices and smartcards)</li> <li>· Risk analysis and management (Magerit v2)</li> <li>· Easing of security protocols and architectures for mobile devices (AdaptCrypt)</li> <li>· Drawing up secure guidelines for network system configuration</li> </ul> </li> <li>• EVALUATION OF ARCHITECTURES AND PROTOCOLS:               <ul style="list-style-type: none"> <li>· Analysis of compliance and performance in security protocols (IPSEC and SSL)</li> <li>· Controlled analysis of the effects of denial-of-service attacks</li> <li>· External remote system security audit                   <ul style="list-style-type: none"> <li>- Interoperability studies for networked systems</li> </ul> </li> </ul> </li> </ul> <p><b>Technological Offer:</b></p> <ul style="list-style-type: none"> <li>• Data privacy and CLOUD-PKI framed in cryptographic hardware on the cloud</li> <li>• Collaborative tools and processes for the detection, prediction, and correction of vulnerabilities of web applications for security auditors and developers</li> <li>• Reference models for secure architectures of e-payment with intermediation</li> </ul>

Performance of the Project "UC3M Plan to boost innovation and transfer of R&D results in the productive sector of the Community of Madrid with priority in the southern metropolitan area"

of Ref .: OI2018 / PC-UC3M-5152, Acronym PC- UC3M, granted in the 2018 Call for aid to promote technological innovation and promote the transfer of technology to the productive sector, included in the priorities of the Regional Research and Innovation Strategy for an intelligent specialization (RIS3) of the Community of Madrid through liaison entities for technological innovation co-financed at 50% by the Community of Madrid and the European Regional Development Fund under the 2014-2020 ERDF operational program of the Community of Madrid.



**Comunidad  
de Madrid**



**Unión Europea**

Fondo Europeo  
de Desarrollo Regional  
"Una manera de hacer Europa"