

**A. Name of the Academic Unit:**

Technologies for the Digital World

**B. Justification of creation:**

The Technologies for the Digital World (TechWorld) Academic Unit aims to establish next generation Information and Communication Technologies (ICT) to build the “nervous system” of the future emerging digital society. This nervous system will be based on intelligent robots, infrastructures and services interconnected with digital eco-systems through cloud, edge and high efficiency computing networks. The knowledge-based and human-centered approach will resemble a living being capable of improving the citizens’ quality of life in the future digital world.

The TechWorld is based on the main targets of the ICT Horizon 2020 European Program for Research and Innovation. The members of this Unit have eight running European Union projects on this field, one of them as coordinators. The Unit’s objectives also match the R&D priorities at national and regional levels. Three Madrid’s Regional Digital Hubs (“macrogrupos”) are coordinated from TechWorld: Robotics, Telematics and e-Learning.

This Unit is a unique one in the UC3M due the fact that two of its members, Prof. Balaguer and Prof. Azcorra, are elected members of the Public-Private-Partnership (PPP) Board of Directors (BoD) formed by a very small number of European experts, less than 12 (euRobotics and 5G). BoD directly negotiating with the European Commission the future Work Programs and Strategic Actions. It means that TechWorld is not only based, as others universities Units, in the public-domain information but also, and it is very important, in the Future Strategic Research Agendas.

The main strengths of Technologies for the Digital World, among others, are: a) clear research objectives, b) interdisciplinary approach, c) international oriented research, d) excellence of the team members, e) significant team’s critical mass, and f) knowledge transfer leadership. This way the Unit will enable revolutionary ICT and cyber-physical services and applications, based both on sensor-communication-processing-actuator and knowledge-learning-imagination holistic approaches.

**C. Research Activity:**

The R&D objectives of Technologies for the Digital World match the priorities of the EU Horizon 2020 Work Program 2018-2020 in ICT, and are aligned with the current drafts of the Framework Program beyond H2020. This Unit will address, in a multidisciplinary approach, the following key scientific areas (figure 1):

- *Robotics and Artificial Intelligence:* Intelligent robots working and living with people in daily live environments with high-level self-organizing and interaction skills.

- *5G networks and systems*: Future ultra-fast networks to meet new digital use cases such as ubiquitous robotics, IoT, broadcasting and lifeline communication.
- *Autonomous and smart transportation*: Self-driving cars network with electrical propulsion and sharing use concept, integrated in digital society applications.
- *Internet of Things*: Internet-based networking of physical devices, vehicles, buildings, and other items embedded with electronics, sensors and actuators.
- *High-Density Photonics*: New ICT devices and sensors with new and improved functionalities using nanostructured materials.
- *Industry 4.0*: New smart & personalized production processes including cyber-physical systems control, monitoring & additive manufacturing during the life cycle.
- *Educational technology*: Internet-based technologies for education & knowledge sharing, information extraction, semantic technologies and social network analysis.
- *Knowledge Centric Engineering*: Reuse the knowledge representation and knowledge retrieval in the software engineering research field.

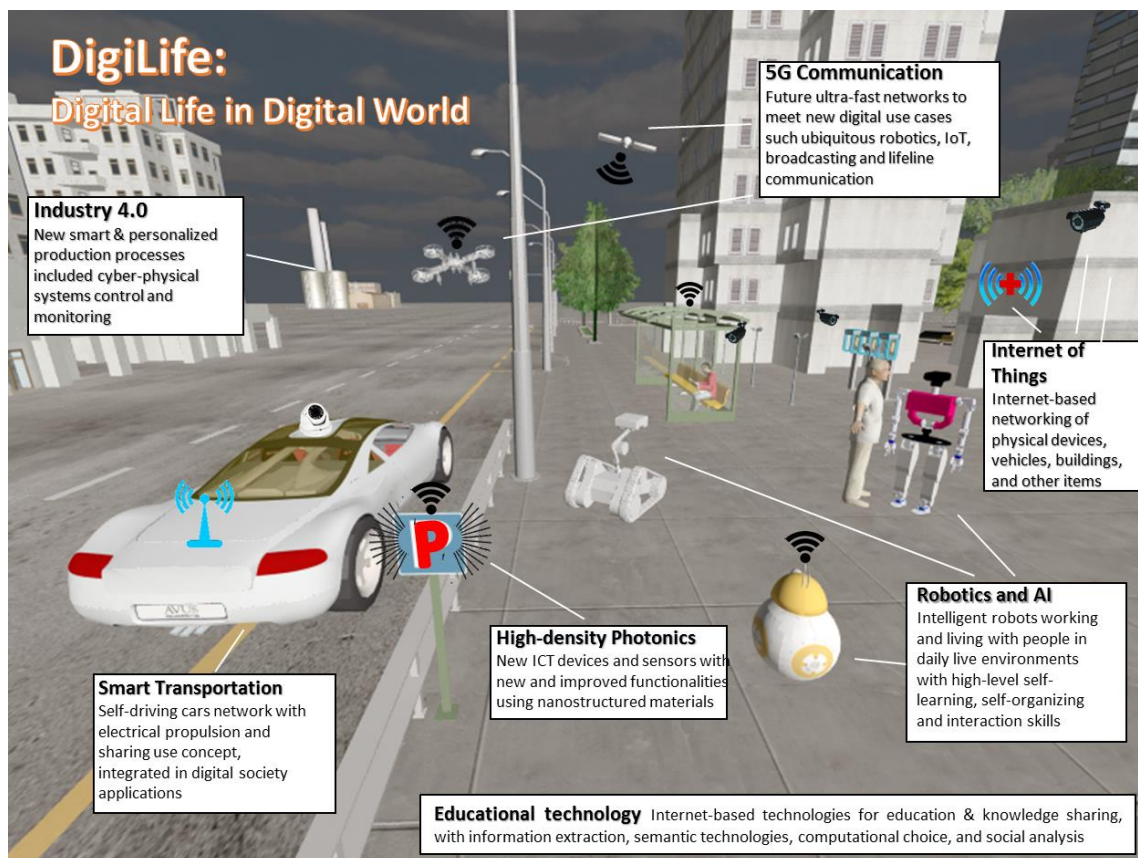


Figure 1. Technologies for the Digital World overview in urban environment with main scientific and technology domains

*Imagine that we live surrounded by friendly intelligent robots connected through powerful and fast 5G communication networks and ubiquitous distributed sensors. Imagine that traditional smart phones, computers and automated devices do not exist anymore and are substituted by high-density embedded, and even bionic, devices. Imagine that connectivity is global and continuous, which permits us to predict any situation. Imagine that factories produce goods attending an automatic and personalized demand. Imagine that we do not use our own stick-based cars anymore and share autonomous vehicles to move in ecological cities. This story, which is much closer to reality than what people think, is the core of new Digital Life in Digital World that will transform our society. We shall live in a different and better manner.*

To smoothly transform the nowadays society to the new Digital one, a multi- and inter-disciplinary approach is necessary. Research teams from different fields need to work coordinately and not in isolation, as commonly happens today. The Technologies for the Digital World Unit is not an artificial joint of researchers but a careful grouping of knowledge in different domains with common objectives. Each research team brings its own technologies and experiences to try to solve cross-disciplinary problems (figure 2).

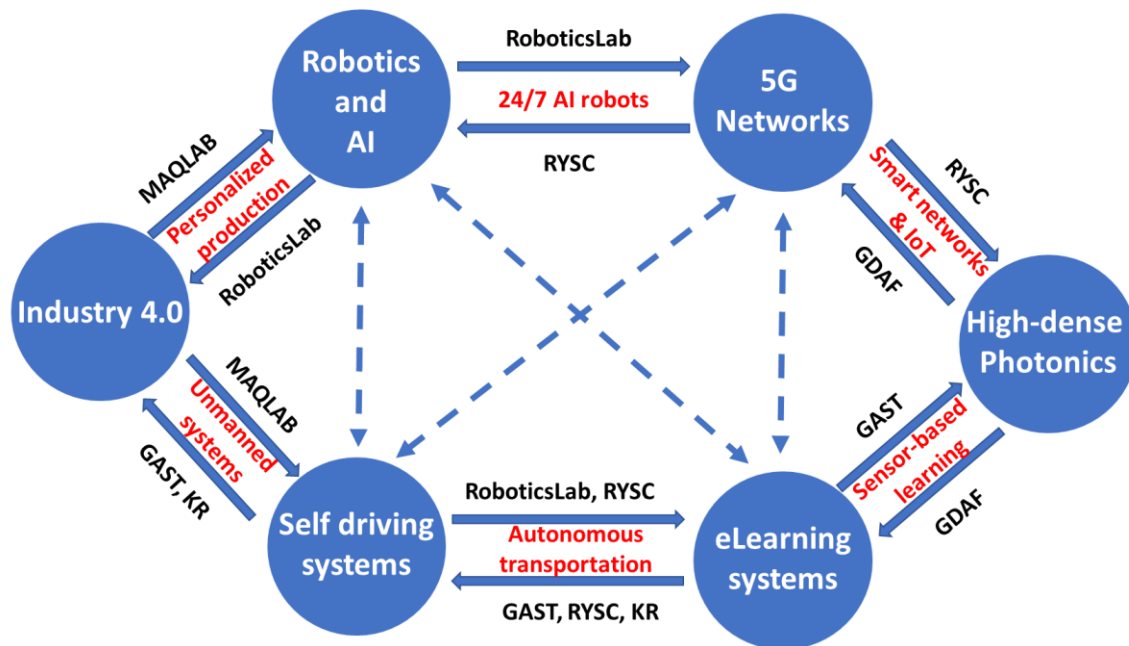


Figure 2. Technologies for the Digital World cross-technologies interconnections

The seven research teams involved in the Technologies for the Digital World Unit are the following:

- RoboticsLab (RL)
- Communication Networks and Services (RYSC)
- Displays and Photonics Applications (GDAF)

- Telematics Applications and Services Group (GAST)
- Machines Laboratory (MAQLAB)
- Knowledge Reuse (KR)
- Biblloeconomics and Documentation (BD)

The Technologies for the Digital World Academic Unit will plan to carry out a number of joint activities among its multidisciplinary scientists. As a non-exhaustive list of joint activities, we may cite:

- Applications to joint EU projects
- Applications to ERC research grants
- Application to María de Maeztu program
- Creation of joint Research Institute
- Creation of joint Master degrees
- Applications to “macrogrupos” from the regional government
- Cross-access to the leading laboratories of the involved members
- New shared laboratories
- Joint multidisciplinary publications
- Contributions to standards bodies
- Promotion of spin-off companies
- Joint supervision of PhD Thesis

## **D. Academic Board of the Unit (provisional)**

All the above-mentioned persons fulfill the UC3M’s Academic Unit conditions

### **1. Academic Board: Directors (12)**

Albert Banchs (CU) – Communication Networks and Services research team  
Arturo Azcorra (CU) – Communication Networks and Services research team  
Carlos Balaguer (CU) – RoboticsLab research team – *Coordinator TechWorld (provisional)*  
Carlos Delgado (CU) – Telematics Applications and Services Group research team  
David Larrabeiti (CU) – Communication Networks and Services research team  
José Manuel Sánchez Pena (CU) – Displays and Photonics Applications research team  
Juan Carlos García Prada (CU) – Machines Laboratory research team  
Juan Llorens Morillo– (CU) - Knowledge Reuse research team  
Luis Moreno Lorente (CU) – RoboticsLab research team  
Luis Sánchez (CU) – Telematics Applications and Services Group research team  
Mario Muñoz Organero (TU) - Telematic Applications and Services Group research team  
Miguel Ángel Salichs (CU) – RoboticsLab research team

**Academic Board: Members (47)**

Abderrahim, Mohamed - RoboticsLab  
Alario Hoyos, Carlos - GAST  
Algorri Genaro, José F. - GDAF  
Almenares Mendoza, Florina – GAST  
Álvarez Rodríguez, José María - KR  
Bagnulo Braun, Marcelo Gabriel - RYSC  
Barber Castaño, Ramón - RoboticsLab  
Basanta Val, Pablo - GAST  
Bernardos Cano, Carlos Jesus - RYSC  
Calderon, María – RYSC  
Campo Vázquez, Celeste - GAST  
Castejón Sisamón, Cristina - MAQLAB  
Cuevas Rumin, Ángel - RYSC  
Cuevas Rumin, Rubén - RYSC  
de la Vara González, Jose Luis - KR  
Díaz Sánchez, Daniel - GAST  
Estévez Ayres, Iria Manuela - GAST  
Fraga, Anabel – KR  
García Cámara, Braulio - GDAF  
García Martínez, Alberto - RYSC  
García Reinoso, Jaime José - RYSC  
García Rubio, Carlos – GAST  
Génova Fuster, Gonzalo - KR  
Gómez García, María Jesús - MAQLAB  
González Vectores, Juan - RoboticsLab  
Guerrero López, María Carmen - RYSC  
Hernández Gutiérrez, José Alberto - RYSC  
Ibáñez Espiga, María Blanca - GAST  
Jardón Huete, Alberto– RoboticsLab  
Malfaz, María - Robotics Lab  
Marín López, Andrés - GAST  
Meneses Alonso, Jesús – MAQLAB  
Moreiro González, José Antonio – BD  
Moreno Pelayo, Valentín Miguel - KR  
Muñoz Merino, Pedro J. - GAST  
Oliva Delgado, Antonio de la – RYSC  
Pérez Garcilópez, Isapel - GDAF  
Rubio Alonso, Higinio - MAQLAB  
Serrano Yañez-Mingot, Pablo - RYSC  
Soto, Ignacio- RYSC  
Torres Zafra, Juan Carlos - GDAF  
Urruchi del Pozo, Virginia - GDAF  
Urueña Pascual, Manuel - RYSC

Valera Pintor, Francisco - RYSC

Vegaz Benito, Ricardo - GDAF

Vidal Fernández, Ivan – RYSC