

# Brain inspired data engineering

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What if next-generation ICT systems could be based on the brain's structure and its cognitive and adaptive processes? A groundbreaking paradigm of brain-inspired intelligent ICT architectures is being born.

With the advent of Big Data and the resulting need to increase computing and networking power to manage the vast amount of information available, a new generation of ICT systems inspired by the operating principles of the brain has emerged. Novel solutions toward improved information processing in computer networks/hardware are being addressed from a multidisciplinary approach, using knowledge from neuroscience and applying it to computer and network architecture. Stemming from the premise that the brain is an ideal model for information processing, in recent years we have witnessed multiple examples of bio-inspired systems, which have eased progress in different ICT areas. Some examples are neuronal networks for learning systems or ant algorithms used to trace optimal paths in communication networks.

Neuroscientists are making game-changing discoveries in their understanding of the full-scale functional models of the brain, yet nobody has a complete picture of how the brain works, even less at the level of higher cognition—how we perceive, how we remember, how we act. Recent advances in data acquisition techniques about the brain's anatomic-functional organization and cognitive processes (for both humans and animals) have allowed the scientific community to start analyzing and understanding the brain's structure and its cognitive and transmission processes. This offers a unique opportunity for the design of novel ICT systems inspired by the brain's structure, as well as by its

cognitive and adaptive processes. Recently, some of the main companies in the ICT sector such as IBM, Qualcomm or Intel have launched pioneering projects for the design of brain-inspired ICT systems, which indicates the importance of this research line for the ICT sector.

In this context, IMDEA Networks launches a pioneering research project on BRAin inspired Data Engineering (BRADE-CM). The Madrid research institute is part on an interdisciplinary team with a multi-tiered research approach spanning neuroscience, the development of imaging instrumentation, the modeling of complex systems and networks, and the design of information processing ICT systems. BRADE has the ambitious goal of contributing to a [new generation](#) of computation and [information processing](#) systems for large-scale datasets inspired by how the brain processes information, learns, makes decisions and copes with large amounts of data.

## **The BRADE team**

The research groups that are working on this project are the BDA group from IMDEA Networks Institute , the NETCOM Group from University Carlos III of Madrid, the NEUROCOM group from the Complutense University of Madrid and the BiiG group from the Foundation for Biomedical Research of the Gregorio Marañón Hospital (Fundación para la investigación Biomédica del Hospital Gregorio Marañón). BRADE also counts with the support and collaboration of well known national and international companies as well as universities within the ICT sector: Alcatel Lucent Bell Labs, IBN, ZED Worldwide, Medianet, Telefonica R&D, Orange Labs, the Computer Lab at the University of Cambridge and 4DNature. Moreover, the Network for Biomedical Mental Health Research (CIBERSAM - Centro de Investigación Biomédica en Red en Salud Mental), which brings together some of the most prestigious Spanish research groups in the field of neuroscience, also collaborates on this project.

BRADE is funded by the Department of Education, Youth and Sports of the Regional Government of Madrid, through the 2013 R&D technology program for research groups, co-financed by Structural Funds of the European Union. It commenced last October 2014 and will conclude in September 2018.

**More information:** [www.networks.imdea.org/](http://www.networks.imdea.org/)

Provided by IMDEA Networks Institute

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