Mission

Nowadays, companies and individuals are immersed in digital interconnected ecosystems in which huge amounts of heterogeneous data, the so-called Big Data, are generated at an unprecedented speed. In this scenario, approaches and technologies for Big Data have the aim to make computable problems that involve large volumes of data, highly heterogeneous in size and structure, often generated in real-time, which can not be dealt with the existing information technologies.

The purpose of the laboratory is the study of methods, models, algorithms, approaches and languages for the management and analysis of heterogeneous Big Data, such as text, images, video, networks, structured data, geo-referenced data, multi-media and multi -dimensional, which vary in time, in order to foster the realization of innovative Smart Technologies. These technologies are capable to transform Big Data in Smart Data, i.e. data enriched by explicit semantics, modelled and elicited through semantic technologies, and implicit semantics, obtainable by means of machine learning techniques, artificial intelligence and data analytics. Moreover, the definition of Smart Models with Operations Research based methods, and mathematical evaluations for the study of quantitative and qualitative data are of primary importance.

Smart technologies make more effective and efficient activities such as business analytics, decision support, management and use of content, improve marketing activities and the quality of products/services offered to customers/users. In general, they optimize all the practical aspects present in different business and operation processes of organizations in different application fields.

Fields of application

The scientific and technological achievements of the laboratory can be used in:

industries, including: financial services, telco, retail and online retail, utilities, health care, public institutions, etc.

application areas, such as business intelligence, open data, marketing, customer operations management, supply chain management, document and content management, internet of things, smart cities, cyber security, fraud detection, risk management, failure detection, logistics, medical diagnostics , etc.

Research themes

The laboratory combines and makes available the experiences gained by ICAR researchers over the years in the fields of representation and management of large amounts of data, and knowledge extraction, social network and media analysis and mining, image and video analysis, semantic technologies, methods and mathematical models of optimization, artificial intelligence and machine learning. Expertise covers the following two main areas:

- Mathematical and Smart Models
- Smart Data

In the first macro area Mathematical and Smart Models there are the following specific research topics:

- Models and algorithms for planning transport and logistics networks
- Not differentiable and not convex optimization methods
- Methods and models for the resolution of supervised and / or semi-supervised classification problems
- Models and algorithms for image processing

The second macro area Smart Data includes the following research themes:

- Models, approaches, techniques and languages for the semantic management of data, both in structured/unstructured form
- Approaches and algorithms for the extraction of information from the web and from documents, also in natural language
- Models, approaches and languages based on artificial intelligence and machine learning techniques for handling and querying structured and unstructured data, pattern recognition and natural language processing
- Models and techniques for managing and extracting contents from social media, analysis and mining of complex networks
- Data Mining techniques with descriptive, predictive and prescriptive approaches.