Mission

The aim of Computational and Data Lab is to develop algorithms, models and software tools to detect, understand and design scientific and tecnologic solutions through the analysis of data obtained from experiments and tests, and/or through simulation of the processes generating them, dealing with new scientific challanges and multidisciplinary activities, related to ICT. Its activity is focused on the resolution of real problems with methodologies spanning from computer simulation, to scientific modelling and analysys, processing and management of complexand big data, sometimes heterogenous, integrating knowledge domains and competences that belong to Computer Science, Applied Mathematics and Statistics.

Fields of applications are going to be characterized by big data from different sources (numeric variables, items and values, symbolic data, texts, pictures and video, streams and multi-way data, networks, etc.). At the same time, appropriately integrating the methodologies of CDS-Lab with different knowledge domains, it is possible to yield a new and more efficient perspective to real problems analysys and interpretation of the results. Moreover, the research activity will be held in collaboration with experts of different.

Fields of application

- Computational Biology: devolopment of models to describe and predict biologic phenomena.
- Bioinformatics: data analysis of high throughput sequencing and spectrometry experiments.
- Biotechnology: detecting new prognostic and therapeutic targets.
- Video and pictures processing: pattern recognition and video tracking from phase contrast and fluorescence microscopy.
- Computer graphics: photorealistic rendering of interesting biological molecules and of ambience and landscapes.

- Energy and Environment: simulation, prediction and control of energy production and distribution coming from renewable and intermittent resoursces, fluid dynamic simulations of low emission engines and of oil sumps.

Research themes

In computer science area, researchers study methodologies for the characterization and prediction of biological phenomena, through optimization algorithms and machine learning. The analysis of data coming from high throughput experiments integrates a priori knowledge generated from secondary ontologies and databases, containing information on biologic mmolecules iteration. Determination of new prognostic targets is based on selection techniques of the charactirstics obtained from sperimental data. The study is dedicated to the detection of new characteristics and new methods that allow to find these target accurately.

Transient time-varing phenomena, such as stem cell differentiation and vitality of cells that undergo to certain treatements, are going to be studied and characterized starting from electronic microscopy video, using segmentation technologies and pursuit of variable shapes over time.

Photorealistic rendering techniques will be used for the analysis of tridimensional models of secondary and tertiary interesting biological molecules. New algorithms for photorealistic rendering of scenes and ambience.