

Computational Data Science group (CDS-group)

Goals

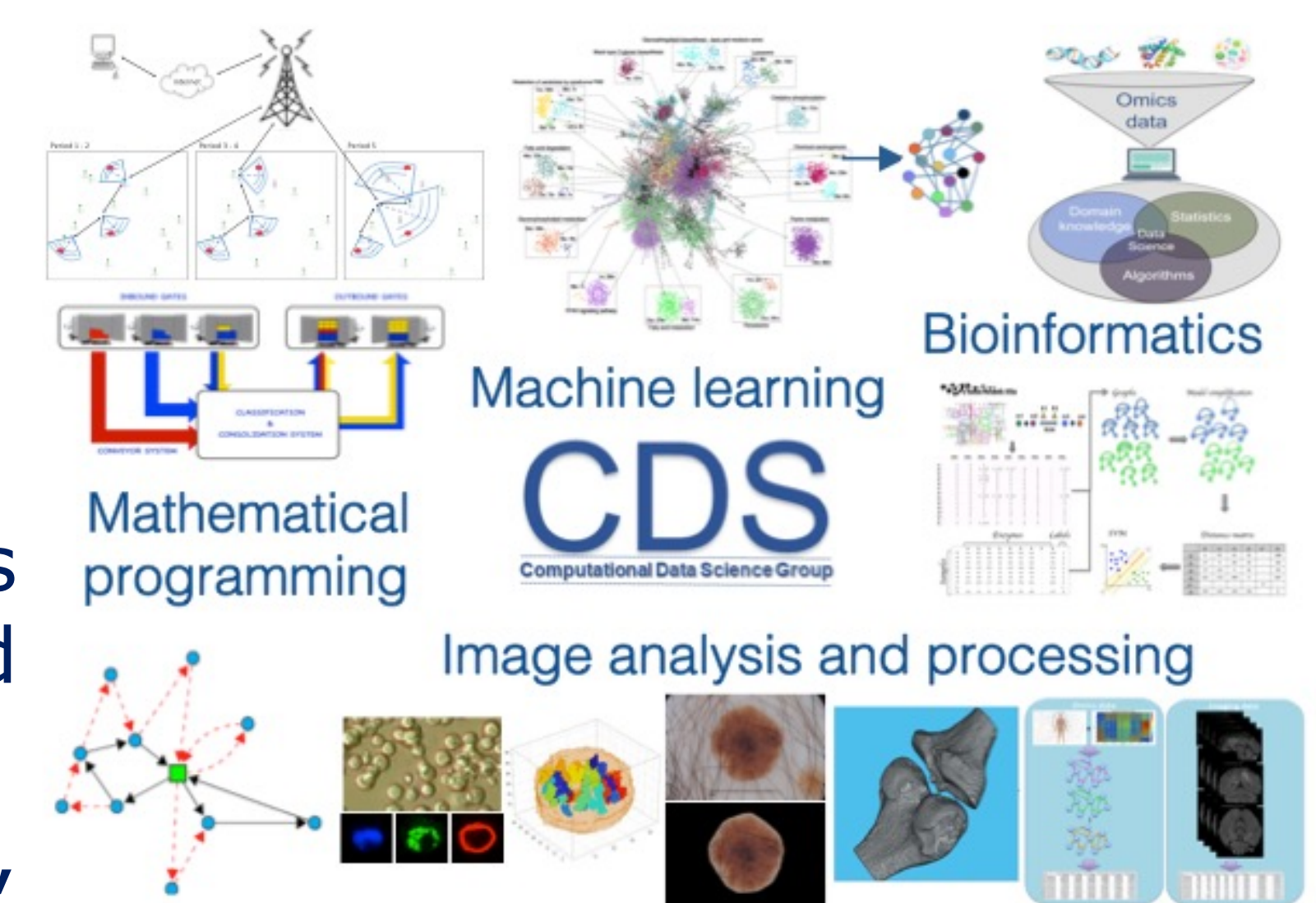
Development of models, algorithms, and software tools to discover, understand, and model scientific phenomena through the analysis of data produced in experiments and tests and/or through the simulation of the processes that generate them. This allows us to face new multidisciplinary challenges in the field of ICT

Research Activities

Methodologies include computational simulation, scientific modelling, analysis, processing and management of complex, heterogeneous, and large data sets. They integrate high-performance computing and distributed computing, with skills from Computer Science, Applied Mathematics and Statistics. By appropriately integrating the CDS-group methodologies with the knowledge of different application domains, a new and more effective perspective is provided to the analysis of real problems and the interpretation of the results




Topics

- **Mathematical Programming and Machine Learning:**
 - development of new optimization techniques for non-differentiable problems
 - development of mathematical models and optimization methods for complex systems
 - Machine Learning methods for optimization algorithms
 - development of methods for classification and clustering of data in the form of networks
- **Image analysis and processing:** analysis, design, and development of methods, algorithms and high-performance software for processing and quantitative analysis of images and image sequences
- **Bioinformatics:** development and implementation of methodologies for network biology, omics data analysis and integration, and "omics imaging"



Application Fields include Logistics, Transportation, Telecommunications, Robotics, Video/image analysis and processing, Medicine, Biology, Genetics

Projects

- **CNRBiOmics**, National Research Center in Bioinformatics for Omics Sciences: empowerment of infrastructure (data storage 5PB for a distributed biorepository to preserve omics and bioinformatics data) & human capital (2 years research grant) [Referee for ICAR-CNR: L. Maddalena] 
- **BiBiNet** - Big Biocancer Network. POR FESR Lazio 2014-2020: Analysis of biological networks for marker identification and active molecules repositioning [Head of ICAR-CNR Research Unit: I. Granata]
- **INdAM** (Istituto Nazionale di Alta Matematica "F. Severi") **ICAR-CNR Research Unit** [Director: L. Maddalena] 
- **PRIN 2022** "Optimizing sustainable multi-modal last-mile distribution with carbon-free autonomous vehicles, ground robots, drones, and public transport", MUR [Head of ICAR-CNR Research Unit: L. Di Puglia Pugliese]
- **PRIN 2022** "A mathematical approach to inverse problems arising in cultural heritage preservation and dissemination" MUR [Head of ICAR-CNR Research Unit: L. Antonelli]
- **PRIN 2022** "The Asplenia Biobanking Community: from Analytes to theRapEutic decision making (ABCare)" MUR [Head of ICAR-CNR Research Unit: I. Granata]
- Collaboration with **MEDIA** - METodiche DIAgnostiche ad alta efficienza per il paziente osteoarticolare, Distretto Tecnologico Campania BioScience: dedicated MRI for pre-operative non-invasive imaging for prosthesis implants 
- **GNCS 2023** "Advanced Models and Methods in Computer Vision"

Collaborations

- CEINGE - Biotecnologie Avanzate
- CNR (IBPM, ICAR HPCCS-group, IEOS, IGB, ISASI)
- GNCS-INDAM
- National Research Univ. Higher School of Economics (RU)
- Ospedale Policlinico San Martino, Genova
- Sapienza Univ. of Rome
- Univ. Magna Graecia of Catanzaro
- Univ. of Calabria
- Univ. of Campania Luigi Vanvitelli
- Univ. of Cassino and South. Lazio
- Univ. of Florida, CAO (USA)
- Univ. of Naples "Federico II"
- Univ. of Naples "L'Orientale"
- Univ. of Naples Parthenope
- Univ. of Sheffield (UK)



See also CDS-

Main results (2021-2023)

Publications

- 28 Journal papers
- 6 Book chapters
- 18 Conference papers
- 4 Technical Reports
- 2 publicly available **Datasets**
- 4 publicly available **Software Packages**
- 3 **Keynote Talks**
- 3 Journal **Special Issues**
- Organization of 5 **international Events**



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XIX WORKSHOP CNR-ICAR

6-8 SETTEMBRE 2023 RESORT TUI MAGIC LIFE CALABRIA