

## Presentation

At the heart of the **SophiaTech Campus** in the French Riviera's Technopole, the I3S Laboratory is a joint research center for Informatics covering the main current research challenges, both theoretical and applied, in **Computer Science, Computer Engineering, Automation and Signal Processing**.

300 people organized in 4 teams work in close relation with our academic partners CNRS and Inria, and private companies. Our main objective is to enlarge our domain of knowledge, train students to both scientific and engineering activities. We also address the current challenges of the digital world and encourage the development of innovative solutions for the future. We bring together academics who teach in a rich environment composed of a science department, an engineering school (Polytech Sophia) and a technological institute, along with full-time researchers.

## Four Dynamic Teams

### Communication Networks, Embedded and Distributed Systems (COMRED)

Head of team: Frederic Havet, Senior Researcher at CNRS, [Frederic.Havet@cnr.fr](mailto:Frederic.Havet@cnr.fr)

The COMRED teams study various theoretical problems and provide software solutions in three related domains: Graph theory for telecommunications, concurrency theory for the analysis and optimization of embedded systems, safe composition of applications with large scale execution environment. It addresses the entire design chain: modeling via graphs, specification and programming formalisms, implementation techniques, optimization, simulation and verification. These activities involve the development of many software and algorithmic tools. They are conducted in the context of many industrial collaborations.

Highlights : Researchers of COMRED team won in 2016 the Flinders Hamiltonian Cycle Problem (FHCP) Challenge organized by the Flinders Hamiltonian Cycle Project (Flinders University, Adelaide, Australia). The start-up company ActiveEon dedicated to Open-source solutions for Distributed Computations, Grids and Cloud infrastructures spun off in 2006.

### Discrete Models for Complex Systems (MDSC)

Head of team: Professor Enrico Formenti, [Enrico.Formenti@unice.fr](mailto:Enrico.Formenti@unice.fr)

MDSC is mainly devoted to fundamental research which impacts the main current societal changes in the domain of: combinatorial optimization; complexity in dynamical models; program verification; and systems biology. In the past 5 years, the team research activities have been internationally recognized through several prizes (e.g., Turing scholarship by John Templeton foundation, AAAI classic paper award, CP research excellence award). Members of MDSC serve regularly as editors, PC members or chairs of international events. In the last 5 years, they have organized renown international conferences of our domain like LATA, CP, PRIB, AUTOMATA. The team is highly involved in teaching activities both at master and PHD level and regularly organizes international schools in bioinformatics, constraint programming. The research activity is also confirmed by over 200 publications in high impact international journals and top class conferences and by more than 14 phd theses defended in the past 5 years.

One of the main goals of the team is to provide a formal foundation for the study of complex systems within the framework of discrete dynamical systems. We focus on the asymptotic behavior of the system, its decidability and computational complexity. Another strong activity of the team is the use of constraint programming techniques for program verification, ranging from automatic test case generation to the automatic detection of non-conformances between a program and its specification. Constraint solving techniques are also successfully applied to some classical problems.

In bioinformatics, we aim at providing rigorous and formal frameworks for modelling complex dynamic biological systems with a focus on genetic regulation networks and neurosciences. The group focuses on the formalisation of system behavior, the analysis of models, and the identification of the environment and timing constraints to drive the model to behave as expected. As for neurosciences, we aim at simplifying and integrating models from computer science, mathematics and biology, through in silico experiments.

### Signals, Images and Systems (SIS)

Head of team: Professor Vicente Zarzoso, [Vicente.Zarzoso@unice.fr](mailto:Vicente.Zarzoso@unice.fr)

The SIS team addresses current societal challenges and needs in health and biology, multimedia and telecommunications, robotics, observation and modeling. The team conducts research into signal and image processing for biology and biomedicine, future-generation fixed and mobile communication networks, 3D and multimedia data compression and coding, autonomous navigation, localization and mapping systems, and statistical tools for optimal experimental design.

Over the last five years alone, these research activities have given rise to over 10 patents, more than 40 PhD theses, nearly 600 publications and the foundation of two start-up companies (Cintoo3D et PiXmap), both awarded the French national innovation prize for the creation of start-ups.

Highlights : Research conducted in the team has been recognized by a number of prestigious national and international awards (e.g., Michel Monpetit's prize from the French Academy of Science, International Statistical Institute membership, Institut Universitaire de France nomination).

### Scalable and Pervasive softwARe and Knowledge Systems (SPARKS)

Head of team: Professor Andrea Tettamanzi, [Andrea.Tettamanzi@unice.fr](mailto:Andrea.Tettamanzi@unice.fr)

The SPARKS team investigates the organization, the representation, and the distributed processing of knowledge, as well as its extraction from data and its semantic formalization. A particular attention is dedicated, on the one hand, to large-scale architectures and massive data and, on the other hand, to the design of human- and knowledge-centered, evolutionary and adaptive software systems. The team scientific objectives are structured around three main research themes Knowledge Extraction and Learning, Formalizing and Reasoning with Users and Models and Scalable Software Systems.

SPARKS addresses timely challenges, such as the development of the Web of Data, the management and exploitation of very large data repositories (structured and unstructured), the formalization of knowledge in an open and linked environment, the use of massively distributed computing resources, and the interaction between users and computing platforms.

Highlights : SPARKS chaired major international conferences such as ESWC15 and WWW12. Over the last years 8 scientific publications were distinguished with awards and 2 start-up companies were spun off SPARKS research.

Director  
Olivier Meste

Deputy Director  
Frédéric Mallet

contact@i3s.unice.fr  
Tél. : +33 4 92 94 27 01

Location  
SophiaTech Campus  
2000 route des Lucioles  
Les Algorithmes  
Euclide B Building  
06903 Sophia-Antipolis  
FRANCE



## About Sophia-Antipolis

- Europe's leading Science and Technology Park
- World reference in terms of innovation and cross-fertilization between public and private sectors
- 36 000 employees, 2 230 companies
- 22 % of companies and 43 % of jobs in ICT
- 63 nationalities
- 14 000 engineers / 4 500 researchers / 5 500 students
- 170 foreign-owned companies
- 2 400 hectares with 2/3 green spaces

## Local Environment of Excellence

### IDEX UCA<sup>JEDI</sup>

UCA (Université Côte d'Azur) coordinates an initiative of excellence (IDEX) positioning it as a flagship University with premium research and education curriculums. The I3S laboratory is involved in the IDEX academies of excellence (trans-disciplinary departments) in Networks, information and digital society; Complex systems; Complexity and diversity of living systems; Human societies, ideas and environments.

I3S is also involved in the transversal reference centers which promote effective connections between academic research, the territory and local authorities. In particular, I3S is particularly active in the reference centers on "Digital Challenges", "The intelligent city and the management of the risk on the territory" and on "Health, well-being and aging".

### Labex UCN@Sophia

In partnership with the University Côte d'Azur, CNRS, INRIA and EURECOM, leveraging a strong expertise, I3S works on innovating research areas at the forefront of science and technology: next generation networks, Internet of Things, ubiquitous systems, smart cities, e-health, modeling and optimisation for renewable energy networks... I3S is the initiator of the Labex UCN@Sophia, an 8-year ambitious multi-partners and trans-disciplinary research program awarded "laboratory of excellence" for studying the networks of tomorrow and their usages.

## Distinguished Researchers



**Marc Antonini** is a CNRS Research Director and the head of the "MediaCoding" group at the I3S Lab. His research activities focus on image and video coding, as well as the geometric processing and compression of static mesh surfaces, 3D animations and digital holograms. He is also interested in the analysis of the information contained in the neural code of the visual system, with the aim of developing bioinspired image and video compression systems. He has co-authored over 200 publications, 7 book chapters and more than 10 patents on these topics. In 2013, he created "Cintoo3D", a spinoff company offering innovative 3D streaming solutions, award-winner at the National Contest for the Creation of Start-ups.



**Fabien Gandon** is a senior researcher at Inria and the leader of the Wimmics Inria project-team. He is also the Inria representative at the World-Wide Web Consortium (W3C) where he participated in several standardization groups. His professional interests include: Web, Semantic Web, Social Web, Ontologies, Knowledge Engineering and Modelling, Mobility, Privacy, Context-Awareness, Semantic Social Network / Semantic Analysis of Social Network, Intraweb, Distributed Artificial Intelligence.



**Bruce Reed** is a Canadian mathematician and computer scientist. Before returning to I3S in 2016, he held positions at MacGill, the University of Waterloo, Carnegie Mellon University. He was elected as a fellow of the Royal Society of Canada in 2009, and is the recipient of the 2013 CRM-Fields-PIMS Prize. His thesis research concerned perfect graphs. Reed has also published highly cited papers on the giant component in random graphs with a given degree sequence, random satisfiability problems, acyclic coloring, tree decomposition, and constructive versions of the Lovász local lemma.



**Jean-Charles Régin** is an internationally recognized expert of Constraint Programming. He has proposed many algorithms to quickly eliminate incoherent values for major challenges in Graph Theory such as Flow Network problems. He has been working for more than 20 years on constraint modelling to empower known values elimination algorithms. Companies such as IBM, Oracle, Microsoft and Google are routinely using Constraint Programming solvers which implement his research results. He co-authored many publications in Constraint Programming, among which is the most cited one in the community. The article describes the All-Different global constraint which is now implemented in almost all Constraint Programming solvers and routinely used in many applications. This article, published in 1994, received the "Classical Paper Award" from the American Association on Artificial Intelligence. In 2013, he received the prestigious Research Excellence Award from the Constraint Programming Association (ACP) for both his theoretical and practical contributions.

## I3S in Numbers

Approximately 250 people

- 120 permanent members (CNRS/INRIA/UNS)
- 80 PhDs
- 40 non-permanent members
- 30 administrative members of staff
- 10 patents
- 20 protected software