

Research **UniTrento** Skills for innovation



UNIVERSITY
OF TRENTO - Italy



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The University of Trento at a glance	4
Fostering innovation: spin-off, start-up and knowledge transfer	7
Research at UniTrento	10
Departments and Centres at UniTrento	16
Department of Civil, Environmental and Mechanical Engineering	17
Department of Economics and Management	20
Faculty of Law	23
Department of Humanities	26
Department of Industrial Engineering	30
Department of Information Engineering and Computer Science	33
Department of Mathematics	36
Department of Physics	39
Department of Psychology and Cognitive Science	42
Department of Sociology and Social Research	45
Centre for Integrative Biology	48
Center for Mind/Brain Sciences	50
School of International Studies	53

The University of Trento at a glance





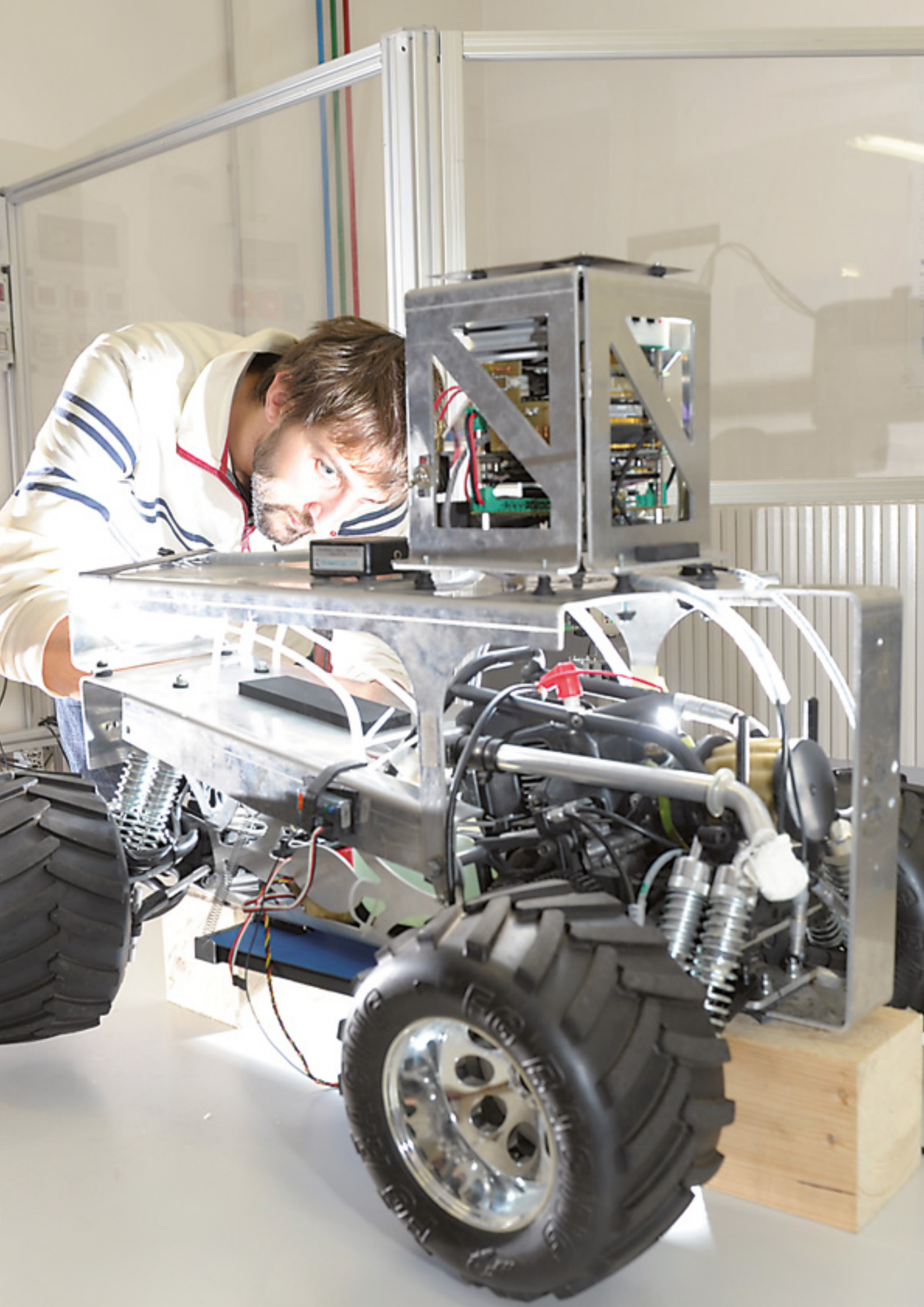
The University of Trento is a medium-sized university, founded in 1962. It is a young, dynamic, research oriented institution, marked by high-level teaching opportunities and facilities.

The figures describing the University – 16,000 students and about 600 faculty members and 600 staff personnel – reflect this institution, which is organized into 10 Departments and 3 Centres. Moreover, the University continues to expand its fields of research and to offer new courses.

The distinct international approach of the University of Trento is one of its strong points. It is involved in many research networks and has prestigious cooperation agreements with important research centres and universities throughout the world, which encourage scientific exchanges and mobility of teaching staff and students. The University also takes pride in offering Double Degree Programs, which involve high-profile international scientific contacts. Many Master's courses and Doctoral courses are taught in English.

The high-quality research activities are described in the Italian National Agency for the Evaluation of the University and Research Systems (ANVUR) 2013 Report, which evaluated the quality of research in the period 2004-2010: Trento ranks first place for the scientific production in the medium-sized Italian universities. The knowledge and skills of researchers and teaching staff at the University of Trento have significantly increased its ability to access European funding for research projects and to obtain ERC grants.

The University of Trento devotes a lot of energy to the strengthening of international relationships but, at the same time, believes in the continuous consolidation of relations and connections with local bodies. There is constant communication among these groups, and the aim is to find solutions that meet the needs of all parties, i.e. the University pursues the technological transfer to the benefit of the firms and collaborates in the drafting of training and study plans, while firms and public and private bodies offer internship opportunities for students.



Fostering innovation: spin-off, start-up and knowledge transfer

The University of Trento has been able to maintain constant communication with business companies. The aim is to establish sound cooperation networks between the academic research carried out in the laboratories and the everyday management of companies, including small ones based in Trentino and internationally-oriented ones.

The University has already been proactive in fostering the attention paid by companies and the productive world to some recently-initiated areas of strategic research. Within the areas of ICT, neurosciences, integrated research, mechatronics, and civil and environmental engineering, fruitful connections have been set up, which have sometimes resulted in the mobility of PhD students and in the creation of spin-offs and start-ups. Since 2007 the University of Trento has supported the creation of thirteen spin-offs. Three have concluded their recognition period, while the remaining ten are still active.

Smart Hydrogeological Solutions s.r.l.

*Department of Civil, Environmental and
Mechanical Engineering*

Software development and application for the management of surface and underground water resources (forecast of extreme events, optimal management of water at basin level, modelling of underground flows, IT support for the recovery of polluted sites).

www.smarthydrosol.com

Xtensa s.r.l.

*Department of Information Engineering and
Computer Science*

Low-cost software products for people with serious motor disabilities. Trading of software, in synergy with commercial hardware, which allows for greater PC/user communication opportunities. The high cost of tools with high technological content can be reduced by shifting the complex content of hardware to the intelligence of the system (software).

www.xtensa.it

Robosense s.r.l.

Department of Industrial Engineering

Consulting in industrial robotics and artificial vision with direct application to metrology and quality control. The mission is the trading of SmartFinder, a device aimed at improving the flexibility and working capacity of automatic vehicles in storehouses (pallet recognition and automatic generation of paths and routes to load them).

www.robosense.it

HydroMates s.r.l.

*Department of Civil, Environmental and Mechanical
Engineering*

Marketing of open source software to be used for a wide range of services, aimed at the optimisation of water resource management, such as, for example, the reduction of energy consumption and of water leakage from the utility networks.

www.hydromates.com

Sim Idra s.r.l.

*Department of Civil, Environmental and Mechanical
Engineering*

The provision to professionals and public administration institutions of a wide range of software (from the development phase to the trading, support, training and specialized consulting) for the modelling of water strains and flooding events, for the management/prevention of the hydrogeological risks.

www.simidra.com

Timber Tech s.r.l.

Department of Civil, Environmental and Mechanical Engineering

The provision of an integrated range of software (also tailor-made) and specialised tailored consulting services for the calculation of structures in wood (from the designing phase of structural products to the support for trading activities, making products user-friendly).

www.timbertech.it

RSens s.r.l.

Department of Information Engineering and Computer Science

Production and trading of sensors to measure radiation and, in particular, the development of innovative sensors for radon gas (featuring low price, small dimensions, wireless control and simple use).

www.rsens.it

Okkam s.r.l.

Department of Information Engineering and Computer Science

The enterprise expands the use of semantic technologies within the company information systems, offering innovative solutions for the management and integration of data. It aims at providing Data Links solutions (connecting information in a dynamic way from different sources), Object Links (interface of real objects and virtual objects on the web) and Business Solutions for the efficient management of information company data or public data in complex contexts.

www.okkam.biz

Seelko s.r.l.

Department of Civil, Environmental and Mechanical Engineering

Development of energy harvesting solutions and investment in new ideas and technologies; the areas of expertise include numerous fields in the horizon of renewable energies and clean technologies.

www.seelko.com

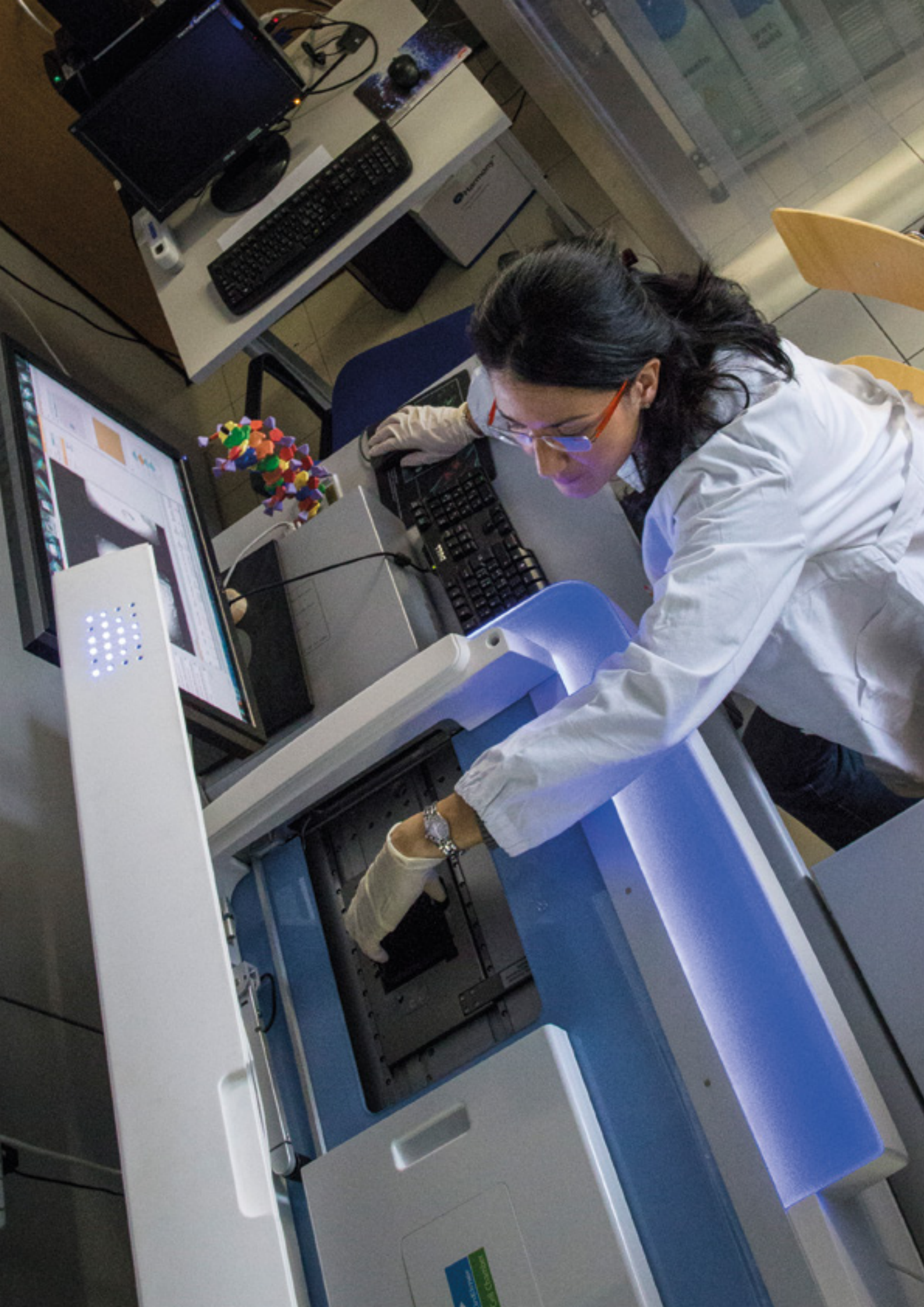
I3 (Intelligent Infrastructure Innovation)

Department of Civil, Environmental and Mechanical Engineering

Research, development and commercialisation of web based IMS – Infrastructure Management Systems interfaceable with structural monitoring systems and applications for augmented reality in mobile devices.

www.i-kubed.com

The strengthening of the connection between academic research and companies depends also on communication. Thanks to the newsletter **KNOWTRANSFER** – a quarterly paper and online publication by the University of Trento – we aim at strengthening the ability to communicate, using the business language. In this way, projects are disseminated and new connections are fostered, in order to create networks with companies, enterprises, public and private research bodies and public administrations.



Research at UniTrento

The research policy at UniTrento is built on few simple principles.

The first is the recruitment of highly-skilled, proactive, enthusiastic young researchers who form the basis of our ability to direct our areas of research toward new and pertinent fields.

We then help our researchers in developing networks with colleagues, by organising special programs, meetings and conferences, aimed at the establishment and consolidation of research networks, which are essential for keeping up to date with, and applying for, *multicentre grants*.

Lastly, we carefully maintain, and continuously redesign an infrastructure for research support which goes from the “project engineering” phase to the financial report-writing. Indeed, the whole process for obtaining grants to cover projects is increasingly complex and competitive.

In addition to this, Trentino – a small region – is a genuine large-scale “living lab”, where the public sector plays an important role as driving force for innovation and research; key members of the business world collaborate in order to develop innovative ideas and, then, the triangle of knowledge is further enhanced by the direct involvement of the end-users.

As a result, UniTrento is the leading University in Italy for research quality among the medium-sized universities (as stated by the National Agency for Research Evaluation, ANVUR 2013) and, according to the Times Higher Education survey, 2013, it is ranked first among Italian universities.

In order to give an idea of UniTrento research, we will describe below the research topics of our European Research Council (ERC) career grant holders. The main goal of the ERC program is to encourage high quality research in Europe through competitive funding. The applicants for an ERC grant undergo a very selective evaluation based on the single criterion of scientific excellence.

The University of Trento has got **seventeen ERC grants**:

ERC starting grants

8 projects: 2 in the Physical sciences and Engineering field, and 6 in the Social sciences and Humanities field.

BIHSNAM – Bio-inspired hierarchical super nanomaterials

Department of Civil, Environmental and Mechanical Engineering

Nicola Pugno (1 million euro – 60 months)

The idea is to combine nature and nanotechnology in order to design hierarchical composites with tailor-made characteristics, optimised as regards strength and sturdiness, and to create materials with strong adhesion/easy detachment, smart damping, self-healing/-cleaning properties or controlled energy dissipation.

CoPeST – Construction of perceptual space-time

CIMeC - Center for Mind/Brain Sciences

David Paul Melcher (1 million euro – 60 months)

We build on a decade of groundwork in studying specific instances of the integration of visual information over space and time, with a new focus on the mechanisms that unite the various phenomena which have been studied separately up to now.

This project, driven by specific hypotheses, aims to uncover how uni-sensory, ego-centric sensory responses give rise to the rich, multisensory experience of unified space-time.

Win2Con – Brain-state dependent perception: finding the windows to consciousness

CIMeC - Center for Mind/Brain Sciences

Nathan Weisz (1.5 million euro – 60 months)

We follow an alternative strategy by regarding the history of neuronal activity preceding the stimulus as a window for consciousness. Central to this novel framework is the extent to which relevant sensory regions are functionally connected to the frontoparietal system prior to stimulus arrival, constituting brain-states that open or close the “window” for specific contents.

COMPOSES – Compositional operations in semantic space

CIMeC - Center for Mind/Brain Sciences

Marco Baroni (1.12 million euro – 60 months)

We tackle the meaning induction and composition problem from a new perspective that brings together corpus-based distributional semantics (that is very successful at inducing the meaning of single content words, but ignores functional elements and compositionality) and formal semantics (that focuses on functional elements and composition, but largely ignores lexical aspects of meaning and lacks methods to learn the proposed structures from data).

FAMINE – Families of inequalities social and economic consequences of the changing workfamily equilibria in European societies

Department of Sociology and Social Research

Stefani Scherer (0.48 million euro – 48 months)

This project investigates social change and its correlates in European societies. To be more specific, we study the change in social and economic inequalities associated with new welfare-work-family equilibrium. The project, therefore, focuses on the changes in the female labor-market behavior, the inter-linkage between female employment and family decisions, the capabilities of families to compensate for increasing market risks, and the consequences of these developments for social and economic inequalities among families in post-industrial societies over recent decades, considering the role of the different welfare - and labor - market arrangements and the way they have evolved.

STiMuLUS – Space-time methods for multi-fluid problems on unstructured meshes

Department of Civil, Environmental and Mechanical Engineering

Michael Dumbser (0.92 million euro – 60 months)

We develop new algorithms for the solution of general nonlinear systems of time-dependent partial differential equations in the context of non-ideal magnetized multifluid plasma flows with thermal radiation. We will produce new high-order schemes on unstructured tetrahedral meshes that are applicable to a rather general class of problems in general geometries, thus, opening a wide range of possible applications in science and engineering.

NeuroInt – How the brain codes the past to predict the future

CIMeC - Center for Mind/Brain Sciences

Uri Hasson (0.98 million euro – 48 months)

The overarching objective of this research program is to use neuroimaging methods to determine how the recent past is coded in the human brain and how this coding contributes to the processing of incoming information. A central tenet of this proposal is that being able to maintain a representation of the recent past is fundamental for constructing internal predictions about future states of the environment.

MADVIS – Mapping the deprived visual system: cracking function for prediction

CIMeC - Center for Mind/Brain Sciences

Olivier Marie Claire Collignon (1.49 million euro - 60 months)

One of the most striking demonstrations of experience dependent plasticity comes from studies of blind individuals showing that the occipital cortex (traditionally considered as purely visual) massively changes its functional tuning to support the processing of non-visual inputs. These mechanisms of cross-modal plasticity, classically considered compensatory, inevitably raise crucial challenges for sight-restoration. The neglected relation between cross-modal plasticity and sight recovery will represent the testing ground of MADVIS in order to gain important novel insights on how specific brain regions become, stay and change their functional tuning toward the processing of specific stimuli.

The main goal of MADVIS is therefore to make a breakthrough on two fronts: (1) understanding how visual deprivation at different sensitive periods in development affects the functional organization and activity of the occipital cortex; and (2) use the fundamental knowledge derived from (1) to test and predict the outcome of sight restoration. Using a pioneering interdisciplinary approach that crosses

the boundaries between cognitive neurosciences and ophthalmology, MADVIS will have a large impact on our understanding of how experience at different sensitive periods shapes the response properties of specific brain regions. Finally, in its attempt to fill the existing gap between cross-modal reorganization and sight restoration, MADVIS will eventually pave the way for a new generation.

ERC Consolidator

1 project: in the Social sciences and Humanities domain.

TRANSFER LEARNING - Transfer Learning within and between brains

CIMeC – Center for Mind/Brain Sciences

Giorgio Coricelli (2 million euro – 60 months)

The neural computation of adaptive behavior in social environments is far from being understood. We intend to study social learning mechanisms underlying cortical and subcortical activity in humans. We will use both computational and neuroscientific methodologies to provide new and more accurate models of learning in interactive settings.

The long-term objective is to develop a neural theory of learning: a mathematical framework that describes the neural plasticity and computations mediating social learning. We plan to develop and test a model of adaptive learning based on three basic principles: (1) the observation of the outcome of the un-chosen options improves the learning process, (2) learning can be transferred from one domain to another, and (3) learning can be transferred from one agent to another (i.e. social learning). The potential findings of this project could lead us to suggest general principles of social learning, and we will be able to measure and model neural activation to show those general principles in action.

ERC Advanced Grants

6 projects: 5 projects as coordinator (1 in the Social sciences and Humanities domain and 4 in the Physical sciences and Engineering domain) and 1 project as partner (in the Social sciences and Humanities domain).

Premesor – Predisposed mechanisms for social orienting: a comparative neuro-cognitive approach

CIMeC – Center for Mind/Brain Sciences

Giorgio Vallortigara (2.37 million euro - 60 months)

The aim is to develop a detailed animal model of vertebrate social predispositions, using the domestic chicken, and relating this work closely to the equivalent behavioural and neural measures in human newborns, including those at risk of autism, for which there is no widely-accepted animal model.

INSTABILITIES – Instabilities and nonlocal multiscale modelling of materials

Department of Civil, Environmental and Mechanical engineering

Davide Bigoni (2.38 million euro - 60 months)

The aim of the project is to unveil failure mechanisms of materials through the analysis of instabilities, and to develop innovative microstructures to be embedded in solids, in order to open up new possibilities in the design of ultra-resistant materials and structures. This will enable the achievement of innovative dynamical properties, defining elastic metamaterials, for instance, flat lenses for elastic waves, evidencing negative refraction and superlensing effects, thus opening up new horizons in the dynamics of materials.

QGBE – Quantum gases beyond equilibrium

Department of Physics

Sandro Stringari (1.64 million euro - 60 months)

The aim is to theoretically explore novel dynamic and transport properties of quantum gases at both finite and zero temperature, with special emphasis on the effects of quantum statistics, super-fluidity and the role of interactions.

Lucretius – Foundations for software evolution

Department of Information Engineering and Computer Science

John Mylopoulos (2.46 million euro - 60 months)

The aim is to develop principles that underlie, and concepts, tools and techniques that support, evolution. The project will focus on software-intensive systems. Such systems consist of software, human and organizational elements that work together to fulfil organizational and human objectives. The proposed research is based on ideas and research results from requirements engineering.

PERCEPTUAL AWARENESS Perceptual awareness in the reorganizing brain

CIMeC – Center for Mind/Brain Sciences (partner)

Angelika Lingnau (2.13 million euro – 60 months)

The project aims at casting light on the neural and cognitive reorganization of the visual function, following unilateral lesion at various levels of the central visual system, such as, the optic tract, optic radiation, primary visual cortex, and extrastriate visual areas. This objective will be pursued by means of behavioural paradigms associated with fMRI scanning and ERP and MEG recording. The result should lead to the development of novel imagery-based visual rehabilitation protocols which are individually tailored.

OMVac – Outer Membrane Vesicles (OMVs) from Vaccinobacter: a Synthetic Biology approach for effective vaccines against infectious diseases and cancer

CIBIO - Centre for Integrative Biology

Guido Grandi (2.61 million euro – 60 mesi)

The project will involve applying Synthetic Biology to create Vaccinobacter, a new bacterial species for the production of multivalent, highly- effective vaccines. The idea originates from the evidence that Outer membrane Vesicles (OMVs) naturally produced by all Gram-negative bacteria can induce remarkable protective immunity, a property already employed in anti-Neisseria vaccines, now also available for human use. OMV protection is mediated by Pathogen-Associated-Molecular Patterns, known to play a key role in stimulating innate immunity.

ERC Proof of Concept

2 projects in the Physical sciences and Engineering domain.

REPLICA2 – Large-area replication of biological anti-adhesive nanosurfaces

Department of Civil, Environmental and Mechanical engineering

Nicola Pugno (147.000 euro – 12 months)

KNOTOUGH – Super-tough knotted fibers (from 1st March 2015)

Department of Civil, Environmental and Mechanical engineering

Nicola Pugno (149.490 euro – 12 months)



Departments and Centres at UniTrento



Department of Civil, Environmental and Mechanical Engineering

Environment, climate change, security, infrastructures, materials, energy, green technologies, architecture: at DICAM we foster innovation and we design and shape sustainability

www.unitn.it/en/dicam

The Department focuses much attention on the direct transfer of technology from the University to the businesses. Indeed the first spin-off at the University of Trento, generated in 2008, was created within this Department, which currently hosts six of the ten spin-offs and start-ups at the University of Trento.

Within the Department, the research work performed in the Doctoral Programme in Civil, Environmental and Mechanical Engineering is of central importance. The aim of this research is to develop an exploratory approach to the topics of research on - and transfer of - important and specialized scientific results to problems and applied contexts, with a view to reinforcing the ties between basic and applied research in environmental studies which are important for the society, and call for the development of highly-innovative technologies, methods, and solutions.

The research activity in the Department focuses on the key areas of engineering, planning and applied sciences, such as environmental protection, landscape, architecture, natural renewable resources, energy, biomedical sciences, smart structures and materials, risk prevention, infrastructures and efficient and sustainable structures, building and estates, service networks and territory.

The activities may be grouped into six research areas:

Environmental Resources, Security and Climate Change

Research is based on modern fluid mechanics as the tool for the quantitative study of geophysical fluids and the transport mechanisms of chemical agents (pollutants), biological agents (pathogens) and physical agents (sediments) in the environment.

The understanding of the complex natural processes which shape the environment and rule the mass and energy exchanges, as well as the best management of natural resources, are the main issues to be analysed.

Mechanics, Materials and Smart Structures

The main scientific topics are: materials, meta-materials, biomechanics, solid and soil mechanics, structural mechanics and structural systems.

The most innovative subjects deal with the analysis and modelling of the acoustic, mechanic and electromagnetic properties of meta-materials; the mechanic features of biological structures; the properties of geo-materials, and the optimization, structural monitoring and control of the structures, including smart structures.

Surveying, planning and design for sustainable places – SusPlaces

Research in this area is related to the transformations of the city and the territory, within the perspective of sustainable development.

The virtuous interaction between anthropic and natural processes, at urban and rural levels, is based on the knowledge, methods and tools capable of meeting the requirements for inhabiting an area but, at the same time, protecting the biodiversity, the functionality of the natural ecosystems, and also the sustainability of the energetic systems.

Energy and Green Technologies

The Subject area Energy and Green Technologies is marked by an interdisciplinary approach and deals with the modelling and quantitative study of processes and systems of energy transformation and the distribution systems (smart grids) and energy storage.

The research activities regard also the development of models for a rational use and management of energy and energy saving, in end uses and in the tertiary sector, for domestic use, in urban buildings and in the industrial sector.

Research in the area of the Green Technologies also includes topics related to the development and optimization of technologies for the treatment of water, gaseous and solid materials (muds, solid wastes, polluted soils) and targeted to the enhancement of energy and materials deriving from the treatment processes (biogases, fertilizers, soil improvers, secondary raw materials for the industrial and building sectors).

Architectural Sciences

This research area concerns the many issues related to architectural planning and it is marked by a strong multidisciplinary nature. It considers the architectural project in its historical evolution and contemporary trends, the knowledge of the design of the building and the materials used, the relationship between shape and building feasibility, and the (traditional and innovative) building techniques.

It also studies refurbishment and renovation of existing buildings, the legal framework and the management of the entire project and implementation/building, quality testing and the representation of architecture, the city and the territory.

Modelling and Simulation in Engineering and Sciences

The Subject area Modelling and Simulation in Engineering and Sciences deals with the mathematic modelling and numeric simulation of complex systems through the development of new algorithms for calculations. This area is marked by multi-scale approaches, the validation of models and the quantification of uncertainty. Calculation and simulation methods are used, which derive from sciences and engineering, to be applied in all phases of the life-cycle of an engineered product-system.

The modelling and simulation activities are part of the most advanced research activities, relating to natural and artificial systems, supporting, integrating or replacing complex experiments and theoretical surveys.

Modelling and simulation are interdisciplinary topics, due to their strong connection with the main sectors of mathematics, physics and geophysics, mechanics and material sciences.

Research Laboratories

The research work is carried out in the following laboratories:

- Biomasses
- Chemistry of Materials for Engineering
- Atmosphere Physics
- Ecology
- Geodesy and Geomatics
- Geotechnics
- Hydraulics
- Hydrology and Hydraulic Constructions
- Health and Environment Engineering
- Materials for Energy
- Computational Mechanics of Solids and Structures
- Physic Modelling of Structures and Photoelasticity
- Interdisciplinary laboratory of Energetic Technologies
- Applied Chemistry-Physics
- Material Tests and Structures
- Building Planning,
- Building Refurbishment and Recovery
- History and Architecture
- Residual tensions
- Shot-Peening and X-rays
- Sustainable development planning
- Applied Mathematics

Three research centres are also active within the Department:

Centre for Metrology (CUM)

The main activity of the Centre is in the field of calibration of load cells in tension and in compression and material testing machines.

Centre for Intelligent Buildings (CUNEDI)

The mission of CUNEDI is to further investigate the potential of domotics – home automation – by experimenting on real cases, and to provide scientific and planning support to public and private bodies in developing innovative solutions for domotic installations.

Centre for the Protection of Mountain Environment (CUDAM)

Over the years, CUDAM has gained wide experience in the analysis and in the monitoring of the most popular works and most important articles on hydrogeological protection and stabilisation in mountain areas. The aim in this research field is to provide tools for the management of the territory as regards hydrogeological safety, in order to implement new technologies (hardware and software) for the monitoring and control of the environment and to develop new equipment for projects.

ERC (European Research Council) grants

The Department has obtained five ERC grants under different funding schemes.

ERC Starting Grants:

BIHSNAM – Bio-inspired hierarchical super nanomaterials

Nicola Pugno (1 million euro – 60 months)

STiMulUS – Space-time methods for multi-fluid problems on unstructured meshes

Michael Dumbser (0.92 million euro – 60 months)

ERC Advanced Grants:

INSTABILITIES – Instabilities and nonlocal multiscale modelling of materials

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ERC Proof of Concept:

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KNOTOUGH – Super-tough knotted fibers (from 1st March 2015)

Nicola Pugno (149.490 euro – 12 months)

Department of Economics and Management

Decision-making dynamics, experimental economics, cognitive psychology, finance, markets, entrepreneurship, innovation, tourism and sustainable development

www.unitn.it/economia



Research activities span the following topics: algorithmic social sciences; cognitive and experimental economics; tourism and management of sustainable development; the economics of institutions and organisations; international development; macro-economics and finance; support to decision-making; the net-economy; statistics; entrepreneurship and innovation.

The Department is organised into eleven research groups:

Algorithmic Social Sciences Research Unit (ASSRU)

The main research areas are: computable economics, classical behavioural economics, technological progress and productivity, macroeconomic dynamics, business cycles, economic policy, Sraffian economics, Keynesian economics, computable evolutionary economics, global and local economic dynamics, and the theory of simulation.

Cognitive and Experimental Economics Laboratory (CEEL)

The research activity of the Cognitive and Experimental Economics Laboratory (CEEL) relies on experimental methods to advance the understanding of how human cognition affects economic behaviour. Research is conducted in a lively interdisciplinary environment that draws from economics, cognitive psychology, and organizational studies. CEEL also offers young scholars research-training opportunities through workshops, research grants, and partnerships with PhD programmes.

Economics, Management and Sustainable Consumption (EMaSus)

The EMaSus research group involves researchers from different fields (management, environmental economics, statistics, psychology and economic history), and they analyse behavioural consumption and strategic choices in different sectors – tourism, culture, agriculture, and commerce. The sustainable approach is the main framework to study multi-stakeholder systems for fostering local development. The behaviour of individuals, enterprises and institutions is studied from an interdisciplinary perspective which integrates management, environmental economics, psychology and economic history, using quantitative, qualitative and experimental methods.

Behavioural Economy and Economic choices (ECSE)

The research conducted relies on both theoretical and empirical, mainly experimental, knowledge to study human behaviour in the economic domain. The research activity has a strong interdisciplinary nature and combines insights from economics and psychology. The main research areas are: risk and uncertainty, inter-temporal choice, consumer behaviour, social preferences, and behavioural finance. The main goal of ECSE is to promote high-quality research that may contribute to the international academic debate.

Economics of Institutions Organizations and (social & ethical) Norms (EION)

The research activity of EION is characterised by a multidisciplinary approach based on game theory, behavioural and experimental economics, social and public choice, the theory of distributive justice, (non-monotonic logic and bounded rationality. The list of research topics covers social contract explanations of endogenous conformity with different types of norms and institutions: fairness and stability of constitutions; multi-stakeholder corporate governance and social responsibility; contractarian business ethics and corporate culture; alternative forms of economic organizations (nonprofit, cooperative and social enterprises); governance of common goods and self-regulation; multi-stakeholder and multilevel governance of social welfare systems based on shared social responsibilities.

International Development Economics unit (IDE)

The research focuses on the changes in the economic process at an international level – global value chains, competitiveness of enterprises – and on some key factors of economic wellbeing in the developing countries (prices of food and raw materials; sources of income of families; informality; efficiency of international aid) in the current globalised context.

Macroeconomics and Finance unit (McFIN)

The research work aims at analysing the nature, behaviour and management of financial institutions, banks and enterprises, the functioning of financial markets and their interconnections with real markets and macroeconomics.

Multi-expert decisions and interactive aggregation unit (MEDIA)

The central research area is that of preference representation and aggregation functions, particularly generalised means and Choquet integration, with special focus on the interactive structure of the aggregation scheme. The applications are mainly in (1) multicriteria decision models, for instance the AHP; (2) indices of welfare and inequality, particularly the generalized Gini family, and poverty measures; (3) multidistances, measures of dissensus, and consensus models.

Business Ethics, Social and Environmental Accounting unit (RIBES)

This research group deals with issues relating to corporate social responsibility, business ethics and forms of accountability which are different from a traditional balance sheet. Some examples of these include a social-environmental or mission-oriented accounting system. The RIBES group collaborates at national and international level with universities and other research centres with which the sharing of ideas, projects and visiting researchers are common practice. The special interest areas of the RIBES group can be outlined as follows: - accounting practices for profit and non-profit organizations which are part of the field of studies involving social and environmental accounting; managerial practices used by business organizations to create social as well as economic value; the study of models to measure and account for economic-monetary performance in non-profit organizations, by utilizing multivariate statistical analysis tools.

Statistics unit (STATA)

Research topics cover a broad spectrum of areas: spatial micro-data at firm level; economic data at meso-territorial resolution; impact evaluation of industrial policies; theoretical models and indicators supporting entrepreneurial activities; business surveys based on spatial sampling techniques; methods and models for financial data; non-standard probability distributions and their applications; complex statistical problems for large dimensional multivariate data; multivariate models for loss distributions.

Strategy, Entrepreneurship and Innovation unit (STEIN)

Research activities are organized into three macro-areas: enterprises and entrepreneurship; innovation, technology and internationalization; industrial dynamics, institutions and territory. The research group has sound experience in the field of research applied to enterprises. In particular, methodologies include econometric techniques, spatial statistics, and the construction of case-studies.

Faculty of Law

*Bio Law, Criminal Law, International Law,
Public and Private Law, Administrative Law*

www.unitn.it/giurisprudenza



Research at the Faculty of Law is carried out in a wide range of subjects, thereby favoring the development of individual research areas and, at the same time, strengthening the fundamental unity of the structure, which is the essential feature of the legal profession.

The scientific activities are organised into the following areas:

- Administrative law
- Civil procedure law
- Commercial law
- Comparative studies
- Criminal law
- Criminal procedure
- Economics
- Historical and juridical studies and canon law
- International law
- Labour law
- Philosophical-juridical studies
- Private law
- Public law
- Roman law
- Sociological-juridical studies

There are thirteen research groups in the Faculty:

Biolaw

The group studies matters concerning bioethics and science of life studies. The research work covers several topics, ranging from the most traditional issues regarding a person's right to health care, to the beginning and end of life, to the most recent discussions dealing with clinical research, genetic engineering, synthetic biology and neurosciences.

Legal methodology (CERMEG)

The group focuses on the topic of methodology in the field of legal sciences. The exchange of ideas between theoreticians, with different approaches, and highly qualified lawyers and barristers is proof that the methodologies and reasoning strategies have an influence on the administrative practices of the law, and that they are marked by a strong interdisciplinary nature.

Law of Tourism Sports

The aim of the study group is to revise the current Treaties and offer a thorough and systematic analysis of the norms of civil and criminal responsibility and the safety rules regarding sport tourism.

European company law and EEIG

The researchers analyse the European Economic Interest Group (EEIG) within the productive pattern of the EU, testing the advantages offered by the individual national laws of implementation, and also evaluating the phenomenon of law shopping, which has been legislated and stimulated by the recent decisions of the European Court of Justice.

eCrime

The group involved focuses on research into eCriminology, and it was created in response to the fact that Information and Communication Technology (ICT) influences contemporary society in an invasive way (eSociety). The group's aim is to form an open network of top level researchers who share the same research interests and seek to open up new frontiers in criminology.

European Legal Integration (Elinis)

The aim of this group is to circulate the Italian scientific production regarding the laws on European integration, in particular with regard to those with a critical review of the traditional structures and of the academic acquis regarding legal studies in the EU.

Italian Laboratory

The group's aim is to study the history of Italian political thought from the Middle Ages to the present day.

Law and Technology (LawTech)

The research group focuses on the relationships and the reciprocal influences between law and technology. On the one hand, the law is used for technology regulation but, on the other hand, the law employs technologies to pursue its own goals. There are two main research areas which are recent developments of European contract law and behavioural theories of contract.

Network for the integration of migrants (PONTEST)

The aim of this group is to analyse the difficulties migrants, especially those from Eastern European countries and countries of the "enlarged EU", face as regards access to, and integration in, the labour market. The group members focus on the specific needs emerging from the local economic patterns and the internationalisation processes of enterprises.

The Common core of European Private Law

This group explores the development of a shared work methodology that may facilitate sophisticated specialised communication among professional lawyers who have already been trained in their own legal tradition, rather than focusing on the creation of a potential common European Lawyers' Board. The group also carries out comparative research on all European legal systems and focuses, above all, on those systems which might be considered as less influential at European level.

Legal comparison, translation and linguistics (TRANSJUS)

The goal of this study group is to improve the writing and the terminology used when drafting legal papers within a multilingual context. The group aims at developing constructive synergies among different professionals – language experts, legal experts and, above all, experts in comparative law – through research on legal terminology, reviews on the theory and methodology of legal translation applied to the transposition of the community legal data.

Jurisdiction and Pluralism

The Research Project JPs aims at exploring the impact of the plurality of pluralisms on basic features of the judicial organization and function. It does this by analysing ways of accommodation experienced so far and by attempting to draw some insights from the coexistence of different legal traditions within the same legal order, whether it be a nation-state or an international or supranational jurisdiction.

LIA – Laboratory of institutional Innovation for complete Autonomy

The LIA Project promotes cultural and scientific activities aimed at studying in depth, using a comparative juridical method, the rationale and the methods of developing a strategy of institutional innovation defined as "complete autonomy" of the region of Trentino. This "complete autonomy" is interpreted as an advanced formula – and, thus, as a pioneering experience with respect to the special autonomy already provided for, and guaranteed, by the Constitution of the Italian Republic.



Department of Humanities

Philosophy, History, Literature and Languages

www.unitn.it/lettere





Research in the Department of Humanities encompasses two areas:

- Philosophy, History and Cultural heritage;
- Language, Philology and Literature studies.

Philosophy, History and Cultural heritage

In the field of philosophy, researchers deal both with the history of philosophy, from the ancient world to contemporary philosophical issues, and with a more theoretical approach, mainly in the fields of ethics, aesthetics and political philosophy. Specific attention is devoted to theological studies and interreligious dialogue.

In the field of history, the research focuses on the history of institutions and of the administration, social structures, and communication structures, and on the interactions between history and culture. In this regard, particular interest is paid to the Alpine regions and the relationship between Italy and the German world. From a more theoretical point of view, specific studies are dedicated to the means of diffusing the historical memory – at individual and collective levels – and to the relationship between historical research and political ideologies.

In the field of cultural heritage, the research activities focus on three main topics: Archaeology, History of art, and Music.

Languages, Philology and Literature

Research in the areas of Languages, philology and literature focuses on texts and their contexts.

As regards languages, the department fosters research in English, German, French, Russian, and Spanish, both from a historical point of view (the study of literature) and from a synchronic point of view (the study of the spoken languages).

Philology and literature are two subjects that are strongly connected, following the best Italian and European traditions. The research focuses on two main areas: the classical and medieval traditions, both Latin and the vernacular, and contemporary literature, seen from a comparative and theoretical point of view.

Two laboratories are at work in these areas: one for the study of European cultural journals (CIRCE: Catalogo Informatico delle Riviste Culturali Europee); and one for the study of contemporary poetry (SEMPER: Seminario Permanente di Poesia).

Two journals are published by scholars working in this area: the «Osservatorio critico della germanistica» (German Studies) and «Ticontre» (Theory, Text, Translation).

In the Department, there are the following laboratories:

Aesthetics in Practice and Community Design

The research group investigates places and communities, applying the methodologies of design and aesthetics. To this end, the activities in the laboratory are based on the principles of action-research and on the community design. Techniques in the areas of photography, scenic design and cinema are also studied.

Archaeology

The laboratory is the result of the need to apply computer science technologies in the field of territorial archaeology. The research group was also involved in the creation of the Digital Archaeological Maps of Dougga (Tunisia), of the Parc National d'El Kala (in the east of Algeria) and the area of Karasis (in the east of Cilicia, Turkey), completed with the GIS database which allows for the immediate reference to data, as well as their processing for the purpose of analysis and digital management.

Archival Science and Disciplines concerning documents

The activities performed in the laboratory focus, in particular, on the drafting of models to manage the current archives of public administrations and on the study and enhancement of historical archives.

Musical Philology

In the laboratory, research work is carried out on the history of music, in particular, concerning the conservation and preservation of the musical heritage. The most traditional philological methodologies are complemented by the new digital technologies and their applications in musicology.

Microfilms and Digital Photography

The group carries out research in the field of documents regarding the cultural heritage, using digital technologies. Particular attention is devoted to manuscripts, ancient printings and archaeological evidence.

Laboratory of Prehistory “Bernardino Bagolini”

The research activities in the laboratory regard the entire chronological time span of human prehistory. Particular attention is paid to the methodological features, the use of the territory and the genesis of the archaeological stratifications. A specific research topic of the group is the area of Trentino and the area of the Po valley and the Alps; however, views on other Italian and European areas are also included – Sicily, the Iberian Peninsula and Romania).

Digital Research on the European cultural journals and magazines

The laboratory deals with the filing and digital conservation of Italian and foreign journals and magazines from the end of the 19th century until today (about 100 titles).

Theatre Laboratory

In the Theatre Laboratory, the research activities mainly involve the theatrical iconography and the theatre of the Middle Ages. One of the main initiatives of the research group is the creation of Arianna, a digitalized database of theatrical iconography. There is also an observatory on contemporary theatre.

Laboratory of Experimental Phenomenology

The Laboratory of Experimental Phenomenology carries on from the theoretical tradition of phenomenology and develops it experimentally. The Laboratory conducts experiments on the nature of the primary (perception) and secondary (conceptualization and imagination) cognitive processes, paying particular attention to the visual and acoustic perception of complex patterns.

LabSA

The LabSA (Laboratory of Ancient History) inherits the activities of the former Sepesta (Permanent Workshop of Ancient History) in terms of promoting the historical and philological study of the past, as well as interdisciplinary and cross-cultural studies. The LabSA does this by promoting collaboration among scholars from different countries and research areas (history, philology, archaeology, epigraphy, anthropology, history of religion, political studies); by strengthening relationships with other institutes of classical studies in an international framework; and by drawing early-career scholars and students into critical debate about the investigative, analytic and interpretative methods and techniques appropriate to its aims.

Dionysos – A digital archive of the ancient theatre

The “Dionysos” laboratory encourages and coordinates scientific and didactic activities regarding the ancient theatre and its tradition, within a wide range of prestigious cultural institutions, both national and international, such as, theatres, universities, research centres, libraries and museums. The main part of this laboratory consists of a digital archive of the ancient theatre. The archive currently consists of about 450 detailed data sheets which record ancient Greek and Roman plays that were performed throughout the years 1948-2012 in Italy. This archive is the first one to be compiled in Italy, and it is continuously expanding. The laboratory also contains a digital archive of manuscripts and printed editions of ancient dramas from the sixteenth century to today, and an archive of videos and films inspired by ancient dramas.



Department of Industrial Engineering

*Mechatronics, materials engineering,
embedded electronics support decision making*

www.unitn.it/en/dii

The Department performs research in the sectors of industrial engineering, in particular, in mechanics, mechatronics, materials engineering, electronic and micro-electronic systems, managerial information systems, and optimisation methods and models to support decision making. The Department's research objectives are the structure of materials, and their features and applications; new materials and technologies; automation systems of processes and machineries; energy production and storage; the design and implementation of mechanical/electronic integrated devices, with specific functions in innovative applications; the optimisation of products and processes.

The Department cooperates with various national and international research institutions, and is involved in basic and applied research projects, with a strong connection to the industrial world.

The research areas are:

Materials Engineering

Most of the activities are carried out in cooperation with international – and national – partner universities and research centres. Several research projects are jointly developed with industrial partners worldwide. The expertise and research activity of the members are focused on: materials production and optimisation, structural and functional materials applications, and nanomaterial and nanotechnologies. The relevant areas of applied research are: biomedical technologies and applications, agro-food technologies, materials for energy and environment, the food processing industry, materials and technologies for cultural heritage, and mechanical and processing industry.

Mechatronics

The research in this area concentrates on the system-level engineering of smart, innovative, intelligent, mechanical systems, i.e. systems possessing the characteristics of being both “physical” and “smart”. The main research fields are: manufacturing systems and industrial automation, mechanical measurements and sensor data fusion, intelligent systems (vehicles and robotics), space technologies, and accessibility and assisted living.

Electronic-and Micro-electronic Systems

The research programme is mainly focused on the technological issues related to the design, modelling and characterization of intelligent electronic systems, and their ability to be distributed and “embedded” in an environment in order to solve complex problems. In this general context, the research at DII covers the following main topics:

- Design of wireless sensor networks
- Techniques and algorithms for the localization and synchronization of mobile- wireless devices
- Measurement and control systems in mechatronic applications
- Systems and techniques for energy harvesting and power management
- Systems and algorithms for parameter estimation in energy smart grid

Novel micro-electronic sensors and micro-electro-mechanical systems (MEMS) for scientific, industrial and consumer applications are also developed, covering all steps from the conceptual idea to the realization of prototypes, with emphasis on:

- Particle and ionizing radiation detectors
- Optical and image sensors
- Interface electronics for sensors
- MEMS and biosensors


Operational Research

In this area, topics are related to: problems of guided optimisation, optimisation on graphs, models and systems to support decision making, models for the management of stocks, multiple-criteria evaluation methods, project management, information retrieval systems, analytical databases, applications of databases on the web, information systems for management purposes, e-learning platforms for training in companies, social network platforms for management, multimedia applications, web strategies for branding, promotional and e-commerce activities, website evaluation quality, and website redesign.

Within the Department, there is also the following structure:

BIotech – Biomedical Technologies

BIotech aims at fostering research in the field of biomedical sciences and technologies in cooperation with external public and private partners, research institutions, companies and health service facilities.

The background of the entire page is a composite image. It features a view of the Earth from space, showing the curvature of the planet and the blue oceans. Overlaid on this is a digital rain effect, with vertical columns of binary code (0s and 1s) falling from the top. The text is positioned in the upper left quadrant, within a dark red banner.

Department of Information Engineering and Computer Science

The right balance between theoretical and applied research

www.disi.unitn.it

The Department of Information Engineering and Computer Science (DISI) at the University of Trento is one of the leaders in research and development in the Information and Communication Technology sector at both Italian and European levels. The research pursued at DISI seeks the right balance between theoretical and applied research, as shown by the strong focus on European as well as industrial projects, and the key role in the initiatives of the European Institute of Innovation and Technology (EIT ICT Labs).

The outreach of DISI is also attested by the many synergies with other research institutions located in Trentino, including Trento RISE, CoSBI Research Centre, Create-Net Association and Graphitech Foundation.

Research at DISI is organised into eleven areas:

Data and Knowledge Management

The research is in the following fields: data management and analysis, view maintenance, caching and prefetching, data mining, personalization technologies, sensor data management, streaming data summarisation and processing, business process monitoring and analysis, metadata management, schema mapping, data translation and integration, knowledge representation and management, semantic web, contexts and ontologies, user-centric data and knowledge search, XML and P2P data and knowledge management, and game theory in P2P systems.

Embedded Electronics and Computing Systems

In this area, the focus is mainly on the technological issues related to intelligent systems and their ability to be distributed in an environment in order to solve complex problems. This central topic stems from the description of intelligent systems as products that use communication channels, electronics, microprocessors and software technologies to accomplish predefined tasks, e.g., to control objectives given to an autonomous mechatronic system. Embedded systems are fundamental for intelligent products and can be considered as computing systems dedicated to special purposes.

Language, Speech and Interaction

The research area is related to speech and language processing, vision, machine learning and interaction. Studies concentrate on how humans process speech, language and vision and the study of mathematical models for automatic processing, suitable for communicating machines.

The research is also oriented towards examining models of interactions in all of the ICT settings, such as, in speech-to-speech, speech-to-web and multimodal interactions. Collaborative systems and web architecture are also studied.

Machine Learning and Intelligent Optimization (LION)

The research is into the development of intelligent optimisation and reactive-search techniques for solving pertinent problems arising in different application areas, including intelligent transportation systems, computer networks and mobility, mobile services and ubiquitous computing, social networks, and clustering and pattern recognition in bio-informatics.

These challenges require an integration of different theoretical and practical tools in a creative environment that eliminates the borders between disciplines.

Multimedia Signal Processing and Understanding

This area is concerned with the whole multimedia content lifecycle, from representation and coding, to processing, storage and retrieval, protection, analysis, and understanding. The main focus is on visual data and, in particular, on the still picture and video. In this field, different fundamental aspects are considered, including: smart representation and transmission of information (adaptive coding, scalability, multiple description coding), middle and high-level analysis (video object tracking, trajectory analysis and matching, activity and behavior analysis), interactive systems and man-machine interfaces (gesture recognition, eye tracking).

Remote and Distributed Sensing

Airborne and satellite remote sensing represents the most important and promising technology for Earth observation and environmental monitoring, developed in the last few decades. A key component is related to image processing, pattern recognition, and data fusion methodologies, which are the main tools for an efficient extraction of the information necessary to end-users from the remote sensing data. These techniques are complemented by distributed sensing on the ground, e.g., via wireless sensor networks, which also provides the core technology for several application domains, e.g., including energy efficiency and smart city infrastructures at large.

Signal Processing and Recognition

The research activities focus on the design of smart computerized signal/image processing and recognition systems. Research keywords are: computer vision, data mining, image/signal processing, information retrieval, machine learning, neural systems, optimization, and pattern recognition.

Social Informatics

Social Informatics is an emerging part of informatics that studies how information systems can achieve social goals, apply social concepts, and become sources of information relevant for social sciences and for the analysis of social phenomena. It is concerned with the intersection of social behavior and computational systems, and deals with the interdisciplinary study of the design, uses and consequences of information technologies that take into account their interaction with institutional and cultural contexts.

Software Engineering, Formal Methods and Security

Research is related to the design and deployment of trustworthy and effective socio-technical systems.

The main topics are: goal-oriented requirements engineering, agent-oriented software engineering, security engineering, security-by-contract, and formal methods.

Results from the research have been applied to software development, software/protocols/hardware verification, service-oriented architecture design and development, organisational and business process modelling and analysis, and mobile software systems development.

Systems and Networks

The research in this field is concerned with the design and implementation of modern distributed systems and networks, increasingly characterised by strict requirements in terms of high performance, quality of service, and large scale, dynamicity, and security.

The aim of the research is to tackle the challenges of distributed systems at all levels, spanning from the definition of systems, to distributed algorithms, to middleware and language constructs, and to the implementation of application-level protocols and system services.

Wireless Networking

The aim is to foster high-quality theoretical, methodological and experimental research in wireless network systems, architectures, protocols and devices and to teach advanced issues relating to wireless networking, antennas, and modern communication techniques over wireless channels.

Office hrs: Thursday 16:00 ÷ 18:00

Tomorrow (here) 08:30 ÷ 10:30
"Computability" replaces "Complexity"

(From yesterday)

We have an effective enumeration of recursive functions
(let's consider just $\mathcal{R}^{(1)}$).

$$\varphi: \mathbb{N} \longrightarrow \mathcal{R}^{(1)}$$

φ is a surjective mapping, so for each $f \in \mathcal{R}^{(1)}$ there
exists n such that $f = \varphi(n)$. [We shall write φ_n for $\varphi(n)$].

Indeed, for each $f \in \mathcal{R}^{(1)}$ there exist infinitely many n 's
such that $f = \varphi_n$.

Department of Mathematics

Mathematics in its applications: from epidemiology to the nutritional systems, didactics, cryptography... and to its relevance in the industrial field

www.unitn.it/en/dmath

Research at the Department of Mathematics is carried out in the various fundamental sectors of mathematics and its applications in the fields of industry and sciences, interacting with various disciplinary areas, such as physics, biology, engineering and economics.

The Department pivots on numerous, dynamic and productive research teams, and it is marked by fruitful cooperation among its various active members: professors, researchers, PhD students and visiting professors.

The Department encompasses nine research groups and three interdisciplinary laboratories. The research groups are:

Lie Algebras, Groups, Codes and Cryptography

The members of this group are mainly interested in group theory, also algebraic; Lie algebras; combinatorial identities; computer algebra; cryptography, codes, and other applications of Algebra. The group collaborates with public and private companies on issues concerning security and data encryption.

Numerical Approximation of Partial Differential Equations

This research group mainly studies approximation methods for partial differential equations, in particular the finite element, finite difference, and finite volume methods. The issues addressed are primarily derived from electromagnetism and fluid dynamics.

Calculus of Variations and Geometric Measure Theory

The main research interests of this group are minimisation of functionals defined on Riemannian manifolds and depending on the areas and curvatures; asymptotic methods for nonlinear problems; issues in geometric measure theory in Carnot-Caratheodory spaces.

Nonlinear Partial Differential Equations

The research field of this group (which also involves engineers, physicists and other scientists) is devoted to the study of mathematical models of various physico-engineering phenomena. In particular, (i) phase transitions, (ii) filtration in porous media, (iii) hysteresis phenomena (in the presence of elasto-plasticity, ferromagnetism, etc..), (iv) homogenisation of composite materials, (v) multi-scale phenomena are studied.

Mathematical Physics, Dynamical Systems and Geometric Methods in Physics

The research interest of this group is twofold. On the one hand it concerns classical mechanics and its interplay with differential geometry and, in the context of the theory of dynamical systems, the study of planar dynamical systems and perturbation theory for Hamiltonian systems. On the other hand, research concerns the mathematical (axiomatic, algebraic, constructive) formulation of quantum theories, and the theory of general relativity and relativistic quantum theory of fields, including the arguments of so-called “quantum gravity.”

Analytic Geometry and Algebraic

The research interests of this group concern the classification of projective varieties (curves, surfaces, higher dimensional varieties and related moduli spaces), real algebraic geometry, analytic geometry and complex and hypercomplex analysis.

Mathematical Logic and Theoretical Computer Science

In the field of logic, this group deals with techniques and applications of non-standard functional analysis and the extension of the logic of continuum of propositions and predicates; in the context of theoretical computer science, the research group deals with the theory of programming languages.

Stochastic Processes and Control Theory

The researchers of this group study the theory of evolution equations whose characteristic parameters vary randomly. To study this kind of problem tools of Functional Analysis and Infinite-dimensional Analysis are exploited, in particular the recent “Malliavin Calculus”. Along with these “theoretical” issues various applications to neuroscience, networks, financial models, quantum mechanics and diffusion in materials with memory are analysed. Research in Control Theory is mainly devoted to tackling problems of optimal control of differential equations (in particular, Bellmann/Isaacs equations and systems of differential equations with hysteresis effects) and related problems of differential games.

History of Mathematics

Research in the History of Mathematics is primarily concerned with the critical study of “the writings of Peano and his school” and the historical-linguistic analysis of the “language of mathematics”.

The interdisciplinary Laboratories are:

Laboratory of Mathematics and Computational Biology

The main areas of research of this laboratory are the spread of infectious diseases, ecology, nutrigenomics (interaction of molecular physiology and the external environment, such as diet) and the dynamics of molecular networks. The methods range from analytical and numerical study of ordinary differential equations and partial differential stochastic simulation to advanced statistical techniques in bioinformatics.

Laboratory of Mathematics Education and Communication

Within this laboratory we perform both research and experimentation of methodologies for the teaching and learning of mathematics. Materials, text, software designed for those purposes are produced.

Laboratory of Industrial Mathematics and Cryptography

The Laboratory activities (internships, research and development, consultancy, organization of courses) concern cryptography and computer security topics such as ciphers of the SSL / TLS protocol, strong authentication and transaction signing for online banking, recognition of digitized signatures, erasable biometrics, advanced electronic payment systems and coding for passports.

Collaboration with other national and international research centres is crucial. In particular, the Department cooperates with:

CIRM: International Centre for Mathematical Research of the Bruno Kessler Foundation

CoSBI: Computational Systems Biology Centre, Microsoft / University of Trento

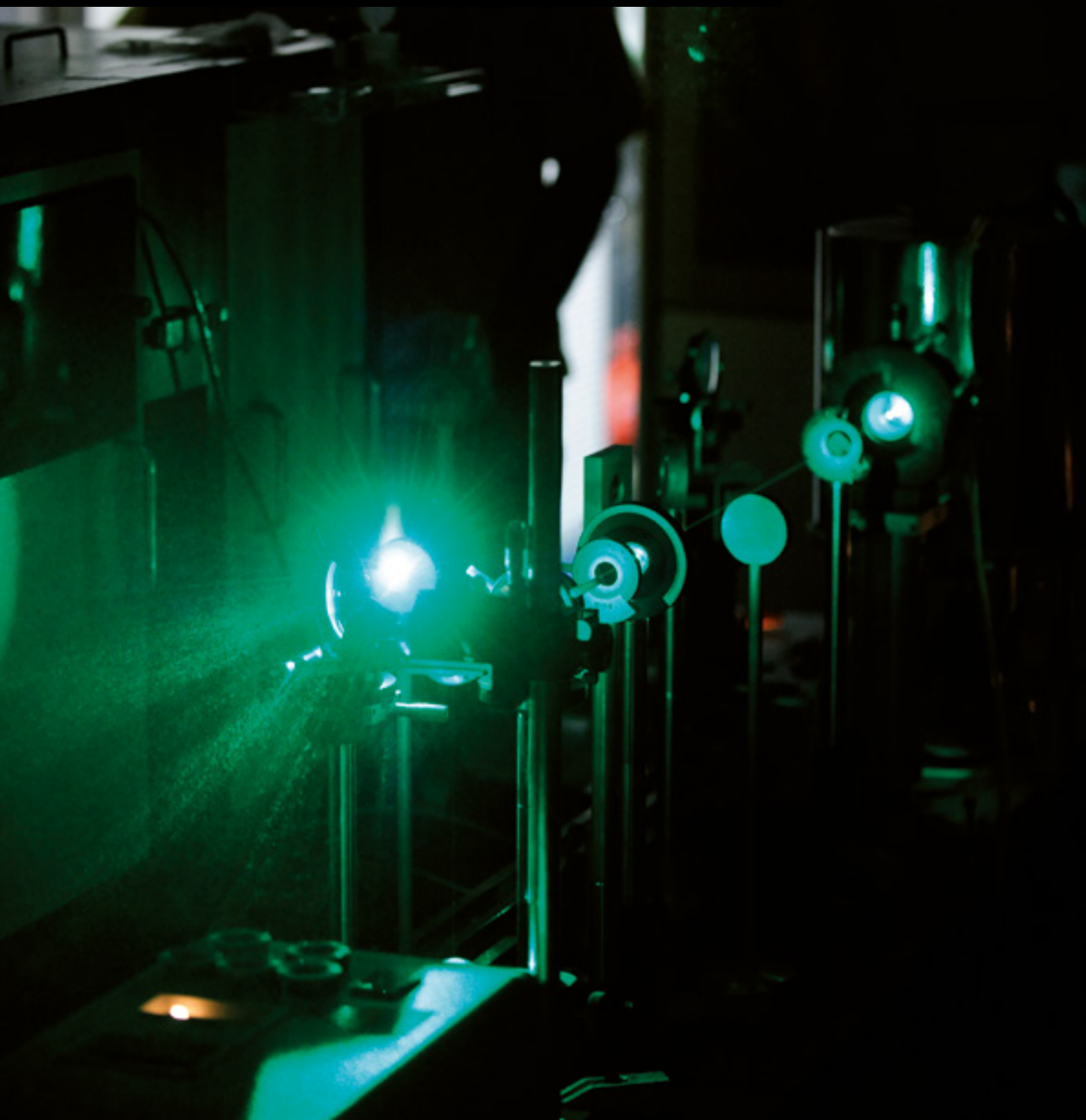
INDAM: National Institute of Advanced Mathematics “Francesco Severi”, Research Unit, University of Trento

MATEMATITA: Inter-University Research Centre for informal communication and learning of mathematics

Department of Physics

Cosmology, gravitational physics, cold gasses, photonics, complex systems, molecular, atomic and nuclear spectroscopy, nanoscience, biophysics and medical physics, supercomputing and research in science education.

www.unitn.it/en/dphys



Research in the Department spans from theoretical investigations of fundamental interactions, gravitational physics and cosmology, to nuclear and sub-nuclear physics, quantum many body systems, ultracold gases and Bose Einstein condensation; and from experimental gravitation to molecular and atomic physics, biophysics, biochemistry, energetics, research in education; and from material sciences to nanoscience, photonics and complex systems.

The Department effectively collaborates with many research centres and universities and, specifically, with the Italian and European Space Agency (ASI and ESA), the National Research Council (CNR), the National Nuclear Physics Institute (INFN); at a local level, it shares research projects and programmes with the Bruno Kessler Foundation (FBK), the Edmund Mach Foundation (FEM) and the Regional Healthcare Organization (APSS). Worth mentioning is the fact that the Department hosts the Trento Institute for Fundamental Physics and Applications (TIFPA) – a joint initiative including INFN, University, FBK and APSS – and the Trento sections of INO-CNR and IFN-CNR institutes.

Research is carried out in nine laboratories:

Experimental Gravitation

The research is dedicated mainly to the development, realisation, and operation of gravitational wave astronomical observatories, both ground-based and spaceborne. Additional activities include the development of high-sensitivity experiments and low-temperature detectors in fundamental physics.

The group, from the beginning, participated in the core scientific team that studied the spaceborne laser interferometer antenna known as LISA and it is currently involved in its evolved version eLISA, which is the reference gravitational wave observatory now adopted by ESA for their third large-class mission. LISA Pathfinder will be launched in 2015.

The group is part of the international collaboration Virgo, that runs a ground-based gravitational wave detector. Advanced Virgo will resume joint observation with LIGO detectors in 2016. Trento is involved in the data analysis of the detector network, in the squeezed-light sensitivity enhancement for Advanced Virgo and in developing instrumentation working near the quantum limit.

Biophysics and Biosignals

Within the Laboratory, the structure and dynamics of biological systems are investigated at multiple scales, by using an experimental and application-oriented interdisciplinary approach. Modern techniques of optical and functional imaging, quantitative modelling and computer simulation are applied to study the human cardiovascular system and, in collaboration with CIMeC, neural systems of different complexity. The research objectives range from biophysical aspects to biomedical applications. Translational research is carried out in collaboration with several medical institutions and biomedical companies.

Bio-organic Chemistry

The main focus of the research activities is the use of modern methods of organic chemistry in order to understand and solve problems lying at the interface between chemistry and biology or physics, in all the cases where the knowledge of molecular detail is essential. In particular, the research topic, broadly named “Natural Product Chemistry”, requires a strong interdisciplinary approach, providing the basic information on some interesting natural products, a condition necessary for their exploitation in applied fields, like medicine, biotechnology, agronomics, environmental sciences and ecology. Advanced NMR and mass spectrometric measurements are carried out daily in this laboratory.

Communication of Physical Science

In addition to the traditional areas of experimental research in the fields of mechanics, fluid mechanics, electromagnetism and optics, work in the Laboratory is also focused on the new context of information and multimedia technologies, aiming, in particular, at a renewed teaching of quantum and matter physics. The Laboratory is also the reference point for the design and implementation of training programs for students and teachers of schools at all levels.

Atomic and Molecular Physics

The research activity is devoted to the investigation of the dynamics of atomic and molecular systems. The main research lines concern experimental astrochemistry and physics and chemistry of cold atmospheric plasmas. The principal experimental techniques are mass spectrometry, gas chromatography and optical spectroscopy.

IdEA (Hydrogen, Energy, Environment)

The IdEA (Hydrogen, Energy, Environment) Laboratory brings together specific expertise in material science, for the study and the production of new materials (nanocatalysts, photocatalysts, membranes), relevant in the energy (hydrogen production by water splitting) and environmental fields (water purification, gas separation), with knowledge and instrumentation in the field of radiation interaction with surfaces and molecules. Some parts of the research activity are carried out in cooperation with the Department of Chemical Science and Materials technology of CNR (the National Research Council).

Structure and Dynamics of Complex Systems

The research activities are focused on the study of the interplay of structural and dynamical properties of a class of materials including: liquids and glasses, soft matter, ceramics and disordered photonic systems. The aim is to achieve an in-depth understanding and, possibly, a tailored design of materials with predefined properties. The structural and dynamical properties of these materials are investigated in the laboratory using different techniques including X-ray diffraction, Raman and Brillouin scattering spectroscopy, luminescence and dynamic light scattering. These experiments are complemented by X-ray spectroscopic studies carried out at synchrotron radiation sources (e.g. Elettra at Trieste and the ESRF at Grenoble, France) and free electron laser centres (e.g. Fermi at Trieste and LCLS at Stanford, USA).

Nanoscience

The main fields of research are in nanophotonics, silicon based photonics and nano-biotechnologies. The mission of the Laboratory is to generate new knowledge and understanding of physical phenomena which occur when the matter is of nanometer size. In particular, the aim of the research is to apply the nanoscience paradigm to silicon or silicon compatible materials in order to enable new applications of this key material, and to develop nanosystems, compatible with the main driving silicon technologies.

Theoretical and Computational Physics

Within the Laboratory, research is carried out in various fields of theoretical physics, using also advanced computational techniques. The main areas concern: astrophysics, gravitational physics, field theory and particle physics, nuclear physics, quantum fluids and solid-state physics, Bose-Einstein condensation and ultracold atomic gases, and statistical physics of biomolecules.

The research activities benefit from important national and international collaborations with other institutes and research centres. At a local level, there are collaborations with the Trento Institute for Fundamental Physics and Application (TIFPA), the European Centre for Theoretical Research in Nuclear Physics and Related Areas (ECT*), the INO-CNR Centre on Bose-Einstein Condensation (BEC), and the Interdisciplinary Laboratory for Computational Science (LISC).

Department of Psychology and Cognitive Science

The scientific study of the human brain: from the models of the cognitive processes to the development of new treatments, education, labor and social organization

www.unitn.it/cogsci



The Department's core research focuses on the creation of models of human brain functioning, both in normal and in pathological conditions, by employing empirically-verifiable scientific methods and rigorous multidisciplinary approaches. This is possible thanks to the interplay of different skills and knowledge and of the numerous research perspectives pertaining to experimental and applied psychology, such as, linguistics, pedagogy, mathematics, statistics, and neurosciences. These models and approaches are applied to various fields: psycho-diagnosis, social and psychological rehabilitation, neurology, education, forensics, the management of groups and organisations, and the analysis of working and social environments.

The Department's key research areas are:

Social Mind

The research group on Social Mind investigates the cognitive and social processes involved in language and communication, in the ascription to, and understanding of, states of mind, in the relationships among individuals and groups, and in socio-cultural and institutional settings.

Clinical Neurosciences

Basic and applied research is carried out in three areas: the neurophysiological bases of cognitive, affective and behavioural disorders resulting from neurological and mental pathologies; the impact on families and on society of these disorders, caused by neurological and mental pathologies; and the development of diagnostic, testing, and therapeutic methodologies aimed at evaluating and treating cognitive, affective and behavioural deficits in patients suffering from neurological and mental pathologies.

Organisation, education, and identity

This research area focuses on the processes of reciprocal influence among individuals, groups, and organisations, as far as behaviours are concerned and, in particular, on motivation and learning in individuals, seen as members of specific social backgrounds. Thus, it is possible to explore the individual's wellbeing in his/her social and working environments; the degree of efficiency in the construction of forms of collective identities; the management of human resources; the achievement of objectives in organizational structures; the teaching and professional methodologies applied in pedagogical activities and settings; and the development of personal and professional identities.

These fields of investigation can be fully explored thanks to the Department's numerous experimental laboratories, which are equipped with technological tools and software for collecting behavioural and physiological data (including psychophysics, kinematics, EEG, eye-tracking, and multisensory laboratory equipment). Moreover, our researchers actively and effectively cooperate with local healthcare

services and providers, in order to carry out studies on patients suffering from neurological and psychiatric illnesses, as well as studies on functional and structural neuroimaging.

In the Department, there are also three areas devoted to basic and applied research, in the following fields:

Laboratory of Efficient Communication and Narrative Psychology

The laboratory is dedicated to the analyses of children's acquisition of symbolic, textual, and narrative skills. This laboratory is equipped with video-recording devices and allows for data collection about, and investigation of, the relationship between narrative skills and conceptual knowledge, with a focus on meta-cognition. The research is mainly based on a qualitative approach and makes use of action-based research methodologies.

Neurocognitive Development Laboratories

This laboratory is equipped with video cameras, monitors and laptops, used to create visual and auditory stimuli to test babies and children and to record their looking behaviour and other motor or verbal reactions. A set of tests to measure children's communication skills and their verbal and non-verbal intelligence is also available in the laboratory. The investigations have, so far, mainly focused on communicative and conceptual development in the domain of causality, theory of mind and moral cognition.

Observation, Diagnosis and Education Laboratory (ODFLab)

The ODFLab is devoted to the study of emotional and cognitive development in neurotypical individuals and in individuals with special needs. Cutting-edge research and golden standard clinical practices make ODFLab one of the best-known university centres in Italy for the diagnosis and the treatment of Autism Spectrum Disorders (ASDs). The ODFLab collaborates with prestigious national research centres (e.g. IRCSS Stella Maris, Pisa, Ospedale Bambin Gesù, Rome) and international research institutes (NICHD – NIH, USA; University of Florida; Georgia State University; Riken BSI; Nagasaki University, Japan). The identification of the early markers of ASDs, as well as the study of social and emotional skills of individuals with atypical development, are among the main research lines of the ODFLab. Observation methods represent the signature of the ODFLab and have been recently complemented by the use of TMS and fMRI. Of great importance is the fact that the ODFLab has achieved recent significant results in the study of the neurobiological correlates of emotional processing of individuals with ASD.

Department of Sociology and Social Research

*Social changes, local development, gender studies,
democracy and global governance*

www.unitn.it/en/sociologia



The Department of Sociology and Social Research is the oldest Sociology Department in Italy. It has been consistently ranked among the best Social Sciences departments in the country. It has a strong inter-disciplinary character: sociologists, political scientists, historians, economists and anthropologists work daily together in their teaching and research. It encourages its members and its students to work using a wide variety of conceptual traditions and approaches, all having as their common core the practice of theoretically oriented empirical research. The Department has a strong international profile: it has recently launched the first Italian Sociology MA program taught entirely in English. Moreover, a large share of the research carried out within the department appears in international peer-reviewed journals and books. Within the Department, there are several research units, each providing students and colleagues with a specialized forum for their researches.

Età della Vita - eVita

The research unit 'eVita' works on the different stages of life, paying particular attention to the changing structures and roles of youth, adults and seniors. Furthermore, eVita is specifically focused on the interactions among youth, adults and seniors together with the long-term outcomes arising from these interactions.

Local Development and Global Governance – LoG

The research unit LoG focuses on the relationship between global and local governance, and investigates in which ways, both formal and informal, institutions interact in order to promote the development of local areas.

Center for Social Inequality Studies

The CSIS research unit has as its main objective the promotion and coordination of initiatives of theoretically driven empirical research, focusing on social inequalities, their relation to institutions and their change over time and across generations.

Research Unit on Communication, Organizational Learning and Aesthetics – RUCOLA

The Research Unit on Communication, Organizational Learning and Aesthetics is a group of scholars promoting research in specific aspects of Organization studies. Common areas of interest include: exploring the practices of organizing, a focus on knowing and learning as a collective, social, affective and not entirely cognitive activity, and a particular emphasis on the relationships between linguistic, symbolic, material and emotional aspects of organizational processes.

STSTN – Science and Technology in Society

Science Technology and Society - STSTN - is an interdisciplinary university project aimed at raising awareness among researchers (especially younger ones) of issues concerning the relationship between science and society, as well as offering a platform for discussion of these themes both within the university and in the local community.

VADem – Values, Belonging and Democracy

The Research Unit on "Values, belonging and democracy" (VADem) is a group of scholars and researchers collaborating to explore the connections between socio-cultural change, particularly in the area of values, political culture and the transformation of democratic institutions.

Center of Interdisciplinary Gender Studies – CSG

This study center adopts gender differences as a key to interpretation and as an instrument in research and interdisciplinary practices involving different fields: economics, law, politics, science, sociology and liberal arts. The main aim is to spread gender culture by means of many different events: cultural exchanges, scientific debates, as well as national and international collaborations.

Research Center on Democracy and Global Governance – DEMOGLOB

DEMOGLOB is an interdisciplinary research unit whose main goals are: to sponsor and coordinate research projects on the transformation of democracy within the national, European, and international contexts; to contribute to the development of theories concerning the processes of Europeanisation, internationalisation, and globalisation; and to study the permutation of the conflicts connected with the processes of internationalisation and globalisation.

Migration Scenarios and Social Changes – SMMS

SMMS is a group of students, academics and practitioners interested in the study of migration as a factor of social change, both in sending and receiving contexts. SMMS advocates the development of meticulous programs of empirical research on international migration, favoring the exchange and sharing of the research results across national and disciplinary boundaries.



Centre for Integrative Biology

An integrative view of biological processes and their derangement in disease

www.unitn.it/en/cibio

The Centre for Integrative Biology – CIBIO promotes the idea of merging the classical cellular- and molecular-biology perspective with the new effective approaches provided by systems and synthetic biology, and it also places strong emphasis on integration with chemistry, physics, informatics, mathematics and engineering.

CIBIO Principal Investigators pursue their goals in the frame of a holistic view of basic biological processes and of their derangement in disease, with the aim of establishing a “double- edge” model to biomedical research, in which basic science co-exists with translational approaches.

Research at CIBIO covers a number of topics, all emphasizing experimental analysis at various levels of biological organization, and they are largely focused on four major Research Programmes:

Cancer Biology & Genomics

The CBG Programme is characterized by a strong focus on fundamental studies, directed towards molecular determinants of gene expression control, conducted also with a network-oriented approach. The applicative goal of this research is the description of pathways involved in cancer onset and progression, and the identification of bioactive molecules in a drug-screening setting.

The CBG Laboratories are:

- The Laboratory of Computational Oncology
- The Laboratory of Transcriptional Networks
- The Laboratory of Genomic Screening
- The Laboratory of Translational Genomics
- The Laboratory of Gene Expression

Cell & Molecular Biology

The CMB Programme addresses research topics, such as intracellular trafficking, host-virus interaction, RNA and protein homeostasis, and molecular mechanisms controlling the turnover of nucleic acids and proteins.

The CMB Laboratories are:

- The Laboratory of Molecular Virology
- The Laboratory of RNA Biology and Biotechnology
- The Laboratory of Molecular and Cellular Neurobiology
- The Laboratory of Neurodegenerative Diseases
- The Laboratory of Virus-Cell Interaction

Microbiology & Synthetic Biology

The MSB Programme construes the identification of genes and small molecules involved in the virulence of pathogenic microorganisms and the mechanisms of their action with the experimental investigation of the first phases of protocell evolution.

The MSB Laboratories are:

- The Laboratory of Microbial Genomics
- The Armenise-Harvard Laboratory of Synthetic and Reconstructive Biology
- The Laboratory of Computational Metagenomics

Neurobiology & Development

The aims of the NBD Programme are to identify and distinguish genetic determinants of the central nervous system (CNS) development, which could also contribute to the proposal of mechanistic explanations for the onset and progression of CNS pathologies, and of their possible innovative therapies.

The NBD Laboratories are:

- The Laboratory of Molecular Neuropathology
- The Laboratory of Transcriptional Neurobiology
- The Laboratory of Developmental Neurobiology
- The Armenise-Harvard Laboratory of Axonal Neurobiology
- The Laboratory of Stem Cell Biology

The Research Programmes established at CIBIO are interconnected by a high degree of internal co-operation, in the setting of a dynamic experimental environment, characterised by the coordinated work of young independent group leaders and advanced postdoctoral fellows. CIBIO has acquired state-of-the-art equipment, comprising all the tools necessary for biomedical projects to be carried out with the required level of technological sophistication (<http://www.unitn.it/en/cibio/21286/core-facilities>). Researchers at CIBIO have full access to commonly-shared instrumentation facilities operated by dedicated and highly-qualified staff scientists.

Center for Mind/Brain Sciences

Cognitive neurosciences and animal cognition, computational linguistics and man-machine interfaces

www.unitn.it/en/cimec



Research at the CIMeC (Center for Mind/Brain Sciences) is conducted in several areas that range from experimental psychology, to neuroimaging acquisition methods, cognitive neurosciences and animal cognition, as well as in computational linguistics and human-machine interfaces.

The Center consists of six interdisciplinary Laboratories:

Functional Neuroimaging Laboratory (LNiF)

In the Laboratory, the commitment is to developing new techniques for imaging human brain and to applying these techniques toward a more comprehensive understanding and better care of the human mind and body. This involves the development and continued improvement of new hardware, software and procedures for data acquisition, visualisation and statistical analysis, and the application of these advancements to medically-relevant investigations (with CeRiN).

Neuropsychology Laboratory (NP)

In the Neuropsychology Laboratory, the commitment is to investigating the nature of the cognitive, linguistic, perceptual, motor, and emotional deficits that result from brain damage or other forms of neurocognitive dysfunction in adults and children. There are two main objectives in the Laboratory. The former is to understand the functional organization of the human brain and how damage to its various parts leads to cognitive disorders; the latter is to use knowledge of the working of the brain in order to develop better tools for the assessment of cognitive disorders and better rehabilitation techniques.

Animal Cognition and Comparative Neuroscience Laboratory (ACN)

The main goal in the ACN Laboratory is the study of cognitive processes and their neurobiological bases in a comparative perspective. Research is mainly focused on the mechanisms of cerebral representation of physical and social objects, numbers, time and space.

In particular, special attention is given to animal models, characterized by having cerebral architectures that are simpler than (or otherwise different from) those of mammals, in order to provide support for comparative research and investigations into basic neurological mechanisms.

Language, Interaction and Computation Laboratory (CLIC)

In the CLIC Laboratory, the interest is in studying verbal and non-verbal communication. Research in the Laboratory uses both computational and cognitive methods and is focused on the following areas: the use of semantic and encyclopedic knowledge in communication; classical questions in theoretical linguistics and, in particular, semantics with computational and experimental methods; multimodal communication, in which agents communicate, using a variety of expressive means that go from verbal expressions to gestures, as well as in the direction of a look, and that can also use images and diagrams; extraction and integration of semantic information from different multimodal sources; adaptive interfaces.

Center for Neurocognitive Rehabilitation (CeRiN)

Within the NP Laboratory, the CeRiN has integrated the rehabilitative centers already present in the Trentino Province, by setting up a center which is devoted to the diagnosis and treatment of cognitive, language, neurobehavioral and motor-sensory disorders in encephalopathic adults. This structure is dedicated to the diagnosis and treatment of the cognitive, linguistic, neurobehavioral and motor-sensory problems in brain damaged adult subjects. As a result of the center, a collaboration has been established between the University of Trento and the local medical infrastructures.

Experimental Psychology Laboratory (EPL)

In the EPL Laboratory, human cognitive functions and behavior are studied. The Laboratory consists of five different laboratory areas and adopts EEG, Eye Tracking, Kinematics, Multisensory and Psychophysics research tools.

Two other laboratories have become part of CIMeC, thanks to a collaboration with the **Bruno Kessler Foundation**: the Computational Cognition Laboratory and the NeuroInformatics Laboratory. Moreover, the collaboration with the Research and Innovation Centre of the **Edmund Mach Foundation** has led to the creation of the Insect Neurobiology and Neuroecology Laboratory.

The Center collaborates with the **Center for Neuroscience and Cognitive Systems** (Italian Institute of Technology, IIT) in Rovereto.



School of International Studies

Institutional change, economic growth and social development

www.unitn.it/en/ssi

The School of International Studies (SIS) is a Graduate School and an advanced institute of interdisciplinary studies and, in the few years since its inception, has become a leading reference point in Europe for graduate teaching and research in economics, law, and politics.

The School has undertaken and funded three interdisciplinary research projects which fall within the more general topic of interest “Institutional change, economic growth and social development” co-funded by the Autonomous Province of Trento.

The reform of the Chinese growth model: economic, political and institutional issues

The research project focuses on the evolution of the Chinese growth model. Despite the remarkable economic performance attained so far, the Chinese socio-economic model has, in fact, been characterised by significant macroeconomic imbalances and serious social problems that need to be urgently addressed. The Chinese élite is aware of the need of such a wide range of reforms, but the required corrective actions appear to be politically, institutionally and socially challenging.

This research project aims to develop some theoretical macroeconomic models to study the transition path and the long-term implications on growth of various reform scenarios, taking fully into account the complex balance of power between the dominant social groups and the élite that governs the country. The project will also aim to address the impact of the transformation of the Chinese socio-economic model on the international relations that China maintains with the Western countries and its Asian neighbours. The research activities of the project require a thorough examination of both the Chinese institutional framework and an interdisciplinary analysis of the links between the legal, social, economic and political realms.

A Legal Analysis of the Financial and Economic Crisis Management in the European Union: Intergovernmentalism and its Implications

The economic and financial crisis that has hit economies around the world in the last few years has highlighted an overall lack of tools in order to address market turbulence at European level.

Against this background, default risks and fears of contagion throughout Europe urged EU Member States to set up effective mechanisms to cope with national vulnerabilities. This happened mostly through the conclusion of international agreements outside the EU Treaties framework. Such an approach gives rise to a number of crucial legal questions, not only as

to the limits of the current normative framework, but also as to the relationship between the instruments put in place and the Treaties system. It also stimulates further reflection on the current and future role of the Union in economic governance and the possible evolution of the relevant normative framework.

The overall purpose of the project is to investigate, in a multidisciplinary manner, the causes that led to an intergovernmental approach to crisis management by EU Member States, assess its impact on the EU legal system and discuss its possible future developments.

Crisis in the European Union: between Transnational Integration and National Disintegration

This research concerns the European crisis and the integrative and disintegrative pressures generated by it: the severe problems of the European Union today are both economical and institutional, and their depth endangers the very existence of the integration process and the stability of the member States. It compares the current crisis with another one that has severely hit Europe, namely that of the 1970's, and the impact of the crisis of the institutional changes introduced to overcome it. It also analyses the interplay between economic and social aspects, and the growing tension between an increased centralisation of economic governance while mechanisms of social protection remain essentially national. This phenomenon implies an increasing complexity in the legal regulation of areas covered by European competences, such as labour and finance, and generates frictions and gaps. Furthermore, this tension has a significant impact on the political actors involved and on the mechanisms of political accountability, which is changing the model of democracy in Europe. The problem of the democratic deficit in the European Union is moreover related to the mechanism of participation of civil society in decision-making, which starts at the local level but is increasingly relevant also at the European level.

Externally funded research projects (ongoing):

The global virtual-water network: social, economic and environmental implications (funded by the Italian Ministry of Research)

This multidisciplinary project studies the main drivers and consequences of international virtual water flows. Virtual water is the water virtually embodied in all commodities. The research activity carried out at the SIS aims at identifying the main economic and legal determinants of virtual water flows and their impact on global water efficiency: in fact, the exchange of goods represents a way to transfer water from water-rich countries to water-scarce ones and therefore can enhance water efficiency at a global level.

The INTL-UNI Project : the Challenges of the Multilingual and Multicultural Learning Space in the International University (funded by EU Commission)

In the process of internationalisation, universities are faced with new challenges and opportunities for maintaining and improving the quality of their programmes. Students and lecturers alike form much more heterogeneous groups than ever before, speaking a wide spectrum of languages and representing a wide spectrum of cultural backgrounds in what may be termed the Multilingual and Multicultural Learning Space (M&MLS). This three-year EU funded project aims to identify ways of addressing these challenges and making the most of the opportunities to eventually produce a series of quality criteria for international programmes.

Externally funded research projects (recently concluded):

The SPEAQ Project: sharing Practice in Enhancing and Assuring Quality (funded by EU Commission)

The general aim of this two-year EU funded project has been to connect the three key quality stakeholders, teachers in higher education, students and quality managers in order to share and enhance quality assurance practice in higher education and ultimately foster a quality culture. At a local level the project focused on a student-driven project to enhance the educational experience of international students, and as a consequence also national students by enhancing information and communication channels at all levels and between all stakeholders.

The Structure and Growth of World Trade and the Role of Europe in the Global Economy (funded by Fondazione Banca Intesa San Paolo)

The project has investigated the growing interdependency of social and economic relationships among world countries using a network approach. It employed a sample stochastic model of network formation and evolution to describe the structure and dynamic properties of international trade, and used it as a benchmark against which to test the performance of countries. The research has been carried out thanks to a Research fellowship in memory of the late prof. Ferdinando Targetti, first Director of the School of International Studies.

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