Perspectives from our Students and Industry Representatives

My entire academic path from Bachelor studies in informatics to Master studies in computational science has been here at USI. In my perspective, the two most appealing aspects about informatics at USI are the high professor/student ratio and the teaching focus on both theory and practice. During my studies I also had the opportunity to work at the Institute of Computational Science (ICS), which allowed me to explore the world of high-performance computing and scientific simulations. Studying and working in this field has been a really enriching experience. For this reason I decided to continue my career development here at the ICS with Ph.D. studies.
Patrick Zulian, former Master Student, now Ph.D. Candidate

Modern business analytics has become a high-tech industry based on decision modeling, mathematical programming, and complex simulations. There is an increasing quest for advanced levels of computational simulations and data analytics within the Forensic Technology & Discovery Services at Ernst & Young AG, Zurich. This requires not only unconventional ideas but also motivated and well educated students that have a profound knowledge of various disciplines which are offered within the MCS master at USI.
Dr. Madan Sathe, Forensic Technology & Discovery Services, Ernst & Young AG, Zurich, Switzerland

I am a Ph.D. student in the group "Computational Time Series Analysis". Our goal is the development of novel techniques for time-series analysis and prediction. My research interest is dedicated to the analysis of extreme events like heat-waves or heavy precipitation. During my Ph.D. studies I did not only delve into the research of time series analysis, but also established a strong basis in data analysis and machine learning. The education and experience, gained through my studies, provide a stable foundation not only for a scientific but also for an engineering or financial career, e.g. as data or risk analyst.
Olga Kaiser, Ph.D. Candidate

The computer industry is currently undergoing a tremendous change from homogenous, sequential architectures to heterogeneous, massively parallel ones. In order to master this transition, we need a new generation of computational scientists capable of designing next generation algorithms. The new curriculum in computational sciences at USI will offer a great balance between theoretical depth and practical experience to prepare the students to become leaders in that revolution.
Dr. Peter Messmer, Director NVIDIA Co-Design Center Zurich, Switzerland

Working in the field of computational science allowed me to study at the interface between applied mathematics, computer science and life sciences and to direct my research focus according to my own preferences. It is a rewarding feeling to develop algorithms and numerical techniques, implement and optimize them for supercomputers and then see how they help researchers in life science to speed up their work. Being part of a multidisciplinary and international team broadened my perspective and allowed me to significantly extend my professional network. The experience I gathered and qualification I achieved gives me a significant edge on the job market and allowed me to find my dream job right after graduation. Dorian Krause, Ph.D., Alumnus, now working at Jülich Supercomputing Centre

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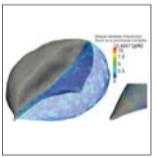
Università della Svizzera italiana · Faculty of Informatics · Institute of Computational Science ICS

USI Università della Svizzera italiana
Institute of Computational Science

Master of Science Programme Computational Science


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Selected Application Domains at ICS

Computational Life Sciences

Computational life sciences use methods and tools from computational science and high-performance computing to understand complex systems in life sciences such as **biology** and **medicine**. The simultaneous analysis on a molecular, cellular, tissue and organism level by computational models and the computational analysis of multi-scale and multi-physics systems has the potential to improve technology, drug discovery and the development of new medical therapies for diseases. ICS hosts the unique "**Center for Computational Medicine in Cardiology**", which aims at developing new computational methods and tools for cardiology.
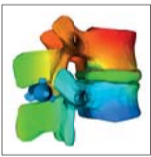
Computational Shape Analysis

Shape recognition and **pattern recognition** are of central importance in our modern and digitalized world. We develop computational models for 2D and 3D computer vision and pattern recognition applications, allowing the machines to process, analyze, and understand visual information.
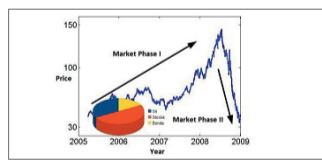
Computational Finance

There is a strong and growing demand in the **financial services industry** for advanced quantitative computational competencies. This includes risk management as well as the analysis of financial data. Numerical methods and tools applicable to risk analysis and in particular to time series analysis are part of our offer.

Computational Fluid Dynamics

Fluid mechanics is at the heart of many processes in our lives, at scales ranging from motion of cells in microcirculation to the global circulation in the atmosphere and oceans. Understanding **fluid mechanics** is therefore an important topic of research in the academic world and also in industry. At the moment, many fluid mechanics problems are intractable using classical theoretical approaches. We develop and implement methods for carrying out simulations using state-of-the-art computational systems which oftentimes can be the only option to provide an insight into the problems emerging in real-life applications.
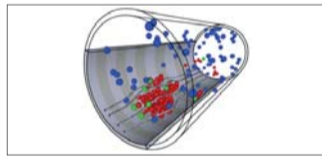
Computational Engineering

These days, progress in (industrial) engineering depends strongly on the capabilities provided by methods and tools from computational science. Numerical experiments carried out on (high-performance)-computers are nowadays an indispensable tool in the development of, e.g., new machine parts, mechanical components, or cars. Thus, **Computational Science engineering** is an area of ever growing importance for our modern industrial society.
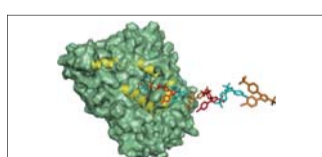
Computational Geoscience

Complex multi-scale interactions characterize the geophysics of the earth. Resolving structures, processes and dynamics on a wide range of interacting spatio-temporal scales is a unifying grand challenge common to all branches of **earth science** which must be addressed in order to achieve a comprehensive understanding of the earth as a multi-physics system.

Medicinal Chemistry and Drug Design

Computer simulations can shed light on the binding process of a drug to its target, resulting of invaluable help in understanding its mechanism of action and **developing new medications**. Advance calculations can also describe the behaviour of biomolecules (**proteins and DNA**) in their biological context. These virtual models can be so close to the real world to show how cells work and the way to counteract cellular malfunctions that lead to severe diseases.


Computational Science lies at the intersection of mathematics, informatics and natural as well as social sciences and is the latest and most dynamic scientific method aimed at explaining real-world processes and solving increasingly complex problems.

The multidisciplinary **Computational Science** Master programme of the Institute of Computational Science at the University of Lugano offers a streamlined blend of cutting-edge scientific research and practical application, thus providing an excellent foundation for a corporate, industrial or academic career.

Our students receive a firm grounding in programming, mathematical modeling and numerical simulation as well as a strong orientation towards applied mathematics. Our graduates are sought-after experts in data evaluation, data modeling and prognosis. The unique scope of our Master programme creates an **exceptionally wide spectrum of occupations** for our graduates in a large variety of different application domains.

Programme Description

Our MCS Master programme provides a unique high-level education in computational science. By combining a solid and deep theoretical background in applied mathematics and numerical analysis with state-of-the-art knowledge in computer science and high-performance computing, students will get the best of two worlds: A general and abstract view on computational techniques given by the mathematical framework, and a hands-on and application oriented education in modern informatics and software engineering. With the resources available at ICS and our partners at CSCS, ETH, or CCT, the students are trained to exploit the power of mathematics and of large supercomputers for real-world simulations in a broad range of application areas.
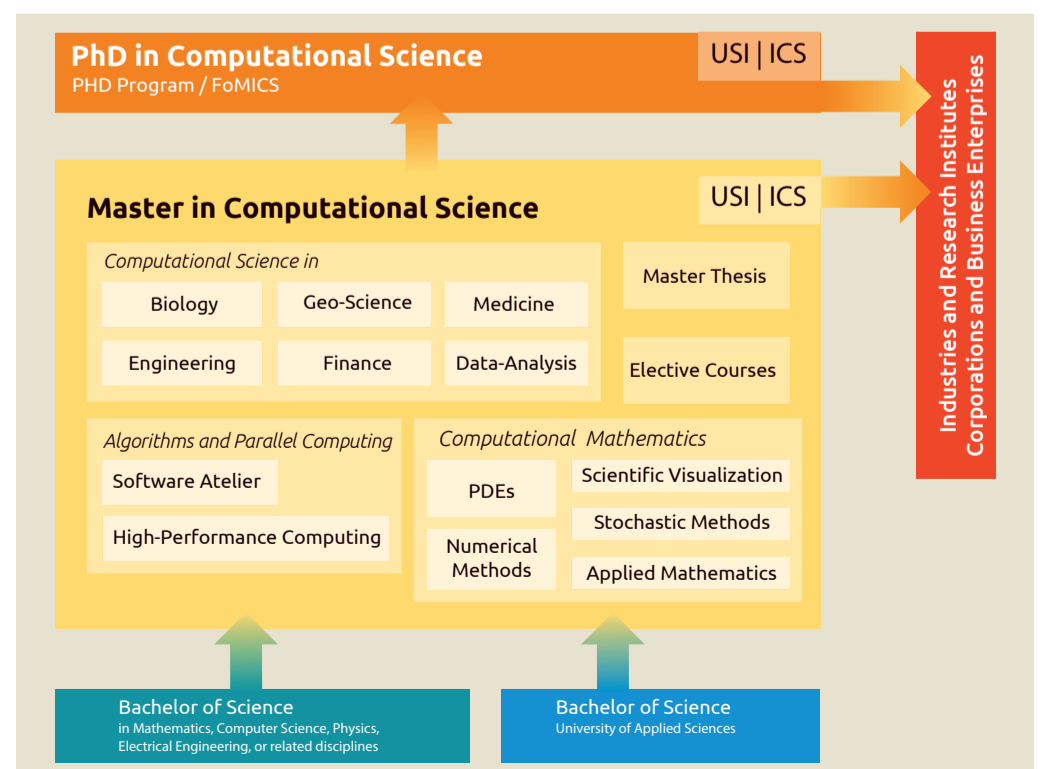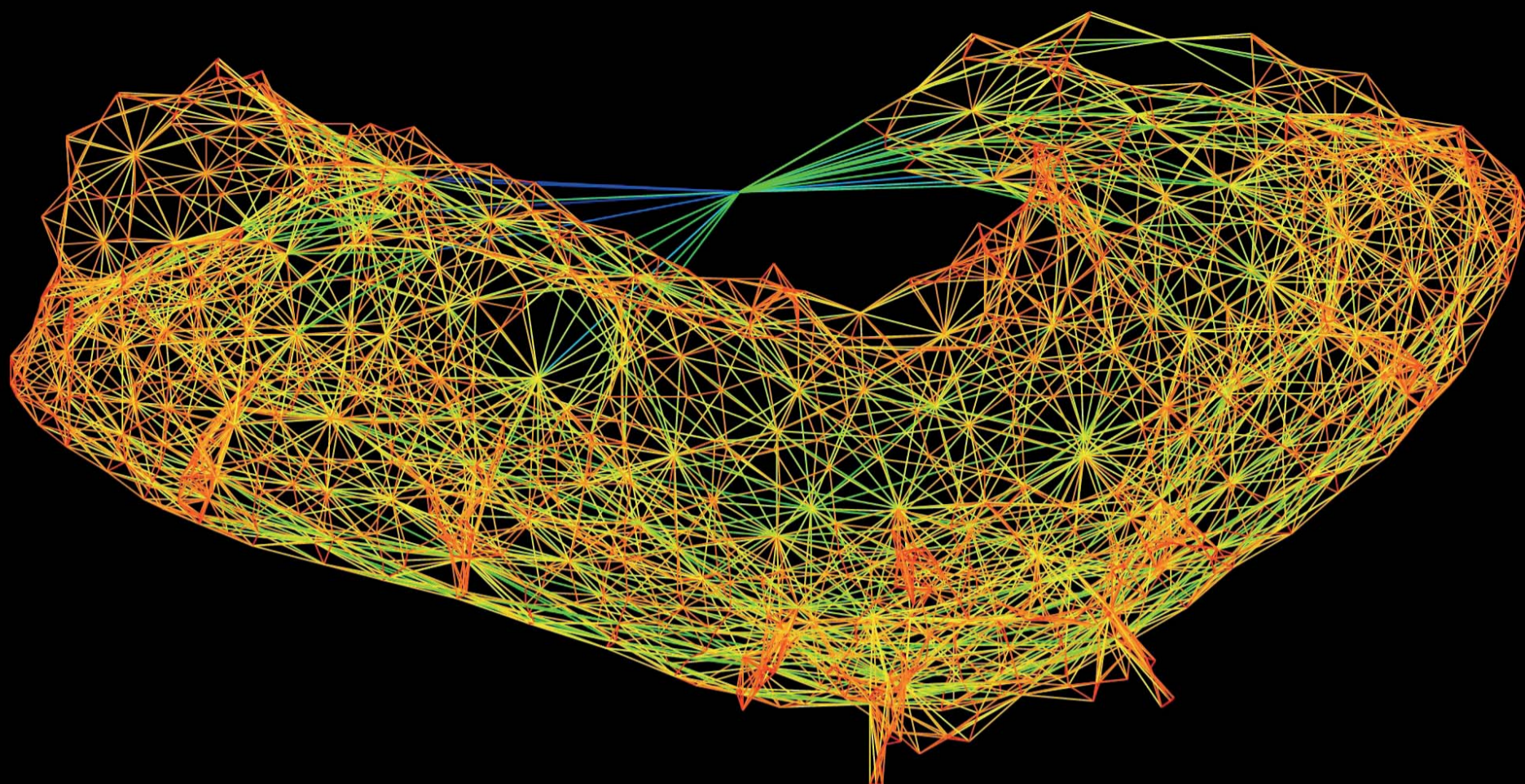
Graph visualization to discover and visualize structures in complex relations

Master in Computational Science

Revolutionizing Scientific Discovery.

Computational science offers thrilling new perspectives for understanding complex processes in almost all areas of our life – ranging from natural sciences over economy, finance, and social science to life sciences and medicine. Through numerical simulation and mathematical modeling, computational science made possible what was unthinkable only a few years ago: problems that were impossible to test in an experimental setting were made accessible by developing models that can be solved by increasingly powerful supercomputers. The application domains are as diverse as the scientific disciplines applying models from computational science, with new areas emerging virtually every day in a poineering interdisciplinary science field.

The graduate Master Programme Computational Science at the Institute of Computational Science welcomes visionaries that are eager to extend the boundaries of knowledge and to set new standards for scientific discovery, research and industrial development, thus shaping the world of tomorrow.