Neural Systems and Computation
A specialized Masters program in which brain sciences meet technology

How does the brain perform computation?
How does computation support and give rise to behavior?
How can we translate insights about neural systems into usable technologies?
Understanding the principles underlying brain function and discovering how to develop artificial systems that use the same principles are key issues for the future success of medical sciences and for the development of artificial intelligent systems. Answering these questions requires expertise that extends across multiple academic disciplines. To approach these questions, researchers must work at the interface between physics and medical sciences, engineering and cognitive sciences, mathematics and computer science.

Goals of the program
The MSc in Neural Systems and Computation is an interdisciplinary program offered jointly by the University of Zurich and the ETH Zurich. The main contributing Institutes are the Institute of Neuroinformatics, the Brain Research Institute, and the Institute for Empirical Research in Economics. The program provides trans-disciplinary knowledge, skills, and a mindset to prepare researchers for their first decade of independent research and development. Students have the opportunity to be trained and mentored in the following areas:

- systems neuroscience and the current understanding of how neural architectures give rise to sensory, motor, and cognitive functions
- neural computation and how theories of neural computation relate to the classical theory of computation
- experimental techniques in neurobiology such as electrophysiology, optical imaging, and electron microscopy
- theories, methods, and algorithms employed in the computational analysis of neurobiological data
- theory and design principles for the construction of neuromorphic hardware and of systems that interact intelligently with the world

The training covers how to:
- conduct independent scientific research and complete a research project
- analyze, evaluate, and summarize scientific literature and write a research proposal
- present scientific research results in talks and written reports targeted at specialist, trans-disciplinary, and general audiences
Program overview

The program consists of a set of core modules, a set of elective courses, and a Master’s thesis. Students may choose, in consultation with the course coordinator, a selection of core and elective courses to suit their backgrounds and goals. The Master’s thesis is mandatory and students have the option to reduce the duration of the thesis project in favor of two short research projects. The core courses provide a common foundation for students with different educational backgrounds. The set of core courses cover the following:

1. Systems Neurosciences
2. Neural Computation and Theoretical Neurosciences
3. Neurotechnologies and Neuromorphic Engineering

Students must attend core courses from at least two of the three above listed disciplines.

In addition to theoretical courses, the core modules include a practical education in instrumentation, measurement, and data analysis relevant to neuroinformatics as well as an opportunity to study, discuss, and report on a list of foundational research papers in neuroscience and computation. In addition, a journal club, held with graduate students, postdocs, and group leaders will provide a forum for the analysis and evaluation of recently published high-profile research. The journal club provides a state-of-art awareness of progress in the field.
Information on the
NSC Program
Institute of Neuroinformatics
Winterthurerstrasse 190
8057 Zürich
Phone +41 44 635 30 51
nsc@ini.uzh.ch
www.nsc.uzh.ch