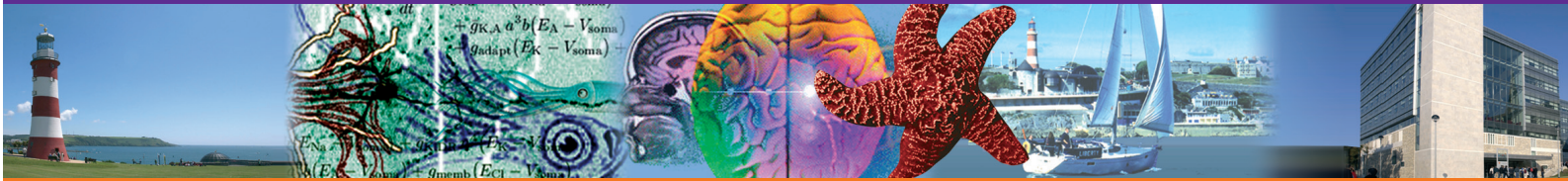


MSc/MRes Theoretical and Computational Neuroscience



MASTER OF SCIENCE/MASTER OF RESEARCH

WHY STUDY THEORETICAL AND COMPUTATIONAL NEUROSCIENCE?

- You will participate in an new, and unique interdisciplinary programme to study fundamental principles of information processing in the brain
- You will develop confidence and competence in the theoretical and computational dimensions of modelling in neuroscience, through taught modules, practical work and project development
- You will become experienced in brain-inspired algorithms and neuromorphic techniques for finding solutions to complex information processing problems
- You will be taught by recognised international experts involved in major international research projects and be able to take advantage of our worldwide partnerships with neuroscience centres in UK, Europe, USA and Japan.

INTRODUCTION TO THEORETICAL AND COMPUTATIONAL NEUROSCIENCE

Neuroscience is one of the most intensively developing and important sciences of the 21st century. Huge progress has been made in recent years in experimental approaches and techniques. In particular the imaging and recording of brain activity is providing extensive experimental data about different aspects of brain functioning. Theoretical and computational neuroscience provides the solid basis necessary to understand the data and shed fresh light on the basic mechanisms underpinning brain function at the cellular, circuit and systems levels.

The MSc programme is taught by staff in the Centre for Theoretical and Computational Neuroscience (CTCN) at the University of Plymouth, UK. The CTCN is one of the leading centres in the field of theoretical neuroscience. The Centre has brought together a range of international experts from various backgrounds with expertise in mathematical and computational techniques and their application in neuroscience. This rich mix of computational, mathematical, and neuroscience expertise provides a unique opportunity for students to acquire a sound multidisciplinary training, in this emerging field of study.



KEY FEATURES

We offer a unique training scheme to students in two streams:

1 “Physical Sciences” stream.

Students with a background in the physical sciences or mathematics will acquire knowledge and understanding in fundamental principles of neurobiology and in theoretical and computational neuroscience. Students will apply mathematical and computational methods to the modelling of neural activity, brain circuits, and cognitive function.

2 “Life Sciences” stream.

Students with a background in the life sciences will acquire knowledge and skills in theoretical methods and computational techniques for studying the brain. Students will deepen their understanding of neurobiology, study new ideas and methods of computational neuroscience, use specialised software to develop and analyse neuronal models, and apply gained knowledge in neuroscience.

The research projects which students complete for their dissertation include both mathematically/computationally oriented and biologically oriented topics. Students of both streams working closely together on mini-projects and there is an extensive exchange of skills and knowledge between students.

RESEARCH OPPORTUNITIES

The programme provides a broad multidisciplinary foundation for students wishing to undertake further research training at PhD level. The dissertation is based on an individual research project which can form the basis for continuing research at PhD level. Part of the philosophy of the programme team is to involve MSc students directly with our research groups, providing experience that will be exceptionally beneficial for anyone wanting to continue in a research career.

CAREER OPPORTUNITIES

The programme provides an excellent training for those wishing to pursue an academic or industrial research career in the exciting area of brain research. The acquired computational knowledge, skills, and brain-inspired algorithms can also be successfully used for a career in industrial organisations which require deep analytical skills and use of effective brain-inspired computational methods of information processing (finance, commerce, medicine, etc).



UNIVERSITY FACILITIES

The Centre has extensive computer modelling/simulation facilities including a dedicated 40-processor Linux-based cluster, and a Compaq ES45 AlphaServer multiprocessor computer, together with Neuron, Genesis and Matlab modeling and simulation software. It has dedicated laboratories for psychophysical experiments in vision, audition and sensorimotor control, and a 64-channel system for the measurement and analysis of high-resolution electroencephalography (EEG) and evoked potential (EP) signals, together with visual and auditory stimulus presentation equipment. It also has access to the 1.5T fMRI research facility within the Peninsula Medical School, which is equipped to carry out visual and auditory experiments. The Centre is located in a self-contained area of the new Portland Square building on the University's Plymouth city centre campus, and includes its own seminar and library space, together with offices for academic staff and research students. It is collocated in the same building with the Department of Psychology, the School of Biological Sciences and the Peninsular Medical School.

ENTRY REQUIREMENTS

A minimum of a lower second class honours degree (2.2) in Mathematics, Computing, Engineering, and Physics for the Physical Science stream. A minimum of a lower second class honours degree (2.2) in Biology, Chemistry, Psychology, and other natural sciences for the Life Sciences stream. Students with advanced standing who can evidence an academic ability to a similar level may also be considered. For overseas students, proficiency in English is required to British Council standards. Applicants are encouraged to enquire about their suitability.

PROGRAMME CONTENT

The programme's taught modules provide knowledge and skills in a wide range of theoretical techniques which are under intensive use in neuroscience. These include techniques for the development and analysis of mathematical and computational models of neural activity, brain structures, cognitive functions, etc, and probabilistic and statistical techniques for analysing different types of experimental neuroscience data. In addition to the taught modules, students will work individually with one or more research advisors to develop a research project for their dissertation and to learn how to carry out advanced interdisciplinary research in their chosen research area.

TERM 1 (12 WEEKS MSc and MRes students)

The core taught modules delivered in this term integrate the neurobiological, cognitive, mathematical, and computational knowledge and skills needed to theoretically investigate fundamental issues concerning brain function. The core modules include: Foundations of Neurobiology, Foundations of Theoretical Neuroscience, Functional Neuroanatomy, Neural Computation, Research Skills

TERM 2 (12 WEEKS MSc students)

The taught modules delivered in this term provide in-depth knowledge in specific areas of brain function, in particular in vision, audition, sensorimotor control, and cognition, and in statistical analysis methods. Core modules delivered in this semester include: The Neurobiology and Modelling of the Sensory-Motor System; Audition; Vision; Stochastic Models and Statistical Methods in Neuroscience; Computational Models of Cognitive Function; Biophysical Models of Neural Dynamics and Cognition

TERM 3 (18 WEEKS for MSc, Term 2-3 30 weeks for MRes students)

In this period students work individually with one or more research advisors to carry out a research project for their dissertation in their chosen research area. The research project is normally carried out in one of the Centre's research groups and closely related to the group's research programme.

FOR FURTHER INFORMATION CONTACT:

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Separate brochures describing undergraduate and postgraduate courses at the Faculty of Science are available. To request these, call +44 (0) 1752 233093 All applications are subject to status. We reserve the right to make variation to or to discontinue any course at any time. You may be expected to make a financial contribution towards the cost of field visits or course activities (particularly diving). University of Plymouth, Drake Circus, Plymouth, PL4 8AA Fax: 01752 233095

