

# COMPUTER SCIENCE

Computer Science affects every aspect of our lives, placing increasing demands on education, business, and industry to ensure that the workforce of the future is equipped with the skills necessary to thrive in the Digital Age. Computer Science at Swansea is at the heart of the technological innovation that is redefining the way we live, learn, and work.

The Department welcomes proposals for postgraduate research projects that complement its research interests – please see [www.swansea.ac.uk/compsci/research/index.html](http://www.swansea.ac.uk/compsci/research/index.html) for further information.

A research degree in Computer Science will:

- provide you with new and specialised research skills
- prepare you for a career in academic research and teaching
- equip you with skills relevant for a rewarding career in a range of diverse fields, including software development and Internet systems.

## Research Strengths

The Department's research interests are based on algorithms, programs and systems, rather than on the construction of hardware, so a sound background in programming and/or mathematics is a prerequisite for most projects.

There are currently three broad areas of research:

## Algebraic and Logical Methods for the Design of Software and Hardware

Research focuses on the mathematical analysis of fundamental problems concerned with algorithms, programs and programming languages, and machines. The group is at the forefront of research in the following areas:

- computations on topological data types such as the real numbers and on infinite data streams
- higher-order and component-based methods for programming language semantics
- type theory and its applications in programming technologies
- descriptive complexity theory and algorithmic model theory
- operational semantics that give meaning to concurrent systems, and the use of game theory, particularly the study of winning strategies, in understanding verification problems
- the satisfiability problem and the application of linear programming to this problem
- general algebraic methods for modelling microprocessors
- algebraic theory of synchronous concurrent algorithms (SCAs), and application of SCAs to the specification of scientific simulation in areas such as physiology
- infinite-state automata theory, particularly structural technologies for analysing large general computing systems.

## Computer Graphics and Visualisation

The group has a leading position in the new field of volume graphics and contributes to the development and application of multimedia communications. The group has made significant contributions in the following areas:

- constructive volume geometry as an algebraic framework for volume graphics, and software tools for modelling and rendering complex multi-volume scenes
- distance field and its use in voxelisation of complex objects, and efficient algorithms for computing distance fields, and hypertextures
- algorithms for deformation and animation
- efficient direct volume rendering techniques
- non-photorealistic rendering techniques
- software tools for rapid implementation of software systems involving remote collaboration and multimedia communication

- scalable virtual environments and knowledge-based user interfaces
- industrial applications in the management of commercial software development and maintenance using Internet/intranet-based multimedia communications
- 3D volumetric display technology.

## Future Interaction Technologies

Future Interaction Technologies (FIT) refers, broadly, to complex devices that have immediate impact on our lives, for better or worse – whether in our homes, cars, mobile phones or medical devices, etc. The research of the FIT Lab focuses on evaluating and changing design through better human-orientated tools, technology, models and methods.

Its aim is to improve quality of life by addressing key technological challenges that are relevant to the whole of society. Interests include research focused on the digital divide, mobile information seeking, education and patient care.

## Facilities

- Computing facilities are based on a fibre optic backbone and 1G switched fast Ethernet LANs
- Postgraduate laboratories are equipped with modern workstations running Linux, Windows XP/Vista, Solaris and Mac OS X
- Workstations are served by a high-performance computing infrastructure comprising a 168-processor cluster architecture, an eight-processor computation engine, and several terabyte servers
- PhD and MPhil students are allocated a desk and their own computing facilities in the research laboratory
- The Department is an institutional member of the Association for Computing Machinery and the British Computer Society.

## Research opportunities

MPhil/PhD

RAE2008 70% of research rated world-leading (4\*) or internationally excellent (3\*)

## Professors

M Chen  
M Jones  
P D Mosses  
H W Thimbleby  
J V Tucker

Academic and research staff 30

Postgraduates 70

## Entry requirements

PhD, MPhil, MRES: normally a 2.1 Honours degree in Computer Science, Mathematics, or a closely related discipline.

## English Language requirement:

IELTS 6.5 or Swansea University recognised equivalent.

## Scholarships and Bursaries

A range of postgraduate scholarships and bursaries is available. For details, please visit [www.swansea.ac.uk/scholarships/Postgraduate](http://www.swansea.ac.uk/scholarships/Postgraduate).

Each year, the Department is able to offer a number of EPSRC studentships to research students. Research work is currently supported by a range of grants from funding councils, the EU, and industry. In some cases, these provide research studentships.

## Further information

Website: [www.swansea.ac.uk/compsci](http://www.swansea.ac.uk/compsci)

## Contact the Admissions Tutor:

Email: [o.kullmann@swansea.ac.uk](mailto:o.kullmann@swansea.ac.uk)  
Tel: +44 (0)1792 513369

Visit the University: see page 176 for details

Applications can be made online at [www.swansea.ac.uk/applyonline](http://www.swansea.ac.uk/applyonline) – see pages 178 – 179 for further information

For details of the taught Master's courses available in Computer Science, please see page 84