



Work in the Computer Vision and Pattern Recognition research group looks at building 3D structures from 2D images

Our research

The Department of Computer Science at York is one of the leading research centres in Computer Science in the UK. We carry out fundamental research which is setting the agenda in the discipline; we also work extensively with industry, translating research results into usable solutions.

We have a major role in several important national and international research programmes and initiatives, and we collaborate both with academic institutions and industry. Members of the Department also work in interdisciplinary groups within the University, including the York Centre for Complex Systems Analysis (YCCSA).

Our research activity centres on our nine major research groups, and each group has dedicated laboratory space within Computer Science. You can find out more about all the groups at www.cs.york.ac.uk/research/research-groups

Advanced Computer Architectures

The Advanced Computer Architectures group develops novel computer architectures, producing specialised solutions for solving complex, data-intensive problems. Inspired by neuro-science and how humans process information, the results include 3D facial recognition systems, and analysis of engineering data to predict (and hence potentially avoid) failures of critical systems,

for example, aero engines, road networks, power systems and trains.

Artificial Intelligence

The Artificial Intelligence group studies a range of technologies including constraint solving and machine learning, with wide-ranging applications, from games to natural language processing. Uses of natural language processing include automated question answering systems, and support for avatars – which have the potential to improve human-machine interaction in some applications. In games, some of the most exciting innovations are in emergent dramas, which substantially reduce the need for pre-planned interactions; this has the potential to dramatically improve the gaming experience, and could provide uses in education and therapy, as well as classical games.

Computer Vision and Pattern Recognition

The Computer Vision and Pattern Recognition group blends skills in mathematics, computation and physics to provide novel solutions to complex problems in image



Our researchers are working on pioneering swarm robotics which could one day explore distant worlds

analysis. Applications include chemical structure matching, image retrieval from large image databases and brain image analysis, for example processing data from CAT scanners. Some of the more exciting current research directions include developing methods for building 3D structures from 2D images, which gives the potential for far superior facial recognition than classical 2D approaches.

Enterprise Systems

Enterprise Systems studies the challenges of developing and sustaining complex, business critical software systems, extending across and between organisations, on which modern society depends. The group addresses problems such as the scalability of development, and issues of security, reliability and energy consumption. Approaches

pioneered by the group include model-based development, and transformational techniques for developing and evolving software systems. Work is also underway on test automation, including using the Cloud to improve the speed and effectiveness of testing. The group delivers and develops technology that is used throughout the world in industry, product development and research.



“Working with intelligent and motivated people is probably the most rewarding aspect of my job. I have stimulating and challenging discussions with my colleagues and students on a daily basis! York is a world-leader in embedded and real-time systems, having developed some of the foundations of this area. My goal is to strengthen that position by contributing to the most recent challenges in that area through my own research and that of my students.”

Leandro Soares Indrusiak
Lecturer in Real-Time Embedded Systems

“I did my MSc in Human-Centred Interactive Technologies at York, and I built up a good working relationship with the academics in this research area. The sub-set of human-computer interaction that I wanted to pursue for my PhD is a new, innovative area. The academics at York really supported me, helping to formulate my proposal and source funding. The opportunity to work with internationally renowned academics was also a key factor in staying at York. Being constantly surrounded by bright but approachable people from a variety of fields means that I’m constantly learning about wider Computer Science topics, and not just limiting my knowledge to my specific area.”



Anna

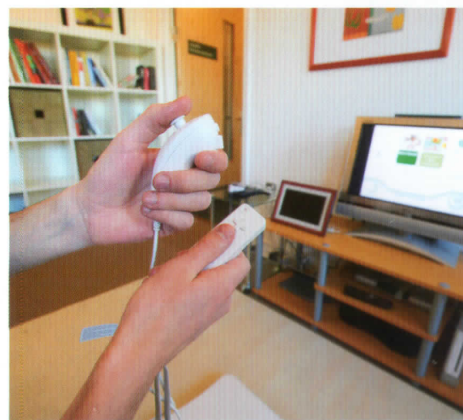
PhD in Computer Science
Use of music in human-computer interfaces

High Integrity Systems Engineering

The High Integrity Systems Engineering group has pioneered techniques for developing and assessing safety-critical software, and for producing safety cases, which are increasingly widely used in industry. The Circus method developed by the group provides an effective means of analysing both concurrent and sequential behaviour; this allows it to be used on quite challenging problems, for example, verifying the operating system for the Chinese moon lander. The Goal Structuring Notation (GSN) method developed by the group is probably the most widely adopted method worldwide for the presentation of safety cases.

Human-Computer Interaction

The aim of the Human-Computer Interaction group is to improve the quality and experience of interaction between humans and computers. The group is well-known for its work on evaluation of usability and accessibility – often applied to web design,



but also to a wide range of interactive systems. A particular emphasis is on novel forms of communication, particularly for older or disabled users; for example, the group supports the Department’s interactive Home Laboratory, which houses computer-based technologies to help disadvantaged users remain independent.

Non-Standard Computation

The Non-Standard Computation group studies a wide variety of forms of non-standard, non-classical models of computation. For example, artificial immune systems have been shown to be highly resilient, and have found applications in security mechanisms for financial applications. Quantum cryptography has the potential to profoundly change computing systems, giving the possibility of absolutely secure communications. One current area of work is extending quantum cryptography to work more effectively in networks, and thus greatly expand its applicability. As part of YCCSA, the group works with engineers and biologists on complex emergent systems and novel bio-inspired computational paradigms.

Programming Languages and Systems

The Programming Languages and Systems research group aims to advance programming languages, methods and tools, with a special interest in radical alternatives to conventional languages. Areas of interest include functional programming and co-ordination languages, which have the potential to provide a systematic means of developing applications for the Cloud. NASA



and the US National Institute of Aerospace are two examples of organisations which have benefited from the group’s work on the exploration of principles of new kinds of programming languages and the practical challenges of implementing and using them effectively in the transference of new technology to engineering practice.

Real-Time Systems

The Real-Time Systems group is involved with the design of systems which are embedded in the fabric of our society, including washing machines, mobile phones, cars, aeroplanes and nuclear power plants. Their research focuses on fundamental problems in timing analysis, for example determining worst case execution times of software running on complex modern processors, the performance of networks, and scheduling of software to meet timing constraints. Work on network timing analysis has led to products used in millions of vehicles around the world.



Degrees by research

Our degrees by research give you the opportunity to tap into the broad range of research expertise in the Department.

MSc or PhD in Computer Science

MSc – 1 year full-time/2 years part-time

PhD – 3 years full-time/6 years part-time

When you take a degree by research in Computer Science, you will work closely

with one of our internationally respected research groups. You define your area of study, and work with one of our world-leading academics as your supervisor. A second member of staff – an assessor – provides further support. You become a member of one of our established research groups, and you will benefit from the accumulated knowledge and resources of your colleagues.

Whether your interest is in how users interact with technology or you want to work with world-leading researchers in quantum computing or artificial immune

systems, our Department is the place for you to gain a degree in research.

You become part of the Department, including having access to our excellent facilities and having your own desk and fully networked computer. You are encouraged to work in collaboration with others and to present your ideas at some of the many informal research seminars held regularly in the Department.

You will follow a structured programme that includes a series of milestones carefully chosen to guide you, culminating in the



“As a PhD student, I’ve had a number of opportunities that come from being at York. I’ve helped to organise the York Doctoral Symposium twice – a venue for York research students to get friendly feedback and advice on their work from other research students. I have also been fortunate enough to attend a number of international conferences and showcase my work to the research community. The work environment here is fantastic; colleagues and supervisors are also friends, and, if you need it, support can be found wherever you look.”

James

PhD in Computer Science
Software engineering for large-scale complex IT systems

submission of a successful thesis. In the first year, research skills seminars are provided, and relevant advanced taught modules may be attended if necessary. You are expected to give a literature review seminar in your field after three months.

MSc

The MSc is awarded following the successful completion of a period of research over one year full-time or two years part-time. You will submit your thesis, which is expected to display a particular knowledge of some aspect of your chosen field of study, and to make a contribution to knowledge or understanding.

PhD

A PhD is awarded following the successful completion of a period of research over three years full-time or six years part-time. Your thesis must contain an original element that makes a publishable contribution to knowledge or understanding in your chosen field of research.

Entry requirements

You should normally have (or expect to receive) at least an upper second class honours degree (or international equivalent). You are not required to have a Masters level degree for direct entry to the PhD programme.

Studentships

We have a number of studentships available every year to students wishing to undertake a PhD. Further details can be found at www.cs.york.ac.uk/postgraduate



Engineering Doctorate in Large Scale Complex IT Systems

This is a unique opportunity to become part of a new generation of specialised engineers and scientists dedicated to meeting the challenges inherent in dealing with current and future large scale complex IT systems (LSCITS) and systems-of-systems. The on-going growth in the size and complexity of IT systems means that these skills will continue to be in demand.

The Engineering Doctorate is a full-time, four-year doctoral level research degree with both a research and a taught component. You will gain a detailed understanding of technology innovation, development and deployment in applied industrial and business contexts. This will enable you to understand how to analyse, design, deploy and manage LSCITS, so you can take up a senior role in industry and commerce, or go into academic research in this area.

Working with a sponsoring organisation or your current employer, you will conduct independent research based on a project identified by the organisation, leading to the submission of a doctoral thesis. Skills training is also embedded throughout the programme so you can work effectively in an industrial environment.

Entry requirements

The Engineering Doctorate is suitable for recent graduates in Computer Science or a related discipline, and has been designed

to be of particular benefit to those who already have relevant industrial experience and may wish to work with their current employer as their sponsoring organisation.

Studentships

This programme is sponsored by the Engineering and Physical Sciences Research Council (EPSRC), and fees for Home/EU students will be paid in full. Annual EPSRC studentships are available to eligible students, and are awarded on a competitive basis.