Computing and informatics

How to apply

Applicants should email their completed postgraduate application form to C3RI@shu.ac.uk by 12 noon on Friday 29 January 2016.

Please indicate clearly in the body of your email whether you would like to be considered for:

- Both scholarship schemes
- GTA Scholarship only
- VC Scholarship only

Applicants for a practice-led PhD in the Art & Design Research Centre should include a short CV outlining relevant projects or exhibitions undertaken over the last 5 years and any current work in progress.

Where English is not your first language, you must show evidence of English language ability to the following minimum level of proficiency: an overall IELTS score of 7.0 or above, with at least 6.5 in each component or an accepted equivalent. Please note that your test score must be current, i.e. within the last two years.

For full details on the eligibility criteria, see: www.shu.ac.uk/studentships/eligibility

Selection process

Interviews for C3RI candidates will be held on 2-4 March.

Shortlisted applicants will be required to give a 10 minute presentation (see below) followed by an interview. Interview panel members include the head of postgraduate research, a prospective director of studies and (for GTA applicants) a representative from the relevant teaching department. Applicants for a practice-led PhD will be invited to show examples of creative practice at the interview stage. Where travel to Sheffield is not possible, interviews are conducted by Skype or conference call.

The presentation should outline your PhD research proposal or a research project you have already undertaken, as targeted to a non-expert audience, as we want to see how clearly you can articulate your ideas and key concepts. You may use PowerPoint if you wish or other visual aids as appropriate, but this isn't compulsory.

Research Areas

We particularly want to encourage candidates to apply in the areas of:

- projects in data analytics, information management, policing, security and intelligence, aligned to CENTRIC
- digital inclusion
- projects related to interaction design
- projects on conceptual structures in Computing

Specific projects are also listed below. In all cases, we recommend that you contact a prospective supervisor to discuss and develop your research proposal before submitting your application form.

Project 1: Harmonising Critical Infrastructure Resilience principles through Enterprise Architecture

Drawing upon the latest academic and practitioner trends and breakthroughs in Enterprise architecture, this project will support the requirement for a paradigm shift in the area of design of safety, security and resilience for critical infrastructure protection through the study of the interconnected systems and dependencies that exist within the extend value and supply chains of critical infrastructures. Supporting Critical /infrastructure protection through harmonizing European Resilience EU policy, the study will facilitate informed decision making by risk and resilience professionals by harmonising the many different and non-aligned methods, approaches and indicators to risk and resilience.

Project lead: Prof Babak Akhgar

Project 2: Comparing and contrasting different online extremist risks to UK societal security

Modern extremist groups are increasingly using the internet as a platform for propaganda, recruitment and disinformation. Individuals within society hold unprecedented access to graphic material capable of indoctrination and desensitization. Whilst such threats are legitimate, Western-European media has focused specifically on Islamic-Jihadist internet use, particularly of the Salafi and Wahhabi variations. The study will undertake a divergent approach; researching, reviewing and comparing alternative factions behind online radicalisation and their potential disruptive impact. The study should undertake a multi-facetted approach, combining an understanding of social science, political theory and communications-technologies.

Project lead: Prof Dave Waddington

Project 3: Exploitation of social media for open-source intelligence in law enforcement contexts.

Personal posts made on social media are often available for anyone to view including by members of law enforcement agencies (LEAs). By smartly capturing, monitoring, processing and analysing this data automatically through the use of social media APIs, data mining techniques, natural language processing and visualisation, information posted on social media can be turned into open-source intelligence and used by LEAs. Working alongside LEA representatives, this research would investigate methods for exploiting social media data in a particular law enforcement context such as for situational awareness, identification of radicalisation or extremist content, or for specific areas of criminality.

Project lead: Prof Babak Akhgar

Project 4: Detection and Analysis of Terrorism Related Content on the Internet

Law Enforcement Agencies (LEAs) across Europe face challenges in how they identify, gather and interpret terrorist generated content online. The Dark Web presents additional challenges due to its inaccessibility and the fact that undetected material can contribute to the advancement of terrorist activities. This project will investigate fast and reliable planning and prevention functionalities for the early detection of terrorist organised activities, radicalisation and recruitment. Methodologies will integrate automated and semi-automated tools for searching, crawling, monitoring and gathering online terrorist-generated content from the Surface and the Dark Web; through intelligent dialogue-empowered bots; Information extraction from multimedia and multilingual content.

Project lead: Dr Simon Andrews

Project 5: Embedding technology into community policing services

While a number of both public and private services have begun to move online, much of community policing is yet to catch up with this rapid expansion and the concept of the bobby on the beat prevails. The technology employed by the police is usually limited to the maintenance of social media pages and a website without facilitating community policing itself. This research will look to develop a holistic view of

community policing and to understand where technology, such as mobile applications, web portals and social media, can be embedded into police services in order to improve community policing.

Project lead: Prof Babak Akhgar

Project 6: Computational Intelligence for Artificial Agents Cognition and Interaction

The project explores the use of Computational Intelligence techniques to simulate the human-like cognition abilities and use them to address complex real-world problems in which artificial agents should autonomously learn and interact with human beings. In particular, it investigates the novel deep learning paradigm offers a highly biologically plausible way to train neural network architectures with many layers, inspired by the hierarchical organization of the human brain. Impressive results have been obtained in several areas, where deep learning architectures have outperformed state-of-the-art algorithms on various tasks, such as computer vision, automatic speech recognition, natural language processing, and human action recognition.

Project lead: Alessandro Di Nuovo

Project 7: Rapid prototyping tools for teaching C++ game development

C++ programming skills remain essential to the process of creating AAA videogame titles for mainstream console platforms like the PlayStation 4. These skills are highly prized throughout the IT industry, but developing the competencies required to build applications using C++ is a significant learning challenge. This project proposes to produce and evaluate a rapid-prototyping tool designed to scaffold the deep-learning needed for such programming tasks. It will build on similar environments (e.g. BlueJ) by addressing their known limitations, and use the extensive experience of teaching game development within AGTRG (including on PS4 devkits) to enhance the learning experience through gamification.

Project lead: Dr Jacob Habgood

Project 8: Performance with Complex Information and Control Structures

The design of interactive systems that support live performance of is a new and exciting area of research. The aim of research in this area would be to examine the interplay between live performance and behaviours that can be prescribed and used during performance. The domains of teaching and learning, live music and live coding would provide valuable examples of the demands made upon system to enable performance.

Project lead: Chris Roast

Project 9: Mobile Social Commerce

Characteristics such as mobility, ubiquity, and context awareness keep on transforming e-commerce offerings including personalisation, location-based services, and richer user experiences. The potential of combining mobile with social features, such as recommendations, referrals, ratings and reviews, expands the potential for innovative business models while challenging the underlying technological platforms. The scope of the project and the interests of the supervisory team range from innovative business models and the impact on the organisation, to novel apps design and development, to the implications of this emerging field in terms of security, ethics, user experience, or Interaction Design.

Project lead: Dr Elizabeth Uruchurtu

Project 10: Smart Technology for Enhanced Learning

Smartphones and other devices are increasingly being adopted by employees and employers to support their professional practice. In Higher Education (HE) students are using and staff are beginning to use personal smart devices to support their academic practice crossing physical and temporal boundaries. The research project aims; to identify the extent and evaluate the potential of existing affordable mobile

computing technology and applications (BYOD research field) for HE both for students and academics; to identify best practice; application requirements and design for social and practical acceptability for supporting HE learning.

Project lead: A Nortcliffe

Project 11: Intrusion Detection System for Medical Cyber-Physical System

This project will aim to develop novel intrusion detection techniques for detecting malicious attack on vital life supporting machines and data in hospitals. Unauthorised access to these facilities would allow an attacker to tamper with critical data bases (such as medical dose) or to be able to alter the operation of medical systems, putting the patient s life at risk. Existing network security for hospital facilities is inadequate and with increasing use of wireless medical security is increasingly more important. Methods such as signature, anomaly and behaviour-based intrusion detection will be explored and further developed for both wired and wireless networks.

Project lead: B Pranggono

Project 12: Protecting Smart Grid from cyber-attacks

Smart grid (SG) is the most fundamental critical infrastructure of the modern society. Internet connected SG makes pervasive and agile monitoring, control and management of the grid possible. On the other hand, it makes SG more vulnerable to the cyber-attacks. Therefore, research on cyber-security issues in SG is extremely urgent and important. The project will aim to develop novel cyber security tools and framework for securing the future smart grid networks from cyber-attacks. It requires research into cyber-security threats and countermeasures relating to SG, SCADA and Industrial Control Systems networks (ICS). Collaboration between academic partners and industries is expected.

Project lead: B Pranggono

Project 13: The Application of Big Data in Smart Home

The project will investigate the application of big data in smart home in relation to health and social care. Smart home can enable automatic systems or caregivers to control the environment on behalf of the residents, predict their actions and track their health condition from the responses received from the sensors and actuators installed. The volumes of data generated from the sensors are highly complex and difficult to process with the traditional tools, yet big data has the potential to revolutionize delivery of services. It is expected that the data will be collected in collaboration with research collaborators.

Project lead: B Pranggono

Project 14: Smart City Architectures

Smart Cities are a powerful concept that reflects the increasing prominence of cities and broader metropolitan areas as the key driver of investment, innovation, research and public policy. For city authorities, Enterprise Architecture (EA) discovers how they can most cost-effectively deliver their citizens' needs. Furthermore, their actual realisation increasingly relies on the productivity of computers using smart technologies such as the Semantic Web. The project thus aims to derive the extent that EA and semantic technologies can be applied to cities and their services in order to create an agile platform that makes the provision of smart services a reality.

Project lead: Dr Simon Polovina

Project 15: Deep learning techniques in artificial intelligence for improved neural network based pattern recognition

For more than half a century computer scientists have attempted to create a computational model of intelligence capable of representing the world and making accurate predictions. However we are still a

long way from this - especially in domains such as image interpretation which require both pattern recognition and processing of semantic concepts. Deep-learning architectures offer a way forward by more accurately mimicking the structure of the human brain - although it is only recently that advances in training algorithms have made such approaches feasible. This project aims to build upon the current state-of-the-art in deep-learning to develop improved real-world classifiers

Project lead: A Shenfield

More information can be found on the C3RI website.

Queries

For all queries please email C3RI@shu.ac.uk