

New partnerships within academia and industry

Research that integrates theory, engineering, and applications...

The 'Center for Informatics and Information Technologies' – CITI – is a research institute partially funded by the Fundação para a Ciência e Tecnologia (FCT) and Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa (FCT-UNL). CITI hosts 30 senior researchers and 60 PhD students, and belongs to the Department of Informatics, a leading and pioneer institution in graduate level education and research in informatics at the national level.

CITI agenda is currently focused on frontier research challenges emerging for future networked software services and media, leveraging on the expertise of the three thematic areas: computer systems, software systems and multimodal systems.

Computer systems of all kinds are becoming more and more pervasive and already integrate most infrastructures in society. A wide range of information processing and communication infrastructures supported in the internet continue to emerge following fast adoption rates. Such infrastructures range from sensing systems that monitor the physical environment with tiny sensors and mobile devices to all sorts of software systems providing a multitude of services, such as content, multimedia and resource dissemination, provisioning systems, and corporate services.

Many of such infrastructures are becoming critical: how can we make sure that computer systems built within them are dependable and trustworthy? Such infrastructures currently provide huge computing power and bandwidth: how can we exploit them to provide better services, while optimising resources? Users' needs and ambitions change fast:

how can we build and adapt systems in good time, without compromising requirements? What are the appropriate ways and modes for interfacing all such systems and environments with themselves and with humans?

'In software systems we investigate novel programming languages, tools, and environments to increase the flexibility, reliability, and usability of present and future software systems and services.'

CITI research integrates theory, engineering, and applications, including tool building. We are contributing with high-quality research in our field, and leading in some topics (eg software verification tools and languages, aspect-oriented software engineering, advanced human-computer interaction, and mobile data management). New bridges from our core research fields to other scientific or societal disciplines are also being established, in collaboration with domain experts, and combining the activities and expertise of our three thematic research groups: computing systems, software systems and multimodal systems.

Computer systems research

The widespread availability of high-performance computing, of low-cost parallel architectures, of high capacity file storage devices, and of clusters and grids, involving huge amounts of data, processing power, and distributed resources, is fostering

the development of applications in all areas of society. All computing devices, from servers to mobile phones and tiny sensors, are becoming interconnected in a global 'internet of things' world. In computer systems we are investigating: innovative solutions for reliably and efficiently managing data in clusters and Clouds; simplification of the development of programs in clusters; running applications with high computational requirements; and providing support for the development of reliable applications in pervasive environments.

Multimodal systems research

Multimedia computing is a key enabling technology for communicating ideas and data between humans and machines. In multimodal systems we develop new techniques for building mobile storytelling applications, for processing and accessing personal memories, for representing and observing natural phenomena, and for interacting in more natural ways with emerging devices and sensors. We are also developing efficient techniques, based on statistics and machine learning, to extract knowledge from human written text collections, so as to improve language independent parsing, translation, information retrieval tasks, and advancing the state of the art in computer-based visualisation of physical and virtual phenomena, with an emphasis on application fields such as medical imaging, cloth simulation, 3D modelling, and animation.

Software systems research

'Software is the new physical infrastructure of the information age' How can we simplify the construction of large and complex software systems, while making sure they correctly

capture the users' needs, and do not incur in erroneous or insecure behaviour? How can we structure the software production and engineering process, while taking into account the requirements of modern large-scale information systems and software services? In software systems we investigate novel programming languages, tools, and environments to increase the flexibility, reliability, and usability of present and future software systems and services. We are also proposing new approaches to promote the reusability of software, and developing novel approaches to experimental software engineering, reengineering, and visualisation.

Outreach activities

CITI has been developing outreach actions related to specific research activities, to the overall mission of the host department, and to the scientific community and public service both at the national and international level. CITI members have been involved in the organisation of media presentations of research projects, namely those related to international research partnerships. Frequently, CITI prototypes and solutions have been demonstrated or installed in public events; a recent case is the installation of an innovative multimedia module for the exhibition 'Sem Rede' by internationally acclaimed artist Joana Vasconcelos at Museu Coleção Berardo.

CITI researchers are serving in steering committees of national innovation networks on 'Security and Critical Infrastructure Protection', 'Services and Technologies for Interactive Media', and 'Software Engineering', in close cooperation with many other Portuguese universities and industrial partners. CITI has organised and co-organised several initiatives to promote science and technology among the general public and in secondary schools, such as 'Ciência Viva'.

Among these are the open days of FCT where CITI researchers usually present their work and ongoing projects to an audience of hundreds of secondary school students, which involved the participation of many CITI researchers and their graduate students. CITI has a key role in several educational programmes at FCT-UNL, namely the BSc in Computer Science, MSc in Computer Science, PhD in Computer Science, Carnegie-Mellon | Portugal Dual Degree PhD in Computer Science, and PhD in Digital Media.

Research highlights

The CITI team increased its overall productivity and impact in recent years. More than 470 research papers were published in archiving journals, competitive international peer reviewed conferences and book chapters, from a total of around 600 publications since 2005. Publications with foreign researchers have reached 30%.

40 PhD thesis and 190 MSc theses were supervised at CITI since 2005, while 60 PhD theses are currently in the pipeline. We are developing an active pole of the Carnegie-Mellon Portugal PhD Degree in Computer Science, with several students being co-supervised by CITI researchers. We are also a key participant in the local Undergraduate Research Opportunities Program, with about 50 fellowships granted in the last couple of years.

CITI members regularly participate in international conference programme committees, editorial boards, and are members of distinguished technical committees (IFIP TC2 WG2.2, IFIP TC14). CITI members have chaired or involved otherwise in organising first tier international conferences (UML'04, ICALP'05, Euro-Par'05, Concur'07, Mobile HCI'10, ACE'11) and are often invited to deliver research talks at international events. CITI hosts a regular seminar series, with talks by members, students and visiting researchers.

The citation trail of our publication record continues to increase. However, not just citations witness the impact and acknowledgement of CITI research. CITI researchers are involved in many national, international and EU projects, networks and bilateral actions: the majority is FCT or EU funded, involving ICT firms such as OutSystems SA, EVOLVE, SINFIC, Duvideo, Zon Multimedia, and RTP, including several 100% privately funded. CITI also coordinates a CMU | Portugal lead project with Carnegie Mellon University, on security of web applications, and a UT Austin | Portugal lead project with University of Texas at Austin, on immersive television. CITI was also recently awarded a research grant from Google Inc, in collaboration with INRIA, to investigate scalability in cloud applications. CITI participation in – the recently concluded – EU FP6 and FP7 projects has also been recognisably influential. Both SENSORIA and AMPLE were extremely well graded in their final reviews, with AMPLE results featured in ACM Technews. We continuously seek to expand our collaborative network, and look forward to establishing new partnerships within academia and industry.



Luis Caires
Chair

Nuno Correia
Vice-Director

Nuno Preguiça
Vice-Director

CITI – Center for Informatics and
Information Technologies
Departamento de Informática
Faculdade de Ciências e Tecnologia
Universidade Nova de Lisboa
Quinta da Torre
2829-516 Caparica
Portugal

Tel: +351 212948536

citi-admin@di.fct.unl.pt
<http://citi.di.fct.unl.pt/>