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University of
Kent

Kent Interdisciplinary
Research Centre
in Cyber Security
(KirCCS)

KirCCS

*Kent Interdisciplinary
Research
Centre in Cyber Security*





INTRODUCTION

The Kent Interdisciplinary Research Centre in Cyber Security (KirCCS) at the University of Kent harnesses expertise across the University to address current and future research challenges in cyber security.

KirCCS represents the University of Kent as a UK government recognised **ACE-CSR (Academic Centre of Excellence in Cyber Security Research)**, one of only 19 such centres in the whole UK. The current recognition started from 2018 and will last until 2022. The Centre was also recognised as an ACE-CSR in the past from 2015 to 2017, one of only 13 such centres.

The Centre's strategic objectives include to promote wide-ranging interdisciplinary research and to develop skills of students and the wider community in cyber security, through its research activities, degree programmes, external-facing events, visits to external organisations, public talks, and professional training.

Included in its remit is to work with external organisations including industry, government and NGOs to help produce and promote good products, systems, policies, practices and behaviours in cyber security.

KirCCS also works closely with international researchers, practitioners, policy makers and organisations, helping increase the international visibility and influence of UK researchers in cyber security.

KirCCS will be a core part of the larger and more interdisciplinary Institute of Advanced Studies in Cyber Security and Conflict, to be launched in 2020.

More about KirCCS can be found at:
<https://cyber.kent.ac.uk>

PEOPLE

The Centre currently has 16 Core Members from the **School of Computing** and the **School of Engineering and Digital Arts**, 42 Associate Members from **13 different schools**, and a number of affiliated researchers (research associates, PhD students, and visiting researchers).

Core Members



Budi Arief

Director of External Liaison, KirCCS
Senior Lecturer and
Director of Innovation,
School of Computing



Theodosios Dimitrakos

Chair of Advisory Board, KirCCS
Professor of Computer
Science, School of
Computing



Sanjay Bhattacharjee

Lecturer, School of
Computing



Virginia Franqueira

Lecturer, School of
Computing



David Chadwick

Professor of Information
Systems Security, School
of Computing



Richard Guest

Reader in Biometric
Systems Engineering and
Deputy Head of School,
School of Engineering
and Digital Arts



Farzin Deravi

Professor of Information
Engineering and Head of
School, School of
Engineering and Digital
Arts



Julio Hernandez-Castro

Deputy Director, KirCCS
Professor of Computer
Security, School of
Computing



Sanaul Hoque

Lecturer in Secure Systems Engineering, School of Engineering and Digital Arts



Rogério de Lemos

Senior Lecturer, School of Computing



Gareth Howells

Deputy Director, KirCCS
Professor of Secure Electronic Systems, School of Engineering and Digital Arts



Shujun Li

Director, KirCCS
Professor of Cyber Security, School of Computing



Özgür Kafalı

Lecturer in Cyber Security, School of Computing



Jason Nurse

Lecturer, School of Computing



Andy King

Director of Research, KirCCS
Professor in Program Analysis, School of Computing



Carlos Pérez-Delgado

Lecturer, School of Computing

PEOPLE (CONT)

Associate Members

Pervaiz Akhtar

Professor of Management Systems,
Kent Business School

Chee Siang (Jim) Ang

Senior Lecturer in Multimedia/Digital
Systems, School of Engineering and
Digital Arts

Samer Bagaean

Professor of Planning, Kent School
of Architecture

John Batchelor

Professor of Antenna Technology,
School of Engineering and Digital
Arts

David Barnes

Senior Lecturer, School of
Computing

Mark Batty

Lloyds Register Foundation and
Royal Academy of Engineering
Research Fellow and Senior
Lecturer, School of Computing

Laura Bocchi

Senior Lecturer, School of
Computing

Howard Bowman

Professor of Cognition and Logic,
School of Computing

Adam Burgess

Director of Critical Studies in Risk
and Uncertainty research cluster
and Professor of Risk Research,
School of Social Policy, Sociology
and Social Research

Jack Cunliffe

Lecturer in Quantitative Methods
and Criminology, School of Social
Policy, Sociology and Social
Research

Lisa Dickson

Reader and Co-Deputy Head of
School, Kent Law School

Karen Douglas

Professor of Social Psychology,
School of Psychology

Christos Efstratiou

Senior Lecturer in Ubiquitous
Computing, School of Engineering
and Digital Arts

Alex Freitas

Professor of Computational
Intelligence and Head of
Computational Intelligence research
group, School of Computing

Steven Gao

Professor of RF/Microwave
Engineering and Director of
Graduate Studies (Research),
School of Engineering and
Digital Arts

Stuart Gibson

Senior Lecturer in Forensic Science,
School of Physical Sciences

Radu Grigore

Senior Lecturer, School of Computing

Tim Hopthrow

Reader in Psychology, School
of Psychology
Associate Dean for Research and
Innovation, Faculty of Social Sciences

Stephen Kell

Lecturer, School of Computing

Timothy King

Senior Lecturer in Finance, Banking
and Innovation, Kent Business School

Alan McKenna

Lecturer in Law, Kent Law School

Matteo Migliavacca

Senior Lecturer, School of Computing

Vince Miller

Reader in Sociology and Cultural
Studies and Deputy Head of School,
School of Social Policy, Sociology
and Social Research

PEOPLE (CONT)

Gareth Mott

Lecturer, School of Politics and International Relations

Dominic Orchard

Lecturer, School of Computing

Scott Owens

Reader, School of Computing

Thanos Papadopoulos

Professor of Management (Operations Management / Information Systems), Kent Business School

Palaniappan Ramaswamy

Reader and Head of Data Science research group, School of Computing

David Roberts

Reader in Biodiversity Conservation and Academic Head Conservation Biology, School of Anthropology and Conservation

Peter Rodgers

Professor of Visual Computing, Director of Research and Deputy Head of School, School of Computing

Jeremy Rossman

Honorary Senior Lecturer in Virology, School of Biosciences

Maria Paola Scaparra

Professor in Management Science and Head of Management Science research group, Kent Business School

Konstantinos Sirlantzis

Senior Lecturer in Intelligent Systems, School of Engineering and Digital Arts

Christopher Solomon

Reader in Physics and Head of Forensics Imaging Group, School of Physical Sciences

Simon Thompson

Professor of Logic and Computation,
School of Computing

Paraskevi Triantafyllopoulou

Lecturer in Intellectual and
Developmental Disability, School
of Social Policy, Sociology and
Social Research

Harmonie Toros

Reader in International Conflict
Analysis, School of Politics and
International Relations

Cristiano Villa

Senior Lecturer in Statistics, School
of Mathematics, Statistics and
Actuarial Science

Zaki Wahhaj

Reader in Economics, School of
Economics

Jiangzhou Wang FEng

Professor of Telecommunications,
School of Engineering and
Digital Arts

Shaomin Wu

Professor in Business/Applied
Statistics, Kent Business School

Jian Zhang

Professor of Statistics and Head
of Statistics group, School of
Mathematics, Statistics and
Actuarial Science

More information about members and affiliated researchers
of KirCCS can be found at: <https://cyber.kent.ac.uk/people.html>

RESEARCH

Research themes



Authentication and authorisation

Lead: Gareth Howells

Example topics: biometrics, passwords and new user authentication technologies, identity management, CAPTCHA, device authentication, authorisation and access control, autonomic authorisation



Communication and network security

Lead: Julio Hernandez-Castro

Example topics: IoT security, RFID security, cloud security, network security protocols, secure quantum communications, network intrusion detection, data loss prevention



Security testing and verification

Lead: Andy King

Example topics: software security analysis, malware code analysis, security metrics and automated testing, self-adaptive security in software systems, self-testing of quantum computing for next-generation quantum based security systems



Socio-technical security

Lead: Shujun Li

Example topics: usability, human behaviour, human profiling and modelling, cybercrime, privacy online social networks, risk management (eg, cyber insurance), insider threats, trust and reputation, socio-technical aspects of selected topics (eg, malware, blockchains and cryptocurrencies)

CROSS-CUTTING RESEARCH TOPICS

The Centre also has capabilities in some other important cyber security areas beyond and cross-cutting the four main research themes. Four such cross-cutting topics are:



Applications of AI related technologies in cyber security

Example AI technologies used: machine learning, data mining, data analytics, discrete optimisation, information visualisation



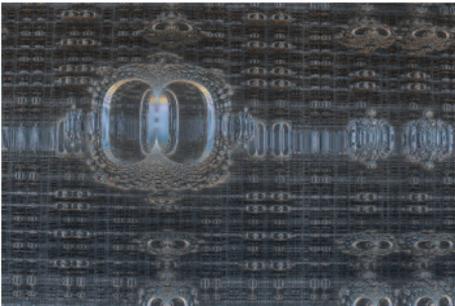
Digital forensics and cybercrime

Example sub-topics: computer forensics, network forensics, multimedia forensics, cybercrime prevention, cyber threat intelligence



Information hiding

Example sub-topics:
steganography, steganalysis,
behaviour based information
hiding, digital watermarking, joint
watermarking and encryption



Quantum cyber security

Quantum-resistant cyber security
systems using quantum
mechanics (beyond the existing
quantum based key
exchange/distribution systems)

For more information about our research, please check individual members' research profiles at: <https://cyber.kent.ac.uk/people.html>

TIMELINE

- 2012** Interdisciplinary Research Centre in Cyber Security was established, with over 20 members from seven schools.
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- 2015-2017** The University of Kent was recognised as an Academic Centre of Excellence in Cyber Security Research (ACE-CSR) by GCHQ and EPSRC.
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- 2017** The Centre supported the School of Computing's MSc programme in Cyber Security to be provisionally certified by NCSC, part of GCHQ.
- Cyber Security was recognised as a university wide area of research excellence (one out of only two).
- The Centre's name was changed to Kent Interdisciplinary Research Centre in Cyber Security (KirCCS).
- Shujun Li joined as the new Director.
- The membership structure changed to accommodate more people who are interested in Cyber Security research.
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- 2018** The University of Kent was re-recognised as an ACE-CSR (2018-2022) by NCSC and EPSRC.
- The Centre's Advisory Board was established.
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- 2019** KirCCS hosted a number of events in July-September: Summer School on The Human Aspects of Cyber-crime and Online Fraud, Network Defenders' 'Hacking' competition, PriCom 2019 (5th International Symposium on Privacy Computing), ARES 2019 (14th International Conference on Availability, Reliability and Security), and Kent Cyber Security Forum (KCSF) 2019

SELECTED RESEARCH PROJECTS

Since its establishment in 2012, the Centre has secured over £7m research funding from different external sources. Some selected research projects are:

- Kent as lead, a number of PhD studentships funded by NCSC/GCHQ, Dstl, and industry
- Kent as partner, **A Platform for Responsive Conversational Agents to Enhance Engagement and Disclosure (PRoCEED)**, funded by EPSRC, competitive grant, value to Kent £163,555, 2019-2021
- Kent as lead, **Robust Video Watermarking**, funded by Huawei Technologies, value to Kent £230,000, 2019-2020
- Kent as lead, **PriVELT: PRIVacy-aware personal data management and Value Enhancement for Leisure Travellers**, funded by EPSRC, competitive grant, value to Kent £429,069, 2018-2021
- Kent as lead, **ACCEPT: Addressing Cybersecurity and Cybercrime via a co-Evolutionary aPproach to reducing human-relaTed risks**, funded by EPSRC, competitive grant, value to Kent £162,044.34, 2017-2019
- Kent as co-lead, **EMPHASIS: Economic, Psychological, and Social Aspects of Ransomware**, funded by EPSRC, competitive grant, value to Kent £344,547, 2017-2019
- Kent as partner, **INCASE: Industry 4.0 via Networked Control Applications and Sustainable Engineering**, funded by Interreg IV 2 Seas Programme (North), competitive grant, value to Kent £561,824, 2016-2019
- Kent as partner, **C3ISP: Collaborative and Confidential Information Sharing and Analysis for Cyber Protection**, funded by European Commission (H2020), competitive grant, value to Kent £448,300, 2016-2019
- Kent as partner, **SPIRIT: Security and Privacy for the Internet of Things**, funded by EPSRC (CHIST-ERA), competitive grant, value to Kent £174,413, 2016-2019
- Kent as lead, **AMBER: Enhanced Mobile Biometrics MCSA ITN**, funded by European Commission (H2020), competitive grant, value to Kent £585,783, 2016-2020

CONTINUED OVERLEAF

SELECTED RESEARCH PROJECTS (CONT)

- Kent as partner, **RAMSES: Malware analysis for digital forensics**, funded by European Commission (H2020), competitive grant, value to Kent £305,815, 2016-2019
- Kent as lead, **SEEK (Steganalytic vidEo-rEsearch framework)**, funded by EPSRC, competitive grant, value to Kent £273,996, 2016-2019
- Kent as partner, **NeCS (European Network for Cybersecurity) MCSA ITN**, funded by European Commission (FP7), competitive grant, value to Kent £388,645, 2015-2019
- Kent as lead, **Vulnerability discovery using abduction and interpolation**, Singapore-UK joint research project, UK part funded by EPSRC, competitive grant, value to Kent £199,130, 2016-2019
- Kent as lead, **Improving cyber security using realistic synthetic face generation**, Israel-UK Cyber Research project, UK part funded by EPSRC, competitive grant, value to Kent £155,087, 2015-2017
- Kent as lead, **Horizontal cloud security and network capabilities for accredited cloud application and data**, funded by BT, value to Kent £170,000, 2015-2017
- Kent as partner, **Authenticated Self – The ‘aS’ Platform**, funded by Innovate UK, competitive grant, value to Kent £115,957, 2015-2016
- Kent as partner, **PIDaaS: Private Identity as a service**, funded by European Commission (FP7), competitive grant, value to Kent £145,103, 2014-2017
- Kent as lead, **Se-Ma-Match: semantic malware matching**, funded by EPSRC, competitive grant, value to Kent £245,526, 2013-2016
- Kent as lead, **Compositional security analysis for binaries**, funded by EPSRC and GCHQ, competitive grant, value to Kent £261,718, 2013-2016

More research projects of the Centre can be found at:
<https://cyber.kent.ac.uk/projects.html>

COLLABORATIONS

The Centre has been working with many external organisations and researchers in the UK and from all over the world. Some examples of such collaborations are given below.

UK research community

- Other ACEs-CSR
- 4 NCSC (co-)funded UK Research Institutes in Cyber Security
 - RISCS (Science of Cyber Security)
 - VeTSS (Automated Program Analysis and Verification)
 - RITICS (Trustworthy Industrial Control Systems)
 - RISE (Secure Hardware and Embedded Systems)
- Wider cyber research groups in UK universities

International research community

- **Europe:** France, Germany, The Netherlands, Spain, Italy, Austria, Poland, Norway, Portugal, Belgium, Hungary, Croatia, Lithuania, ...
- **Asia:** China, Singapore, Japan, Malaysia, Saudi Arabia, Israel, ...
- **Oceania:** Australia
- **Americas:** United States, Canada, Brazil, ...

Industry

- **CyberInvest companies:** BT, IBM UK, Thales UK, NCC Group, Corporate Risk Associates Limited (CRA), Crossword Cybersecurity plc, ...
- **Other companies:** Huawei Technologies, SecureData, NHS, Lloyds Banking Groups, TRL Ltd, ...

COLLABORATIONS (CONT)

- Innovate UK **KTP (Knowledge Transfer Partnership)** programme
 - Three-way partnership: A company + A university (at least two academics) + An associate (a person employed by the university but fully embedded at the company)
 - Solving real-world problems of the company + Giving academics access to real-world problems + Developing the associate as a professional
- Industry funded PhD studentships
- Industry funded research projects
- Secondments and internships in industry

Governmental bodies

- National Cyber Security Centre (NCSC)
- Defence Science and Technology Laboratory (Dstl)
- Department for Digital, Culture, Media and Sport (DCMS)
- Law enforcement agencies
 - Home Office
 - Local police forces
 - Europol

If you are interested in discussing collaborations with us, please find how to contact us at: <https://cyber.kent.ac.uk/contact.html>

INNOVATION AND WIDER IMPACT

The Centre has been conducting innovation and wider impact generation activities as well. Some examples of our activities in innovation and impact are given below.

Technology Transfer

- Patenting
- Spin-offs
- Collaboration with industrial partners
- Working with tech transfer companies
- Special tech transfer programmes such as DCMS and Innovate UK jointly funded CyberASAP programme

Wider Impact

- Annual Public Engagement Events (eg, Kent Cyber Security Forum 2019)
- Expert comments on public media
- Cyber security awareness activities
- Education and professional training
- Industrial consultancies

We work closely with **Kent Innovation and Enterprise (KIE)**, a dedicated department of the University supporting innovation activities and collaborations with industry.

If you are interested in commercialising or helping us increase the wider impact of our research work, please find how to contact us at: <https://cyber.kent.ac.uk/contact.html>

FURTHER INFORMATION

<https://cyber.kent.ac.uk>

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Kent, CT2 7NF, United Kingdom