

The Computer Laboratory: an Introduction

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This document gives a brief introduction to the people and activities that make the University of Cambridge Computer Laboratory an internationally leading player in Computer Science.

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Introduction

Cambridge has been an internationally respected centre of learning since the 13th century. In the 20th century Cambridge was the origin of fundamental advances in nuclear physics, molecular biology and computer science. Over three hundred companies and commercial laboratories specialising in computing and advanced technology are concentrated in the area.

The Computer Laboratory was founded in 1937, as the Mathematical Laboratory, for work on mechanical calculators and analogue computers. It became involved in digital computing after 1945 under the direction of Professor Sir Maurice Wilkes FRS. Some of the Cambridge developments of that period belong in the basic stock of computing knowledge, for example the ideas of subroutines and of microprogramming.

In those early days the study of computing as an academic subject and the provision of computing facilities to the University as a whole were intimately bound together. The research undertaken involved either the production of workable computer systems, both hardware and software, or the development of new computer application techniques. Original pioneering work in building complete computers (the EDSAC was commissioned in 1949 and the EDSAC 2 in 1958) gave way to the early development of programming languages and operating systems. The latter included the first British time-sharing operating system on the Titan computer.

The Computer Laboratory continues to be at the forefront of Computer Science research. The grade point average for the Computer Laboratory's submission to the 2008 Research Assessment Exercise was the highest of all submissions to Computer Science and Informatics. Moreover, along with the Department of Engineering and the Department of Material Science & Metallurgy, it attained the highest grade point average among departments in Cambridge.

Current research areas include artificial intelligence; computer architecture; digital technology; graphics and human-computer interaction; natural language and information processing; programming, logic, and semantics; computer and communications security; systems.

The Cambridge Diploma in Computer Science, which ran from 1953 to 2008, was the world's first taught course in computing; undergraduate teaching was introduced in 1970. A specialist MPhil in Speech and Language Processing (later MPhil in Computer Speech, Text and Internet Technology) ran from 1986 to 2010, taught jointly with the Engineering Department. An MPhil in Advanced Computer Science was introduced in 2009. At present there are about 200 undergraduate students and 50 MPhil students. A further 154 postgraduates are engaged in research for the PhD degree.

The Laboratory received an *Excellent* rating in the most recent Teaching Quality Assessment.

The Head of Department is Professor Andy Hopper FRS.

The Computer Laboratory's web pages are at <http://www.cl.cam.ac.uk/>

Research Groups

Members of the Computer Laboratory undertake research in a wide variety of areas and the Department has a reputation as an international centre of excellence. Current, although by no means static, research groups are listed here, together with the relevant URL for detailed information about each group.

Artificial Intelligence Group

Theory and applications of intelligent systems.

Professor John Daugman, Dr Sean Holden, Dr Mateja Jamnik, Dr Pietro Liò

<http://www.cl.cam.ac.uk/research/ai/>

Computer Architecture Group

Microarchitecture, VLSI techniques and design, electronic CAD, secure hardware.

Dr David Greaves, Dr Andrew Moore, Dr Simon Moore, Dr Robert Mullins,
Professor Alan Mycroft

<http://www.cl.cam.ac.uk/research/comparch/>

Digital Technology Group

All aspects of technology in particular for pervasive, sentient and mobile computing and communication systems.

Dr Alastair Beresford, Dr Robert Harle, Professor Andy Hopper, Dr Andy Rice,
Dr Frank Stajano, Dr Ian Wassell

<http://www.cl.cam.ac.uk/research/dtg/>

Graphics and Interaction Group (Rainbow)

Computer graphics, human-computer interaction, affective computing, interdisciplinary design, image processing, display technology.

Dr Alan Blackwell, Professor Neil Dodgson, Professor Peter Robinson

<http://www.cl.cam.ac.uk/research/rainbow/>

Natural Language and Information Processing Group

Computational modelling of natural (human) languages and related applications.

Professor Ted Briscoe, Dr Stephen Clark, Professor Ann Copestake, Dr Simone Teufel

<http://www.cl.cam.ac.uk/research/nl/>

Programming, Logic, and Semantics Group

Programming languages, compilers, and analysis; development and application of automated reasoning tools; mathematical models of hardware, software, and networks; finite model theory.

Professor Anuj Dawar, Professor Marcelo Fiore, Professor Mike Gordon,
Dr Timothy Griffin, Dr Mateja Jamnik, Professor Alan Mycroft,
Professor Larry Paulson, Professor Andrew Pitts, Dr Martin Richards, Dr Peter Sewell,
Dr Sam Staton, Professor Glynn Winskel

<http://www.cl.cam.ac.uk/research/pls/>

Security Group

Security, cryptology, and their applications.

Professor Ross Anderson, Dr Alan Blackwell, Professor John Daugman,
Dr Markus Kuhn, Dr Simon Moore, Professor Larry Paulson, Dr Frank Stajano

<http://www.cl.cam.ac.uk/research/security/>

Systems Research Group

Networks, operating systems, multimedia, mobile and sensor systems, distributed systems. The Systems Research Group has two subgroups:
Networks & operating systems, and Opera.

Professor Jean Bacon, Professor Jon Crowcroft, Dr Richard Gibbens,
Dr David Greaves, Dr Timothy Griffin, Dr Steven Hand, Professor Ian Leslie,
Dr Cecilia Mascolo, Dr Ken Moody, Dr Andrew Moore

<http://www.cl.cam.ac.uk/research/srg/>

University Teaching Officers

Ross Anderson

Ross Anderson is Professor of Security Engineering. His research interests include security engineering, cryptographic protocols, hardware tamper-resistance, the analysis and design of ciphers and the economics of security. He has MA and PhD degrees from the University, the latter being on the robustness of computer security systems.

Professor Anderson is one of the founders of the discipline of security economics; many systems fail not for purely technical reasons, but because of misaligned incentives. For example, the people guarding a system may not be the people who bear the costs of failure. He is one of originators of the current peer-to-peer movement; a paper he wrote in 1996 on the “Eternity Service” inspired later systems such as gnutella and freenet. He and his students also invented attacks on most of the available cryptographic processors, and on most of the existing schemes for embedding copyright marks in digital media. He has documented security failures in a number of important distributed systems including automatic teller machines, prepayment electricity meters and medical record systems. He is also the joint inventor, with Dr Simon Moore, of techniques to build integrated circuits with the properties that a single transistor failure will not give rise to incorrect outputs, and that the power consumption is independent of the data being processed.

Professor Anderson is the author of the standard textbook *Security Engineering* and teaches three undergraduate courses: Software Engineering (Part IB), Economics and Law (Part IB) and Security (Part II). He is also joint organiser of the second-year undergraduate group projects.

He is a Fellow of the Royal Society, the Royal Academy of Engineering, the IET and of the IMA, and a Chartered Engineer.

Personal web page:

<http://www.cl.cam.ac.uk/~rja14/>

Research group:

<http://www.cl.cam.ac.uk/research/security/>

Alastair Beresford

Alastair Beresford is a University Lecturer working in the Digital Technology Group. He is also a Fellow and Director of Studies in Computer Science at Robinson College.

Dr Beresford’s research concerns the security and privacy issues found in mobile devices and their associated software platforms, with a particular emphasis on designing, building and evaluating solutions which address the privacy problems found in such systems.

Dr Beresford teaches the first-year undergraduate course, Programming in Java, and the second-year undergraduate course, Further Java.

Personal web page:

<http://www.cl.cam.ac.uk/~arb33/>

Research group:

<http://www.cl.cam.ac.uk/research/dtg/>

Alan Blackwell

Alan Blackwell is Reader in Interdisciplinary Design. His main interests are in human–computer interaction and design. He has worked as a commercial software engineer for 12 years, has a Master’s degree in artificial intelligence – although his PhD, gained in Cambridge, was in Psychology. His research employs both cognitive science and experimental psychology methods as well as ethnographic observation, interviews, and exploratory implementation of interactive prototypes.

He collaborates a great deal with researchers in other Cambridge departments. He works particularly in art–science collaboration, in the design of new notations such as visual programming languages, and in “tangible” user interfaces based on augmented physical objects. He does much research in “end-user programming”, done by people who are not professional programmers. Most research in that field concentrates on business applications, but Dr Blackwell’s research extends to home programming such as central heating controls, media networks and remote controls for video and audio equipment.

Dr Blackwell is a Fellow and Director of Studies in Computer Science at Darwin College. He is co-director of Crucible, the Cambridge network for research in interdisciplinary design. He gives lectures on Human–Computer Interaction and Software Design, and runs the second-year undergraduate group projects.

He is a member of the Graphics and Interaction (Rainbow) Group, of the Security Group, and of several groups outside the Computer Laboratory.

Personal web page:

<http://www.cl.cam.ac.uk/~afb21/>

Research groups:

<http://www.cl.cam.ac.uk/research/rainbow/>

<http://www.crucible.cl.cam.ac.uk/>

<http://www.inference.phy.cam.ac.uk/is/Welcome.html>

<http://www.cl.cam.ac.uk/research/security/>

Ted Briscoe

Ted Briscoe has been a member of staff at the Computer Laboratory since 1989, a Reader since 2000 and Professor of Computational Linguistics since 2004. His broad research interests are computational and theoretical linguistics and automated speech and language processing. He directed and was heavily involved in the teaching of the MPhil in Computer Speech, Text and Internet Technology, taught jointly with the Engineering Department.

From 1990 until 1996 he was an EPSRC Advanced Research Fellow undertaking research at Macquarie University in Sydney, University of Pennsylvania in Philadelphia and Xerox European Research Centre in Grenoble, as well as at the Computer Laboratory.

His specific research interests include (nearly-)deterministic, statistical, and robust parsing techniques, acquiring lexical information from electronic textual corpora and dictionaries, defaults and constraint-based approaches to linguistic description, exploiting prosody and punctuation during parsing, models of human language learning and parsing, and evolutionary simulations of language variation and change.

He has published over 70 research articles, edited three books, and been Principal/Co-Investigator or Coordinator of fourteen EU and UK funded projects since 1985. He is joint editor of *Computer Speech and Language* and on the editorial board of *Natural Language Engineering*.

Personal web page:

<http://www.cl.cam.ac.uk/~ejb1/>

Research group:

<http://www.cl.cam.ac.uk/research/nl/>

Stephen Clark

Stephen Clark is a Senior Lecturer in the Computer Laboratory, and a member of the Natural Language and Information Processing Research group. He was previously a University Lecturer in Computer Science at Oxford University, and a postdoctoral researcher at the University of Edinburgh. He holds a PhD in Artificial Intelligence from the University of Sussex and a BA in Philosophy from Cambridge.

His research draws on techniques from Computer Science, Linguistics and Machine Learning, with a main theme of combining symbolic and data-driven approaches to Natural Language Processing. His main research interest is the automatic parsing of natural languages. He is on the Editorial Boards of *Computational Linguistics*, the *Journal of Natural Language Engineering*, and *Computer Speech and Language*, and is a regular participant at the 6-week Language Engineering research workshops at Johns Hopkins University, where he led a team in 2009 working on large-scale parsing of the Web. In 2010 he was program co-chair for the Annual Meeting of the Association for Computational Linguistics (ACL), and he is currently chair-elect of the European Chapter of the ACL.

Personal web page:

<http://www.cl.cam.ac.uk/~sc609/>

Research group:

<http://www.cl.cam.ac.uk/research/nl/>

Ann Copestake

Ann Copestake is Professor of Computational Linguistics in the Computer Laboratory. Her main interest is in Computational Linguistics. She teaches on the MPhil in Advanced Computer Science and also teaches a Part II Tripos course on Natural Language Processing.

Within Computational Linguistics, Professor Copestake's research is mainly in semantics (including lexical semantics and robust semantics), lexical representation and on the syntax/semantics and semantics/pragmatic interfaces. Her work has been used in several applications, including systems for language teaching, e-mail response, information extraction, lexical acquisition and machine translation. She has also worked on augmentative and alternative communication, which concerns the needs of people with communication-related disabilities. She is heavily involved in the DELPH-IN collaboration, which releases open-source technology for NLP utilising high-precision grammars.

Personal web page:

<http://www.cl.cam.ac.uk/~aac10/>

Research group:

<http://www.cl.cam.ac.uk/research/nl/>

Jon Crowcroft

Jon Crowcroft has been the Marconi Professor of Communications Systems in the Computer Laboratory since October 2001. He has worked in the area of Internet support for multimedia communications for over 30 years. Three main topics of interest have been scalable multicast routing, practical approaches to traffic management, and the design of deployable end-to-end protocols. Current active research areas are Opportunistic Communications, Social Networks, and techniques and algorithms to scale infrastructure-free mobile systems. He leans towards a “build and learn” paradigm for research.

He graduated in Physics from Trinity College, University of Cambridge in 1979, gained an MSc in Computing in 1981 and PhD in 1993, both from UCL. He is a Fellow of the ACM, a Fellow of the British Computer Society, a Fellow of the IET and the Royal Academy of Engineering and a Fellow of the IEEE.

He likes teaching, and has published a few books based on learning materials.

Personal web page:

<http://www.cl.cam.ac.uk/~jac22/>

Research group:

<http://www.cl.cam.ac.uk/research/srg/>

John Daugman

John Daugman is Professor of Computer Vision and Pattern Recognition. He obtained his AB and PhD degrees from Harvard University in the USA, where he also then taught on the Faculty. Before coming to Cambridge he held the Toshiba Chair at the Tokyo Institute of Technology, Japan, and during 2002–2004 he was the Johann Bernoulli Professor of Mathematics and Informatics at the University of Groningen, The Netherlands. At Cambridge he currently teaches Information Theory and Coding, and Computer Vision, to third year students, and he co-teaches with Richard Gibbens a course for second-year students, Mathematical Methods for Computer Science.

Professor Daugman conducts research in statistical pattern recognition, computer vision, decision theory, and neural computing. One development and outgrowth of this research has been iris recognition, an automatic and rapid method for determining a person's identity with very high confidence, by mathematical analysis of the random patterns that are visible in the iris of an eye from some distance. Professor Daugman's algorithms for this process are the basis of all current publicly deployed iris recognition systems and have been licensed internationally, particularly in airports where governments (including the UK in Project IRIS) allow the process to substitute for a passport. (He is currently unable to take PhD students.)

Personal web page:

<http://www.cl.cam.ac.uk/~jgd1000/>

Research group:

<http://www.cl.cam.ac.uk/research/ai/>

Anuj Dawar

Anuj Dawar is Professor of Logic and Algorithms and is one of the two Deputy Heads of Department. He has been with the Computer Laboratory since January 1999, having previously been a senior research assistant and a lecturer at the University of Wales, Swansea. He has degrees from the Indian Institute of Technology, Delhi, and the University of Delaware and obtained his PhD from the University of Pennsylvania in 1993 with a thesis on the use of model-theoretic methods in the study of feasible computation.

More generally, Professor Dawar works on applications of logic in Computer Science. He is especially interested in those areas of theoretical computer science where logical and combinatorial methods combine in the study of algorithms. These include finite model theory and its connection to the study of computational complexity; the theory of databases; the complexity of games and the expressive power of logical formalisms.

Professor Dawar is a Fellow of Robinson College. He is vice-president of the European Association for Computer Science Logic and organiser of the 2012 Turing Centenary Conference

(<http://www.cl.cam.ac.uk/cie2012/>).

In 2006, he organised a six-month long programme of research activities on the subject of Logic and Algorithms at the Isaac Newton Institute of Mathematical Sciences,

Cambridge (see

<http://www.newton.ac.uk/programmes/LAA/>)

Personal web page:

<http://www.cl.cam.ac.uk/~ad260/>

Research group:

<http://www.cl.cam.ac.uk/research/pls/>

Neil Dodgson

Neil Dodgson is Professor of Graphics and Imaging and is one of the two Deputy Heads of Department. He leads the Graphics and Interaction Research Group (Rainbow) in collaboration with Peter Robinson and Alan Blackwell. His research interests are geometric modelling, aesthetic image processing, and 3D display technologies.

Professor Dodgson took his first degree at Massey University in New Zealand: a joint major in physics and computer science. He came to Cambridge in 1989 on a Cambridge Commonwealth Trust scholarship. His PhD was in image resampling where, amongst other advances, he discovered and analysed a useful family of quadratic reconstruction functions. He joined the Cambridge autostereoscopic 3D display project in 1991 and has undertaken research in the fields of image rendering, image processing, image compression, optics, and hardware design for the display. He became a permanent member of staff in 1995 and has since worked on a range of topics in computer graphics and image processing.

His current research centres around geometry modelling and image processing. In collaboration with Dr Malcolm Sabin, his group has been researching subdivision schemes. He currently has three PhD students looking at imaging and 3D techniques, and runs an EPSRC project in geometric modelling with three post-doctoral researchers. Past PhD students have worked on image processing for the imagination, animation of autonomous actors, virtual sculpting of three-dimensional models using free-form deformation, physical modelling for animation of liquids, and image compression.

Professor Dodgson teaches research skills to Masters students and graphics to undergraduates. He is a Fellow of Emmanuel College where he has served for many years as Director of Studies in Computer Science and as Assistant Bursar. He is a Fellow of the IET, a member of Eurographics and ACM SIGGRAPH, and a Chartered Electrical Engineer.

Personal web page:

<http://www.cl.cam.ac.uk/~nad10/>

Research group:

<http://www.cl.cam.ac.uk/research/rainbow/>

Marcelo Fiore

Marcelo Fiore is Professor of Mathematical Foundations of Computer Science, having previously been a Reader and Lecturer in the Computer Laboratory holding the EPSRC

Advanced Research Fellowship *Mathematical Models for Functional and Concurrent Computation* since October 2000. He is a Fellow of Christ's College, where he has been serving as Director of Studies in Computer Science since January 2002.

Professor Fiore's general research interests are in mathematical models of computation and interaction. In particular, he is interested in investigating the mathematical structure of computational languages and interactive systems regarded as syntactic objects equipped with a behavioural semantics, with the aim of developing models that provide tools for thinking and reasoning about both syntactic and semantic aspects in a principled manner and lead to the design of foundational theories. His recent research interests also include combinatorics, computational algebra, and the analysis of algorithms. Indeed, one of his current main research programmes advocates a combinatorial perspective, together with its methods, in the investigation and study of models of computation structures. This has already opened new ways in which to look at data type structure, yielding unexpected connections between various areas of computer science and mathematics; *to wit*, category theory, combinatorics, computation theory, computational algebra, group theory, mathematical logic, number theory, programming-language theory, type theory.

Professor Fiore obtained his doctorate at the Department of Computer Science in the University of Edinburgh in 1994. His doctoral thesis, *Axiomatic Domain Theory in Categories of Partial Maps*, was published in the British Computer Society Distinguished Dissertations Series in 1995. After his PhD, and before coming to Cambridge, he was a Research Fellow at the Laboratory for Foundations of Computer Science in the University of Edinburgh and, subsequently, a Lecturer in Computer Science in the University of Sussex.

Personal web page:

<http://www.cl.cam.ac.uk/~mpf23/>

Research group:

<http://www.cl.cam.ac.uk/research/pls/>

Richard Gibbens

Richard Gibbens is Reader in Network Modelling in the Computer Laboratory.

He joined the Computer Laboratory in 2001 having previously spent 20 years in the Statistical Laboratory, University of Cambridge initially studying for a degree in mathematics, a Diploma in Mathematical Statistics and a PhD degree. He then continued researching into the design and analysis of communication networks together with lecturing across a range of courses in applicable mathematics. In 1993 he was appointed to a Royal Society University Research Fellowship.

He has worked on a number of research topics in the field of communication networks. His doctoral thesis developed, in conjunction with colleagues at Cambridge and British Telecom, the Dynamic Alternative Routing strategy now in use within BT's national networks. He has also worked on traffic characterisation and helped develop the notion of effective bandwidths for statistical multiplexing of traffic in packet networks and on resource pricing and packet marking for the distributed control of IP networks. Recent

work has involved modelling of transport networks especially journey time prediction of vehicles using real-time data. He collaborates in a range of research projects often with the communications and transport industries and is a member of the Systems Research Group.

Dr Gibbens is a Fellow of Gonville and Caius College. He lectures courses on Probability, Mathematical Methods for Computer Science and Computer Systems Modelling as well as supervising a broad range of courses in mathematics and computer science.

Personal web page:

<http://www.cl.cam.ac.uk/~rg31/>

Research group:

<http://www.cl.cam.ac.uk/research/srg/>

Mike Gordon

Mike Gordon is Professor of Computer Assisted Reasoning. He studied mathematics as an undergraduate at Cambridge and also obtained a postgraduate Diploma in Linguistics. His PhD was from the Department of Machine Intelligence in the University of Edinburgh. Following research positions at Edinburgh and Stanford, he joined the Computer Laboratory in 1980 as a Lecturer and founded the Hardware Verification Group (HVG), which is now part of the Programming, Logic, and Semantics Group.

Members of HVG have done research in functional programming, the design and implementation of proof assistants for higher order logic, methods of combining user-assisted and automatic theorem proving, hardware and software specification and verification, formal verification of floating point algorithms, mechanically checked program refinement, formal semantics of programming languages and hardware description languages, specification and verification of real-time systems, proof support for process algebra.

Mike Gordon lectures on formal methods for both hardware and software.

Personal web page:

<http://www.cl.cam.ac.uk/~mjcg/>

Research group:

<http://www.cl.cam.ac.uk/research/pls/>

David Greaves

David Greaves is a University Senior Lecturer interested in compiler and hardware design. He has considerable industrial experience at the CTO/Chief Scientist level and has led the design of many hardware systems, including semi-custom VLSI design.

Current research activities concern power estimation from high-level models of computation, experimental system specification languages, hardware compilers and automated methods for component assembly and compositional formal checking.

Dr Greaves is a practical engineer who has designed many systems and ASICs which are in wide use throughout the world. He is an MIET.

He is a Fellow of Corpus Christi College where he is Director of Studies in Computer Science.

Personal web page:

<http://www.cl.cam.ac.uk/~djg11/>

Research groups:

<http://www.cl.cam.ac.uk/research/srg/>

<http://www.cl.cam.ac.uk/research/comparch/>

Timothy Griffin

Timothy Griffin is a University Senior Lecturer in the Computer Laboratory, having joined the Department in January 2005. Previously he had been a researcher with Intel Research, AT&T Research, and Bell Laboratories. He received a BS in Mathematics from the University of Wisconsin, and a PhD in Computer Science from Cornell University.

Dr Griffin's research is currently focused on applying rigorous modelling and analysis methods to problems of network design and network protocol design, especially Internet routing protocols.

Personal web page:

<http://www.cl.cam.ac.uk/~tgg22/>

Research groups:

<http://www.cl.cam.ac.uk/research/pls/>

<http://www.cl.cam.ac.uk/research/srg/>

Steven Hand

Steven Hand is Reader in Computer Systems, a member of the Systems Research Group in the Computer Laboratory, and a Fellow of Wolfson College. His interests lie in the areas of operating systems, networking, distributed storage, concurrency, security, and computer architecture. At undergraduate level, he delivers lectures on Concurrent and Distributed Systems. He is also Course Director of the MPhil in Advanced Computer Science, within which he convenes the Advanced Topics in Computer Systems module.

He was one of the originators of the Xen hypervisor, which allows a single machine to host multiple operating systems concurrently, providing secure isolation between operating systems while retaining unprecedented efficiency. The first release of Xen was in 2003, and today it is in use on hundreds of thousands of machines across the world. Ongoing research in this space is looking at building a resilient cloud, incorporating new processor and interconnect technologies as well as new systems software and a new distributed runtime based on CIEL.

Other ongoing work falls in the multi-core area, with a focus on speculation as a

technique to improve performance. This includes speculation of memory accesses to elide locks and speculation past I/O accesses to improve user-perceived response times. Some of the techniques developed here may also be of use in supporting automatic partitioning of complex software systems to provide privilege separation.

Personal web page:

<http://www.cl.cam.ac.uk/~smh22/>

Research group:

<http://www.cl.cam.ac.uk/research/srg/>

Robert Harle

Dr Robert Harle is a University Lecturer in the Computer Laboratory. He obtained the BA and MSci degrees in Natural Sciences (Physical) at Cambridge, before going on to complete a PhD in the Cambridge University Engineering department under the supervision of Professor Andy Hopper. He spent a few years as a Research Associate in the Digital Technology Group at the Computer Laboratory, before becoming an Assistant Director of Research in 2007 and a University Lecturer in 2010.

His research interests lie in sensor and positioning systems and mobile, ubiquitous and pervasive computing, as well as wireless sensor networks. He is a Fellow of Downing College and a Director of Studies in Computer Science.

Personal web page:

<http://www.cl.cam.ac.uk/~rkh23/>

Research group:

<http://www.cl.cam.ac.uk/research/dtg/>

Sean Holden

Sean Holden is a University Senior Lecturer in the Computer Laboratory. He obtained his BSc in Electronic Systems Engineering from the University of East Anglia in 1989, and then moved to the Digital Signal Processing Group at Cambridge University Engineering Department (CUED), obtaining a PhD in Information Engineering in 1994 under the supervision of Prof Peter Rayner. He was a postdoctoral researcher at King's College London and CUED before being appointed Lecturer in Computer Science at University College London in 1995, where he set up and Directed the MSc programme in Intelligent Systems. He was appointed University Lecturer at Cambridge in 2002 and Senior Lecturer in 2004.

His research interests are in the theory and applications of machine learning techniques, including neural networks, support vector machines, Gaussian processes and others. His theoretical work is concerned with the use of computational learning theory, Bayesian inference, statistical physics and other techniques to better understand the foundations of the supervised learning problem and thereby to develop better learning algorithms. His work on applications is addressed primarily at drug design, automatic theorem-proving and regenerative medicine. In addition, he has current interests in

planning algorithms, semi-supervised and multiple kernel learning, functional programming methods for artificial intelligence, and SAT-solving algorithms.

He teaches the second- and third-year undergraduate courses on artificial intelligence, and is a Fellow and Director of Studies at Trinity College.

Personal web page:

<http://www.cl.cam.ac.uk/~sbh11/>

Research group:

<http://www.cl.cam.ac.uk/research/ai/>

Andy Hopper

Andy Hopper is Professor of Computer Technology at the University of Cambridge and Head of the Computer Laboratory. His research interests include networking, pervasive and sentient computing, and using computers for assuring the sustainability of the planet.

Andy Hopper has pursued academic and industrial careers in parallel. In the academic career he has worked in the Computer Laboratory and the Department of Engineering at Cambridge. In the industrial career he has worked in senior roles for multinational companies and also co-founded a dozen spin-outs and start-ups, two of which floated on stock markets. He is currently chairman of RealVNC, Ubisense and Adventiq, and a director of Solarflare.

Professor Hopper received the BSc degree from the University of Wales Swansea (1974) and the PhD degree from the University of Cambridge (1978). He is a Fellow of the Royal Academy of Engineering (1996) and of the Royal Society (2006). He was made a CBE for services to the computer industry (2007).

Personal web page:

<http://www.cl.cam.ac.uk/~ah12/>

Research group:

<http://www.cl.cam.ac.uk/research/dtg/>

Mateja Jamnik

Mateja Jamnik is University Senior Lecturer in the Computer Laboratory. She also holds the EPSRC Advanced Research Fellowship “Automating Informal Human Mathematical Reasoning”. She is a member of the Automated Reasoning Group and the Artificial Intelligence Group.

Mateja Jamnik obtained her PhD at the Department of Artificial Intelligence in the University of Edinburgh. Her doctoral thesis, “Automating Diagrammatic Proofs of Arithmetic Arguments” broke new ground in automated reasoning, and as a result, she was invited by CSLI Press, Stanford, to write a book about her work – *Mathematical reasoning with diagrams: from intuition to automation* (2001).

Dr Jamnik is interested in exploring how people solve mathematical problems. She

computationally models this type of reasoning on computers to enable machines to reason in a similar way to humans. In particular, her research aims to investigate and mechanise some of “informal” human mathematical reasoning, such as the use of diagrams in proofs of mathematical theorems. Few automated reasoning systems attempt to benefit from the power of human techniques. In Dr Jamnik’s work, she aims to do just that: integrate informal human reasoning techniques with classical formal techniques.

Dr Jamnik teaches Automated Reasoning and occasionally Artificial Intelligence courses. She also is the director of the women@CL network.

Personal web page:

<http://www.cl.cam.ac.uk/~mj201/>

Research groups:

<http://www.cl.cam.ac.uk/research/ai/>

<http://www.cl.cam.ac.uk/research/pls/>

women@CL:

<http://www.cl.cam.ac.uk/women/>

Markus Kuhn

Markus Kuhn is a University Senior Lecturer in the Computer Laboratory. He received his Diplom at the University of Erlangen-Nürnberg (Germany) in 1996, his MSc at Purdue University, West Lafayette, Indiana, in 1997, and his PhD at the University of Cambridge in 2002, all in computer science. His main research interests include distributed systems and computer security. Some of his recent research focused on hardware and signal-processing aspects of security (security microcontrollers, smartcards, compromising emanations), intellectual-property protection mechanisms, positioning-system security, and administration concepts for distributed data collections. He is a Fellow of Wolfson College.

Personal web page:

<http://www.cl.cam.ac.uk/~mgk25/>

Research group:

<http://www.cl.cam.ac.uk/research/security/>

Ian Leslie

Ian Leslie is a Professor in the Computer Laboratory and was Head of Department from 1999 until 2004. His main interests are in operating systems and networks. His PhD, obtained in the Laboratory in 1983, was concerned with high capacity wide area networks. His approach to his research is experimental, and he has been involved in many collaborations that have built real systems, the most recent of which are the Nemesis operating system and the Tempest networking environment.

His current interests are specifically about resource guarantees and the response of systems to unforeseen workload. As we depend more and more on the large-scale

distributed systems we build, how can we be sure that they will perform as expected? How do we make it possible for the time scale on which new network technology is introduced to be on the same time scale on which applications change?

Much of this work is collaborative in nature and he works closely with Steven Hand.

He is a Fellow of Christ's College and served as Director of Studies in Computer Science there from 1985 to 1999. He gave lectures on Digital Communication until recently.

Personal web page:

<http://www.cl.cam.ac.uk/~iml1/>

Pietro Liò

Pietro Liò is a University Senior Lecturer in Bioinformatics algorithms at the Computer Laboratory. He holds a PhD in Complex Systems and Non Linear Dynamics (School of Informatics, Department of Engineering of the University of Firenze, Italy) and a PhD in (Theoretical) Genetics (University of Pavia, Italy). He is affiliated to the Cambridge Computational Biology Institute and Cambridge Neuroscience.

His research interests focus on using computers to investigate biomedical systems and employing a combination of techniques, ranging from machine learning to deterministic and stochastic models, to pursue this aim. His research activities could be classified in three areas. (1) Developing and testing methodologies for modelling biomedical systems (including bioinformatics and system biology): he is interested in methodological cross-comparison (ODEs, Bayesian inference, formal methods) and multiscale approaches; integration of multiscale modelling of biological systems and machine techniques. (2) Infectious diseases informatics: this involves both statistical bioinformatics and mathematical modeling; on going collaborations focus on HIV, influenza, haematopoietic stem cells development. A focus is on how both pathogen's molecular characteristics and social networks structure influence epidemics spreading and *vice versa*. (3) Bioinspired technology: the growing relevance of bioinspired and synthetic biology will depend on our understanding and skill in modelling biological systems and *vice versa*.

He teaches the following courses at the University of Cambridge: Bioinformatics (Computer Laboratory); Models and Methods in Genomics (Department of Mathematics) System Biology (4G1) (Department of Engineering); Modelling in System Biology (+ Probability) (System Biology Tripos, Department of Biochemistry).

Personal web page:

<http://www.cl.cam.ac.uk/~pl219/>

Research group:

<http://www.cl.cam.ac.uk/research/ai/>

Cecilia Mascolo

Cecilia Mascolo is Reader in Mobile Systems in the Computer Laboratory. She is a member of the Systems Research Group. Prior to this, she was with the Department of

Computer Science of University College London. She holds an MSc (1995) and a PhD (2001) in Computer Science from University of Bologna (Italy). She has been a visiting fellow in Washington University in St Louis in 1998.

Her research interests include mobile systems, realistic mobility models, mobile sensor networks and social network analysis. Dr Mascolo is currently working on projects on sensing through mobile phones, wildlife monitoring, human network information dissemination and online social network modelling.

Personal web page:

<http://www.cl.cam.ac.uk/~cm542/>

Research group:

<http://www.cl.cam.ac.uk/research/srg/>

Andrew Moore

Andrew Moore is a University Senior Lecturer in the Computer Laboratory. Prior to joining the Computer Laboratory, Dr Moore had been a Fellow at Queen Mary, University of London, an Intel Research Fellow and a foundation researcher at the Cambridge Marconi Research Laboratory. He took a PhD with the Computer Laboratory in 2001 and prior to 1995 worked for some number of years in Australia. Dr Moore took his first and Master's degrees from Monash University in Melbourne.

His research interests include the characterisation and accurate reproduction of Internet traffic – a specific topic being the application of Machine-Learning methods to the characterisation of network applications. Recent work has focused upon the effective use of such methods given a constrained feature-set.

His interests also encompass photonic communications and switching systems. Specific recent work is examining the use of photonic switch devices as a low-power alternative to the PCI-interconnect architecture.

Dr Moore lectures on Digital Communication I and C & C++.

Personal web page:

<http://www.cl.cam.ac.uk/~awm22/>

Research group:

<http://www.cl.cam.ac.uk/research/srg/>

Simon Moore

Simon Moore is Reader in Computer Architecture. He has a long-standing interest in computer design, from transistor level design to processor architecture and parallel programming languages. Embedded systems hold a particular fascination, from complex multiprocessor control systems to low power, low cost and secure systems for consumer products. Work on high end systems resulted in a book on *Multithreaded Processor Design* which included a novel hardware scheduler to improve real-time performance.

The Computer Architecture Group, which Simon leads, is undertaking research into future parallel computer systems. One project (Communication Centric Computer Design) is addressing power and performance issues associated with communication in chip-multiprocessors and multiple chip systems. Another project (with Universities of Manchester, Sheffield and Southampton) is looking at Biologically Inspired Million Processor Architectures (BIMPA).

Dr Moore's research interests are reflected in his teaching of Electronic Computer Aided Design and Computer Design courses with associated laboratory sessions. He is also a Director of Studies in Computer Science and a Staff Fellow at Trinity Hall.

Personal web page:

<http://www.cl.cam.ac.uk/~swm11/>

Research group:

<http://www.cl.cam.ac.uk/research/comparch/>

Robert Mullins

Robert Mullins is a University Lecturer in the Computer Laboratory. He received his BEng, MSc and PhD degrees from the University of Edinburgh before joining the Computer Laboratory in 2000.

His research interests include computer architecture and VLSI design. He is particularly interested in how real performance gains can be maintained as fabrication technologies approach the atomic scale and processor architectures are forced to become increasingly parallel. Recent work has focused on the design of efficient on-chip interconnection networks and a novel parallel processing fabric (Loki).

His PhD and early work in the Computer Laboratory involved the design and implementation of asynchronous microprocessors. This work also examined the benefits of asynchronous logic from a security perspective.

Dr Mullins lectures on Comparative Architectures and Chip-Multiprocessors and has lectured the Computer Design course.

He is a Fellow at St John's College and Director of Studies for Computer Science. As a trustee of the Raspberry Pi Foundation he aims to help promote the study of computer science and related topics at the school level.

Personal web page:

<http://www.cl.cam.ac.uk/~rdm34/>

Research group:

<http://www.cl.cam.ac.uk/research/comparch/>

Alan Mycroft

Alan Mycroft is Professor of Computing in the Computer Laboratory where he has worked since 1984. He was awarded the higher degree of ScD for his work in 1995. He is a Fellow at Robinson College (and was Director of Studies there 1987–2005).

At the Computer Laboratory he is part of the Cambridge Programming Research Group. His research interests span an arc from semantic models of programming languages to actually building optimising compilers. A core interest is that of static analysis of programs to extract properties of their run-time behaviour. Such properties can be used to enable optimisations or to facilitate “compile-time debugging”. His PhD created the subject of “strictness analysis” when he argued that apparent run-time inefficiencies in modern high-level languages can often be removed by program analysis and optimisation phases. Other work has encompassed type-based decompilation and also language and compilation issues for “Silicon Compilers”, i.e. compiling specifications directly to hardware. Recently he has been collaborating with Intel Research on languages and techniques for compiling to “multi-core” processors; this research illuminates the benefits of type-like systems of program analysis at enabling programmers to express and manage their implicit treaty with a compiler (“optimise as much as you can, but don’t step over the line”). He welcomes applications from potential PhD students in the above (or cognate) areas.

Professor Mycroft has lectured various courses from Discrete Mathematics to Comparative (Processor) Architectures but currently lectures the Floating-Point Computation, Foundations of Functional Programming and Optimising Compilers courses.

Wearing a more commercial hat, Professor Mycroft is part of a consortium that produced compilers for various OEM suppliers of innovative processors such as ARM, ST-Microelectronics’ range (including Inmos’s “Transputers”) and other niche processors.

He is a founder and past president of EAPLS (European Association for Programming Languages and Systems): see the web page below to become a member. As a trustee of the Raspberry Pi Foundation he aims to help promote the study of computer science and related topics at the school level.

Personal web page:

<http://www.cl.cam.ac.uk/~am21/>

Research groups:

<http://www.cl.cam.ac.uk/research/pls/>

<http://www.cl.cam.ac.uk/research/comparch/>

EAPLS web page:

<http://eapls.org/>

Lawrence Paulson

Larry Paulson is Professor of Computational Logic. His research interests include automated theorem proving, verification and computer security.

His latest research concerns MetiTarski, an automatic theorem prover for real-valued functions such as exponential, logarithm, sine and cosine. Complicated formulas containing combinations of these functions can be established automatically, often in seconds, with a machine-readable proof delivered. MetiTarski is a unique combination

of resolution theorem proving with a decision procedure for real-closed fields (RCF).

Professor Paulson has spent much of his career developing the interactive theorem-prover Isabelle, which aims to support substantial proofs while being independent of particular logical formalisms. His recent research delivered a decisive improvement in automation by building an effective link with resolution theorem provers. He works in collaboration with Professor Tobias Nipkow and his colleagues at the Technical University of Munich and with other colleagues elsewhere. His research is funded by the EPSRC.

He has used Isabelle to perform formal proofs in various domains. He has worked on verifying security protocols, such as those used to protect transactions on the Internet. He has developed an operational trace model, which lends itself to natural models in Isabelle and is extremely flexible at coping with unusual features, such as smart cards or multicast. He and colleagues (Bella, Massacci) have investigated several protocols, including major ones like TLS and SET. The proofs have highlighted subtle features and identified a number of flaws.

Professor Paulson has mechanised substantial proofs in set theory, such as Gödel's proof of the relative consistency of the axiom of choice. He has also mechanised the UNITY formalism, which is used for reasoning about concurrent systems. In the early 1980s, he worked on the proof tool LCF, alongside Gordon, Huet and Milner. He introduced several conceptual improvements, laying the foundation for Gordon's HOL system. HOL became one of the world's most popular interactive theorem provers. In his PhD research, he built a semantics-directed compiler generator: a tool for use in the design of programming languages. It combined techniques such as attribute grammars, denotational semantics and SECD machines.

Professor Paulson is a Fellow of Clare College, where he serves as Director of Studies in Computer Science. In the Computer Laboratory he gives lectures on Foundations of Computer Science and Logic and Proof, and a Master's course on Interactive Formal Verification. He is a Fellow of the ACM and belongs to the London Mathematical Society.

Personal web page:

<http://www.cl.cam.ac.uk/~lp15/>

Research group:

<http://www.cl.cam.ac.uk/research/pls/>

Andrew Pitts

Andrew Pitts has been Professor of Theoretical Computer Science since 2001, having previously been a Lecturer and a Reader in the Computer Laboratory since 1989. He is a Fellow of Darwin College.

He is interested in all aspects of programming language semantics, be they operational or denotational (or somewhere between the two). His research makes use of techniques from mathematical logic, type theory and category theory to advance the foundations of programming language semantics. The aim is to develop mathematical models and methods that aid language design and the development of formal logics for specifying

and reasoning about programs, with an emphasis on higher order, typed programming languages, such as ML and Haskell. He has a long-standing interest in the semantics and logic of names, locality and binding. He is currently researching *nominal sets*, which provide a syntax-independent model of freshness and alpha-equivalence of bound names with very good support for recursion and induction. He is interested in the applications of this model to metaprogramming languages and metalogics that underlie systems for machine-assisted reasoning about programming language semantics. He has received research funding from the Royal Society, the ESPRIT, SCIENCE, HCM, and TMR programmes of the European Union, SERC, EPSRC and Microsoft Research.

Personal web page:

<http://www.cl.cam.ac.uk/~amp12/>

Research group:

<http://www.cl.cam.ac.uk/research/pls/>

Andrew Rice

Andrew Rice is a Lecturer in the Digital Technology Group at the Computer Laboratory. Previously he worked as an Assistant Director of Research in the DTG after studying for his BA and PhD also at the Computer Laboratory. His PhD, completed in 2006, studied the dependability of location systems using marker-based machine vision.

His current research considers “Computing for the future of the planet”. His interests in this area include: improving the energy efficiency of computing and supporting infrastructure, dependable modelling and numerical programs, large-scale sensing of environmental data and mobile computing.

Dr Rice teaches the first-year undergraduate course, Programming in Java, the second-year undergraduate course, Further Java, and the Programming for Mobiles course in the ACS MPhil.

Personal web page:

<http://www.cl.cam.ac.uk/~acr31/>

Research group:

<http://www.cl.cam.ac.uk/research/dtg/>

Peter Robinson

Peter Robinson is Professor of Computer Technology, working in the Rainbow Group on computer graphics and interaction. He is also a Fellow and Director of Studies in Computer Science at Gonville and Caius College.

Professor Robinson’s research concerns problems at the boundary between people and computers. This involves investigating new technologies to enhance communication between computers and their users, and new applications to exploit these technologies. The main focus for this is human-computer interaction, where he has been leading work for some years on the use of video and paper as part of the user interface. The idea is to develop augmented environments in which everyday objects acquire computational

properties through user interfaces based on video projection and digital cameras. Particular examples include desk-size projected displays and tangible interfaces.

Recent work has included socially and emotionally adept technologies. These include inference of people's mental states from facial expressions, vocal nuances, body posture and gesture, and other physiological signals, together with the expression of emotions by robots and cartoon avatars. Applications include monitoring car drivers and improved on-line teaching. He has also pursued a parallel line of research into inclusive user interfaces. This has broader applications for interaction with ubiquitous computers, where the input and output devices themselves impose limitations.

He is a Chartered Engineer and a Fellow of the British Computer Society.

Personal web page:

<http://www.cl.cam.ac.uk/~pr10/>

Research group:

<http://www.cl.cam.ac.uk/research/rainbow/>

Peter Sewell

Peter Sewell is a Reader in Computer Science and holds an EPSRC Leadership Fellowship. He is a Fellow of Wolfson College.

His research is at the interface between theoretical semantic models and practical systems, aiming to establish mathematically rigorous and pragmatically useful foundations for real systems. Research interests include: semantics for multiprocessors and concurrent programming languages; verified compilation; the rigorous modelling of real-world network protocols; the design of high-level distributed programming languages; the specification and enforcement of security properties; and mechanisation and tool support for semantics.

Personal web page:

<http://www.cl.cam.ac.uk/~pes20/>

Research group:

<http://www.cl.cam.ac.uk/research/pls/>

Frank Stajano

Frank Stajano is a University Senior Lecturer. He was appointed to Cambridge in 2000, then at the Department of Engineering, and in 2004 he moved back to the Computer Laboratory, where he originally earned his PhD in computer security.

His research interests revolve primarily around three interconnected themes: systems security, privacy in the electronic society and ubiquitous computing. His works on ubicomp authentication (Resurrecting Duckling, with Ross Anderson) and on location privacy (Mix Zones, with Alastair Beresford) are widely cited. He wrote the book *Security for Ubiquitous Computing* (Wiley, 2002).

Before his academic appointments Dr Stajano worked in industrial research. This gave

him first-hand experience of Cambridge start-up companies and of related issues of technology transfer, entrepreneurship and patents. His academic research therefore maintains a strong practical orientation. He was elected a Toshiba Fellow in 2000.

Dr Stajano enjoys teaching and, beyond his main research areas of security and ubiquitous computing, he has had the privilege of lecturing Cambridge undergraduates on many fundamental computer science topics, from computer architecture and operating systems to data structures and algorithms. He is also a sought-after public speaker and has given about 40 invited and keynote talks at international events.

Very few things one can do with a computer are as fun as programming: Dr Stajano's favourite programming language is Python, which comes with batteries included.

Outside computers, Dr Stajano writes books about comics and is a keen practitioner of kendo (Japanese swordsmanship). He earned his 3rd dan grade in Japan, he is a BKA-licensed regional coach (meaning he trains and licenses other kendo instructors) and has been leading the Kendo Society of the University since 2002.

Personal web page:

<http://www.cl.cam.ac.uk/~fms27/>

Research groups:

<http://www.cl.cam.ac.uk/research/security/>

<http://www.cl.cam.ac.uk/research/dtg/>

Sam Staton

Sam Staton is a University Lecturer in the Computer Laboratory. His general research interests are in programming languages and mathematical models of computation. He is particularly interested in the semantics of programming languages. His PhD thesis, completed in 2006, is a semantic analysis of Milner's pi-calculus. Two of his current research areas are (a) side effects in functional programming, (b) a theory of concurrent computation.

After holding an EPSRC Postdoctoral Research Fellowship in Cambridge, he spent some time as a researcher in Université Paris VII. He returned to Cambridge to take up his current post in January 2011.

Dr Staton lectures Discrete Mathematics I, Semantics of Programming Languages, and Category Theory and Logic.

Personal web page:

<http://www.cl.cam.ac.uk/~ss368/>

Research group:

<http://www.cl.cam.ac.uk/research/pls/>

Simone Teufel

Simone Teufel is Reader in Language and Information. Her main interest is in Natural Language Processing (NLP) and in Information Retrieval (IR). After her PhD

(Edinburgh), she was a Postdoctoral Researcher in the Computer Science Department of Columbia University from 2000 to 2001. At Cambridge, she taught on the MPhil in Computer Speech, Text and Internet Technology, a joint course with the Engineering Department.

Within NLP, Dr Teufel's research is mainly in applications of discourse and other linguistic information for information retrieval and summarisation. She is interested in the interaction of tasks such as generation, topic segmentation and clustering with classic IR and summarisation. Her current work concentrates on generation techniques for robust summarisation, and on task-based experiments of human text processing. She has also worked on multilingual summarisation and medical information extraction.

Dr Teufel is a Fellow of King's College.

Personal web page:

<http://www.cl.cam.ac.uk/~sht25/>

Research group:

<http://www.cl.cam.ac.uk/research/nl/>

Ian Wassell

Ian Wassell joined the Computer Laboratory as a Senior Lecturer in January 2006. Prior to this appointment, he was with the University of Cambridge Department of Engineering for approximately six and a half years.

Dr Wassell obtained his PhD at the University of Southampton in 1990 where he investigated Viterbi Equalisation for wireless and mobile systems. He has in excess of 15 years' experience in the simulation and design of radio communication systems gained via a number of positions in industry and higher education. His research interests include Fixed Wireless Access (FWA) systems, radio propagation, wireless sensor networks and communication signal processing.

In the Computer Laboratory Dr Wassell lectures on Digital Electronics to first-year undergraduates; he is a Fellow of Churchill College, where he has supervised second year communication topics to engineering students for a number of years.

He is a Member of the Institution of Engineering and Technology (IET).

Personal web page:

<http://www.cl.cam.ac.uk/~ijw24/>

Research group:

<http://www.cl.cam.ac.uk/research/dtg/>

Glynn Winskel

Glynn Winskel has been a Professor in the Computer Laboratory since October 2000. He is a Professorial Fellow at Emmanuel College.

Professor Winskel's research has been mainly in the foundations of computer science,

especially in mathematical semantics and logics of computation. His research is often guided by a fundamental belief in the usefulness of mathematical models and logic to help understand, structure and analyse computation, from the sequential execution of a single program to the interaction within distributed systems. He is particularly interested in models and proof techniques for interactive computation, from, for example, specific issues in the semantics and logics of security protocols to the general programme of extending domain theory and denotational semantics to give an adequate treatment of distributed computation.

Glynn Winskel read mathematics at Cambridge and mathematical logic at Oxford before turning to computer science in his PhD work at the University of Edinburgh. During the last year of his PhD he was employed as a research associate on a grant of Robin Milner and Gordon Plotkin. For a period he was a Royal Society Postdoctoral Fellow, and then a Research Scientist at the Computer Science Department of Carnegie Mellon University. From 1984 he was Lecturer then Reader in the Computer Laboratory, leaving in 1988 to become Professor at Aarhus University in Denmark. There he was founding director of BRICS, a research centre for Basic Research in Computer Science.

He currently lectures on Discrete Mathematics, Topics in Concurrency, Set Theory for Computer Science and Advanced Topics in Concurrency.

Personal web page:

<http://www.cl.cam.ac.uk/~gw104/>

Research group:

<http://www.cl.cam.ac.uk/research/pls/>

BRICS:

<http://www.brics.dk/>

A full list of staff and visitors (with their e-mail addresses) may be found at <http://www.cl.cam.ac.uk/people/>

Computer Science courses

There are two taught courses in Computer Science at Cambridge:

- the **Computer Science Tripos**: a three- or four-year course for undergraduates;
- the **MPhil in Advanced Computer Science**: a one-year course for graduates; there are two formats, one a taught course, and the other a project course consisting of taught modules and a research project.

The **PhD** is the only purely research degree that can be taken in the Computer Laboratory.

Computer Science Tripos

This is a three- or four-year course for undergraduates. There is also a computer science option in the first year of the Natural Science Tripos and in the first year of the Politics, Psychology and Sociology Tripos.

The first year (Part IA) of the Computer Science Tripos consists of courses in Computer Fundamentals, Foundations of Computer Science (using the polymorphically-typed functional language ML), Object-Oriented Programming and Java, Discrete Mathematics, Software Design, Floating-Point Computation, Algorithms, Digital Electronics, Operating Systems, Probability. Most students also study Mathematics and an experimental subject from Part IA of the Natural Sciences Tripos, although students may choose, instead of the experimental subject, social psychology (from Part I of the Politics, Psychology, and Sociology Tripos). Some students study Mathematics from Part IA of the Mathematical Tripos in place of Natural Science Mathematics and the experimental subject.

The Computer Science option in Part IA of the Natural Sciences Tripos and Part I of the Politics, Psychology, and Sociology Tripos consists of Computer Fundamentals, Foundations of Computer Science, Object-Oriented Programming and Java, Discrete Mathematics, Floating-Point Computation, and Algorithms. Students taking this option are not normally expecting to continue with Computer Science but may, with the permission of their College, switch to Computer Science at the end of the first year. They would need to do some catching up over the summer.

In the second year (Part IB) core Computer Science topics are covered as part of four streams: Theory, Systems, Programming, and Applications and Professionalism. There is assessed work in programming (Further Java and C++ or Prolog), hardware design, and a group project.

In the third year (Part II) a number of advanced areas are covered giving options that span systems, engineering, theory and such application areas as artificial intelligence. Each student also works on a substantial project which includes a dissertation of about 10,000 words.

The three-year course leads to the BA degree and is accredited by The British Computer Society (BCS) and The Institution of Engineering and Technology (IET) counting as full or partial accreditation for professional membership of those organisations (MBCS, MIET) and towards chartered status (CEng, CSci, CITP). It is necessary for students to graduate with honours and to pass the project in order to meet these standards.

The four-year course leads to the BA and MEng degrees: the fourth year has a significant overlap of content with the MPhil in Advanced Computer Science.

Syllabus: <http://www.cl.cam.ac.uk/teaching/current/CST/>

MPhil in Advanced Computer Science

The MPhil in Advanced Computer Science (the ACS) is designed to prepare students for doctoral research, whether at Cambridge or elsewhere. Typical applicants will have undertaken a first degree in computer science or an equivalent subject, and will be expected to be familiar with basic concepts and practices. The ACS covers advanced material in both theoretical and practical areas as well as instilling the elements of research practice. It combines lectures, seminars and project work in various combinations tailored to the individual student; more details are given on the course web page.

Web page: <http://www.cl.cam.ac.uk/admissions/acs/>

The PhD degree

The Cambridge PhD is a three-year programme of individual research on a topic agreed by the student and the Laboratory, under the guidance of a staff member as the student's Supervisor. There is no compulsory course work, and students are expected to complete the substance of their research by the end of their third year, submitting their thesis then or within a few months.

Details concerning applications and admission can be found at <http://www.cl.cam.ac.uk/admissions/phd/>

Applications for Admission

The procedure for admission to Cambridge as an undergraduate student is explained in the *University of Cambridge Undergraduate Prospectus*, obtainable from the Cambridge Admissions Office. Enquiries can be made to undergraduate.admissions@cl.cam.ac.uk at the Computer Laboratory in the first instance.

Formal application for admission for PhD study and for the MPhil in Advanced Computer Science must be made through the University's Board of Graduate Studies, from whom application forms and copies of the *Graduate Studies Prospectus* may be obtained. However, intending PhD applicants are advised to read the information on <http://www.cl.cam.ac.uk/admissions/phd/> or to make enquiry at the

Computer Laboratory to postgraduate.admissions@cl.cam.ac.uk before making a formal application. Intending applicants for the MPhil in Advanced Computer Science are asked to read the information on <http://www.cl.cam.ac.uk/admissions/acs/> and the linked pages.

The Computer Laboratory does not admit students for the MSc degree.

A list of contact addresses is given at the end of this document.

Careers

The University Careers Service Computer Science specialist, David Ainscough, provides Laboratory students with careers advice and circulates vacancies. Summer placements are encouraged and can be found, along with permanent jobs, through the Laboratory Supporters Club annual jobs fair. The Supporters Club is administered by Jan Samols who can be contacted at jan.samols@cl.cam.ac.uk.

The “Cambridge Computer Lab Ring” is the department’s Graduate Association. Named by Sir Maurice Wilkes, it is a non-profit, independent and voluntary members’ association funded by members’ subscriptions providing former students with a lifetime benefit from their time in the Laboratory. Our 3,900 graduates are now widely dispersed in the computer industry and other fields. As well as those doing technical roles in computer and software companies, there are others in IT and management in large end users in fields as diverse as finance, industry and the public sector. 170 companies have been founded by Laboratory graduates, the most of any department in Cambridge University. The Association makes this valuable graduate community accessible to its members through regular social events, talks, tri-annual newsletter, online contact directory and a network of informal volunteer careers advisers whom members can contact after they leave Cambridge. The Association also organises volunteers to go into schools to talk about careers in computing and studying in the Laboratory. The Association is governed by a Council chaired by the Head of Department. Details at <http://www.camring.ucam.org/> or e-mail jan.samols@cl.cam.ac.uk.

Departmental Contacts

Head of Department	Professor Andy Hopper ah12@cl.cam.ac.uk +44 (0)1223 334607
Deputy Heads of Department	Professor Anuj Dawar (Teaching) ad260@cl.cam.ac.uk +44 (0)1223 334408 Professor Neil Dodgson (Research) nad10@cl.cam.ac.uk +44 (0)1223 334417
Departmental Secretary	Mrs Margaret Levitt mal@cl.cam.ac.uk +44 (0)1223 334603
Departmental Secretary (Finance)	Mrs Carol Nightingale cs219@cl.cam.ac.uk +44 (0)1223 334684
PA to Head and Deputy Head of Department	Ms Caroline Matthews cb210@cl.cam.ac.uk +44 (0)1223 334607
Graduate Education Manager	Ms Lise Gough lmg30@cl.cam.ac.uk +44 (0)1223 334656
Student Administrator (undergraduates)	Mrs Megan Sammons ms725@cl.cam.ac.uk +44 (0)1223 763505
Chief Computer Officer	Dr Martyn Johnson maj@cl.cam.ac.uk +44 (0)1223 334647
Departmental Librarian	Mr Nicholas Cutler ncc25@cl.cam.ac.uk +44 (0)1223 334648

Contact Addresses

Computer Laboratory

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+44 (0)1223 334600 (telephone)

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<http://www.cl.cam.ac.uk/>

<http://www.cl.cam.ac.uk/admissions/>

undergraduate.admissions@cl.cam.ac.uk

postgraduate.admissions@cl.cam.ac.uk

Cambridge Admissions Office

for the Undergraduate Prospectus and application form

Fitzwilliam House
32 Trumpington Street
Cambridge
CB2 1QY

+44 (0)1223 333308 (telephone)

+44 (0)1223 366383 (fax)

admissions@cam.ac.uk

<http://www.cam.ac.uk/admissions/undergraduate/>

Board of Graduate Studies

*for the Graduate Prospectus and application form for the PhD and for the MPhil in
Advanced Computer Science*

4 Mill Lane
Cambridge
CB2 1RZ

+44 (0)1223 760606 (telephone)

+44 (0)1223 338723 (fax)

admissions@gradstudies.cam.ac.uk

<http://www.admin.cam.ac.uk/offices/gradstud/admissions/>