UNIVERSITY OF CAMBRIDGE

Department of Computer Science and Technology

ANNUAL REPORT OF THE FACULTY 2020-21

Photo by Jan Blumenkamp (created with help from Qingbiao Li and Hai Zhong) showing researchers in the Prorok Lab working on the 'Minicar' project

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INTRODUCTION

The Department of Computer Science and Technology continues to undertake world class research, combining theory with practical activities, and significantly advancing both the field and computing in the wider world. Our research spans the breadth of computer science, and we encourage the development of new technologies and applications. Despite the Covid-19 pandemic, our undergraduate numbers have remained stable, while the number of PhD admissions has risen significantly. We have, however, seen a drop in MPhil students and whilst the pandemic has contributed to this drop, we are currently considering what actions we should take to ensure we increase student numbers to our desired target in 2022/23.

2019/20 was a challenging year and whilst we are still amidst testing times, we are pleased to report our research and teaching remains strong. However, space issues continue to restrain our work and we hope to get a better opportunity to address this over the coming years.

Academic recruitment was put on hold during 2020/21, as well as academic promotion and most of the other reward schemes so disappointingly, there are no promotions to report for October 2021. The Senior Academic Promotions exercise has now been replaced with Academic Career Pathways (ACP), which is running in 2021/22 and so we hope that we will be able to report a number of promotions in our next Annual Report. We are pleased to report that we have been able to continue with the recruitment of Professional Services Staff throughout the pandemic and our aim to gradually increase the number of support staff in the Department continues.

STAFF OVERVIEW

As of 30 September 2021, the Department of Computer Science and Technology consisted of 198 members of staff:

Academic staff	54
Professional Services Staff	37
Research Fellows	5
Research Staff	95

New Staff
Academic Staff
There were no new academic staff in 2020-21.

Professional Services Staff
Victoria Barrett, Programme Coordinator
Paula Bibby, Project Manager
Marion Cobby, Teaching Administrator
Sarah Matthews, Project Coordinator

Promotions
Senior Academic Promotions (now Academic Career Pathway)
Due to the financial impact of the Coronavirus pandemic, the University Council determined a limit on the use of the University's reward and progression schemes for the academic year 2020/21. Amongst other contribution reward and progression schemes, the Academic Career Pathway (the promotions scheme for

senior academics) was not run this year.

Senior Research Associates

The following Research Associates were promoted to Senior Research Associate:

- Dr Jennifer Cobbe
- Dr Nikola Simidjievski

Leavers

John Daugman, Professor of Computer Vision and Pattern Recognition retired on 30 September 2021. We wish him well in his future endeavours.

College Fellowships

The Department continues to strengthen its links with the Colleges. Dr Alice Hutchings has taken up a College Fellowship with King's College.

HONOURS, AWARDS AND ACHIEVEMENTS

We are pleased to report many staff and student honours, awards and achievements over 2020-21 (https://www.cst.cam.ac.uk/news). These include:

October 2020
UKRI Future Leaders Fellowship for **Dr Cengiz Oztireli**
https://www.cst.cam.ac.uk/news/future-leaders-fellowship-3d-digital-reality-researcher

November 2020
The **Cambridge Ring Hall of Fame 'Better Future Award' 2020** to affiliated lecturer **Luke Church** for his work with the Africa's Voices Foundation
https://www.cst.cam.ac.uk/news/cambridge-ring-hall-fame-awards-recognise-our-staff-students-and-alumni

December 2020
The **undergraduate and MPhil students** who featured in the top three teams at the International Cyber Security Centre of Excellence Country-to-Country 'Capture the Flag' competition
https://www.cst.cam.ac.uk/news/students-take-crown-global-cybersecurity-contest

January 2021
Professor Srinivasan Keshav named as **founding Vice-Chair, ACM Special Interest Group on Energy**
https://www.cst.cam.ac.uk/news/professor-named-founding-vice-chair-acm-special-interest-group-energy

March 2021
The Part 1B students who won the **Most Impressive Technical Achievement, Most Impressive Professional Achievement** and **Best Contribution to a Better Future** prizes at the **Group Project Awards**
https://www.cst.cam.ac.uk/news/success-students-design-project-awards

April 2021
Dr Robert Watson wins EuroSys Jochen Liedtke Young Researcher Award 2021
https://www.cst.cam.ac.uk/news/robert-watson-wins-eurosys-jochen-liedtke-young-researcher-award-2021

May 2021

Part 1A students **Marc Harvey-Hill, Yash Shah, Nicole Choong and Matthew Elliot** win the **AstraZeneca 'Embracing Neurodiversity' hackathon**

https://www.cst.cam.ac.uk/news/undergraduates-win-neurodiversity-hackathon

June 2021

Professor Andy Hopper awarded a knighthood for his contributions to computer technology

https://www.cst.cam.ac.uk/news/professors-contributions-computer-technology-recognised-knighthood

June 2021

Jonáš Fiala receives the inaugural **Gold and Silver Wyre Drawers' Award for Excellence and Achievement in Computer Hardware**

https://www.cst.cam.ac.uk/news/award-celebrates-medieval-craft-helping-power-modern-day-computers

July 2021

Alexander Kuhnle named runner-up in the **CPHC/BCS Distinguished Dissertation Competition**

https://www.cst.cam.ac.uk/news/alumnus-commended-his-contributions-computer-science

September 2021

Kiran K Rachuri, Cecilia Mascolo and **Andrius Aucinas win 10-year Impact Award at UbiComp 2021**

https://www.cst.cam.ac.uk/news/mobile-phone-system-can-monitor-our-happiness-wins-10-year-impact-award

September 2021

Ashwin Ahuja and **Andrea Ferlini** win **Best Paper Award** at **EarComp 2021**

ACTIVITIES

The Departmental Garden Party

We held a Departmental Garden Party on Wednesday 22nd September on the Jock Colville Lawn at Churchill College. It was very well attended by many members of the Department and the sun shone all afternoon! A Cambridge Jazz Band entertained us, and there was a non-competitive cricket activity for all to enjoy. It was a great occasion for people to reconnect again after so many months of working from home.

Supporters' Club

Companies enrolled in our Supporters' Club pay a modest annual subscription in exchange for opportunities to interact with our students, mostly for the purposes of recruitment. Ranging from start-ups to multinational enterprises, they give Tech Talks, engage in Part IB projects, advertise opportunities / events to students and take part in the Department's annual Recruitment Fair. We are encouraged that despite the pandemic, membership has stayed stable: the number of participating companies has fallen only slightly from the mid 90's two years ago, to a current level in the high 80's.

Subscriptions were formerly paid by donation, at an amount averaging around £1,000 per member per year. (The funds raised are used, where possible, for Department activities such as outreach, alleviating student hardship, supporting initiatives like women@CL and providing funding for early-stage research.) However, the payment model changed last year, after it became apparent that subscriptions could no longer be considered donations, since members were receiving tangible benefits in return. As a result, the subscription was split into three parts: a basic membership, a fee for the Recruitment Fair, and a donation component for those able to contribute further. Initially, this increased the bureaucracy involved in taking payments. But we have overcome that difficulty this year by setting up card payments for most payments, via the University's eSales platform.

Most of the Supporters' Club activities, such as the Tech Talks, have continued as normal this year though in virtual form. The annual **Recruitment Fair** was also held online in October 2021, rather than in the building, using software specially developed in-house. We were uncertain as to how it would go but in the event were very pleased with the outcome: the Fair was attended by 41 companies and attended by 320 students, and the numbers of interactions were actually significantly up on the previous year. There were 542 live chat sessions with companies initiated, and 867 email introductions requested by students.

Cambridge Computer Lab Ring

The Ring is our alumni association. Originally restricted to graduates of the Department, membership has recently been extended to past staff members and longer-term visitors, and also graduates of other departments who were significantly involved with Computer Science while at Cambridge.

In the past, only a small fraction of those eligible to join actually signed up as members. But in 2019, the Ring was brought under the management of the Department's Research Strategy Team, which put more membership management structure in place and undertook a significant recruitment and data-gathering effort in conjunction with the University's alumni relations department. We have also increased the frequency of communication with alumni and also set up a Ring Forum at the end of 2020, an online discussion venue for peer-to-peer discussions, which has around 1,000 members. Ring membership has more than doubled in the last two years. It continues to rise and is now over 2,000 members.

The annual Ring Dinner in 2020 had to be postponed because of the pandemic, However, for the first time we ran an alumni event – The Antiques Code Show (https://www.cst.cam.ac.uk/news/antiques-code-show) – in September 2021. This was a webinar that interspersed pre-recorded content with live contributions. Run as part of the University's Alumni Festival, it was attended by over 200 guests and generated some very positive feedback. The Research Strategy Team is now discussing ideas for the next alumni event in September 2022.

The 'Hall of Fame'

The annual Cambridge Ring 'Hall of Fame' awards are given in four categories: the company and the product of the year (from among the almost 300 companies started by staff and/or graduates of the Department); the publication of the year (from among those produced by members of the Department); and the Better Future Award (to recognise those who have made significant contributions to humanity through technology).

The awards are normally presented at the annual Ring dinner, but this had to be cancelled because of Covid restrictions. Instead, award presentations were made by video and shared with Ring members via the Department's YouTube channel:
https://www.youtube.com/watch?v=1_2l0IBF4IE&list=PLstyePOvf2d3KtHVjPis4vobPkOsXrQMx

We are hoping to be able to hold a Ring dinner in April 2022.

Wheeler Lecture

The annual Wheeler Lecture is held in memory of Professor David Wheeler, one of the pioneers of Computer Science. The lecture in May 2021 (the 10th Wheeler Lecture) was given by Professor Daniela Rus, Director of the Computer Science and Artificial Intelligence Laboratory at MIT. The lecture was entitled "Reimagining Robots". The Wheeler Lecture is usually delivered in person but, as in 2020, it was held online. It attracted over 300 attendees.

Prof Rus is the Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science at MIT, and Deputy Dean of Research in the Schwarzman College of Computing at MIT. Her research interests are in robotics, mobile computing, and data science. Prof Rus is a Class of 2002 MacArthur Fellow, a fellow of ACM, AAAI and IEEE, and a member of the National Academy of Engineering, and the American Academy for Arts and Science. She earned her PhD in Computer Science from Cornell University.

Research Showcase: Healthcare

Using body sound recordings to train computer models to predict Covid-19, and employing AI techniques in the quest to improve cancer treatment, were among the projects discussed at our first ever Research Showcase in 2021. The event – comprising a series of lightning talks by early-career researchers in this Department – was run by the Research Strategy Team to raise awareness of the healthcare-related research being conducted here. The showcase attracted a range of attendees on the day, while the recording of it subsequently gained over 250 views on the Department's YouTube channel. And we were delighted when the Raspberry Pi magazine Hello World approached all the researchers who spoke at the event and asked them to contribute to a feature in its October 2021 issue (https://helloworld.raspberrypi.org/issues/17?fbclid=IwAR00czXqk-DlyRV41NE4LxhhZVSIdLXLCV-AS5eBsloMnomAtEAw67HsvcU).

RESEARCH

The Department continues to produce world-leading research and this is at the heart of the Department's activities. https://www.cst.cam.ac.uk/research. Research grant income in the last financial year was £11,495,563.00.

A selection of Research Grants received between October 2020 and September 2021 include:

- **Dr Cengiz Oztireli** – UKRI Future Leaders' Fellowship: Scene Processing with Machine Learnable and Semantically Parametrized Scene Representations
- **Dr Amanda Prorok** – ERC Starting Grant: Scalable Co-Optimization of Collective Robotic Mobility and the Artificial Environment
- **Dr Alice Hutchings** – ERC Starting Grant: Interdisciplinary Cybercrime Project
- **Dr Neel Krishnaswami** – ERC Consolidator Grant: Foundations of Type Inference for Modern Programming Languages
- **Dr Anil Madhavapeddy and Prof. Srinivasan Keshav** – Tezos Foundation: Cambridge Centre for Carbon Credits
- **Dr Timothy Jones** – EPSRC: CAPCELERATE–Capabilities for Heterogeneous Accelerators
- **Professor Neil Lawrence** – McGovern Foundation: Establishing a Centre of Excellence for Data Trust Projects
- **Professor Alastair Beresford** – Raspberry Pi Foundation: Raspberry Pi Computing Education Research Centre
- **Professor John Crowcroft** – Alan Turing Institute: Trustworthy Digital Infrastructure for Identity Systems
- **Professor Pietro Lio** – GSK: Learning the Next Generation of Drug Targets by Modelling Diseases, Targets and their Relationships
- **Dr Cengiz Oztireli** – Ceres Agri-Tech: Autonomous Black-Grass Detection

DONATIONS

A selection of donations received between October 2020 - September 2021 include:

Huszár, Dr Ferenc, **Twitter**, Twitter Scholarships in Machine Learning, £450,000.00
Vlachos, Dr Andreas, **Huawei Technologies Co Ltd**, Dialogue AI Systems Programme, £150,000.00
Mullins, Dr Robert, **Gavin Ferris**, LowRisc Project – Developing Open Source Hardware, £100,000.00
Crowcroft, Prof Jon, **Microsoft Research Ltd**, Microsoft Cloud Computer Research Centre. £131,071.70

TEACHING

Undergraduate Teaching
A total of 122 Part IA students were admitted in Michaelmas Term 2021. This is an increase of 8 students on 2020 and close to the Department's numbers target of 120. The numbers break down into 65.8% home students, 3.3% of whom are EU students, and 30 international students which represents a large increase in home students and a dramatic fall in EU students. The percentage of Non-EU has increased by just a small amount. The percentage of female students is 22%. Numbers management continues to be in place for 2022 as applications continue to rise.

Undergraduate teaching was almost entirely on-line for the year and whilst we are happy to be able to offer in-person teaching again, we have learned from this experience. The 2021 Tripos examinations were once again held online using Moodle and were 'open book' exams. In 2020 only Part II students were classed and a safety net was applied ensuring that no Part II students received a class lower than that achieved in Part IB. All students were classed for 2021. There was no safety net applied to adjust marks but all Part IA and IB students were allowed to progress to the next academic year regardless of results, providing they had attempted the examinations.

The classing boundaries were set at the percentages shown below. Class distribution has now returned to normal and reflects the expected boundaries as set out in the Department's Marking and Classing

document, allowing for examiner discretion.

Marking and Classing Expected distribution		2019 Part II results Final Distribution		2020 Part II results Final Distribution with safety net applied		2021 Part II results Final Distribution	
I	40%	II.1	40%	I	40%	I	41%
II.1	50%	II.2	49%	II.1	48%	II.1	50%
II.2	7.5%	III	9%	II.2	9%	II.2	7%
III	2.5%	III	2%	III	3%	III	2%

Postgraduate Teaching

The MPhil in Advanced Computer Science continued to run smoothly throughout 2020/21. We were able to teach mostly in person in the Michaelmas Term, and then moved everything online due to lockdowns. This time around we could capitalise on the experience of online teaching from the end of the academic year before, so the transition was smooth and anticipated: the supervision of the projects and the examination process moved online without any difficulties. We were very pleased to receive the External Examiner's positive comment that he was extremely impressed with the diligent and professional way the examination process had been conducted.

Application numbers for the MPhil remained very strong and 34 students started the course in October 2021. We also have another 52 PhD admissions in 2021-22.

OUTREACH

The Department participated in the University Open Days in July 2021 (which this year were run virtually). We offered visitors a pre-recorded talk giving an overview of the Tripos and the application process for Computer Science. There was also a sample lecture and the chance to ask questions about studying Computer Science at Cambridge, which was in the form of a live webinar offered by Dr Timothy Jones and Dr Jamie Vicary. We also participated in the University virtual Open Days in September, with the Q&A session through a text-based message system with Professor Frank Stajano and Dr Jamie Vicary.

As usual, the Department also took part in the Sutton Trust Summer School, aimed at widening participation in higher education for state-school pupils. Like last year, the event was run virtually. Over the course of the week, the 38 students had a series of live online lectures on topics ranging from algorithms to computer architecture, coding challenges to tackle and talks about research from a variety of members of the Department. They also took part in a supervision and had a Q&A session with current students.

The Postgraduate Education Office participated in the annual Postgraduate Studies Open Day in November 2020. The Department offered course talks from the Deputy Head of Department, Professor Cecilia Mascolo, and the Director or Postgraduate Education, Professor Mateja Jamnik. The sessions were pre-recorded and included a Q&A session using questions elicited from prospective students, a virtual tour of the facilities and a live session with current students. The Postgraduate Education Office also hosted a live mini-conference of research students' work using an event streaming platform. Applicants with offers for admission to the PhD programme were invited to attend.

Professor Ann Copestake
Head of Department, November 2021