



## **SICSA Annual Report 2013 - 2014**

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## **1. Executive Summary**

The reporting period 2013-14 has been another strong year for SICSA and one which has seen a number of important new developments. The pool has maintained a lively calendar of events and activities, primarily supported through the SICSA Research Themes and the SICSA Graduate Academy. SICSA has acted pro-actively to changing priorities within Computing Science by creating new short-term research themes; fostering new, collaborative communities within emerging topics. The SICSA Knowledge Exchange programmes (via the restored SFC funding) have begun to develop momentum; as have the SICSA Postdoctoral and Early Career Researcher Exchanges (PECE) and Pools Engagement in European Research Support (PEER) programmes. The SICSA Directors, alongside the SICSA Committee, continue to work towards a sustainable future for SICSA and a proposal for a second phase of SICSA (beyond July 2015) was submitted in summer 2014 and recently agreed by SFC.

SICSA has adapted to a changing research and funding landscape by creating opportunities for researchers working in emerging areas and encouraging new research collaborations. This has been achieved by investing further funds into short-themes and focus topics. During the reporting period 2013-14, SICSA initiated two short research themes – “Future Cities” and “Data Science”; as well as investing a further £12.5K into the already established research themes for the development of 4 focus topics. This investment has resulted in new communities being formed among Scottish-based researchers as well as a number of collaborative funding proposals. SICSA will continue to adapt as it moves towards a new phase, with budgets allocated for further short themes in the future.

The SICSA Graduate Academy continues to support Scottish Computing PhD students through a lively programme of events. Among those, the SICSA PhD Conference continues to develop as a forum for Postgraduate students from all parts of the country and all levels of study to come together to network and share ideas. The event has risen in popularity year-on-year and in 2014 it sold out in 3 days, with over 160 attending in June 2014 at the University of St Andrews. The SICSA Distinguished Visitor programme has brought 8 prestigious international academics to Scotland in 2013-14, generating long-lasting relationships and collaborative academic outputs. The SICSA Summer Schools and Sponsored Conferences programmes also continue to enable the organisation of high-level academic events within Scotland. SICSA PhD Studentship funding is now fully allocated and no further studentships were awarded during the reporting period. A number of SICSA Prize PhD Students graduated in 2013-14, in all cases gaining employment immediately after graduation. Around half of the graduates stayed within Scotland, with others going abroad to take up positions in industry or academia. The SICSA Directors are continuing to explore possibilities for further PhD Studentship funding as SICSA moves toward a new phase in 2015. The SICSA Executive will also explore the development of a SICSA PhD Alumni group, in order to maintain engagement with graduates.

SICSA played a significant role in the successful bid for The Data Lab Innovation Centre and in the coming months the SICSA Directors will be working closely with this and the other relevant Innovation Centres (e.g. Digital Health Institute, Centre of Excellence for Sensor and Imaging Systems) to guarantee robust linkages and a clear strategy for engagement. Both Iadh Ounis (SICSA Director for KE/Deputy SICSA Director) and Ian Miguel (SICSA Graduate Academy Director) are represented on the Board of The Data Lab. During the reporting period, the SICSA Knowledge Exchange Programmes (via SFC restored funding) have gained momentum and the regular calls have attracted significant interest from SICSA academics and research students. Alongside this, the PECE programme has been extremely well subscribed, with 90% of funding now being allocated to high quality applicants. It is clear from post-exchange reports that this programme is facilitating long-term relationships between Scottish-based academics and those based elsewhere. Despite an initial slow response to the PEER programme, the volume of good quality applications is now beginning to increase – something that is expected to continue with the imminent release of further Horizon 2020 calls in ICT.

It is important that SICSA continues to have influence on Scottish Computing Science education at a time where there are some fundamental challenges present in this area. At the beginning of 2013-14, Dr Karen Petrie of the University of Dundee replaced Professor Greg Michaelson (Heriot-Watt University) as SICSA Director of Education. Dr Petrie ensures SICSA influence in wider education policy by sitting on the boards for both the Skills Development Scotland ICT Investment Plan Implementation Group and the Advanced Higher Qualification Development Team. Dr Petrie also works closely with all SICSA institutions and appropriate external parties on related matters. The SICSA Education group sponsored a number of events in 2013-14; as well as initiating two new Education short-themes – “Towards a Continuum in School to University Computing Education” and “Recruiting and Supporting Women in Computing”. Both themes will kick-off during 2014-15.

All SICSA staff appointments have now been made, with a number of minor changes occurring in the reporting period as explained in Point. 7.1. A high number of SICSA staff appointees continued to engage closely with SICSA during 2013-14; from organising SICSA sponsored events; to leading Research Themes; and in one case to membership on the Board of Directors. SICSA staff appointees have demonstrated evidence of developing collaborations, both within academia and with industrial or public sector partners, which in a number of cases has led to collaborative paper submissions and grant proposals.

The SICSA Committee have continued to develop plans for a sustainable future for the Research Pool beyond the current phase, which ends in July 2015. It is a testament to the perceived success of SICSA among the community that all of the current member institutions have agreed to provide cash contributions towards SICSA from August 2015 onwards to support its future continuation. Further to this, SICSA will be supported by significant contributions in time from academics belonging to member institutions (estimated at £155K per annum); as well as cash contributions of £150K per annum agreed from SFC. The SICSA Directors are continuing to work with SFC and the SICSA Committee to ensure a clear strategy and objectives for the period 2015-2020.

## **2. Future Sustainability**

The SICSA Committee unanimously agreed in 2013 that SICSA Research Pool has been a success and that it should continue beyond the initial funding period. Since then the SICSA Committee has developed a sustainable funding model, which will ensure the continuation of SICSA for at least 5 more years. All 14 of the current SICSA member institutions have agreed to contribute matched funds towards the continuation of SICSA for the next 5 years (£6K per institution, per annum). As such, from August 2015 SICSA will receive cash contributions of approximately £84K per annum from the 14 institutions, credited to the lead HEI (expected to be the University of Glasgow). Further to this, the member institutions will contribute approximately £155K per annum of in-kind contributions. For the most part, this will consist of contributions in academics' time for SICSA Directorial duties and Research Theme Leadership – a full breakdown can be found in the original proposal. Alongside this, SICSA will receive a further £150K cash contribution per annum from SFC, beginning in August 2015. A detailed proposal for the next phase of SICSA was submitted to SFC in July 2014, which has recently been agreed.

The SICSA Directors, along with the SICSA Committee will work closely with SFC during 2014-15 to develop a robust and sustainable strategy for the second phase of SICSA. Alongside this, a new set of Key Performance Indicators will be developed and mechanisms for reporting reviewed.

## **3. SICSA Research Themes**

During the reporting period there were a number of important developments around the SICSA research themes. As reported last year, the SICSA Directors are keen to continue to support new research directions and collaborations between Scottish Computing Science researchers and to establish new activities in emerging areas; and as a result of this SICSA launched the "Future Cities" research theme in August 2013, led by Dr Matthew Chalmers (University of Glasgow).

At this time, the Directors also agreed to increase funding within the established research themes in order to support focussed activities in other specific areas. These received varied amounts of funding totalling approximately £12.5K. The focus areas included:

- Practical Type Theory: new generation of programming languages for safety, security, and performance; led by Neil Ghani (Strathclyde), Kevin Hammond (St Andrews), Katya Komendantskaya (Dundee)
- CoCo: Communication-Based Computation; led by Simon Gay (Glasgow), Phil Wadler (Edinburgh)
- Technology for Health and Well-Being (THAW); led by Lynne Baillie (GCU), Marilyn McGee-Lennon (Strathclyde)
- Bounded Rationality: Computational and Behavioural Aspects; led by Alan Bundy (Edinburgh), Subramanian Ramamoorthy (Edinburgh), Rahul Santhanam (Edinburgh)
- Argumentation; led by Katarzyna Budznska (Dundee), Mark Snaith (Dundee)

Furthermore, in synergy with the Data Lab Innovation Centre, there was a further open call in early 2014 for a new SICSA Data Science Research Theme, with £4K of funding available for 12 months activity. The new theme was launched in summer 2014 and it is led by Professor David W. Corne (Heriot-Watt University) and Dr Amos Storkey (University of Edinburgh).

Each of the SICSA research themes has actively continued to support and organise a variety of events, ranging from research group meetings; workshops and seminars; and in the case of the HCI theme, a Doctoral Consortium linked to the SICSA PhD Conference.

During 2013-14 there were 53 events which were either primarily organised by and/or funded by the SICSA research themes. A summary of all research theme related events during 2013-14 can be found in Appendix III (SICSA KPIs).

A summary of the main activities and developments during the reporting period within each theme follows.

### 3.1. Complex Systems Engineering

The Complex Systems Engineering research theme continues to be led by Professors John McCall (RGU) and Neil Ghani (University of Strathclyde) and activity has remained steady throughout the reporting period. There were a number of events during the period that have historically received strong support from the research theme including the Self-organising, Emergent, Autonomous, Biologically Inspired Systems (SEABIS) meeting held in September 2013; the Scottish Programming Languages Seminars (SPLS) in October 2013 and February 2014; and the Scottish Category Theory Seminar (SCOCATS) in November 2013.

Highlights during the year for the theme included:

1. A seven-week Course on Dependently Typed Metaprogramming held at the School of Informatics, University of Edinburgh from 14 November 2013 until 3 April 2014. The course lecturer was Conor McBride from the Mathematically Structured Programming Group of the University of Strathclyde. Local organizers were Danel Ahman and Sam Lindley.

The course was run over seven Thursdays, each of which consisted of two one-hour lectures and a one-hour lab session.

There were 27 participants with the following affiliations:

- University of Edinburgh: 16
- University of Strathclyde: 5
- University of Dundee: 2
- Heriot Watt University: 2
- Industrial: 2

2. Sponsorship towards the European LLVM Compiler Conference 2014, which took place from 7th-8th April 2014 at the University of Edinburgh. The EuroLLVM conference serves as a venue to discuss recent innovations and hot topics around the LLVM project. It attracted over 200 attendees from industry, academia, and the open-source community from Europe, the US, and Asia. The conference programme included two keynote speeches, fourteen technical presentations in two parallel tracks, two hands-on tutorials, ten lightning talks and a poster session. SICSA funding made it possible for 9 Scottish PhD students to attend the conference without registration or accommodation fees. The funded participants were:

- Stephen Kyle, University of Edinburgh
- Kiran Chandramohan, University of Edinburgh
- Evgenij Belikov, Heriot-Watt University
- Harry Wagstaff, University of Edinburgh
- Tom Spink, University of Edinburgh
- Turkey Alsalkini, Heriot-Watt University
- Muhannad Hijaze, Heriot-Watt University
- Yuan Wen, University of Edinburgh
- Malak Aljabri, University of Glasgow

3. Sponsorship of the 1st Workshop on Parallel Quantum Computing, which took place on 8<sup>th</sup> September 2014 at the University of Edinburgh. The workshop was held in conjunction with the 22nd International Conference on Parallel Architectures and Compiler Techniques (PACT 2013), which was

separately sponsored by the SICSA Conferences programme. This was the first workshop focusing on parallel quantum computing, a very specific subfield of quantum computing. As such the main goal was to bring together scientists from all over the world working on all the aspects of parallel quantum computing. This succeeded and the workshop had altogether 12 speakers from 11 institutions and the total number of participants was around 25.

The newly developed mini-themes also stimulated significant activity in the theme of Complex Systems Engineering. The theme contributed financially to activities in the areas of Practical type Theory; Communication based Communication; Technology for Health and Well-Being and Bounded Rationality – all of which are discussed separately in section 3.7.

### **3.2. Human-Computer Interaction**

During the reporting period, the SICSA Committee decided to retitle “Multimodal Interaction” to “Human-Computer Interaction”. It was felt that the title change would promote greater involvement and engagement with the theme from those groups that may have previously felt that their areas of research lay outside the theme. The theme continued to be led by Professor Stephen Brewster of the University of Glasgow, with assistance up to 31 August 2014 of Dr Per Ola Kristensson of the University of St Andrews.

The theme was particularly active during the reporting period, supporting the organisation of and sponsoring seven events across a variety of SICSA institutions. As with some other themes, there were a number of theme sponsored events in this area that have traditionally been funded by the theme – these included the Doctoral Consortium in June 2014 (linked to the SICSA PhD Conference); the annual theme all-hands meeting also in June 2014 and the CHI papers presentation, held in April 2014 before the ACM CHI Conference on Human Factors in Computing Systems, the premier international conference of Human-Computer Interaction. The SICSA CHI presentation event was first held in 2013 and it provides the Scottish HCI community with a platform to come together to discuss CHI papers and to network with colleagues ahead of the conference. It is worthy of note that a proportionally high number of Scotland-based HCI academics presented at the CHI Conference in 2014.

Other highlights for the HCI theme included:

1. Sponsorship of the Speech Technology and Human Computer Interaction Workshop, held on 27<sup>th</sup> March 2014 at the University of Edinburgh. This workshop aimed to harness the expertise in Scotland, the UK and Europe by bringing together researchers, students, practitioners and technologists from diverse fields (psychologists, linguistics, computer scientists, HCI researchers) from academia and industry to explore the nature of speech-based human-computer interactions and opportunities for cross disciplinary collaboration on mutual challenges. The workshop was a lively event with 48 attendees from all the main engineering departments in Scotland as well as researchers from York, Northumbria, Trinity College Dublin, and the Centre of User Experience Research in Leuven. Keynotes were Per Ola Kristensson from University of St. Andrews, who has considerable experience of using speech technology in his HCI work (and co-led the HCI theme in 2013-14); Russell Beale, from the University of Birmingham, who presented a usability and design view of speech technology; Steve Renals from the University of Edinburgh, with over 25 years-experience with speech technology, who gave a summary on what he saw as the main challenges for speech technology in the field human computer interaction; and Holly Branigan, from the University of Edinburgh, who presented a psychological perspective of speech technology and computer interaction.

2. The Designing and Interacting with Spatial Information in the Wild workshop, held on 28<sup>th</sup> March 2014 at the University of Edinburgh. This workshop aimed to provide an opportunity for researchers within SICSA to come together to discuss and define this area and the research challenges that it poses. The workshop was extremely well subscribed, with 38 attendees from 7 SICSA institutions as

well as colleagues from University of Birmingham and Trinity College, Dublin. This workshop facilitated discussions across not only the HCI community in Scotland but also in other disciplines such as Psychology, Speech Technology, Big Data Analytics, Mobile Sensing, NLP, Computer Vision, Art, Design and Geography/Geosciences.

Similarly to other themes, the HCI theme contributed funds towards the new mini-themes – specifically to Technology for Health and Wellbeing and Argumentation, which will be discussed separately in 3.7.

### **3.3. Next Generation Internet and Cyber-Security**

After a number of years of being led by Professor Saleem Bhatti of the University of St Andrews, the Next Generation Internet theme leadership passed to Dr Marwan Fayed of the University of Stirling in August 2013. As theme leader for NGI, Dr Fayed also assumed responsibility for stewardship of the Cyber-Security sub-theme, with Dr Martin Beaton (BDE, Informatics Ventures) continuing to act as the SICSA link to businesses and public sector organisations with concerns in this area. Activity within the NGI and Cyber-Security themes remained steady during the reporting period, although the SICSA Directors recognise that work needs to be done to stimulate further collaborations in both Cyber-Security and NGI in the next Academic Year.

The bulk of Cyber-Security sub-theme funding during the reporting period was used to support the regular Cyber-Security meet-ups, which aim to bring Scotland-based researchers working in this area to discuss current research and developments. The sub-theme also supported the 4th International Conference on Cybercrime, Security and Digital Forensics, held in June 2014 at the University of Strathclyde. Keynote presentations at the conference were led by Scott Ainslie, Global Technology Services, IBM Australia; and Dr Barry Cartwright, of the Simon Fraser University, Vancouver, Canada.

The NGI theme continued to fund the SCOTTish Networking Events (SCONE), which brings together Scotland-based researchers working in Networking. The theme also sponsored the International Semantic Web Applications and Tools for the Life Sciences (SWAT4LS) event held in December 2013 at the Royal Society of Edinburgh and University of Edinburgh. SWAT4LS is an international workshop series which provides researchers with the opportunity to meet and present high-quality research results and demos from all fields of Semantic Web Technologies in life sciences. To place emphasis on the practical use of Semantic Web Technologies in Life Sciences, the event features a two day hackathon featuring data-sets on clinical breast cancer trials and adverse event data. The workshop was a great success, with over 70 delegates. SICSA sponsorship made it possible for 10 PhD students to attend the event free of charge.

Alongside these activities, the theme also supported mini-theme activities in the areas of Communication Based Computation and Practical Type Theory, discussed in 3.7.

### **3.4. Modelling and Abstraction**

The SICSA Modelling & Abstraction theme continues to be led by Dr Carron Shankland of the University of Stirling. Deputy theme leaders are Dr Gethin Norman of the University of Glasgow and Dr Matthias Hennig of the University of Edinburgh. The theme continued to support a range of activities and cooperated with a number of the other research themes during the year on several multi-disciplinary workshops.

In May 2014 the theme sponsored the inaugural meeting of the Scottish Mathematical Biology Network. The meeting represented an opportunity for the academics involved in modelling (both mathematical and computer-oriented) to meet and to discuss the potential for joint grant applications. Feedback from the meeting pointed to a possibility of an application for a large programme or platform grant, possibly led by the University Stirling. There was also a broad agreement that a similar meeting should be organized next year. The keynote lecture was given by Dr Philippa Hemmings and Dr Mike

Ward from EPSRC. They presented the EPSRC policy on funding research in the area of Mathematical Biology and reviewed current and future funding opportunities.

The theme also continues to support events specifically centred on women in computing, sponsoring a second Women in Computing networking event in February 2014 at Glasgow Caledonian University. Unlike the 2013 event, this year's meeting was open to all women involved in computing, not only professorial staff. There were 23 participants, representing 9 institutions. The meeting began with a talk by Professor Pamela Gillies, the principal and vice-chancellor of Glasgow Caledonian University. Pamela had some very wise words to impart on the importance of developing the careers of women in academia. She was well placed to talk about this as GCU have improved their balance of female:male in the Professoriate to 34% (well above the national average of 21%).

The rest of the meeting was focussed around two talks on research strategy. Professor Muffy Calder of the University of Glasgow spoke about the path she had taken to become Chief Scientific Advisor to the Scottish Government. Muffy described how her research interests had evolved over time, although research with impact, in terms of applying computing science to problems of societal value, has been a constant theme. After a networking break, Professor Lynne Baillie, director of the Interactive and Trustworthy Technologies Research Group at Glasgow Caledonian University, explored institutional strategy with a forward look to REF 2020. As discussed in Section 6. (Education), SICSA will be allocating specific funding in 2014-15 towards an Education Short-Theme around Recruiting and Supporting Women in Computing.

In May 2014, the theme co-sponsored (along with Complex Systems Engineering) a workshop on Deep Learning at the University of Edinburgh. This workshop was designed to be a benefit to those currently utilising or developing Deep Learning methods; those wanting to know what can be done and understand some of the practical issues; and those in early stage businesses who wish to harness this exciting technology. The workshop was exceptionally well attended, bringing together 170 participants from 10 SICSA institutions. One specific idea arising from this event was the potential organisation of a SICSA wide data analytics competition that will require deep learning techniques. This will allow collaborative teams to form to enable SICSA members who are new to this area to begin to get some practical experience using these methods, with some forum based feedback. Discussion is currently continuing about how best to progress this idea; and other future events in this area.

Alongside the above activities the theme also contributed funds towards the Practical Type Theory; Communication-based-Computation; Bounded Rationality; and Argumentation mini-themes which are discussed in 3.7.

### **3.5. Future Cities**

The SICSA Future Cities theme was officially launched in August 2013 and has been led by Dr Matthew Chalmers of the University of Glasgow. The theme was established after the SICSA Directors recognised a need to establish mutual awareness of skills and priorities, connect research activities in SICSA to the Future Cities work already being implemented in UK urban areas and beyond, and initiate applications for funding of longer-term research in this growing area. The theme was granted £4K of funding for the Academic Year 2013-14, with which it delivered 3 workshops held in Glasgow, Edinburgh and Dundee. The first workshop, held in January 2014, brought together 38 academics and stakeholders to network and discuss diverse areas within this broad field of research such as extending traditional software infrastructures and information retrieval approaches to city settings; artistic and community-led approaches to urban data systems; and urban applications of small-scale sensors and sensor-based interaction techniques.

The second workshop was more focussed and consisted of speakers giving presentations on future cities challenges as seen by local authorities, and representatives of government agencies. The afternoon featured four parallel breakout sessions.

Speakers included:

- Chris Dibben (Director, ESRC Administrative Data Research Centre)
- Andy Kerr (Director, Edinburgh Centre for Carbon Innovation)
- Sally Kerr (Digital Services Manager, City of Edinburgh)
- Andrew Unsworth (Smart Cities & Communities Programme Manager, Scottish Government)
- Paul Carroll (Performance & Improvement Manager, Dundee City Council)
- Richard Bellingham (Director, Institute for Future Cities)

The third workshop was held in Dundee and focused on the potential of bottom-up citizen led initiatives to support 'Future City' challenges, such as democracy, engagement, accessibility and with relevance to developments such as citizen science. There were 24 participants, ranging from Professorial to PhD students; the majority being from SICSA at the Universities of Glasgow, Edinburgh, Dundee, Strathclyde and Aberdeen. Disciplines of HCI, Computer Science, Psychology and Design were represented as well as external agencies such as NESTA, NESTA code fellows and SMEs.

Given the broad interest and the scope for funding of longer-term research in this area the SICSA Directors have agreed to extend theme funding in 2014-15 to support a fourth workshop. Further to this, the SICSA Directors will be working with the Future Cities theme leader and other relevant academics to ensure that momentum continues to grow in this area.

### **3.6. Data Science**

In synergy with the Data Lab Innovation Centre, SICSA launched the Data Science theme in the summer of 2014 following an open call to academics working in this area – there were over 60 delegates at the event, demonstrating the strong interest in this area within SICSA. The SICSA Data Science theme is led by Professor David W. Corne of Heriot-Watt University and Dr Amos Storkey of the University of Edinburgh. Within SICSA, there are many groups and individuals pursuing world-class research in one or more areas of data science, covering the full spectrum from theory to application, and covering all of the enabling technologies that support current and future data science. The SICSA Directors conceived the theme with the objective of bringing academics together to link the activities and to encourage new collaborations, with the objective of helping to establish a leading portfolio of data science research, enterprise and innovation to support scientists and industry in Scotland and beyond.

To-date the theme has delivered one event – the Data Science Theme Launch, which was held in July 2014 at the University of Edinburgh. The objective of this event was to discuss three main activities: (1) characterizing data science interests and expertise across SICSA; (2) exploring some of the key application domains from which data science challenges arise; (3) exploring the current research questions in key areas of data science (e.g. machine learning, visualization, linked-data, and so on), and how SICSA researchers might work together to address them. Speakers included scientists from the British Geological Survey, the Edinburgh Institute for Astronomy, and the St Andrews School of Biology, The Data Lab, and several others from SICSA Departments.

There are 4 further workshops planned in this theme over the course of 2014-15 and progress in this area will be reported upon next year.

### **3.7. SICSA Mini-Themes (Focus Topics)**

As a result of careful financial management in previous years SICSA was able in 2013-14 to increase research theme funding by approximately £12.5K, to support a range of focussed research activities. These activities were co-funded by each of the established research themes and included the following areas:

### **3.7.1. Practical Type Theory: new generation of programming languages for safety, security, and performance; led by Neil Ghani, Kevin Hammond, Katya Komendantskava**

This mini-theme was co-funded to a maximum of £1.5K by the Complex Systems Engineering, Modelling and Abstraction and Next Generation Internet themes for a period of 12 months. The aim of this theme was to provide a focus and a sense of the common goal to all related SICSA groups, by formulating a common agenda that would bring together researchers from different research areas contributing in varied ways to taking Types to the next “practical” stage; bringing major expertise to bear on the task of identifying key interdisciplinary research directions. Both theoretical and practical importance of this area have been recognised by EPSRC, with its increased funding for the areas of Programming Languages and Compilers and Verification and Correctness. The “Practical Types” SICSA mini-theme existed in the intersection of the two.

The funds for this mini-theme were utilised for a 2 day residential workshop held 4-6 June 2014 at the Burn, Brechin, Angus. The focus of the event was to explore ways in which the use of types in functional programming languages could be made more practical. The event was jointly organised by the universities of Dundee, St Andrews and Strathclyde; but the list of attendees included participants from the Universities of Edinburgh, Stirling; and industry (Well-Typed LLP).

The workshop played a crucial role in starting joint in-depth research discussions among PhD students, early career researchers, and more senior academics from the participating universities. The talks had a free schedule, which allowed participants to hold longer discussions and question/answer sessions. In that respect, it was unlike standard-style formal workshop. It transpired that each of the participating research groups has its own unique identity, however, the discovered range of mutual research interests inspired participants to think about continuing this initial discussion with a series of further training events for PhD students and early career researchers. For this aim, the organisers created a forum page:

<https://plus.google.com/u/0/b/103531595284048628662/103531595284048628662/about>

In the long term, the organisers wish to build upon these activities, and acquire further financial support for joint PhD supervision. In particular, the workshop has already resulted in work on the following proposals:

1. Carnegie Trust Collaborative Research Grant, deadline January 2015;
2. European Training Network grant, deadline June 2015

### **3.7.2. CoCo: Communication-Based Computation; led by Simon Gay, Phil Wadler**

This area was funded to a maximum of £2K by the Complex Systems Engineering, Next Generation Internet and Modelling and Abstraction themes for a period of 12 months. The rise of communication-based computation is presenting new challenges for: programming languages and abstractions; for parallelism and communication; compilation techniques; computer architecture; algorithm design; software engineering; testing and verification. While there is a great deal of activity within SICSA in many of these areas, there was an identified need for a coherent, unified approach to the whole field. The main objective of this mini-theme was to bring together researchers with different perspectives, for mutual benefit and potential new future collaborations.

During 2013-14, the mini-theme funded one workshop held on 8 May 2014 at Cameron House, Loch Lomond. There were 30 participants at the workshop, representing 8 SICSA institutions and 2 from industry. There were 18 speakers in total. The workshop was deemed to be a success by the organisers as it brought together researchers from many different areas. Several of the talks provoked lively discussions. In particular, there was a long discussion at the end of the workshop about the possibility of establishing a set of challenge problems in order to compare different approaches to communication-based computation; and discussion is continuing about this.

The theme leaders are currently in discussion about follow-up activity, which will be reported upon next year.

### **3.7.3. Technology for Health and Well-Being (THAW); led by Lynne Baillie, Marilyn McGee-Lennon**

This area was funded to a maximum of £1.5K for a period of 12 months. The mini-theme leaders saw a clear opportunity for investing in this area in the fact that health care is currently moving from being hospital focused to being embedded in the community and in people's homes. This introduces research challenges around the use of technology and the appropriateness of technologies for the home (security, privacy, accessibility, usability and user experience) and how they can make an impact on health and wellbeing (e.g. engagement, immersion, motivation, persuasion, visualisation, self-management, behaviour modification, gamification). The primary aim of the mini-theme was to foster collaboration between SICSA institutions that would lead to innovative ideas-generation and development. A secondary aim was to raise the profile of SICSA-based research in health and wellness technology among relevant bodies such as DHI, NHS, Charities, Companies and Government.

The mini-theme held a series of events which focused on bringing together researchers working in the area of multimodal technologies for health and wellbeing in order to determine how researchers can best lead the way in identifying the grand research challenges in the area of technologies for health and wellbeing. This consisted of 3 workshops, which explored how best to define the research roadmap in this area and inform significant, timely and exciting areas of research in this area. The third workshop was supported by the British Computer Society and was held at the British Computer Society's Health Informatics Scotland Conference, which involved reaching out to the NHS and a wider computing audience.

Through these workshops, the mini-theme established a network of academics (across the UK), NHS workers, SMEs, charities and third sector agencies. The mini-theme has also attracted attendees from the Big Data, Smart Cities and Sensors themes.

### **3.7.4. Bounded Rationality: Computational and Behavioural Aspects; led by Alan Bundy, Subramanian Ramamoorthy, Rahul Santhanam**

This area was funded to a maximum of £600 by the Modelling & Abstraction and Complex Systems Engineering themes for a period of 12 months. Recent years have seen the proliferation of computer systems that perform automated decision making in complex and variable environments. Bounded rationality is a major issue for such systems - the problems being addressed are intractable in general, perfect modelling of the environment is often infeasible, and the automated systems must deal with the boundedly rational (non-optimal) behaviour of human users. There is however a lack of general computational models and corresponding analytical methods for such systems. Moreover, achieving such an understanding requires the collaboration of researchers from many sub-areas in computer science, including algorithmic game theory, robotics, security and artificial intelligence, as well as insights from other fields such as psychology and behavioural economics. The purpose of this funded mini-theme was to foster such collaboration, and to begin to build a community of researchers in Scotland with interests in bounded rationality.

The funding was used to sponsor a two-day workshop on 4 and 5 April 2014 at the University of Edinburgh's Informatics Forum. The organisers were Alan Bundy, Subramanian Ramamoorthy and Rahul Santhanam. The goal of the workshop was to get together an inter-disciplinary collection of researchers thinking about limitations of human and automated decision making. There were two invited lectures, by Professor Joseph Halpern from Cornell University and Dr Dan Goldstein from Microsoft Research and London Business School. There were also talks from various researchers at the University of Edinburgh, from Informatics, Psychology, Economics and Geosciences. As a concrete outcome from the workshop, the organisers prepared a mailing list of Scottish researchers interested in bounded rationality, with a view towards further talks and events in this area. More than

40 researchers have since subscribed to this list. A further series of talks by visiting researchers are now planned for this year on the topic, funded by the Edinburgh Multidisciplinary Multiscale Modelling initiative.

### **3.7.5. Argumentation; led by Katarzyna Budznska, Mark Snaith**

This area was funded to a maximum of £800 from the Human Computer Interaction and Modelling and Abstraction research themes for a period of 12 months. Scotland has started to establish a leading position with one of the greatest concentration of people working in this research area. In the last eighteenth months, there have been a remarkable number of new hires in Scottish groups and projects on argumentation, including 2 PhD students, 2 post-docs and 2 lecturers in Dundee, and 3 PhD students, 2 post-docs and 1 lecturer in Aberdeen. Scotland also won a bid to organise the next edition of the main conference in the field – COMMA 2014. The mini-theme leaders saw the theme as a good opportunity to help strengthen the already emerging visibility and recognition of Scotland as a coherent and leading force in computational models of argument. The mini-theme aimed to bridge the gap between argumentation studies and established areas of expertise in Scotland such as Information Extraction and Information Retrieval.

The mini-theme held 1 workshop during the reporting period (<http://www.arg-tech.org/SWAM2014/>), which took place on 9-10 July 2014 in the School of Computing in Dundee. The event attracted 14 participants from SICSA institutions (and further 3 contributors to position statements presented at the workshop), as well as 7 from non-SICSA institutions (and further 4 contributors to position statements). The participants and contributors from non-SICSA institutions included researchers from universities in Oxford, Leuven (Belgium), and Toulouse (France), as well as Open University (UK), Prometil, IRIT, University of Toulouse, INRIA Sophia Antipolis (France), and Florida Institute of Technology (US). The invited talk was given by Professor Marie-Francine Moens - the world-leading specialist in the area of argument mining.

The first day of the workshop was arranged around the short presentations from each contributor on argument mining from their own research perspective. The second day was divided into working sessions during which participants discussed and drafted a joint document on argument mining: “From Information Extraction, Information Retrieval and Computational Linguistics to Argumentation Mining”. The document will be co-authored by the contributors to the workshop and published online as a leading roadmap on the subject.

Moreover, the workshop helped to forge new or cement existing ties with the participants. Amongst many discussions on possible collaboration and joint projects, possibly the most prominent is the establishment of cooperation between Dundee and Professor Marie-Francine Moens. Budzynska, Reed and Moens plan to pursue the opportunities for a joint EU proposal in the nearest future.

## **4. Graduate Academy**

### **4.1. SICSA Prize Studentships**

As reported last year, all of the original SICSA members have now recruited their quota of SICSA Prize Students. There were 90 Ph.D. Studentships allocated across the 10 institutions that were originally awarded SICSA PhD studentship funding.

#### **4.1.1. Studentship Outputs**

During the reporting period, SICSA gathered data on outputs for the SICSA Prize Studentships, including: details of peer-reviewed journal publications; conference publications; prizes; committee membership and attendance at events. Out of those contacted for information, 51 responded. The full details of individual SICSA Prize Studentship outputs are available from SICSA upon request, but a summary of the numbers and some notable details are included below:

## **Publications**

A high number of SICSA Prize Students published either journal or conference papers during the reporting period, with 73% respondents confirming one or more publications.

Given that not all SICSA Prize Students responded to the request for data it is not possible to provide complete numbers of publications for the cohort during 2013-14, but the 51 respondents published a total of 96 peer-reviewed papers between them.

## **Prizes and Fellowships**

Bevan Jones: Japan Society for the Promotion of Science Postdoctoral Fellowship for Overseas Researchers. Awarded: July 2014. Commences: February 2015. Duration: 1 year. This is a competitive fellowship awarded through an international competition among applicants from North America and Europe wishing to conduct postdoctoral research in Japan.

Alyssa Alcorn: Prize for best HCI presentation at SICSA PhD Conference 2014. Awarded June 2014.

## **Committee Membership**

Of the 51 respondents, 35% confirmed membership with one or more organizing committees during the reporting period. A number of the students were indeed very active on committees, with some having been involved in the organization of numerous events and activities. Some of the respondents were involved directly in SICSA sponsored events, such as Research Theme sponsored events; SICSA Sponsored Conferences; The SICSA Cyber-Security Schools Lectures and SICSA Summer Schools. A number of the SICSA Prize Students were also representatives on the organizing committee for the SICSA PhD Conference 2014.

It is of note that many of the respondents who were not involved with the organization of SICSA events provided details about their participation at such events. In some cases, SICSA PhD Students participated as speakers at Research Theme workshops. SICSA PhD Students also demonstrated at the DEMOfest events in both Glasgow and Aberdeen.

## **Internships**

A small number of SICSA Prize Students (3) took part in internships during the reporting period. Of these, 2 were successful in receiving funding to take part in a SICSA Industrial Internship (via the restored funding programmes). These were:

- Paolo Pareti, University of Edinburgh: 7 month internship at the National Institute of Informatics (NII), Japan.
- Jakub Dostal, University of St Andrews: 8 month internship at Microsoft Research Cambridge, UK.

Furthermore, Krzysztof Geras (University of Edinburgh) took part in an industrial internship (not sponsored by SICSA) at Amazon Machine Learning research group in Berlin.

### **4.1.2. Studentship Graduates**

Of the 51 respondents, 8 confirmed that they graduated during the reporting period. All but 1 of the graduates gave details of their first destination after graduation and it is notable that half of them found positions within Scotland. Details of each graduate follows:

- Roman Kutlak: Research Assistant - University of Aberdeen
- Ohad Kammar: Research Associate - University of Cambridge
- Lakshitha de Silva: Scientific Officer - University of St Andrews
- David Oaken: Position unknown - CGI Glasgow
- Saray Shai: Post Doc Researcher - University of North Carolina, Chapel Hill
- Tobias Von Koch: Senior Engineer - Qualcomm Innovation Center, Inc. in Austin, Texas
- Özgür Akgün: Research Assistant - University of St Andrews

Given that many of the SICSA Prize Students are expected to graduate over the coming year, the SICSA Executive will be exploring the potential for creating a SICSA Alumni network in order to maintain close ties with previous SICSA Graduates and to further develop the community-building that has come about as a result of SICSA. It is expected that the vast majority of SICSA Prize Students will graduate in the Academic Year 2014-15.

#### **4.2. SICSA Ph.D. Conference**

The SICSA PhD Conference 2014 took place on 9th and 10th June at the University of St Andrews. The event was the 6th annual SICSA PhD Conference and this was the second time that the event has been held in St Andrews. There were approximately 160 delegates (around 130 being PhD Students) on both days and it is of note that the conference sold-out within 3 days after the opening of registration.

As in previous years, the conference was organised by a committee of PhD students and SICSA Executive staff members. The organising committee this year was chaired by Dr Dharini Balasubramaniam of the University of St Andrews.

There were 4 main themes running through the conference in 2014, which were closely aligned to the established SICSA Research Themes of: Human Computer Interaction; Modelling and Abstraction; Complex Systems Engineering; and Next Generation Internet.

Sessions in 2014 included:

- A Student Hub session
- Poster Session
- Day 1 Transferrable Skills Sessions: Presentation Skills; Networking Skills; Talking Science with Non-Scientists; Thesis Statements
- Day 2 Transferrable Skills Sessions: Funding Proposals for Academia; Skills for Industry Panel
- Defending your Research Workshops
- Student Presentations

Both the Student Hub session and the Student Presentations were new to the SICSA PhD Conference.

The conference also featured two keynote talks by Professor Mike Edmunds of Cardiff University (“The Antikythera Mechanism and the Origins of Computing”); and Professor Nitin H. Vaidya of University of Illinois at Urbana-Champaign (UIUC) (“Resilient Distributed Consensus”).

Full programme details and a show-reel video for the conference are available on the SICSA Conference Web Site – [www.sicsaconf.org](http://www.sicsaconf.org). A detailed event evaluation is also available from SICSA upon request.

#### **4.3. SICSA Funding for Summer Schools**

SICSA continues to offer funding for Computing Science Summer and Winter Schools, organised within Scotland. During the reporting period SICSA sponsored one Summer School - the SICSA Summer School on Cognitive Computation, held 25<sup>th</sup> - 30th August 2013 at the University of Stirling.

The vision of this Summer School was to empower participants with an interdisciplinary understanding of some of the key underlying methodologies, concepts and techniques in cognitive computation, and their strengths and limitations (demonstrated by a range of case studies). Participants also learned of future directions in this exciting multi-disciplinary field. Topics included: perception, action, attention, cognitive and affective learning and memory, decision making and control, social cognition, language processing and communication, reasoning, pattern recognition, problem solving, and consciousness.

The five-day programme consisted of a set of tutorial-style lectures, all delivered by experts of international standing, combined with hands-on practical sessions for constructing and working with the techniques covered in the course material. The initial sessions were served as an advanced introduction to cognitive computation, including practical sessions and a comprehensive review of the underlying interdisciplinary specifically:

- Computational modelling in neuroscience: a workshop style introduction (Dr. Bruce Graham, Stirling),
- Computational intelligence and machine learning: methods, theories and tools for solving key cognition tasks such as learning and pattern recognition (Kevin Swingler, Incite Ltd., Stirling)
- Cognitive augmentations of swarm intelligence & agent-based simulation: theory & applications (Dr. Jerry Swan, Stirling)
- Social cognition & cognitive behavioural systems: theory to applications (Dr. Alessandro Vinciarelli, Glasgow)

The subsequent sessions covered more advanced approaches to cognitive systems research and development (including emerging theories, real-world application case studies and future challenges, complemented by hands-on practical exercises):

- Informational models of 'mind' theory and practice: from computational models of consciousness to theories of information integration and intuitions about the mind and creation of mind-like state structures - case studies with an exploratory robot (Keynote Lecturer: Prof. Igor Aleksander, Imperial College)
- Reverse engineering the brain for cognitive computation: multi-scale modelling from membranes, to circuits, systems and robots - a case study with action selection in the basal ganglia (Prof. Kevin Gurney, Sheffield)
- Towards multi-modal cognitive systems: case studies on insect robotics (Prof. Barbara Webb, Edinburgh)
- Novel bayesian approaches to perception, cognition and disease: case studies using theoretical models and psychophysical experiments (Dr. Peggy Series, Edinburgh)
- Silicon/neuromorphic cognitive systems: building bridges to build brains (Prof. Leslie Smith, Stirling)
- Towards neurobiologically inspired cognitive control of complex autonomous agents and their networked systems: case studies in next-generation intelligent transportation systems and planetary exploration rovers (Prof. Amir Hussain, Dr. Erfu Yang, Stirling, and Dr. Mark Woods, Scisys Ltd.)

The School was fully-subscribed, with 40 participants in attendance. Most participants received SICSA funding to cover registration and accommodation fees and there were 7 SICSA institutions represented. Other participants came from Turkey, Denmark, Iran and Canada.

Based on the excellent feedback received from the participants, a follow-on Summer School is planned for 2014-15.

#### **4.4. SICSA Funding for Student Attendance at Summer Schools**

SICSA continued to support Scotland-based students travelling to international summer schools during 2013-14. This mechanism provides students with a maximum of £500 towards registration and accommodation for summer schools taking place both abroad and at home. The students' home institution is responsible for travel costs as part of the matched funding arrangement within SICSA.

This mechanism continues to grow in popularity among the Scottish Computer Science PhD community and during the reporting period SICSA funded a total of 16 applications for funding.

A summary of the successful applications follows:

<b>Student Name</b>	<b>Institution</b>	<b>Title of Summer School</b>	<b>Location of Summer School</b>	<b>Dates</b>
Evgenij Belikov	Heriot-Watt	Applied Functional Programming in Haskell (AFPH)	Utrecht, Netherlands	19 - 30 August 2013
Cristina-Adriana Alexandru	Edinburgh	DemAAL Summer School on Ambient Assistive Living	Crete, Greece	16-20 Sept 13
Zhegnshuai Lin (Howard)	Edinburgh	DemAAL Summer School on Ambient Assistive Living	Crete, Greece	16-20 Sept 13
Hadi Daneshvar	Edinburgh	DemAAL Summer School on Ambient Assistive Living	Crete, Greece	16-20 Sept 13
Ruby Valverde Ibanez	Heriot Watt	Social Human-Robot Interaction	Cambridge, UK	26-30 Aug 13
Daniel Franzen	Edinburgh	The International School on Foundations of Security Analysis and Design (FOSAD)	Bertinoro, Italy	2-7 Sept 13
Severin Fichtl	Aberdeen	The European Xperience Project	Mallorca, Spain	2-5 Oct 13
Robbie Simpson	Glasgow	Bar-Ilan Winter School on Cryptography	Tel-Aviv, Israel	27 - 30 Jan 14
Theodoros Kapourniotis	Edinburgh	Quantum Games and Protocols	Berkley, USA	24-28 Feb 14
Shimin Feng	Glasgow	Gaussian Process Winter School	Sheffield, UK	13-16 Jan 14
Eshrag Refaee	Heriot Watt	7th GATE Training Course: Mining social media content with GATE	University of Sheffield	9 - 13 June 2014
Li Sun (Kevin)	Glasgow	VISION Understanding and Machine Intelligence (Visum)	University of Porto, Portugal	3 - 10 July 2014
Punyanuch Borwarnginn	Edinburgh	The 10th Annual LearnLab Summer School	Carnegie Mellon University, Pittsburgh, PA, USA	16 - 20 June 2014
Haocheng Shen	Dundee	BMVA Computer Vision Summer School	University of Swansea	30 June to 4 July 2014
Aamir Khan	Glasgow	VISION Understanding and Machine Intelligence (Visum)	University of Porto, Portugal	3 - 10 July 2014
Sergio Elizondo	Edinburgh	UKERC International Energy Summer School 2014	Warwick, UK	6 - 11 July 2014

#### **4.5. SICSA Sponsored International Conferences**

SICSA offers organisers of international conferences to be hosted within Scotland the opportunity to apply for SICSA sponsorship for such events. SICSA sponsorship brings a range of benefits for conference organisers, including: marketing support; support for proposal-writing if required; and significant funding towards the event itself. The primary SICSA-wide benefit of this initiative is to attract international Computer Science conferences to Scotland. A secondary benefit is that in return for SICSA sponsorship, organisers provide fully funded places for Scottish PhD students – exposing SICSA researchers to events that they might not otherwise have had the opportunity to attend.

During the reporting period there were 5 SICSA sponsored conferences, out of a total of 6 applied for. The only unsuccessful applicant (EUROLLVM 2014) received funding of £700 from the SICSA Complex Systems Engineering theme.

Those successful conferences in 2013-14 were:

<b>Title of Conference Sponsored</b>	<b>Venue</b>	<b>Dates</b>
International Conference on Intelligent Virtual agents (IVA) 2013	University of Edinburgh	29-31 Aug 2013
The 22nd International Conference on Parallel Architecture and Compilation Techniques (PACT 2013)	University of Edinburgh	7-11 September 2013
ACM ITS 2013 and UIST 2013	University of St Andrews	6-11 October 2013
ACM International Conference on Multimedia Retrieval (ICMR)	University of Glasgow	1-4 April 2014
4th International Conference on Cybercrime, Security and Digital Forensics	University of Strathclyde	23-24 June 2014

Full reports for all SICSA Sponsored Conferences can be found at <http://www.sicsa.ac.uk/about-us/reports/>.

#### **4.6. Distinguished Visitor Fellowships (DVF)**

##### **4.6.1 Distinguished Visitor Fellowships in 2013-14**

The SICSA Distinguished Fellowship programme has continued to attract academic talent from around the world to Scotland and there were 8 visitors during the reporting period 2013-14, as follows:

<b>Visitor</b>	<b>Home Institution</b>	<b>Host Institution</b>	<b>Visit Duration</b>
Jonathan Seldin	University of Lethbridge, Canada	Heriot-Watt University	1 week
Aravind Joshi	University of Pennsylvania, USA	University of Edinburgh	1 week
Andy Gill	The University of Kansas, USA	University of Strathclyde	1 week
John Soldatos	Athens Information Technology, Greece	University of Glasgow	2 weeks
John Bass	University of Tasmania	University of St Andrews	2 weeks
Adriana Compagnoni	Stevens Institute of Technology	University of Edinburgh	2 weeks
Stuart Shieber	Harvard University	University of Aberdeen	3 weeks
Ryan R Newton	Indiana University	University of Glasgow	10 days

In all cases, SICSA Distinguished Visitors were involved in events at sites outside of the host institutions, and there were a total of 23 events associated with Distinguished Visitors across Scotland during the reporting period 2013-14, as detailed in Appendix III (SICSA KPIs).

Full and detailed individual reports for the Distinguished Visitor Fellowships are available from SICSA upon request.

##### **4.6.2 Continuing collaboration among hosts and previous Distinguished Visitors**

During the reporting period the SICSA Executive continued to collect follow-up information from previous Distinguished Visitor hosts in order to demonstrate any long term outcomes/outputs that occurred as a result of the SICSA funded fellowship.

During the period 2013-14 a total of 20 previous hosts were contacted to provide follow-up information on their DVF. As a rule, only those that were not previously contacted in the last review (reported upon in 2012-13) and only those whose visit took place longer than 9 months previously were contacted. Hosts were questioned about continuing collaboration with the visitor and were asked to provide information about:

- Collaborative funding bids that may have occurred as a result of the Fellowship
- Collaborative publications that may have occurred as a result of the Fellowship
- Reciprocal visits
- Continued contact and further collaborative work that might not yet have led to funding bids or publications

65% of those previous hosts contacted responded with information.

Of those:

- 38% have submitted or are due to submit a collaborative funding bid with their visitor.
- 61% have collaborated on publications with their visitor since the visit took place.
- 30% have participated in at least one reciprocal visit.
- 23% have participated in collaborative work not covered under the above categories.
- 92% commented that the fellowship had other benefits. For example, hosts commented that the scheme had helped them to build long-term links with the visitor and their research group. Another commented that the scheme had provided Scottish students and researchers with exposure to the work of a specific researcher, where otherwise they may not have had a chance.

In the case of John Stasko, the host (Professor Aaron Quigley) commented that John has now become a visiting Professor at the University of St Andrews. Furthermore another previous visitor, John Soldatos, is now a Senior Visiting Research Fellow at the University of Glasgow.

The SICSA Administration will continue to collect data for more recent visits during the current Academic Year and report on these again in the next Annual Report.

## **5. Knowledge Exchange Activities**

### **5.1. Pools Engagement in European Research (PEER) Funding**

#### **5.1.1. Report on use of funding (funds allocated 2011-12; 2012-13; 2013-14)**

As detailed in the previous SICSA Annual Report (2012-13) the SICSA Directors predicted a significant increase in proposals for the PEER funding programme as a result of agreed amendments to the funding guidelines and the release of the EC Horizon 2020 funding calls. The SICSA Administration has also worked hard to publicise the funding programme across the SICSA community in order to build awareness among those researchers involved in developing consortia for EC grants. As the financial statement in Section 5.2.4 illustrates, there have been a significant number of successful proposals for PEER funding during the reporting period; with a total of £29K committed in this area to-date. The SICSA Directors expect the uptake of the PEER funding to further increase with the numerous upcoming Horizon 2020 call deadlines.

Where proposals for PEER grants have been successful, the funding has been utilised for:

- Travel to Information and Networking events hosted by the EC
- Horizon 2020 Challenge launch events
- Travel to Consortium meetings
- Consultancy for Horizon 2020 bid preparation
- Business Development Executive travel to networking events and meetings related to EC Grants

The SICSA Administration has a process in place to capture outcomes that come as a result of the PEER funding and all recipients of this funding were surveyed shortly after their visits/activities took place, with follow-up surveys planned for later this academic year. Full reports for some of the respondents are available upon request from the SICSA Administration, but a summary of the outcomes so far is included below. It is important to note that several reports are still pending.

### **5.1.2. PEER Outcomes**

#### **Oliver Lemon – Heriot-Watt University:**

PEER funding enabled Professor Lemon to develop several new consortia and several Horizon 2020 proposals were submitted as a result, including:

- OSCA (Coordinator)
- AtYourSide (PI at Heriot Watt)
- Disgolem (PI at Heriot Watt)
- MIMAR (PI at Heriot Watt)
- CLAN (PI at Heriot Watt)

The results of these proposals will be known in autumn 2014.

#### **Heriberto Cuayahuitl – Heriot-Watt University**

PEER funding enabled Dr Cuayahuitl to develop a consortium and submit a Horizon 2020 proposal as follows:

Supermarket Mobile Robot with Robust Navigation and Natural Interaction

Call: H2020-ICT-2014-1

Topic: ICT-23-2014

Proposal number: SEP-210132844

The results of this proposal will be known in autumn 2014.

#### **John Isaacs – Abertay University**

PEER funding enabled Dr Isaacs and Dr Daniel Gilmore to attend an Information and Networking day in Luxembourg for the following Horizon 2020 calls: ICT 21 Advanced Digital Gaming/Gamification technologies; and ICT 22-b Multimodal and Natural Computer Interaction Assisting people with disabilities. As a result of their presence at the event, Abertay University was invited to join four Horizon 2020 consortia bids, the last of which was submitted on 28 August. Dr Isaacs comments that without the SICSA PEER funding, this would have not been possible. The results of the bids will be known in autumn 2014.

#### **Aaron Quigley – University of St Andrews**

Professor Aaron Quigley utilised SICSA PEER funding to travel to a consortium meeting to finalise a proposal for The Touchless Interaction ETN, which consisted of 5 private-sector companies, 3 academic partners and 12 associate partners across Europe. The original proposal did not turn out to be successful, but it did receive a very high score and plans are being made to resubmit shortly.

#### **Simon Keizer – Heriot-Watt University**

Dr Keizer utilised SICSA PEER funding to attend an information and networking day for Horizon 2020 call: ICT 22a “Multimodal and Natural computer interaction”. This resulted concretely in the involvement in two proposals that were submitted April 2014. For one of these proposals, Dr Keizer is the named coordinator; for the other, Heriot-Watt is a project partner. The results of these proposals will be known in autumn 2014.

### 5.1.3. Future plans for SICSA PEER Funding

The SICSA Directors believe that whilst there is £35K still to be committed from the SICSA PEER programme; that the number of good quality proposals for funding in this area will continue to grow over the coming months, stimulated by the forthcoming numerous Horizon 2020 calls. Through effective communication with SICSA academics, awareness of this programme is continuing to increase among the Scottish Computing Science community. Coupled with this, it is of note there are a number of ICT based EC Horizon 2020 calls expected for the near future – with which we expect Scottish academics to be involved. We expect therefore to have committed any remaining PEER funds by July 2015.

### 5.1.4. Financial Statement (funds allocated in 2011-12; 2012-13; 2013-14)

A full outline of spending/commitments on the PEER programme to-date follows below:

#### PEER Financial Statement - July 2014

Total Funding available: £66,117.00

Total Committed to date: £ 29,327.49

**Total Remaining: £36,789.51**

Name of applicant	Institution name	Title of EU Framework Programme call	Amount Requested	Amount Granted	Amount Paid	Granted in AY
Lynne Baillie	GCU	Horizon 2020 Meeting	£225.31	£225.31	£225.31	2012-13
Simon Dobson	St Andrews	Horizon 2020 Meeting	£214.36	£214.36	£214.36	2012-13
Ian Ferguson	Abertay	Horizon 202: Security in 2020	£2,220.00	£2,220.00	£1,737.57	2013-14
Heriberto Cuayahuitl	Heriot-Watt	H2020 – Robotics & H2020 Multimodal & Natural Interaction	£545.00	£545.00	£545.47	2013-14
Oliver Lemon	Heriot-Watt	Horizon 2020 ICT: Unit CNECT G3 "Data Value Chain"	£425.00	£425.00	£425.56	2013-14
Simon Keizer	Heriot-Watt	Horizon 2020 call: ICT 22a "Multimodal and Natural computer interaction"	£550.00	£550.00	£514.61	2013-14
Aaron Quigley	St Andrews	Information and Networking Day - Horizon 2020 Work Programme 2014-2015, Connecting Europe Facility - 15-16 January Luxembourg	£2,280.00	£2,280.00	£1,720.49	2013-14
John Isaacs & Daniel Gilmore	Abertay	Horizon 2020 Information and Communications Technologies	£1,000.00	£1,000.00	£1,000.00	2013-14
Naeem Ramzan	UWS	Home Office Horizon 2020 Secure Societies UK Launch Event	£1,280.00	£320.00	£0.00	2013-14
Aaron Quigley	St Andrews	Touchless Interaction ETN (TIE-TN)	£371.15	£371.15	£371.12	2013-14
Dr Stefano De Paoli	Abertay	Information and Communications Technology 9-10 October, Florence, Italy	£850.00	£850.00	£0.00	2014-15
David Benyon	Napier	Information and Communication Technologies work programme 2014 – 2015 ICT 22 – 2014: Multimodal and Natural computer interaction topic Innovation Action:	£2,377.00	£2,377.00	£0.00	2014-15
Robert Stewart	Heriot-Watt	H2020-ICT-2014-2	£525.00	£525.00	£0.00	2014-15

Mark van Rossum	Edinburgh	BRAIN_FETs 2014: 1st Clustering Workshop on Future Emerging NeuroTechnologies	£540.00	£540.00	£0.00	2014-15
Nir Oren	Aberdeen	H2020-ICT10-2015 (tentative): Electronically Empowering Citizens for Social Innovation through Agreement Technologies (E2P)	£675.00	£675.00	£0.00	2014-15
Boris Grot	Edinburgh	FETHPC-1-2014: VIRTUE: Vertically-Integrated Datacenter Technologies (tentative).	£815.00	£815.00	£0.00	2014-15
Informatics Ventures	N/A	Various Calls - Travel and BDE time	£16,471.00	£16,471.00	£0.00	2014-15

\*Note that where "amount paid" is £0, claim has still to be processed

## 5.2. Postdoctoral and Early Career Researcher Exchanges (PECE) Funding

### 5.2.1. Report on use of funding (funds allocated 2011-12; 2012-13; 2013-14)

The Postdoctoral and Early Career Researcher Exchanges programme continued to be very well subscribed during 2013-14, with approximately 90% of the total funds in this category now allocated. As of 31 July 2014 SICSA has funded a total of 17 high quality proposals, of which 9 occurred during 2013-14.

With just over £15K remaining in the budget for this programme, the SICSA Directors plan to hold one further general call across SICSA in October 2014, after which they envisage that the remaining funds will be allocated. Should this not be the case, there will be a further call planned with a deadline of 30 April 2015.

### Individual Exchange Reports

SICSA requests all successful applicants for this programme to complete a short exchange report after the visit has taken place. Included within Appendix V are a number of the reports received during the reporting period 2013-14, which all provide detail about the individual exchanges and any outcomes and outputs that came as a result.

### 5.2.2. Financial Statement (funds allocated in 2011-12; 2012-13; 2013-14)

A full outline of spending/commitments on the PECE programme to-date follows below:

#### PECE Financial Statement - July 2014

Total Funding available: £72,500.00

Total Committed to date: £ 56,284.86

**Total Remaining: £16,215.14**

Name of applicant	Institution name	Amount Requested	Amount Granted	Amount Paid	AY in which Exchange took place
Adam Barker	St Andrews	£3,997.00	£4,155.00	£4,141.98	2011/12 & 2012/13
Adam Barker	St Andrews	£7,500.00	£3,345.00	£2,078.00	2012/13
Martin Halvey	Glasgow Caledonian University	£5,750.00	£4,850.00	£3,792.35	2012/13
Ilias Diakonikolas	Edinburgh	£6,000.00	£6,000.00	£5,606.51	2012/13 & 2013/14
Rik Sarkar	Edinburgh	£4,900.00	£4,300.00	£3,259.63	2012/13
Tim Storer	Glasgow	£3,500.00	£3,500.00	£3,493.39	2013/14
Marwan Fayed	Stirling	£5,400.00	£5,400.00	£5,031.76	2013/14
Michele Sevegnani	Glasgow	£4,200.00	£3,650.00	£1,789.56	2013/14
Changyu Dong	Strathclyde	£2,900.00	£2,900.00	£2,438.63	2013/14
David Flatla	Dundee	£5,655.05	£3,000.00	£0.00	2014/15
David Flatla	Dundee	£5,432.00	£3,000.00	£0.00	2014/15
Kyle Montague	Dundee	£3,047.45	£3,047.45	£0.00	2014/15
Ilias Diakonikolas	Edinburgh	£4,300.00	£4,300.00	£0.00	2014/15
Zhuoran Wang	Heriot-Watt University	£3,300.00	£3,300.00	£2,511.10	2013/14
Ozgan Akgun	St Andrews	£4,400.00	£4,400.00	£2,699.50	2014/15
Kyle Montague	Dundee	£4,409.80	£4,100.00	£0.00	2014/15
Dr Kira Mourao	Edinburgh	£1,995.00	£1,995.00	£0.00	2014/15

\*Note that where "amount paid" is £0, claim has still to be processed

### 5.3. Restored Funds – SICSA Knowledge Exchange programmes

#### 5.3.1. Introduction

Subsequent to SFC approval of our planned use of restored pools funds (totalling £410K) SICSA launched 6 new KE Programmes in January 2013. Our original 6 programmes included: Industrial Internships, Industrial Visitors, Proof of Concept, Team Placement, a SICSA Elevate program and Early Career Fellowship support. Following a trial period for each of the original programmes, it was agreed by the SICSA KE group and subsequently by the SICSA Committee that the Proof of Concept and the Team Placement programmes were not viable. The former programme received very few good quality applications and the latter received none. Whilst it was disappointing that the 2 programmes were not a success, it was felt by the SICSA Committee that the funds could be better used if diverted to the other remaining KE programmes.

During the reporting period 2013-14, SICSA held calls in October 2013, April 2014 and June 2014 for the 4 remaining programmes. We received a number of high quality proposals during the year and in each case a number were funded after a thorough review process. A summary of the activity within each programme follows below.

#### 5.3.2. Postgraduate Industry Internships

The Postgraduate Industry Internships programme was designed to facilitate industry internships for up to 9 months for current PhD students. The programme funds stipend payments (or a percentage of) whilst the student is on the internship; as well as travel and accommodation costs if necessary. This has proven to be a competitive programme and therefore priority has generally been given to applications of the highest quality and those that have some element of financial support from the host company.

During the reporting period 2013-14 SICSA funded 12 proposals for SICSA Industry Internships, as follows:

Name of applicant	Home University	Name of host organisation	Length of Internship
Herry Herry	Edinburgh	HP Labs	9 months
Marta Vallejo	Heriot-Watt	IBM	3 months
Volker Seeker	Edinburgh	CriticalBlue Ltd	3 months
Ying He	Glasgow	Fengcheng Central Hospital, China	6 months
Daryl Weir	Glasgow	Nokia	6 months
Paolo Pareti	Edinburgh	National Institute of Informatics (NII), Japan	7 months
Daniel Boland	Glasgow	Syntonetic A/S	6 months
David Adam Braude	Edinburgh	CereProc	6 months
Ross McLachlan	Glasgow	Bang & Olufsen	4 months
Daniel John Rough	St Andrews	The Commonwealth Scientific and Industrial Research Organisation (CSIRO)	9 months
Sean McKeown	Glasgow	ID inquiries	9 months
Yu Lu	Glasgow	Shenzen Jumper Medical Equipment Co. Ltd	7 months

Full and detailed reports for most of the completed internships are available from SICSA upon request.

### 5.3.3. Early Career Industry Fellowships

The Fellowship program is aimed at Early Career SICSA academics who wish to work on a collaborative project with industry for a period of 1 year full-time or 2 years part-time. The programme funds the salary of the academic up to a total of £35K for the Fellowship. Similar to the Internships programme, a financial commitment from the host organisation is encouraged.

Given the level of commitment required from the participating academic, their home institution and the host organisation the SICSA Directors did not envisage high numbers of applications for this programme. This was indeed the case and numbers are on-track with early estimates. However, there was a surge in applications during the reporting period and a total of 3 Early Career Fellowships were funded during 2013-14; representing up to £90K of funding. The SICSA Directors expect to fund one further Early Career Industry Fellowship in 2014-15.

The successful applications during 2013-14 are as follows:

Applicant Name	Applicant Institution	Host Organisation
Olivier Regnier-Coudert	Robert Gordon University	ARR Craib Transport Ltd
Susmit Sarkar	University of St Andrews	ARM Ltd
Prapa Rattadilok	Robert Gordon University	British Telecom

### 5.3.4. Distinguished Industrial Visitor Fellowships

The Distinguished Industrial Visitor Fellowships programme follows the SICSA DVF model; the only difference being that visitors must come from industry, rather than academia. Visits can take place from 1 week to 3 months and the funding guidelines stipulate that the visitor should be engaged with at least 2 SICSA institutions during the visit.

There were 4 calls under this programme during the reporting period and a total of 3 proposals were funded, as follows:

Host Institution	Visitor	Visitor Organisation	Visit Length
University of Glasgow	Andrew Dinn	Red Hat	3 Days
University of Edinburgh	Aaron Smith	Microsoft Research	4 Weeks
University of Glasgow/GCU	Paul Thomas	CSIRO, Australia	3 Weeks

Full and detailed reports for most of the completed visits are available from SICSA upon request. The visit by Paul Thomas will take place in February 2015.

### 5.3.5. Proof of Concept

Prior to the suspension of this programme, SICSA funded two applications for PoC funding which both took place during the reporting period 2013-14. The two funded PoC projects were:

Applicant Name	Applicant Institution	Proposed Organisation	Project Title/details	Funding Agreed
Ekaterina Komendanstkaya	University of Dundee	Centaur Technology & Rockwell Collins	Machine-Learning for Industrial Theorem Proving	£9,989.00
Miguel Nacenta	University of St Andrews	Axis Maps	FatFonts	£7,000.00

The FatFonts project is still underway but the former is now complete. A full report of that project is available in Appendix VI.

### **5.3.6. Elevate**

SICSA Elevate is an applied research accelerator program, supporting early career and early stage researchers from across SICSA to accelerate promising research ideas into sound business start-ups, transfer or licensing over a 12-week period. Modelled on similar short-term accelerator programs available globally, the programme makes use of existing supports within the SICSA partner Universities, and employs funds to directly support early career researchers with an investment of £15,000 (£3,000 per researcher, up to groups of 4 and £3,000 project costs).

After a very successful programme based at the University of Edinburgh in 2013, an open call was circulated around SICSA early in 2014 for expressions of interest for hosting Elevate 2014. The successful proposal came from Edinburgh Napier University's Bright Red Ventures Business Incubator and the SICSA Elevate 2014 programme commenced on 1<sup>st</sup> July 2014. There were 3 successful teams this year.

There were two key elements to the 2014 programme:

1. Interactive workshops and applied learning for participants each week. Although mainly based on an existing module delivered by Edinburgh Napier University, the content was adapted to meet the needs of the participants.
2. Individual mentoring tailored to each participant business.

The Elevate programme in 2014 was based on Edinburgh Napier University's New Venture Planning module. This programme took the participants from ideas generation / development and evaluation through the business planning process to develop a potential business model for their idea.

The module covered the following topics:

- Entrepreneurial thinking, aspirations and role models
- The business planning process
- Idea generation / development / evaluation
- Market identification including exposure to market players
- Researching the resources required including equipment, people, funding
- Segmentation / positioning & differentiation / targeting
- Developing the marketing Mix (7 Ps)
- Financial planning, production of financial statements with realistic assumptions
- Growth aspirations of entrepreneurs

The Elevate 2014 programme was delivered by Nick Fannin, Maebh Coleman, Susan Laing and Aidan Craig from the Edinburgh Napier Entrepreneurship team; with contributions from colleagues in Edinburgh Napier's School of Computing and the Institute for Informatics & Digital Innovation. In addition, the programme was supported by external agencies including Informatics Ventures and other participants in the Enterprise Network.

A further Elevate programme is planned for 2015.

### **5.3.7. SICSA KE Short Themes**

In June 2014, the SICSA KE Director circulated a call across the SICSA community for Knowledge Exchange Short Theme Proposals. The objective behind creating SICSA KE short themes was to connect SICSA academics and industry partners to work on a topic in a specific area. The introduction of SICSA short research themes during the reporting period demonstrated that creating short, focussed themes was an effective way to gain critical mass in specific areas of Computing Science research and to stimulate the Scottish community in emerging areas of interest. The SICSA

Directors agreed that a KE short-theme should be led by an early stage researcher within any SICSA institution *and* have at least one lead from an industrial partner. Suggested ideas for theme topics included:

- Wearables
- Citizen Science
- Programming the "Internet of Things"
- Next gen multicore
- Sensing and Computing
- Low power hardware
- Computing and new materials
- Intelligent transport systems and Smart Mobility
- Privacy

The call generated a number of responses, though the SICSA Directors agreed funding for one KE short-theme after this particular call. The theme title is "Computing, Medical Imaging & Sensing" and it will be led by David Harris-Birtill of the University of St Andrews and Robert Davey of Toshiba Medical Visualization Systems. The theme was launched in August 2014 and received a budget of £4K from the SICSA restored funding KE budget. A full report on the activities of the short-theme will be included in the SICSA Annual Report for 2014-15.

A further call for SICSA KE short-themes is planned for autumn 2014.

#### **5.3.8. Saltire Fellowship**

In partnership with the Saltire Foundation, SICSA has agreed to fund 2 early career researcher places on the Saltire Fellowship 2015. The Saltire Fellowship is a world-class, 8 month long programme that equips successful candidates with the skills and attitude required to take a leadership role within Scottish business. It blends teaching at Babson College, Massachusetts (the number 1 ranked business school in the world for entrepreneurship) with hands-on international experience at a major, global company then a Scottish high growth SME.

The SICSA Directors have committed approximately £45K to fund the two SICSA places on the programme and the SICSA Executive will be advertising in-line with the Saltire Foundation in the autumn 2014.

A full report on progress in this area will be provided in the SICSA Annual Report 2014-15.

#### 5.4. A statement on the use of restored funding to-date

A summary of spending/commitments on the KE Programmes to-date follows below:

<b>Programme:</b>	<b>Total Budget allocated until 31 July 2015</b>	<b>Total Committed/Paid to-date</b>	<b>Budget Remaining as of July 2014</b>
PG Industry Internships	£129,260.00	£73,335.35	£55,924.65
Early Career Fellowships	£90,000.00	£65,000.00	£25,000.00
Distinguished Industrial Visitors	£15,370.60	£10,333.60	£5,037.00
Proof of Concept	£16,403.21	£16,403.21	£0.00
Team Placements	£0.00	£0.00	£0.00
Saltire Fellowship	£45,508.00	£0.00	£45,508.00
SICSA Elevate	£74,874.06	£42,599.43	£32,274.63
Elevate Supports	£9,797.20	£547.20	£9,250.00
Enhanced Theme ES-ECR support	£5,950.00	£0.00	£5,950.00
KE Short Theme - Computing, Medical Imaging, Sensing	£4,000.00	£0.00	£4,000.00
Marketing and publicity	£6,432.00	£3,932.00	£2,500.00
Training & Course Fees	£8,145.75	£5,695.75	£2,450.00
Misc (board costs etc.)	£7,497.00	£4,268.60	£3,228.40
<b>TOTALS</b>	<b>£413,237.82</b>	<b>£222,115.14</b>	<b>£191,122.68</b>

#### 5.5. Informatics Ventures

Informatics Ventures promotes and champions SICSA across Scotland through a range of programs and events and continues to be the main driver behind SICSA's knowledge exchange, industry innovation / collaboration and entrepreneurial training. In addition there is a strong focus on encouraging new company start-ups / spinouts and accelerating their growth through mentoring to equip these companies with the right skills for successful growth, sustainability and access to finance through exposure to investors.

A summary of the main activities under Informatics Ventures for the reporting period follows:

##### 5.5.1. DEMOfest

DEMOfest has established itself as one of the largest informatics and computing science showcase events in the annual calendar. Its success in bringing the research community together with industry has provided an important element in exchanging ideas, building relationships and increasing awareness, creating knowledge exchange opportunities and raising the profile of SICSA.

The event attracts the best Informatics and Computer Science research with commercial potential from Scottish Universities and creates an environment for industry partners and academics to come together and identify opportunities for: Collaborative Innovation; Studentships & Placements; Technology Licensing & Consultancy; Feasibility & Proof of Concept Studies.

The event is organised in partnership between SICSA, Informatics Ventures and ScotlandIS; with collaboration from Knowledge Transfer Partnership (KTP), Interface, Scottish Institute for Enterprise (SIE) and Scottish Enterprise.

Building on its success, for the first time DEMOfest was delivered at 2 new venues during the reporting period 2013-14;

**The Mitchell Library, Glasgow, 6 November 2013:**

The event was held in Glasgow with 60 exhibits. 226 visitors and 53 companies attended. There were two workshops to encourage deeper engagement with industry – the themes were Big Data for Smart Cities; and Cyber Security.

**Robert Gordon University, Aberdeen, 11 February 2014:**

Affectionately promoted as DEMOfest North, this event was held in the new RGU campus Riverside East atrium with 40 exhibits. There were two workshops themed on Smart Tourism; and Big Data in Oil and Gas. There were 135 attendees and 27 companies represented.

Another DEMOfest is planned for October 2014, in conjunction with The Data Lab Innovation Centre launch.

A table illustrating numbers of participants at each DEMOfest event to-date follows:

-	2009	2010	2011	2012	2013	2014 North
Registrations	245	252	260	290	220	158
Attendance		198	213	243	210	151
Exhibitors	46	47	50	57	60	39
Exhibitor guests	40	34	41	33	20	
Guests	146	162	181	155	72	67
Academic guests				82	58	84
Staff	11	9	9			2
No Shows		54	66	83	40	54
Walk on			19	37	30	31
Companies Registered	78	72	73	132		63
Companies Attended		53	46	88		35

**5.5.2. Entrepreneurship Programs**

**5.5.2.1. IV Tuesday**

This is now established as one of the main Entrepreneurial talk series' in Scotland - held monthly during term time with a number of local entrepreneurs sharing their stories. This is now streamed on the internet to give access to staff, students and the business groups who cannot attend the venues.

**5.5.2.2. Research Ventures**

Research Ventures is a 2-day residential course for early career researchers with business ideas. It is designed to provide an introduction to research commercialisation and entrepreneurship as well as networking for researchers across the research pools. The first course ran in 2009 and it has since become an annual event. Each of the research pools fund registration costs for their attendees. The course covers business planning and different models of research commercialisation (including spin-outs and licensing). It also covers how to cost projects and manage finance in a new venture; protecting your ideas and intellectual property and how to win funding and sources of support.

Research Ventures 2014 took place at the Lighthouse, Glasgow on 16/17 June. There were 60 participants from SICSA, SUPA, Energy Tech Partnership, SAGES and MASTS.

### **5.5.2.3. CEO Masterclass**

Informatics Ventures' Masterclasses are practitioner led by successful business people who are keen to share their knowledge and experience to help others. Each class is designed to educate a small group of 10-30 people involved or wanting to be involved in early stage start-up companies in specialist subject areas, such as marketing, sales, and raising finance. There were 4 events during the reporting period.

### **5.5.2.4. Learning Lunch**

Learning Lunch complements the CEO Masterclass and is aimed at start-up/early stage technology company founders and executives to cover fundamental topics such as capital requirements, VAT, annual accounts, and R&D Tax credits. There were 5 such events during the reporting period.

### **5.5.2.5. Engage, Invest, Exploit, London 2013 and Engage, Invest, Exploit 2014**

Traditionally, the Engage Invest Exploit (EIE) program starts in October/November and selects 60 companies, typically from approximately 150 applicants. Those selected are then taken through a program of articulation practice, mentoring and pitch practice to prepare them for the EIE Investor conference in May. EIE has been extended to include Life Sciences (15 companies curated by BioQuarter), Energy and Renewables (15 companies curated by EICC) as well as the 30 Technology prospects. It has grown to be the largest investor conference ever held in Scotland and is one of the more significant events of its kind in Europe. The EIE program has supported 156 Scottish Start-ups so far and they have now raised more than £100M in venture funding.

EIE 2014 - Assembly Rooms, Edinburgh on 8th May included;

60 companies selected from training/mentoring programs Edinburgh

Civic Reception from Edinburgh City Council

VIP dinner from ECC

Convention Bureau funded 10 investors' expenses

Significant sponsorship from: MBM, Marks & Clerk, Johnstone Carmichael, RBS

Keynotes – Sir Brian Souter, Julie Meyer

After dinner speakers – Judy Murray, Eve Muirhead

648 attendees and 169 investors.

The EIE-London event was held in November 2013 with 12 of the more scalable companies selected to connect them with London investors. It is recognised that scaling companies involves introducing them to city investors. Companies that have gone through this program have so far attracted in excess of £40M of seed investment. A group of over 50 mentors has been built up who give their time and expertise for free. The event itself has also built up a substantial amount of sponsorship of £140K over the last 2 years, from private companies to control costs while putting on a really professional show to impress non-local investors.

It is important to note that many of the early stage start-ups exhibit at EIE and entrepreneurial researchers and academics attend the event to network and gain an insight to what it takes to build a successful business.

#### **5.5.2.6. Bursaries Awarded**

##### **The Massachusetts Institute of Technology EDP Bursary Program**

Informatics Ventures, Scottish Enterprise and HIE organised the “Scottish Contingent” for the 2014 edition of MIT’s EDP program in Boston. In the final pitch competition, though the Scottish teams did not win this year, they did fill 3 out of the top-4 places. Of the 13 companies attended this EDP, 10 came from Informatics Ventures programs in some form; all are now account managed by Scottish Enterprise.

##### **Cambridge Ignite**

The University of Cambridge Judge Business School Ignite is a renowned intensive, one-week training programme in July for aspiring entrepreneurs and corporate innovators to trial and prepare business ideas for the commercial environment.

Informatics Ventures manage and fund places on this course, selecting researchers and managers who show exceptional potential.

##### **School for Entrepreneurs**

Informatics Ventures ran this 3-day activity with the Hunter Centre at Strathclyde University.

##### **Teaming with Start-ups**

Informatics Ventures were invited by Scottish Enterprise to promote Scotland’s innovative start-ups as part of the Common Wealth Games, Scotland House series.

The event was held at Scottish Scotland House, Glasgow, 30-July-14. John Innes, ex CEO of Amor Group, John Swinney, Cabinet Secretary were the keynote speakers.

#### **5.5.3. Industrial Innovation**

Informatics Ventures drives key strategic growth in the high tech sector to take advantage of and enhance SICSA’s expertise. This activity encourages collaboration of early-stage companies, SMEs, corporates and public sector organisations engage with world-leading research across SICSA. It delivers collaborative innovation activities across the following themes:

- Cyber Security
- Data Science – ‘Big Data’
- Mobile Technology – Start-up encouragement
- Smart Tourism

A short summary of activities in this area during the reporting period follows:

##### **5.5.3.1. Cyber-Security**

The momentum in Scotland’s Cyber-Security sector is starting to build. Compared to last year, which concentrated on creating a strong foundation on which to build a Cyber-Security economy, there are now multiple initiatives, which are already beginning to bear fruit. It is becoming clear what can be achieved when academia, police, Government and industry come together in Scotland with a common goal.

##### **University of Edinburgh Centre for Advanced Studies in Cyber Security & Privacy**

The University of Edinburgh is launching Scotland’s first centre for Cyber-Security research. This is a multi-discipline centre, encompassing computer science, engineering, mathematics, law, politics and social sciences. It is being built on a model of industrial sponsorship and will interface heavily with industry.

The University of Edinburgh is currently recruiting for two new members of security staff.

### **ACE-CSR/ACE CSE**

GCHQ and EPSRC have been running an accreditation scheme to pre-select Universities seen to be leaders in cyber security research and education. Edinburgh Napier University has successfully achieved a GCHQ excellence award for one of its Masters courses. The research centre at University of Edinburgh should become ACE-CSR (Academic centre of Excellence in Cyber-Security research) by January 2015. Anecdotal evidence suggests that inward investment increases markedly with this award and it will be a beacon for Scottish research.

### **Schools Consultation**

In May around 40 computer science teachers were consulted for their opinions on the state of Cyber-Security education in Scotland and reasons that pupils were not pursuing Computer Science or Cyber Security through upper School. The resulting consultation document outlines many of the reasons and possible solutions to the problem, as suggested by the teachers.

### **Christmas Lectures**

SICSA has organised Schools Christmas Lectures in Cyber-Security for the last two years. In the first year around 600 school pupils attended. During this reporting period the figure rose to 3000. For the next series of lectures in the reporting period 2014-15 there is an ambitious live streaming project planned, which will extend the reach across the U.K.

### **PWC/NCC Group Breakfast series**

From January 2014 through until June 2014 Informatics Ventures ran a pilot series of breakfast lectures for SMEs. The lectures, based in Edinburgh, were well attended and covered a number of areas from data assurance to protection from cyber-attack. Informatics Ventures plans to roll out a similar series of lectures in Glasgow in the reporting period 2014-15.

### **Collaborative Projects in Cyber-Security**

Calls for university / industry collaborative Cyber-Security proposals were launched during the reporting period and circulated across SICSA. Two proposals were funded from Informatics Ventures (AspeKT), as follows:

#### **1. Abertay University - "Automating the gathering of Open Source Intelligence evidence from social media networks".**

Project lead: Ian Ferguson

SMEs: Evidential Systems Ltd, Data Duplication Ltd

Amount: £4k

#### **2. St Andrews University - "Intelligent learning of anomalous behaviour in cyber security"**

Project lead: Juan Ye

SMEs: Zonefox Ltd

Amount: £19,082

#### **5.5.3.2. Data Science - 'Big Data' – Data Lab Innovation Centre**

SICSA and Informatics Ventures were a major element in developing the successful bid to Scottish Funding Council for an Innovation Centre in Data Science – The Data Lab. The Data Lab was approved by SFC and funding agreed at £11.3m. The Data Lab official launch event will be held in October 2014.

Two Collaborative projects have been funded from Informatics Ventures – as precursors to The Data Lab activity, as follows:

### **1. Glasgow University – “Information extraction from ‘Family notices and obituaries’ ”**

Project lead: Craig Macdonald

SMEs: DC Thomson, Brightsolid

Amount: £25,605

### **2. Heriot Watt University – “Intelligent actionable analytics for injury prevention”**

Project lead: David Corne

SMEs: Heart of Midlothian FC, High performance sports innovation Ltd

Amount £24,938

#### **5.5.3.3. Mobile Technology - Start-up Encouragement**

The nature of this fast moving industry is attractive to students, especially those wishing to try to start businesses. Informatics Ventures has been involved in a range of activities; hackathons, appathons and mobile apps / tech ‘meet-ups’ to develop the community and team building skills required.

##### **Mobile Apps**

The Informatics Ventures Mobile Apps meet-ups are running during term time in Glasgow (with assistance from the Informatics SIE Intern), Napier and Heriot Watt (again with help from the SIE Intern) and Edinburgh (in association with Mobile Mondays).

##### **Tech Meetups**

In addition to the Mobile Apps meet-ups, Informatics Ventures sponsor monthly ‘Tech meet-ups’ in Edinburgh and Glasgow – these usually have around 70 – 100 attendees from the tech and academic community. Tech meet-ups are also now running in Dundee, Inverness and Aberdeen.

#### **5.5.3.4. Smart Tourism**

The Smart Tourism horizon project is nearing completion and is in the final phase. The final workshop was held with Museum Galleries Scotland in June 2014, which focused on showcasing the Smart Tourism projects across the community. As part of the dissemination process, Tourism will be one of the key themes at this year’s DEMOfest with 12 of the projects exhibiting in October 2014.

The Smart Tourism project has run to budget and exceeded deliverables forecast. The investment for Smart Tourism is £600k from SFC; £150k from the RCUK dot.rural hub; and the remainder being made up by in-kind funding from SMEs and tourism partner organisations. The key investing partners have been Historic Scotland and Museums Galleries Scotland, who are involved in several projects.

Smart Tourism has now completed all of its calls and has launched 18 different projects, 6 on additional funding brought in to the project via dot.rural and contracts Edinburgh Informatics have obtained. The projects funded cover a wide group of SICSA HEI’s: 10 Innovation Projects have been funded, (2 via dot.rural) and 5 Challenge Fellowships (1 via dot.rural).

The programme has delivered a range of new products, devices (apps) and services. Many of these are currently being evaluated and tested.

Pilot projects currently being tested on sites are;

- Smart Beacons at The national museum of flight
- Living History at Spynie Castle

- Laddie at St Andrews
- Smart at museum of St Andrews
- Talisman – museums and galleries
- Travelling Treasures – Apps available – Edinburgh museums

These projects, and earlier completed ones, such as SUMMIT and Content beyond the Internet 'qraqrbox' still continue to be developed further for commercial exploitation. In fact, projects Qrabox and PAST have created spin-out companies at St Andrews to capitalise on the opportunity.

An important part of the legacy is that the projects, relationships, research stimulated and commercial opportunities are continuing under their own momentum. SICSA has proven to be an excellent framework and community to engage with tourism activities across Scotland. All of the SICSA universities have engaged with Smart Tourism through events, workshops, proposals in response to calls and projects.

Smart Tourism is now in the reporting phase and in addition to the case studies, the impacts and outcomes will be surveyed, measured and reported.

The project coordinators are currently looking for continuation of funding for the project in some of the key areas that have been identified as essential to growth of the Scottish tourism economy. These fit into the landscape that they have been working in, namely: Geo-location services; Data Analytics; Digital Archives; and Improving the visitor experience (customer profiling).

## **6. SICSA Education**

On the 1 August 2013 Dr Karen Petrie (University of Dundee) replaced Professor Greg Michaelson (Heriot-Watt University) as the SICSA Director of Education. Dr Petrie has taken over as HE representative on a number of boards including the Skills Development Scotland ICT Investment Plan implementation group and the Advanced Higher Qualification Development Team. SICSA recognises that the skills agenda in ICT raises important questions in the Higher Education sector, so Dr Petrie is planning to work with Skills Development Scotland in the coming year to develop a joint project plan.

### **6.1. Summary of Education Activities and outputs**

Activities during 2013-14 included:

7-Nov-13: Admission Criteria Round-Table: The majority of the University admissions tutors for computing in Scotland met with representatives of the school sector (including computing teachers and the SQA) to discuss admission criteria. Following this meeting 7 Universities in Scotland decided to endorse the new Curriculum for Excellence qualifications by recommending Higher Computing Science for entrants.

14-Mar-14: SICSA Education Ministerial Visit (Women in Computing). A women in computing event was held in the University of Dundee as part of the Scottish Government focus on Young People wee that coincided with the launch of the ICT Skills Investment Plan. The speakers at this event included Shona Robison MSP who has Equality within her portfolio. Members of the computing industry and academic also shared best practice for recruiting and retaining women in the ICT industry.

13-Jan-14: New Lecturer Induction Event. Aimed at all new lecturers appointed in Computing departments within the last year.

The Education group also provided sponsorship for:

- Young people to be able to attend the YRS Festival of Code
- A bus to transport attendees from a Dundee High School to the SICSA Christmas Cyber-lectures.
- Meetings with School Teachers with SICSA representatives to talk about the best ways to integrate cyber-security into teaching.

### **6.2. Planned Education activities for 2014-15**

After Dr Karen Petrie took over as the director of Education a number of people contacted her to say they would like to work on a specific area with a SICSA education remit. SICSA wished to encourage these contributions as much as possible and the SICSA Directors agreed that a further £5K should be allocated to SICSA Education to enable the development of two short Education themes, with a budget of £2.5K each.

The period of time allotted for these themes is deliberately short, as Computing Science education continues to evolve rapidly. The SICSA directors agreed that SICSA will require different Education themes over time to adapt to changes in education policy, technology, funding opportunities and the interests of the SICSA academic communities. Therefore, it is envisaged that SICSA Education funding will remain at £10K per annum; with £5K being allocated specifically to 2 short themes each year.

An open call was circulated at the end of February 2014 with a deadline of the end of March 2014. In total, 4 bids were submitted to this call. The bids were reviewed by all of the SICSA Directors and the following themes were chosen as the first SICSA Education short themes:

1. Towards a Continuum in School to University Computing Education, led by Richard Connor, University of Strathclyde along with Quintin Cutts, University of Glasgow and Greg Michaelson, Heriot Watt University,

2. Recruiting and Supporting Women in Computing, led by Ishbel Duncan, University of St Andrews and Alison Pease, University of Dundee. The theme will focus to some extent on STEM secondary school activities, which are being coordinated by Natalie Coull, University of Abertay.

A number of workshops are planned for both of these themes in the coming year and these will be reported on in the SICSA Annual Report 2014-15.

## **7. SICSA Appointed staff**

There are currently 37 SICSA appointed academic staff across 8 Universities. For the purposes of this report, SICSA appointed staff were requested to provide data on their outputs for the reporting period 2013-14 – of those, 24 responded with information. Full details for each respondent is available from SICSA upon request, but a summary of the information provided follows in the sub-sections below.

### **7.1. Recruitment**

All SICSA institutions have now recruited their full quota of SICSA appointees. However, University of Aberdeen confirmed that due to the departure of a staff member, Professor David Pym, they have reinvested surplus funds as follows:

- George Macleod Coghill appointed to SICSA Chair. George is currently Professor of Computing Science, and now leads the Aberdeen Systems Modelling Theme formerly led by David Pym.
- Chenghua Lin (start date 14 March 2013) part-funded by the SICSA investment. Dr Lin is an expert in sentiment analysis, which is one of the research area's central to the focus of the recent Data Lab SFC investment associated with SICSA.

### **7.2. New research materials/products developed**

A number of respondents confirmed that they had developed new research products or materials during the reporting period, including:

- Adam Barker (University of St Andrews): CloudBench: <http://bitly.com/cloudbench>
- Guido Sanguinetti (University of Edinburgh): Bioconductor M3D package [www.bioconductor.org/packages/devel/bioc/html/M3D.html](http://www.bioconductor.org/packages/devel/bioc/html/M3D.html)
- Charles Sutton (University of Edinburgh): Naturalize, a prototype for learning coding conventions from software (<http://groups.inf.ed.ac.uk/naturalize/>)
- Oliver Lemon (Heriot-Watt):
  - SpeechCity system
  - SpaceBook system and data set
  - JAMES system and data set
- Richard Mayr (University of Edinburgh): Software library and software tools for computationally hard problems in automata theory - RABIT version 2.2 and REDUCE version 1.2. Improved performance and extended functionally to handle both types of automata: NBWA and NFWA. Provided at the research hub [www.languageinclusion.org](http://www.languageinclusion.org)
- Marwan Fayed (University of Stirling): In association with Georgia Tech, developed (and open-sourced) software to investigate the merits of network-level support for streaming video fairness.
- Dimitrios Pezaros (University of Glasgow): Set up the Programmable Networks and Services Laboratory: a fully programmable hardware/software research infrastructure to emulate Cloud and Data Centre environments for experimentation on next generation Internet mechanisms.
- Jeremy Singer (University of Glasgow): Developed two new systems benchmarking datasets, in collaboration with students. Available on bitbucket online repositories.

### **7.3. New products or interventions produced and benefiting industrial sectors**

Two respondents confirmed that during the reporting period they had developed new products or interventions benefitting industrial sectors, including:

- Oliver Lemon (Heriot-Watt): SpeechCity demo system
- Marwan Fayed (University of Stirling): Inter- and intra-disciplinary staff have launched HUBS as an independent not-for-profit entity. HUBS will simultaneously support research endeavours, while providing high quality broadband to those left behind by industry broadband providers.

### **7.4. New academic (including interdisciplinary) or business collaborations established, both national and international.**

The vast majority of respondents confirmed that they had developed either new academic collaborations (78%) or new business collaborations (43%) during the reporting period.

A number of new academic collaborations detailed by respondents are of an inter-disciplinary nature and many involve one or more institutions or organisations from outside of the UK.

Some examples of new collaborations included:

- George Coghill (University of Aberdeen): Led the development of a unique industry focused Master's programme in Oil and Gas Computing. This has had input, and contributions, from a number of industrial organisations.
- Dimitris Pezaros (University of Glasgow): Business collaborations established with:
  - Solarflare (<http://www.solarflare.com/>)
  - NATS (<http://www.nats.aero/>)
  - Airbus Group (<http://www.airbusgroup.com/>)
- Hans-Wolfgang Loidl (Heriot-Watt University): Collaborations with University of Glasgow on the SICSA MultiCore Challenge and ongoing collaboration with University of St Andrews based on the EPSRC-funded HPC-GAP project, which ended in October 2013.
- Alexander Voss (University of St Andrews): Collaborating with Wire Free Productions Ltd. (<http://www.wirefreeproductions.com/>) on developing a new format for BBC Radio 5live based on social media.
- Simon Dobson (University of St Andrews): Ongoing work to apply machine learning to intrusion detection, in collaboration with a Scottish SME.
- Oliver Lemon (Heriot-Watt University): 5 EC H2020 proposals with multiple new academic partners e.g. Charles Uni Prague, Fraunhofer, Twente.
- Marwan Fayed (University of Stirling): Was granted a SICSA Postdoctoral and Early Career Researcher Exchanges (PECE) bursary to travel to both University of Cambridge and Georgia Institute of Technology to develop collaborations with researchers there. As a result of the exchanges Dr Fayed is preparing a EPSRC fellowship application and a joint proposal with Timothy Griffin of the University of Cambridge. Further collaborative work is planned with both institutions in future.

### **7.5. Collaboration with the public sector**

A small number of respondents (16%) gave information about new collaborations with the public sector that occurred during the reporting period, including:

- Yolanda Vazquez-Alvarez (University of Glasgow): Began collaborations with the MRC Institute of Hearing Research based at the Glasgow Royal Infirmary and the School of Communication at The Royal College of Art in London.
- Simon Rogers (University of Glasgow): Received research funding from Leukaemia and Lymphoma Research.
- Marwan Fayed (University of Stirling): Further developed collaboration with Community Broadband Scotland, via HUBS.
- Alexander Voss (University of St Andrews): Gave a presentation to the Foreign Office on work on the Sochi Olympics - with Manchester and Open Universities.

### **7.6. Research outputs during the reporting period i.e. Peer reviewed journal publications/ conference presentations, both national and international.**

The total number of publications (including peer reviewed journal publications/ conference presentations, both national and international; and book chapters) authored or co-authored by SICSA appointed staff (those that responded) during 2013-14 was 143. Full details of the publications for those that responded are available upon request.

### **7.7. National or international seminars, workshops, conferences organisation**

As mentioned below in Point. 7.8., a number of SICSA appointees have demonstrated engagement with SICSA by involvement in SICSA funded activities and events. A high number of respondents (84%) also confirmed that they had been involved in organisational committees for workshops, seminars, conferences and summer schools, both at home and abroad.

### **7.8. Other notable points**

A number of SICSA-appointed staff have been very closely engaged with SICSA activities during the reporting period 2013-14.

For example, a number of SICSA appointed staff took advantage of funding activities available through the SICSA Graduate Academy, the SICSA Research Themes and the KE programmes, including:

- Per Ola Kristensson: International Conference Sponsorship (UIST and ITS 2013)
- Aaron Quigley: Complex System Engineering Sponsorship – Workshop
- Yolanda Vazquez-Alvarez: Human-Computer-Interaction Sponsorship – Workshop
- Rahul Santhanam: Funding for Bounded Rationality Mini-Theme
- Ilias Diakonikolas: PECE funding for exchange to MIT, USA.
- Marwan Fayed: PECE funding for exchange to University of Cambridge and Georgia Tech
- Oliver Lemon; Aaron Quigley; and Simon Dobson: all took advantage of the Pools Engagement in European Research (PEER) support.
- Jeremy Singer: Funding for SICSA Distinguished Industrial Visitor

Furthermore, Aaron Quigley (University of St Andrews) continued to act as Deputy SICSA Director and Director of Knowledge Exchange during the reporting period. Marwan Fayed (University of Stirling) continued to lead the Next Generation Internet/Cyber-Security research theme and Gethin Norman (University of Glasgow) continued to act as deputy theme leader for Modelling and Abstraction.

## **8. SICSA communications, marketing and publicity, and public engagement**

During 2013-14 SICSA continued to place an importance on communicating effectively with the pools' wide range of stakeholders; and maintaining a strong brand identity. As such, during the reporting period SICSA continued to utilise a range of media to circulate information about all activities including; targeted printed materials; regular targeted e-bulletins and newsletters; the SICSA web site; outreach events (such as DEMOfest, Ph.D. Conference, Ph.D. Induction events and Education events); liaison with the media where appropriate; and social media.

During the reporting period the SICSA Executive also undertook a number of marketing and communications projects with the objective of strengthening the SICSA brand for the future and further engaging Computing Science researchers; researchers from other disciplines; research students; and industry. The main project in this respect was the development of a brand new web site, in partnership with design agency, Red Empire. The main aim of this project was to create a web site that presents SICSA as a world-class computing science research cluster, by providing visitors with a much richer visual experience through the design of a more modern, sophisticated, vibrant and image-led interface. The site was also designed to enable visitors to reach essential information much more quickly and easily, through more intuitive navigation and better site organisation. Finally, it was deemed important that the site should be accessible to not only those with Computing Science backgrounds; but to researchers from other disciplines and to those outside of academia – for example Government, public sector and industry.

In parallel with the development of the new web site, the SICSA Executive produced a number of short films which give information about the various SICSA Research Themes and larger events, such as the PhD Conference and DEMOfest. The new site also has a research video wall, featuring two-minute pitches from current researchers – which aims to showcase a small slice of the research happening in Scotland currently.

Furthermore, over the course of the reporting period Dr Iadh Ounis and Dr Craig MacDonald of the University of Glasgow developed a new SICSA Experts Finder search engine, which has been integrated into the new SICSA Web Site. It was recognised by the developers that many researchers find it a challenge to find out who to cooperate with or who has previously worked on a specific problem or topic – sometimes creating barriers to research collaboration. The Experts Finder was therefore developed to address this and it is envisaged that the software will be of real value to both Computing Science researchers and to those working in other disciplines; as well as to the SICSA community as a whole. The search engine allows the user to enter a query, and receive a ranking of SICSA academics that are predicted to have relevant expertise, based around their recent publications, thus reducing the challenge of locating researchers to collaborate with on a specific problem. So far, the developers have collected 23,000 publications for 1585 academics across the SICSA institutions and hope to further this over the coming year. The product was launched in tandem with the new SICSA web site in August 2014.

The SICSA Directorate hopes to be able to report positive outcomes from all of the projects above in the next annual report, following planned evaluations at the 6 and 12 month points.

## 9. Governance Structures

Throughout the reporting period SICSA continued to follow the governance structures as followed in previous years of operation.

Day-to-day decisions continue to be made by the SICSA Directors and the SICSA Administration. The SICSA Executive Officer, Steven Kendrick, has continued to manage all of the operational aspects of the pool, reporting directly to the SICSA Director.

The Directorate during 2013-14 were:

- Professor Rod Murray-Smith (University of Glasgow) – SICSA Director
- Professor Aaron Quigley (University of St Andrews) – SICSA Director for Knowledge Exchange / Deputy SICSA Director
- Professor Jon Oberlander (University of Edinburgh) – SICSA Graduate Academy Director
- Dr Karen Petrie (University of Dundee) – SICSA Education Director

The SICSA Administration during 2013-14 was:

- Steven Kendrick (University of Glasgow) – SICSA Executive Officer
- Miss Nicola Hogg (University of Edinburgh) – SICSA Executive Assistant
- Mrs Aileen Orr (University of Glasgow) – SICSA Executive Assistant (commenced post March 2014)

The Executive Assistant post is now undertaken by two members of staff at 0.5FTE each. Miss Nicola Hogg is also employed at 0.5FTE by Informatics Ventures, based at the University of Edinburgh. Further to the above named administrators, the University of St Andrews contributes clerical support at approximately 0.2FTE.

A number of the SICSA Directors were replaced (as per the usual two year cycle) in August 2014. The new Directors for the coming year (2014-15) are:

- Professor Stuart Anderson (University of Edinburgh) – SICSA Director
- Dr Iadh Ounis (University of Glasgow) - SICSA Director for Knowledge Exchange / Deputy SICSA Director
- Professor Ian Miguel (University of St Andrews) - SICSA Graduate Academy Director

The new Directors will be in post for 2 years.

The SICSA Directorate continues to be overseen by the SICSA Committee, comprising Heads of School or senior members of staff from each of the SICSA member institutions (including SICSA associate members). The SICSA Committee also comprises SICSA Research Theme Leaders and their deputies. The SICSA Committee met on three occasions during the reporting period (October 2013, March 2014 and May 2014) and full minutes of those meetings are available from SICSA upon request.

The SICSA International Advisory Board (IAB) was established as a steering group for SICSA, advising upon future strategy making. The SICSA IAB met once during the reporting period on 11<sup>th</sup> November 2013. Full minutes of the meeting are available upon request. It is of note that a number of new members joined the IAB in 2013 including: Robert Shorten (IBM); Derek McAuley (Nottingham University); and Barry Smyth (University College Dublin). Several IAB members stood down in 2013, including Crawford W. Beveridge; Marta Zofia Kwiatkowska; and Gerhard Rigoll.

The next IAB meeting is planned for January 2015.

## Appendix I: Grant Income

Grant income:	2013-14	Pending applications
Awarded to a single institution within the pool	£13,145,376	£37,146,381
Awarded jointly to two or more institutions within the pool	£15,438,241	£3,673,030
Awarded jointly to two or more institutions across two or more pools	£357,578	£31,936
Awarded to one or more SICSA Institutions and partners outside Scotland	£8,747,593	£40,004,707
<b>Total</b>	<b>£37,688,788</b>	<b>£80,856,054</b>

### To note:

\* Figures are for *Price paid* by Funding body and not *FEC*

\*\* Includes data from 10 full SICSA members. Data from 4 Associate members is not included

\*\*\* Figures include the share awarded to SICSA Schools. Where a joint grant, the figure awarded to the institutions outside SICSA is not included

Appendix I Continued: Grant Income

Grant Source	Scottish	UK	European	Other international	Total
	AY2013-14	AY2013-14	AY2013-14	AY2013-14	AY2013-14
Research Councils		£21,849,126			£21,849,126
European Framework Programmes			£7,029,165		£7,029,165
Other public bodies*	£49,562	£5,313,510	£287,066	£1,325,584	£6,975,721
Charities	£0	£855,756	£0	£0	£855,756
Industry	£0	£552,603	£50,764	£375,653	£979,020
<b>Total</b>	£49,562	£28,570,995	£7,366,995	£1,701,237	£37,688,788

## **Appendix II: SICSA Funded Staff (as of 31 July 2014)**

### **University of Aberdeen**

Matthew Collinson, Reader/Lecturer, from HP Labs  
George Macleod Coghill, Chair, from University of Aberdeen  
Chenghua Lin, Lecturer, from the Open University  
Advait Siddharthan, Reader/Lecturer, from University of Cambridge

### **University of Abertay**

Alexey Goltsov, Reader/Lecturer, from University of Edinburgh

### **University of Edinburgh**

Ilias Diakonikolas, Lecturer, from UC Berkeley, USA  
Vincent Danos, Chair, from CNRS, Paris  
Sharon Goldwater, Reader/Lecturer, from Stanford University  
Andrew Gordon, Chair, from Microsoft Research, Cambridge  
Michael Herrmann, Reader/Lecturer, from Max-Planck Institute for Dynamics and Self-Organization  
Elham Kashefi, Reader/Lecturer, from University of Oxford  
Victor Lavrenko, Reader/Lecturer, from University of Massachusetts Amherst  
Richard Mayr, Reader/Lecturer, from North Carolina State University  
Iain Murray, Reader/Lecturer, from University of Toronto  
Guido Sanguinetti, Reader/Lecturer, from Sheffield University  
Rahul Santhanam, Reader/Lecturer, from University of Toronto  
Charles Sutton, Reader/Lecturer, from University of California Berkeley

### **University of Glasgow**

Gethin Norman, Reader/Lecturer, from University of Oxford  
Dimitrios Pezaros, Reader/Lecturer, from Lancaster University  
Simon Rogers, Reader/Lecturer, from University of Glasgow  
Jeremy Singer, Reader/Lecturer, from University of Manchester  
Alessandro Vinciarelli, Reader/Lecturer, from IDIAP, Martigny  
David White, SAF, from University of York  
Julie Williamson, Research Fellow, from University of Glasgow  
Yolanda Vasquez-Alvarez, Research Fellow, from University of Glasgow

### **Heriot Watt University**

Oliver Lemon, Chair, from University of Edinburgh  
Hans-Wolfgang Loidl, Reader/Lecturer, from Ludwigs-Maximilians Universität Munich

### **University of St Andrews**

Adam Barker, Reader/Lecturer, from University of Melbourne  
Edwin Brady, SAF, from University of St Andrews  
Simon Dobson, Chair, from University College Dublin  
Dr John Thomson, Reader/Lecturer, from University of Innsbruck  
Aaron Quigley, Chair, from University of Tasmania  
Alex Voss, Reader/Lecturer, from University of Manchester

### **University of Stirling**

Andrea Bracciali, Reader/Lecturer, from Istituto di Scienze e Tecnologie dell'Informazione "A. Faedo"  
Marwan Fayed, Reader/Lecturer, from University of Ottawa

### **University of Strathclyde**

Eva Hornecker, Reader/Lecturer, from Open University  
Dmitri Roussinov, Senior Lecturer, from Arizona State University

## Appendix III: KPI Information

### 1) Start-up/Spin out, Jobs created

*During the census period: Numbers of new start-ups, spin outs, patents, licenses, Proof of Concept projects, SMART projects, KTP awards and other notable awards e.g. Intermediate Technology Institutes, Enterprise Fellowships.*

#### University of Edinburgh:

- Start Ups (x5): YourTaximeter Ltd, 3Dei Ltd, Digicore Systems Ltd, Autoden Ltd, Spacesurfer Ltd
- Commercial Licenses (x9): Simedics Ltd., Voicebase Inc. (x2), Koemei S.A., Samsung Beijing Telecom R&D Center, L.B.Consulting LLC (x2), University of Ghent, Cartoon Interactive Group Inc.
- Industry PhD Student Sponsorship (x6): Agilent Technologies UK Ltd., Wolfson Microelectronics plc, Microsoft Research (x4)

#### University of Glasgow:

There are no spin-outs and start-ups, or jobs directly created from these, in the census period. However, there are a number of other notable awards in Computing Science at Glasgow.

- 2 European Union FP7 collaborative small or medium scale research projects (Brewster, Ounis)
- 1 EPSRC First Grant Scheme awards (Williamson)
- 1 industrially supported studentship
- 1 charity supported studentship
- 5 European Industry and UK Government/Other UK research donations
- 2 consultancies (industry partners cannot be disclosed)
- 4 SFC innovation vouchers: Investigating the feasibility of iBeacons technology for mobile marketing applications (Bell), Logistics Tracking System (Morrison), The Jigsaw Project (Chalmers), Workbound (Chalmers)
- 1 Encompass GU award (Manlove)
- 4 internally funded Impact Acceleration Account grants (Azzopardi, Chalmers, Murray-Smith, Williamson)

#### Heriot-Watt University

One start-up as follows:

- High Performance Sports Innovation Ltd, started with partial support from Informatics Ventures 'Collaborative Innovation' award. (Corne)

#### Robert Gordon University:

- Development of a planning and resource control programme linking flexible resource with varying demand using the latest advancements in technology within the road transport market - £149,131 (McCall)
- To develop and commercialise a process simulation model specifically designed for hydrocarbon allocation systems - £146,806 (McCall)

#### University of Stirling:

- Hylas project: Industrial collaboration with Agilent (\$15K) for automatic improvement of relational database queries.
- Haiku project: Industrial collaboration with Dataductus (£5K) for development and application of a metaheuristic combinatorial framework to warehouse scheduling.

- 2013-17: Professor Hussain is PI for a new four-year University of Stirling and industry (Utech Ltd.) co-funded (~£30k) IMPACT PhD project (M. Ilyas), aimed at developing intelligent prognostic decision support system for predicting growth hormone deficiency in children – in collaboration with Glasgow Yorkhill NHS Hospital & Harvard Medical School
- 2014-18: Professor Hussain is PI for a new (~£50k) PhD grant co-funded by a US based company: Behavioural Media Networks, Inc. (a spin-off of the Mind-Machine Project at MIT Media Lab) and the University of Stirling international PhD scholarship, (for S. Poria), for: multi-modal sentiment and opinion mining

#### **University of Strathclyde:**

- Expert Systems for Space Applications (Eirini Komninou, RSE Enterprise Fellowship) Royal Society of Edinburgh Award amount - £36,813.00

#### **2) Esteem indicators, e.g. Fellowships, Invitations, Conference Chairing etc. and 7) Prizes**

*In each department: Fellowships of learned societies, personal research fellowships (e.g. EPSRC), notable prizes (awarded to staff and students) and any other notable esteem indicators.*

#### **University of Aberdeen:**

- Fellow: Institution of Engineering and Technology (Coghil)
- Fellow: EPSRC Peer Review College (Edwards, Mellish, Norman, Pan)
- Fellow: ESRC Peer Review College (Edwards)
- Editorship: Int. J. on Semantic Web and Information Systems (Pan)
- Editorial Board: Web Semantics (Pan)
- Editorial Board: Big Data Research (Pan)
- Editorial Board: Autonomous Agents and Multi-Agent Systems (Sycara)
- Editorial Board: Interactive Learning Research (Beacham)
- Editorial Review Board: Artificial Intelligence Research (van Deemter)
- Editorial Review Board: Interactive Learning Research (Beacham)
- Associate Editor: Topics in Cognitive Science (van Deemter)
- Editor: Special Theme Section on Trust in Social Networks and Systems, ACM Transactions on Internet Technology Norman
- Programme Chair for 17th International Workshop on Trust in Agent Societies (Norman)
- Chair: 5th International Conference on Computational Models of Argumentation (Oren)
- Chair: 17th International Workshop on Coordination, Organisations, Institutions and Norms (Oren)
- Co-organiser: the ACL Workshop on Predicting and Improving Text Readability (Siddharthan)
- Chair: 4th Joint International Conference on Semantic Technology (Pan)
- SPC: 23rd International Joint Conference on Artificial Intelligence (Norman)
- SPC: 13th International Semantic Web Conference (Pan)
- Programme Chair for 13th International Conference on Autonomous Agents and Multiagent systems: (Norman, Oren, Vasconcelos)
- Programme Chair for 23rd International Joint Conference on Artificial Intelligence (Oren, Vasconcelos, Pan)
- Programme Chair for 14th International Conference on Principles of Knowledge Representation and Reasoning (Oren)
- Programme Chair for 12th European Conference on Artificial Life (Pang)
- Programme Chair for 2014 Genetic and Evolutionary Computing Conference (Pang)
- Programme Chair for 11th International Conference on Artificial Immune Systems (Pang)

*Invited Keynotes:*

- 5th International Workshop on Collaborative Agents - Research & Development (Oren)
- Advanced Courses in AI: Argumentation in Artificial Intelligence 2013 (Oren, Wyner)
- 2014 Summer School on Argumentation (Oren, Wyner)
- 15th European Agent Systems Summer School (Vasconcelos)
- Workshop-Escola de Sistemas de Agentes, seus Ambientes e aplicações (Vasconcelos)
- Multi-Agent Programming Summer school (Vasconcelos)
- 7th Cina Semantic Web Symposium (Pan)

*Prizes:*

- Kirsten Smith - Best 2nd year Poster - SICSA PhD Conference

**University of Abertay:**

- Session Chair for European Conference on Visual Perception, Belgrade. 26th August 2014. Visual Search Session.
- Session Chair for European Conference on Eye Movements. 16 August 2013, in Lund, Sweden. Human Factors Session.
- Invited talk – Behavioural biases and oculomotor search strategies in multiplex scene viewing: experimental and applied perspectives'. University of Leicester, UK
- Plenary talk at European Biotechnology Congress 2014, Novel technological approaches and their applications in biotechnology.
- Plenary talk and Session Chair at European Biotechnology Congress 2014, Process-based vs data-driven modeling in cancer cell biology.
- Invited talk and Session Chair at European Biotechnology Congress 2014, Quantitative analysis of proliferation behaviour of ovarian cancer cells with the dynamics of reactive oxygen species production and sequestration
- Students from Abertay University's art and design courses showcased their work at a V&A Digital Futures event in London.
- Abertay University won the Best Educational Institute at the TIGA Games Industry Awards. Abertay students also took the Best Student Game award for Wee Paper Planes (by Pixel Blimp), while Mr Shingu's Paper Zoo (by Stormcloud Games) – a game supported by the Abertay University Prototype Fund – won Best Casual Game (Small Studio).

**University of Dundee:**

*Professional Recognition:*

- ACM Secretary-Treasurer (to 2014) (Hanson)
- ACM Vice-President (from 2014) (Hanson)

*Fellowships:*

- Fellow: BCS (Arnott, Parkes)
- Fellow: HEA (Arnott)
- Fellow: Institute of Physics (Parkes)
- Fellow: Institution of Engineering Technology (Parkes)

*Awards (Staff):*

- University of Saskatchewan Dept of Computer Science Best Graduate Student Award 2013 (Flatla)
- ACM SIGACCESS Outstanding Contributions Award 2014 (Hanson)
- Colleges Scotland Learning & Teaching Award (Hughes, Hewitt)

- Winner of 1st International Contest on Performance Evaluation of Indirect Immunofluorescence Image Analysis Systems, Tasks 1 & 2; ICPR 2014. (Manivannan, Li, Akbar, Wang, Zhang, McKenna)
- British Association for Cancer Research Prize for Best Cancer-Related Paper, MIUA 2014. (Zhang, McKenna)
- Royal Aeronautical Society Written Paper Award 2014 (Parkes)
- Courier Business of the Year 2013 (Parkes)
- Courier Digital Business of the Year 2013 (Parkes)
- Scottish Chamber of Commerce Business of the Year 2014 (under 25 employees) (Parkes)
- Best poster award, SINAPSE annual scientific meeting, RSE, 2014 (Trucco)
- Work closest to market award, SINAPSE annual scientific meeting, RSE, 2014 (Trucco)
- Second place, MICCAI 2014 Challenge on Brain Tumour Digital Pathology Segmentation, (Zhang)

*Awards (Students):*

- Second place in the Most Useful category: Student Innovation Competition ACM Symposium on User Interfaces, Software and Technology 2013 (Crabb, Stein, Zutis)
- SIGCHI Best Paper Award 2014 (Nicolau)
- EPSRC UK ICT Pioneers Finalist 2014 (Stein)

*Editorships:*

- Editor (joint): Special Issue of journal Computer Speech & Language, Sept. 2013 (Arnott)
- Editorial Board: Journal Technology and Disability (Arnott)
- Editorial Board: Italics (Hughes)
- Associate Editor: Machine Vision and Applications (McKenna)
- Guest editors: International Journal of Computer Vision, 2014 (McKenna, Trucco)
- Editor of the SpaceWire Standard for ESA/ECSS (Parkes)
- Editor in chief: Argument & Computation (Reed)
- Editorial board: Informal Logic (Reed)
- Editorial board: Journal of Public Deliberation (Reed)
- Editorial board: Argumentation & Advocacy (Reed)
- Associate Editor, IEEE Trans on Systems, Man and Cybernetics (Trucco)
- Editorial Board: Frontiers in Computational Intelligence (Komendantskaya)

*Programme Committees:*

- Scientific Board for AAATE 2013 (Arnott)
- SLPAT 2013 & 2014 (Arnott)
- From Real Data to Argument Mining (12th ArgDiaP), 2014 (Budzynska)
- The Polish School of Argumentation (11th ArgDiaP), 2013 (Budzynska)
- Argumentation 2013 (Budzynska)
- 3rd International Workshop on Advances in Semantic Information Retrieval (Budzynska)
- International Workshop on the Theory and Applications of Formal Argumentation 2013 (Budzynska)
- Member ASSETS 2014 Doctoral Consortium Panel (Flatla)
- Chair Experience Report & User Experience Panel ASSETS 2014 (Flatla)
- ACM ASSETS (Flatla, Hanson)
- Chair: Specific Application Areas on the CHI'14 Subcommittee (Hanson)
- CSEDU 2014 (Hughes)
- IEEE Symposium Series on Computational Intelligence 2014 (Komendantskaya)
- 24th International Conference on Inductive Logic Programming 2014 (Komendantskaya)

- The Tenth Doctoral Consortium of the International Conference on Logic Programming 2013 (Komendantskaya)
- The International Conference on Artificial Neural Networks 2014 (Komendantskaya)
- ACM Multimedia (McKenna)
- Medical Image Understanding and Analysis (McKenna) Int. Conf. Pattern Recognition (McKenna)
- ICPRAM (McKenna)
- AAI 2015 (Petrie)
- Principles and Practices of Constraint Programming 2014 (Petrie)
- Co-chair of COMMA 2014 (Reed)
- Co-chair of ACL 2014 workshop on argument mining (Reed)
- Co-chair of Argumentation 2013 (Reed)
- Co-chair Arguing on the Web (Reed)
- Co-chair of CMNA 2013 (Reed)
- Co-chair, mini-symposium on validation of retinal image analysis algorithms, IEEE EMBC, Osaka, Japan (Trucco)
- General co-chair, International Workshop on Mathematical Challenges in Ophthalmology, UCLA (Trucco)
- Institute for Pure and Applied Mathematics (Trucco)
- Co-chair, mini-symposium on low-cost retinal fundus cameras, IEEE EMBC (Trucco)
- IEEE Computer-Based Medical System 2013, special track on capillaroscopy (Trucco)
- IEEE Computer-Based Medical System 2013, special session on retinal image analysis (Trucco)
- IEEE International Conference on Image Processing 2013 (Trucco)
- IEEE International Symposium on Biomedical Imaging 2014 (Trucco)
- IEEE International Conference on Computer Vision and Pattern Recognition (McKenna, Trucco, Zhang)
- IEEE International Conference on Computer Vision (McKenna, Trucco)
- European Conference on Computer Vision (McKenna, Trucco)
- Program Co-chair of the 6th International Workshop on Video Event Categorization, Tagging and Retrieval towards Big Data 2014 (Zhang)
- Area Chairs, British Machine Vision Conference 2014 (McKenna, Trucco, Zhang)
- Special Track on Computational Intelligence and Video & Image Analysis, ACM SAC 2014 (Zhang)

*Invited Talks:*

- 19th conference on applications of logic in philosophy and mathematical foundations, Szklarska Poreba (Budzynska)
- Invited talks: University of Washington; University of York; Robert Gordon University; University of Glasgow; University of Calgary, University of Toronto, Saskatchewan, University of Regina, Michigan (Flatla)
- Laboratoire de l'Informatique du Parallélisme, Ecole Normale Supérieure de Lyon, France, 2014 (Komendantskaya)
- University of Leicester, 2013 (Komendantskaya)
- Shonan'13 meeting on Coinduction for Computation Structures and Programming Languages, 2013 (Komendantskaya)
- Invited speaker, 2nd International Workshop on Image-based Systems Biology, Jena, Germany, 2014 (McKenna)
- Invited talks: UCL, RGU (McKenna)
- Invited talks: University College Cork, Heriot Watt University, Edinburgh University, Napier University and Glasgow University (Petrie)

- Keynote at 5th ICAART (Reed)
- Keynote at 19th Conference on Applications of Logic (Reed)
- Keynote at 10th ArgDiap (Reed)
- Invitation to contribute to Argupolis (Switzerland), ACAI (London) and IGSAR (Poland) graduate schools (Reed)
- Invited talks: Workshop on Educational applications of argument (Pittsburgh), Argumentation colloquium (Lisbon), IMPACT workshop (Amsterdam) (Reed)
- Invited talks: IRIT Toulouse, University of Aberdeen and Robert Gordon University (Reed)
- Invited plenary speaker, 6th Latin American Conference on Networked and Electronic Media (Trucco)
- Invited seminar, Dept of ophthalmology, Yamagata University, Japan 2013 (Trucco)
- Invited seminar, Sun Yat Sen University, Guang Zhou, China 2013 (Trucco)
- Invited talk, annual workshop of the UK Biobank Eye Group 2014 (Trucco)
- Invited seminar, Master in Medical Informatics, University of Porto, Portugal 2014 (Trucco)
- Invited lecturer, 3-day course on computer vision, Universidad Nacional de Colombia, Medellin 2014 (Trucco)
- Keynote: Human Interaction 2014 (Alm)

*Other:*

- Chair, Steering Committee: ArgDiaP organisation (Budzynska)
- Member, Steering Committee: European Conference on Argumentation (Budzynska)
- ACM-W Europe Executive Committee (Hanson)
- Chair of Review Panel in Signal & Image Processing and Acoustics, Academy of Finland, Helsinki, 2013 (McKenna)
- BBSRC TRDF Panel member 2014 (McKenna)
- EPSRC peer review college (Hanson, McKenna, Newell, Reed, Trucco)
- Carnegie Research Assessor (appointed 2014) (McKenna)
- Grant referee for Chilean National Science and Technology Commission 2014 (McKenna)
- Grant referee for Netherlands Organization for Scientific Research 2014 (McKenna)
- Steering Committee for Medical Image Understanding and Analysis Conference (McKenna)
- Director of Education for SICSA (Petrie)
- Director of Education for the Data Lab (Petrie)
- Member: SQA Qualification Development Team for the Advanced Higher (Petrie)
- Member: ICT Skills Investment Plan deployment group (Petrie)
- Member: Royal Society equality group looking at nominations for RS and FRS awards (Petrie)
- Member, RCUK dot-rural DE Hub steering committee (Reed)
- Member, Advisory board of NEH Agora project at Georgia Tech (Reed)
- Member, Steering committee for the European Conference on Argumentation (Reed)
- Invited external expert on REF submission by Comp Science, University of Warwick (Trucco)
- Invited reviewer for A\*STAR President Technology Award, Singapore (Trucco)
- Invited expert referee for application for associate professorship, NTU Singapore (Trucco)
- Lifetime Achievement Award: Royal National Institute of Blind People, 2013 (Newell)

## University of Edinburgh:

### ANC/CISA Return:

- “How far can rate neurons go”, Invited keynote speech at the Kongsberg Vision Meeting, Norway, December 10, 2013 (Bednar).
- Series of 3 talks in the St Andrews Distinguished Lecture series on 27th November 2013 to all staff and students, including undergraduates: i) The Interaction of Representation and Reasoning; ii) Theory Evolution in Physics; iii) Reformation: A Domain-Independent Algorithm for Theory Repair (Bundy).
- Reviewing Editor for 'Brain Research Bulletin' (Hennig).
- Keynote speaker, 33rd International Meeting on Bayesian Inference and Maximum Entropy Methods in Science and Engineering, Australia (Murray).
- Area Chair, Neural information processing systems (NIPS) (Murray).
- Prize Committee, Neural information processing systems (NIPS) (Murray).
- UG student, Razvan Ranca, won top place in Computer Science in the international "Undergraduate Awards" for his project under my supervision (Murray).
- Research Challenges in Data Science, Launch of the SICSA Data Science Theme, Edinburgh, UK, 2014 (Murray).
- Computational Methods Workshop for Massive/Complex Data, Imperial College, London, UK, 2014 (Murray).
- GREAT3 Mid-challenge Workshop, University of Edinburgh, UK, 2014 (Murray).
- Uncertainty Quantification using Bayesian Methods workshop, University of Edinburgh, UK, 2013 (Murray).
- Invited Seminars at School of Mathematics, University of Leeds, UK, 2014; Gatsby computational neuroscience unit, London, UK, 2014; Monte Carlo tutorial, Department of Computing, Imperial College London, UK, 2014; Hoppers, Women in Informatics, University of Edinburgh, UK, 2014; School of Mathematics, University of Edinburgh, UK, 2013 (Murray).
- Elected as Chair of the UK Computing Research Committee (Aug 2014) (Robertson).
- "Research Challenges", invited presentation, IBM Big Data Colloquium, Royal Academy of Engineering, London, 2014 (Robertson).
- "Socialising Artificial Intelligence", thought leadership seminar, BT, Martlesham, 2014 (Robertson).
- "From Agency to Social Computation", keynote talk at the 12th International Conference on Practical Applications of Agents and Multi-agent Systems, Salamanca, 2014 (Robertson).
- Invited NETADIS Summerschool lecturer Copenhagen (van Rossum)
- Action editor Journal of Computational Neuroscience (van Rossum)
- Keynote speaker "Challenges in Computational Neuroscience" Nottingham (van Rossum)
- Invited speaker at NETADIS workshop in honour of John Hertz's 70th birthday (Stockholm June 2014) (Sanguinetti).
- Invited speaker at IST Machine Learning and Vision workshop (IST Austria, Vienna, September 2013) (Sanguinetti).
- Invited seminar speaker: at SISSA (Trieste, Italy, Nov 2013), University of Udine (Nov 2013), FBK Trento (Mar 2014), University of Camerino (Mar 2013), Chalmers University of Technology, Gothenburg (May 2014) (Sanguinetti).
- Best paper award at QEST 2013 (Buenos Aires, Sept 2013) (Sanguinetti).
- Election to the Young Academy of Scotland at the Royal Society of Edinburgh (Simpson).
- Area chair for Neural Information Processing Systems, "NIPS" (Storkey),
- Associate Editor: IEEE Transactions in Pattern Analysis and Machine Intelligence (Storkey).
- Action Editor Journal of Machine Learning Research (storkey).
- Invited Speaker, Toronto Machine Learning Summer School 2013 (Storkey).
- Invited Keynote Speaker, AIGM2013, Paris : Machine Learning Markets (Storkey).
- Invited Speaker, Microsoft Research Machine Learning Summit, Paris : Machine Learning Markets (Storkey).
- Member of Royal Academy Engineering Industrial Secondment Scheme Selection Panel (Tate, 2013-2016)
- Coordinator for Virtual University of Edinburgh (Tate)
- Senior Member of IEEE Intelligent Systems Editorial Advisory Board (Tate)
- Conference Organiser of Research and Education Track of OpenSimulator Community Conference 2013 (Tate)

### **ILCC/CSTR return:**

- Senior area editor of IEEE/ACM Transactions Audio Speech and Language Processing, 2013-date (Renals)
- Member of ISCA Advisory Council (2011-2014) (Renals)
- Member of advisory board ACM ICMI conference series, 2010-date (Renals)
- Member EPSRC College of Computing, 2006-date (Renals)
- Programme committee NIPS-2014 conference, Montreal (Renals)
- Invited keynote, HSCMA-2014, Nancy (Renals)
- Invited tutorial, UKSpeech-2013, Nancy (Renals)
- Invited talk, University of Birmingham, May 2014 (Renals)
- Visiting professor, Nagoya Institute of Technology, Japan 2012-2017 (Renals)
- Invited talk, University of Cambridge (Cohen)
- Invited talk, University of Sheffield (Cohen)
- Visiting Professor, Carnegie Mellon University (Cohen)
- Members of editorial board of Semantics and Pragmatics (Lascarides)
- Editorial Board Member, Interacting with Computers, 2013-2016 (Wolters)
- Editorial Board Member, ACM Transactions on Accessible Computing (Wolters)
- Associate chair, ACM Conference on Computer-Human Interaction
- SIGCHI, 2014 and 2015 (Wolters)
- Programme Committee, Health Informatics Scotland Conference - Research Track (Wolters)
- Invited talk at Universite Paris-Ouest Nanterre, Laboratoire MoDyCo (Goldwater)
- Invited talk at Science of Learning Symposium, Johns Hopkins University (Goldwater)
- Invited talk at Macquarie University, Department of Computing (Goldwater)
- Invited talk at University of Maryland, Department of Linguistics (Goldwater)
- Invited talk at Carnegie Mellon University, Language Technologies Institute (Goldwater)
- Invited talk at University of Pennsylvania, Department of Computer Science (Goldwater)
- Invited talk at Johns Hopkins University, Center for Speech and Language Processing Workshop at ACL: Cognitive Modelling and Computational Linguistics (Goldwater)
- Invited talk "Robust Compositional Semantics" Keynote, 18th Australasian Document Computing Symposium (ADCS) and 11th Annual Workshop of the Australian Language Technology Association (ALTA), Brisbane (Steedman)
- Invited talk "Planning and Language: A New Synthesis". Keynote, 31<sup>st</sup> Workshop of the UK Planning and Scheduling. Special Interest Group, Edinburgh, January 2014 (Steedman)
- Invited paper, Conference on Tense in Semantics and Philosophy of Language, June 2014, St. Andrews (Steedman)
- Member of EPSRC Peer Review College (Pain)
- Invited keynote speaker, EACL conference, 2014 (King)
- Invited visiting Professor at Universidad de Chile Nov 2013 - Jan 2014 (King)
- Chair of the Blizzard Workshop, 2013 (King)
- Editorial board of Computer Speech & Language (King)
- Guest editor on IEEE Signal Processing Letters (King)
- Co-organiser of the annual Blizzard Challenge, 2006-date, (King)
- Member EPSRC College (King)
- Invited talk at COIN network of excellence meeting, Finland, August 2014 (King)
- Invited Visiting Professor, Universidad Politecnica Madrid, Spain, March-April 2014 (King)
- Vice Chair, TextLink, July 2014-May 2018, (Webber)
- Invited talk, SIGDial Conference (Metz FR), August 2013 (Webber)
- Invited talk, ALTA Conference, Brisbane, Australia, November 2013 (Webber)
- Member of Editorial Board of Annual Review of Linguistics 2013-2014 (Klein)
- Visiting Professor, MIT, 2012-13 (Keller)
- Invited talk, Maryland Mayfest workshop, University of Maryland, 2013 (Keller)
- Invited seminars at Harvard, MIT, Stanford, Cornell, Tufts, Rochester, UMass Boston, 2013 (Keller)
- Governing board member, European Chapter of the Association for Computational Linguistics, 2013-2016 (Keller)

- Editorial board member, Computational Linguistics, 2012-2014 (Keller)
- Peer review college member, Engineering and Physical Sciences Research Council, 2012-now (Keller)
- Managing committee member, iV&L Net: The European Network on Integrating Vision and Language, 2013-now (Keller)
- Conference area chair, Association for Computational Linguistics, 2013 (Keller)
- 2014-2017 Associate Editor of IEEE-ACM Transaction on Audio, Speech, and Language Processing (Yamagishi)
- Appointed visiting associate professor, Nagoya Institute of Technology, Japan 2010-date, (Yamagishi)

*Prizes:*

- Elected Fellow of IEEE, 2014 (Renals)
- Joint paper with Liang Lu and Arnab Ghoshal won best paper award at IEEE ASRU 2013 (Renals)
- James S. McDonnell Foundation Scholar Award in 2013 (Goldwater)
- Elected Fellow of the Cognitive Science Society (CSS) (Steedman)
- 2015 President Elect, ACL SIGDAT (Steedman)
- Elected Fellow of the Association for Computational Linguistics December (Webber)
- 2014 The Young Scientists' Prize, The Minister of Education, Culture, Sports, Science and Technology, Japan (Yamagishi)
- 2013 The Kiyasu Special Industrial Achievement Award, The Information Processing Society of Japan (Yamagishi)

*Other notable esteem indicators:*

- PI of EPSRC Programme Grant Natural Speech Technology 2011–2016 (Renals)
- Coordinator of EU Support Action ROCKIT 2013–2015, (Renals)
- Unrestricted donation from Mitsubishi Electric Research Laboratories, March 2014 (Renals)
- PI on the EU grant JAMES, and CoI on the ERC grant STAC (Lascarides)
- PI on EU ERC Advanced Fellowship GRAMPLUS: Grammar –based Robust Natural Language Processing 2010-2015 (Steedman)
- Co-PI on EU IST Cognitive Systems 'Xperience' 2011-2016 (Steedman)
- Co – PI on ARC Discovery grant 'Incremental Parsing and Coreference Resolution' (Edinburgh Component) 2011-2014 (Steedman).

**LFCS Return:**

- Programme Chair - Mathematical Knowledge Management 2013 (Aspinall)
- Programme Extended Review Committee ACM Symposium Principles of Programming Languages (POPL), 2015 (Aspinall)
- Programme Committee - Workshop User Interfaces Theorem Provers 2014 (Aspinall)
- Jury member for the Beth Prize (awarded by FoLLI)(Bradley)
- PC member, WoLLIC 2014 (Bradley)
- PC member, Principles of Programming Languages 2014 (Cheney)
- Programme Committee Member – IEEE International Conference on BigData 2014 (Cheney)
- PC member, IFIP conference on Theoretical Computer Science 2014 (Cheney)
- PC member, Conference on Information and Knowledge Management 2014 (Cheney)
- Invitation: 4th COMBINE Forum, Institut Curie, Paris Sep 16-20 2013 (Danos)
- Talk+Panel: Franco-British Symposium on Synthetic Biology 17-18 Oct 2013, French Embassy, London (Danos)
- Invitation: Innsbruck Computer Science colloquium, Oct 24 2013 (Danos)
- Invitation: 10th birthday Conference, laboratoire de mathématiques appliquées (MAS) de l'école centrale Paris, Dec 11-13 2013 (Danos)
- Invitation: 8th Scottish Category Theory Seminar, International Centre for Mathematical Sciences, Edinburgh, Nov 29 2013 (Danos)
- Invitation: Wageningen Centre for Systems Biology (WCSB), Nov 11-12 2013 (Danos)
- Invitation: Workshop on Control Engineering and Synthetic Biology, 10-12 Sep 2014, Oxford (Danos)
- Keynote: Workshop on Graph-based tools York, Jul 25 2014 (Danos)

- Keynote: VEMDP Vienna, Jul 17 2014 (Danos)
- Invitation: Dagstuhl Seminar, "Feature Interactions: The Next Generation" Jul 6-11 2014 (14281) (Danos)
- Invitation: "Open Problems in Concurrency Theory" IFIP Working Group 1.8, 16-22 Jun 2014, Bertinoro (Danos)
- Keynote: CS2Bio Berlin, 6 Jun 2014 (Danos)
- Talk: Edinburgh maths-bio seminar, May 27 2014 (Danos)
- Keynote: Stochastic Biology: from Cells to Populations, May 4-7 2014, IST Austria (Danos)
- Talk: Bounded Rationality workshop Edinburgh, Apr 4-5 2014 (Danos)
- Talk: Flowers Consortium ISAB review London, Apr 1-2 2014 (Danos)
- Invitation: Franco-Scottish Computer Science Seminar, Edinburgh, Feb 14 (Danos)
- Invitation: Seminaire d'histoire des probas et de la statistique, Centre Koyre, Paris, 17 Jan 2014 (Danos)
- Public outreach: news and views on Markus Covert piece in the french edition of Scientific American, May (Danos)
- Consultant: DARPA Big Mechanism programme; a USD 2M, 42 months project led by Fontana (Harvard) (Danos)
- PC: RECOMB 2014, Pittsburgh, Apr 2-5 2014 (Danos)
- PC: HSB'14 (3rd International Workshop on Hybrid Systems Biology), Vienna 2014 (Danos)
- PC: TermGraph'14 (3rd International Workshop on Hybrid Systems Biology), Vienna 2014 (Danos)
- PC: Sixth International Workshop on Bio-Design Automation, Boston, Jun 11-12 2014 (Danos)
- Invited speaker at the ETAPS QAPL workshop in Grenoble in April 2014 (Gilmore)
- Keynote speaker at the TechShare Europe conference in Glasgow in September 2014 (Gilmore)
- Invited speaker at the Envisage Workshop on Contracts for Efficient and Reliable Services held in Bertinoro, Italy in September 2014 (Gilmore)
- Editorial Board Member - Journal of Logical Methods in Computer Science (Gordon)
- 9th International Symposium on Trustworthy Global Computing, Rome, 5-6 September 2014 - PC member (Gordon)
- Mathematical Foundations of Programming Semantics (MFPS XXX), Cornell, June 2014 - Invited speaker (Gordon)
- Scottish Programming Language Seminar (SPLS), Dundee, February 26, 2014 - Invited speaker (Gordon)
- Luca Cardelli Fest, Microsoft Research, Cambridge, September 8-9, 2014 - Co-organiser (Gordon)
- Third Workshop on Formal Methods and Tools for Security (FMATS3), May 1-2, 2014 - Co-organiser (Gordon)
- Invited speaker at CONCUR 2014, Rome 2nd-5th September, and TCS 2014, Rome 1st-3rd September (Hillston)
- Invited seminar at the PUMA group at Technical University of Munich, July 23rd 2014 (Hillston)
- Member of the Executive Board of Informatics Europe 2013-2015 (Hillston)
- Editorial Board of the Journal of Logical and Algebraic Methods in Programming (JLAMP) 2014 (Hillston)
- Editorial Board of Theoretical Computer Science C, 2011 (Hillston)
- Juan Reutter (my PhD student) won the 2014 ERCIM Cor Baayen Award given by the European Research Consortium for Informatics and Mathematics, for his dissertation "Graph Patterns: Structure, Query Answering and Applications in Schema Mappings and Formal Language Theory" defended here in 2013 (Libkin)
- The 2014 Ray Reiter Best Paper Prize for "Certain Answers as Objects and Knowledge" published at KR'14 (International Conference on Principles of Knowledge Representation and Reasoning) (Libkin)
- Keynote speaker - 33rd ACM SIGMOD–SIGACT–SIGART Symposium on Principles of Database Systems (PODS 2014) (Libkin)
- Editorial board member of the following journals: Bulletin of Symbolic Logic; Journal of Applied Logic; Journal of Algorithms in Cognition, Informatics and Logic; Theoretical Informatics and Applications (RAIRO) (Libkin)
- Advisory board member - Theory and Practice of Logic Programming (Libkin)
- Chair, ICDT Test-of-Time Award Committee (Libkin)
- PC member: Workshop PV 2014 (satellite workshop of CONCUR 2014) (Mayr)

- Invited lecturer: 1st EATCS Young Researchers School on Automata, Logic and Games July 27 - Aug 1, 2014. Telc/Czech Republic (Mayr)
- awarded the EATCS Distinguished achievements in July 14 (Plotkin)
- <http://eatcs.org/index.php/eatcs-award> (Plotkin)
- Elected as Fellow of the Royal Society of Edinburgh Feb 14 (Sanella)
- Editor-in-chief, Theoretical Computer Science (Sanella)
- ERC Consolidator Grant 2014-2019 (Sanathanam)
- EATCS-IPEC Nerode Prize (jointly with Lance Fortnow). (Sanathanam)
- Edinburgh partner in an EPSRC Programme Grant - REMS: Rigorous Engineering for Mainstream Systems (Stark)
- This is a collaboration across three sites (Cambridge, Edinburgh, Imperial) and runs for six years 2013-03 -- 2019-02 (Stark)
- Appointed as steering committee chair for Bx (the bidirectional transformation community) (Stevens)
- Digiteo Scientific Council: I am one of the 8 international experts appointed to oversee the scientific planning and progress of the Digiteo research cluster, which is a 24.8 million Euro programme involving 2600 scientific staff (of whom 1200 are PhD students) in 23 laboratories in France. (Stevens)
- EPSRC: College member (Stevens)
- BCS Distinguished Dissertation judging panel member (Stevens)
- Programme Committee Member -- VLDB 2014 (Viglas)
- Programme Committee Member -- SIGMOD 2015 (Viglas)
- Programme Committee Member -- ICDE 2015 (Viglas)
- Programme Committee Member -- DASFAA 2015 (Viglas)
- Invited tutorial -- VLDB 2013 (August 2013) (Viglas)
- Invited tutorial -- ICDE 2014 (April 2014) (Viglas)
- Invited talk -- Intel European Research and Innovation Conference (October 2013) (Viglas)
- Invited talk -- University of Wisconsin, Madison (April 2014) (Viglas)
- Colin Runciman Celebration, York, 23 Oct 2013, keynote speaker. (Wadler)
- FP Days, Cambridge, 24 Oct 2013, keynote speaker. (Wadler)
- Workshop on Secure Cloud and Reactive Internet Programming Technology (SCRIPT) Vrije University, Brussels, 12—13 Nov 2013, invited speaker. (Wadler)
- YOW! 2013 Australia Developers Conference, Melbourne 5—6 Dec, Brisbane 9—10 Dec, Sydney 12—13 Dec 2013, keynote speaker. (Wadler)
- Programming Languages Workshop, University of Melbourne, 4 Dec 2011, invited speaker. (Wadler)
- Functional Programming with the Stars, Brisbane, 7 Dec 2013, invited speaker. (Wadler)
- ScalaSyd, Sydney, 11 December 2013, invited speaker. (Wadler)
- SAPLING, Sydney, 16 Dec 2013, keynote speaker. (Wadler)
- Programming Language Mentoring Workshop (PLMW), co-located with POPL, San Diego, Jan 2014, invited speaker. (Wadler)
- Functional Programming eXchange, London, 14 March 2014, invited speaker. (Wadler)
- Software Contracts for Communication, Monitoring, and Security, NII Shonan Meeting, Shonan Village, 26—30 May 2014, co-organizer. (Wadler)
- BETTY Summer School, Lovran, Croatia, 30 June—4 July 2014, instructor. (Wadler)
- Summer School on Trends in Computing (SSTiC), Tarragona, 7—11 July 2014, keynote speaker. (Wadler)
- Advances in Programming Languages, Heriot Watt, 19—22 August 2014, instructor. (Wadler)
- Imperial College Computing Student Workshop, London, 25—26 September 2014, keynote speaker. (Wadler)
- The Third International Conference on Parallel, Distributed and Grid Computing (PDGC), Himachal Pradesh, 11—13 December 2014, keynote speaker. (Wadler)
- ECOOP, Prague, 6—10 July 2015, invited speaker. (Wadler)

### ICSA/IPAB Return:

- Licensing of Dermofit software to Simedics (Fisher)
- Publication of second edition of: Fisher et al., Dictionary of Computer Vision and Image Processing, J. Wiley & Sons. (Fisher)
- Invited talk at Cyprus Technical University, 2014 (Fisher)
- Invited talk at CS, Bristol, 2014 (Fisher)
- Keynote talk, Computer Vision for Analysis of Underwater Imagery, workshop at ICPR 2014, Stockholm (Fisher)
- Organising Committee and Publicity Chair, Robotics: Science and Systems 2015, Rome, Italy (Vijaykumar)
- Area Chair, Neural Information Processing Systems (NIPS), 2013 (Vijaykumar)
- Area Chair, IEEE International Conference on Advanced Robotics (ICAR), 2015, Istanbul, Turkey (Vijaykumar)
- IET Keynote Public Lecture, TAROS, Birmingham (Sep 2, 2014) (Vijaykumar)
- Keynote Lecture at London International Youth Science Festival (Jul 26) (Vijaykumar)
- Fellowship of the Royal Society of Edinburgh (Vijaykumar)
- 2013 IEEE Transactions on Robotics Best Paper Award (Vijaykumar)
- Awarded the EPSRC CDT in Robotics and Autonomous Systems, jointly with Heriot-Watt (£5.1M) (Vijaykumar)
- Awarded the EPSRC Infrastructure Grant (£6.1M) for Robotics (Vijaykumar)
- Awarded the CDT Equipment grant (£320,000) across UoE/HWU (Vijaykumar)
- Awarded Royal Society Industry Fellowship (Komura)
- Invited Speaker, AAIL-14 Workshop on Multiagent Interaction without Prior Coordination. (Ramamoorthy)
- Senior Programme Committee Member, The Twenty-Seventh AAAI Conference on Artificial Intelligence (AAAI-14) (Ramamoorthy)
- Co-Organizer, Workshop on Humanoid Soccer Robots, IEEE-RAS International Conference on Humanoid Robots, 2014. (Ramamoorthy)
- Publications Chair, IEEE International Symposium on Robot and Human Interactive Communication, 2014. (Ramamoorthy)
- Executive Committee, Standard Platform League, RoboCup 2015. (Ramamoorthy)
- Co-Chair, RoboCup International Symposium, 2014. (Ramamoorthy)
- Co-Organiser, AAAI Spring Symposium on Knowledge Representation and Reasoning in Robotics, 2014. (Ramamoorthy)
- Co-Chair, Special Session on Knowledge Representation and Reasoning in Robotics, International Conference on Social Robotics 2014. (Ramamoorthy)
- Stefano Albrecht, was a finalist in the EPSRC ICT Pioneers Competition, 2014. (Ramamoorthy)
- Invited talk, Neuroinformatik-Kolloquium, December 4, 2013, University Ulm, Germany (Hermann)
- Invited speaker, Symposium on Non-Linear Dynamics, March 17-24, 2014, Mandarfen, Austria (Hermann)
- Invited talk, Robotics Colloquium, June 12, 2014, State Key Laboratory for Robotics, Shenyang, China (Hermann)
- Invited speaker, Third Workshop on The Brain: Criticality, Dynamics, Network and Function, September 10-12, 2014, HRL Laboratories, Malibu, CA, USA (Hermann)
- Invited speaker, Workshop on Artificial Neural Networks for Pattern Recognition, October 6-8, 2014, Montreal, Canada (Hermann)
- Technical Programme Committee Member, NOLTA2014, September 14-18, 2014, Luzern, Switzerland (Hermann)
- Program Committee Member, ALIFE 14, July 23-26, 2014, Javits Convention Center, New York, NY, USA (Hermann)
- Associate Editor, Frontiers in Neurorobotics (Hermann)
- Area Chair for ICCV 2013 and CVPR 2014 which are two of the top 3 international conferences in computer vision. (Ferrari)

- Google Research Award of about USD 73k for research in learning visual models from video (Ferrari)
- BMVC 2013 best poster award; this is a good conference in computer vision (Ferrari)
- Associate editor of IEEE Transactions on Pattern Analysis and Machine Intelligence (from February 2014 onwards) (Ferrari)
- co-organizer of the Vision and Sports Summer School 2014 (Ferrari)
- EU Grant: Horizon 2020 Research and Innovation Program "AEROWORKS" (3.7 Meu) involving 10 partners in total from academia and industry (Chli)
- Associate Editor for the IEEE International Conference on Robotics and Automation (ICRA 2015) (Chli)
- PC member for the Robotics Science and Systems conference (RSS 2015). (Chli)
- Invited speaker to the British Machine Vision Association meeting (December 2014). (Chli)
- Invited talk, University of Oxford. Sept 2014 (Fallon)
- Invited talk, Imperial College. Sept 2014 (Fallon)
- Co-organizer of workshop on the DARPA Robotics Challenge at "Robotics: Science and Systems" conference. UC Berkeley, CA. July 2014 (Fallon)
- Perception Lead on MIT's DARPA Robotics Challenge Team finishing in 4th place in an international competition demonstrating humanoid robot capability (Resulting in \$1m continued funding) (Fallon)
- PLDI '14: Finance chair + session chair (Nagarajan)
- Invited by Beihang university for a short course on Parallel Architectures. (Nagarajan)
- Invited talks at Beihang university, IISc Bangalore, ICT China. (Nagarajan)
- Intel early career faculty award. (Nagarajan)
- Programme Chair of ETAPS CC 2015 (Franke)
- General Chair of CGO 2016 (Franke)
- Member of EPSRC Peer Review College (Franke)
- Assessor for the Carnegie Trust for the Universities of Scotland (Franke)
- General Chair PLDI 2014 (O'Boyle)
- HLPP14 PC member (Cole)
- PDP14 PC member (Cole)
- HLPGPU14 PC member (Cole)
- Invited talk, University of Glasgow, Computing Science. (Cole)
- EPSRC Centre for Doctoral Training in Pervasive Parallelism, c. £4M. (Cole)
- Google Faculty Research Award (PhD scholarship, USD 53K) (Dubach)
- Co-organisers ADAPT 2015 workshop (Dubach)
- CGO 2015 PC member (Dubach)
- CGO 2015 Workshops/Tutorials chair (Dubach)
- PACT 2014 Local arrangement chair (Dubach)
- HPCA 2015 Extended Review Committee member (Dubach)
- ADMS 2014 PC member (Dubach)
- Local Arrangements Chair for PLDI-14 (Leather, Hugh/ICSA) (Leather)
- General Chair of ParCo-15 (Leather, Hugh/ICSA) (Leather)
- PAM 2014 PC member (Lee)
- Invited talk at Queen Mary University of London (Nov. 2013) (Patras)
- Invited talk at University College London (Mar. 2014) (Patras)
- Invited talk at University of Trento, Italy (Mar. 2014) (Patras)
- Invited talk at University of Brescia, Italy (Mar. 2014) (Patras)
- Demos/posters chair for ACM MobiWAC 2013 (co-located with ACM MSWiM) (Patras)
- IFIP Wireless Days 2013 PC member (Patras)
- IEEE VTC 2013 PC member (Patras)
- IEEE PIMRC 2013 PC member (Patras)
- WiFlex Workshop 2013 PC member (Patras)
- IFIP Networking 2014 PC member (Patras)
- Invited panelist, Workshop on Architectural support for Big Data Computing, June 2014. (Grot)
- Guest co-editor, IEEE Micro, Special Issue on Big Data. July/Aug 2014. (Grot)

- Invited speaker: CUSO winter school on Data-Centric Systems (Dec 2014). (Grot)
- Invited talk: Pennsylvania State University (June 2014) (Grot)
- Invited talk: Oracle Research (Mar 2014) (Grot)
- Invited talk: AMD (2014) (Grot)
- Invited talk: Xilinx (July 2014) (Grot)
- Invited talk: University of Cambridge (Oct 2013). (Grot)
- ASPLOS 2015 PC member (Grot)
- HPCA 2015 PC member (Grot)
- MICRO 2014 PC member (Grot)
- IISWC 2014 PC member (Grot)
- ISCA 2014 PC member (Grot)

### **University of Glasgow:**

#### *Fellowships and membership:*

- Elected fellow of RAE (Calder)
- Elected member of UKCRC (Brewster)
- Elected member of UKCRC (Calder)
- Elected member of UKCRC (Murray-Smith)
- Elected member of UKCRC Executive Committee (Sventek)
- Member of Nokia Scientific Board (Murray-Smith)
- Member of IETF Transport Area Directorate (Perkins)
- Member of IFIP Working Group 2.11 on Program Generation (O'Donnell)
- Member of the NASA/ESA/IAASS Sub-Orbital Safety Committee (Johnson)
- Member of Scottish Qualifications Authority's Qualification Design Team for Computing Science (Cutts)

#### *Editorships:*

- Associate Editor of Discourse, Context and Media, Elsevier (Vinciarelli)
- Associate Editor of IEEE Signal Processing Magazine (for the Social Sciences) (Vinciarelli)
- Editorial board member for Personal and Ubiquitous Computing journal (Brewster)
- Editorial board member for Communications in Mobile Computing journal (Brewster)
- Editorial board member for Universal Access in the Information Society journal (Brewster)
- Editorial board member for The International Journal of Mobile HCI (Brewster)

#### *Other:*

- Chair and member of the Scientific Advisory Committee for the €3 Billion EC SESAR Programme (Johnson)
- Chief Scientific Adviser for Scotland (Calder)
- Co-chair of the RAE UK Forum for Computing Education (UKforCE) (Cutts)
- Impact assessor for the REF 2014 Computer Science subpanel (Calder)
- Member of 2014 Computer Science REF Panel (Sventek)
- Member of panel for DFG (German science funding council) Excellence initiative, allocating B€27 for science research in Germany (Brewster)
- Scientific adviser to NATO on Cybersecurity Simulations in the MNE7 programme (Johnson)
- Scientific adviser to the European Railway Agency on Accident Investigation across Member States (Johnson)
- Scientific adviser to the European Network and Information Security Agency on the new European
- Cyber Incident Reporting System (Johnson)
- Scientific adviser to the Civil Aviation Authority on Future Safety Concerns (Johnson)
- Scientific adviser to EUROCONTROL on Safety and Security (Johnson)
- SICSA Knowledge Exchange Champion (Ounis)
- Two-year secondment to deliver Scottish government CPD programme for teachers (Cutts)

### **Heriot-Watt:**

- 'Most Influential Paper' prize for Sixth ACM SIGPLAN Conference on Principles and Practice of Declarative Programming, PPDP'04. (Gabbay)
- Two female 2<sup>nd</sup> year CS students at our Dubai campus, Neeha Ali and Yasmine Fadel won the GISWORKX Mobile Developer Challenge. <http://www.gisworx.ae/mobile/index.html>  
<http://www.hw.ac.uk/news-events/news/dubai-campus-computer-systems-students-win-16872.htm>
- Best paper prize for: C. Y. A. Brenninkmeijer, I. Dunlop, C. Goble, A. J. G. Gray, S. Pettifer, and R. Stevens, "Computing identity co-reference across drug discovery datasets," in Semantic web applications and tools for life sciences (swat4ls 2013), Edinburgh, UK, 2013. (Gray)
- Expert member on the W3C Health Care and Life Sciences Interest Group (Gray)
- Proposal reviews for the Netherlands Organisation for Scientific Research (NWO), Sept 2013 (Aylett)
- EPSRC Engineering panellist, 2013 (Aylett)
- Computer Science panel member for the Academy of Finland 2013/14 funding round. (Corne)
- Co-organiser: Dagstuhl worksop Computational models of culture, March 2014. (Aylett)
- Senior Programme Committee AAMAS 2014 (Aylett)
- Invited keynote at AAMAS workshop Agents, Virtual Societies and Analytics (ASVA 2014) May 5 2014. (Aylett)
- Invited talk Lorentz centre workshop Interactive Intelligence Jun 2014 (Aylett)
- Successful application to the Royal Society Pairing Scheme Jul 2014 (Aylett)
- Chair of SWAT4LS 2014: International Workshop on Semantic Web Applications and Tools for Life Sciences, Edinburgh, 9-12 December 2013  
<http://www.swat4ls.org/workshops/edinburgh2013/> (Burger)
- Editor for Journal of Biomedical Semantics (Semantic technologies in healthcare and life sciences theme): <http://www.jbiomedsem.com/series/SWAT4L2013> (Burger)
- Associate Editor of "Frontiers in ICT: Big Data". (Corne)

### **Robert Gordon University:**

- Fellow of BCS (Allison)
- Fellow of HEA (Doolan)
- Special Issue Editor of Cloud Computing Migration and Adoption for Journal of International Technology and Information Management, IIMA 2013, (Allison, Bass)
- Special Issue Editor of Electronic Journal of Information Systems in Developing Countries, Vol. 62, March 2014, (Bass)
- Senior Editor, Electronic Journal of Information Systems in Developing Countries (Bass)
- Member of Board of Data Lab (Allison)
- Member of Board of ScotlandIS (Allison)
- Board memberships: SICSA 2008-2014, Scottish Graduate Academy 2008-2014, Horizon Scottish Sensor Systems Centre 2011-2014, Oil & Gas Innovation Centre 2013-2014 (Craw)
- Keynote: Agile Methods and Capability Maturity: Addressing the Paradox, Keynote at CMMI Conference Portugal October 2013 (Allison)
- Invited keynotes: Oil & Gas ICT Leader Conference 2014, Aberdeen City and Shire Tourism Conference 2014 (Craw)
- Chair EDA Track, GECCO 2014 (McCall)
- Chair IEEE Task force on Biomedical Applications of Evolutionary Computing (McCall)
- Chair IEEE Task Force on Probabilistic Modelling (McCall)
- Chair: DemoFest Smart Tourism Workshop February 2014 (Craw)

- Programme Chair, European Workshop on Iterative and Incremental Approaches to ICT4D, International Federation for Information Processing (IFIP) Working Group on the Social Implications of Computing in Developing Countries (WG 9.4), Aberdeen, May 2014. (Bass)
- Track Co-Chair “Designing Applications, Services, Systems and Infrastructure for Development” and “PhD Graduate Student Track,” IFIP 12th International Conference on Social Implications of Computing in Developing Countries, Ocho Rios, Jamaica, May 2013. (Bass)
- Track chair for Database Applications and Data Mining, 16th IEEE International Conference on High Performance Computing and Communications, HPCC 2014 (Gaber)
- Program co-chair for 2014 FTRA International Symposium on Frontier and Innovation in Future Computing and Communications, FCC 2014 (Gaber)
- General co-chair BCS SGAI Workshop on Social Media Analysis (Gaber, Wiratunga)
- Advanced seminars co-chair IEEE Mobile Data Management, MDM 2014 (Gaber)
- EPSRC Peer College since 2003 (Craw)
- SICSA Theme Leader on Complex Systems Engineering (McCall)
- Secretary of the International Federation for Information Processing (IFIP) Working Group on the Social Implications of Computing in Developing Countries (WG 9.4), (2009-13). (Bass)
- BCS Chartered Membership Assessor (Bass)
- Invited software: RGU-MFS texture representation in QMUL’s QMVamp audio analysis plugin system (Craw)

#### **University of St Andrews:**

- Initial contacts for research with Imperial College (sensor networks) and the University of North Carolina, Chapel Hill (complex systems). (Dobson)
- Worked (ongoing) with a colleague to apply machine learning to intrusion detection, in collaboration with a Scottish SME. (Dobson)
- Contributed to several government consultations through UKCRC. (Dobson)
- Committee member for approximately 10 conferences and workshops. (Dobson)
- Associate editor, ACM Transactions on Autonomous and Adaptive Systems. (Dobson)
- Invited talks at the University of York and the University of Glasgow. (Dobson)
- Founding Director of St Andrews' Institute for Data-Intensive Research, co-ordinating activities across the university in data science and digital humanities. (Dobson)
- Workshop chair for ACM MobiSys 2014 (The 12th International Conference on Mobile Systems, Applications, and Services) (<http://www.sigmobile.org/mobisys/2014>). (Henderson)
- Best paper at IEEE HotPOST 2014 (The 6th International Workshop on Hot Topics in Peer-to-peer computing and Online Social neTworking) (<http://hotpost14.realmv6.org>). (Henderson)
- Book published - <http://www.springer.com/computer/hci/book/978-1-4471-5133-3> (Baxter)
- Chair of the Scottish region of the BCS Interaction Group. (Baxter)
- General chair of ISSAC 2015 (International Symposium on Symbolic and Algebraic Computation). (Linton)
- Membership of steering committee (with a tenure of 7 years) of the ACM Interactive Tabletops and Surfaces conference. (Nacenta)
- Program co-chair ACM Interactive Tabletops and Surfaces conference 2013. (Nacenta)
- Fellow of the Software Sustainability Institute. (Konovalov)
- Collaboration with Wire Free Productions Ltd. (<http://www.wirefreeproductions.com/>) on developing a new format for BBC Radio 5live based on social media analysis (Voss)
- Editorial board of a new Sage journal on Big Data and Society. (Voss)
- Invited talks at LFMTTP 2014 (Logical Frameworks and Metalanguages: Theory and Practice) and Scala workshop 2014 PC Chair of DTP 2014 (Brady)
- Invited to join the HiPEAC European network of excellence for High Performance Computing. (<http://www.hipeac.net/>) (Thomson)

- Submitted an application for an Innovation Voucher to work with Butterfly Catcher: <https://www.butterflycatcher.co.uk> (Miguel)
- Invited tutorials at the recent CP'14 conference. (Jefferson and Nightingale)
- Associate Editor, ACM Transactions on Intelligent Interactive Systems (Kristensson)
- Associate Editor, International Journal of Human-Computer Studies (Kristensson)
- Royal Society of Edinburgh Early Career Prize in Physical Sciences, Sir Thomas Makedougall Brisbane Medal (Kristensson)
- ACM User Interface Software and Technology (UIST) Lasting Impact Award, 2014 (Kristensson)
- Member of the Royal Society of Edinburgh International Committee (Kristensson)
- Member of the Royal Society of Edinburgh / Scottish Enterprise Industry Fellowship Scheme Review Board (Kristensson)
- Programme Co-Chair, ACM Conference on Intelligent User Interfaces (Kristensson)
- Associate Chair, ACM Conference on Human Factors in Computing Systems (Kristensson)
- Demo Co-Chair, ACM Symposium on User Interface Software and Technology (Kristensson)
- SICSA HCI Theme Co-Leader (Kristensson)

#### **University of Stirling:**

- Editorial board of Journal of Biological Dynamics (Graham)
- Tutorial Chair for Computational Neurosciences 2014 conference in Quebec in July 2014 (Graham)
- Track Chair: Advances in High-Performance Bioinformatics, Systems and Synthetic Biology at PDP14 (International conference on Parallel, Distributed, and Network-Based Processing). (Bracciali)
- Session Chair: Large-scale and HPC data analysis in Bioinformatics: Intelligent Methods for Computational, Systems and Synthetic Biology at CIBB'14(International Meeting on Computational Intelligence Methods for Bioinformatics and Biostatistics). (Bracciali)
- Member of 13 Symposium On Theory of Modeling and Simulation (TMS'13), USA. (Bracciali)
- WIVACE2013 Italian Conference on Artificial Life and Evolutionary Computation. (Bracciali)
- 12th European Conference on Artificial Life. (Bracciali)
- DCPeRF2014 (Bracciali)
- Professor Smith became UK Node representative on INCF taking over from Professor Willshaw, (Edinburgh) in Jan'14 (Smith)
- General Chair of 2014 IEEE/EPSC/SICSA Workshop on Autonomous Cognitive Robotics, Stirling, 27-28 March 2014 (Hussain)
- Chair of 2013 SICSA International Summer School on Cognitive Computation, University of Stirling, 25-30 August 2013 (Hussain)
- Publications Chair of the 2014 IEEE World Congress on Computational Intelligence (IEEE WCCI), Beijing, July 6-11, 2014 (IEEE WCCI is the world's largest technical event in the field). (Hussain)
- Visiting Professor at Anhui University in China, and the University Sultan Zainal Abidin, Malaysia. (Hussain)

#### **University of Strathclyde:**

- SICSA workshop: Towards a School- University Education Continuum in Computing – 25th June 2014. (Connor)
- SICSA workshop: Third SICSA funded workshop on Technologies for Health and Wellbeing – 20th June 2014. (Lennon)
- Invited Speaker, The Internet of Things – Building a Connected World, British Science Association, Dundee, January 2015 (Weir).
- Member of the International Cybercrime Research Centre, Simon Fraser University, Vancouver, Canada, September 2014 (Weir).
- Senior Research Affiliate, Canadian Network for Research on Terrorism, Security & Society, September 2014 (Weir).

- General Chair, 4th International Conference on Cybercrime, Security and Digital Forensics (Cyberforensics 2014), University of Strathclyde, June 2014 (Weir).
- Invited Seminar, Strategies for Covert Web Search, Australian Institute of Criminology, Canberra, Australia, November, 2013 (Weir).
- Co-opted member, E-crime subgroup of the Scottish Financial Crime Group (organised by the Scottish Business Crime Centre) (Weir).
- General Chair, 3rd International Conference on Cybercrime, Security and Digital Forensics (Cyberforensics 2013), University of Cardiff, June 2013 (Weir).
- International Program Committee Chair, International Conference on CyberCrime and Computer Forensic 2013, 25-28 August 2013, Hong Kong (Weir).
- Elected Committee Member, UK Chapter of the Association of Certified Fraud Examiners (Weir).
- International Editorial Board Member, International Journal of Information Security Science (Weir).
- International Editorial Board Member, International Journal for Information Security Research (Weir).
- International Editorial Board Member, Interconexões: Revista de Ciências Sociais (Weir).
- Invited academic representative on the Scottish Governments National Telecare Advisory Board (McGee-Lennon)
- Editorial Board: Journal of Reliable Intelligent Environments International Journal on Advances in Intelligent Systems (Terzis)
- Editorial board membership for Journal of Discrete Mathematics (JDM) (Kitaev)
- Editorial board membership for Open Journal of Discrete Mathematics (OJDM; 2010-2013) (Kitaev)
- Plenary speaker for the international Permutation Patterns conference in July 2014 <http://www.etsu.edu/cas/math/pp2014/> (Kitaev)
- Member of editorial board for Empirical Software Engineering Journal: <http://www.springer.com/computer/swe/journal/10664?detailsPage=editorialBoard> (Wood)
- Associate Chair ACM International Conference on Multimodal Interfaces (ICMI) 2013 (Halvey)
- Local Organising Chair ACM International Conference on Multimedia Retrieval (ICMR) 2014 (Halvey)
- Laboratory Chair Conference and Labs of the Evaluation Forum (CLEF) 2014 (Halvey)
- Organiser SIGIR workshop on Gathering Efficient Assessments of Relevance (GEAR), workshop was jointly funded by AHRC and ELIAS (Halvey)
- Editorial Board: Journal of Software Testing, Verification and Reliability (Wiley)
- <http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291099-1689> (Roper)
- Editorial Board: Software Quality Journal (Springer) <http://link.springer.com/journal/11219> (Roper)
- Area Chair for CHI 2015 (Dunlop)
- Associate Editor for Int Journal Mobile HCI (Dunlop)
- Associate Editor for Personal and Ubiquitous Computing (Dunlop)
- Managing Editor of mUX: The Journal of Mobile User Experience (Dunlop)
- Member of International Steering Committee for MobileHCI Conference Series (Dunlop)
- Co-editor of the post-proceedings of the Tenth International Tbilisi Symposium on Language, Logic and Computation (Kupke)
- Invited speaker at the 60th birthday symposium of Prakash Panangaden in Oxford (Kupke)
- Editorial board for Mathematical Logic of "The Scientific World Journal" (Kupke)
- Appointed as strategic review for AHRC 2014-2016 (Ruthven)
- Editorial Board: Foundations and Trends in Information Retrieval. (Ruthven)
- Editorial Board: Information Processing and Management. Elsevier. (Ruthven)

- Editorial Board: Journal of American Society for Information Science and Technology. (Ruthven)
- Editorial Board: Journal of Documentation. (Ruthven)
- Editorial Board: Journal of Information Science. (Ruthven)

### 3) Cross-SICSA institutional research funding

See Appendix I for full details.

### 4) Other notable activities

*Any other notable activities e.g. cross disciplinary funding or activities, international collaborations, industrial collaborations. Activities may be notable due to the scale of the funding or the novel nature of the funding source, the nature or prestige of the company or institution involved or because it represents a new or novel activity for the department.*

#### University of Aberdeen:

- Arvind Joshi (U. Penn) visited Aberdeen between the 15th and 16th of May 2014, and Barbara Grosz (Harvard) gave a seminar and had discussions with members of staff on May 20-21 2014. Stuart Shieber (Harvard) was hosted at the University of Aberdeen between the 2nd and 4th and the 11th and 18th of June, where a master class of three lectures on synchronous semantics was presented.
- Northern Lights Conference (Organised by Scharlau) was held in October 2013 at Aberdeen. This outreach event, primarily dealing with Ruby programming, attracted a variety of industrial speakers, as well as staff and students.
- Code the City event was run with 3 of the 4 Scottish NESTA sponsored 'code fellows'. Around 40 attendees, from a variety of disciplines, came and created civic applications over the weekend.

#### University of Abertay:

- Abertay University and Glasgow Caledonian University (GCU) hosted the Scottish Game Jam, with 200 participants in two events held simultaneously. Game Jam is a worldwide race against the clock to develop original games.
- Abertay hosted Scotland's largest cyber-security conference, which is entirely organised by Ethical Hacking students. Securit-Tay brought together over 100 delegates from education, industry and law enforcement.
- Abertay hosted Eye for an Eye public engagement event, a continuing exploration of visual stimuli that aims to simultaneously engage audiences of varied colour vision acuities. Prints, motion graphics, colour vision deficiency (CVD) simulation software and smart devices are used to create new perceptions; exploring the idea that artwork can be intentionally created to be experienced differently dependent on one's visual abilities.
- Abertay University is a key partner in devising and delivering NEoN, Scotland's only international digital arts festival, featuring moving image, performance, music and technology-driven arts across Dundee.
- Abertay is part of an AHRC funded network titled Video Games in the Museum. The project aim is to discover new ways of displaying game design in museums.
- Abertay hosted the TIGA GameHack event, where industrial and academic communities combine to develop a game from scratch in 24 hours.
- Abertay hosted the Dare Protoplay, Scotland's biggest computer games festival.
- In collaboration with the Hannah Maclure Centre, Abertay hosted Forever Falling Nowhere, a performance, combining contemporary dance with projection mapping and animation to communicate themes of memory, love and loss.

#### *Industrial Links:*

- Abertay University's Food Innovation team have helped a military veteran launch a distinctive new brand of premium vodka using video animation and eye-tracking technology to help determine how the label performed against that of other premium brands of vodka.
- Abertay University and the University of Dundee and are among universities in the UK to secure funding for technology and digital innovation projects in the 2014 Fast Forward competition run by the Intellectual Property Office of the Department of Business, Innovation and Skills. Abertay University has been awarded £85,000 for its 'Investing in Digital Assets' project, while the University of Dundee has been given £73,000 for its 'Technology Accelerator Programme'.
- The Future Internet Consortium in association with Abertay University launched the Future Internet Games Contest, seeking for experimental pervasive games that enable large groups of people to play together in the real world.
- Interface funds (£50K) for the development and evaluation of a Share Trading Education App (with Dundee Business School and industry partners).
- AGRI-AP: Applied Graphics and Rendering Innovation for Agricultural Precision- £30K

#### **University of Dundee:**

Most members of staff and many PhD students have contributed to SICSA theme events. Highlights of the year include:

- SICSA Summer School on Argumentation: Computational and Linguistics Perspectives (4th September –8th September).
- Scottish Workshop on Argument Mining, July 9-10 and a Distinguished Visiting Fellowship for Prof. Francine Moens, KU Leuven, both in the Argumentation group.
- Silicon Valley Internship award to BSc student Stewart Taylor.
- Host for Women in Computing event, including address by Shona Robinson, MSP, and two Dundee students presenting.
- Host for New Computing Lecturer Induction Day
- Industrial "Proof of Concept grant" (7 months £10K) helped to establish collaboration with Rockwell Collins and Centaur. (Komendantskaya)
- SICSA Workshop sponsorship for Scottish Programming Language Seminar, February 2014 (£1K) (Komendantskaya)
- SICSA Networking support: Komendantskaya is one of the PIs in SICSA Theme "Practical Types" (£2k), which resulted in a two day workshop in the Burn in June 2014 and is expected to lead to a European Training Network grant.

#### **University of Edinburgh:**

##### *Cross Institutional:*

- Data Lab Innovation Centre (£11.2M) (SFC) 5 year (initial) 3 hub partner project (Edinburgh/Glasgow/Robert Gordon)
- CDT in Data Science (£4.7M) (EPSRC) 8 year project (multiple academic & industrial partners Scotland/UK/International)
- CDT in Pervasive Parallelism (£3.9M) (EPSRC) 8 year project (Agilent Technologies Ltd., ARM Ltd., Wolfson Microelectronics plc)

##### *Staff and School Awards:*

- Informatics gains Silver Athena Swan Award
- Edinburgh is one of over 80 universities and research institutes which are members of the Swan Charter. The Charter is open to any university or research institute which is committed to the promotion of the careers of women in science, engineering and technology, mathematics and medicine (STEMM) in academia.

#### *Staff Awards:*

- Gordon Plotkin Receives EATCS Award 2014
- Don Sannella Elected Fellow of the Royal Society of Edinburgh
- Prof. Sethu Vijayakumar has been awarded the 2013 King-Sung Fu IEEE Transactions on Robotics Best Paper award
- Vijay Nagarajan wins Intel 2013 Early Career Faculty Honor Program Award.
- Google awarded 4 Faculty Research Awards for 2014.

#### *Student Achievements, Prizes and Awards:*

- Google Anita Borg Scholarship: Second year undergraduate student Alexandra Kearney awarded a Google Anita Borg Scholarship. Alex, who studies Artificial Intelligence and Computer Science, was one of just five students across the UK to receive this prestigious scholarship for female students after competing in a worldwide competition.
- EPSRC "UK ICT Pioneers" Competition: Two Informatics PhD Students; Herry Herry and Stefano Albrecht reached the final of the EPSRC Competition "UK ICT Pioneers 2014".
- New Research aims to improve Energy Efficiency, Cut Costs and Carbon Emissions: Dr Nigel Goddard, Director of the Institute for Adaptive and Neural Computation, at the School of Informatics will lead the "Data-Driven Sociotechnical Energy Management in Public Sector Buildings" Project. The project is part of a wider research study, funded with £3 million from the Engineering and Physical Sciences Research Council (EPSRC), on behalf of the Research Councils UK Energy Programme (RCUKEP)
- Sensors help keep Smartphone Data Secure (Edinburgh/Glasgow Caledonian): Dr David Aspinall from the School of Informatics, along with researchers at Glasgow Caledonian University are making a smarter "kill switch" for phones that knows when a gadget is in the hands of a thief. As well as acting as an anti-theft device, the software can also be used as a guarantor of identity when people use their phones to shop online or send messages to friends and family.

#### *Events:*

- Engage Invest Exploit 2014 ( 8 May 2014): Building on the success of EIE 13, Informatics Ventures, the Edinburgh BioQuarter and the Edinburgh Centre for Carbon Innovation (ECCI) again joined forces to create the largest ever investor showcase in Scotland. Engage Invest Exploit (EIE) is an annual event which brings together a selection of the most talented young high growth companies in Scotland and introduces them to a wide range of investors from across the world. Companies are able to meet and pitch to Entrepreneurs and Investors in the technology, energy and life science sector. The event was attended by representatives from 247 companies, 60 exhibitors and 176 investors.
- EIE London 13 (28 November 2013): Launched in London bringing Scottish entrepreneurs to meet London based investors. The event was run in association with Angel News. Attended by 34 companies, 12 exhibitors, 58 investors.
- DEMOfest 2013 (Informatics Ventures for SICSA – held 5 November 2013 Mitchell Library, Glasgow and DEMOfest North) – held 11 February 2014, Robert Gordon University
- Informatics Ventures events for The Scottish Informatics & Computer Science Alliance (SICSA) in association with ScotlandIS; technology showcases that bring together industry and academia in the SICSA research community. Scottish Universities can be considered to have the largest ICT research cluster in Europe and DEMOfest demonstrates the best of Informatics and Computing Science state-of-the-art research in Scotland.

## **University of Glasgow:**

*Improved facilities and resources created/purchased (as a direct result of SICSA):*

- NAO: a humanoid robot equipped with multiple sensors, has been acquired at a cost of ~£5k. NAO will be used to analyse and understand human behaviour, and explore domains like social robotics and social signal processing. NAO can also synthesise both speech and bodily behaviour.
- Cricket kit location system at a cost of ~£4k. This is used for tracking users in indoor environments for mobile applications.
- Rackmount server and storage at a cost of ~£23k to store network traffic data for pattern analysis identification of anomalies, and for evaluating novel algorithms for network intrusion and anomaly detection. Currently we have NDAs with network and data centre providers in industry and host a few terrabytes of data which we analyse. We plan to host more data in the near future. Being able to evaluate algorithms/systems over real workloads is invaluable and absolutely crucial in order for our research to be accepted by the community as valid and to have impact in next generation Internet mechanisms.

*Other notable points:*

- Glasgow, together with Edinburgh and Robert Gordon University are each hubs for the five year SFC-funded Data Lab Innovation Centre.
- Computing Science is major co-investigative partner in the five-year ~£7 million Urban Big Data Research Centre, funded by ESRC.

## **Heriot-Watt:**

*Improved facilities and resources created/purchased (as a direct result of SICSA):*

- As part of the HWU/UoE Robotarium capital grant awarded in this period, HWCS won £802k for a range of facilities to boost research in multimodal interaction, high-performance computing, and robotics equipment, which will underpin new collaborative ventures between all HWCS areas as well as support new external interactions.
- Building on the Robotarium equipment, HWCS has opened a new Lab, the Intelligent Space for Interaction Science (ISIS), with facilities including Google Glass, Kinect, Oculus Rift, eye trackers, wearable displays, CCTV video recording equipment (with 4 dome cameras), multi-touch screens, and a variety of robotic platforms.

*Other notable points:*

- HWCS academics played a role in the award of the £17M 'Sir Charles Lyell Centre', led by Prof Murray Roberts (HWU School of Life Sciences), which will open in 2015 at HWU, and be a leading European interdisciplinary research centre for the earth and marine sciences.
- The HWU Intelligent Systems and Interaction Labs comprised one third of the team that won the £7M HWU/UoE Robotarium capital grant from EPSRC.
- Eight HWUCS academics were part of the teams that won the Embedded Systems CDT (led by deMulliez, HWU EPS, in collaboration with Loughborough University, and the Robotics CDT (led by Lane, Engineering and Physical Sciences at HWU).
- Awarded £6k in crowdfunding from 254 members of the public worldwide, for start-up work in the area of marine robotics to repair coral reefs; this involves an interdisciplinary team of roboticists, computer scientists and marine biologists at HWU (Corne).
- Awarded £60k for machine learning in undersea sonar classification from the Maritime Collaborative Enterprise (MarCE), a new DSTL organisation administered by BAE Systems, supporting applied multidisciplinary projects in Maritime science. Other project partners included SeeByte Ltd, BAE Systems, and the HWU School of Engineering and Physical Sciences (Corne).

- Saltire Fellowship award; The Saltire Foundation aims to "help shape Scotland's economic future" by means of these Fellowships. As part of the scheme Georgieva will be spending most of the latter part of 2014 in Boston (Georgieva).
- Hastie was part of a consortium that won an 'Exploratory Project' from the Digital Health Institute, entitled "Digital Multi-Channel Platform to Support Citizens with Chronic Eczema". The project involves five HWCS academics (led by Hastie), and several stakeholders from NHS Lothian, medical schools and eczema societies.
- Kamareddine was invited twice for two-week visits to Beihang University, China, to give several talks and consult on research and teaching in Datamatics and Informatics; Kamareddine is the only UK representative on the 'Network of Datamatics and Informatics', funded by the State Key Laboratory of Software Development .
- Reiser became a member of the RSE Young Academy; HWCS now has three members (Hastie, McNeill, and Rieser).
- Vargas organized a multidisciplinary workshop in April 2014 at the University of Sao Paulo in Brazil, to boost collaboration between Brazilian and UK scientists, and set up a number of MoUs with the Sao Paulo regional funding organization (FAPESP) and two major universities in Brazil (Vargas).

### **Robert Gordon University:**

*Improved facilities and resources created/purchased (as a direct result of SICSA):*

- During the academic year 2013-14, computing facilities in RGU were enhanced by the provision of a Big Data Server (£83k), a private Cloud Computing Server (£32k) and further high spec PCs (£32.5k).

*Other notable points:*

- Data Lab bid (Innovation Centre bid) – one of the three hubs to be in RGU
- Two new centres to be set up in RGU - Smart Data Technologies Centre and Digital Interactions & Visualisation Centre

### **University of Stirling:**

The following are notable in that they are new and recent collaborations and involve new collaborators for Stirling CS:

- An inter-disciplinary EPSRC application for HUBS, between Stirling, Edinburgh, and Cambridge
- Two on-going pieces of research with Cambridge, that are designed to reduce latency in network and network evolution
- Two on-going projects with Georgia Tech (GaTech); one related to virtual network migration, and another related to streaming video
- Krzysztof Krawiec, Laboratory of Intelligent Decision Support Systems, Poznan University of Technology
- Douglas Hofstadter, Centre for Research on Concepts and Cognition, Indiana University
- 2013-15: a new British Council funded joint-research project (~£36k), with Anhui University, titled: "Towards a Cognitive Vision-based Multi-agent Modelling & Control Framework", (Details : PI: Prof.Hussain, CI: Dr Jozsef Farkas (Stirling Maths). This is one of 30 competitive grants funded by the British and Chinese Governments (under the Sino-UK Higher Education Research Partnership Funding Call). The Stirling-Anhui project was ranked first by the Experts Panel (following two rounds of peer review in both the UK& China)
- 2014-16: Professor Hussain is Co-PI for Royal Society of Edinburgh and National Natural Science Foundation of China grant (£12k) for a 2 year joint-research project with China's top-ranked Tsinghua University in Beijing, (entitled: "Cognitive SenticNet and Multimodal Topic Structure Parsing Techniques for Both Chinese and English Languages")

## 5) Recruitment success against world-class international competition

*Number of SICSA funded staff appointments and the previous institution (if any) of appointees.*

As confirmed in the previous Annual Report, all SICSA institutions have now recruited their SICSA appointees. However, University of Aberdeen confirm that due to the departure of a staff member, Professor David Pym, they have reinvested surplus funds as follows:

- George Macleod Coghill appointed to SICSA Chair. George is currently Professor of Computing Science, and now leads the Aberdeen Systems Modelling Theme formerly led by David Pym.
- Chenghua Lin (start date 14 March 2013) part-funded by the SICSA investment. Dr Lin is an expert in sentiment analysis, which is a research area central to the focus of the recent Data Lab SFC investment associated with SICSA.

## 6) Distinguished Visiting Fellows (DVs)

*Number and home institution of DVs. Duration of DV visits.*

Visitor	Home Institution	Host Institution	Visit Duration
Jonathan Seldin	University of Lethbridge, Canada	Heriot-Watt University	1 week
Aravind Joshi	University of Pennsylvania, USA	University of Edinburgh	1 week
Andy Gill	The University of Kansas, USA	University of Strathclyde	1 week
John Soldatos	Athens Information Technology, Greece	University of Glasgow	2 weeks
John Bass	University of Tasmania	University of St Andrews	2 weeks
Adriana Compagnoni	Stevens Institute of Technology	University of Edinburgh	2 weeks
Stuart Shieber	Harvard University	University of Aberdeen	3 weeks
Ryan R Newton	Indiana University	University of Glasgow	10 days

## 7) Number of applications for SICSA Prize Studentships

*a) Number of applications logged directly by SICSA for the Ph.D. Prize Studentships during the period 2013-14*

All SICSA institutions have recruited their quota of SICSA PhD Studentships.

*b) The nationality of applicants*

N/A

## 8) Prize studentships

*Number of SICSA Prize studentships allocated and taken up.*

N/A

## 9) Cross institution supervision

*Number of SICSA Prize students who had a supervisor from out with their "home" University as at 31 July 2014*

The level of cross-institutional supervision remains constant since the last report, with 48% of current SICSA Prize Students with a second supervisor outside of their home institution.

## 10) International conferences attracted to Scotland

*a) Notable conferences attracted to Scotland (i.e. which took place during the census period) where a substantial connection to a SICSA department can be demonstrated*

Data unavailable

*b) Number of notable conferences which received an element of SICSA funding*

6, including the SICSA PhD Conference 2014.

## 11) SICSA Research Theme events

*Number of SICSA supported research theme related events.*

There were a total of 50 SICSA events that were funded by the SICSA Research Themes, as follows:

Research Theme	Event Title	Dates	Location
RT: Cyber-Security	Cyber-Camp: Cyber-Security Challenge UK	28-Aug-2-Sep-2013	GCU
RT: Cybersecurity	Random Hacks of Kindness Cyber-Security Hackathon	6-9-Sep-2013	Glasgow (IET Teacher Building)
RT: CSE	Parallel Quantum Computing (ParQ 2013)	8-9-Sep-2013	University of Edinburgh
RT: CSE	SEABIS Meeting	17-18-Sep-2013	Edinburgh Napier University
RT: CSE and RT:NGI	Software-Defined Networking Workshop	19-Sep-13	University of Edinburgh
RT: NGI	Cyber-Security Meeting	02-Oct-13	Glasgow Caledonian
RT: CSE	SPLS Meeting	30-Oct-13	University of Edinburgh
RT: CSE	SICSA CSE Sponsored Lecture Series: Dependently typed metaprogramming (in Agda)	14-Nov-13	University of Edinburgh
RT: CSE	SICSA CSE Sponsored Lecture Series: Dependently typed metaprogramming (in Agda)	28-Nov-13	University of Edinburgh
RT: CSE	Eighth Scottish Category Theory Seminar	29-30-Nov-2013	University of Edinburgh
RT: FC	Future Cities Theme Workshop 1: New Research Challenges and Directions	05-Dec-13	University of Glasgow
RT: NGI	International Semantic Web Applications and Tools for the Life Sciences (SWAT4LS)	6-7-Dec-2013	Edinburgh (Royal Society)
RT: NGI	Semantic Web Applications and Tools for the Life Sciences (SWAT4LS)	9-11-Dec-2013	University of Edinburgh
RT: CSE	SICSA CSE Sponsored Lecture Series: Dependently typed metaprogramming (in Agda)	12-Dec-13	University of Edinburgh
RT: FC	Future Cities Theme Workshop 1: New Research Challenges and Directions	09-Jan-14	University of Glasgow

RT: CSE	SICSA CSE Sponsored Lecture-Series: Dependently typed metaprogramming (in Agda)	16-Jan-14	University of Edinburgh
RT: M&A	PlanSIG2013	29 - 31 Jan 2014	University of Edinburgh
RT: CSE	SICSA CSE Sponsored Lecture-Series: Dependently typed metaprogramming (in Agda)	30-Jan-14	University of Edinburgh
RT: CSE	SICSA CSE Sponsored Lecture-Series: Dependently typed metaprogramming (in Agda)	20-Feb-14	University of Edinburgh
RT: CSE	Scottish Programming Languages Seminar 2014 Winter Meeting	26 - 27 Feb 2014	University of Dundee
RT: FC	Future Cities Workshop 2	28-Feb-14	ECCL, Edinburgh
RT: M&A	SICSA Senior Women in Computing: February 2014	28 Feb - 1 March 2014	Glasgow Caledonian
RT: Cybersecu rity	SICSA Cyber-Security Meeting	04-Mar-14	University of Glasgow
RT: KE	Informatics Ventures Learning Lunch: Doing business in the USA	12-Mar-14	University of Edinburgh
RT: KE	Informatics Ventures Learning Lunch: Team Building	12-Mar-14	Corinthian Club, Glasgow
RT: NGI	SICSA NGI: SCONE Meeting	13-Mar-14	University of Stirling
RT: CSE	International Workshop on Autonomous Cognitive Robotics	27 - 28 March 2014	University of Stirling
RT: HCI	Speech Technology and Human Computer Interaction Workshop	27 - 28 March 2014	University of Edinburgh
RT: HCI	International Conference on Multimedia Retrieval 2014	1 - 4 April 2014	University of Glasgow
RT: CSE	SICSA CSE Sponsored Lecture-Series: Dependently typed metaprogramming (in Agda)	03-Apr-14	University of Edinburgh
RT: CSE & M&A	Bounded Rationality Workshop (CSE & MA)	4 - 5 April 2014	University of Edinburgh
RT: CSE	EuroLLVM 2014	7 - 8 April 2014	University of Edinburgh
RT: HCI	CHI Papers Presentation	22-Apr-14	University of Glasgow
RT: CSE	Workshop on Real World Domain Specific Languages	01-May-14	University of Edinburgh
RT: CSE/M&A	Deep Learning Workshop	06-May-14	University of Edinburgh
RT: CSE/M&A/ NGI	SICSA CoCo: Communication-Based Computation: Workshop 1	08-May-14	Cameron House, Loch Lomond
RT: Cyber Security	Cyber Security Teachers Meetings	13, 19, 20 & 22 May 2014	Scottish Government, Broomielaw
RT: CSE	CSE: An Introduction to NoSQL and MongoDB	19-May-14	University of St Andrews
RT: M&A	Scottish Mathematical Biology Network	28-May-14	University of Stirling
RT: HCI	Invited Talk: Professor Matt Jones, There's Not an App for That	29-May-14	University of Glasgow
RT: CSE/M&A/ NGI	The Practical Types Brainstorming Event	04-Jun-14	The Burn, Glenesk, Brechin, Angus
RT: HCI	SICSA HCI: Doctoral Consortium	11-Jun-14	University of Glasgow
RT: HCI	SICSA HCI All Hands Meeting	13-Jun-14	University of Dundee
RT: CSE &	Third SICSA funded workshop on Technologies	20-Jun-14	University of

HCI	for Health and Wellbeing		Strathclyde
RT: M&A	Computational Neuroscience and Neuroinformatics Workshop	24-Jun-14	University of Edinburgh
RT:NGI	4th International Conference on Cybercrime, Security and Digital Forensics	23 - 24 June 2014	University of Strathclyde
RT: Education	Towards a School-University Educational Continuum in Computing - Theme Launch	25-Jun-14	University of Strathclyde
RT: Data Science	SICSA Data Science Launch Event	03-Jul-14	University of Edinburgh
RT: HCI & M&A	Workshop on Argument Mining: Perspectives from Information Extraction, Information Retrieval and Computational Linguistics	9 - 10 July 2014	University of Dundee
RT: Future Cities	Future Cities Workshop 3	22-Jul-14	University of Dundee

## 12) SICSA DVF events

*Number of specific events involving Distinguished Visiting Fellows.*

There were 23 events during 2013-14 associated with the SICSA Distinguished Visitor programme.

<b>Title of Event</b>	<b>Date</b>	<b>Location</b>
Professor Jonathan Seldin - Relating Church Style Typing and Curry-Style Typing: Preliminary Report	28-Aug-13	Heriot-Watt University
Professor Jonathan Seldin - Relating Church Style Typing and Curry-Style Typing: Preliminary Report	03-Sep-13	University of St Andrews
Prof Aravind Joshi - Some Limits of Language: A Perspective from Formal Grammars and Languages	11-Oct-13	University of Edinburgh
Prof Aravind Joshi - Some Limits of Language: A Perspective from Formal Grammars and Languages	15-Oct-13	University of St Andrews
Prof Aravind Joshi - Penn Discourse Treebank and the Problem of Attribution	16-Oct-13	University of Aberdeen
Dr Andy Gill - Building your own DSL	06-Nov-13	University of Strathclyde
Prof John Soldatos - Internet-of-Things (IoT) Technologies for Integrated Smart Cities Applications	02-Apr-14	University of St Andrews
Prof John Soldatos - OpenIoT: The Open Source Internet-of-Things	03-Apr-14	University of Edinburgh
Prof John Soldatos - Internet-of-Things (IoT) Technologies for Integrated Smart Cities Applications	04-Apr-14	University of Glasgow
Prof John Bass - National and International Data Linkage - top down or bottom up?	23-May-14	University of Glasgow
Adriana Compagnoni, Towards a Computational Modelling Platform for Complex Systems Stimulation	27-May-14	Heriot-Watt University
Professor John Bass - There's more to data linkage than just making links	29-May-14	Heriot-Watt University
Professor Stuart Shieber, Why Open Access Really Matters: A Discussion with Professor Stuart Shieber	05-Jun-14	University of St Andrews
Professor Stuart Shieber, "What's so great about compositionality?"	06-Jun-14	University of St Andrews
Professor Stuart Shieber, Lecture - "What's so great about compositionality?"	09-Jun-14	University of Edinburgh
Professor Stuart Shieber, Seminar: "The Harvard open-access initiatives"	10-Jun-14	University of Edinburgh
Professor Stuart Shieber, Master class on synchronous grammars: Tutorial: "Synchronous grammars introduced"	11-Jun-14	University of Aberdeen
Professor Stuart Shieber, What's so great about compositionality?	12-Jun-14	University of Aberdeen
Ryan R Newton Assistant Professor at Indiana University. Design Frontiers in Parallel Languages; the role of determinism	12-Jun-14	University of St Andrews
Professor Stuart Shieber, "Synchronous grammar applications in language processing"	13-Jun-14	University of Aberdeen
Ryan R Newton, Assistant Professor at Indiana University. Hackathon at Heriot-Watt "Evolving the parallel Haskell ecosystem"	16-Jun-14	Heriot-Watt University
Ryan R Newton, Assistant Professor at Indiana University. Keynote at the Scottish Programming Languages Seminar "Stream-processing for functional programmers" University of Glasgow	18-Jun-14	University of Glasgow
Ryan R Newton, Assistant Professor at Indiana University. Seminar at the University of Edinburgh "Design frontiers in parallel languages: the role of determinism".	20-Jun-14	University of Edinburgh

### 13) SICSA summer schools

a) Number of summer school events (for which SICSA has funded student attendance)

During 2013-14 SICSA funded attendance for 16 students to attend summer schools at home and abroad. Full details below:

Applicant Name	Institution	Title of Summer School	Location of Summer School	School Dates	Duration
Evgenij Belikov	Heriot-Watt	Applied Functional Programming in Haskell (AFPH)	Utrecht, Netherlands	19 - 30 August 2013	2 weeks
Ruby Valverde Ibanez	Heriot Watt	Social Human-Robot Interaction	Cambridge, UK	26-30 Aug 13	1 week
Daniel Franzen	Edinburgh	The International School on Foundations of Security Analysis and Design (FOSAD)	Bertinoro, Italy	2-7 Sept 13	1 week
Cristina-Adriana Alexandru	Edinburgh	DemAAL Summer School on Ambient Assistive Living	Crete, Greece	16-20 Sept 13	1 week
Zhegnshuai Lin (Howard)	Edinburgh	DemAAL Summer School on Ambient Assistive Living	Crete, Greece	16-20 Sept 13	1 week
Hadi Daneshvar	Edinburgh	DemAAL Summer School on Ambient Assistive Living	Crete, Greece	16-20 Sept 13	1 week
Severin Fichtl	Aberdeen	The European Xperience Project	Mallorca, Spain	2-5 Oct 13	1 week
Robbie Simpson	Glasgow	Bar-Ilan Winter School on Cryptography	Tel-Aviv, Israel	27 - 30 Jan 14	1 week
Shimin Feng	Glasgow	Gaussian Process Winter School	Sheffield, UK	13-16 Jan 14	1 week
Theodoros Kapourniotis	Edinburgh	Quantum Games and Protocols	Berkley, USA	24-28 Feb 14	1 week
Punyanuch Borwarnginn	Edinburgh	The 10th Annual LearnLab Summer School	Carnegie Mellon University, Pittsburgh, PA, USA	16 - 20 June 2014	5 days
Eshrag Refaee	Heriot Watt	7th GATE Training Course: Mining social media content with GATE	university of Sheffield	9 - 13 June 2014	1 week
Haocheng Shen	Dundee	BMVA Computer Vision Summer School	University of Swansea	30 June to 4 July 2014	5 days
Li Sun (Kevin)	Glasgow	VISION Understanding and Machine Intelligence (Visum)	University of Porto, Portugal	3 - 10 July 2014	1 week
Aamir Khan	Glasgow	VISION Understanding and Machine Intelligence (Visum)	University of Porto, Portugal	3 - 10 July 2014	7 days
Sergio Elizondo	Edinburgh	UKERC International Energy Summer School 2014	Warwick, UK	6 - 11 July 2014	5 days

*b) Number of SICSA sponsored Summer Schools, held in Scotland*

There was one SICSA sponsored Summer School during 2013-14 as follows:

SICSA Summer School on Cognitive Computation, 25-30 August 2013, University of Stirling

*c) Number of attendees of SICSA sponsored/funded summer school events*

There were 40 participants at the above SICSA Summer School, of which 20 were from SICSA institutions.

**14) SICSA courses for Ph.D. students**

*a. Number of courses (including conferences but excluding summer schools which have been attended by students from more than one SICSA department.*

Almost all SICSA sponsored events during 2013-14 (97) were attended by students from more than one SICSA department.

Courses/events specifically aimed at PhD students included:

- SICSA PhD Conference, 9-10<sup>th</sup> June 2014
- SICSA HCI Doctoral Consortium, 11<sup>th</sup> June 2014
- Research Ventures Entrepreneurship Course, 16-17<sup>th</sup> June 2014

**15) SICSA Prize Studentship cohort events**

*Number of events specific to (or primarily attended by) SICSA Prize students:*

During 2013-14 there were no events organised specifically for SICSA Prize Students. However, SICSA Prize Students were present at many of the SICSA Research Theme events; as well as at the SICSA PhD Conference 2014 at the University of St Andrews.

Appendix IV: Outline of applications for £410K KE Funding as of 31 July 2014

	Postgrad Industry Internship			Early Career Industry Fellowship			Distinguished Industry Visitor			Proof of Concept			Elevate			Team Industry Placements			Total Applications Funded	Total Funding granted
	Applications	Awarded	Grant total	Applications	Awarded	Grant total	Applications	Awarded	Grant total	Applications	Awarded	Grant total	Applications	Awarded	Grant total	Applications	Awarded	Grant total		
Aberdeen	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	£ -
Abertay	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	£ -
Dundee	-	-	£ -	-	-	£ -	-	-	£ -	2	1	£ 9,989.00	-	-	£ -	-	-	£ -	1	£ 9,989.00
Edinburgh	7	5	£ 21,023.77	-	-	£ -	2	1	£ 3,200.00	1	-	£ -	4	3	£ 33,000.00	-	-	£ -	9	£ 57,223.77
Edinburgh Napier	-	-	£ -	-	-	£ -	-	-	£ -	1	-	£ -	1	1	£ 9,000.00	-	-	£ -	1	£ 9,000.00
Glasgow	7	6	£ 32,627.25	1	-	£ -	2	2	£ 1,550.00	-	-	£ -	1	1	£ 6,000.00	-	-	£ -	9	£ 40,177.25
Glasgow Caledonian	-	-	£ -	-	-	£ -	1	1	£ 3,000.00	1	-	£ -	1	1	£ 9,000.00	-	-	£ -	2	£ 12,000.00
Heriot-Watt	2	1	£ 2,800.00	2	-	£ -	1	1	£ 960.00	1	-	£ -	-	-	£ -	-	-	£ -	2	£ 3,760.00
Robert Gordon	-	-	£ -	3	2	£ 55,000.00	1	1	£ 2,980.00	-	-	£ -	-	-	£ -	-	-	£ -	3	£ 57,980.00
UHI	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	£ -
St Andrews	3	2	£ 20,770.00	1	1	£ 20,000.00	-	-	£ -	2	1	£ 7,000.00	-	-	£ -	-	-	£ -	4	£ 47,770.00
Stirling	1	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	£ -
Strathclyde	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	£ -
UWS	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	-	£ -	-	£ -
	<b>20</b>	<b>14</b>	<b>£ 77,221.02</b>	<b>7</b>	<b>3</b>	<b>£ 75,000.00</b>	<b>7</b>	<b>6</b>	<b>£ 11,690.00</b>	<b>8</b>	<b>2</b>	<b>£ 16,989.00</b>	<b>7</b>	<b>6</b>	<b>£ 57,000.00</b>	<b>-</b>	<b>-</b>	<b>£ -</b>	<b>31</b>	<b>£ 237,900.02</b>

## Appendix V: Postdoctoral and Early Career Researcher Exchange (PECE) Reports

**Visitor: Marwan M Fayed**  
**Computer Science & Mathematics**  
**University of Stirling**  
mmf@cs.stir.ac.uk

**Hosting Inst.: Prof. Jon Crowcroft**  
**Computer Laboratory**  
**Cambridge University**

**Hosting Inst.: Prof. Mostafa Ammar**  
**School of Computer Science**  
**Georgia Institute of Technology**

The following is a summary of outputs and on-going collaboration stemming from a 5 month visit, split across the two aforementioned institutions.

### 1. Outputs

- Samantha Lo, Mostafa Ammar, Ellen Zegura, and Marwan Fayed. Virtual Network Migration on Real Infrastructure: A PlanetLab Case Study. IFIP Networking, Oslo, Norway, 2014.
- Ahmed Mansy, Mostafa Ammar, and Marwan Fayed. Max-min Fairness for Adaptive Video Streaming. (In prep.)
- (As P.I.) HUBS: A Model for Community-driven Backhaul Services. EPSRC proposal with Crowcroft (Cambridge), Buneman (Edinburgh), Fourman (Edinburgh), Simmons (Stirling).

### 2. On-going Work and Collaboration

(Cambridge) Work is on-going with Matthew Grosvener, a PhD student who has developed a novel tra\_c prioritisation implementation. We are pursuing this work both as a viable means of providing QoS mechanisms in data centres, as well as a means to eliminate queueing delay for control traffic in software defined networks. Current plans are to return to Cambridge this summer for 1-2 weeks to complete this work.

(Georgia Tech) I am co-supervising, and a named member of the PhD committee, for Samantha Lo. She is exploring protocol-support for network migration. This work is the foundation of longer-term research projects that investigate network migration architectures. We hold weekly video conferences in support.

(Georgia Tech) Ahmed Mansy's work on video streaming continues. Ammar and I are currently looking for students to investigate mechanisms that enable max-min fairness to scale, and to eliminate central points of failure.

(Funding - Personal) I am preparing an EPSRC fellowship application based on feedback and discussion with hosts, and nearby faculty.

(Funding - Cambridge) A joint proposal is in preparation with Timothy Griffin. In this work we will investigate applications of algebraic methods he has developed for wired networks, within the wireless space. Submission is expected in Summer 2014.

(SICSA DVF Application) An application is pending to SICSA under the DVF program, to host Mostafa Ammar for one week. If successful, Ammar will offer to participate in the SICSA PhD Conference in addition to site visits to NGI staff at St Andrews, Edinburgh, and Glasgow.

In general feedback from my visits was extremely positive. Collaborations with both hosts continue, and open invitations to return have been extended.

**Visitor: Michele Sevegnani**  
**Computer Science**  
**University of Glasgow**  
**Michele.Sevegnani@glasgow.ac.uk**

**Hosting Inst.: Professor Raja Sengupta**  
**University of California, Berkeley**

### **Title of Research**

Bigraphs for realtime verification of heterogeneous mobile robotic systems

### **Brief Outline of Research Objectives**

Mobile robots are characterised by the ability to determine their location through a GPS receiver (i.e. location awareness) and by the capability to move around in the host environment which can dynamically change over time. They can also communicate with each other over radio links and perform local computational task to coordinate joint missions. Example applications are typically for military use. However, applications for civilian use are recently becoming more common in scenarios such as environmental monitoring missions where teams of heterogeneous unmanned vehicles collaborate for locating and tracking oil tankers and sample water at their vicinities to serve as proof for water contamination.

The dynamic nature of these systems, the unreliability of their components (e.g. communication links and hardware failures) and the serious limitations of current software engineering approaches make it difficult to understand, specify and ultimately verify critical requirements from the point of view of functional correctness, reliability, availability, security, and safety. The aim of this project is to develop new foundational conceptual frameworks for realistic and practical modelling and analysis of heterogeneous mobile robotic systems. We wish to detect and predict when the robots in a systems are in a configuration resulting in undesired behaviours. For example, will an Unmanned Aerial Vehicle (UAV) have enough power left to carry out its mission in two hours time? Will an Autonomous Underwater Vehicle (AUV) stop diving when it reaches a depth of 200 ft? This involves extensions of the theory of bigraphs in order to integrate the techniques for runtime verification of bigraphical systems that I developed during my previous research in Glasgow with the BigActor Model developed at Berkeley by Professor Sengupta's group.

### **Achievements/Results to date**

The key finding is that runtime analysis and verification techniques for bigraphs can indeed be used with BigActors. This can be achieved with a formal encoding of BigActors into bigraphs. The immediate benefits of this approach are that tools and theory developed for bigraphs can be used without further modifications with BigActors. Moreover, stochastic rates can be used to model uncertainty of events in real robotic systems deployments. We are planning to test the encoding in an exercise simulating an oil spill tracking mission in the ocean to coordinate the efforts of UAVs and AUVs.

Further findings include:

- development of a machine learning technique to infer the placing of GPS sensors over a
- biograph discussions on the use of sensors for other applications such as city/buildings operating systems

### **Outputs**

During my short stay at UC Berkeley I focussed on developing the main theoretical aspects of the papers my partners and I are planning to submit in the next months. The main strands of research that emerged from our collaboration are:

- Encoding BigActors in Bigraphs
- Bigraph inference from GPS readings

The outputs so far are:

- A tutorial on my previous work on bigraphs for PhD students of the Department of Engineering at UC Berkeley.
- A seminar on the encoding BigActors/Bigraphs for the FATA group in the School of Computing Science at the University of Glasgow.

- Submission of a workshop paper with the preliminary work on the encoding: M. Sevegnani, E. Pereira, Towards a bigraphical encoding of actors, 1st International Workshop on Meta Models for Process Languages (MeMo) (<http://www.itu.dk/research/models/wiki/index.php/MeMo2014>), 2014.

**Expected achievements/outputs for next year**

The expected outputs are a journal paper on the full bigraphical encoding of BigActors and a conference paper on the inference process of bigraphs from GPS readings. Discussions with Professor Sengupta on the choice of an appropriate venue are still underway.

I have also started a collaboration with Professor Sventek's group (School of Computing Science, University of Glasgow) to develop a framework based on bigraphs and actors for the modelling and analysis of cloud computing and virtualisation. I expect this to lead to another publication.

**Visitor: Zhuoran Wang**  
**Interaction Lab, MACS, Heriot-Watt University**  
**zhuoran.wang@hw.ac.uk**

**Hosting Inst.: Mr Haifeng Wu, Director of Natural Language Processing Department, Baidu Inc., China**

### **Title of Research**

Policy Learning for Domain Selection in a Multi-domain Voice Assistant System

### **Summary**

My exchange to Baidu lasted two months from 1st April 2014 to 30th May 2014. The main focus of my research at Baidu is data-driven decision making for dialogue flow control in the Baidu Voice Assistant (BVA) system (a publicly deployed mobile app similar to Apple's Siri). A novel Markov Decision Process (MDP) based model has been developed for the central dialogue management problem in BVA, which can preserve the extensibility of the entire architecture, such that new domain-specific dialogue managers can be easily integrated into the system without re-training the central control policy. Gaussian Process Temporal Difference (GPTD) reinforcement learning algorithm is employed for policy optimisation based on human subjects. Internal human-based evaluation results suggest that the policy learnt by proposed approach marginally outperforms the handcrafted policy used in the current released version of BVA.

### **Introduction**

Due to growing demand for natural human-machine interaction, over the last decade Spoken Dialogue Systems (SDS) have been increasingly deployed in various commercial applications. Furthermore, latest progress in open-vocabulary Automatic Speech Recognition (ASR) is pushing SDS from traditional single-domain information systems towards more complex multi-domain speech interfaces, of which typical examples are those voice assistant mobile apps, such as Apple's Siri, Google Now, Microsoft Cortana, etc.

A voice assistant application provides a unified speech interface to a collection of individual information access systems. It aims to collect and satisfy user's requests in an interactive manner, where different types of interactions can be involved, including task-oriented multi-turn dialogues (e.g. flight booking, restaurant search, etc.) and single-turn queries (e.g. Question-Answering, web search, and various services built on top of semantic search, such as weather report, news summary, etc.)

Baidu Voice Assistant (BVA) is a mobile app of this kind, similar to Apple's Siri but in Chinese language. BVA is based on a distributed architecture, where several individual dialogue systems in different domains (a.k.a. domain experts) and a collection of single-turn services (referred to as out-of-domain services) are selectively employed to handle user's queries. The dialogue flow is processed as follows. Firstly, a user's query is passed to a user intention identifier, which labels the raw query with a list of intention hypotheses each with a confidence score. After this, a central controller distributes the raw query together with its intention labels and confidence scores to all the domain experts and the service modules, which will attempt to process the query and return their results to the central controller. Finally, the central controller decides the module (a domain expert or a service), from which the results will be output to the user. In addition, the central controller also has two basic dialogue abilities: (1) to confirm whether the user wants to continue with the dialogue in a particular domain; (2) to clarify the user's intention between two domains.

My research at Baidu is focused on using reinforcement learning techniques to seek an optimal policy for the decision-making problems in the central controller of BVA. The decision (system action) at each turn of a dialogue here is either to select a particular domain expert or the out-of-domain services (ranked according to a service priority ranker) to address user's query or to choose a confirmation or clarification action (with domain operand(s)). In addition, the algorithm developed here

should also take the extensibility of the system into account, such that new domain experts can be integrated without re-training the central control policy.

### **Methodology**

Due to the confirmation and clarification system actions defined above, the domain selection problem in BVA is not a simple classification task but a planning problem that has to consider future decisions. Therefore, an established sequential decision-making model, Markov Decision Process (MDP), is employed here for policy optimisation. Featurised representations are used for the MDP states to yield tractable computations, which results in a function approximation formulation of the policy learning problem. Furthermore, in order to achieve an extensible system, feature function decomposition and parameter tying tricks are applied as follows. Firstly, a feature function is defined for each action type, which generates a feature vector for every state-action pair by only considering the state information of the operated domain(s). After this, in the function approximation phase, identical model parameters are shared by those system actions of same type (but with different domain operands). Finally, the sample-efficient Gaussian Process Temporal Difference (GPTD) reinforcement learning algorithm is used to learn the optimal policy for the proposed MDP.

### **Experimental Results**

The GPTD reinforcement learning was conducted directly based on human subjects. Fifteen experienced users volunteered to contribute dialogue examples with multiple or compound goals (which involve dialogues in difference domains). After each dialogue, the user was asked to rate the system according to a pre-defined scoring standard. The scores were then used as the rewards for the GPTD algorithm. Approximately 50~70 dialogues were collected on each day, based on which the policy learning was iterated daily for 5 days. Note here, each day's data collection procedure can yield an evaluation of the policy obtained on the previous day at the same time. By investigating the learning curve, we selected the best-scored policy to carry out a series of paired tests to compare the learnt policy with the handcrafted policy used in the current released version of BVA.

Four scenarios were studied in the paired tests. The first two scenarios aim to test the performance of the two systems on (1) switching between a domain expert and out-of-domain services, and (2) switching between two domain experts, where only the domains used in the training process are considered. Scenarios (3) and (4) are similar to scenarios (1) and (2) respectively, but at this time, the users were required to carry out the tests surrounding a new domain that had been blocked during the training. Therefore, scenarios (3) and (4) are aiming to evaluate the generalisability of the learnt policy to new domains. During each of the paired tests, the identifications of systems were hidden to the users, and the users were required to test the two systems with an identical goal and similar queries. After each trial, the users were asked to score the two systems accordingly based on the scoring standard mentioned above.

It was found that the learnt policy performed significantly better than the rule-based policy in scenarios (2) and (4) ( $p < 0.05$  based on paired t-test), but in scenarios (1) and (3) the differences between the two systems were statistically insignificant ( $p > 0.05$ ). Moreover, the learnt policy preserved the extensibility of the entire system as expected, which was indicated by the user scores in scenarios (3) and (4).

### **Conclusion**

This research exchange has initialised a productive collaboration between iLab at Heriot-Watt and Baidu on the cutting-edge research topic, statistical approaches to multi-domain SDS. Further collaborations on the refinement, extension and promotion of the technology developed here are under preparation. Future research surrounding this topic will include large-scale online learning with real users and automatic user satisfaction estimation for publicly deployed SDS.

## **Outputs**

### **Papers accepted/published:**

1. Z. Wang, H. Chen, G. Wang, H. Tian, H. Wu, H. Wang

Policy Learning for Domain Selection in an Extensible Multi-domain Spoken Dialogue System

To appear in Proceedings of Conference on Empirical Methods in Natural Language Processing (EMNLP 2014), Doha, Qatar, 26-28 Oct. 2014.

2. Z. Jiao, Z. Wang, G. Wang, H. Tian, H. Wu, H. Wang

Large-scale Analysis of the Spoken Dialog System in a Publicly Deployed Flight Booking Mobile App (Abstract)

In Proceedings of the 18th Workshop on the Semantics and Pragmatics of Dialogue (SemDial 2014 – DialWatt), Edinburgh, UK, 1-3 Sep. 2014.

### **Paper under review:**

Z. Jiao, Z. Wang, G. Wang, H. Tian, H. Wu, H. Wang

On the Granularity of Dialog Strategies: Insights from Large-scale Analyses of Two Commercial Travel Information Spoken Dialog Systems

Submitted to IEEE SLT 2014 Workshop

### **Grant proposal submitted:**

Dr Shiqi Zhao, Senior Researcher at Baidu Inc., has been listed as an advisory collaborator in my EPSRC fellowship proposal below:

DAEDALUS: Deep Architecture for Extensible Dialogue Systems, from Acoustics to Language Understanding

Submitted to the July 2014 panel (interviewed on 4th September 2014, awaiting final decision)

I have been invited to submit a proposal to Baidu's University Collaboration Funding Scheme. The proposal (in Chinese) titled “多场景多线索对话管理与大规模基于真实用户的增强学习” (Large-scale Reinforcement Learning with Real Users for Multi-domain Multi-thread Dialogue Management) – submitted in August 2014.

**Visitor: Changyu Dong**  
**University of Strathclyde**  
**changyu.dong@strath.ac.uk**

**Hosting Inst.: Dr Yanmin Zhu, Shanghai Jiao Tong University**

The main objective of this visit was to identify the security and privacy problems in vehicle networks that we can work on, and to pool our strength together in order to produce high impact research output. The visit took place from 1<sup>st</sup> July to 31<sup>st</sup> July 2014 and it was very fruitful.

Before the visit, I exchanged several emails with Dr Zhu discussing the possible research problems that may be interesting to both of us. We found that vehicle networks are often used as the infrastructure for sensing environmental data and the privacy of the data is a big issue. We identified a few applications such as data collection, data aggregation and location-based services. Then we decided to further investigate the problems during the visit.

When I arrived Shanghai, Dr Zhu had recruited a summer research intern to work on the topic. The discussion was narrowed down to how to privately collect sensing data in participatory sensing. In general, a participatory network consists of many clients and a server. Each client has various sensors. Those can be sensors on a vehicle or more generally on a mobile device (e.g. a smart phone or wearable device). The client collects data, such as noise level and air pollution level, with the embedded sensors. The data can then be sent to the server, who will process it and derive some results. There is a clear motivation for privacy protection mechanisms in participatory sensing.

We discussed a few possible solutions:

1. Using cryptography. The idea is that each client encrypts the data and sends the ciphertext to the server. The server then stores only encrypted data and later process it blindly. The main drawbacks are firstly the server needs to obtain the result, which is not trivial if the server does not know the key; secondly this encrypted computation is computationally too expensive, especially when there are a lot of sensing data.
2. Using differential privacy. The idea is that the clients add noises to the sensing data, so that the noise would distort the data enough to prevent the server from knowing the data, while also allow the server to process the data statistically. However, in the case of participatory sensing, since clients can join or leave at their discretion, it is difficult to quantify the privacy guarantee.
3. We eventually decided to take the anonymous channel approach. In this approach, the client sends its data through an anonymous channel. The anonymous channel is built by utilizing other participants as proxies. The goal is to make it difficult for the server to identify the originator of the data.

To this end, an onion routing like protocol is developed. Since the server cannot link the data back to the originator, the originator's privacy is preserved. The challenge is that if some of the participants are corrupted and collude with the server, can we still maintain privacy of the originator? We analyse the scheme and proved that with a high probability, the scheme can maintain the privacy level we need, the probability can be adjusted by changing the path length and other parameters. We also did experiments to simulate different scenarios with different percentage of malicious nodes, and to measure the performance of the scheme. The result was summarized into a paper and has been submitted to Infocom 2015.

As to future work, we felt that there are still much to do. Building an anonymous channel on mobile devices, especially computationally constrained devices such as smart phones, is not easy. There are many papers on building anonymous channel using distributed servers, but very little has been done on mobile devices. It could be interesting to investigate further from a system or network protocol point of view. For example, currently we assume a fully trusted server that maintains a list of online

participants, this may be too strong and it would be more interesting if we can achieve the same without this trusted party. Also the other possible solutions that we discussed initially might be worth further investigation. Dr Zhu and I have agreed to continue working in this direction.

**Output**

Shengbao Zheng, Yanmin Zhu, Changyu Dong, Privacy Preserving Data Collection in Participatory Sensing, submitted to Infocom 2015.

## **Appendix VI: Proof of Concept Report**

### **Katya Komendantskaya Machine Learning for ACL2**

#### **Background**

The SICSA Industrial Proof of Concept grant was awarded to sponsor Re-search Assistant (J.Heras) to work with K.Komendantskaya (Dundee) on the industrially-motivated improvements to the machine-learning library ACL2(ml) [1] for automated theorem prover ACL2 that arose from Komendantskaya's EPSRC First Grant. The SICSA PoC grant covered, as it was requested, 2 days per week of Heras'es salary for 7.5 months, between September 2013 and April 2014.

Among the goals of the PoC grant were:

- Make contacts with industrial partners Rockwell Collins and Centaur Technology;
- Gather user requirements relevant for industrial usage of ACL2 and ACL2(ml);
- Improve usability of ACL2(ml) in response to the above;
- Make a longer-term research link with industry; and e.g. follow up SICSA PoC grant with SICSA Research Fellowship proposal, and further bigger research proposals.

#### **Achievements**

The first three goals were successfully achieved. The initial contacts in the form of emails and Skype calls have been made between Heras, Komendantskaya, Rockwell Collins and Centaur Technology, and some user requirements have been collected at the early stage of the grant. These requirements inspired ACL2(ml) technical and engineering improvements; – this work was published in the specialised ACL2 Workshop [2]; with high appraisal of the engineering solutions found in the course of the project. There have been four reviews, 2 “accept” and 2 “weak accept”. An indicative quote from the referee report:

“This is really important work and a nicely written paper too! Many have wondered whether Machine Learning could actually be useful when performing proofs [in ACL2]. This paper makes a serious attempt at answering that question.”

At the early stages of the collaboration with industrial partners, they ex-pressed a desire of hosting the main technical developer of ACL2(ml) – Jonathan Heras; for organising seminars, workshops, and demos for the developers work-ing in these companies. To even further increase the value for the trip to Texas,

ACL2 group at University of Texas at Austin proposed to host this visit along-side with the industrial partners. I offered to fully sponsor this trip from my current EPSRC grant.

However, very unexpectedly for all participants of this discussion, Heras refused to visit Texas in either near or distant future, motivating it by personal reasons of which he gave no details. Already after the the end of SICSA PoC grant, Heras terminated his longer-term research contract with University of Dundee in June 2014.

Thus, my general feeling is that this technically, academically and industrially sound and valid project fell short of realising its full industrial or academic potential; even despite of achieving most of the technical goals that were formulated at the beginning.

## Mitigating actions

Among the mitigating actions we undertook were:

- Publishing a thoroughly refereed paper on the topic of SICSA PoC grant [2]; at the international workshop ACL2 at the major conference FLoC'14 in Vienna (<http://vsl2014.at/meetings/ACL2-index.html>).
- Disseminating the results as widely as we could among ACL2 community and wider theorem proving community: a talk has been given at STP workshop in St Andrews, in January 2014; a meeting has been held between Heras and J Moore (U. Texas) in February 2014 in Edinburgh; Heras' talk at ACL2 workshop at FLoC in Vienna (July 2014) was attended by our industrial and academic partners, and received a positive feedback.
- Making all papers, user manual and software available at the specially created and maintained webpage: <http://staff.computing.dundee.ac.uk/katya/acl2ml/>.

Overall, the results of this SICSA PoC grant have been well-received and are now known among the ACL2 academic and industrial community. It remains to hope that the tool – or its improved version – finds more users in the future.

## References

[1] J. Heras et al. Proof-Pattern Recognition and Lemma Discovery in ACL2. In 19th Logic for Programming Artificial Intelligence and Reasoning (LPAR-19), volume 8312 of LNCS, pages 389–406, 2013.

[2] J. Heras and E. Komendantskaya. ACL2(ml): downloadable programs, manual, examples, 2013–2014. <http://staff.computing.dundee.ac.uk/jheras/acl2ml/>.

