Institution: UNIVERSITY OF DUNDEE

Unit of Assessment: UoA11 COMPUTER SCIENCE & INFORMATICS

a. Overview

The research covered by this submission is based in the School of Computing, one of three Schools in the University of Dundee's College of Art, Science, and Engineering. The School is built upon a foundation of high-impact applied research, and has developed a high level of income (grown from £1.3m p.a. during RAE to £1.9m p.a. during REF), and strong connections with industry (over 50 commercial collaborators). This success has laid a foundation for making eight new permanent appointments during the period. The School's research has been re-organised during the period into two groups, *Intelligent Systems* and *Human-Centred Computing*. The former covers four areas: Argumentation Technology, Computer Vision & Image Processing, Space Technology and Theory of Computation; whilst the latter group includes research in Accessibility, Augmentative & Alternative Communication, and Social Inclusion. Research strategy is coordinated by the School Research Committee, chaired by the Head of Research, who sits ex officio on the College Research Committee, and has been appointed to the University Research Committee, ensuring strategic planning that is coherent with that across the University.

b. Research strategy

Strategic aims for the REF period were to grow research funding and research student numbers, and to develop critical mass in a series of focused specialisms, each driven by strong connections to research users.

In line with these aims, the School has raised its profile in Human-Centred Computing, expanded Argumentation Technology and Computer Vision & Image Processing, and grown a new Theory of Computation subgroup, now having at least three REF-submitted academic staff in each of these four areas. At the close of the RAE 2008 period, the School Research Strategy identified 'niche criticality' as a mechanism by which a relatively small unit such as Dundee's could compete effectively, viz., by focusing on and excelling at research in a small number of niche areas. The specific goal was that for each of the School's specialisms, it should be not just world-leading, but critical (to, for example, the success of a potential funding bid involving the area). An early example of strategic success of niche criticality was Hanson's coordination of Dundee's involvement as a £2.2m partner in the £12m *Social Inclusion in the Digital Economy* RCUK Hub with Newcastle. The strategy of specialising and growing has been developed by the School Research Committee and supported by the University administration through initiatives such as Dundee Fellows, launched by the College to identify and recruit researchers with proven track records and clear potential to become leaders in their discipline. This attracted over 400 applications from a worldwide search, resulting in three appointments in the School of Computing.

The goal set at RAE to sustainably grow research funding has been achieved. Research income increased from an average of £1.3m p.a. over the RAE period to £1.9m p.a. over the REF period. RA4 income per RAE2008 FTE was £86k p.a., then third highest in the UK. Despite hiring eight staff at lecturer level during the REF period, of whom four meet the REF definition of Early Career Researcher, income per FTE has increased by 88% since RAE2008 to £160k p.a.

During the period, the School raised its profile by hosting a number of conferences, including MIUA 2008, BMVC 2011 and ASSETS 2011 as well as workshops such as STP 2011 and ARW 2013. In 2010, the School commissioned a research review from Taylor (Manchester) and Rodden (Nottingham) which highlighted an opportunity to raise the level of publication ambition by targeting top venues, and to secure improved quality as a result. This has been catalysed by internal peer review within research groups, appropriate PhD training, and cross-School sharing of best practice coordinated by the School Research Committee.

The School's vision is to be a world-leading centre of research excellence in its areas of specialisation, and to enable significant societal benefits through its research. This articulates clearly with the vision of the institution and its transformational plan (launched in 2013) which has as its core purpose "the transformation of lives, working locally and globally through the creation, sharing and application of knowledge". The University strategy is to focus on three key challenges facing society: (i) promoting sustainable use of global resources, (ii) shaping the future through innovative design, and (iii) improving social, cultural and physical wellbeing. These challenges overlap with those identified by research council strategic plans and the School will further align its strategy with them. Current areas of research strength where investment will be focused map onto these challenges. For example, the School's Space Technology Centre will aim to increase the

number and value of US, EU, Russian, Japanese and Chinese missions to which its software is critical, as well as providing a near-Earth observation service consistently top-rated by NERC. Human-Centred Computing research is in areas of high impact and national priority and the School will expand and capitalise on its longstanding reputation in this area; its work on Augmentative and Alternative Communication and on Digital Social Inclusion impacts directly on social, cultural and physical wellbeing. Developing critical literacy through research in the theory and practice of debate and argument will contribute to cultural wellbeing by partnering with organisations such as the BBC. Computer Vision & Image Processing will emphasise biomedical image analysis working with disciplines such as oncology, surgery, ophthalmology and the life sciences, and with application to translational and stratified medicine with a particular focus on high-incidence conditions.

In 2011 the School coordinated the *Informatics@Dundee* report, detailing collaborations the School maintains across the University's disciplines, including proteomics, forensics, engineering, environmental science, physics, mathematics, medicine, dentistry, law and design. The School aims to harness and build coherence across *Informatics@Dundee* through awareness raising and enhanced collaboration in areas of local strength where there are natural synergies. To give a few examples, the University was recently awarded one of four UK eHealth Informatics Research Centres, it has invested heavily in its Clinical Research Imaging Facility, a further extension of its College of Life Sciences infrastructure with a core in microscopy underway, and Duncan of Jordanstone College of Art and Design will be a key partner for cross-disciplinary research, particularly in areas such as data visualisation and technology design.

In support of its strategic aims, the School will invest in areas of success to allow them to grow, identify opportunities for expanding the number of such areas, increase per capita funding and ensure stable funding for groups by diversifying its funding base. Specifically, the School plans to sustainably grow its academic staff numbers (an indicative mid-term target being 6 FTE over 3 years), focusing this expansion on excellence (appointing the very best staff) and coherence (strengthening existing specialisms and cross-group synergies). Simultaneously, it aims to increase the ratio of post-doctoral research assistants to staff from 2.0:1 to 2.5:1 by mentoring and supporting staff in preparing successful funding bids.

The size of the School's research student cohort has been a particular focus, resulting in PhD completions rising from 18.5 during the RAE2008 period to 26 during the REF period, representing a 63% increase in the average number of PhD graduations per year. Building on this success, the School plans to increase the size of its PhD cohort to a PhD to staff ratio of 2.0:1, up from 1.5:1. It will boost international recruitment of high quality candidates by leveraging its extensive research networks, further exploiting opportunities available through e.g. the China Scholarship Council, and pursuing new agreements, e.g. extending the successful 3+1+1 scheme (in which strong overseas students take their final undergraduate and Masters year in Dundee) to PhD level. Rolling recruitment of PhD students at School-level will be instituted, advertising via web sites (linkedin, School, College), topic newsgroups (e.g. AISB, imageworld, ISMRM and SPS mailing lists), target journals, existing undergraduate cohorts, and direct email to collaborators and likely sources of applicants worldwide.

New high value international partnerships with leading research institutes will be sought, reflecting research strengths. Extended visits and exchanges of researchers and PhD students with leading labs will be strongly encouraged and facilitated through strategic (co-)funding. The School will also further raise its profile by hosting major international conferences, such as COMMA 2014.

The School Research Committee will further enhance monitoring, governance, and management of the School's research and research strategy. It will use a small number of key performance indicators to assess the more quantifiable aspects of research performance, including funding per capita, funding source diversity, and post-doctoral research assistant and research student to staff ratios. Communication, monitoring, planning and horizon scanning with staff will increasingly rely on the successful programme of bi-annual research meetings between the Head of Research, Dean, and each member of staff in turn. These meetings, together with target setting and definition at group level will help to keep the ambition level high for the School's research and resulting outputs. More extensive use of strategic research retreats for staff in cognate research areas will be encouraged and supported through the School's Research Impact Investment Fund, created by the School Research Committee in 2013.

c. People

i. Staffing strategy and staff development

*(Some appointments, indicated *, were decided in the period but with contracts starting after 31 July 2013).*

The School is committed to research-led teaching and thus recruits individuals with both an outstanding research track record and excellent communication skills, with the potential for further achievement at the highest level. Building on the measured and sustainable approach to diversification developed during the RAE 2008 period, the School has invested in growth of its best performing areas. Specifically, the appointment of **Moncur** (2011, Aberdeen) and **Flatla** (2013, Saskatchewan) to Human-Centred Computing, **Budzynska** (0.5FTE, 2013, Polish National Academy of Sciences) and **Pease** (*2013, QMUL/Goldsmiths) to argumentation, and **Zhang** (2010, Queen's University Belfast) to Computer Vision & Image Processing, have helped build capacity in these areas. The School has also been able to nurture new directions in its Theory of Computation subgroup by successfully attracting and then mentoring early career researchers in type theory, **Komendantskaya** (2010, St Andrews), and constraint programming, **Petrie** (2009, Oxford). This has laid a foundation for consolidating these moves with the appointment of **Gaboardi** (*2013, Bologna) to this subgroup. Personal research Fellowships were won in open competition by **Gaboardi** (Marie Curie, 2012-14), **Komendantskaya** (EPSRC, 2008-11), **Moncur** (EPSRC, 2011-13), and **Petrie** (Dorothy Hodgkin, 2009-11).

The School has achieved a strong increase in its research funding set against a challenging environment by instituting a focused programme of awareness and training for all staff, coordinated by the School Research Committee. Senior members of staff provide pre-reviewing of proposal drafts and staff who have held fellowships take on a mentoring role during the fellowship proposal drafting process for others. Individuals are regularly briefed on funding opportunities appropriate to them and best practice is shared through discussion and an internal online wiki. Individual staff research activities, particularly strategically important and new initiatives, are supported at School level by a Research Investment Fund which provides small grants. All staff ally their principal research interests with one of the thematic groups and thereby become incorporated in group activities (e.g. reading groups, postgraduate supervision, group funding applications). The School operates a system of differential workload allocation to protect research time; all newly appointed academic staff on teaching and research contracts are allocated reduced teaching workloads.

Given eight new academic staff and the goals of increasing Post-doctoral Research Assistants and PhDs per academic, mentoring and development are critical. The University is committed to supporting academic staff at all career stages. A key component of this is the Objective Setting and Review process which is performed each year for all members of staff. This process prompts reflection and guidance regarding research goals, achievements and challenges. Early career researchers are provided a tailored programme of support to prepare them for leadership and are assigned a mentor (a senior academic in a closely aligned research area), who meets regularly with them and offers advice, particularly regarding funding and fellowship opportunities. They are also enrolled on postgraduate training for teaching and learning in Higher Education. Researcher development is an integral part of the University's Organisational and Professional Development unit, and encompasses the entire research lifecycle with an aim to develop a complementary range of skills for researchers. Provision includes short training workshops on writing, research funding, enterprise, presentation skills, coaching, and career advice, and support on working effectively with teams, setting research objectives and managing research projects. The researcher development programme has been mapped to the Vitae Researcher Development Framework which provides a way to fulfil the requirement of the QAA Quality Code of Practice for Research Degree programmes, the Roberts recommendations on training for research staff and postgraduate researchers, and the Concordat to Support the Career Development of Researchers. The University officially launched the Concordat in February 2009 and the School Research Committee monitors the School's implementation of the Concordat. Progress achieved in this regard is evidenced by recognition of the University by the European Commission for its 'HR excellence in research', an accolade granted to universities whose policies and processes demonstrate continued development of a working environment supporting research excellence and increasing focus and impact. Staff and research students, through the Organisational and Professional Development unit, have access to many local schemes, such as mentoring for early career academics and national collaborative initiatives designed specifically

and exclusively for researchers, for example, Scottish Crucible, Research Futures, Part-time Researchers Conference, and Converge Challenge.

The School has made recent international appointments in **Budzynska** (2013, Polish National Academy of Sciences), **Flatla** (2013, Saskatchewan), and **Gaboardi** (*2013, Bologna), and has seen Hanson move part-time to Rochester Institute of Technology (she remains at Dundee 0.2FTE). The School has a continuous flow of international research visitors including exchanges based on exchange/travel grants or project grants. For example, Zheng's 2012-13 visits from Sun Yat-sen were funded by an RSE/NSFC exchange grant. Four Distinguished Visiting Fellows (competitively awarded through the SFC-funded Scottish Computer Science pool initiative, SICSA) were hosted by the School: Power (2009, Bath), Prakken (2009, Utrecht), Roark (2010, Oregon) and Szaja (2010, Miami). Other international visits included Acuna (2011, Santiago de Chile), Barla (Genoa, 2011), Kawasaki (2012, Yamagata), and Vasquez (2012, Costa Rica). The School runs a seminar series during semester which funds visitors largely from the UK and Western Europe for short stays, and occasionally longer visits from further afield, including in 2013, for example, Christiansen (Roskilde), Kumar (RMIT Melbourne), and Luo (Anhui). **Trucco** was appointed visiting professor at both Palermo and A-STAR Singapore during the period.

The School makes appointments on the basis of merit alone and is committed to equality and diversity. That commitment is reflected in the fact that of the 13 REF-returned staff, 7 are female (at professorial grade: 3 male, 2 female; at senior lecturer/reader grade: 1 male, 3 female; at lecturer grade: 2 male, 2 female). **Petrie** was appointed chair of BCSWomen in 2008, and in 2013 to the Royal Society's Equality & Diversity Network responsible for maintaining diversity in the FRS candidate pool. The School's Athena SWAN self-assessment committee focuses on actions that will maintain and further enhance the School's inclusive culture and collegiate working practices. The Organisational and Professional Development unit supports the Athena Swan agenda by means of workshops such as 'Resilience in Academia' as part of the Dundee Women in Science Festival. Staff undertake mandatory online training in equality and diversity. A module on *Recruitment and Selection* is taken by staff involved in these activities. Completion of the training programme is monitored centrally and the importance of the action is emphasised to staff by all levels of senior management in the College and School.

ii. Research students

The School strives for a balance between retaining talented local graduates and attracting students from elsewhere in its recruitment of PhD students. The University is an annual recipient of an EPSRC Doctoral Training Award, and this is used competitively to fund 50% studentships, with staff securing matched funding externally, typically from industry. High quality recruitment is further stimulated by strategic allocation of fee waivers.

The School's procedures and practices for Postgraduate Research are developed in line with the 18 indicators set out in the UK Quality Code for Higher Education (Chapter B11: Research degrees). Research student supervision is governed by the University Code of Practice for Supervised Postgraduate Research, supplemented by the School's own Postgraduate Research Guide. All doctoral students are allocated at least one secondary supervisor in addition to their primary supervisor and, in the case of interdisciplinary research, further supervision from collaborating academics. Each student meets biennially with two members of academic staff other than their supervisors through the Thesis Monitoring Committee programme the aim of which is to discuss achievements, goals and individual development plans. This provides an opportunity to raise any concerns (e.g. regarding supervision or access to necessary resources) and contributes to a documented portfolio of the student's progress. Students can also seek guidance from the School's Postgraduate Advisor of Studies at any time. Students transfer formally to the PhD programme after their first year having satisfied an examining committee based upon a report (including a plan), a presentation and an oral examination. (It is possible to exit with a Masters degree at this point.)

All research students are encouraged to present at high quality international and national conferences, and to attend relevant summer schools, supported by the School's Research Investment Fund should other sources of travel funding prove insufficient. Students benefit from the environment provided by the Scottish Informatics and Computer Science Alliance (SICSA) which provides them with seminars, masterclasses, conferences and funding opportunities across Scottish universities, e.g., there have been 37 Dundee PhD students attendees at the SICSA PhD Conferences. The University's Library & Learning Centre delivers many short courses in areas

such as presentation & communication, career development, entrepreneurship and teaching skills. Examples of relevant workshops are *Practical Presentation Skills for Researchers*, *Editing and Revising your Writing*, *Spin-out Companies*, *Intellectual Property and Commercialisation*, and *The Complete Researcher*. Bespoke training (e.g. in statistics) and occasional graduate school events (e.g. on discourse analysis in 2013) provide further opportunities for research student development. Several research subgroups run regular journal clubs at which staff and students meet to review recent work together. The School supports an annual two-day PhD Symposium with organisation, chairing, reviewing and presentations by its PhD students, with two senior academics in an advisory role. All students are required to participate in and present their research at this symposium each year and typically attend international graduate schools during their first year. The School's staff engage with PhD training internationally by contributing to graduate schools including **Reed**'s contributions to DAMAS 2008 (Dubai), Argupolis 2010 (Lugano), OSSA 2011 (Ontario) and ACAI 2013 (London) and **Budzynska**'s to EASSS 2013 (Girona) and IGSAR 2013 (Warsaw). The quality of PhD education is evidenced by awards made to the School's research students, e.g., British HCI Award for International Excellence (Gil, 2008), Best paper award at UK BMVC student workshop (John, 2010), Digital Economy Conference Best Student Paper Prize (Stein, 2012), 1st place Student Research Competition ACM ASSETS (Black, 2011), ACM ASSETS Best Student Paper (Trinh, 2012), 1st place ACM CHI Student Research Competition (Prior, 2011), Silver Medal ACM/Microsoft SPLASH Student Research Competition (Zarb, 2012), 1st place ACM Graduate Student Research Competition at CHI (Crabb, 2013).

d. Income, infrastructure and facilities

Research Funding Portfolio

The School attracted £9.4m in research funding over the period, of which £5.7m was to the Intelligent Systems group and £3.7m to the Human-Centred Computing group. This included £5.8m from the UK Research Councils, the Royal Society, the British Academy and the Royal Society of Edinburgh. Funding from industry, commerce and public corporations was £0.5m. A further £1.6m was obtained from the EU, £1.1m from UK Government bodies and authorities, and £0.2m from UK-based charities. Major awards in the period include (figures indicate value to Dundee): SiDE (£2.2m RCUK, **Hanson**) a Digital Economy Hub in partnership with Newcastle, NEODAAS (£2m, NERC, Parkes) and BESiDE (£1.3m EPSRC, **Hanson** & **Reed**) which represents a strategic collaboration between successful areas in Human-Centred Computing and Intelligent Systems.

Obtaining EU funding has been a strength historically but this needs to be reprioritised to take advantage of opportunities presented by Horizon 2020 and the European Research Council. The School will seek opportunities with colleagues in other Colleges with whom it collaborates, and with other institutions, to bid for initiatives such as Centres for Doctoral Training. The School will harness its industrial advisory board in planning how to better marshal and leverage its many successful commercial collaborations, both as a way of winning service and industrial research funds, and of establishing an impact agenda which responds to priorities at RCUK and BIS.

One of the key components of recruitment strategy over the period has been the development of sufficient critical mass in the School's areas of excellence to support strong bids for EPSRC platform funding. One goal for the coming period is to win such funding for areas such as argumentation technology. Other key targets for 2014-16 include securing seed RCUK funding for Early Career Researchers and a focus on fellowship funding at all levels across the School, including RCUK, European Research Council and charitable sources. Increased effort will be directed at EU opportunities, supporting mobility and the attraction of researchers under the Marie Curie and successor schemes within Horizon 2020. Submission of a First Grant proposal is a minimum expectation for Early Career Researchers, as is the seeking of externally-funded personal Fellowship support. Internal peer review involving fellowship holders, and RC panel and college members will be a key facilitating mechanism for ensuring bids of the highest quality.

Infrastructure and Facilities

The 2005 purpose-built Queen Mother Building in which the School is largely based has received further investment during the period including a £21k refit of audiovisual equipment in the Wolfson Theatre and the lecturing rooms to enable live online broadcast of events: its inaugural use at the Scottish Argumentation Day in 2013 allowed remote attendees to engage. School servers have been updated recently at a cost of £20k. The School houses the Satellite Receiving Station which

has received RCUK funding of £3m over the period, and has provided data to over 500 academic projects and supported over 4m public downloads p.a. The School's research is aided by a support team of 3.0FTE administrative and 5.0FTE technical staff. All research students and staff have access to a wide range of software including Matlab (with over 40 toolboxes) in-house, and to high performance computing resource in collaboration with Life Sciences.

Further capacity building in existing areas of success, along with capitalising on opportunities for introducing new specialisms, will put pressure on physical infrastructure. However, the Queen Mother Building was designed to allow a fourth floor to be added, a cost-effective option that maintains colocation and cohesion, and which can be exercised as that pressure continues to increase. In the meantime, space in the building has been reorganised to colocate members of each research group, achieving a working environment in which cognate researchers, from PhD students to professorial staff, are in close physical proximity thereby facilitating collaboration.

Consultancy

Consultancy is a central part of the School's research activity as it provides a means both to deliver impact outside Higher Education, and to establish new commercial relationships. Some consultancy is conducted by individuals and some institutionally. Examples of the former are **Reed**'s work for local SME, J&L Technology, which has led to an offer of PhD sponsorship, and **Trucco**'s employment by TEKBAC Australia to provide computer vision training in Malaysia and Singapore leading to new collaborative research. In the latter category, the School's Digital Media Access Group, which provided digital accessibility and inclusive design consultancy to clients from industry, education, healthcare, and government, has recently combined with the consultancy arm of the Augmentative & Alternative Communication research group to form the Human Centred Computing Consultancy under the lead of **Waller**. Finally, Whitehorn has offered consultancy in the area of big data to companies including IBM, Lloyds TSB, Microsoft (US and UK), Oracle and Scottish Water.

e. Collaboration or contribution to the discipline or research base

Using as a criterion individuals with whom papers have been co-authored or grants worth over £50k have been won during the period, staff in the School collaborated with 24 UK Universities (e.g. Bath, Edinburgh, Leeds, Newcastle, St. Andrews), 32 overseas universities (e.g., Brown, Carnegie Mellon, Chalmers, Indiana, Leuven, Melbourne, Northwestern, Padova, St Petersburg, Toronto, UCLA, Utrecht), and over 50 companies and NGOs (e.g., the BBC, Intel, Liberty, Microsoft, Telenor, Thales, the V&A Museum). Current exemplars are the JISC/RCUK/NEH project *Digging by Debating* building linguistic models of reasoning structures in an open subset of Google books (**Reed** with the Universities of Indiana and London), and the £3m ERC project *Colonic Disease Investigation by Robotic Hydrocolonoscopy* (**Trucco** with Leeds). Further exemplars in the period were the £1.4m, Dundee-led Technology Strategy Board project, *FABRIC* (**McKenna** with Liberty, System Simulation, and the V&A) and the ongoing international VAMPIRE programme on retinal image analysis (**Trucco**) which recently led the first international, large-consensus manifesto for validation of retinal image analysis algorithms with 14 international clinical and image processing centres.

External collaborations are fostered through encouraging incoming visitors as seminar speakers, visiting scholars and distinguished visitors funded both through external programmes such as SICSA and by internal strategic funding. The £51m SICSA pool and £52m Northern Research Partnership pool, to both of which Dundee is an active contributor (with **Trucco** Deputy Director of the NRP Institute of Computational Systems; **Petrie** SICSA Director of Education, **Reed** a member of the SICSA Research Committee and **Komendantskaya** a member of the SICSA Early Career Committee), have provided further facilitation for collaboration with colleagues specifically in Scotland. Exemplars are the establishment of a network of researchers in argumentation (involving **Budzynska**, **Pease** and **Reed**), and the building of new links between researchers in functional programming and automated reasoning (involving **Komendantskaya** and **Gaboardi**).

Much of the School's research is interdisciplinary. At a local level this benefits from major critical masses in Dundee: a world-renowned College of Life Sciences, the Medical School situated in Ninewells Hospital, and the nationally leading Duncan of Jordanstone College of Art and Design. The *Informatics@Dundee* report, detailing collaborations across the University's disciplines, has helped secure commitment at both College and University levels for cross-discipline working

groups in areas such as data visualisation. As an exemplar, McKenna's EPSRC/MRC/BBSRC discipline hopping award *Microscopy Image Analysis for Cell Biology* (2010-11) opened up new areas of research leading to further MRC funding in collaboration with the life sciences (*Dynamics of Fundamental Cellular Processes by Live Cell and Tissue Imaging,* MRC, £1.3m, 2013-17). The Dundee-led EPSRC *BESiDE* project (with Newcastle University) involves Nursing (Ninewells Hospital, Dundee), Duncan of Jordanstone College of Art and Design, and Architecture.

End users are involved in the majority of the School's research from grant application through to commercialisation. All the world's major space agencies use research from the School's Space Technology Centre; collaboration between Dundee and companies such as Astrium and Thales delivered research for those agencies worth over £2m in the period with results being used in mission critical systems on over $15bn worth of spacecraft. A spin-out company, STAR-Dundee, formed in 2002, continues to work with the University and continues to grow year-on-year, and won Business of the Year at the Courier Business Awards 2013, out of more than 100 entries. The School convenes an Industrial Advisory Board, chaired by Farquhar, to advise on both teaching and the commercial application of research, with members drawn currently from Cisco, Amazon, NCR and a number of SMEs. Strong links are also maintained with other user groups, such as Capability Scotland, Scottish Education Departments, NHS Community Dentistry, NHS Speech & Therapy Departments, Balhousie and BUPA groups. Collaboration with clinical user groups has seen, for example, the School's retinal measurement software deployed at clinical sites in the UK (Manchester, Edinburgh & Leeds), the US (UCLA & the Jules Stein Eye Institute) and elsewhere (e.g. Brazil). During the REF period, the School has instituted a register of user collaboration to ensure coherent engagement, particularly with large organisations. This has had recent success in work with the BBC (which now spans the Intelligent Systems and Human-Centred Computing groups) and with care homes across the UK and US who, through existing relationships, helped secure £1.3m EPSRC BESiDE funding. Finally, **Hanson** has built a unique user pool of over 900 older adults signed up to be available for various studies conducted as a part of the SiDE hub.

Exemplars of Leadership

Journal Editorship Editors-in-Chief: ACM TACCESS (**Hanson**); Argument & Computation (**Reed**). Board Membership: ACM Trans. Web (**Hanson**), ACM TACCESS (**Waller**), Augmented & Alternative Communication (**Waller**), App. Analysis & Disc. Math. (Edwards), Argument & Advocacy (**Reed**), Cogency (**Budzynska**), Disc. Math. (Edwards), IEEE SMC (**Trucco**), Informal Logic (**Reed**), Int. J. HCI (**Hanson**), J. Public Deliberation (**Reed**), Machine Vision & Apps. (**McKenna**), Nonlinear Analysis (**Trucco**), Pattern Analysis & Apps. (**McKenna**, **Trucco**), Tech. & Disability (Arnott). Selected Guest Editorships: Int. J. Comp. Vision (**McKenna**, **Trucco**), Pattern Recognition (**Zhang**),Topics in Cog. Sci. (**Pease**).

Conference Chairs: ACM ASSETS 2010 Programme Committee Chair (**Hanson**), MIUA 2008 Chair (**McKenna**), BMVC 2011 Chairs (**McKenna**, **Trucco**), Argumentation 2013 (**Reed**), ECCV 2012 Tutorials Co-Chair (**Trucco**), ArgDiaP 2008-13 (**Budzynska**), RCUK Digital Engagement 2011 (**Hanson**, 2011).

Keynote talks (selected): Argumentation, Informal Logic & Critical Thinking 2010, Santiago (**Reed**), ACM Distinguished Speaker 2013 (**Hanson)**, Textile Institute's 2010 Roy Godden lecture, Royal College of Art, London (**McKenna**), Whitehead lecture, 2013, Goldsmiths (**Pease**), 4th IEEE Biosignals and Biorobotics Conference, Rio de Janeiro, 2013 (**Trucco**).

Awards: Anita Borg Institute Women of Vision Winner for Social Impact 2013 (**Hanson**), Business Insider Top 25 most powerful women engineer (**Hanson**), IBM Corporate Award 2009 (**Hanson**), Royal Aeronautical Society Specialist Bronze Award (Parkes), RNIB Lifetime Achievement Award 2013 (Newell, professor emeritus), CHI Social Impact Award 2011 (Newell), CHI Academy (Newell, 2012), BCS HCI 2008 Award for International Excellence (Arnott).

Fellowships: FRSE (**Hanson**), FBCS (**Hanson**).

Other Roles: ACM Secretary/Treasurer (**Hanson**), ACM Executive Committee (**Hanson**, 2010-13) Chair ACM SIG Governing Board (**Hanson**), Chair of Review Panel for Academy of Finland (2010, 2013, **McKenna**), EPSRC College Membership (**Hanson**, **McKenna**, **Reed**, **Trucco**), Senior Member of the IEEE (**McKenna**, elected 2008**),** Chair of ACL SIG Speech Language Processing for Assistive Technology (**Waller**), Royal Society of Edinburgh Sectional Committee Member (**Hanson**, 2013).