Institution: Liverpool Hope University

Unit of Assessment: Computer Science and Informatics

a. Overview: The Computer Science and Informatics (CS&I) Unit of Assessment (the UoA) at Liverpool Hope comprises researchers from the Departments of Mathematics and Computer Science (M&CS: 6 FTEs are returned in this exercise out of the total of 8 FTEs) along with the School of Health Sciences (1 FTE) working on multi-disciplinary research themes; amongst the 7 FTE, submitted 3 are Early Career Researchers appointed since 2010.The UoA is a lively and energetic unit, supporting a strategic range of theoretical, mathematical, and applied computer science research. Research activity of the UoA is part of the Centre for Applicable Mathematics and Systems Science (CAMSS; which is hosted in M&CS) and organised around the following research themes: Applied Mathematics, Theoretical Computer Science, Natural Computing, Computational Biology/Bio-informatics, Human Computer Interaction, Bio-Medical and Health Informatics, Networks and Communication Systems, and Software and Systems Engineering.

During the period covered by this review, the Department has undertaken a major re-positioning to meet both external factors (e.g. changes in student numbers) and changes in the strategic direction with repositioning of the University. This in turn has led to a significant shift in staffing profile. This re-positioning has also led to a more Mathematics and Computer Science focus and has shifted the emphasis of its postgraduate provision from primarily Information/Software Systems to Mathematics and Theoretical and Algorithmic Computer Science areas. It has also helped to establish a healthy postgraduate research programme as well as develop a vibrant research environment.

b. Research strategy

Overview of Approach to Research Strategy: Our strategy for establishing a research culture involves growing a viable and sustainable "research community" in each area/theme consisting of academic staff, research assistants, research students, visiting/adjunct professors, and collaborators from industry. Whilst growing research communities is a long-term undertaking, there have already been some notable successes as evidenced by the establishment of the *Centre for Applicable Mathematics and Systems Science* (CAMSS). In order to fulfil this strategy, development of a strong and active research culture has been a priority for the University, which has repositioned and restructured the University into Departments, thus creating strong research themes with critical mass and providing opportunities for interdisciplinary research. Maintenance of an international profile is a priority for staff in a *research-informed teaching* environment, as is provision of a rich and satisfying environment for research students, advancing knowledge, developing technology, and providing highly trained scientists and engineers to meet the needs of industry and society. This thereby contributes to UK economic competitiveness and quality of life, and thus fulfilling the University's mission of engaging with the world beyond academia, to '*be the critic and conscience of society*' and to '*make a difference*'.

Research in CS&I at Hope spans a coherent theoretical/mathematical core firmly underpinning diverse applied and experimental research. The Unit's willingness to look across its disciplinary and sub-disciplinary boundaries is exemplified in many ways, most recently through the appointment of two new staff in Applied Mathematics; the appointment of visiting and adjunct professors: Prof Konar, a leading researcher in Intelligent Systems and Robotics; Prof Arumugam, a leading Graph Theorist; Prof Subramanian, a leading Theoretical Computer Scientist; Dr Thamburaj, an expert in Natural Computing who has also been recognised for his innovations in developing tools and techniques for special needs school children; Prof Thomas, a leading figure in the area of P-Systems and Grammatical Inference; and Prof Abdullah, a leading researcher in HPC and Parallel Computing area. These visiting colleagues although not part of this REF submission hold fractional contracts and work in a close collaboration with the team. They are involved with mentoring of emerging researchers, joint publications, bids, and conference (e.g. BIC-TA 2010) organisation with the Department, as well as residing in the Department for extended periods of visits of one to three months duration; and jointly supervising PGR students.

Achievements and evaluation of strategic aims during the assessment period: Since RAE 2008, the CAMSS and M&CS research strategy has been to focus on: fostering research in carefully selected growth areas of Computer Science and its applications; to raise the visibility of Computer Science and Mathematics research at Hope by publishing in internationally respected venues/outlets; to increase the quality and quantity of Ph.D. students; to increase external grant income in order to attract researchers and visitors; to improve laboratory equipment provision; and

to increase external research, knowledge exchange and technology transfer collaborations. As a result of this strategy, research has expanded rapidly over the last five years. As part of our conscious policy of investment for the future we have a balance between experienced, mature researchers and others at an early career stage. Of the 7 FTE staff returned, 4: Dr Hu in Networks and Communications; Dr Mc Auley, from the Health School in Computational Biology; and Drs Kirpichnikova and Foulkes in Applied Mathematics; were appointed after 2008 (2011 and 2013, respectively). Achievements during the assessment period against the RAE 2008 strategy and research targets include:

- Creation of active and sustainable research thematic(s) in key areas that build on the strengths established through repositioning of the University, rebranding of the Department as Mathematics and Computer Science, as well as the creation of the CAMSS.
- That the CAMSS is well-represented on the programme committees, organising committees and editorial boards of the top international conferences and journals in the Computer and Information Sciences.
- That research quality is evidenced by publications in highly ranked journals and the top archival conferences. For example articles in: the International Journal of Advances in Engineering Sciences and Applied Mathematics; the International Journal of Foundations of Computer Science; the IEEE Transactions on Systems, Man, and Cybernetics; IEEE Transactions on IT in Biomedicine; Discrete Applied Mathematics; Fundamenta Informaticae; IET Control Theory & Applications, Chaos, Frontiers In Behavioural Neuroscience, Physical Review E; and examples of papers in major conferences include Bio-inspired Computing: Theory and Applications (BIC-TA) series, IEEE HPCC-ICESS 2012; IEEE-EMBS International Conference on Biomedical and Health Informatics; IEEE World Congress on Computational Intelligence; International Conference on Computational Science (ICCS).
- Growth in PhD student numbers from none in 2007/08 to 10 in 2013, with an approx. 3-year completion rate for the doctoral degrees; 4 PhD completions during the review period.
- Improved research infrastructure with excellent facilities and environment.
- Key appointments include Dr Hu in Computer Science, and Drs Kirpichnikova and Foulkes in Applied Mathematics, as new researchers; and promotions for Dr Tawfik as Associate Professor, and Prof Nagar as Foundation Chair and Head of Department.

With the achievements highlighted above, since the last RAE, Computer Science and Informatics at Hope has enjoyed a period of both growth and consolidation. The portfolio of research has been focused adding more depth in key strategic areas such as Applied Mathematics, Theoretical Computer Science, Intelligent Systems, Health Informatics, Networks and Security. New appointments have provided direction and leadership resulting in an increase in both funding and research output. The Department now has the people, facilities and a future strategy in place to ensure that it enhances its position as a leading Computer Science unit in the coming years.

The establishment of CAMSS as a multidisciplinary centre, led from the M&CS Department and drawing on membership from other Departments such as Psychology and Biological Sciences from within the University and from industrial partners (e.g. Dr Anya from the IBM working on e-Workbench project with Prof Nagar and Dr Tawfik), has thus further consolidated the Research profile of the Department and CAMSS as it contributes to the Third Stream agenda. This has been achieved by increasing the capacity to respond to requests and stimuli from industry and by enhancing the first-hand and up-to-date knowledge of members associated with the centre. Examples of this strategy include recent collaborations with the NHS on the Health Informatics project for developing Text-to-Speech Synthesis for patients with speech-impairment (e.g. Amyotrophic Lateral Sclerosis) and the KTP with the Nuclear Skills Development Agency (NSAN) in the area of Knowledge Management and Nuclear Skills passport.

Future research strategy, aims and goals for sustainability:

The continuing development of research excellence is central to the University's vision for the future. One of its strategic objectives is the development of areas of research excellence in all Departments/Schools. The researchers belonging to the CAMSS continue to set for themselves the objective of prosecuting both fundamental and applied research at the forefront of technological development as well as responsiveness to national and international initiatives; for example Computational/Systems Biology; Big Data Analysis; and e-Health/Health Informatics. This strategy will continue to be adopted and developed. It is envisaged that focusing research activities on themes reflecting national and international priorities, for example Big Data Analysis and e-Health,

will lead to continued growth in our research outputs and already fruitful activities.
Our strategic plan within the Department and CAMSS at Liverpool Hope is to continue the policy of developing strength in depth, with emphasis on multidisciplinarity, building upon existing themes and diversifying in a carefully controlled fashion, and achieving international excellence in aspects of our portfolio. We will continue to grow research activity through our staff development procedures, by emphasising and encouraging synergy, and by attracting active researchers in relevant areas. A conscious effort will continue to be made to ensure relevance and timeliness of research, while continuing to anchor the research firmly in the process of income generation through consultancy and technology transfer activities, funding bids (e.g. CAMSS has recently been successful in attracting FP7 EU funding as part of a consortium led by the Brunel University), and enterprise activities (e.g. work with the Barclays Plc. and one PGR research student to be sponsored by the NHS).
Within the framework of this strategy, the CAMSS will pursue a set of well-identified goals over the next five years. In particular:

a. Respond to the challenges presented by the explosive growth of Big Data Analysis, 'e-science', mobile communications, and embedded systems areas.
b. Focus on exploiting our core skills in Theoretical Computer Science, Systems Engineering and Mathematical Modelling and Simulation areas by prosecuting both fundamental research and applications as diverse as State Estimation for Communication Systems and Petroleum Well Optimisation problems, Bio-informatics, Health Informatics, and Embedded Systems.
c. Further raise the quality of publications to higher standards and outlets through target setting in staff performance reviews, staff development and mentoring.
d. By ensuring that future strategy continues to emphasise sustainability through research grants, commercialisation of research and technology transfer. Increasing the number of research funding bids will continue to be a priority.
e. By supporting less experienced and Early Career researchers in the research teams including through mentoring by more experienced researchers.
f. Ensuring that future strategy also recognises the importance of collaboration as a further impetus for external funding.
g. By carrying out commercial exploitation and patency of the impact of our research findings.
h. By further increasing the critical mass of graduate student body and successful research degree completion.
i. By consolidating and improving our research activities, focussing on our strengths both at national and international levels. Accomplish this by adopting well focussed objectives and research themes; encouraging multi and inter-disciplinary research; and by attracting active researchers in relevant areas.
j. Developing Mathematics in the Department so that a planned submission to the Mathematics UoA takes place in the next REF exercise.

c. People, including:

i. Staffing strategy, staff development (and support for research)

The University maintains a rigorous policy of staffing and for established posts it recruits research-promising academics as well as high-calibre, early researchers into academic positions (e.g. Drs Hu Foulkes, and Kirpichnikova). Moreover, as part of the annual staff appraisal, the research achievements, aspirations and development needs (e.g. bids and grants writing, conference organisation) of staff are explored and acted upon. New members of staff are mentored by more experienced senior academics, who provide guidance and help, and wherever possible new members of staff carry out at least part of their research work in conjunction with other colleagues (e.g. joint supervision of PhD by Prof Nagar and Dr Reid). Funding is provided for recruiting Graduate Teaching Assistants (GTAs) who are enrolled for PhD degrees and support the Department's research and teaching. During the assessment period a total of five PhD bursaries were created. We are a relatively young department: category A staff have a mean age of approx. 39.00, and no staff reach retirement age within five years. Liverpool Hope has a sound staff profile, with a good balance between research leaders (Prof Nagar), experienced researchers (Drs Tawfik, Reid, Mc Auley), new and emerging researchers (Drs Hu, Kirpichnikova, Foulkes, Mr Blakeway, Mr Barrett-Baxendale), and visiting scholars and professors. Prof Nagar works in a number of areas across CS&M and contributes with his mathematics background by enriching and mentoring the research of emerging and early career researchers.

Research Management: The organisation of the UoA's research as *Centre for Applicable Mathematics and Systems Science* (CAMSS) grouped under key themes facilitates efficient deployment of resources, effective coordination of research, multidisciplinary collaboration and the subsequent transfer of knowledge and expertise. Day to day management of research activities is coordinated by the Centre director Prof Nagar (who is also the Head of Department). This ensures a coordinated approach and facilitates the cross fertilisation of ideas and projects as well as the integration and mentoring of new and upcoming members, encouraging the development of junior researchers, identifying publication targets and putting together of applications for funding. Each research theme has leaders who also help in mentoring less experienced staff. Institutionally, research is the responsibility of the Research Committee, chaired by the Pro-Vice Chancellor (Research and Academic Development), which reports directly to Senate. All research at Hope is managed in accordance with the Research and Scholarship Plan, which is currently undergoing periodic review; each Faculty articulates its own strategy within the parameters of this, and the Dean of Faculty oversees and monitors research within his or her area as part of annual monitoring processes.

Research time for staff is built into workloads. Wherever possible staff are given the equivalent of one day per week free of other university commitments during term time. Research time is monitored via a '*Mitigation of Teaching'* procedure (granting of this time is contingent on targets having been achieved in the previous year), and through performance reviews. Hence, the Department ensures that active researchers have dedicated research time.

Research is a standing item for discussion on Departmental meetings and administration work for research activity is undertaken by the Departmental Office staff, who perform administrative functions such as the convening and minuting of meetings. Other, occasional, more substantial tasks such as the co-ordination of conferences can be undertaken by arrangement with the University's Conference Office. Researchers are also provided with a comprehensive computing and information infrastructure. The Research Facilitator (based in the central University Research Support Office) works in partnership with academics to secure, manage and increase funding from external organisations both nationally and internationally. This is achieved through: one-to-one support; staff development workshops on topics such as proposal writing, costing and pricing and the support of early career researchers; and the provision and analysis of management information statistics.

Research funds are available from the Faculty and University for travelling to and participating at conferences as well as for organisation of conferences and symposia (e.g. EMS 2008 and EMI 2013 symposia were funded by the Research Committee). In particular, priority is given to staff presenting papers at conferences, tutorials or workshops or chairing special sessions at conferences. During the current research assessment period, all members of staff presenting papers at recognised conferences have been supported. Drs Hu, Kirpichnikova and Foulkes will be applying for the "*First Grant*" awards during 2013-2015 academic years and they have been/will be supported to help them develop fully as independent researchers.

As with most Mathematics and Computer Science departments, the ratio of male to female academic staff and research students remains disproportionately high. The department, and CAMSS, is working actively to try and address this issue as part of the University's Equality and Diversity policy. The Department has an international staff profile with 50% of its staff with international background (Prof Nagar: India, Dr Hu: China, Dr Tawfik: Iraq, and Dr Kirpichnikova: Russia).

ii. Research students:

The University acquired Research Degree Awarding Powers (RDAP) in 2009; prior to this the University had accredited status for awarding PGR degrees from the University of Liverpool. The Department started its Doctoral programme in 2006 with the creation of 3 research bursaries (and later two further bursaries were created in 2009 and 2012) and since RAE 2008 (during which we had no completions), we have supervised 4 PhD students to successful completion (one joint (0.5 FTE) PhD completion with the Faculty of Education at Hope). Furthermore, the research student population has grown substantially to 10 PGRs. There has been 1 MPhil completion to July 2013, 2 more PhD have had successful vivas since July, and several PhD students are close to submission. Our PGRs have been successfully employed: 1 PhD is working for IBM at California, 2 PhDs are in academic position (1 in the UK and 1 in Pakistan). Application numbers for the PGR programme have been healthy and the Department carefully selects its research students, keeping

in view the research strengths and expertise as well as supervisory capacity of the staff members. Research supervisory status is approved by the Research Degree Sub-Committee which is a sub-committee of the University's Research Committee.

Our students come from our own taught degrees, other UK universities and several countries overseas, including India, Nigeria, and the Middle East. Our MScs in Computer Science, and Networks and Security are important sources of very high quality PhD students.

Research students are a key part of our research community, participating fully in research of the Department and CAMSS. Research Students are required to be based in a dedicated PGR laboratory space in the Department. Research students are required to attend the Departmental Research Seminar series and informal meetings where research active staff encourage research discussions and create an excellent research "buzz". One result was 2nd prize for a poster presentation by a PGR student who entered at the London Hopper Colloquium 2013, where his poster won the people's vote. All research students undertake the Research Skills programme, interactive workshops, seminars and group activities. Department Staff are also involved in delivering University wide PGR sessions. PGR students participate in PGR skills and Poster sessions. Success is evidenced by the healthy 3-year (approx.) completion rate for the cohorts since 2008. A supervisor training programme has run since 2008 and before that staff attended the University of Liverpool's supervisor training programme as part of our PGR accreditation status. Research students are supervised by a team, members of which receive appropriate supervisor training (e.g. PGR skills – processes and procedures; how to supervise, examining a thesis; Upgrade/confirmation events: Process and practice; Acting as an independent chair of PhD/MPhil panel; Liverpool Hope doctoral regulations) and dedicated time for supervision. The team may (and frequently does) include external people chosen for their specific expertise. Generic research training is provided centrally and covers topics such as research ethics, project planning, thesis writing, the viva examination, and presentation skills; Hope also subscribes to Research Skills online, a PGR training suite. More specific training, e.g. attending appropriate MSc modules or external courses and events, is provided at departmental level and is tailored to individuals. Research students are encouraged to deliver papers from the first available opportunity, and advantage is taken of "research student friendly" conferences and events, for example a dedicated special session for PhD students at the BIC-TA 2010 conference, Engineering and Medical Informatics (EMI 2013) symposium, at which senior researchers provide feedback and encouragement to students and new researchers.

The progress of research students is monitored annually through an Annual Monitoring process that includes a report by the supervision team, a review of the student's training record, and an interview carried out by an Independent Chair and the Supervisory team. Progression is subject to satisfactory performance in this process and the approval of the University's Research Degree Sub-Committee. The Department's policy of discouraging students from switching to part-time mode without good reason has resulted in maintaining completions within 3-4 years. Structures for supporting our research students were commended as areas of good practice by the Departmental Review which took place in November 2010.

d. Income, infrastructure and facilities: Under the UoA's research strategy, increasing research income is a priority and important for maintaining a vibrant research culture. Hence researchers are expected to include bidding for external funds within their research plans and this is reviewed as part of the Performance Review process. Since RAE 2008, when the research income was none, the external grant income by returned staff has shown growth, most of which can be attributed to a response to the research strategy. During the review period CAMSS/department was awarded the following grants: Leverhulme Trust Visiting Fellowship (Dr Thamburaj from MCC India to work with Nagar); and KTP (held by Prof Nagar, jointly with Business School, with the Nuclear Skills Development Agency (NSAN) in the area of Knowledge Management and Nuclear Skills passport); British Council funding under the PMI2 scheme with the British University in Dubai (Dr Tawfik & Prof Nagar); HEIF funding (Prof Nagar, Dr Tawfik); recently awarded FP7 EU funding (started in October 2013). On the basis of applications in progress, we estimate a steady state of at least £250k income per year from 2014 composed mainly of '*First Grant applications*' (from Drs Hu, Foulkes, and Kirpichnikova), KTP and UKIERI (Nagar jointly with his colleagues in India) awards. Given the age profile of staff this is sustainable subject to succession planning. Strengthened support from the University includes significantly increased investment in the department's equipment and laboratory facility, digital library research resources and increased research support

via creation of a Central Research Support and Development Office/Research Facilitator. The University has spent in excess of £80,000 per-annum on research equipment, this includes:
(1) The creation of thematic laboratories for research specialisms; for example: Intelligent and Distributed Systems Research Laboratory; Informatics Laboratory; Communication Systems Laboratory; Robotics Laboratory; and Visualisation Laboratory. **(2)** A HPC machine which includes 2 racks of 64 cores linked with 2 Tesla and 2 Kepler class GPCPUs. **(3)** The purchase of numerous small pieces of hardware for various research investigations such as Emotiv headsets, VR and AR equipment, robots of differing sizes and complexity and numerous small embedded computational devices such as the XMOS XMP-64, Spartan and Virtex 5/6 FPGAs and M class ARM chips. Recently ReRAM devices have also been obtained. **(4)** A HP DesignJet 3D printer for rapid prototyping and design. **(5)** The department is also currently bidding for space in the university's new Science Building (estimated to be built in late 2014). A Computational Electronics Laboratory and a Robotics Laboratory are being requested. This along with our current investment will allow the department to physically expand as well as give further intellectual coherence and research productivity to our already ebullient research environment.

e. Collaboration and contribution to the discipline or research base: CAMSS fosters interactions between members and with academics in other faculties, units and with our partner HEIs as well as academics nationally and internationally. A summary of international activities, honours and evidence of the professional standing of staff is provided below (all data pertain to the assessment period):
International Collaborations, Credibility and Vitality of Research: The vitality of the research environment is shown by the number of international academic visitors. The Department runs a strong seminar series that invites eminent, high profile researchers from around the globe to describe their ground-breaking work to an audience of Faculty-wide students and academics. Over the assessment period this has attracted a range of external speakers including international experts in the research areas for which the Department is well-known. Some recent visitors include Drs Xia (Senior Research Scientist at Ericsson USA), Thamburaj and Thomas (MCC, India), Shaalan (BUiD, Dubai), Professors Deep, Singh, Dhar (IIT and IIITM, India), Thangavel, Arumugam and Subramanian (various Indian Universities), Subramanian and Abdullah (USM Malaysia), Meduna (Brno, Czech Republic), Fernando (Salford), Ingg (Cape Town, South Africa), and Timmis (York) to list a few. Prof Song (Bedford and Harvard at EMI 2013), Prof Furber (Manchester at BIC-TA 2010), Prof Babulak (Maryland at EMS 2008) and Prof Crosbie (California at EMS2008) are some examples of keynote speakers invited by the department at conferences and events organised on campus during the assessment period. The Department has enjoyed extended visits from international academics who have come to work on specific/collaborative research projects, funded by various bodies. For example: Dr Thamburaj from Madras Christian College (Chennai, India) was a visiting scholar on the Leverhulme Trust Fellowship from October 2009 to October 2010. Professors Thangavel (Madras), Subramanian (USM Malaysia), Konar (Jadavpur), Arumugam (n-CARDMATH - http://www.ncardmath.com/; Kalasalingam), Thomas (MCC, Chennai), Deep (IIT Roorkee) and Dr Thamburaj (MCC, Cennai) are visiting/adjunct professors/senior research fellow at CAMSS funded by the University and work collaboratively with the members). Other visitors have been funded by their own universities (e.g. Prof Ingg from Cape-Town (South Africa), Prof Abdullah from USM Malaysia (who was on a three month sabbatical at CAMSS)). Since 2010 the CAMSS has been involved in engaging with Nuffield Trust funded Sixth Form students (on an average 2 per annum) who reside in the department gaining research and HE experience. As a research informed teaching institution through our widening participation programme (e.g. summer school in July 2013) our research also feeds into advising schools in the current state of art in Computer Science and Informatics.
International links and networks: Formal research collaboration agreements are in effect with the Madras Christian College (Chennai), Christ University (Bangalore). There is also active collaboration with researchers from the following universities: Christian Medical College (Vellore), Universities of Jadavpur, Madras, Banaras Hindu University; Indian Institute of Technology (IITs) e.g. Roorkee and Madras (India); BITS; British University in Dubai (BUiD-UAE), the Work Design Innovation Group at IBM (USA); Fujian Normal University, China; USM Penang-Malaysia.
Sabbatical leave on Indian Government's Invitation (to deliver staff development sessions at IITs (Nagar, 2013))**:** Nagar has been invited by the Government of India on a Department of Science and Technology (DST) India funding for a three month sabbatical leave from Hope. During

this visit he will be delivering staff development sessions for academic staff and PGR students at the Institute of Technology Roorkee (IITR, India), and will also be delivering a three week course on *Membrane Computing* plus a series of three specialist lectures on his expertise in *Complementary Bivariational Principles and their applications*. This visit will not only help Nagar's research leadership capacity as the Director of CAMSS and HoD but also open up new directions for collaborations between the Indian institutions and his research centre at Hope.

Awards and honours: Award of model of the month by the European Bioinformatics institute, Cambridge (UK): (http://www.ebi.ac.uk/biomodels-main/static-pages.do?page=ModelMonth%2F2013-10) for "A whole-body mathematical model of cholesterol metabolism and its age-associated dysregulation" (Mc Auley; October 2013); Award of an EPSRC Early Researchers Grant for attendance at the Cardiac Physiome Project at the Isaac Newton Institute for Mathematical Sciences (Foulkes; 2009; £440); Outstanding Leadership Award and Outstanding Service Award for contributions in IEEE HPCC'12 (Hu; 2012).

Participation in review, advisory, funding and policy bodies: Membership of AHRC Peer-Review College (Nagar; Technical Reviewer, 2008-present); Expert Reviewer for EPSRC/BBSRC (Nagar; number of times during the review period); Reviewers for UAE National research (Emirates) Foundation (Nagar; Tawfik; Foulkes) and Qatar Research Foundation (Tawfik; Nagar).

Reviewer for Journals: All members participate in this activity; some examples are: Journal of Vision, Journal of Physics, and New Journal of Physics (Foulkes, Nagar); IEEE Transactions on Fuzzy Systems (Nagar); Reviewer for PLoS Computational Biology (Mc Auley); BMC Systems Biology (Mc Auley).

Conference keynote speakers/invited papers: Keynote plenary papers at: SocProS 2011 (Nagar, Roorkee-India); BIC-TA Conf. 2012 (Nagar, Gwalior-India); Int'l Conf. on Soft Computing and Problem Solving 2011 (Nagar); Invited talk at Computational Cell Biology: The interplay between models & Experimentation, Cold Spring Harbor Laboratory, USA Conference (Mc Auley, March 2013).

Editorial Work: International Journal of Artificial Intelligence and Soft Computing; Inderscience (IJAISC) (Editor-in-Chief: Nagar); Journal of Universal Computer Science (Nagar); Feature Editor of Natural Computing (Guest editors: Nagar with Prof Gheorghe Păun, 2012); Guest Co-Editor of Special Issue of BIC-TA and SocProS series of conferences (Nagar, since 2010 to present); Journal of Healthcare Technology and Management (IJHTM, Inderscience) (Tawfik, 2013); Guest Co-Editor of special issues: Springer Telecommunication Systems (Hu, 2012); Elsevier Journal of Systems Architecture (Hu); Concurrency and Computation: Practice and Experience (Hu).

Editors of International conference Proceedings: Proceeding of International Conferences on Developments in eSystems Engineering (2010 to 13; Nagar, Tawfik); Proceedings of the European Modelling Symposium, EMS 2008 (Nagar & Tawfik, 2008); IEEE HPCC-ICESS 2012 (Hu, 2012); Proceedings SocProS and BIC-TA series (Nagar, 2010-present).

International conference organisation: Five International, high-profile conferences and symposium were hosted at Hope by CAMSS and staff acted as chairpersons of several conferences and workshops (Nagar, Tawfik, Reid) viz., the 2013 International Conference on Engineering and Medical Informatics (EMI2013); the International Conference on Bio-Inspired Computing: Theories and Applications (BIC-TA 2010); Health Informatics Symposium (2010 and 2011 at Liverpool Hope); EMS2008: European Modelling Symposium, Liverpool. Other conferences co-organised by the CAMSS overseas include: DeSE 2010/11/12/13: International Conference on Developments in eSystems Engineering; Soft Computing for Problem Solving international conference series (SocProS 2011/12/13). **Adjunct/Visiting Professor:** Indian Institute of Technology (IIT) Roorkee, University of Madras, Chennai (India) (Nagar, since 2008).

Visiting/Adjunct Professors who work collaboratively with members with the CAMSS on publications and bids as well as supervising PGRs: As mentioned above as well, some examples are: Profs Konar, Arumugam, Thomas, Subramanian, Abdullah, and Dr Thamburaj.

External PhD/MPhil Examiners: Salford (Nagar, 2008); Wales-Newport (Nagar 2009); Institut de Mathématiques Appliquées, Université Catholique de l'Ouest, Angers, France (Nagar, 2009); Andhara University (Nagar, 2010), National Institute of Technology, Kurukshetra (Nagar, 2011), University of Madras and Indian Institute of Technology Madras (Nagar, 2012), Banaras Hindu University (Nagar, 2013) in India; Coventry (Tawfik 2010); Liverpool John Moores (Tawfik 2011); City-London (Tawfik, 2013).