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Steven Bishop
FuturICT
Department of Mathematics
Room 304
Kathleen Lonsdale Building
University College London
Gower Street
London
WC1E 6BT

VICE-PRINCIPAL AND HEAD OF COLLEGE
Professor Lesley J Yellowlees MBE FRSC
COLLEGE of SCIENCE and ENGINEERING
The University of Edinburgh
The King's Buildings
West Mains Road
Edinburgh EH9 3JY
Telephone 0131 650 5754
Fax 0131 650 5738
Email L.J.Yellowlees@ed.ac.uk

FuturICT – Future and Emerging Technologies Flagship

I am writing to express the University of Edinburgh's strong support for the FuturICT FET-Flagship. Among the six candidate flagships it is most strongly interdisciplinary and provides a viable approach to tackling a wide range of Societal Challenges. It also has the great virtue of filling a very significant gap in European science strategy. In the US, the Cyberinfrastructure Framework provides a coordinated approach to tackling the issue of "Big Data" in science, engineering and more widely in any evidence-driven discipline (e.g. criminology, economics, ...). FuturICT is developing a programme for the construction of a European "data commons" with associated capacity for modelling and simulation. The FuturICT "knowledge accelerator" will provide the means to capture huge volumes of data and combine this with models for its interpretation. The FuturICT vision is to provide an infrastructure for mechanisms that empower interdisciplinary teams to interpret big data. This enables systematic, evidence-driven, research, policymaking and programme delivery. In addition, this goal will be achieved while ensuring democratic and equitable access to such a commons in line with a European approach to governance and the protection of individual privacy. This is in stark contrast to the emerging "Big Data" owners that are mostly US-based multinational companies who manage these resources for their own commercial benefit. The challenges of creating such a platform are manifold and the process of constructing such a system will require progress on a range of Computer Science and Informatics challenges as well providing a platform for evidence-based research in economics, sociology, climate, education, ...

The School of Informatics is the UK's largest high-quality research grouping in Computer Science and Informatics. The goals of FuturICT in tackling the "data deluge" are very closely aligned to those of the School of Informatics and our High Performance Computing unit EPCC which hosts Hector, the main UK high performance computing resource together with novel IBM "Blue Gene" machines. Edinburgh will also host Archer, the next generation of UK national High Performance Computing resource. This alignment means Edinburgh can make a very strong contribution across a wide span of concerns in building the FuturICT vision.

The School of Informatics is housed in a purpose-built, award-winning 12,000m² building, the Informatics Forum. Since its opening in 2008 it has hosted a large number of international scientific meetings and conferences including the Federated Logic Conference – one of the largest theoretical Computer Science Conferences in the world. It is an ideal venue and is recognised as a high-quality meeting place by most members of the Computer Science community. If Edinburgh becomes part of a FuturICT UK hub we would be keen to play our role in organising FuturICT-related events and host visiting researchers, technical meetings and outreach events. We have a dedicated events team who would be available to help with organisation.

I believe that Edinburgh can make clear contributions at a number of different levels. In terms of the underpinning Computer Science there are many issues ranging from the engineering and deployment of the proposed systems to many fundamental problems that will need to be resolved if the “knowledge accelerator” is to be scalable and capable of providing fast reliable service to a large heterogeneous group of users. Edinburgh’s contributions to the data and computational infrastructure underpinning FuturICT could include:

- Work in the Database Group ranges from the fundamentals of combining incomplete and inconsistent data, issues of provenance, and curation to more practical work on real-time analytics on streaming data in cloud platforms. Professors Buneman, Libkin and Fan have world-leading reputations in the area and are supported by a range of EPSRC grants including a platform grant to support the development of their research programme.
- Our Centre for Intelligent Systems and their Applications has a strong interest in Social computation. The recently awarded project: “SOCIAM: The Theory and Practice of Social Machines” is an EPSRC Platform grant (awarded jointly with Southampton and Oxford) with a value of around £10m. Led by Head of School Prof Dave Robertson, it will see a spend of around £2m per year over the next 5 years at the three universities. Much of the work in this area will be highly relevant to understanding collaborative people/machine interaction in FuturICT.
- We also have a strong group (led by Professor Chris Williams) working on Machine Learning with a particular interest in the analysis of online streaming data. We also have a Data-Intensive Research group, led by Prof Malcolm Atkinson that directly researches the issue of how best to manage the data deluge and use it to good purpose. Both groups have strong portfolios of research grants for the UK and EU.
- EPCC is the UK’s largest High Performance Computing centre. It is home to Hector the main UK high performance computing resource and will host Archer – the follow-on machine to Hector. EPCC also houses a novel IBM blue Gene Q machine that has almost the same performance as Hector. Professor Richard Kenway of EPCC also directs PRACE, the main European HPC programme. If FuturICT is funded we envisage that EPCC and its computers will play an important role in the development of the FuturICT modelling capability.
- NAIS: Numerical Analysis and Intelligent Software is an interdisciplinary centre, established with a £5m EPSRC award to investigate the synergy between Mathematics, Informatics and High Performance Computing. NAIS work brings to the fore the role of models in understanding “big data” we envisage that NAIS can make significant contributions in the development of simulation capacity in FuturICT.
- The Software Sustainability Institute, established with a £5m EPSRC grant, is concerned with the long-term sustainability of scientific modelling codes and how to avoid codes becoming outdated and inaccurate. This is a particular challenge for FuturICT and we imagine that there will be scope for a substantial exchange of expertise in this area.

In addition to significant contributions to FuturICT infrastructure we have sizeable activities in the following areas that will be enabled by interaction with the infrastructure provided by FuturICT: our world-renowned medical school is working in collaboration with our School of Informatics to develop an Information-led health initiative; in collaboration with the Scottish Funding Council, Edinburgh City and the Edinburgh Festivals, we have a programme working on the synergy between smart cities, tourism and cultural and creative industries; our School of Geosciences has recently established a major Centre for Climate Change Research; our School of Engineering is strongly engaged in a Scottish consortium working on offshore renewable energy; in association with our School of Philosophy, Psychology and Language Studies the School of Informatics has a very large program of work on human language in the areas of translation, speech processing, and natural language processing – this work combines statistical, corpus-based work with other language processing

techniques. More broadly, our Institute for the Study of Science, Technology and Innovation (led by Prof Robin Williams) has strong research in governance, ethics and adoption of technologies and in the influence of technologies on areas such as Finance (led by Prof Donald MacKenzie) and Medicine. Overall, the annual research spend in these areas is similar to our research spend in core ICT areas.

In summary, Edinburgh is well positioned to add significantly to the FuturICT research agenda by:

- Hosting FuturICT meetings and visitors as part of our participation in a UK hub.
- Providing expertise and negotiating access to High Performance Computing resources to help develop FuturICT modelling capacity.
- Over €5m planned expenditure per year on core ICT research that is strongly related to the FuturICT "knowledge accelerator" vision.
- Over €5m planned expenditure per year on research that can build on FuturICT infrastructure.

In conclusion, I would like to reiterate my strong support for the FuturICT initiative as a bold vision that will ensure Europe has a leading role in the era of big data. Such an initiative is essential if European industry is to remain competitive and European research is to retain its world-leading position.

If you have any issues around the support of Edinburgh University for FuturICT please don't hesitate to get in touch.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Lesley J. Yellowlees'. The signature is fluid and cursive, with a large loop at the end.

Professor Lesley J Yellowlees
Vice-Principal and Head of College