Response to the Call for Evidence by the House of Lords Select Committee on Artificial Intelligence

Compiled on behalf of the UK Computing Research Committee, UKCRC.

Coordinated by:

Chris Johnson
Professor and Head of Computing Science,
School of Computing Science, University of Glasgow, Glasgow, G12 8RZ.
http://www.dcs.gla.ac.uk/~johnson, johnson@dcs.gla.ac.uk

UKCRC is an Expert Panel of the British Computer Society (BCS), the Institution of Engineering and Technology (IET), and the Council of Professors and Heads of Computing (CPHC). It was formed in November 2000 as a policy committee for computing research in the UK. Members of UKCRC are leading computing researchers who each have an established international reputation in computing. Our response thus covers UK research in computing, which is internationally strong and vigorous, and a major national asset. This response has been prepared after a widespread consultation amongst the membership of UKCRC and, as such, is an independent response on behalf of UKCRC and does not necessarily reflect the official opinion or position of the BCS or the IET.

Questions

The pace of technological change

1. What is the current state of artificial intelligence and what factors have contributed to this? How is it likely to develop over the next 5, 10 and 20 years? What factors, technical or societal, will accelerate or hinder this development?

   It is likely that techniques, which are today collectively labelled as 'artificial intelligence' (AI) or machine learning (ML), will become more commonplace within a wide range of computational and embedded systems. It seems likely that this may intersect with other developments in computing, including the Internet of Things and Smart Cities.

   These developments raise considerable challenges – especially in terms of the interactions that arise when AI applications make inferences about human behaviour and vice versa. The practical impact of this is being seen in US states where human drivers can now take additional driving lessons on how to avoid accidents with autonomous vehicles.

   Another key area is the regulation of AI related systems, for instance in safety critical systems. It is hard to demonstrate the safety of algorithms that may evolve or learn over time or when training sets cannot match all of the possible environmental situations that an application might meet. These issues are visible now in the evolving regulations applied to autonomous vehicles but this is a more general concern.

2. Is the current level of excitement, which surrounds artificial intelligence warranted?

   Yes – although there is some hype that exaggerates what is possible in the immediate future. There is a need to distinguish between areas where there is realistic prospect of revolutionary changes in the next 10-20 years and areas where changes will be much slower (e.g., because of poor quality data or the lack of tractable algorithms for addressing recognised problems).

Impact on society

3. How can the general public best be prepared for more widespread use of artificial intelligence?

In this question, you may wish to address issues such as the impact on everyday life, jobs, education and retraining needs, which skills will be most in demand, and the potential need for more significant social policy changes. You may also wish to address issues such as the impact on democracy, cyber security, privacy, and data ownership.

This is part of a far wider question about the need to prepare society for future developments within information technology and networked systems. The UK lags behind many other states in terms of the attention paid to the teaching of Computing Science (as opposed to IT-training which focuses on the ability to use particular applications). Specific areas of government are doing their best to address this concern – for example the NCSC initiatives in cyber education for schools. Initiatives to improve computing science education in the UK are poorly coordinated. They are isolated in silos that result from the particular focus of individual government departments.

The biggest impact of AI will be on the future of work. It will affect when, where and how people engage with computing technologies. We will see a declining importance of some skills sets and a rise in others. It is likely that the skills required for routine knowledge-based work will decline in value, while those dealing with exceptional cases will rise in value. There will be a particular need for strong social skills and human negotiation to resolve these exceptional cases. We should engage the population in more informed discourse on that nature and value of data privacy, balanced against the value of data sharing (particularly in domains such as healthcare).

As well as preparing the general public, Government must itself be prepared for what looks like the biggest disruption since the Industrial Revolution. Automation, fuelled by new technologies including AI, looks set to undermine many assumptions in society concerning people's everyday lives: jobs, education and training, but also remuneration, and leisure.

4. Who in society is gaining the most from the development and use of artificial intelligence and data? Who is gaining the least? How can potential disparities be mitigated?

Many UK companies now use large-scale data analysis techniques, which would previously have been termed 'artificial intelligence'. This trend is likely to continue – for instance, the use of fuzzy reasoning within embedded devices such as the variable speed controllers of washing machines. In most cases, users are unaware that these embedded systems use AI algorithms.

In terms of UK research, it is possible to identify a cluster of companies that fund and then exploit University projects. Many are US based – in particular,

Google, Amazon, Microsoft. This reflects market dominance within the software industry and may also illustrate a need to focus support for UK industry in this area.

There is a risk that developments favour the privileged and further disadvantage those with lower digital literacy; they may also favour larger organisations, at the cost of smaller organisations (e.g. those in the voluntary / charity sector) that do not have the capacity to exploit the new capabilities.

A first step to mitigating the risks of greater disparities is an increasing focus on technology education – not just through formal education, but life-long learning, so that people of various ages and backgrounds are empowered to engage with developments.

Public perception

5. Should efforts be made to improve the public's understanding of, and engagement with, artificial intelligence? If so, how?

Yes – as part of a wider and coordinated programme to improve the teaching of Computing Science in UK schools. There is a lack of scientific research into the pedagogy of computing – we should identify effective ways of teaching the topic and engaging especially with under-represented groups as a means of addressing the gender and racial biases that propagate into University. This should also extend beyond formal education into life-long learning so as to be inclusive of older people.

Industry

6. What are the key sectors that stand to benefit from the development and use of artificial intelligence? Which sectors do not?

In this question, you may also wish to address why some sectors stand to benefit over others, and what barriers there are for any sector looking to use artificial intelligence.

This is a very broad question – all sectors have potential to gain through the application of AI and ML to data analysis. The public sector could do more to benefit from these techniques to support the provision and optimisation of services across a host of areas related to urban planning, healthcare etc. Transport is already making big steps towards the application of control-based algorithms for autonomous vehicles but the regulatory issues mentioned earlier are a significant concern.

More broadly, sectors where quantification is valuable, and where there are existing or potential large bodies of data, stand to benefit. Those that depend more on “soft skills” that are not computationally tractable are less likely to benefit significantly. It is important that, with the growing focus on artificial intelligence, society forgets to value natural intelligence too.

7. How can the data-based monopolies of some large corporations, and the ‘winner- takes-all’ economies associated with them, be addressed? How can data be managed and safeguarded to ensure it contributes to the public good and a well-functioning economy?

Data protection laws place a limit on the disclosure of information but there is a lot to be gained through the provision of APIs or interfaces to aggregate data held by the large corporations so that we can develop an ecosystem of SMEs – archetypal app developers, to generate a more vibrant UK ecosystem in this area.

Ethics

8. What are the ethical implications of the development and use of artificial intelligence? How can any negative implications be resolved?

In this question, you may wish to address issues such as privacy, consent, safety, diversity and the impact on democracy.

Studies of the combination of ethics and law should be funded; especiallly where AI will be used in critical systems. Particular concerns focus on the application of AI in health, transport (see also in 10 below), and also in security and resilience mechanisms designed for use in Critical Infrastructures Protection such as Smart Grids.

As a consequence, the law needs to be updated. Legal and ethical experts need to be educated, preferably in studies combined with technology (see also in 3 above). For example, questions of liability arise when human road-users are in collision with autonomous vehicles. Would there be a degree of culpability associated with the operators of the autonomous vehicle and with the engineers who coded or tested the AI application?

9. In what situations is a relative lack of transparency in artificial intelligence systems (so- called 'black boxing') acceptable? When should it not be permissible?

The laws protecting intellectual property provide well-framed principles for transparency in software engineering; as do the existing regulatory provisions in safety and security critical systems. Problems arise when it is hard to apply existing techniques to determine the reliability of these systems because of the characteristics of AI and machine learning algorithms. These systems, typically, generalise from learning sets to influence behaviour when faced with previously unseen environments. Such approaches undermine existing regulatory provision unless we can require exhaustive testing to help ensure appropriate responses across potential operating environments (this approach is being developed by US National Highways and Transport Safety Agency for approval of autonomous vehicles, UK CRC also supports the team in the Dept for Transport working on connected and autonomous vehicles). Exhaustive testing had previously been widely rejected as an acceptable basis for the engineering of safety and security related systems – how can we be sure that all future behaviours have been considered across millions of lines of code. The resolution of these tensions remains a topic of active research; even having such transparency can provide few guarantees for regulators or the UK public. Related issues include the use of learning – where the behaviour of AI/ML can change over time as new training sets are used – creating non-determinism; hence the behaviour seen in previous environments may not be a reliable guide to future performance.

The role of the Government

10. What role should the Government take in the development and use of artificial intelligence in the United Kingdom? Should artificial intelligence be regulated? If so, how?

AI and ML are algorithmic technologies. Regulation must focus on the application of these approaches. These applications extend across many different branches of government – with autonomous technology being applied in power network management, healthcare, transport etc. There is a strong need to commission studies that identify appropriate regulatory mechanisms that are consistent between these areas. For example, transport will most certainly need new bodies to set up and develop regulation of driverless vehicles including cars, trucks, buses, trams and trains as well as in the aviation industry.

Learning from others

11. What lessons can be learnt from other countries or international organisations (e.g. the European Union, the World Economic Forum) in their policy approach to artificial intelligence?

As mentioned above, the US National Highways and Transport Safety Agency has been innovative in both promoting the use of AI in autonomous vehicles but also in ensuring safeguards. Their use of waivers to permit testing that might otherwise violate federal law is quite different and arguably not so useful as the UK guidelines denoting ‘best practice’. However, the NHTSA move to enable the reclassification of certain AI algorithms as the driver of the car is innovative as is there approach to testing. One major caveat here is the lack of access to the data being generated by companies through the testing – to improve public confidence that they are not being placed at risk by these tests.