Department for Transport

Position Statement on Artificial Intelligence in Transport

DfT Science Advisory Council

Overview

The Department for Transport's (DfT) Science Advisory Council (SAC) met on the 12th October 2017 to discuss Artificial Intelligence (AI) in transport as this technology has the potential to provide transformational change to the transport sector.

The SAC explored the following:

- the current capabilities of AI;
- the current and future impact AI will have on transport;
- the potential barriers to adoption for this technology; and
- the impact this technology could have on the transport labour market and the public perception of the technology.

Background

AI has been researched and developed for over 60 years and there has recently been a rapid uptake of the technology. This has resulted in AI becoming part of a wide variety of services and products in other sectors that are being used regularly every day by the general public.

This recent rapid development and growth of AI has been enabled by the increasing availability and reduced cost of processing power and access to large data sets. This has now resulted in systems being developed that can outperform humans at single defined tasks, for example picture recognition.

The majority of these systems that are commonly referred to as AI are the product of data analytics, in particular, Machine Learning (ML). ML is a process where a decision-making algorithm is trained with large, labelled datasets to produce a desired functionality.

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The potential implications and impact of AI is currently being considered across government and parliament. For instance, the recent DCMS report on growing the UK's AI industry[1] set out recommendations on how to support AI in the UK, while the House of Lords select committee inquiry on the economic and ethical implications of AI[2] reported on the 16th April 2018. Furthermore, growing the Artificial Intelligence and data driven economy is one of the four Grand Challenges outlined in the UK's Industrial Strategy[3] and the National Infrastructure Commission has recently published a report on 'Data for the Public Good'[4].

DfT is both part of this cross-government conversation on AI and is actively considering the opportunities that this technology has for the transport sector.

The capabilities of AI complements other emerging transformative transport technologies such as autonomous vehicles and unmanned aerial vehicles. AI could further revolutionise the transport sector through enabling accurate traffic prediction, real-time journey planners, and more efficient movement of freight.

Key Considerations

The SAC reflected that DfT should consider its role in regulating transport AI and data. While the SAC recognised that there is a risk of potentially harming the market if regulation is not done carefully, they considered that, otherwise, there is a risk that the majority of data could be controlled by a small number of companies. This may limit the ability of Government to access this ground-breaking technology.

The SAC particularly highlighted the barriers to implementation due to public perception of this technology. There is currently no clear definition for AI and this could lead to misconceptions on the scope and capability for the technology, potentially limiting its uptake. Both Government and DfT have a critical role in communicating clearly and defining the technology for the general public.

It was proposed by the SAC that Government and other public bodies could play a role in supporting the acceptance and growth of the AI market by being a leader in showcasing the technology and through procuring the technology directly in order to drive the market. The SAC suggested the following definition for AI, which is provided by the Engineering and Physical Science Research Council[5:]

> Artificial Intelligence technologies aim to reproduce or surpass abilities (in computational systems) that would require 'intelligence' if humans were to perform them. These include: learning and adaptation; sensory understanding and interaction; reasoning and planning; optimisation of procedures and parameters; autonomy; creativity; and extracting knowledge and predictions from large, diverse digital data.

1 https://www.gov.uk/government/publications/growing-the-artificial-intelligence-industry-in-the-uk
2 http://www.parliament.uk/ai-committee
3 https://www.nic.org.uk/publications/data-public-good/
4 https://www.nic.org.uk/publications/data-public-good/
5 https://www.epsrc.ac.uk/research/ourportfolio/researchareas/ait/

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The SAC suggested that, alongside the overarching challenges to the uptake of AI, there is a need to consider and identify the barriers specific to transport, including regional differences in procurement.

DfT could further improve public trust through the creation of technological demonstration trials and ensuring that appropriate legal systems and regulations are in place for AI in transport.

The SAC reflected that, alongside the direct impact AI might have on the general labour market, both DfT and wider industry need to consider the skills and job roles that will be required to maintain the vehicles of the future, such as autonomous and ultra-low emission vehicles, and their systems.

Furthermore, the SAC highlighted the current critical lack of AI expertise within the UK and recommended that there is an interdisciplinary approach to AI in STEM degree courses to ensure the skills needed for the transport of the future are developed in the UK.

Opportunities and Challenges

It is likely that the rapid evolution and implementation of AI (currently driven by consumer needs); commercialisation of data to optimize products and services; and research development will continue. It needs to be ensured that Government recognises the potential for this technology and ensures that it has the internal expertise and knowledge to make decisions now to enable the UK to be at the forefront of utilising its benefits.

AI may also bring significant benefits to security, for instance, through providing threat prediction

Despite this potential, there are a significant number of challenges to adoption of AI, including: public trust and perception, ethics, security, legal, and standards and regulation.

The SAC highlighted the issues arising from the 'black box' nature of this technology, e.g. while it is possible to know both the inputs and outputs of an AI system it can be impossible to discover how it came to its decision. AI systems can also have inherent unconscious bias.

These issues could cause significant challenges for identifying how and why any incidents involving a transport AI system occur, especially in cases that involve a directly controlled vehicle. DfT needs to consider who would be responsible and accountable in the event of such incidents alongside the legal and insurance considerations and DfT is already considering these issues for automated vehicles[6,7]. There is potential to build on this success for other areas of transport.

A key challenge to the adoption of AI identified by the SAC is that posed by the quality, standards and availability of data for AI systems:

- AI systems are only as capable as the data they have access to. For AI to be used safely and effectively in transport it must have extremely high validity and accuracy, and needs sufficient coverage of all segments of society. The SAC suggested that a

6 https://services.parliament.uk/Bills/2017-19/automatedandelectricvehicles.html
7 https://www.lawcom.gov.uk/project/automated-vehicles/

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number of the available data sets for transport have errors and/or incomplete information, which will limit the accuracy of AI.

- To fully utilise the benefits of AI there is a need to combine and link different data sets, however, there is currently little incentive for the current holders of data sets to share them. The SAC suggested that DfT could be a lead in this field by considering which internal data it holds could be made available externally and identifying levers to encourage the sharing of data within the wider transport sector. Organisations such as the Open Data Institute could play a leading role in this.
- There are currently no standard or recommended practices for data services or data infrastructure.

Individual privacy needs to be carefully considered. The constant tracking of an individual's position and regularly visited locations has potential repercussions and could negatively influence public attitudes towards the technology unless proper controls are in place.

There is the need to consider the implication for the security of the transport of the future by ensuring that AI systems are secure from both malicious attack and manipulation of systems from being deliberately fed false information. Consideration of the implications of data that is made openly available is also needed.

Recommendations

From the discussion the SAC recommended the following:

- The transport data sets held by public bodies should be identified and reviewed for open accessibility as part of a funded, targeted AI, competition on a key DfT challenge. This should enable UK companies, especially SMEs, and academia to access data which would otherwise be unobtainable or require significant investment.
- To facilitate the sharing of data between organisations, the Transport Systems Catapult, the Open Data Institute, and others should act as facilitators to bring together data holders and organisations seeking to develop AI systems; and enable the parties to agree terms suiting their needs, which would allow them to share information.
- The future uses and benefits of AI in transport should continue to be explored and identified, especially in key areas such as congestion and traffic flows, to enable the future benefits of this technology to be fully utilised.
- To improve public perception, wider government should clearly define and communicate a consistent definition and explanation of AI to the general public.

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