AI RFI Responses, October 26, 2018

Update to the 2016 National Artificial Intelligence Research and Development Strategic Plan RFI Responses

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Request for Information on Update to the 2016 National Artificial Intelligence Research and Development Strategic Plan
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Comments of
Arm

26 October 2018

Introduction

On behalf of Arm, I am submitting the following comments in the *Request for Information on Update to the 2016 National Artificial Intelligence Research and Development Strategic Plan*. Arm appreciates the opportunity to provide input in this proceeding and applauds the National Science Foundation (NSF) for requesting input to ensure the US government's strategic approach to artificial intelligence remains forward looking in this fast-moving field. Further, many of the justifications for creating and maintaining such a strategy are still relevant. The data and examples provided under the increased economic prosperity, improved educational opportunity and quality of life, and enhanced national and homeland security subheading are all still relevant with improved data and information now available two years on from the release of the original report.[1]

Arm provides the most widely used semiconductor technology in the world. To the extent Americans have utilized artificial intelligence (AI) or machine learning (ML) – whether through voice assistants,[2] corrective/predictive typing, pixel processing, or similar technologies – it has most likely been running on Arm processors. In fact, consumers are not even always aware they are using AI in an edge device as some machine intelligence technology has become so integrated to the overall functionality of the device it may be nearly indistinguishable to the end user. Over the course of 2018, Arm has enhanced its machine intelligence commercial offering with machine learning and object detection processors, and a neural network development product.[3] Arm therefore has a significant interest in promoting advancement of AI/ML, and appreciates the opportunity to comment on the AI strategic plan of the US government.

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[1] See *The National Artificial Intelligence Research and Development Strategic Plan ("the AI Strategic Plan")*, Executive Office of the President of the United States, October 2016, pp. 8-11, https://www.nitrd.gov/PUBS/national_ai_rd_strategic_plan.pdf

[2] *Nearly half of Americans use digital voice assistants mostly on their smartphones*, Pew Research Center, December 12 2017, http://www.pewresearch.org/fact-tank/2017/12/12/nearly-half-of-americans-use-digital-voice-assistants-mostly-on-their-smartphones/

[3] See, Arm Project Trillium, https://www.arm.com/products/silicon-ip-cpu/machine-learning/project-trillium

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Comments on current strategic plan

In general, Arm believes these are all still relevant and important strategies for the US federal government to pursue. Additional comments on each strategic objective can be found below.

Strategy 1: Make long-term investments in AI research.

Arm comments: This is critically important. Decades of AI research, led by early investments from the US government and the Department of Defense's Defense Advanced Research Projects Agency (DARPA) in particular, are just beginning to pay off in the commercial marketplace with increasing deployment and use of AI/ML. The US government still has an important role to play both to improve AI and advance breakthroughs in areas where the private sector alone cannot solve impediments to AI advancement. For instance, continued investments in safety and predictability[4] still remain important areas for research, as does further off technology such as general purpose AI.[5] Other important areas for research should include:

1. Research on AI systems interacting with each other. For instance, knowing how autonomous systems in vehicles will interact with autonomous systems in traffic control systems will be very important. Since AI will be in most systems, and fully autonomous systems will interact with each other without human intervention, the federal government and others involved at these intersections should understand and consider how AI systems will interact with each other.
2. Research on new applications for AI as part of its research strategy. The biggest impact from AI/ML will come from effective application of these technologies in varied domains.

Strategy 2: Develop effective methods for human-AI collaboration.

Arm comments: This will continue to be important as US businesses, government and other organizations are just beginning to adopt AI, with more expected to do so in the near future. As this adoption continues, increases and evolves, the US federal government can assist private sector, academic and global standards bodies leadership in this area.

Strategy 3: Understand and address the ethical, legal, and societal implications of AI.

Arm comments: This is an incredibly important topic for government leadership. Arm has devoted significant time and attention to ethical issues and soon aims to release an "AI Ethics Manifesto" which we hope will drive industry toward outcomes in these areas, much as our Security Manifesto has done around industry responsibility for IoT security.[6] Ethical-by-design needs to become as important a concept for AI as privacy-by-design and security-by-design have with technology generally. While standards bodies have begun doing significant work in this area, government support and

[4] See *The AI Strategic Plan*, p. 15
[5] See *The AI Strategic Plan*, p. 19
[6] See *Arm Security Manifesto*, October 2018, https://pages.arm.com/iot-security-manifesto.html

endorsement of these concepts driven from the private sector and global standards organizations will guide faster and greater industry work in these areas.[7]

Strategy 4: Ensure the safety and security of AI systems.
Arm comments: Arm believes this is a very important role for the US government. While private sector efforts to accomplish this should not be supplanted, government work can complement that which is taking place in the private sector and in global standards organization. For instance, DARPA's current work on explainable AI (XAI) is helping provide solutions for an incredibly important issue that if not addressed correctly could impede AI development, deployment, and wide-spread utilization.[8]

Strategy 5: Develop shared public datasets and environments for AI training and testing.
Arm comments: Arm fully supports government efforts to make data available for AI training and testing. The US federal government holds vast amounts of data that could be used for a range of AI/ML applications and has taken steps to make a significant amount of data available already. We would encourage that to continue. Further, we support the work of the National Telecommunications and Information Administration (NTIA)[9] and the National Institute of Standards and Technology (NIST)[10] to create comprehensive federal consumer privacy frameworks and guidance. We would encourage amending this strategic objective to include that work. Privacy frameworks being put in place in other jurisdictions, both internationally and domestically, have the potential to significantly hamper AI/ML development as obligations on data usage may become onerous, conflicting and/or inconsistent. Arm intends to participate in both these efforts to further elaborate on these points.

Strategy 6: Measure and evaluate AI technologies through standards and benchmarks.
Arm comments: Arm believes this is an appropriate strategic objective, however, global standards bodies are doing significant work toward creating these tools. Some of that was noted in the 2016 report, and much more has been taking place in the two years since that report was released. The US government should survey that work and support appropriate workstreams to address the areas put forth in the 2016 report.[11]

Strategy 7: Better understand the national AI R&D workforce needs.
Arm comments: This is perhaps the most important role the US government can play in advancing US competitiveness in AI. Workforce demands – both those directly working on AI technology and those working alongside it – will shift dramatically as AI/ML become more prevalent in all sectors of the economy. The private sector has an

[7] See, for instance, IEEE's Global Initiative on Ethics of Autonomous and Intelligent Systems, https://ethicsinaction.ieee.org/
[8] See https://www.darpa.mil/program/explainable-artificial-intelligence
[9] See https://www.ntia.doc.gov/federal-register-notice/2018/request-comments-developing-administration-s-approach-consumer-privacy
[10] See https://www.nist.gov/privacy-framework
[11] See *The AI Strategic Plan*, p. 33

important role to play, but collaboration with the federal government will be essential to enable the US workforce to adapt with broad adoption of AI. Further, partnership with the private sector will assist in identifying the number and type of computer science and electrical engineering graduates with significant and marketable AI training that are entering the workforce and how the US government may need to incentivize specific disciplines or reskilling/upskilling to meet gaps in the pipeline and current workforce. Lastly, we would encourage collaboration with outside groups, such as the Center for Technology and Workforce Solutions to think proactively about how to address current, short-term and long-term workforce needs.[12]

Additional proposed strategies

Strategy 8: Promote AI development to address cybersecurity

Arm believes there should be an additional strategy, to utilize AI to address cybersecurity. While developments in this area are taking place in the market, the federal government has a role to play to ensure the best cybersecurity tools are available for the assets it oversees. Across critical infrastructure, the nation's voting systems, and the federal government's own systems, there are no shortage of areas to continue improving cybersecurity. The potential for AI to address these threats is well documented. For example, in Arm's first Security Manifesto, released in October 2017, Milosch Meriac, Arm's Principle Security Research Lead, described how AI will be used as an "IoT immune system." It can observe and monitor system network traffic patterns to fingerprint and learn typical behavior; if atypical behavior is "observed" AI can automatically take a number of actions to remedy or mitigate the behavior or device.[13] In the 2018 Security Manifesto, Damon Civin, Arm's Principal Data Scientist, takes this idea further by explaining how Arm technologies currently accomplish this.[14] Significant advancements like this are being made across the industry and should be embraced and supported as an AI strategic goal for the United States. Further, the US Congress has widely recognized cybersecurity as one of the most promising areas for the federal government to utilize AI. The US and UK governments also recently acknowledged the important intersection in cybersecurity and AI through their signing of an agreement "to work with leading businesses to ensure that the UK-US partnership remains at the forefront of global cyber security, defence and AI."[15] Cybersecurity will be an incredibly important application for AI, and Arm believes should be a strategic priority for the US government.

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[12] https://www.ctwsolutions.org/about-us/what-is-ctws

[13] See *Arm Security Manifesto*, October 2017, p. 4 https://www.arm.com/-/media/global/solutions/security/Security_Manifesto.pdf?revision=6726d274-fa1a-4cda-bb26-1ccf8e401ab1&la=en

[14] See *Arm Security Manifesto*, October 2018, p. 9 https://pages.arm.com/iot-security-manifesto.html

[15] See https://www.gov.uk/government/news/hms-queen-elizabeth-hosts-uk-us-international-trade-day-in-new-york

Strategy 9: Build global trust, acceptance, adoption and use of AI

Arm believes the US government has done a good job of contributing to the development of AI, both through research funding, adoption, promotion of academic and private sector advancements, and working to create a fertile regulatory environment for innovation in AI/ML. Not all governments have been such strong advocates. We encourage the US government to continue working with like-minded allies to drive such strong statements of affirmation about the positive impacts of AI. A great example of that was the outcome statement from the G7 Ministerial Meeting: Preparing for Jobs of the Future.[16] Further, strong public commitments such as those from the White House in May of this year demonstrate the US desire for leadership in AI and avcommitment to the private sector making many of the advancements in this technologies.[17] As with any new technology, public trust is essential for the technology to reach its full potential and maximize the benefits it can provide; this is especially true with AI/ML. The US, and other federal governments can go a long way toward building that trust through use, adoption, and promotion of secure, ethical AI/ML.

Again, Arm appreciates the opportunity to provide feedback in this proceeding, and look forward to working with the US government as AI/ML technology develops and further penetrates the marketplace.

Respectfully submitted,

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[16] See https://g7.gc.ca/en/g7-presidency/themes/preparing-jobs-future/g7-ministerial-meeting/chairs-summary/annex-b/

[17] See https://www.whitehouse.gov/briefings-statements/artificial-intelligence-american-people/