

# **POLICY MEMORANDUM: The case for adopting autonomous vehicles technology and supporting research in Artificial Intelligence**

To: The Honorable John Delaney,  
Chair of the House Artificial Intelligence Caucus for the 115th Congress

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Autonomous vehicles (AVs) are an enormous opportunity for economic growth for the United States and an opportunity for maintaining its technological leadership. AVs have the potential to create \$3.1 trillion in societal benefits and save 1.2 million lives from fatal road accidents over the next 10 years. Automakers are increasingly outfitting their modern motor vehicles with sophisticated connected technologies that gather, process, store, and transmit vast amounts of information for augmenting passenger entertainment, enhancing safety, and improving vehicle performance. Many of these technologies include Vehicle-to-Vehicle communication which pose challenges in the cybersecurity, privacy and security domain, in addition to challenges to our infrastructure, namely our national highways and inner-city roads. A robust regulatory framework is essential to enable such technologies to be commercially viable and safe to the public. Technological fields such as Artificial Intelligence, machine learning, the Internet of Things (IoT), and connected Autonomous Vehicles are expected to continue growing at an exponential rate over the next 2 decades. An analysis by Bank of America Merrill Lynch calculates the total global market for robots and artificial intelligence, within the next three years to reach \$152.7 billion, and estimates the adoption of these technologies to improve productivity by 30% in certain industries. The paradigm-shifting innovation in those fields will usher in a new economic frontier, give rise to countless opportunities for revolutionary

technology commercialization, spawn new ventures, create complete eco-systems of novel applications, and create sustainable jobs.

Considering the challenge, the competition, and the societal and economic impact of Artificial Intelligence, we offer the following recommendations:

1. The Federal government should expand Federal R&D funding for robotics and intelligent systems research; in addition to incentivizing the private sector to invest in the development of AVs and accelerating progress in the research and commercialization of related technologies. The Federal government should double federal R&D investment from \$225M to \$450M in artificial intelligence to create applications that will maximize benefits to society and mitigate any associated risks.
2. To enable efficient and effective public-sector investment, the National Academies and the National Bureau of Economic Research should be commissioned to benchmark the AI state of the art and study the economic impact on the American service industry.
3. The National Institute of Standards and Technology (NIST) should be commissioned to study questions related to AI governance, safety,

public trust, regulations, its impact on privacy and national security.

4. NIST should collaborate with the National Highway Traffic and Safety Administration (NHTSA) on questions related to the development of Automated Vehicles.
5. The Federal government should examine regulatory frameworks that set entry barriers for innovative American startups in this field and remove regulatory hurdles that could stifle the adoption of this technology.
6. The Federal government should prioritize promoting specialized STEM education programs in public learning institutions to meet the continuous demand for highly skilled workers in the field of machine learning and artificial intelligence.

Employing self-driving cars, for instance, will allow the automotive industry to completely reinvent the commute-to-work and road travel experience. McKinsey and Co. estimates that AVs could free as much as 50 minutes per day for drivers which can be spent working, relaxing or accessing entertainment. This can globally generate \$5 billion per year in digital media revenue for every minute drivers spend online while in a car.

Per the World Economic Forum this technology can create \$3.1 trillion potential value in societal benefits including \$381 billion to consumers from reduced driver insurance premiums and reduced crashes by 2025, in addition to reduced costs of vehicle ownership, maintenance, reduced congestion, fuel savings and lower carbon emission. Over the next 10 years, 1.2 million lives could be saved and 540 million metric tons in potential emissions reduced. The adoption of this service will grow from 4% in key markets in 2016 to 30% in 2025. At this rate of adoption disruptive business models and next generation data-driven services, like on-board entertainment which can contribute up to \$65 billion to the industry value chain, will be developed.

Autonomous vehicles and personalized advertising are only two of the applications that make use of recent advances in artificial intelligence and machine learning today and which will have the biggest economic impact. The McKinsey Global Institute surveyed more than 600 industry experts on the potential impact of artificial intelligence and machine learning and identified 120 potential use cases of machine learning in 12 industries. The report estimated a potential economic impact between \$14 trillion and \$33 trillion a year by 2025. The value these technologies could create may be achieved in several ways including the consumer surplus that arises from better products, lower prices, a cleaner environment, and better health. In addition to the 120 use cases that McKinsey identified, a gamut of other possible applications has benefited from the advent of artificial intelligence and machine learning. In retail, machine learning has been used to optimize product pricing, improve merchandising strategy by leveraging customer shopping habits, and coordinate shipping routes based on real-time traffic data. All of this works to reduce logistical costs, increase sales, and improve profitability for retail businesses. In the medical field, artificial intelligence is advancing early medical diagnosis by enabling prediction of personal health outcomes.

In the future, artificial intelligence and machine learning may be able to supplement human-led scientific discovery and enable us to tackle the toughest challenges that impact the quality of our lives and threaten the existence of our species. Because of the ability of machine learning and artificial intelligence to glean significant information from heaps of data, they can help us devise technology for carbon sequestration, or find a pathway to making solar energy economical, or to developing personalized and genomic precision medicine or reverse engineer the human brain. Scientists are already using neural networks to search for evidence of new fundamental particles in the shower of particles left by high energy collisions at the Large Hadron Collider.

Other nations, competitors and allies of the United States, including China, Japan and the European Union realize the potential of AI and are investing extensively in this field, leaving us at a competitive disadvantage. The European Coordinating Committee for Artificial Intelligence (ECCAI), established in 1982, coordinates AI R&D in Europe, and promotes AI study, research, and application. The BrainScaleS project, launched in 2005, is a large-scale effort to build an artificial brain within the EU's Human Brain Project. These large scale artificial brains, or neuromorphic computing machines, will contribute to a better understanding of the human brain functions, and will enable the development of unsupervised machine cognitive intelligence.

China is forging its path to leap ahead of its competitors in the AI race. Chinese technology companies, such as Baidu, are investing heavily in AI technology. China is determined to be the unequivocal world leader in AI. Owing to its great reserve in AI talent, excellent engineering education, and it being the largest digital user base in the world, China is well positioned to be a massive market for AI development and adoption. MIT Technology Review cited Baidu's AI work in speech recognition for its record breaking low error rate. Baidu's Institute of Deep Learning is set up in Silicon Valley and competes directly with Google, Apple, and Facebook for AI talent. Beyond optimizing its search engine and enhanced ability to recognize voice, Baidu is also applying AI technology to automobiles aiming to mass produce self-driving cars in five years. Massive venture capital invested in China is sustaining AI R&D in startup companies. Didi Chuxing Technology of Uber Technology of China, raised \$7.3B in June 2016 to establish a Didi Research center to focus on developing AI technology including deep machine learning and computer vision with the goal to implement them in driverless cars.

A major challenge however, for the wide-scale adoption of Autonomous Vehicles, is the impact AVs will have on the future employment

prospects of professional commercial drivers. The freight industry employs 3.5 million professional truck drivers to haul 10 billion tons of goods across the U.S. each year. Morgan Stanley estimates that by operating AVs, the freight industry will be able to save \$168 billion annually of which \$70 billion will arise from cutting labor alone. Truck driving is the most common job in 29 states, consequently thousands of families' livelihoods are at stake. The Federal government must formulate solutions for those workers to sustain their livelihood by creating vocational retraining programs to retool their skillset for them to be competitive in the market place and be able to take advantage of alternative employment opportunities.

This impact is not limited to professional commercial drivers, but will extend its reach to industrial workers across many sectors of manufacturing. A recent report by PricewaterhouseCoopers suggests that up to 38% of American workers could potentially be at high risk of job loss due to continuous automation by the early 2030s. The sectors where automation pose the highest risks are transportation and storage (54%), manufacturing (46%), wholesale and retail (44%) and health and social work (17%). The risk is appreciably higher among low skilled workers with a GED level of education and lower. These estimates assume that employers will favor automation to cut labor costs instead of outsourcing or offshoring. Knowing however that replacing human workers with industrial robots can save up to 90% on labor costs, compared to only 65% for offshoring to low-cost economies, implies that automation represents the most economical approach. The fast-paced advancement in robotics research enables robots to have better dexterity, sensing capabilities, and intelligence which allows them to increasingly take on delicate and specialized tasks that were never conceived to be achievable by unsupervised robots. Today, robots in the advanced car manufacturing sector in Japan can work around the clock,

unsupervised, for 30 days without interruption. In the Japanese car sector, there are 1520 robots for every 10,000 workers, compared to 66 robots for every 10,000 workers globally in all other sectors of manufacturing.

It is imperative for the United States to harness the great benefits of artificial intelligence to transform our economy and create sustainable American jobs. If the United States will not, we will face a competitive detriment which will

strongly and negatively impact our economy. The United States may lose its leadership position in the development of the technology of tomorrow. Hence policymakers need to expeditiously devise careful, informed and forward-looking policies to promote a safe space for technological innovation to thrive in this field while ensuring a prosperous future for all sectors of our society

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