

Preparing for the Future of Artificial Intelligence

The Center for Democracy & Technology in response to Office of Science and Technology Policy

July 22, 2016

The Center for Democracy and Technology (“CDT”) is optimistic about the future of artificial intelligence (“AI”), and confident the technology will have widespread positive impacts. However, the rapidly developing technology will have significant effects on jobs, education, and policy, as well as ethical and regulatory implications for the federal government. It takes time for processes to change, standards to emerge, and people to learn new skills. In the case of AI, the government must act quickly to prepare for these changes, as the technology will diffuse rapidly.

CDT believes in the power of technology. A 501(c)(3) nonprofit organization, we work to preserve the user-controlled nature of the internet and champion freedom of expression. We support laws, corporate policies, and technology tools that protect the privacy of technology users, and advocate for stronger legal controls on government surveillance.

The nine topics for which OSTP requested responses are the following: (1) the legal and governance implications of AI; (2) the use of AI for public good; (3) the safety and control issues for AI; (4) the social and economic implications of AI; (5) the most pressing, fundamental questions in AI research, common to most or all scientific fields; (6) the most important research gaps in AI that must be addressed to advance this field and benefit the public; (7) the scientific and technical training that will be needed to take advantage of harnessing the potential of AI technology; (8) the specific steps that could be taken by the federal government, research institutes, universities, and philanthropies to encourage multi-disciplinary AI research; and (9) any additional information related to AI research or policymaking, not requested above, that you believe OSTP should consider.

We will address three topics in this Request for Information. Our primary focus is on how the U.S. government should ensure that technological advances are used to reduce inequality and promote progress for all segments of society.

(2) THE PUBLIC GOOD:

AI will be deployed to serve the public good, encourage civic duty, and collaborate and solve some of the world’s most pressing, complex problems. However, historic bias in decision-making is not alleviated by automating the process and reducing human involvement. There is a risk that human bias might be built into the underlying architecture of these systems, from relatively simple analytics to sophisticated artificial intelligence. Creating positive outcomes for all requires humans to consider the ethical implications of the technology they are creating and using. For this vision to become reality, the government must work in collaboration with companies and civil society to deploy AI technology mindfully, and be vigilant about preventing disparities and harm.

- **We must guard against algorithmic bias.** We have seen that big data analytics risk eclipsing longstanding civil rights protections in how personal information is used in housing, credit, employment, health, education, and the marketplace. Machine learning algorithms are trained on large data sets, and when those sets are partial or contain implicit bias, the resulting algorithms can make incorrect inferences that lead to broader algorithmic biases and discrimination. With increasingly automated functions, these built-in discrepancies can multiply exponentially. There is a growing policy debate about how to build accountability into this system. A tremendous incentive exists for policymakers and companies to innovate and lead the way in fair automation. Throughout this discourse, humans remain at the heart of automation - building, testing, refining, auditing, and evaluating these systems. We must both encourage the development of better diagnostic tools and ensure that AI creators are working with robust, high-quality data sets.
- **Promote a diverse workforce.** The development of effective AI mandates diversity on project teams in order to facilitate objective assessment and identify unconscious biases. It is essential that the field attract skilled human data analysts with diverse backgrounds. AI increasingly intrudes on people's personal information, using and manipulating highly granular data. Research demonstrates that the automated judgments behind personalization are not harmless, neither in effect nor in perception; and it is largely left to the data collectors to enforce moral standards. Automated sorting and deeming data "irrelevant" can result in material harm. Given the diversity of human insight and wisdom, much consideration should be given to how data is identified as important and useful, as such decisions are highly subject to personal perspective. Diversity of human control over digital decisions will lead to the application of more necessary and relevant data, and therefore more effective machine learning systems.

(4) SOCIAL AND ECONOMIC IMPLICATIONS:

By 2020, more than a third of the desired core skill sets for most occupations will be composed of skills not yet considered critical to today's jobs. Remote operators may need to help self-driving vehicles manage emergencies, or ride-along UPS concierges may need to manhandle packages and knock on doors. Humans will still need to write dialogue and train corporate chatbot and customer-service; AI will have to be constantly updated and maintained. No matter how advanced AI becomes, research shows that humans will likely perform some jobs better, particularly positions involving creativity, empathy, or social interaction. This category includes doctors, therapists, hairdressers, and personal trainers, as well as scientists, technologists, and artists able to create. There are two challenges ahead: helping existing workers acquire new skills so that they can engage in the AI workforce, and preparing future generations for an AI-integrated workplace.

- **Government action must be timely and responsive.** The experience of the 19th century shows that technological transition can have a short-term traumatic impact on specific segments of

society. In the industrial revolution, economic growth exploded after centuries of stagnant living standards, but governments took nearly a century to respond with new education and welfare systems. Decades passed before wages increased across the board, and the rapid shift of growing populations from farms to urban factories contributed to unrest across Europe. We must move more quickly to address AI.

- **Fund creative, just-in-time education models.** Having a solid foundation of basic literacy, numeracy, and civic skills will be vital to success in the workplace. We must also make it easier for workers to acquire new skills and switch jobs more easily and quickly than in the past.
 - *Incentivize lifelong learning.* Required job skills may change as frequently as every three to five years, and we need to invest in ongoing education opportunities. For example, community college programs often combine education with learning on the job. Apprentices can graduate with a degree in mechatronics — merging electronics and mechanical engineering — while working in the industry, all without incurring student debt. A different model includes online learning programs that employees can tap into any time while on the job.
 - *Promote social and collaboration skills training.* Social skills including persuasion, emotional intelligence, and teaching others will be in high demand across industries. Research suggests employers will highly value “character skills” such as perseverance, sociability, and curiosity, which correlate closely with employees’ ability to adapt to new situations.
 - *Close the “job polarization” gap.* What determines a job’s vulnerability to automation is not so much whether the work under consideration is manual or white-collar, but whether or not it is routine. The workforce bifurcates into two groups doing non-routine work: (1) highly paid, skilled careerists, such as architects and psychiatrists, and (2) low-paid, unskilled laborers, such as cleaners and gardeners. As Jerry Kaplan of Stanford said, automation is “blind to the color of your collar”. As a result, “job polarization” occurs: middle-skill jobs decline, like those in manufacturing, but both low-skill and high-skill jobs expand.
- **Get individuals online.** With the increasing presence of AI, it becomes more critical to connect individuals in all demographic sectors to affordable, consistent, and reliable high-speed internet, and access to online services such as platforms for free expression and access to information. Increasingly, we will connect and collaborate remotely with freelancers and independent or “on-demand” professionals through digital talent platforms.
- **Manage skills disruption by transitioning the workforce.** Automation redefines jobs in ways that reduce costs and boost demand. In an analysis of the American workforce between 1982 and 2012, employment grew significantly faster in occupations that made use of computers, like graphic design. When automation sped up one aspect of a job, it enabled workers to

perform other parts of the job better. The net effect resulted in more computer-intensive jobs, while displacing less computer-intensive positions.

- *Incentivize paid mid-career internships.* Professional mid-career internships provide employees the opportunity to establish work experience in different fields by engaging in internships that are part work, part training, and part exposure. This allows for short-term arrangements that help transition those who have lost their jobs to AI, while mitigating the losses affiliated with long-term unemployment.
 - *Collaboration between the private and public sectors.* AI demands multi-sector partnerships and collaborations that leverage the expertise of each partner in a complementary manner. These are indispensable to implementing scalable solutions to jobs and skills challenges. The government should call for bolder leadership and strategic action within companies and across industries, including partnerships between public institutions and the education sector.
 - *Reinvigorate programs like Americorps Vista to focus on technology.* Federally-funded programs should incorporate a transitioning workforce. Quantitative and qualitative accountability measures will help ensure these programs benefit employers as well as employees, target specific demographics, bring needed technical skills into more fields, and enhance diversity in the workplace.
 - *Invigorate and Fund MakerSpace Communities.* In the spirit of the maker movement promoting a do-it-yourself mindset and the President's Nation of Makers Initiative, a transitioning workforce can engage in community outreach programs that involve adults and children learning about technology and creating products together. Individuals can deepen their technology experience, shape their environment as creators, and build new products with technology in their own market ecosystem. The government can further promote hobbyists, enthusiasts, and students to transform innovation, culture, and education in the AI space.
- **Consider safety net protections.** Concerns about AI and automation have led to calls for a stronger social safety net to protect people from labor-market disruption and help them switch to new jobs. In addition to the job training discussed elsewhere, the government should evaluate and consider what type of financial assistance may be needed for those individuals and families who are transitioning between jobs as a result of AI.
 - **Ethics and civics education.** One of the most difficult and growing policy debates is how to build accountability into AI systems that seem to have lives of their own. A tremendous incentive exists to innovate and lead the way in fair automation, and success comes down to consideration of ethics by humans engaged in the process. Throughout this debate, humans remain at the heart of automation through building, testing, refining, auditing, and evaluating these systems.

(7) SCIENTIFIC AND TECHNICAL TRAINING:

Investment by both the public and private sectors in scientific and technical training to prepare for AI is critical. Training must promote user-oriented methods from engineering and design to enact multidisciplinary processes and methodologies for developing technologically feasible products. We have seen several universities launch projects with similar goals with overwhelming success. The human-centered approach to innovation taps into the ability to recognize patterns and construct functional, emotionally meaningful ideas. The method views innovation and creativity as skills that can be gained, and focuses on inspiration, ideation, and implementation. Users are at the center of design while generating, developing, and testing ideas. The method draws on engineering and design principles to help create insights for the business world. This specialization will grow as AI matures because the human element is critical to every technological creation, and demands government recognition.

(9) ADDITIONAL CALLS TO ACTION:

Increase understanding of this technology. Terms like AI are often used when people are actually discussing machine learning, robotics, or deep learning. Artificial intelligence refers to the engineering discipline of making machines intelligent. Machine learning, in contrast, refers to a particular subfield within artificial intelligence that focuses on drawing inferences from a large set of examples. Jobs at the intersection of AI, robotics, and deep learning will be drastically different in just a few years' time, leading to the creation of new disciplines to explore.