# Special Topic: Artificial Intelligence

## The Promise and Potential of AI

Artificial intelligence (AI) refers to a collection of technologies that demonstrate an "intelligent" thought process by sensing, learning, reasoning and taking action based on the environment. This demonstration can reveal machine-based cognitive processes that extend human capabilities and intelligence.[1,2]

AI technologies are powerful and versatile, with potential applications in virtually every corner of the economy.[3] The breadth of possible applications means that the effects of AI will be far reaching and impactful, reaching across sectors and supply chains. AI is already in use today and changing the way that individuals interact and organizations operate to improve health, safety and productivity. Current and near-term applications of AI technology include autonomous vehicle software, fraud detection mechanisms, medical diagnostic abilities, facial and speech recognition, and advanced applications for energy efficiency.[4] Indeed, AI is already making important contributions to fields as critical as cybersecurity.

AI implementation will lead to changes in the types of jobs being done and the ways in which they are done. How these shifts in labor market composition and the nature of work will unfold is still unknown, but proactive investments in a dynamic workforce will be key to ensuring that the country benefits from a smooth transition that fully leverages the potential of AI. Managed strategically, AI applications promise to augment the ways in which humans handle complex problems, enhancing productivity and enriching the value of human-driven work. AI can also deliver tangible societal benefits — improving how people receive government services, how safely and efficiently cities operate, and how accessible the world is for people with disabilities, among other use cases.[5] Unsurprisingly, the anticipated economic impacts of AI will be tremendous — one estimate expects $13 trillion in additional global economic activity by 2030.[6] In the United States alone, AI is forecast to provide a 2 percentage point boost to economic growth by 2035.[7,8]

## The State of the AI Landscape

Investment in AI research and applications is robust and growing. U.S. firms received half of global equity deals for AI in 2017.[9] Meanwhile, the number of active U.S. startups developing AI systems increased 14 times from 2000 to 2016.[10] U.S. public-sector investment in AI is also accelerating; federal investment in unclassified research and development (R&D) for AI and related technologies rose 40 percent between 2015 and 2018, an increased commitment that comes amid efforts by the Administration to update the federal government's overall AI R&D strategy.[11] This investment also occurs against a buzzing global backdrop of AI activity, with other nations committing federal resources to AI. Globally, companies invested between $26 billion and $39 billion in AI in 2016.[12] Looking forward, maintaining favorable investment conditions in the private and public sectors will be key to maintaining and extending U.S. leadership in AI technologies and applications.

These investments — coupled with enabling conditions such as increases in computing power and improvements to data storage techniques — have catalyzed rapid progress in the development and application of AI.[13] The wave of AI has arrived, and it shows no sign of slowing down. The number of AI papers published annually is nine times higher than it was in 1996.[14] AI performance improvements have made great leaps in key areas; for example, error rates for image labeling fell 26 percentage points between 2010 and 2017.[15] However, AI still faces many challenges. The best AI system falls just short of passing an eighth-grade science test after years of research effort.[16] Focused and coordinated efforts will be key to unlocking solutions to these outstanding challenges and making strides toward the development of more generalizable AI applications.

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## Looking to the Future of AI

Forward-looking policy and regulatory action that supports new and exciting applications of AI will bring U.S. technological leadership into the new digital era.

Thoughtful governance that promotes flexibility and fuels continued innovation is needed for AI. Policymakers should adopt this type of innovation-friendly approach and enable U.S. leadership in AI by working with the private sector to:

1. **Implement a national AI strategy that boosts investment and coordinates progress.** The United States should publish a national AI strategy with clear short-, medium- and long-term R&D investment priorities, in coordination with the private-sector research community. As other countries pursue dominance in AI, the United States should take clear steps to secure its leadership. In particular, investment should focus on developing AI technologies that are explainable and produce traceable outputs.

2. **Formulate policies to prepare workers for New Collar jobs using AI technology.** Equipping workers to be resilient with innovation-ready skills and training resources is key to building a workforce that can adapt in a rapidly changing work environment and propel the innovation economy forward. While many different technologies will affect the nature of work, education and training resources should prepare workers to harness and benefit from enhanced productivity.

3. **Institute mechanisms for promoting user trust and transparency.** AI systems need to be designed with safety and security from the ground up. To promote user trust, the federal government should work with industry to develop standardized mechanisms of disclosure and transparency in AI and promote non-black-box interpretable AI methods. Building user trust also means proactively considering and testing for potential sources of bias in algorithms and data. Efforts to promote trust and transparency should also recognize that many AI applications (e.g., information technology system security) already provide significant benefits without raising similar concerns.

4. **Open access to government-collected data.** Expanding open data efforts to make taxpayer-funded datasets a shared competitive asset catalyzes and democratizes the development of AI applications. It ensures that these datasets are broadly accessible, which helps prevent the creation of data silos, ensure access to representative datasets and support a data-driven learning process.

5. **Limit unnecessary regulatory hurdles for R&D.** The federal government should work with industry to avoid ineffective regulatory hurdles, such as unilateral export controls that do not practically restrict technology availability, and instead merely hinder U.S. development of AI and expedite competitive efforts abroad. The United States should also lead in the development of industry-driven global standards, which would bolster trust, enable interoperability and set best practices while permitting flexibility for innovation.

**ENDNOTES**

1 West, D. M., & Allen, J. R. (2018, April 24). *How artificial intelligence is transforming the world. Brookings.*

2 Kok, J. N., Boers, E . J. W., Kosters, W. A., van der Putten, P., & and Poel, M. *Artificial intelligence: Definition, trends, techniques, and cases.*

3 Information Technology & Innovation Foundation. (2018, September 4). *ITIF technology explainer: What is artificial intelligence?*

4 Chui, M., Manyika, J., Miremadi, M., Henke, N., Chung, R., Nel, P., & Malhotra, S. (2018, April). *Notes from the AI frontier: Insights from hundreds of use cases. McKinsey Global Institute.*

5 West, D. M., & Allen, J. R. (2018, April 24). *How artificial intelligence is transforming the world. Brookings.*

6 Bughin, J., Seong, J., Manyika, J., Chui, M., & Joshi, R. (2018, September). *Notes from the AI frontier: Modeling the impact of AI on the world economy.* McKinsey Global Institute.

7 Accenture. Artificial intelligence is the future of growth.

8 Refers to growth in gross value added in 2035.

9 CB Insights. *Top AI trends to watch in 2018.*

10 AI Index. *Artificial intelligence index: 2017 annual report (p. 16).*

11 The White House. (2018, May 10). Artificial intelligence for the American people.

12 Bughin, J., Hazan, E., Ramaswamy, S., Chui, M., Allas, T., Dahlström, P., . . . & Trench, M. (2017, June). *Artificial intelligence: The next digital frontier? McKinsey Global Institute.*

13 Campolo, A., Sanfilippo, M., Whittaker, M., & Crawford, K. *AI Now 2017 report.* AI Now Institute at New York University.

14 AI Index. *Artificial intelligence index: 2017 annual report* (p. 9).

15 AI Index. *Artificial intelligence index: 2017 annual report* (p. 26).

16 Schoenick, C., Clark, P., Tafjord, O., Turney, P., & Etzioni, O. (2017, September). Moving beyond the Turing test with the Allen AI Science Challenge. *Communications of the ACM, 60*(9), 60–64.