DISRUPTIVE COMPETITION PROJECT

Potential Uses of Artificial Intelligence for the Federal Government

I. Introduction

Artificial Intelligence ("AI") has already transformed everyday life from how individuals interact with their smartphones, travel, diagnose and treat illnesses, to how they grow their food and manage their finances.[1] In addition to these domestic and industrial advances, AI could have real and potential applications for the federal government, improving government services, and, ultimately, achieving efficiencies and helping taxpayers.

THREE AREAS OF FOCUS

- Combating waste, fraud, and abuse
- improving the deliverance of healthcare
- Supporting natural disaster relief

This paper makes no attempt to address the benefits and challenges of introducing AI technologies to the general public. Although AI can be beneficial to the government in a multitude of ways, this paper highlights three areas: combating waste, fraud, and abuse; improving the deliverance of healthcare; and supporting natural disaster relief. In order to realize these and other possibilities, the federal government must begin preparing for this future by iterating upon the national strategy for AI, modernizing federal IT infrastructure, and sharing datasets to the extent permissible by the law.

II. Combating Fraud, Waste, and Abuse

The World Health Organization lists fraud, waste, and abuse among the leading causes of inefficiency in global health.[2] This is particularly detrimental to the U.S. healthcare system because it siphons away

1 White House Office of Science and Technology Policy, *White House Hosts Summit on Artificial Intelligence for American Industry* (May 4, 2018), accessible at https://www.whitehouse.gov/articles/white-house-hosts-summit-artificial-intelligence-american-industry/. *See also* Rachit Agarwal, *10 Examples of Artificial Intelligence You're Using in Daily Life*, Beebom, accessible at https://beebom.com/examples-of-artificial-intelligence/.

2 *More Health for the Money*, WORLD TRADE ORGANIZATION, accessible at http://www.who.int/whr/2010/10_chap04_en.pdf.

already scarce funds that should instead be used for patient treatment.[3] In 2012, fraud, waste, and abuse cost Medicare and Medicaid $98 billion, adding roughly 10% to the total spending of these two programs. Minimizing this loss as much as possible can therefore help make healthcare more affordable.[4] Private companies have already turned to AI and machine learning systems to assist in detecting fraud, waste and abuse, and the federal government would benefit from doing the same.[5]

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In the private sector, Aetna's fraud unit employs a machine learning program that is responsible for identifying and investigating insurance fraud. These machine learning models are trained to look for variations of known fraud patterns and even emerging or new types of fraud.[6] Pondera Solutions offers Fraud Detection as a Service ("FDaaS") as a method of finding improper payments in Medicaid, Unemployment Insurance, the Supplemental Nutrition Assistance Program ("SNAP"), and other large government programs.[7] Similarly, the software platform FraudScope can automatically identify potential fraud, waste, and abuse and translate risk scores into concrete, actionable information so that investigations can be launched.[8] Both Pondera and FraudScope claim to have already identified fraudulent claims that have helped clients recover millions, if not billions of dollars through their AI-assisted fraud detection platforms.[9] Mirroring this kind of AI-assisted quality control in federal government programs could substantially increase the efficiency of large programs.

III. Transforming Healthcare

The average hospital generates 50 petabytes of data annually, including a plethora of medical images, clinical charts, and other patient information.[10] Less than 3% of that data is actually analyzed, however.

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3 Examples of fraud, waste and abuse include providing unnecessary services, use of unlicensed staff, and altering medical records, or mismanagement of resources. See Paramount Healthcare, *Examples of Fraud, Waste, Abuse* (last visited Oct. 14, 2018), accessible at https://www.paramounthealthcare.com/examples-of-fraud-and-abuse.

4 Neil Jordan, *A Data Driven Fight Against Healthcare Fraud, Waste and Abuse, Microsoft Industry Blog* (Feb. 17, 2018), accessible at https://cloudblogs.microsoft.com/industry-blog/industry/health/a-data-driven-fight-against-healthcare-fraud-waste-and-abuse/.

5 Will Hurd, *Washington Needs to Adopt AI Soon Or We'll Lose Millions*, Fortune (June 12, 2018), accessible at http://fortune.com/2018/06/12/rep-will-hurd-artificial-intelligence/.

6 Kurt Schiller, *Aetna is Taking on Insurance Fraud with Machine Learning*, ArcWeb Technologies (Feb. 25, 2018), accessible at https://arcweb.co/aetna-fraud-machine-learning/.

7 PONDERA, accessible at https://www.ponderasolutions.com/about-us/ (last visited Oct. 18, 2018).

8 FRAUDSCOPE, accessible at https://www.fraud-scope.com/solutions/.

9 *See supra* nn. 7-8.

10 *Nvidia and GE Health Join Forces*, Nvidia Newsroom (Nov. 27, 2017), accessible at https://nvidianews.nvidia.com/news/ge-and-nvidia-join-forces-to-accelerate-artificial-intelligence-adoption-in-healthcare.

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AI has the potential to transform healthcare by making predictions about patients, improving medical diagnostics, and monitoring patients by utilizing previously untapped but abundant sources of data.[11]

Predictions about patients can be established when data from Medicaid, Medicare, or other government programs and data from relevant sources, such as electronic health records, are plugged into machine learning techniques. Machine learning is a field of AI and method of data analysis that gives computer systems the capability to learn from data. These can potentially predict patient outcomes, including which individuals are most at risk of being hospitalized, which individuals are most likely to develop substance dependencies, which individuals are likely to use the emergency room frequently, and which members are more likely to die.[12] When these individuals and their subsequent risks are identified through these algorithms, appropriate measures like education and treatment can be taken.

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Additionally, AI can promote both the speed and accuracy of medical scanning devices through AI-driven platforms.[13] For example, a GE Healthcare CT scanner doubled imaging processing speeds over its predecessor generation by utilizing NVIDIA's AI computing platform. Due to its speed, GE's CT system is also expected to deliver better clinical outcomes in liver lesion detection and kidney lesion characterization.[14] A Google-developed AI platform has, under testing circumstances, outperformed human pathologists in detecting cancer, accurately evaluating biopsies 99% of the time.[15] Philips has also developed the HeartModelA.I., which is an AI-assisted ultrasound tool that can assess disease states and determine possible treatment.[16]

Lastly, patient monitoring systems can utilize AI to predict and identify signs of deterioration in a patient's condition so care is given accordingly and in a timely fashion. A Philips patient monitoring system

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11 Melissa Majerol, William Carroll, Sally Finger, *Smart Medicaid: Leveraging Cognitive Technologies to Improve Health and Program Efficiencies*, Deloitte Insights (Jan. 17, 2018), accessible at https://www2.deloitte.com/insights/us/en/industry/health-care/smart-technology-in-health-care-medicaid-programs.html.

12 *Google's Medical Brain Team Uses AI to Predict Patient's Health and Even Death*, Tech2 News (June 18, 2018), accessible at https://www.firstpost.com/tech/news-analysis/googles-artificial-intelligence-in-hospitals-can-predict-patients-outcomes-stay-and-even-death-4539441.html.

13 *GE and NVIDIA Join Forces to Accelerate Artificial Intelligence Adoption in Healthcare*, Nvidia News (Nov. 26, 2017), accessible at https://nvidianews.nvidia.com/news/ge-and-nvidia-join-forces-to-accelerate-artificial-intelligence-adoption-in-healthcare.

14 GE Healthcare, *AI Tech from Self-Driving Cars is Now Coming to Healthcare* (Nov. 26, 2017), accessible at http://newsroom.gehealthcare.com/ai-tech-from-self-driving-cars-is-now-coming-to-healthcare-rsna.

15 Kyle Wiggers, *Google AI Claims 99% Accuracy in Metastatic Breast Cancer Detection*, VentureBeat (Oct. 12, 2018), accessible at https://venturebeat.com/2018/10/12/google-ai-claims-99-accuracy-in-metastatic-breast-cancer-detection.

16 *Philips Launches Anatomically Intelligent Quantification Tool for Cardiac Ultrasound Imaging*, HealthImaging, accessible at https://www.healthimaging.com/topics/cardiovascular/philips-launches-anatomically-intelligent-quantification-tool-cardiac.

enables hospital nurses to identify deteriorating patients. It reports a promising 86% reduction in cardiac arrest and a 40% decrease in intensive care mortality due to faster intervention and response time.[17] If deployed in the federal healthcare context, solutions such as these could considerably improve outcomes at a lower cost.

IV. Supporting Natural Disaster Relief

Amid climate change and increasing industrialization, natural disasters can be expected to increase in the coming years. It is estimated that within the last 40 years, natural disasters have caused more than 3.3 million deaths and $2.3 trillion in economic damages.[18] While the federal government continues to seek ways to mitigate the impact of these disasters, AI can further aid the government before, during, and after these natural disasters by predicting when these extreme weather events will occur, which will help coordinate effective and efficient disaster programs.[19]

There are already several, different, AI-assisted products that can aid in natural disaster relief. OneConcern is an AI-enabled platform that currently monitors earthquakes, assesses the impact of flooding, predicts potential post-earthquake damage, analyzes infrastructure damage, and proposes evacuation routes. Furthermore, a Land Rover project still in the development stages employs an intelligent drone assisting in search and rescue in terrain not be navigable by vehicle, broadcasting live footage back to the rescue crew vehicles and monitoring for changes to the landscape.[20] Microsoft's AI for Earth program, on the other hand, is an AI-assisted platform that, although developed in conjunction with conservation efforts, can help governments predict and anticipate flooding.[21] This dynamic system for generating land cover data anywhere in the U.S. can be used to better design stormwater management systems, and enable planners to keep up with land-use changes, and thus plan accordingly.[22] As catastrophic disaster response becomes a regular responsibility of the federal government, authorities will need to take advantage of every tool available to mitigate the social and economic impact of these phenomena. Deploying AI-assisted platforms similar to these could substantially advance this mission.

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17 Philips Automated Early Warning Scoring Systems, https://www.usa.philips.com/healthcare/clinical-solutions/early-warning-scoring/intellivue-guardian-ews (last visited Oct. 12, 2018).

18 OneConcern, https://www.oneconcern.com/mission (last visited Oct. 12, 2018).

19 *Artificial Intelligence for Primer Relief: A Primer, Lexalytics*, accessible at https://www.lexalytics.com/lexablog/artificial-intelligence-disaster-relief.

20 *See* Hillary Gigonis, *Watch Land Rover's Search and Rescue SUV Launch Infrared-Equipped Drones*, Digital Trends (Mar. 17, 2017) accessible at https://www.digitaltrends.com/cool-tech/land-and-air-rover-red-cross/.

21 *Advanced Mapping for Precision Conservation*, Microsoft, accessible at https://www.microsoft.com/en-us/aiforearth/land-cover-mapping.aspx.

22 *See* Bill Gourgey, *How Artificial Intelligence Could Prevent Natural Disasters*, Wired (July 18, 2018), accessible at https://www.wired.com/story/how-artificial-intelligence-could-prevent-natural-disasters/?utm_campaign=ai-news-brief&utm_source=nb-placement-4.

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V. Promoting AI Adoption in the Federal Government

While AI has the potential to transform the ways in which the federal government functions, agencies nevertheless face a number of barriers to realizing these benefits. Among the challenges of adopting AI are the need for a regularly updated national strategy for AI, the present state of federal IT infrastructure, and the lack of data sharing within the federal government. Therefore, in order to better take advantage of what AI has to offer and to be able to implement AI more seamlessly into government processes, the government should consider iterating upon a national strategy for AI, modernizing federal IT infrastructure, and sharing datasets.

a) Iterating upon the National Strategy for AI

The current U.S. strategy for AI is outlined in the National Artificial Intelligence Research and Development Strategic Plan, which was originally published in 2016. The plan defined seven strategic objectives and two specific recommendations for AI.[23] In what is a step in the right direction, the National Science Foundation has recently published a Request for Information seeking public input in contemplation of updating the original 2016 Strategic Plan. Holistically, the federal government should regularly revise and iterate upon the national strategy for AI, advancing some of the original objectives and recommendations in the 2016 Strategic Plan but also expanding upon them to reflect new objectives and recommendations as they become apparent. A strategy that is a dynamic instrument will provide more value to U.S. officials and more guidance to private sector stakeholders. Similarly, within individual agencies, appropriate divisions should be tasked to assess the agency's needs and then devise and regularly update an internal plan regarding how to take advantage of AI technologies.[24]

Of critical importance to a national strategy is the goal of making long-term investments in AI research.

Of critical importance to a national strategy is the goal of making long-term investments in AI research.[25] At the fundamental core of AI research is educated, skilled experts in the field. This naturally indicates that long-term investments should be made in education, both in terms of investing in and retaining potential talent and upgrading present resources. Numerous recent reports point to an increased shortage of available experts in the

23 *See* National Science and Technology Council, *National Artificial Intelligence Research and Development Strategic Plan* (Oct. 2016), accessible at https://www.nitrd.gov/ PUBS/national_ai_rd_strategic_plan.pdf

24 Congress recently requested such a plan from the FAA in 2018 appropriations. *See* FAA Reauthorization Act of 2018, H.R. 302, § 548.

25 *See* National Science and Technology Council at 17.

field of AI, which means that more investments need to be made into training the next group of scientists and technical experts.[26] Furthermore, investments need to be made to the current resources in universities and other academic institutions. As an example, the vast number of academic research computers are three to five years old and currently incapable of modern AI development; this inevitably stifles AI development.

None of this is to say the federal government must enact and enforce new laws and regulations regarding AI. Rather, iteration upon the national strategy for AI should entail providing the government, businesses, researchers, and private entities with a better sense of direction to innovate and pursue complementary goals. That includes ensuring that enough federal investment is dedicated to the education system, which would incentivize bringing talent and expertise into the AI pool and provide adequate resources to further AI research and development.[27]

b) Modernize Federal IT Infrastructure

Many AI-related innovations, including those described in this paper, cannot be deployed given the current technology infrastructure. To fully utilize AI technologies, federal government IT will require some upgrades. Many government agencies spend a significant portion of their IT budgets on maintenance of legacy IT systems, which limits the budget that could be spent on AI and other emerging technologies. A GAO analysis of the operations and maintenance spending of 10 federal IT investments with the largest budgets found that several were outdated and incurred significant maintenance costs, with insufficient analysis of operational expenses.[28] For example, the Department of Defense relies on a 1970s system using 8-inch floppy disks. Similarly, the Department of Veterans Affairs still tracks veterans claims for benefits, eligibility, and death records on a 50+ year-old system written in COBOL, which is a computer language dating from 1959.[29]

Maintenance costs for legacy systems will continue to rise over time. Additionally, these systems were specifically designed to process individual transactions rather than gather large amounts of data, which limits an agency's ability to utilize existing data to deliver richer insights.[30] In order

26 *Id.* at 35.

27 *Id.*

28 Government Accountability Office, *Agencies Need to Strengthen Oversight of Multibillion Dollar Investments in Operations and Maintenance* (Nov. 2013), accessible at https://www.gao.gov/assets/660/658794.pdf.

29 Kevin C. Desouza, *IBM Center for The Business of Government, Delivering Artificial Intelligence in Government: Challenges and Opportunities* (2018), accessible at http://www.businessofgovernment.org/sites/default/files/Delivering%20Artificial%20Intelligence%20in%20Government.pdf. *See also* COBOL: An Introduction, Smithsonian Natural Museum of American History, accessible at *http://americanhistory.si.edu/cobol/introduction* (defining what COBOL stands for).

30 *See* Kevin C. Desouza.

to better implement AI in the future, the federal government needs to modernize the current IT infrastructure, including conducting performance measures to understand the current state of the federal government's IT infrastructure, then digging into what needs to be modernized and determining how much it would cost to implement a new modernized system. By doing so, the federal government will be able to open up valuable resources and produce a more extensive budget for AI.

A case study of an agency that has successfully modernized its current IT infrastructure and reduced significant costs in the process is the Federal Communications Commission ("FCC"). In 2013, the FCC spent 80% of its IT budget on operation and maintenance of its outdated IT systems. The FCC conducted an inventory of their systems and realize they had 207 of these IT legacy systems. Being able to identify these legacy systems helped the agency decide how to consolidate them (e.g., whether to retire or modify). As a result, the FCC moved some of its IT systems to cloud computing, which in turn eliminated a significant amount of cost. By 2015, the agency was spending only 50% of its budget IT systems — a 30% reduction.[31] Conducting rigorous operational analyses and migrating functions from aging architectures to modern IT infrastructure could realize cost savings of a similar nature, while also facilitating future deployment of AI technologies.

c) Disclosing and Sharing Datasets

The federal government possesses a wealth of data, most of which are unlabeled, unreadable by machines, or proprietary. This paper previously mentioned the amount of data the government has in the public healthcare sector and how little of it can actually be analyzed. To make progress quickly in AI, emphasis should be placed on making available already existing datasets held by the government, those that can be developed with federal funding, and, to the extent possible, those held by industry.[32] The federal government should, therefore, release existing datasets that are known to be valuable as a top priority to the extent permissible by the law.[33] Without these datasets, machine learning algorithms will lag behind other countries in analyzing data sets and providing a more in-depth, richer insight, which is crucial to the continuing development of AI.[34]

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31 *Supra* n.40 at 22.

32 *See* National Science and Technology Council at 31.

33 *See, e.g.*, S. 760, the Open, Public, Electronic, and Necessary ("OPEN") Government Data Act.

34 For example, China has a cultural acceptance of data collection, and an abundance of young engineers have taken advantage of this data in the development of facial recognition and other AI-related uses. *See* Patrick Kulp, *In the AI Race, China is Mere Steps Behind the U.S.*, AdWeek (Sep. 20, 2018), accessible at https://www.adweek.com/programmatic/in-the-ai-race-china-is-mere-steps-behind-the-u-s/.

Data sharing can be fostered by re-evaluating the structure of the current IT systems of federal agencies. Many public agencies build stand-alone systems that makes it difficult to consolidate other datasets. Some agencies also have duplicative systems. For example, in 2013, GAO reported that the Department of Homeland Security had invested in two different IT systems that support immigration processing; it also found that the Department of Defense had invested in two systems for tracking the health status of warfighters and two others for maintaining dental care.[35] Due to the lack of interoperability between agencies, agencies are limited in integrating multiple databases, and datasets cannot be analyzed properly. Thus, agencies need to think about developing guidelines as to how data can be shared and used, and look to cloud computing and other data management methods to help consolidate the vast amount of data that is currently unused and unreadable.[36]

VI. Conclusion

AI has the potential to be more transformative than previous technological developments.[37] While this paper only focuses on a few use cases, including combating fraud, waste, and abuse; transforming healthcare; and supporting natural disaster relief, there are numerous potential and real uses of AI in the federal government. Because AI is constantly developing, growing, and expanding, there are likely additional applications yet to be discovered.

Governments around the world are recognizing the tremendous power, growth, and opportunity that AI can bring to the lives of everyday citizens. To realize these benefits, agencies must consider how to effectively adopt AI into the government. The U.S. government should contemplate iterating upon the national strategy for AI; modernize the federal IT infrastructure in order to make way for a greater budget for AI and lastly; begin sharing data with other agencies and private entities to help further the growth of AI.

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35 *Id*

36 *Id.*

37 *See* Brian Krzanich, *The U.S. Needs a National Strategy on Artificial Intelligence*, Intel Newsroom (May 10, 2018), accessible at https://newsroom.intel.com/editorials/u-s-needs-national-strategy-artificial-intelligence/.