# The UNIVERSITY of VERMONT

## Vermont Legislative Research Service
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**Artificial Intelligence**

"Artificial intelligence" (AI) refers to computerized machinery which exhibits problem-solving behavior, capable of accomplishing tasks that are generally expected to require human intelligence.[1] Experts have identified several important benefits of smart AI, including the improvement of medicine, education, government, and transportation; however, the future of this technology is thought to be highly unpredictable, particularly in comparison to "noncognitive technologies."[2] With the potential to drastically alter careers and governance, AI raises several questions concerning ethics.[3] This paper explores the scope of federal, state, and international policy generated in response to this rising technology, and analyzes AI technology's potential impacts and ethical implications.

**Artificial Intelligence Legislation**

**Federal Policy**

In 2016, the Obama Administration released a statement regarding the advancement of AI, stating that the Federal Government should invest in its research and development, fund evaluations to measure the cost-effectiveness of technologies, and sponsor incentives for those pursuing AI advancement.[4] The report also proposes that the Federal Government develop regulations to protect American citizens while also encouraging technological innovation.[5] The Obama Administration made 12 recommendations, including that the Federal Government should help Federal agencies to build their capacity for AI and create a forum for AI "practitioners."[6] The Administration also suggests monitoring the progress of other countries' AI, so as to remain informed about international technological advancement.[7]

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[1] Executive Office of the President, "Preparing for the Future of Artificial Intelligence," (National Science and Technology Council, 2016), 6.

[2] Executive Office of the President, "Future of Artificial Intelligence," 5; Nick Bostrom and Eliezer Yudkowsky, "The Ethics of Artificial Intelligence," in *The Cambridge Handbook of Artificial Intelligence*, ed. Keith Frankish and William M. Ramsey (Cambridge University Press, United Kingdom, 2014), 320.

[3] Executive Office of the President, "Artificial Intelligence, Automation, and the Economy" (National Science and Technology Council, 2016), 1.

[4] Executive Office of the President, "Future of Artificial Intelligence," 15.

[5] Executive Office of the President, "Future of Artificial Intelligence," 15.

[6] Executive Office of the President, "Future of Artificial Intelligence," 16-24.

[7] Executive Office of the President, "Future of Artificial Intelligence," 16-24.

In contrast to the Obama Administration, the Trump Administration has yet to place emphasis on the advancement of AI.[8] A 2016 report stated that Trump, as President-Elect, had yet to establish a position on AI.[9] In his 2018 proposed budget, President Trump gives no mention of AI.[10] Much of his proposed cyber technology funding is focused on defense, namely cybersecurity.[11]

In 2017, The House of Representatives created an Artificial Intelligence Caucus (AI Caucus), intended to keep policymakers informed of AI innovation, and to encourage its continued advancement.[12] In December 2017, one of the Co-Chair of the AI Caucus, cosponsored the "Fundamentally Understanding the Usability and Realistic Evolution of Artificial Intelligence Act of 2017," otherwise known as the "Future of AI Act."[13] The bill, which is in the Senate as of May 2018, would ensure the establishment of a "Federal Advisory Committee on the Development and Implementation of Artificial Intelligence."[14] More recently in March 2018, H.R.5356, the "National Security Commission Artificial Intelligence Act of 2018," was introduced to the House of Representatives.[15] H.R.5356 proposes the creation of a "National Security Commission on Artificial Intelligence," intended to further advance AI technologies for the purpose of supporting national security.[16]

**State and Local Policy**

Based on a systematic search of state policies, there is little legislation regarding AI. The majority of existing state policies address autonomous vehicles, also known as "self-driving" vehicles (AVs), which can operate partially or completely without the assistance of a human driver.[17] Twenty-two states have enacted policy regarding AVs.[18] The most common legislation authorizes the testing of AVs or allow the operation of such vehicles on public roads in the state.[19] The governors of 10 states, Maine, Massachusetts, Delaware, Ohio, Wisconsin, Minnesota, Arizona, Idaho, Washington and Hawaii, have issued executive orders related to AVs.[20]  Many of these policies are meant to direct the creation of

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[8] John R. Allen, "Trump's 1st State of the Union: Artificial Intelligence and the Future of America," Brookings Institute, last modified January 30, 2018, accessed May 6, 2018, http://www.brookings.edu/blog/fixgov/2018/01/30/trumps-1st-sotu-artificial-intelligence-and-the-future-of-america/.

[9] Information Technology & Innovation Foundation, "Trump's Positions on Technology," 11.

[10] Office of Management and Budget, "America First: A Budget Blueprint to Make America Great Again," (The White House, 2017), https://www.whitehouse.gov/wp-content/uploads/2017/11/2018_blueprint.pdf.

[11] Office of Management and Budget, "America First," 20.

[12] Congressional Artificial Intelligence Caucus, "Delaney Launches Bipartisan Artificial Intelligence (AI) Caucus for 115th Congress," press release, May 24, 2017, https://artificialintelligencecaucus-delaney.house.gov/media-center/press-releases/delaney-launches-ai-caucus.

[13] U.S. Congress, "Cantwell, Young, Markey, Delaney & Olson Introduce Bill to Further Understand and Promote Development of Artificial Intelligence, Drive Economic Opportunity," press release, December 12, 2017, https://delaney.house.gov/news/press-releases/cantwell-young-markey-delaney-olson-introduce-bill-to-further-understand-and; Future of Artificial Intelligence Act of 2017, S.2217, 115th Cong. (2017).

[14] S.2217, 115th Cong. (2017).

[15] National Security Commission Artificial Intelligence Act of 2018, H.R.5356, 115th Cong (2018).

[16] H.R.5356, 115th Cong (2018).

[17] National Conference of State Legislatures, *Autonomous Vehicles| Self-Driving Vehicles Enacted Legislation* (National Conference of State Legislatures, 2018).

[18] National Conference of State Legislatures, *Autonomous Vehicles.*

[19] National Conference of State Legislatures, *Autonomous Vehicles.*

[20] National Conference of State Legislatures, *Autonomous Vehicles.*

recommendations for future legislation or to allow for limited testing of AVs.[21] Eight states have legislation which waive following-distance traffic laws for platooning cars and trucks.[22] AV platoons are a form of AV in which several vehicles are connected in a traffic line through AI and are able to maintain close distances to one another without the danger of collision.[23] Refer to Appendix A, Table 2 for a review of state policies and their general descriptions.

In 2017, Vermont passed H.494, which mandated a meeting of stakeholders to discuss AVs.[24] This group developed two primary recommendations for Vermont's autonomous driving policy. First, they recommended that Vermont promote the testing of AVs on Vermont public roads through waivers of relevant laws and a non-burdensome permitting process to better understand the implications of AVs.[25] This would give communities time to better understand this technology before it becomes available on a large commercial scale.[26] Secondly, they recommended that the State of Vermont revise VSA Title 23, in order to establish who is responsible for AV collisions and accidents.[27]

Nine states have adopted a Uniform Commercial Code (UCC) policy which establishes the role of AI in contract development.[28] It defines electronic agents as tools, and suggests that AI is currently unable to create a contract, but may be able to do so in the future, at which point the courts will be left to "construe the definition of electronic agent accordingly, in order to recognize such new capabilities."[29] New York State provides a capital tax credit of ten to twenty percent of qualified investments in AI.[30] The only other state to explicitly mention AI is Illinois, which has a law requiring that information about human immunodeficiency virus (HIV) testing processed by a computer or AI is "stored and processed in the most secure manner available."[31] Based on a search of all state policies, no states have created permanent or temporary committees on AI.

At the municipal level, New York City passed a law in 2017 mandating the creation of a task force to explore appropriate policies around algorithmic AI to ensure that algorithms do not perpetuate bias.[32]

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[21] National Conference of State Legislatures, *Autonomous Vehicles.*

[22] National Conference of State Legislatures, *Autonomous Vehicles.*

[23] U.S. Department of Transportation Volpe Center, "How an Automated Car Platoon Works," last modified July 31, 2017, accessed April 27, 2018, https://www.volpe.dot.gov/news/how-automated-car-platoon-works.

[24] H.R. 494, 2017 Gen. Assem. § 15 (VT.).

[25] Vermont Agency of Transportation: Policy, Planning, and Intermodal Development Division, *Preparing for Automated Vehicles in Vermont: A Report to the Vermont General Assembly per Section 15 Act 38 (2017),* (2018), 7-8.

[26] Vermont Agency of Transportation: Policy, Planning, and Intermodal Development Division, *Preparing for Automated* 7-8.

[27] Vermont Agency of Transportation: Policy, Planning, and Intermodal Development Division, *Preparing for Automated*, 9.

[28] Al ST §8-1A-2; AR ST §25-32-102;CO ST §24-71.3-102; LA R.S. 9:2602; NJ ST 12A:12-2; NC ST §66-312; OK ST T. 12A § 15-102; PA ST 73 P.S. §2260.103; TN ST §47-10-102.

[29] Al ST §8-1A-2; AR ST §25-32-102; CO ST §24-71.3-102; LA R.S. 9:2602; NJ ST 12A:12-2; NC ST §66-312; OK ST T. 12A § 15-102; PA ST 73 P.S. §2260.103; TN ST §47-10-102.

[30] NY Pub Auth §3102-3; Department of Taxation and Finance, "QETC Capital Tax Credit," New York State, accessed April 28, 2018, https://www.tax.ny.gov/pit/credits/qetc_capital.htm.

[31] IL ST CH 410 §520/6.

[32] New York City Council, Int 1696-2017.

This legislation is believed to be the first of its kind within the United States.[33] The committee will create recommendations on five areas of concern for algorithmic AI.[34]

1.  Determine the types of algorithms to which such regulations will apply.[35]
2.  Develop a grievance procedure that allows people to understand why an AI came to a certain decision in their case.[36]
3.  Develop a system to determine if AI technologies are making decisions because of protected class status, such as gender, race, religion, disability, or sexual orientation.[37]
4.  Develop a procedure for those who believe they are discriminated against by an AI technology because of a protected class status.[38]
5.  Determine the feasibility of keeping track of past AI decisions to see if there are patterns in AI decision-making.[39]

The resulting report from this legislation has not yet been created.

**International Policy**

Internationally, China has pledged $7 billion for the development of AI.[40] The nation aims to become the world's leader in AI by 2030, setting the global standard.[41] Academics, industry researchers, and other such experts are tasked with goals to not only cultivate technological developments, but to also increase the country's potential impact on the AI industry.[42] Currently, China is the United States' biggest competitor in the development of AI technologies.[43]

The United Kingdom has acknowledged its inability to be a front runner in the development of new AI technologies when compared to the U.S. and China.[44] However, the United Kingdom has decided to investigate the ethical implications of AI in detail, and aims to cultivate what it described as a "good AI society."[45] They have established a standing committee on AI in order to create regulatory frameworks for the development and oversight of AI.[46]

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[33] Zoë Bernard, "The First Bill to Examine 'Algorithmic Bias' in Government Agencies Has Just Passed in New York City," *Business Insider*, December 19, 2017, accessed April 28, 2018, http://www.businessinsider.com/algorithmic-bias-accountability-bill-passes-in-new-york-city-2017-12.

[34] New York City Council, Int 1696-2017.

[35] New York City Council, Int 1696-2017.

[36] New York City Council, Int 1696-2017.

[37] New York City Council, Int 1696-2017.

[38] New York City Council, Int 1696-2017.

[39] New York City Council, Int 1696-2017.

[40] Christina Larson, "China's massive investment in artificial intelligence has an insidious downside," *Science Magazine*, February 8, 2018.

[41] Christina Larson, China's massive investment in artificial intelligence, February 8, 2018

[42] Christina Larson, China's massive investment in artificial intelligence, February 8, 2018

[43] Christina Larson, China's massive investment in artificial intelligence, February 8, 2018

[44] Corinne Cath, Sandra Wachter, Brent Mittelstadt, Mariarosaria Taddeo, and Luciano Floridi. "Artificial Intelligence and the 'Good Society': the US, EU, and UK approach." *Science and Engineering Ethics* 24, no. 2 (April 2018).

[45] Corrine Cath et all, "Artificial Intelligence and the 'Good Society': the US, EU, and UK approach.", 2018

[46] Corrine Cath et al, "Artificial Intelligence and the 'Good Society': the US, EU, and UK approach.", 2018

In 2014, the European Union (EU) established Horizon 2020, dedicated to technological research and innovation.[47] The program is set to run until the year 2020, and has close to €80 billion (95 billion USD) in funding, making it the largest EU research and innovation program.[48] Horizon 2020 helps to support the Innovation Union, an initiative of the Europe 2020 strategy guiding the EU's growth over the next decade.[49] In April 2018, 25 EU member countries agreed to a collaborative policy on innovation, signing the Declaration of Cooperation on Artificial Intelligence.[50] The Declaration seeks to combat challenges and to address legal and ethical concerns associated with AI, while encouraging its advancement.[51]

In 2017, the United Arab Emirates (UAE) released the "UAE Strategy for Artificial Intelligence," a policy designed to improve governance and to revitalize their economic market.[52] This follows a 2016 goal set by Prime Minister and Vice President Sheik Mohammed bin Rashid al-Maktoum to have 25 percent of all UAE transportation automated by the year 2030.[53] That same year, Sheik Mohammed invested $270 million for the development of the Future Endowment Fund, created for the purpose of encouraging technological innovation.[54] The UAE also established a position of Minister of Artificial Intelligence, the first Cabinet position globally devoted to the advancement of AI technologies.[55] With the government's new AI strategy and endowment fund, the UAE seeks to incorporate technology development into several industries, including: medicine, transportation, environment, education, and space.[56]

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**Ethical Implications of Artificial Intelligence**

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**Job Displacement**

One of the concerns regarding AI is job displacement due to the capacity of computer-based systems to perform increasingly complex tasks.[57] Due to the fact that AI is comprised of several technologies, it is difficult to predict how jobs and the economy may be affected in the future.[58] Regardless, within the next couple decades, between nine and forty-seven percent of jobs may be threatened due to automation; many of these offer low pay and employ largely uneducated and lower-skilled workers.[59]

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[47] European Commission, "What is Horizon 2020," (European Union, n.d.), accessed May 2, 2018 at https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020.

[48] European Commission, "Horizon 2020."

[49] European Commission, "About the Innovation Union," (European Union, n.d.), accessed May 2, 2018 at http://ec.europa.eu/research/innovation-union/index.cfm?pg=intro.

[50] European Commission, "EU Member States Sign Up to Cooperate on Artificial Intelligence," (European Union, April 2018), accessed May 2, 2018 at https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence.

[51] European Commission, "EU Member States," 2018.

[52] UAE Government, "UAE Strategy for Artificial Intelligence," (Government.ae, n.d.), accessed May 2, 2018, at https://government.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/uae-strategy-for-artificial-intelligence.

[53] Claire Zillman, "Dubai Decrees Itself the A.I. City-State of the Future," *TIME* (March 2018), accessed May 2, 2018 at http://time.com/5195292/dubai-artificial-intelligence-derq-strategy/.

[54] Zillman, "A.I. City-State."

[55] Zillman, "A.I. City-State."

[56] UAE Government, "Strategy for Artificial Intelligence."

[57] Executive Office of the President, "Artificial Intelligence, Automation," 1.

[58] Executive Office of the President, "Artificial Intelligence, Automation," 2.

[59] Executive Office of the President, "Artificial Intelligence, Automation," 2; Carl Benedikt Frey and Michael Osborne, "The Future of Employment: How Susceptible are Jobs to Computerisation," (University of Oxford, 2013), 41, https://www.oxfordmartin.ox.ac.uk/downloads/academic/future-of-employment.pdf.

The University of Oxford estimates that the most at-risk jobs are those in transportation, logistics, office and administrative support, and labor; whereas low-risk jobs are mainly those in management, business, engineering, science, and finance.[60] Table 1 illustrates an estimate of the number of automotive jobs potentially threatened by AI.

Table 1. Estimates of U.S. automotive jobs threatened by artificial intelligence.

| Occupation | # Total Jobs (BLS, May 2015) | Range of Replacement Weights | Range of # Jobs Threatened |
|---|---|---|---|
| Bus Drivers, Transit and Intercity | 168,620 | 0.60 – 1.0 | 101,170 – 168,620 |
| Light Truck or Delivery Services Drivers | 826,510 | 0.20 – 0.60 | 165,300 – 495,910 |
| Heavy and Tractor-Trailer Truck Drivers | 1,678,280 | 0.80 – 1.0 | 1,342,620 – 1,678,280 |
| Bus Drivers, School or Special Client | 505,560 | 0.30– 0.40 | 151,670 – 202,220 |
| Taxi Drivers and Chauffeurs | 180,960 | 0.60 – 1.0 | 108,580 – 180,960 |
| Self-employed drivers | 364,000 | 0.90 – 1.0 | 328,000 – 364,000 |
| TOTAL JOBS | 3,723,930 | | 2,196,940 – 3,089,990 |

*Source*: Data from Executive Office of the President, "Artificial Intelligence, Automation," 17, Table 2.

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Estimates also predict indirect job creation because of AI, through early technology development, the supervising and repair of technologies, and for new urban designers to redesign roadways following the advent of automated vehicles.[61] Further, AI may assist workers in becoming more qualified, and therefore more successful for jobs.[62] For example, studies show that individuals who complete a digital training program have greater prospects of procuring more prestigious, better-paying jobs than those who train without a digital tutor.[63]

Others estimate that automation through AI may have a greater impact on the daily tasks of workers, rather than on workers actually losing their jobs.[64] According to estimates by the OECD, just under 35

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[60] Frey and Osborne, "The Future of Employment," 41-44.
[61] Executive Office of the President, "Artificial Intelligence, Automation," 18-19.
[62] Executive Office of the President, "Future of Artificial Intelligence," 15-16.
[63] Executive Office of the President, "Future of Artificial Intelligence," 15-16.
[64] Organization for Economic Cooperation and Development, "Automation and Independent Work in a Digital Economy," (May 2016), 2, https://www.oecd.org/els/emp/Policy%20brief%20-%20Automation%20and%20Independent%20Work%20in%20a%20Digital%20Economy.pdf.

percent of U.S. jobs may be at risk of change, and just under 10 percent may be lost due to automation.[65]

**Autonomous Vehicles**

The development of AVs presents ethical dilemmas. One of the most common ethical concerns surrounding AVs is how a vehicle responds in an accident which will inevitably result in the death of the passengers. Six different studies demonstrated that people prefer for other drivers to have vehicles which minimize overall death and injury from collision, but personally would prefer to ride in AVs which protect the passengers above all else.[66] Some scholars have suggested that automated vehicles must be programmed with a government-mandated ethics setting which emphasizes minimizing overall collision injuries and mortality.[67] They contend that allowing people or companies to personally decide the ethics setting of their vehicle would lead to a dilemma, in which everyone will choose personal protection, leading to a much worse accident than if all cars had been focused on minimizing overall harm.[68] Other academics suggest that previous legal reasoning can inform the future of ethics on AVs.[69] Based on past legal decisions, some have argued that it is morally acceptable for AVs to deliberately induce damage to avoid greater damage, so long as the people damaged or killed would have otherwise still been involved in the accident.[70] Moreover, these authors suggest that AVs be legally required to be programmed to cause property damage to itself or others in order to avoid killing a human.[71] Finally, some scholars disagree with the entire premise that AVs should be programmed with ethics, suggesting that AVs should simply be programmed to follow existing laws and make decisions randomly in the event of a situation causing unavoidable harm, much as a human would likely do in such a situation.[72]

Another ethical question for AVs is who will be held legally responsible in the event of a collision. One solution would be to make car manufacturers liable for any collision that is the fault of an AV.[73] However, some have rejected this solution, as it would likely incentivize car producers to avoid producing AVs, even when those AVs may be far safer than manually-driven cars.[74] Another solution would be to hold the owner or user of an AV responsible.[75] Even in a fully automated car with no brakes or steering wheel, owners could be held liable under the doctrine of strict liability, in which merely agreeing to use an AV would constitute an agreement to be held liable for its damages.[76]

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[65] Organization for Economic Cooperation and Development, "Automation and Independent Work," 2.

[66] Jean-François Bonnefon, Azim Shariff, and Iyad Rahwan, "The Social Dilemma of Autonomous Vehicles," *Science*, June 24, 2016, 1573.

[67] Jan Gogall and Julian Mueller, "Autonomous Cars: In Favor of a Mandatory Ethics Setting," *Science & Engineering Ethics* 23, no. 3 (June 2017): 695.

[68] Gogall and Mueller, "Autonomous Cars," 692.

[69] Filippo Santoni de Sio, "Killing by Autonomous Vehicles and the Legal Doctrine of Necessity," *Ethical Theory & Moral Practice* 20, no. 2 (April 2017): 413.

[70] Santoni de Sio, "Killing by Autonomous," 428.

[71] Santoni de Sio, "Killing by Autonomous," 428.

[72] Amitai Etzioni and Oren Etzioni, "Incorporating Ethics into Artificial Intelligence#," *The Journal of Ethics* 21, no. 4 (December 2017): 415-416.

[73] Alexander Hevelke and Julian Nida-Rumelin, "Responsibility for Crashes of Autonomous Vehicles: An Ethical Analysis," *Science and Engineering Ethics* 21, no. 3 (June 2015): 620.

[74] Hevelke and Nida-Rumelin, "Responsibility for Crashes," 623.

[75] Hevelke and Nida-Rumelin, "Responsibility for Crashes," 626.

[76] Hevelke and Nida-Rumelin, "Responsibility for Crashes," 626

Finally, there are ethical considerations for whether to allow AVs on public roads. Some academics argue that the current iteration of semi-autonomous vehicles which still require constant driver attention, are more dangerous than manually-driven cars, thus making them unethical to sell.[77] However, this suggests that when AVs become safer than manually-driven cars, as they are predicted to do, it will become unethical to sell manually-driven vehicles.[78] However, others argue that only minimal restrictions should be placed on the AV industry so as not to restrict industry growth that could lead to safer AVs.[79]

**Predictive Policing**

"Predictive policing" refers to the ability of computerized systems to make decisions based on violent crime incidence data to aid police departments in estimating locations in which crime may be more likely to occur.[80] Several AI technologies have been developed to assist officers through predictive policing, including CrimeScan, developed by researchers at Carnegie Mellon University.[81] Programs such as CrimeScan are algorithms based on crime reports, seasonal trends, and rates of serious violent activity to determine areas which may be at an increased risk of experiencing crime.[82] Similar to CrimeScan, PredPol is another algorithm developed eight years ago for the Los Angeles Police Department.[83] These programs rely on the assumption that lesser criminal activity is predictive of future, more serious crime, and that such infractions tend to occur in closely-related geographic locations.[84]

Another, more controversial form of predictive policing is Chicago's Strategic Subject List, which, rather than basing its predictions off of locations, identifies individuals which are at high risk of being involved in a shooting, as either the shooter or the victim.[85] The List ranks individuals on a scale of zero (extremely low risk) to 500 (extremely high risk), and was developed in response to increased rates of gun violence, first seen in 2015.[86] Although it remains unclear just how effective the algorithm is in identifying high-risk individuals, the List has been used to single them out and offer help services.[87] It has also been instrumental in "large-scale roundups" of people.[88]

The ability of algorithms to predict potential crime and criminals raises several questions of ethics. One concern of advocacy groups such as the American Civil Liberties Union (ACLU) is runaway feedback

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[77] Robert Sparrow and Mark Howard, "When Human Beings Are like Robots: Driverless Vehicles, Ethics, and the Future of Transport," *Transportation Research* 80 (July 2017): 206.

[78] Sparrow and Howard, "When Human," 210.

[79] Hevelke and Nida-Rumelin, "Responsibility for Crashes," 623.

[80] Danielle Ensign et al., "Runaway Feedback Loops in Predictive Policing," *Proceedings of Machine Learning Research* 81 (2018), 1-2,  arXiv:1706.09847.

[81] Randy Rieland, "Artificial Intelligence is Now Used to Predict Crime. But is it Biased?" *Smithsonian* (March 5, 2018), accessed May 1, 2018 at https://www.smithsonianmag.com/innovation/artificial-intelligence-is-now-used-predict-crime-is-it-biased-180968337/.

[82] Rieland, "Used to Predict Crime."

[83] Rieland, "Used to Predict Crime."

[84] Rieland, "Used to Predict Crime."

[85] Jeff Asher and Rob Arthur, "Inside the Algorithm that Tries to Predict Gun Violence in Chicago," *The New York Times*, (June 13, 2017), accessed May 1, 2018 at https://www.nytimes.com/2017/06/13/upshot/what-an-algorithm-reveals-about-life-on-chicagos-high-risk-list.html.

[86] Chicago Data Portal, "Strategic Subject List," City of Chicago (December 7, 2017), accessed May 1, 2018 at https://data.cityofchicago.org/Public-Safety/Strategic-Subject-List/4aki-r3np; Asher and Arthur, "Predict Gun Violence."

[87] Asher and Arthur, "Predict Gun Violence."

[88] Asher and Arthur, "Predict Gun Violence."

loops, in which police repeatedly visit certain communities, reinforcing stereotypes of "bad" neighborhoods.[89] These loops may even disregard true crime rates. Once a neighborhood has been identified, the program will continue to feed on data from that location, increasing the likelihood of it being identified again.[90] The problem of feedback loops is exacerbated by varying crime rates between closely related geographic areas; locations within close proximity to each other and which experience similar crime rates are much less likely to encounter feedback loops.[91]

Programs like the Strategic Subject List, which singles out individuals, are criticized as being biased toward race as well as location.[92] The algorithm for the List is secret, and although the Chicago Police Department has released a generalized version of the List, the public is given no opportunity to voice concerns.[93] There is also concern that programs such as the Strategic Subject List may expose individuals to discrimination, as input decisions are made by humans and may therefore be biased.[94]

**Artificial Intelligence in Medicine**

AI has the potential to substantially impact the future of medicine, possibly improving and prolonging lives.[95] Some experts believe that AI may require a paradigm shift: for medical professionals to stop competing with advancing technology, and to instead begin working in unison with AI.[96] In order for this to occur, it may be necessary to redesign AI frameworks, making the technology more accessible to individuals who are not trained in computer science.[97]

As of 2015, AI's average error for image recognition, critical in many clinical fields, was 3.5 percent, as compared to the average of 5 percent seen in humans.[98] In the field of dermatology, there is a 99 percent 5 year survival rate for melanoma patients if their cancer is detected in its early stages.[99] Once the cancer has progressed to late stages, the five-year survival rate drops to only fourteen percent.[100] In testing deep learning algorithms, AI technology was just as effective as 21 different dermatologists in completing visual tasks.[101] In another study, researchers found that when humans and machines worked in unison to identify cancerous cells, the combination had a 0.5 percent error rate, as compared with an error rate of 3.5 percent in humans and 7.5 percent in machines alone.[102] Because one in five Americans

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[89] Rieland, "Used to Predict Crime;" Ensign et al., "Runaway Feedback Loops," 1.

[90] Ensign et al., "Runaway Feedback Loops," 1.

[91] Ensign et al., "Runaway Feedback Loops," 11.

[92] Andrew Guthrie Ferguson, "The Police are Using Computer Algorithms to Tell if You're a Threat," *TIME* (October 3, 2017), accessed May 1, 2018 at http://time.com/4966125/police-departments-algorithms-chicago/.

[93] Ferguson, "The Police."

[94] Ferguson, "The Police."

[95] Andre Esteva et al., "Dermatologist-Level Classification of Skin Cancer with Deep Neural Networks," *Nature* 542 (February 2017): 118, doi:10.1038/nature21056; Executive Office of the President, "Future of Artificial Intelligence," 5.

[96] Joeky T. Senders et al., "Natural and Artificial Intelligence in Neurosurgery: A Systematic Review," *Neurosurgery* 0 (September 2017): 11, https://doi.org/10.1093/neuros/nyx384; Executive Office of the President, "Future of Artificial Intelligence,"10.

[97] An Tang et al., "Canadian Association of Radiologists White Paper on Artificial Intelligence in Radiology," *Canadian Association of Radiologists Journal* (April 2018), 8, https://doi.org/10.1016/j.carj.2018.02.002.

[98] Executive Office of the President, "Future of Artificial Intelligence," 6.

[99] Esteva et al., "Dermatologist-Level Classification," 115.

[100] Esteva et al., "Dermatologist-Level Classification," 115.

[101] Esteva et al., "Dermatologist-Level Classification," 115.

[102] Executive Office of the President, "Future of Artificial Intelligence," 10-11.

will develop melanoma over the course of their lifetime, the highly efficient ability of AI to detect images has the potential to save lives.[103]

Another field which may be heavily transformed by the use of AI technology is radiology, having several clinical applications including: diagnostic testing and screening tools in a triage for the purpose of categorizing examinations based on possibility of disease.[104] Over the next five years, medical professionals expect to see increasingly reliable technologies, with rising use in applications particularly at risk for human error.[105] This raises several ethical concerns, namely that AI may be capable of replacing radiologists in a clinical setting if machines regularly and efficiently produce more accurate results.[106] One method this might be mitigated is through an emphasis on developing technologies capable of performing beyond the scope of human vision, thereby functioning as an aid rather than a replacement.[107]

**Machine-Learning Algorithmic AI**

One type of AI are algorithms which use complex neural networks to make decisions.[108] One major concern with machine-learning AI decision-makers is that their decisions may not be predictable.[109] If it cannot be understood why an AI came to a certain decision, and these results are not predictable, it is ethically questionable whether the decisions that these machines would make could be considered defensible.[110] Of particular concern is that an AI could make biased decisions if it is learning from past decisions which exhibit bias.[111] Non-learning algorithms, such as the COMPAS algorithm used to determine level of risk that a defendant will commit future crimes while out on bail, have demonstrated racial bias.[112] As algorithms move from static decision-making parameters to systems created via "machine-learning," this problem is expected to grow, as it will likely be unclear why these systems come to the outcomes to which they arrive.[113] Transparency and ability to understand why an AI came to certain decisions will remain important as algorithms grow in complexity.[114]

<div align="center">

**Conclusion**

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Although AI represents a rapidly progressing technology which will likely alter several American industries, its impact remains difficult to predict.[115] At this time, few states have enacted policies regarding this technology, and although the Federal Government has outlined several broad goals for

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[103] Esteva et al., "Dermatologist-Level Classification," 115.
[104] Tang et al., "White Paper," 9.
[105] Tang et al., "White Paper," 14.
[106] Tang et al., "White Paper," 9.
[107] Tang et al., "White Paper," 11.
[108] Bostrom and Yudkowsky, "The Ethics,"316.
[109] Bostrom and Yudkowsky, "The Ethics,"317.
[110] Bostrom and Yudkowsky, "The Ethics,"317.
[111] Chris DeBrusk, "The Risk of Machine-Learning Bias (and How to Prevent It)," MIT Sloan Management Review, last modified March 26, 2018, accessed May 2, 2018, https://sloanreview.mit.edu/article/the-risk-of-machine-learning-bias-and-how-to-prevent-it/.
[112] Julia Angwin et al., "Machine Bias," *ProPublica*, May 23, 2016, accessed May 2, 2018, https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing.
[113] Bostrom and Yudkowsky, "The Ethics,"316.
[114] Bostrom and Yudkowsky, "The Ethics,"317.
[115] Executive Office of the President, "Artificial Intelligence, Automation," 2.

future development, some experts are concerned that the U.S. may fall behind in the global sphere.[116] Experts have identified several ethical concerns regarding the future of AI, such as the profiling of certain communities and individuals through the use of predictive policing programs, which can already be observed in Chicago with the Strategic Subject List.[117] Other ethical concerns include the programming of autonomous vehicles and the potential for job losses under AI. There are many forms of AI, all of which have considerable ethical implications which will continue to develop as the technology develops, presenting new challenges and questions for law makers.

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Disclaimer: The material contained in the report does not reflect the official policy of the University of Vermont.

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[116] Executive Office of the President, "Future of Artificial Intelligence," 16-24; Information Technology & Innovation Foundation, "Trump's Positions on Technology," 2.
[117] Rieland, "Used to Predict Crime;" Ensign et al., "Runaway Feedback Loops," 1.

Appendix A

Table 2. State policies regarding artificial intelligence.

| Type of Policy | States with Executive Orders Relating to Policy | States with Laws Relating to Policy |
|---|---|---|
| Allows for restricted testing or study of AVs | AZ, HI, WA | AR, CA, CT, FL, MI, NV, ND, NY, UT |
| Establishes a committee or advisory group on AV | DE, ME, MA, MN, OH, WA, WI | AL, NC, WA, VT, ND |
| Defines terms in relations to AV | | NY, NC, TN |
| Allows for use of AVs on public roads with certain restrictions | | CA, CO, FL, NC, MI, NV, TX, TN |
| Removes or reduces following distance laws to allow for AV platooning | | AL, GA, IN, NV, NC, SC, TX, TN, |
| Defines "electronic agent" as incapable of making contract | | Al, AR, CO, LA, NJ, NC, OK,  PA,TN |
| Allows operators of AV to use "visual display" normally prohibited | | VI, TN |
| Exempts an operator of an AV from the requirement of holding a driver's license | | GA, NC, TN |
| Prevents local authorities from creating ordinances that prohibit the use of AV | | IL, NC, TN |
| Defines "autonomous technology" for the purposes of the Highway Regulatory Act | | LA |
| Places liability for collisions on AV | | TN |
| Allows for operation of an AV without a person inside of the vehicle | | MI, NV |
| Exempts mechanics and repair shops from liability on fixing automated vehicles | | MI |
| Allocates funds to AV transportation systems | | PA |
| Provides a capital tax credit for AI development | | NY |
| Requires high levels of data security for AI processing information about HIV or AIDS status | | IL |

*Source*: Al ST §8-1A-2; AR ST §25-32-102;CO ST §24-71.3-102; LA R.S. 9:2602; NJ ST 12A:12-2; NC ST §66-312; OK ST T. 12A § 15-102; PA ST 73 P.S. §2260.103; TN ST §47-10-102; NY Pub Auth §3102-3; Department of Taxation and Finance, "QETC Capital Tax Credit," New York State, accessed April 28, 2018, https://www.tax.ny.gov/pit/credits/qetc_capital.htm; National Conference of State Legislatures, *Autonomous Vehicles;* IL ST CH 410 §520/6.