

<http://www.uvm.edu/~vlrs/>

## 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.<sup>1</sup> 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."<sup>2</sup> With the potential to drastically alter careers and governance, AI raises several questions concerning ethics.<sup>3</sup> This paper explores the s(IT)-3(r)12(q0.00000912 0 612 792 reWñBT/F7 11.04 Tf1 0 0 1 72.024 454.75 Tm0 g0 G5(3 90Qq0.0000091



recommendations for future legislation or to allow for limited testing of AVs.<sup>21</sup> Eight states have legislation which waive following-distance traffic laws for platooning cars and trucks.<sup>22</sup> 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.<sup>23</sup> 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.<sup>24</sup> 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.<sup>25</sup> This would give communities time to better understand this technology before it becomes available on a large commercial scale.<sup>26</sup> Secondly, they recommended that the State of Vermont revise VSA Title 23, in order to establish who is responsible for AV collisions and accidents.<sup>27</sup>

Nine states have adopted a Uniform Commercial Code (UCC) policy which establishes the role of AI in contract development.<sup>28</sup> 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."<sup>29</sup> New York State provides a capital tax credit of ten to twenty percent of qualified investments in AI.<sup>30</sup> 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."<sup>31</sup>



In 2014, the European Union (EU) established Horizon 2020, dedicated to technological research and innovation.<sup>47</sup> 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.<sup>48</sup> Horizon 2020 helps to support the Innovation Union, an initiative of the Europe 2020 strategy guiding the EU's growth over the next decade.<sup>49</sup>

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.<sup>60</sup> 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.

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

---

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.<sup>61</sup> Further, AI may assist workers in becoming more qualified, and therefore more successful for jobs.<sup>62</sup> 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.<sup>63</sup>

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





loops, in which police repeatedly visit certain communities, reinforcing stereotypes of “bad” neighborhoods.<sup>89</sup> 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.<sup>90</sup> 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.<sup>91</sup>

Programs like the Strategic Subject List, which singles out individuals, are criticized as being biased toward race as well as location.<sup>92</sup> 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.<sup>93</sup> 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.<sup>94</sup>

### Artificial Intelligence in Medicine

AI has the potential to substantially impact the future of medicine, possibly improving and prolonging lives.<sup>95</sup> 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.<sup>96</sup> 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.<sup>97</sup>

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.<sup>98</sup> 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.<sup>99</sup> Once the cancer has progressed to late stages, the five-year survival rate drops to only fourteen percent.<sup>100</sup> In testing deep learning algorithms, AI technology was just as effective as 21 different dermatologists in completing visual tasks.<sup>101</sup> 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.<sup>102</sup> Because one in five Americans

will develop melanoma over the course of their lifetime, the highly efficient ability of AI to detect images has the potential to save lives.<sup>103</sup>

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.<sup>104</sup> Over the next five years, medical professionals expect to see increasingly reliable technologies, with rising use in applications particularly at risk for human error.<sup>105</sup> 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.<sup>106</sup> 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.<sup>107</sup>

### Machine-Learning Algorithmic AI

One type of AI are algorithms which use complex neural networks to make decisions.<sup>108</sup> One major concern with machine-learning AI decision-makers is that their decisions may not be predictable.<sup>109</sup> 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.<sup>110</sup> Of particular concern is that an AI could make biased decisions if it is learning from past decisions which exhibit bias.<sup>111</sup> 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.<sup>112</sup> 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.<sup>113</sup> Transparency and ability to understand why an AI came to certain decisions will remain important as algorithms grow in complexity.<sup>114</sup>

### Conclusion

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

---

<sup>103</sup> Esteva et al., "Dermatologist-Level Classification," 115.

<sup>104</sup> Tang et al., "White Paper," 9.

<sup>105</sup> Tang et al., "White Paper," 14.

<sup>106</sup> Tang et al., "White Paper," 9.

<sup>107</sup> Tang et al., "White Paper," 11.

<sup>108</sup> Bostrom and Yudkowsky, "The Ethics," 316.

<sup>109</sup> Bostrom and Yudkowsky, "The Ethics," 317.

<sup>110</sup> Bostrom and Yudkowsky, "The Ethics," 317.

<sup>111</sup> 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/>.

<sup>112</sup> 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>.

<sup>113</sup> Bostrom and Yudkowsky, "The Ethics," 316.

<sup>114</sup> Bostrom and Yudkowsky, "The Ethics," 317.

<sup>115</sup>

future development, some experts are concerned that the U.S. may fall behind in the global sphere.<sup>116</sup> 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.<sup>117</sup>

