

## Artificial Intelligence & Algorithmic Bias: The Issues With Technology Reflecting History & Humans

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# Artificial Intelligence & Algorithmic Bias: The Issues With Technology Reflecting History & Humans

MAYA C. JACKSON\*©

## Abstract

The use of technology has expanded tremendously in recent decades. Included in this expansion is the use of algorithms across today's internet. Although algorithms have become popular, their intended purpose is not always executed with accuracy. Algorithms have been shown to exclude people of color and women from a wide-range of activities including applying to jobs to simply using a soap dispenser. This happens when algorithms are inaccurately produced, either by an under or overrepresentation of particular data or by the personal bias of engineers that is reflected in the collection of data. This discriminatory practice is called algorithmic bias. This paper will discuss algorithmic bias, how the practice is injurious to many minority persons, and offer several solutions to improve the use of algorithms moving forward.

## I. Introduction

In 2015, Google's photo application algorithm was proven flawed after it mistakenly tagged a photo of two Black people as gorillas.<sup>1</sup> The system's algorithm lacked sufficient training with images of darker skin tones.<sup>2</sup> Similarly, in 2017, an algorithm used to create a no-touch soap dispenser was poorly trained to recognize

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1. Ben Dickson, *What is algorithmic bias?*, TECHTALKS (Mar. 26, 2018), <https://bdtechtalks.com/2018/03/26/racist-sexist-ai-deep-learning-algorithms/>.

2. *Id.*

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different shades of skin color.<sup>3</sup> As a result, the dispenser only responded to white hands while failing to respond to black and brown hands.<sup>4</sup> These stories, like many others, illustrate the workings of algorithmic bias, a term used to describe systematic and repeatable errors in a computer system that creates unfair and discriminatory practices against various legally protected characteristics like race and gender.<sup>5</sup>

This paper explores how artificial intelligence technologies, such as machine learning and deep learning algorithms, are constructed in ways that create bias and discriminatory outcomes against individuals in various environments, including workplaces and healthcare systems. Specifically, this paper will explore algorithmic bias, analyze how it violates individuals' rights under the Civil Rights Act of 1964<sup>6</sup> and suggest potential remedies. Section II will provide a descriptive background of algorithms. Section III will then explain algorithmic bias. Section IV will discuss the history of racial and gender discrimination and indicate how it led to algorithm bias today. Section V will describe how algorithmic bias, via human bias or overrepresented or underrepresented data collection, effects today's society in the employment and healthcare realm. Section VI will explore the legal implications on algorithmic bias under the Civil Rights Act of 1964. Finally, Section VII will recommend other remedies to eliminate algorithmic bias.

### **II. Background: What is an Algorithm?**

Behind every inadequate photo application or soap dispenser is an algorithm.<sup>7</sup> Many of those algorithms are used to create a more advanced machine learning system that falls under the scope of artificial intelligence.<sup>8</sup> The accuracy of these mechanisms are imperative as they are the foundation for many technological uses today. However, algorithms are not always successful.<sup>9</sup>

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3. Tom Hale, *This Viral Video Of A Racist Soap Dispenser Reveals A Much, Much Bigger Problem*, IFLSCIENCE (Aug. 18, 2017, 1:49 PM), <https://www.iflscience.com/technology/this-racist-soap-dispenser-reveals-why-diversity-in-tech-is-muchneeded/>.

4. *Id.*

5. *Algorithmic Bias*, THE FLORIDA STATE UNIVERSITY LIBRARIES, <https://guides.lib.fsu.edu/algorithm> (last updated Oct. 12, 2020, 2:11 PM).

6. Civil Rights Act of 1964 § 7, 42 U.S.C. § 2000e.

7. *Introduction to Algorithm in Programming*, EDUCBA, <https://www.educba.com/algorithm-in-programming/> (last visited Oct. 30, 2020).

8. See Eda Kavlakoglu, *AI vs. Machine Learning vs. Deep Learning vs. Neural Networks: What's the Difference?*, IMB (May 27, 2020), <https://www.ibm.com/cloud/blog/ai-vs-machine-learning-vs-deep-learning-vs-neural-networks>.

9. Jonathan Albright, *Algorithms might be everywhere, but like us, they're deeply flawed*, THE CONVERSATION (Oct. 19, 2016, 3:13 PM), <https://theconversation.com/algorithms-might-be-everywhere-but-like-us-theyre-deeply-flawed-66838>.

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*A. Algorithms*

An algorithm is a set of instructions or rules designed to perform a specific task, duty, or goal.<sup>10</sup> These set of rules are typically designed in a step-by-step or sequential order.<sup>11</sup> From an overgeneralized perspective, algorithms are similar to everyday activities that require specific steps to execute a task.<sup>12</sup> For instance, cooking recipes are similar to algorithms because they list a set of sequential instructions that must be followed to ensure the desired meal is properly made.<sup>13</sup> In the technological sense, an algorithm is the foundation that creates the set of rules allowing computers, smartphones, websites, and the like to function and make desired decisions.<sup>14</sup>

There are five properties an algorithm must possess: (1) finiteness; (2) definiteness; (3) input; (4) output; and (5) effectiveness.<sup>15</sup> For an algorithm to be finite, it must always end after a set number of steps.<sup>16</sup> The definiteness property of an algorithm focuses on the clarity of the instructions.<sup>17</sup> Specifically, the steps in an algorithm must be clearly defined, detailed, and unambiguous.<sup>18</sup> Definiteness focuses on the order of the steps as well as the actual implementation of said steps.<sup>19</sup> This preciseness is necessary to successfully turn an input into an output.<sup>20</sup> An input is the transformation of the step-by-step rules during the computation to produce an output.<sup>21</sup> An output is the result of the input that produces the solution to the overall problem or task.<sup>22</sup> Finally, the algorithm must be effective to be able to perform each step of the algorithm correctly.<sup>23</sup> Effectiveness is necessary to ensure the steps can

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10. *Algorithm*, TECHTERMS, <https://techterms.com/definition/algorithm> (last updated Aug. 2, 2013).

11. TechTarget Contributor, *Algorithm*, TECHTARGET, <https://whatis.techtarget.com/> (choose “AppDev” under “Browse Definitions By Topic;” then choose “Programming;” then click “algorithm.”) (last visited October 30, 2020).

12. *Algorithms*, GFCGLOBAL, <https://edu.gcfglobal.org/en/computer-science/algorithms/1/> (last visited Oct. 30, 2020).

13. *Id.*

14. *Id.*

15. Donald Knuth, *Intro Problem Solving in Computer Science*, CS@VT, [http://courses.cs.vt.edu/cs2104/Fall17Barnette/notes/T16\\_Algorithms.pdf](http://courses.cs.vt.edu/cs2104/Fall17Barnette/notes/T16_Algorithms.pdf) (2011–12).

16. Aristides S. Bouras, *Properties of an Algorithm*, BOURAS PAGE, <https://www.bouraspape.com/repository/algorithmic-thinking/properties-of-an-algorithm> (last visited Oct. 30, 2020).

17. Catherine S., *Properties of Algorithms*, STUDY.COM, <https://www.bouraspape.com/repository/algorithmic-thinking/properties-of-an-algorithm>.

18. *Id.*

19. Steven de Rooij, *What are the major characteristic of an algorithm?*, QUORA (Feb. 17, 2018), <https://www.quora.com/What-are-the-major-characteristics-of-an-algorithm>.

20. *Id.*

21. *Id.*

22. *Id.*

23. Bouras, *supra* note 16.

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be completed in a finite amount of time.<sup>24</sup> This is accomplished by requiring the algorithm to be basic enough to ensure correct and timely execution of all steps.<sup>25</sup> Ultimately, to further advance the technological independence of a computer system and create a form of artificial intelligence, an algorithm must be used.<sup>26</sup>

#### *B. Artificial Intelligence*

Artificial intelligence is the computer science of building machines capable of executing tasks that are typically performed by humans, thus requiring human-like knowledge.<sup>27</sup> As stated by technology professor John McCarthy,<sup>28</sup> the purpose of artificial intelligence is to “understand and model the thought processes of humans and to design machines that mimic this behavior.”<sup>29</sup> It is designed to make thinking machines with the level of intelligence of an actual human being.<sup>30</sup> To do this, large amounts of data must be combined with fast and iterative processing of intelligent algorithms.<sup>31</sup> This process allows a machine learning system to automatically learn from patterns or features within the data.<sup>32</sup> As a result, the data collection should then implement various skills into the machine such as reasoning and perception.<sup>33</sup> Specifically, the human-like capabilities include, but are not limited to, learning new concepts and tasks, reasoning and drawing conclusions about the world, and comprehending natural language and visual scenes.<sup>34</sup> Artificial intelligence is a broad concept that includes branches of algorithmic learning mechanisms, like machine learning and deep learning, that further serve its ultimate purpose.<sup>35</sup>

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24. *Id.*

25. *Id.*

26. *Introduction to Algorithm in Programming, supra note 7.*

27. *What is Artificial Intelligence*, BUILT IN, <https://builtin.com/artificial-intelligence> (last visited Oct. 30, 2020).

28. Shubhendu S. Shukla & Vijay Jaiswal, *Applicability of Artificial Intelligence in Different Fields of Life*, 1 INT’L J. OF SCI. ENGINEERING AND RES. 28, 29 (2013) (explaining that John McCarthy, a former professor Massachusetts Institute of Technology, coined the phrase “artificial intelligence”).

29. *Id.*

30. Darrell M. West, *What is artificial intelligence?*, BROOKINGS (Oct. 4, 2018), <https://www.brookings.edu/research/what-is-artificial-intelligence/>.

31. *Artificial Intelligence – What it is and why it matters*, SAS, [https://www.sas.com/en\\_us/insights/analytics/what-is-artificial-intelligence.html#:~:text=AI%20works%20by%20combining%20large,or%20features%20in%20the%20data.&text=Cognitive%20computing%20is%20a%20subfield,human%2Dlike%20interaction%20with%20machines](https://www.sas.com/en_us/insights/analytics/what-is-artificial-intelligence.html#:~:text=AI%20works%20by%20combining%20large,or%20features%20in%20the%20data.&text=Cognitive%20computing%20is%20a%20subfield,human%2Dlike%20interaction%20with%20machines) (last visited Oct. 30, 2020).

32. *Id.*

33. Jake Frankenfield, *Artificial Intelligence (AI)*, INVESTOPEDIA, <https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp> (last updated Mar. 8, 2021).

34. Shukla & Jaiswal, *supra* note 29, at 28.

35. Kavlakoglu, *supra* note 8.

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*1. Machine Learning*

Machine learning is a branch of artificial intelligence that focuses on the study of algorithms that allows a computer program to independently perform and improve over time.<sup>36</sup> That is, machine learning analyzes a computer algorithm's input and output data which allows it to predict outcomes, make decisions or perform specific tasks.<sup>37</sup> The main difference between traditional algorithms and machine learning algorithms is the desired approach.<sup>38</sup> While a traditional algorithm is finite because it is designed to teach a step-by-step-performance of a particular task from start to finish, a machine learning algorithm is programmed to teach a system how to perform a specific task by properly responding to the data given over a period of time.<sup>39</sup> Thus, the system is not finite. Since the data can change over time, unlike a traditional algorithm, the performance changes as well.<sup>40</sup> Therefore, machine learning algorithms are adaptive in nature.<sup>41</sup>

As new data is developed into the algorithm, the machine learning system continues to analyze and use the data to improve its performance and make better informed decisions.<sup>42</sup> For example, a machine learning system can be taught to analyze and readily distinguish between types of animals.<sup>43</sup> By showing a machine learning system photos of cats and dogs continuously, the system will eventually be able to identify which images are dogs and which images are cats.<sup>44</sup> The improvement and independent performance of machine learning is supposed to resemble the functional ability of the human brain as it learns by experience.<sup>45</sup> A common example of its human-like functions can be illustrated through the popular device, "Alexa."<sup>46</sup> The primary purpose of Alexa is to serve as a personal assistant,

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36. Roberto Iriondo, *What is Machine Learning*, MEDIUM, <https://medium.com/towards-artificial-intelligence/what-is-machine-learning-ml-b58162f97ec7> (last updated Oct. 8, 2020).

37. Roger Chua, *A simple way to explain the key differences between Artificial Intelligence, Machine Learning & Deep Learning*, BECOMING HUMAN (May 20, 2019), <https://becominghuman.ai/a-simple-way-to-explain-the-key-differences-between-artificial-intelligence-machine-learning-a3ebbc330532>.

38. Srinivas Rao, *How Does the ML Algorithm differ from the Traditional Algorithm?*, MEDIUM (Mar. 17, 2020), <https://medium.com/@raosrinivas2580/how-does-the-ml-algorithm-differ-from-the-traditional-algorithm-b7c3a2799e10>.

39. *Id.*

40. *Id.*

41. Katrina Wakefield, *A guide to machine learning algorithms and their applications*, SAS, [https://www.sas.com/en\\_gb/insights/articles/analytics/machine-learning-algorithms.html#:~:text=At%20its%20most%20basic%2C%20machine,developing%20intelligence%20over%20time](https://www.sas.com/en_gb/insights/articles/analytics/machine-learning-algorithms.html#:~:text=At%20its%20most%20basic%2C%20machine,developing%20intelligence%20over%20time) (last visited Oct. 30, 2020).

42. *Id.*

43. Chua, *supra* note 37.

44. *Id.*

45. Archana Oberoi, *9 Machine Learning Examples from Day-to-Day Life*, DAFFODIL (June 16, 2017, 10:00 PM), <https://insights.daffodilsw.com/blog/9-machine-learning-examples-from-day-to-day-life>.

46. *Id.*

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but in a virtual sense.<sup>47</sup> Alexa, and other similar products, can assist in finding information as well as perform various tasks including, but not limited to, setting alarms, streaming music, and managing lists.<sup>48</sup> Machine learning plays an important role in the functioning of Alexa as it collects and refines data based on its continual human interactions, which allows later interactions to be tailored to the owner's daily routines.<sup>49</sup> For instance, Alexa's "Hunches" feature creates a built-in intuition that allows the system to learn its owners daily home routine.<sup>50</sup> Alexa Hunches observes its owner's routine actions like turning off the light before going to bed, locking the door before leaving for work and setting an alarm every night.<sup>51</sup> Once Alexa Hunches recognizes these routines as a pattern, the voice assistant will begin reminding its owner when she forgets to do them.<sup>52</sup> Still, as machine learning algorithms are more advanced in performance than traditional algorithms, a machine learning algorithm is the middle-step to the more advanced deep learning algorithm.<sup>53</sup>

#### *2. Deep Learning*

Deep learning is a subset of machine learning that aims to reflect the functions of the human brain.<sup>54</sup> Deep learning is the more advanced form of algorithmic artificial intelligence, as its functionality relates closer to the overall goal of artificial intelligence: mimicking the human thought process.<sup>55</sup> To create a system that mimics the human brain, deep learning algorithms are structured in a layered style called an artificial neural network.<sup>56</sup> An artificial neural network is an "attempt to simulate the network of neurons that make up a human brain so that the computer can be able to

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47. Mitja Rutnik, *Amazon Alexa: Everything you need to know about the digital assistant*, Android Authority (Dec. 16, 2020), <https://www.androidauthority.com/amazon-alexa-878058/>.

48. *Alexa Features*, AMAZON, [https://www.amazon.com/ref=nav\\_logo](https://www.amazon.com/ref=nav_logo) (click the "All" dropdown tab at the top left of the home page; then click "Echo & Alexa;" then scroll down and click "Alexa Skills.") (last visited Oct. 30, 2020)

49. Archna Oberoi, *supra* note 45.

50. Mark Harris, *Amazon's Alexa knows what you forgot and can guess what you're thinking*, GUARDIAN (Sept. 20, 2018), <https://www.theguardian.com/technology/2018/sep/20/alexa-amazon-hunches-artificial-intelligence>.

51. *Id.*

52. *Id.*

53. Kavlakoglu, *supra* note 8.

54. Marshall Hargrave, *Deep Learning*, INVESTOPEDIA (NOV. 24, 2020), <https://www.investopedia.com/terms/d/deep-learning.asp#:~:text=Deep%20learning%20is%20an%20AI,is%20both%20unstructured%20and%20unlabeled>.

55. Brett Grossfeld, *Deep learning vs. machine learning: a simple way to understand the difference*, ZENDESK, <https://www.zendesk.com/blog/machine-learning-and-deep-learning/> (last updated Oct. 12, 2020)

56. *Id.*

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learn things and make decisions in a humanlike manner.”<sup>57</sup> They are created by programming computers to behave like “interconnected brain cells.”<sup>58</sup> Because the artificial neural network is specifically designed to replicate the human brain, its capabilities are more advanced than machine learning.<sup>59</sup> Rather than learning from the data in an algorithm to make improved informed decisions over time, deep learning structured algorithms are able to initially learn and make decisions on its own without the continual collection and analysis of new data.<sup>60</sup> Hence, the major difference between machine learning and deep learning is that deep learning has the most humanlike capabilities because the algorithm allows the system to make decisions without having to learn from the data given over time.<sup>61</sup> Although artificial intelligence and its machine learning systems are highly developed and widely utilized, its uses are not without error.<sup>62</sup>

### III. The Issue: What is Algorithmic Bias?

Although artificial intelligence and machine learning are heavily founded on algorithms and allows a system to think and make decisions, human individuals still create the algorithmic foundation.<sup>63</sup> Because humans have long held on to racial and gender biases, whether conscious or unconscious, these biases are often trickled into the algorithms.<sup>64</sup> Once biases are within the algorithmic data, the artificial intelligence will reflect these biases in their decision-making processes and task performances.<sup>65</sup> This ill practice has been defined as algorithmic bias.<sup>66</sup>

### IV. How Did We Get Here?

Algorithmic bias based on race and gender can occur in several ways.<sup>67</sup> However the occurrence, its root is in a historical context. Biases based on both race and

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57. Bernard Marr, *What Are Artificial Neural Networks – A Simple Explanation for Absolutely Anyone*, FORBES (Sept. 24, 2018), <https://www.forbes.com/sites/bernardmarr/2018/09/24/what-are-artificial-neural-networks-a-simple-explanation-for-absolutely-anyone/#3691fc471245>.

58. *Id.*

59. Brett Grossfeld, *Deep learning vs. machine learning: a simple way to understand the difference*, ZENDESK (Oct. 12, 2020), <https://www.zendesk.com/blog/machine-learning-and-deep-learning/>.

60. *Id.*

61. *Id.*

62. Jonathan Albright, *Algorithms might be everywhere, but like us, they're deeply flawed*, THE CONVERSATION (Oct. 19, 2016, 3:13 PM), <https://theconversation.com/algorithms-might-be-everywhere-but-like-us-theyre-deeply-flawed-66838>.

63. Rebecca Heilweil, *Why algorithms can be racists and sexists*, VOX (Feb. 18, 2020, 12:20 PM), <https://www.vox.com/recode/2020/2/18/21121286/algorithms-bias-discrimination-facial-recognition-transparency>.

64. *Id.*

65. *Id.*

66. *Id.*

67. *Id.*



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gender have long played a role in how our society functions and reacts. For Black people and women of all races, exclusionary practices based on racial and gender biases date back to some of the earliest days in American history.

### *A. Historical Racial Context*

In a racial context, the discriminatory effect algorithms have placed on Black people reflect discriminatory practices and biases that have existed in the United States well before the first technological advancement.

#### *1. United States Constitution*

Dating back to the 1790s, the United States Constitution indirectly legitimized Black people as the inferior race.<sup>68</sup> Article I, Section 2, Clause 3 of the Constitution required apportionment of seats in the House of Representatives on the basis of “whole [n]umber of free [p]ersons” in each state, minus the number of Indians not taxed, plus “three fifths of all other [p]ersons.”<sup>69</sup> Article I, Section 9, Clause 1 prohibited Congress from outlawing the “[i]mportation of such [p]ersons as any of the [s]tates now existing shall think proper to admit” until 1808.<sup>70</sup> Finally, Article IV, Section 2, Clause 3 required individuals to “deliver[ ] up” any “[p]erson held to [s]ervice or [l]abour in one [s]tate” who escaped into their territory.<sup>71</sup> These clauses heightened the social and legal accessibility of the enslavement of Black people while also spreading the notion that Black people were inferior to their White counterparts. Although slavery was legally prohibited in 1865 by the 13th Amendment,<sup>72</sup> Black codes and Jim Crow laws were soon implemented in response to keep Black people lower in the social ranks.<sup>73</sup>

#### *2. Jim Crow & Black Codes*

In response to the prohibition of slavery, many states created Black codes as an alternative to prevent the progression of Black people.<sup>74</sup> Specifically, Black codes placed limits on many aspects of their lives such as employment and property

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68. David Azerrad, *What the Constitution Really Says About Race and Slavery*, HERITAGE (Dec. 28, 2015), <https://www.heritage.org/the-constitution/commentary/what-the-constitution-really-says-about-race-and-slavery#:~:text=With%20the%20passage%20of%20the,at%20the%20heart%20of%20the>.

69. U.S. CONST. art. I, § 2, cl 3.

70. U.S. CONST. art. I, § 9, cl 1.

71. U.S. CONST. art. IV, § 2, cl 3.

72. Azerrad, *supra* note 68.

73. *The Black Codes and Jim Crow Laws*, NATIONAL GEOGRAPHIC, <https://www.nationalgeographic.org/encyclopedia/Black-codes-and-jim-crow-laws/> (last visited Oct. 30, 2020).

74. *Id.*

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rights.<sup>75</sup> For example, Black people that were able to obtain employment were often forced to sign yearly contracts.<sup>76</sup> Failure to do so could result in one of several harsh penalties including, but not limited to, arrest, the payment of a fine, or forced unpaid labor.<sup>77</sup>

Similarly, Jim Crow laws were state and local laws that continued to enforce racial segregation.<sup>78</sup> In response to the prohibition of slavery and the advancement of Black people during the Reconstruction Era,<sup>79</sup> white southern state legislatures created laws to prevent Black people from obtaining various rights including the right to vote, gain employment, and receive an education.<sup>80</sup> Like Black codes, any defiance could result in arrests, fines, and even violence or death.<sup>81</sup>

### 3. Present Day

Although discriminatory practices are not occurring as openly as in the past, they have not been completely abrogated. There are many ways racial biases are still being practiced and enforced in American society, whether consciously or unconsciously. Within recent decades, studies have proven that Black adults are often racially profiled and overpoliced, especially in comparison to their non-black counterparts.<sup>82</sup> Similarly, Black children have been proven to be overpoliced in schools, causing young children to be arrested and funneled into the juvenile justice system at a disproportionate rate in comparison to their non-black counterparts.<sup>83</sup>

Basic characteristics of Black people are still negatively viewed causing discriminatory practices to persist in a variety of settings. For example, only a few states, including Maryland, currently have laws prohibiting against hair discrimination in the workplace.<sup>84</sup> However, many Black men and women are still being excluded from job opportunities for wearing hair representative of black

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75. *Id.*

76. *Black Codes*, HISTORY, <https://www.history.com/topics/Black-history/Black-codes> (last updated Jan. 21, 2020).

77. *Id.*

78. *Jim Crow Laws*, HISTORY, <https://www.history.com/topics/early-20th-century-us/jim-crow-laws> (last updated Jan. 19, 2021).

79. *See Reconstruction*, HISTORY, <https://www.history.com/topics/american-civil-war/reconstruction> (last visited Oct. 30, 2020) (“Reconstruction (1865-1877), the turbulent era following the Civil War, was the effort to reintegrate Southern states from the Confederacy and 4 million newly-freed slaves into the United States.”).

80. *Id.*

81. *Id.*

82. *See* ALISON BEHNKE, *RACIAL PROFILING: EVERYDAY INEQUALITY* 77 (2017) (“Studies by government agencies, civil rights organizations, and independent researchers show that in the United States, law enforcement profiling contributes to statistically higher numbers of police stops and arrests of people of color . . .”).

83. *Id.* at 78.

84. Taylor Lumpkin, *New law now prohibits hair discrimination in Maryland*, MARQUEE BROADCASTING INC. (Oct. 1, 2020), <https://www.wmdt.com/2020/10/new-law-now-prohibits-hair-discrimination-in-maryland/>.

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culture, such as braids and dreadlocks.<sup>85</sup> All of these discriminatory practices relate back to America's first view of Black people as the lesser being.<sup>86</sup> These views have carried throughout decades and are now being funneled into algorithms and artificial intelligence software that are expected to respond and make decisions better than humans, but are often enforcing the same discriminatory practices and biases.

### *B. Historical Gender Context*

#### *1. The Inability to See Women Outside the Kitchen*

Dating back to the early American centuries, family and gender structures reflected European models.<sup>87</sup> The models held the idea that men took care of the family financially while women took care of the family inside the home.<sup>88</sup> Specifically, a woman's capabilities were often limited to caregiving tasks such as baking, sewing, and raising the children.<sup>89</sup> Viewed as inferior to men,<sup>90</sup> women were essentially left outside the job market.<sup>91</sup> Even women who were able to enter the workforce were faced with limited employment options.<sup>92</sup> Many women were seamstresses or the like.<sup>93</sup> In the early 19th century, women were excluded from most professions, except writing and teaching.<sup>94</sup> This is heavily due to the long-lasting view that women were unable to perform jobs that required muscular or intellectual capacities.<sup>95</sup>

#### *2. Present Day*

Women have entered in nearly all work spaces and environments that were previously dominated by men. However, their mere presence has not resulted in just work environments. For instance, there is still a disproportionately low

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85. See Alisha Jarwala, *Fighting Workplace Hairstyle Discrimination: An Explainer*, ON LABOR. (Mar. 12, 2020), <https://www.onlabor.org/fighting-workplace-hairstyle-discrimination-an-explainer/> (explaining how Chasity Jones's employment offer was rescinded after refusing to cut her dreadlocks).

86. Azerrad, *supra* note 68.

87. *Women and Children in Colonial America*, NAT'L GEOGRAPHIC, <https://www.nationalgeographic.org/encyclopedia/women-and-children-colonial-america/> (last visited Oct. 30, 2020).

88. *Id.*

89. *Id.*

90. *Women's History in America*, WOMEN'S INT'L CTR., <http://www.wic.org/misc/history.htm> (last visited Oct. 30, 2020).

91. *Id.*

92. *Id.*

93. *Id.*

94. *Id.*

95. *Id.*

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representation of women in higher-up positions.<sup>96</sup> Women are still paid less than their male counterparts, often for no other reason other than their gender.<sup>97</sup> Thus, the concept of women as the inferior is still present in the minds of many individuals, including those creating algorithms which causes gender biases to exist in artificial intelligence software.

## V. Where are We Today?

### A. How Algorithmic Bias Functions

Two commonly recognized ways algorithmic biases occur are by human bias or via overrepresented or underrepresented data collection.<sup>98</sup> Human algorithm bias focuses on the individuals gathering and training the data to create an algorithm to later be used for machine learning.<sup>99</sup> This form of bias takes on the notion that data scientists or engineers that are collecting and training the data have their own personal biases, whether conscious or unconscious.<sup>100</sup> These internal biases end up being reflected in the data collection and training process.<sup>101</sup> Algorithm bias that stems from overrepresented or underrepresented data collection leads to the same problem, but occurs in a different manner. This form of algorithmic bias is not based on the internal bias of an individual, but the quantity and quality of the data collected for the algorithm.<sup>102</sup> If the data collected fails to sufficiently represent a particular race or gender, the final system will inevitably disregard or mistreat a particular race or gender in its performance.<sup>103</sup> Because algorithmic technology is rapidly increasing, the negative effect of algorithmic bias is reaching many environments we interact in daily.

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96. Darina Lynkova, *Shocking Male vs. Female CEO Statistics 2020*, LEFTRONIC (Mar. 6, 2020), <https://leftronic.com/ceo-statistics/#:~:text=Fortune%20500%20CEO%20statistics%20prove,new%20record%20for%20women%20CEOs> (stating that only 33 women have been appointed as CEOs of Fortune 500 companies).

97. *The State Of The Gender Pay Gap In 2020*, PAY SCALE, <https://www.payscale.com/data/gender-pay-gap> (last visited Oct. 30, 2020).

98. Rebecca Heilweil, *Why Algorithms Can Be Racists and Sexists*, VOX (Feb. 18, 2020, 12:20 PM), <https://www.vox.com/recode/2020/2/18/21121286/algorithms-bias-discrimination-facial-recognition-transparency>.

99. Richmond Alake, *Algorithm Bias In Artificial Intelligence Needs to Be Discussed (And Addressed)*, TOWARDS DATA SCIENCE (Apr. 27, 2020), <https://towardsdatascience.com/algorithm-bias-in-artificial-intelligence-needs-to-be-discussed-and-addressed-8d369d675a70>.

100. *Id.*

101. *Id.*

102. *Id.*

103. See Tom Hale, *This Viral Video of a Racist Soap Dispenser Reveals a Much, Much Bigger Problem*, IFL SCI. (Aug. 18, 2017, 1:49 PM), <https://www.iflscience.com/technology/this-racist-soap-dispenser-reveals-why-diversity-in-tech-is-muchneeded/> (describing how a soap dispenser did not respond to Black hands because the data collected for the algorithm failed to include a sufficient variety of skin tones).

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### *B. Algorithmic Bias in Employment*

Algorithmic bias has shown to have harmful effects in the employment industry in both job advertising and job screening.<sup>104</sup> From a job advertising perspective, many employers are now using algorithmic platforms in the hopes of seeking the most “relevant” job candidates.<sup>105</sup> The algorithmic platforms include a two-step process for deciding who will see a particular ad. The steps include the ad creation phase and the ad delivery phase.<sup>106</sup> The ad creation phase includes a targeting service that allows advertisers to specify what type of individuals will be eligible to view the ad.<sup>107</sup> Advertisers are able to tailor their audience to focus on or exclude legally protected classes like race and gender.<sup>108</sup> During the ad delivery phase, algorithmic platforms, not the advertiser, use the pool of eligible ad viewers developed in the targeting process to decide who will actually see the ad.<sup>109</sup> To make this decision, the algorithmic platform collects data to determine who is most likely to engage with the ad, including data relating to prior ad performance and interactions.<sup>110</sup> However, this can result in the ad being primarily viewed by a subgroup of the advertiser’s selected audience.<sup>111</sup> That is, instead of targeting the most relevant job candidates as the advertiser planned, the algorithmic platform targets individuals who are likely to click the add based on long-held gender and racial stereotypes about past employers in a particular industry.<sup>112</sup> For example, a recent study targeted Facebook employer ads for various jobs, including the lumber industry and cashier positions.<sup>113</sup> The ads were created with the same broad and diverse target audiences, but the results showed that the lumber industry ads had an audience that was 90% male while the cashier position had an audience that was 85% female.<sup>114</sup> The identical targeting, yet different audiences reached, reveal that the algorithm platform was not predicting the most successful candidates, but mirroring previous employment data as the lumber

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104. JENNY R. YANG & RACHEL SEE, THE PROMISE AND THE THREAT OF ARTIFICIAL INTELLIGENCE IN COMBATING (OR WORSENING) EMPLOYMENT Discrimination in NAPABA CONVENTION SESSION #506 (2019).

105. Miranda Bogen, *All the Ways Hiring Algorithms Can Introduce Bias*, HARV. BUS. REV. (May 6, 2019), <https://hbr.org/2019/05/all-the-ways-hiring-algorithms-can-introduce-bias>.

106. Muhammad Ali et al., *Discrimination Through Optimization: How Facebook’s Ad Delivery Can Lead to Skewed Outcomes*, 3 PROC. OF THE ACM ON HUM.-COMPUT. INTERACTION 1, 1 (2019).

107. *Id.*

108. *Id.*

109. The Secretary, U.S. Dep’t of Housing and Urban Development v. Facebook, Inc., FHEO No. 01-18-0323-8 (filed Aug. 13, 2018).

110. Ali, *supra* note 106, at 1.

111. *Id.* at 1–2 .

112. Bogen, *supra* note 105.

113. Ali, *Supra* note 106, at 1-2.

114. *Id.*

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industry is historically over 80% male<sup>115</sup> and cashiers are historically over 70% women.<sup>116</sup>

Similar issues occur in employment screening.<sup>117</sup> During this process, employers are often seeking to determine which applications are stronger than others.<sup>118</sup> An algorithmic machine learning system can assist by assessing, scoring, and ranking applications based on preferred qualifications and skillsets.<sup>119</sup> The data used to create these algorithms often result in discriminatory results because the algorithm is based on previous hiring decisions and evaluations of top performers.<sup>120</sup> For instance, in 2014, Amazon designed a machine-learning specialist to recruit prospective employees.<sup>121</sup> The system created a scoring scheme for potential candidates based on patterns found in previously submitted resumes collected over a 10-year period.<sup>122</sup> However, since the tech industry is historically male dominant, the machine-learning specialist ultimately erred when the system penalized resumes including the word “women’s.”<sup>123</sup> Thus, past hiring decisions may exclude racial and gender minorities causing the data collected to be under representative of these groups.<sup>124</sup> In turn, the insufficient data will continue to screen out the same historically underrepresented groups in the hiring process.<sup>125</sup>

### C. Algorithmic Bias in Healthcare

Algorithmic bias also has tremendous discriminatory effects regarding access to healthcare. Commercial algorithms are now being implemented into the American healthcare system.<sup>126</sup> Part of the algorithm’s job is to determine which patients are in the most need and should be placed in special treatment programs.<sup>127</sup> Although the

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115. *Labor Force Statistics from the Current Population Survey*, U.S. BUREAU OF LAB. STAT., <https://www.bls.gov/cps/cpsaat18.htm> (last visited Dec. 18, 2020).

116. *Cashiers*, DATA USA, <https://datausa.io/profile/soc/cashiers#:~:text=Gender%20Composition&text=72%25%20of%20Cashiers%20are%20Female,common%20gender%20in%20the%20occupation> (last visited Dec. 18, 2020).

117. Yang, *supra* note 104.

118. *Id.*

119. *Id.*

120. *Id.*

121. Jeffrey Dastin, *Amazon scraps secret AI recruiting tool that showed bias against women*, REUTERS (Oct. 10, 2018, 7:04 PM), <https://www.reuters.com/article/us-amazon-com-jobs-automation-insight/amazon-scrap-secret-ai-recruiting-tool-that-showed-bias-against-women-idUSKCN1MK08G>.

122. *Id.*

123. *Id.*

124. Yang, *supra* note 104.

125. *Id.*

126. Tom Simonite, *A Health Care Algorithm Offered Less Care to Black Patients*, WIRED (Oct. 24, 2019, 2:00 PM) <https://www.wired.com/story/how-algorithm-favored-Whites-over-Blacks-health-care/>.

127. *Id.*

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system was intended to be race neutral, it resulted in racially discriminatory performances that excluded many African-Americans facing severe medical conditions.<sup>128</sup> Rather than race, the collected data for the algorithm focused on patients' healthcare costs.<sup>129</sup> Specifically, the algorithm assigned risk scores to patients based on their healthcare costs within a one-year period.<sup>130</sup> This data collection represents a human algorithmic bias. That is, the individuals who collected the data created the algorithm based on the false assumption that every American can afford access to healthcare and thus reviewing yearly healthcare cost would actually be reflective of patients' medical needs.<sup>131</sup> However, in reality, because many minorities are medically uninsured, their yearly costs are often less than what would be spent if they could afford the necessary care.<sup>132</sup> For instance, prior to the Affordable Care Act's (ACA), 40.5% percent of Hispanics and 25.8% of Black people were uninsured, compared to the 14.8% of White people.<sup>133</sup> This lack of healthcare insurance was reflected in the commercial algorithm as it only flagged 17.7% of Black people as in need of extra medical care, even though evidence showed that the number would have been approximately 46.5% had the algorithm been based on factors other than annual medical spending.<sup>134</sup>

The healthcare system has also tried using an artificial intelligence system to help alleviate missed and overbooked appointments.<sup>135</sup> The system was designed to predict which patients were most likely to no-show their appointments.<sup>136</sup> Like the previously described example, this system was flawed due to the choices made by the individuals collecting the data. First, the data collected personal information such as ethnicity, financial class, and body mass index to determine who was likely to no-show.<sup>137</sup> By doing this, the system would likely result in excluding already marginalized groups, such as Black people from low-income communities.<sup>138</sup>

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128. *Id.*

129. Heidi Ledford, *Millions of Black people affected by racial bias in health-care algorithms*, NATURE (Oct. 24, 2019), <https://www.nature.com/articles/d41586-019-03228-6>.

130. *Id.*

131. *Id.*

132. Christen Linke Young, *There are clear, race-based inequalities in health insurance and health outcomes*, BROOKINGS (Feb. 19, 2020), <https://www.brookings.edu/blog/usc-brookings-schaeffer-on-health-policy/2020/02/19/there-are-clear-race-based-inequalities-in-health-insurance-and-health-outcomes/>.

133. Thomas C. Buchmueller et al., *Effect of the Affordable Care Act on Racial and Ethnic Disparities in Health Insurance Coverage*, 106 AM. J. PUB. HEALTH 1354 (2016).

134. Ledford, *supra* note 129.

135. Sara G. Murray, Robert M. Wachter & Russell J. Cucina, *Discrimination by Artificial Intelligence in a Commercial Electronic Health Record – A Case Study*, HEALTH AFF. (Jan. 31, 2020), <https://www.healthaffairs.org/doi/10.1377/hblog20200128.626576/full/>.

136. *Id.*

137. *Id.*

138. *Id.*

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Although the system was recreated, potential bias still occurred.<sup>139</sup> Absent personal information, the system focused on prior patterns of healthcare use.<sup>140</sup> Again, this data will make predictions that will disproportionately effect minorities as they typically have less access to healthcare.<sup>141</sup>

**VI. Legal Implications: Violations of the Civil Rights Act of 1964**

In response to the civil rights movement, the Civil Rights Act of 1964 (“CRA”) was passed.<sup>142</sup> As it still stands today, the CRA prohibits discrimination on the basis of race, color, religion, sex, or natural origin.<sup>143</sup> These prohibitions further apply to employers under Title VII on the CRA.<sup>144</sup> In addition, Title VI of the CRA makes clear that “any program or activity that receives Federal funds or other Federal financial assistance” is also prohibited from discriminating on the basis of race, color, or national origin.<sup>145</sup>

Under Title VII, the CRA specifically states that, “it shall be unlawful employment practices for an employer . . . to fail or refuse to hire . . . because of such individual’s race, color, religion, sex, or national origin . . . .”<sup>146</sup> Although not a deliberate refusal, it could be argued that individuals that create machine learning or deep learning algorithms that exclude racial or gender minorities are committing discriminatory practices under Title VII.

In order to make a claim for employment discrimination, a plaintiff must prove the four following elements:

*(1) the [potential] employee is a member of a protected class; (2) the discriminator knew of the [potential] employee’s protected class; (3) acts of harm occurred; and (4) others who were similarly situated were either*

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139. *Id.*

140. *Id.*

141. Murray et al., *supra* note 135.

142. *Civil Rights Act of 1964*, HIST., <https://www.history.com/topics/Black-history/civil-rights-act#:~:text=The%20Civil%20Rights%20Act%20of%201964%2C%20which%20ended%20segregation%20in,of%20the%20civil%20rights%20movement> (last visited Oct. 30, 2020).

143. Civil Rights Act, 42 U.S.C. § 2000e (1964).

144. *Title VII of the Civil Rights Act of 1964*, EEOC, <https://www.eeoc.gov/statutes/title-vii-civil-rights-act-1964> (last visited October 30, 2020).

145. *Civil Rights Requirements- A. Title VI of the Civil Rights Act of 1964, 42 U.S.C. 2000d et seq. (Title VI’)*, U.S. DEP’T OF HEALTH AND HUM. SERV., <https://www.hhs.gov/civil-rights/for-individuals/special-topics/needy-families/civil-rights-requirements/index.html#:~:text=Title%20VI%20of%20the%20Civil%20Rights%20Act%20of%201964%2C%2042,or%20other%20Federal%20financial%20assistance> (last visited October 30, 2020).

146. Civil Rights Act, 42 U.S.C. § 2000e-2(a)(1) (1964).



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*treated more favorably or not subjected to the same or similar adverse treatment.*<sup>147</sup>

Focusing on the algorithmic bias in employment screening, the first element is met because Black people and women are typically screened out of the hiring process and race and gender are both protected classes.<sup>148</sup> Although the second element may be more challenging to prove, it could be satisfied when highlighting algorithms that take race into account. It could then be argued that both the creator and employer knew of the race or gender when the algorithmic system continually excluded those protected classes based on its predicative performance. Third, the harm occurred would be the denial of employment if it can be shown that the system penalizes or screens out factors associated with the particular race or gender. For example, the Amazon recruiter algorithm previously discussed was shown to penalize applications that included the word “women’s” demonstrates a harm based on the account of gender.<sup>149</sup> Finally, the fourth element can be proven based on evidence that shows screening algorithms are based on previous racial and gender inequities which in turn causes others, such as White males, to be treated more favorably because the data collected and trained demonstrates a strong preference for that particular race and gender.<sup>150</sup>

Focusing on discrimination in healthcare, state funded hospitals using artificial intelligence that results in algorithmic bias may fall under Title VI as a federally funded “program or activity.”<sup>151</sup> This language includes indirect sources of hospital funding such as Medicare and Medicaid payments.<sup>152</sup> Under the disparate impact discrimination theory, the violation focuses on discriminatory practices that have an adverse or disproportionate effect on individuals of a protected class.<sup>153</sup> Further, an entity is “prohibited from utilizing criteria or methods of administration that have the effect, even if unintentional, of subjecting individuals to discrimination because of

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147. Jennifer Issacs, *Proving Title VII Discrimination in 2019*, AM. B. ASS’N, [https://www.americanbar.org/groups/young\\_lawyers/projects/no-limits/proving-title-vii-discrimination-in-2019/](https://www.americanbar.org/groups/young_lawyers/projects/no-limits/proving-title-vii-discrimination-in-2019/) (last visited Oct. 30, 2020).

148. 42 U.S.C. § 2000e-2.

149. Dastin, *supra* notes 121-123.

150. *AI and Equitable Hiring in a Post-Pandemic World: Trend Brief*, CATALYST (Jul. 21, 2020), <https://www.catalyst.org/research/ai-equitable-hiring-trend-brief/>.

151. Sarah Rosenbaum et al., *Civil Rights in A Changing Health Care System*, 16 HEALTH AFF. 90, 92-93 (1997).

152. *Id.* at 93.

153. *Applying Title VI of the Civil Rights Act of 1964*, AM. B. ASS’N, (Nov. 1, 2016), [https://www.americanbar.org/groups/public\\_interest/child\\_law/resources/child\\_law\\_practiceonline/child\\_law\\_practice/vol-35/november-2016/applying-title-vi-of-the-civil-rights-act-of-1964/#:~:text=Overview%20of%20Title%20VI%20of%20the%20Civil%20Rights%20Act%20of%201964&text=T%20o%20prove%20intentional%20discrimination%2C%20one,ill%2Dwill%20is%20not%20required.](https://www.americanbar.org/groups/public_interest/child_law/resources/child_law_practiceonline/child_law_practice/vol-35/november-2016/applying-title-vi-of-the-civil-rights-act-of-1964/#:~:text=Overview%20of%20Title%20VI%20of%20the%20Civil%20Rights%20Act%20of%201964&text=T%20o%20prove%20intentional%20discrimination%2C%20one,ill%2Dwill%20is%20not%20required.)

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their race, color, or national origin, or have the effect of defeating or substantially impairing accomplishment of the program's objectives."<sup>154</sup>

To prove a disparate impact, a plaintiff must initially show that a facially neutral practice has a racially disproportionate effect.<sup>155</sup> In the aspect of algorithmic bias in access to healthcare, it can be argued that the algorithm was designed with the intent to be racially neutral, as stated by its very creators.<sup>156</sup> However, as stated above, there is evidence of racially disproportionate effects as the algorithm proved to exclude Black people who were actually in more need of extra medical attention than many of the non-black counterparts who were chosen to receive special healthcare treatment.<sup>157</sup> The burden would then shift to the recipient to prove a substantial legitimate justification for the practice.<sup>158</sup> However, a plaintiff may prevail by proffering an equally effective alternative practice that results in a lesser racially disproportionate effect.<sup>159</sup> Thus, a plaintiff could argue that a previous non-algorithmic practice or an algorithmic method that is unbiased would be a more effective alternative with a less racially disproportionate effect. Previous litigation indicates that courts have found disparate impact violations under Title VI in cases where recipients have practices that result in the fewer services or benefits to members of a protected class.<sup>160</sup> Here, it is evident that Black healthcare patients were largely excluded from special treatment programs they were actually in need of, especially in comparison to some of the non-black patients that were actually treated.<sup>161</sup>

### VII. What's Next?: Potential Remedies Outside Litigation

Although litigation is a potential option to address algorithmic bias, it is not the only option to consider. One consideration is enhancing diversity in the technology industry. As recent years demonstrate, the technology industry lacks sufficient numbers of women and people of color. For instance, a 2019 study showed that only 2.5% of Google employees were Black, while Facebook and Microsoft are each only

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154. *Id.* See also 28 C.F.R. § 42.104(b)(2) (2003).

155. *Applying Title VI of the Civil Rights Act of 1964*, *supra* note 153.

156. Simonite, *supra* note 128 (explaining how even race-neutral formulas can still have discriminatory effects when they lean on data that reflects inequalities in society).

157. *Supra* notes 128, 134.

158. *Applying Title VI of the Civil Rights Act of 1964*, *supra* note 153

159. *Id.*

160. See *Meek v. Martinez*, 724 F. Supp. 888 (S.D. Fl. 1987) (holding that the utilization of a funding formula for distributing federal aid resulted in a substantially adverse disparate impact on minorities and the elderly and thus violated the Civil Rights Act). See also *Larry P. By Lucille P. v. Riles*, 793 F.2d 969 (9th Cir. 1984) (holding that the use of a non-validated IQ test that resulted in a disproportionate number of African-American school children being placed in special education classes qualified as a disparate impact under Title VI).

161. Simonite, *supra* note 128.

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at 4%.<sup>162</sup> Another study found that 80% of artificial intelligence professors in 2018 were men.<sup>163</sup> Since human bias in algorithms is rooted in internal biases of the individual creating the algorithm, it may be better moderated and eliminated if more diverse individuals participated in the collection and training of data.<sup>164</sup> Thus, a more diverse representative set of individuals could result in the elimination of human bias.<sup>165</sup>

Further, much of algorithmic bias is hard to fully understand because their processes and methods are not easily visible.<sup>166</sup> Not only does this leave many without knowledge of why or how they were discriminated against, but it also leaves no room for public accountability. Thus, transparency will better allow for remedial processes to occur when bias algorithms are detected.<sup>167</sup> Similar to public accountability, internal accountability must be prioritized as well. If companies began doing internal audits periodically, it can better monitor, locate and adjust algorithms that indicate discriminatory performances.<sup>168</sup> Ultimately, more involvement from diverse parties in the data collection and training process and the continual monitoring of algorithms are crucial to decrease or eliminate algorithmic bias.

### **VIII. Conclusion**

Technological advances are always known for their contributions to social growth, but it is just as important to be mindful that they are not always perfect or functioning as desired. Although artificial intelligence systems have expanded and improved over the years, the technology may only be as well as the people or data that create it. Thus, it is imperative to properly collect, train, and oversee the data periodically to prevent algorithmic bias.

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162. SARAH MYERS WEST, MEREDITH WHITTAKER & KATE CRAWFORD, *DISCRIMINATING SYSTEMS: GENDER, RACE AND POWER IN AI 5* (2019).

163. *Id.*

164. Michael Li, *To Build Less-Biased AI, Hire a More-Diverse Team*, HARV. BUS. REV. (Oct. 26, 2020), <https://hbr.org/2020/10/to-build-less-biased-ai-hire-a-more-diverse-team>.

165. *See id.* (explaining how lack of diversity in building facial recognition can lead to lack of diversity in the data collection).

166. West et al., *supra* note 162, at 4.

167. *Id.*

168. Ramprakash Ramamoorthy, *How Can We Remove the Bias in Algorithmic Decision Making?*, DATAVERSITY (Nov. 22, 2019), <https://www.dataversity.net/how-can-we-remove-the-bias-in-algorithmic-decision-making/#:~:text=In%20order%20to%20protect%20against,and%20after%20implementing%20AI%20tools>.