



WHEN ARTIFICIAL INTELLIGENCE INVENTS:  
RECALCULATING THE PATENT ACT  
FOR AI-GENERATED INVENTIONS

*Justin Dersh*

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I. INTRODUCTION

On April 22, 2020, the U.S. Patent and Trademark Office (“USPTO”) upheld a patent examiner’s rejection of a patent application listing an artificial intelligence (“AI”) neural network named “DABUS” as its sole inventor.<sup>1</sup> The USPTO reasoned that conception of an invention could be performed only by a natural person.<sup>2</sup> The finding was based on the plain language of the Patent Act and the Manual of Patent Examining Procedure, as well as Federal Circuit precedent describing conception as a “formation of the *mind* of the inventor” and a “*mental act*.”<sup>3</sup> The ruling, though consistent with current law, undoubtedly presents questions about how patent law should address AI-inventions in the future.<sup>4</sup> Unsurprisingly, as AI has become more ubiquitous and advanced, there has been an uptick in AI-related patent application filings at the

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1. *Ex parte* FlashPoint IP Ltd., 2019 Dec. Comm’r Pat. DABUS is a series of neural networks that have been trained with general information in the field of endeavor. *Id.* The U.S. Patent Application in this case was titled “Devices and Methods for Attracting Enhanced Attention.” *Id.*

2. Rebecca Tapscott, *USPTO Shoots Down DABUS’ Bid for Inventorship*, IPWATCHDOG (May 4, 2020), <https://www.ipwatchdog.com/2020/05/04/uspto-shoots-dabus-bid-inventorship/id=121284/>.

3. *Id.* (emphasis added).

4. *See id.*

USPTO.<sup>5</sup> Between 2002 and 2018, the annual number of AI patent applications increased by more than 100%.<sup>6</sup> In response to this surge, the USPTO initiated a “request for comments” in 2019 on AI-inventions from both industry and the general public.<sup>7</sup> The survey posed twelve questions about how certain areas of patent law for AI-inventions should be addressed including inventorship and ownership, non-obviousness, written description and enablement, prior art, and subject matter eligibility.<sup>8</sup> This commentary will explore inventorship and ownership, prior art, infringement liability, and non-obviousness issues. It will analyze how well the current law can address them and posit ideas on how they should be resolved by the Patent Act in the future.

In order to determine how patent law should address “AI-inventions” going forward, it is imperative to first explicitly define that term.<sup>9</sup> The USPTO has suggested that AI-inventions may refer both to inventions that *utilize* AI, as well as inventions that are *generated* by AI.<sup>10</sup> These conceptions, however, are vastly different and require independent analysis. This commentary will primarily consider only those inventions that were developed or generated by AI.

## II. INVENTORSHIP AND OWNERSHIP CONSIDERATIONS

Two great areas of concern for AI-generated inventions are the issues of inventorship and ownership. In a typical non-AI invention scenario, the “inventor” of a patent is the natural person who conceives the “definite and permanent idea” of the claimed invention and reduces it to practice.<sup>11</sup> The ownership of the patent (or patent application) initially vests in the named inventor of the patent, but ownership can be transferred through written instrument to other legal entities like an employer.<sup>12</sup> Ownership is what ultimately provides “the right to exclude

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5. See *When AI Creates AI—Who Owns the Rights?*, DAVIS WRIGHT TREMAINE LLP (Sept. 9, 2019), <https://www.dwt.com/blogs/artificial-intelligence-law-advisor/2019/09/uspto-comments-on-ai-patent-applications>.

6. USPTO, INVENTING AI: TRACING THE DIFFUSION OF ARTIFICIAL INTELLIGENCE 2 (2020), <https://www.uspto.gov/sites/default/files/documents/OCE-DH-AI.pdf>.

7. See *When AI Creates AI—Who Owns the Rights?*, *supra* note 5.

8. *Id.*

9. Much confusion seems to arise from this issue alone, as academics debating the issues have wildly different conceptions of the term.

10. Request for Comments on Patenting Artificial Intelligence Inventions, 84 Fed. Reg. 44889, 44889 (Aug. 27, 2019).

11. MPEP § 2138.04 (9th ed. Rev. 10.2019, June 2020).

12. MPEP § 301 MPEP § 2138.04 (9th ed. Rev. 10.2019, June 2020).

others from making, using, offering for sale, or . . . selling, or importing . . . into the United States the [invention claimed in the patent].”<sup>13</sup>

In resolving inventorship and ownership issues for AI-generated inventions, it is important to distinguish whether the AI is more akin to (1) an automated “tool” simply aiding a human inventor, or (2) a fully autonomous system capable of performing tasks in the absence of human instruction or interaction.<sup>14</sup> As discussed below, the differences between these two types of AI lead to different conclusions about how they should be treated under the Patent Act.

#### A. *Automated AI*

Today, “narrow” or automated AI is state of the art.<sup>15</sup> This type of AI performs tasks in well-defined domains.<sup>16</sup> This AI is akin to an automated “tool” aiding a human inventor. In a typical case, a human programmer first codes detailed instructions that determines how an input-output relation is derived through computation.<sup>17</sup> A human then decides which data should be used to train the AI.<sup>18</sup> Once trained, the AI is used to automate calculations on real data without human participation.<sup>19</sup> After the AI displays an output, the results are interpreted by a human and ultimately applied to solve a real world problem.<sup>20</sup> Here, there are strong arguments that the AI should not be considered the “inventor” and ownership of the invention should not vest in the AI. First, the AI is a reflection of the human ingenuity and intelligence of the programmer and the data trainer.<sup>21</sup> The performance of a neural network depends principally on the framework arranged by the programmer: the number of nodes in the network, how they are interconnected, and the weights attributed to each node and each interconnection.<sup>22</sup> The neural network then learns and adjusts weights to improve accuracy through training data that is often selected and

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13. 35 U.S.C. § 154(a)(1).

14. See Daria Kim, *‘AI-Generated Inventions’: Time to Get the Record Straight?*, 69 GRUR INT’L 443, 446–47 (2020).

15. USPTO, PUBLIC VIEWS ON ARTIFICIAL INTELLIGENCE AND INTELLECTUAL PROPERTY POLICY 2 (2020), [https://www.uspto.gov/sites/default/files/documents/USPTO\\_AI-Report\\_2020-10-07.pdf](https://www.uspto.gov/sites/default/files/documents/USPTO_AI-Report_2020-10-07.pdf).

16. *Id.*

17. See Kim, *supra* note 14, at 446–47.

18. See *When AI Creates AI—Who Owns the Rights?*, *supra* note 5.

19. See Kim, *supra* note 14 at 448.

20. See *When AI Creates AI—Who Owns the Rights?*, *supra* note 5.

21. Kim, *supra* note 14, at 447.

22. See *id.* at 445.

applied in an inventive manner by the data trainer.<sup>23</sup> The programmer and data trainer are therefore the ones who determine the algorithm inputs and define the relationship to the outputs. The AI merely executes stipulated computational instructions, and therefore should not be personified as an independent legal entity capable of property ownership. Furthermore, it is ultimately a human engineer that formulates the “definite and permanent idea” of the invention, identifies a real world problem and applies the output in an inventive manner to solve that problem.<sup>24</sup> Therefore, the programmer, data trainer, and implementing engineer control the intellectual pursuit and contribute the ingenuity necessary to create the invention.<sup>25</sup> The reduction to practice occurs when the output is implemented, or when the patent application is submitted.<sup>26</sup> Ultimately, the AI programmer, data trainer, or implementing engineer can all be inventors provided they can articulate their contribution to the ultimate patent claim.<sup>27</sup> Ownership would also vest in them unless they assign their rights to another entity, like an employer.<sup>28</sup> Based on this analysis, modern-day patent law seems sufficiently capable of resolving inventorship and ownership issues when AI is akin to an automated tool.

One argument against this approach is that the human contribution may not be sufficient to satisfy the inventorship requirements.<sup>29</sup> In that case, there are only two potential outcomes under the current law: (1) no patent is granted; or (2) the human overstates their contribution in order to fraudulently obtain a patent in their own name.<sup>30</sup> Stephen Thaler argues these outcomes are “contrary to existing law and at odds with the policy underlying the patent system” in his recent District Court complaint against the USPTO, the latest occurrence in the DABUS saga.<sup>31</sup> Thaler explains that if no patent is granted to AI, AI-generated

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23. Letter from Laurie L. Hill, Vice President/Intell. Prop., Genentech, to The Hon. Andrei Iancu, Under Sec’y of Com. for Intell. Prop./Dir. of the U.S. Pat. and Trademark Off. (Nov. 8, 2019), [https://www.uspto.gov/sites/default/files/documents/Genentech-Roche-Diabetes-Care\\_RFC-84-FR-44889.pdf](https://www.uspto.gov/sites/default/files/documents/Genentech-Roche-Diabetes-Care_RFC-84-FR-44889.pdf).

24. See MPEP § 2138.04 (8th ed. Rev. 7, Sept. 2008).

25. See Gene Quinn, *Inventorship 101: Who are Inventors and Joint Inventors?*, IPWATCHDOG (Mar. 9, 2018), <https://www.ipwatchdog.com/2018/03/09/inventorship-joint-inventors-co-inventors/id=94592/>.

26. *Id.*

27. *See id.*

28. See MPEP § 301 (8th ed. Rev. 7, Sept. 2008).

29. See Dani Kass, *Physicist Says AI Inventor Ban Alters Patentability Criteria*, LAW360 (Aug. 10, 2020), <https://www.law360.com/articles/1299867/physicist-says-ai-inventor-ban-alters-patentability-criteria>.

30. *See id.*

31. Complaint at 1–2, Thaler v. Iancu, No. 1:20-CV-00903 (E.D. Va. Aug. 6, 2020).

inventions will head straight into the public domain.<sup>32</sup> He contends that outcome would directly undermine the purpose of the patent system, which is designed to encourage innovation through grant of “government-sanctioned monopolies.”<sup>33</sup> Alternatively, he argues a lack of patent grant to an AI could lead humans who were only tangentially involved to overstate their contribution and commit fraud on the Patent Office.<sup>34</sup> This fraud could lead to the patents being rejected and even result in criminal punishment under 18 U.S.C. § 1001.<sup>35</sup>

Although Mr. Thaler makes ostensibly valid arguments, the district court is likely to reject them. First, the incentive to develop AI capable of generating inventions will not be stifled by denial of patent applications listing AI as inventors. In fact, the U.S. currently does not grant patents to AI, and yet research and investment in AI has exploded in recent years.<sup>36</sup> There has been a sixfold increase in the investment levels by venture capitalists in U.S.-based AI startups since 2000.<sup>37</sup> This growth can be attributed to AI’s potential in “reducing costs, managing risks, streamlining operations and fueling innovation.”<sup>38</sup> Moreover, AI has the ability to efficiently recognize complex patterns and correlations that may go undetected by humans and can lead to competitive advantages for businesses.<sup>39</sup> Second, as explained previously, the humans who program the input-output relationship, train the AI, and implement the output to solve a real world problem will have likely contributed to the claimed invention through their active involvement in the entire

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32. *Id.* at 7.

33. *Id.* at 8–9.

34. *Id.* at 7–8.

35. *Id.* Among other things, 18 U.S.C. § 1001 states that “any materially false, fictitious or fraudulent statement or representation” made to “the executive, legislative, or judicial branch” can be punishable by fine or up to five years imprisonment. 18 U.S.C. § 1001(a)(2).

36. See generally Jacques Bughin, et al., *Artificial Intelligence: the Next Digital Frontier?*, MCKINSEY & COMPANY: MCKINSEY GLOBAL INSTITUTE (June 15, 2017), <https://www.mckinsey.com/~media/mckinsey/industries/advanced%20electronics/our%20insights/how%20artificial%20intelligence%20can%20deliver%20real%20value%20to%20companies/mgi-artificial-intelligence-discussion-paper.ashx>.

37. Louis Columbus, *10 Charts That Will Change Your Perspective on Artificial Intelligence’s Growth*, FORBES (Jan. 12, 2018, 1:55AM), <https://www.forbes.com/sites/louiscolombus/2018/01/12/10-charts-that-will-change-your-perspective-on-artificial-intelligences-growth/?sh=5bc73b164758>.

38. Stephen Diorio, *Realizing the Growth Potential of AI*, FORBES (May 8, 2020, 6:44 PM), <https://www.forbes.com/sites/forbesinsights/2020/05/08/realizing-the-growth-potential-of-ai/?sh=1c707cfc33f3>.

39. See *id.*; see also, Ron Schmelzer, *Understanding the Recognition Pattern of AI*, FORBES (May 9, 2020, 3:49 PM), <https://www.forbes.com/sites/cognitiveworld/2020/05/09/understanding-the-recognition-pattern-of-ai/?sh=2ef1ae621c7a>.

process.<sup>40</sup> Third, granting patent rights to AI creates practical and administrative difficulties. AI systems cannot independently choose to license their inventions to others, assign their rights, sue for infringement, or collect royalty payments.<sup>41</sup> Finally, fraud on the Patent Office will likely not occur at a greater rate than it does today because inventors must still clearly articulate their contributions to the invention.<sup>42</sup> This notion is made clearer by analogizing AI's role to that of a lab technician. Today, lab technicians who merely carry out the directions of a superior in performing work or experiments that lead to an invention are not designated as inventors—no matter how much time and energy they expend.<sup>43</sup> Patent law rewards one's contributions to an inventive concept, rather than extent of one's labor.<sup>44</sup> In the case of modern-day machine learning, AI is akin to a lab technician. The AI simply follows the directions of its superior—the data trainer and programmer—and executes only those computations (or experiments) which it was told. It does not incorporate any “new” or “novel” architecture or feature that was not pre-determined.<sup>45</sup> As such, in the same way that the superior of a lab technician must articulate their contribution to a patent claim, so too must the AI programmer, data trainer, and implementing engineer when AI is used as a tool. Furthermore, fraud on the Patent Office will continue to be combated through the oath or declaration requirement of 35 U.S.C. § 115.<sup>46</sup> This statute requires that inventors affirm that “(1) the [patent] application was made or was authorized to be made by the affiant or declarant; and (2) such individual believes himself or herself to be the original inventor or an original joint inventor of a claimed invention.”<sup>47</sup>

### B. Fully Autonomous AI

Inventorship and ownership becomes considerably more difficult to ascertain in the case of a fully autonomous AI that is capable of determining input-output relationships (changing or improving its neural network architecture), choosing its own training data, and

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40. See *supra* Part II.A.

41. See Hodon Omaar, *Patent Law Doesn't Need to Recognize AI Inventors*, CENTER FOR DATA INNOVATION (June 25, 2020), <https://datainnovation.org/2020/06/patent-law-doesnt-need-to-recognize-ai-inventors/>.

42. See Quinn, *supra* note 25.

43. *Id.*

44. *Id.*

45. See Omaar, *supra* note 41.

46. See 35 U.S.C. § 115(b).

47. *Id.*

implementing an invention in the absence of human interaction.<sup>48</sup> Currently, a robust form of this self-executing AI does not exist.<sup>49</sup> However, this kind of AI may be developed in the not-so-distant future, and it would produce significant inventorship and ownership issues.<sup>50</sup> Under the current law, inventorship in this scenario could arguably reside in one of two places: (1) the programmers or data trainers that produced the original self-improving AI, or (2) the engineer at the entity licensing and implementing the AI. In the first case, the AI will almost inevitably have changed its input-output structure (neural network structure) from that which the original programmers created by the time of invention.<sup>51</sup> At that point, it is no longer a reflection of those who created it. Its architecture may be unrecognizable. With time and intervening changes to the AI structure, it would be difficult to square the original programmer or data trainer as an inventor of later created outputs.<sup>52</sup> In the second case, the engineer implementing the autonomous AI will likely have contributed little to the overall invention process. There could be an argument that the engineer contributed if the engineer was the one who identified the real-world problem and applied the solution in an inventive manner (explained in the previous section). But, apart from that, it is difficult to conclude that any human has contributed to the invention at all. In sum, no patent would be granted for fully autonomous AI inventions under the existing law.

Theoretically, if patents were to be granted to inventions generated by fully autonomous AI, granting a twenty-year patent term under the current Patent Act would have harmful and anti-competitive consequences.<sup>53</sup> Current inventorship and ownership laws would essentially provide an unlimited source of monopolies on new technologies to only those few entities with the financial resources and computing capabilities necessary to create and run sophisticated autonomous self-executing AI. This could lead to concentration of a great deal of intellectual property power in just a few large companies and would widen the existing disparity in market dominance of large firms

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48. See Edd Gent, *Artificial Intelligence Is Evolving All By Itself*, SCIENCEMAG (Apr. 13, 2020, 11:20 AM), <https://www.sciencemag.org/news/2020/04/artificial-intelligence-evolving-all-itself>; Edd Gent, *Google's AI-Building AI Is a Step Toward Self-Improving AI*, SINGULARITYHUB (May 31, 2017), <https://singularityhub.com/2017/05/31/googles-ai-building-ai-is-a-step-toward-self-improving-ai/>.

49. See Gent, *Artificial Intelligence Is Evolving All by Itself*, *supra* note 47.

50. See Gent, *Google's AI-Building AI Is a Step Toward Self-Improving AI*, *supra* note 48.

51. *When AI Creates AI—Who Owns the Rights?*, *supra* note 5.

52. *Id.*

53. See 35 U.S.C. § 154.

over small entrepreneurs. The large firms could dominate the markets by employing their algorithm in a wide range of scientific disciplines. The firms would not even need to practice or produce the claimed subject matter themselves – they could simply patent the AI generated inventions, license the patents, and profit. Arguably, these companies could reach a point where they violate Section 2 of the Sherman Act.<sup>54</sup> Their abuse of the patent system could be classified as an unlawful monopoly or attempted monopoly.<sup>55</sup> Autonomous AI could be run continuously, churning out patentable inventions. Less efficient (and sleep-prone) human inventors would not stand a chance in competing with these large firms and would be prevented from entering the marketplace unless they paid some kind of licensing fee.

This analysis begs two questions: if Congress were to amend the Patent Act, should it create a new patent right for inventions produced by fully autonomous AI, and if so, who should be considered the inventor and owner?

### C. *Sui Generis Patent Right for Fully Autonomous AI*

Because of the bleak anti-competitive outcome that could result from granting traditional patents to inventions of fully autonomous AI, a new type of intellectual property right should be recognized by Congress specifically to address technologies invented in that manner. This *sui generis* “AI-Patent” would balance the interest of entities employing fully autonomous AI for inventive purposes, as well as the public interest in not concentrating market power in a select few firms.

The new “AI-Patent” would have different inventorship and ownership rules and provide a shorter exclusionary term than traditional patents. As to inventorship and ownership, the AI-Patent would grant only to legal entities (persons or business-organizations) (1) actually using the autonomous AI and (2) employing the resulting AI-generated invention in a commercial marketplace. Under this framework, an AI-Patent would issue to the licensee using an autonomous AI, rather than the licensor that develops or owns the AI algorithm. This would help spread intellectual property rights to a greater number of firms, and would prevent AI-owning firms from reaping all the benefits. Additionally, it would resolve any ambiguity surrounding ownership and

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54. See Sherman Act of 1890, 15 U.S.C. § 2.

55. See *FTC, Single Firm Conduct*, FED. TRADE COMM’N, <https://www.ftc.gov/tips-advice/competition-guidance/guide-antitrust-laws/single-firm-conduct> (last visited June 16, 2021).

inventorship. The commercial marketplace requirement would also hamper the ability of one firm to simply stockpile AI-inventions and concentrate market power. Under this requirement, firms would actively need to invest in, and practice claimed inventions in order to be granted exclusionary rights. This would effectively place an upper limit on the number of patents granted to one firm, since firms would have only finite resources available to practice AI-generated inventions. An exception to these new inventorship requirements could be made for universities, which have historically developed patentable technology and licensed the rights to industry (as opposed to entering markets themselves).<sup>56</sup> Under the exception, universities would be exempt from the commercial marketplace requirement. This exception is justified by the public benefits of universities – they drive new business startups, improve people’s lives, and advance science and society.<sup>57</sup> Moreover, universities are unlikely to overtake big-industry and become the dominating market forces that are of primary concern.

In addition to the altered inventorship criteria, the exclusionary term of the “AI-Patent” would be shortened to five years. The twenty-year term currently given to traditional patents simply provides too great a benefit to firms, especially given that AI-generated inventions are not conceived by human beings.<sup>58</sup> The five-year term would give AI-Patent holders a competitive advantage in the market by enabling them to build their market share and consumer base for five years before other entities could practice the invention. It would reward those who invested time and money into autonomous AI with a valuable–albeit, limited–benefit. At the same time, the five year limit would enable smaller players and startups to enter the market without having to wait twenty years when the technology would presumably be obsolete (except perhaps in the case of life-saving pharmaceuticals). In sum, this new “AI-Patent” framework would help resolve the anti-competitive results that would occur if traditional patents under the current laws were to issue for inventions generated by autonomous AI.

The creation of the “AI-Patent” right will negate several countervailing arguments. It will render ineffective the argument that if

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56. See Dipanjan Nag, et al., *The Evolution of University Technology Transfer: By the Numbers*, IPWATCHDOG (Apr. 7, 2020), <https://www.ipwatchdog.com/2020/04/07/evolution-university-technology-transfer/id=120451/>.

57. See Jean-Paul Addie, *Seven Ways Universities Benefit Society*, THE CONVERSATION (Aug. 11, 2017, 7:37 AM), <https://theconversation.com/seven-ways-universities-benefit-society-81072>; Adam Hayes, *When Universities Patent Their Research*, IPWATCHDOG (Nov. 20, 2017), <https://www.ipwatchdog.com/2017/11/20/universities-patent-research/id=90200/>.

58. See 35 U.S.C. § 154.

patents are granted to AI inventions in other countries, but not in the United States, innovation in the United States will be disadvantaged on the global stage.<sup>59</sup> The underlying assumption of that argument is that there would be a lack of incentive to develop both new AI and new technologies using AI.<sup>60</sup> First, as noted earlier, there is currently no lack of incentive for investment in AI technology due to efficiency gains, reduced costs, and AI's ability to recognize complex patterns.<sup>61</sup> However, even if that were to change going forward, the AI-Patent would retain incentives to innovate by providing a five year right-to-exclude benefit to its holder. In fields like pharmaceuticals, where it is virtually impossible to keep an invention a trade secret due to regulation and opportunity for reverse engineering, this right to exclude will be invaluable.<sup>62</sup> Second, since we now live in a global marketplace, companies using autonomous AI would still be incentivized to develop AI and AI-generated technologies in order to patent their technologies in foreign countries where it is allowed.<sup>63</sup> In sum, companies would be incentivized to create new AI and AI-generated technologies in order to license and protect their technologies in foreign countries, and to practice their inventive ideas in the U.S. with a five year head start over competitors. Finally, all of the IP5 jurisdictions—consisting of the European, Japanese, Korean, Chinese, and U.S. Patent offices—currently require that an inventor be a natural person.<sup>64</sup> Until those organizations, which account for 80% of the

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59. See Memorandum from Student Members of Benjamin N. Cardozo's Intell. Prop. L. Soc'y to the U.S. Pat. and Trademark Off. 1–2 (Nov. 8, 2019), [https://www.uspto.gov/sites/default/files/documents/Cardozo-IPLS\\_RFC-84-FR-44889.pdf](https://www.uspto.gov/sites/default/files/documents/Cardozo-IPLS_RFC-84-FR-44889.pdf).

60. See *id.*

61. Diorio, *supra* note 38.

62. See Gunjan Agarwal, *Practical Tips for Securing Patent Rights for AI-Generated Inventions*, FOX ROTHSCHILD LLP (Mar. 30, 2020), <https://www.foxrothschild.com/publications/practical-tips-for-securing-patent-rights-for-ai-generated-inventions/>; see also Donald G. McNeil Jr., *Selling Cheap 'Generic' Drugs, India's Copycats Irk Industry*, N.Y. TIMES (Dec. 1, 2000), <https://www.nytimes.com/2000/12/01/world/selling-cheap-generic-drugs-india-s-copycats-irk-industry.html>.

63. See Gene Quinn, *PCT Basics: Understanding the International Filing Process*, IPWATCHDOG (Nov. 3, 2011), <https://www.ipwatchdog.com/2011/11/03/pct-basics-understanding-the-international-filing-process/id=19960/>.

64. *About IP5 Co-operation*, FIVEIPOFFICES, <https://www.fiveipoffices.org/about> (last visited June 26, 2021); EUR. PAT. OFF., REPORT FROM THE IP5 EXPERT ROUND TABLE ON ARTIFICIAL INTELLIGENCE 1–2 (2018), [https://www.fiveipoffices.org/wcm/connect/fiveipoffices/5e2c753c-54ff-4c38-861c-9c7b896b2d44/IP5+roundtable+on+AI\\_report\\_22052019.pdf?MOD=AJPERES&CVID=](https://www.fiveipoffices.org/wcm/connect/fiveipoffices/5e2c753c-54ff-4c38-861c-9c7b896b2d44/IP5+roundtable+on+AI_report_22052019.pdf?MOD=AJPERES&CVID=).

global patent market, change their policy, this counter argument will not have proper footing.<sup>65</sup>

Another argument submits that if no patent were granted for inventions of autonomous AI, inventions would never be published for the public, resulting in diminished dissemination of information and the slowing of technological advancement.<sup>66</sup> This argument has significant merit as the U.S. Constitution states that the patent system serves “[t]o promote . . . the useful arts.”<sup>67</sup> Fostering dissemination of information through a detailed patent is one of the principle means through which this objective is carried out.<sup>68</sup> This Congressional policy objective is made clear through the enablement requirement found in 35 U.S.C. 112(a). That statute ensures that “[t]he information contained in the disclosure of a [ ] [patent] application . . . be sufficient to inform those skilled in the relevant art how to both make and use the claimed invention.”<sup>69</sup> This requirement ensures that any person skilled in the art can make and use the invention without undue experimentation.<sup>70</sup> If patents are not fully enabled, they may be invalidated, or not granted in the first instance.<sup>71</sup> Public dissemination of information informs the public of how to practice the invention and gives the public the opportunity to build on it – toward advancement of science and society. The public disclosure is what is provided by a patent application as part of the quid-pro-quo for the right to exclude.<sup>72</sup> Clearly, dissemination of information is an important policy consideration. The creation of the AI-Patent right would render this issue moot as it would continue to require public disclosure of a patentable technology in order for the new intellectual property right to issue.

### III. PRIOR ART CONSIDERATIONS

Another problematic area under the current patent laws is AI’s potential for abuse – principally its use in the creation of mass amounts

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65. EUR. PAT. OFF., REPORT FROM THE IP5 EXPERT ROUND TABLE ON ARTIFICIAL INTELLIGENCE, *supra* note 64, at 1.

66. E-mail from Manny W. Schecter, Chief Pat. Counsel, IBM Corp., and Jennifer M. Anda, Pat. Portfolio Manager, to Hon. Andrei Iancu, Under Sec’y of Com. for Intell. Prop., U.S. Pat. and Trademark Off. (Nov. 8, 2019), [https://www.uspto.gov/sites/default/files/documents/IBM\\_RFC-84-FR-44889.pdf](https://www.uspto.gov/sites/default/files/documents/IBM_RFC-84-FR-44889.pdf).

67. U.S. CONST. art. I, § 8, cl. 8.

68. Email from Manny W. Schector to Hon. Andrei Iancu, *supra* note 66, at 4–5.

69. MPEP § 2164 (9th ed. Rev. 7, July 2020).

70. *See* Minerals Separation Ltd. v. Hyde, 242 U.S. 261, 270 (1916).

71. *See* MPEP § 2161 (9th ed. Rev. 7, July 2020).

72. Email from Manny W. Schector to Hon. Andrei Iancu, *supra* note 66, at 4–5.

of prior art.<sup>73</sup> In patent law, “[p]rior art constitutes those references or documents which may be used to determine novelty and/or non-obviousness of claimed subject matter in a patent application.”<sup>74</sup> Prior art includes disclosures that are “patented, described in a printed publication, or in public use, on sale, or otherwise available to the public.”<sup>75</sup> In a world where companies’ value and success are largely determined by the strength of their intellectual property relative to others, it is not unreasonable to imagine companies using AI to intentionally generate mass amounts of prior art to stifle competitors’ entry into the market.<sup>76</sup> Companies could apply their AI at high levels of abstraction to find every possible incremental solution to a certain problem and publish the results.<sup>77</sup>

Mass production of prior art through AI would have deleterious effects on competition and would obstruct the goals of the patent system. In the face of crushing amounts of AI-generated prior art in a given field, other companies or researchers in the given field would be justifiably dissuaded from pursuing research as the chances of receiving a patent of their own would be greatly diminished. Scientific pursuits in entire branches of science and technology could be terminated and ignored. By discouraging parties from engaging in research in certain fields, the amount of genuine unexpected discoveries—often fundamental to the advancement of science—would drop off considerably. In medicine, for example, fewer drugs for any given disease would be pursued or developed in fields with crowded prior art landscapes. Less competition in certain technological fields (like life-sciences) could lead to monopolies, and ultimately price gouging.<sup>78</sup> Such price gouging could prevent consumers from receiving life-sustaining drugs.<sup>79</sup>

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73. Letter from Barbara A. Fiacco, President, AIPLA to Hon. Andrei Iancu, Under Sec’y of Com. for Intell. Prop., USPTO 9–10 (Nov. 8, 2019), [https://www.uspto.gov/sites/default/files/documents/AIPLA\\_RFC-84-FR-44889.pdf](https://www.uspto.gov/sites/default/files/documents/AIPLA_RFC-84-FR-44889.pdf) (last visited June 26, 2021).

74. FENN MATHEW, USPTO, UNDERSTANDING PRIOR ART AND ITS USE IN DETERMINING PATENTABILITY 5, <https://www.uspto.gov/sites/default/files/documents/May%20Info%20Chat%20slides%20%28003%29.pdf> (last visited June 26, 2021).

75. 35 U.S.C. § 102.

76. Letter from Barbara A. Fiacco, President to Hon. Andrei Iancu, *supra* note 73, at 9–10.

77. *Id.*

78. See Oliver McPherson-Smith & Steve Pociask, *Competition, Not Capping Increases, is the Cure for High Drug Prices*, THE HILL (Jan. 22, 2020, 1:32 PM), <https://thehill.com/blogs/congress-blog/healthcare/479366-competition-not-capping-increases-is-the-cure-for-high-drug>.

79. See *id.*

Furthermore, massive amounts of AI-generated prior art would make the prior art disclosure requirements during patent prosecution unrealistic. The Code of Federal Regulations currently requires applicants to disclose to the USPTO “all information known to that individual to be material to patentability.”<sup>80</sup> Violation of this regulation can result in a lack of patent grant.<sup>81</sup> Because of the rate at which mass generation of prior art by AI would expand the universe of prior art, the disclosure standard would become increasingly more challenging to satisfy over time. This would lead to more patents being rejected and would harm inventors in the United States.

Finally, mass AI-generated prior art would substantially diminish the efficiency of patent examiners, who would be required to sift through the massive amounts of AI generated prior art during their patent application examinations.<sup>82</sup> As of June 2021, even without these massive data sets, the average wait time for the patent examiner’s first substantive review and examination is about 17 months.<sup>83</sup> That wait time could increase dramatically with massive AI-generated data sets. Long patent pendency periods can render patents in certain industries largely futile, harm startup entrepreneurs, delay consumer access to products (including pharmaceuticals), and impose social costs such as job loss, lost products, and lost innovation.<sup>84</sup>

To combat the AI prior art dilemma, the USPTO should promulgate rules excluding mass AI-generated prior art from consideration during patent examinations provided certain criteria is met.<sup>85</sup> In order to qualify for the exclusion, a patent applicant would be required to produce direct or circumstantial evidence that the prior art in question was the result of a mass prior-art generation by AI. Factors to be considered might include the source, form, and context of the prior art.<sup>86</sup> Making this option available to patent applicants would resolve the three major issues

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80. 37 C.F.R § 1.56 (2020).

81. *Id.*

82. Letter from Barbara A. Fiacco, President to Hon. Andrei Iancu, *supra* note 73, at 9–10.

83. *Patents Data, at a Glance September 2020*, USPTO, <https://www.uspto.gov/dashboard/patents/> (last visited June 26, 2021).

84. MARK SCHULTZ & KEVIN MADIGAN, THE LONG WAIT FOR INNOVATION: THE GLOBAL PATENT PENDENCY PROBLEM 3 (2016), <https://sls.gmu.edu/cpip/wp-content/uploads/sites/31/2016/10/Schultz-Madigan-The-Long-Wait-for-Innovation-The-Global-Patent-Pendency-Problem.pdf>.

85. Memorandum from Student Members of Benjamin N. Cardozo’s Intell. Prop. L. Soc’y to the U.S. Pat. and Trademark Off. 6 (Nov. 8, 2019), [https://www.uspto.gov/sites/default/files/documents/Cardozo-IPLS\\_RFC-84-FR-44889.pdf](https://www.uspto.gov/sites/default/files/documents/Cardozo-IPLS_RFC-84-FR-44889.pdf).

86. *See id.*

brought about by AI prior art abuse. First, it would eliminate companies' incentive to publish mass quantities of AI-generated prior art thereby removing deterrents for companies looking to enter a new market. Second, it would make compliance with the Federal Code of Regulations feasible and would prevent patents from being unnecessarily denied. Third, it would substantially reduce the quantity of prior art patent examiners would need to consider in order to make their determinations as to whether to grant a patent. This would help sustain the efficiency of the USPTO and maintain the status quo with regard to examination timelines for new patent applications.

#### IV. INFRINGEMENT LIABILITY CONSIDERATIONS

Another pressing issue that will arise in the age of AI is the question of liability in cases where AI independently infringes a third party's patent.<sup>87</sup> This issue raises the question of who should be held responsible for infringing actions solely taken by AI – the end user of the AI, the developer of the AI, or the AI itself.<sup>88</sup> As it stands today, the Patent Act does not recognize a finding of patent infringement that is independent of human involvement.<sup>89</sup> If this policy were to continue going forward, it would result in parties sticking their head in the sand and encouraging AI to infringe others' patent rights in order to escape liability.<sup>90</sup> Clearly, someone needs to be held liable going forward.

At first glance, the developer of an AI may seem a more suitable candidate to burden with infringement liability. This is because they are most likely to foresee potential patent infringement by the AI due to their proximity to and understanding of the AI system.<sup>91</sup> End users might be unsophisticated and unaware of the inner workings of the AI they are licensing, and thus it would seem unfair to burden them with liability.<sup>92</sup> However, if the "AI-Patent" framework previously discussed was adopted, the AI-Patent right would grant to the end users. Since end

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87. *Artificial Intelligence Collides with Patent Law*, CTR. FOR THE FOURTH INDUS. REVOLUTION 10 (Apr. 20, 2018), [http://www3.weforum.org/docs/WEF\\_48540\\_WP\\_End\\_of\\_Innovation\\_Protecting\\_Patent\\_Law.pdf](http://www3.weforum.org/docs/WEF_48540_WP_End_of_Innovation_Protecting_Patent_Law.pdf).

88. *Id.*

89. *Id.* Under patent law, infringement occurs when "*whoever* without authority makes, uses, offers to sell, or sells any patented invention . . ." 35 USC § 271(a) (emphasis added). This makes clear that a claim arises only when a natural person makes an infringing act. *See id.*

90. *See* CTR. FOR THE FOURTH INDUS. REVOLUTION, *supra* note 87, at 10.

91. *Id.* at 11.

92. *See id.*

users would be the primary beneficiaries of the infringing activity of the AI, they should shoulder any liability for infringement by the AI. The end users are the actual cause of the infringement, as infringement would not have occurred “but for” their use of the AI.

The fact that end users may not be sophisticated does not justify their exclusion from infringement liability. Today, when a potential infringer – even an unsophisticated one – “has actual notice of another’s patent rights, he has an affirmative duty to exercise due care to determine whether or not he is infringing.”<sup>93</sup> This affirmative duty, established in *Underwater Devices, Inc. v. Morrison-Knudsen Co.*, “includes, *inter alia*, the duty to seek and obtain competent legal advice from counsel *before* the initiation of any possible infringement.”<sup>94</sup> If the opinion of counsel is obtained before initiation of possible infringing activity, the potential infringer is able to escape a finding of willful infringement later.<sup>95</sup> Similar to the affirmative duty established in *Underwater Devices*, courts should create a common law affirmative duty of care for the end users of AI. This duty of care would require end users to determine “whether the AI can or will infringe third party patent rights” before they employ it. Under this common law rule, unsophisticated parties would need to obtain advice of competent counsel. Though liability would lie in end users, end users would still be permitted to hold AI developers accountable through contractual indemnification clauses covering cases of direct infringement by the AI.<sup>96</sup>

Proving infringement by an AI may be a particularly challenging task. AI decision making often occurs within a black box, and it may be impossible to ascertain whether the AI practices all elements of a third party’s patent claim.<sup>97</sup> Moreover, even if claimants are able to interpret the inner workings of the black box, they would need to commit significant time and capital into an action before even knowing their prospects of success.<sup>98</sup> This would deter AI infringement suits from being brought at all. Unfortunately, there is no perfect solution for resolving this issue at the current time. Perhaps an algorithm can be developed

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93. *Underwater Devices, Inc. v. Morrison-Knudsen Co.*, 717 F.2d 1380, 1389 (Fed. Cir. 1983).

94. *Id.* at 1390.

95. *See id.*

96. CTR. FOR THE FOURTH INDUS. REVOLUTION, *supra* note 87, at 12.

97. Jonathan Solomon, *The Impact of Artificial Intelligence on Patent Infringement Claims*, MARKS & CLERK (Oct. 27, 2019), <https://www.marks-clerk.com/Home/Knowledge-News/Articles/The-Impact-of-Artificial-Intelligence-on-Patent-In.aspx#.X8QGkWhKj7w>.

98. *See id.*

going forward capable of interpreting the “black box” of other AI and explaining what elements of a claimed patent have been infringed.

Another problem that is created when AI infringes a patent is trying to ascertain where the infringement took place.<sup>99</sup> As the law currently stands, an infringement occurs when “whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention . . . .”<sup>100</sup> An AI neural network, however, may exist on servers across numerous countries, or jurisdictions, and plaintiffs may have trouble establishing the jurisdictional requirement under the current code.<sup>101</sup> One possible solution to this problem would be to amend the patent code to provide that if the plaintiff-patentee proves that the infringing AI utilized even a single server existing in the United States, then jurisdiction will be found by a court.

#### V. NON-OBVIOUSNESS CONSIDERATIONS

The non-obviousness requirement in patent law has often been considered the most significant hurdle for patentability. The requirement prevents a patent from issuing “if the difference between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art . . . .”<sup>102</sup> The hypothetical “person of ordinary skill in the art” is presumed to have known the relevant art at the time of invention.<sup>103</sup> They have been described as a “person of ordinary creativity, not an automaton”<sup>104</sup> and as “one who thinks along the line of conventional wisdom in the art and is not one who undertakes to innovate.”<sup>105</sup> The nonexhaustive list of factors considered by the Federal Circuit in determining the level of skill in the art include “the type of problems encountered in the art, prior art solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field.”<sup>106</sup> One point of uncertainty today is how the

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99. *See id.*

100. 35 U.S.C. § 271 (a).

101. Solomon, *supra* note 97.

102. 35 U.S.C. § 103.

103. MPEP § 2141 (8th ed. Rev. 7, Sept. 2008).

104. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

105. *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 454 (Fed. Cir. 1985).

106. USPTO, *supra* note 15, at 12.

definition of “person of ordinary skill in the art” would change if it were applied to an invention generated by a fully autonomous AI.

Some commentators suggest that the definition of “person of ordinary skill in the art” should be adjusted to include a person using AI, or even just the AI itself.<sup>107</sup> This would substantially raise the standard of non-obviousness.<sup>108</sup> Strictly interpreted, this higher standard would hinder innovation because it would prevent deserving inventions from being patented.<sup>109</sup> If adopted, the definition would increasingly raise the bar of patentability over time due to the ever-improving nature of autonomous AI.<sup>110</sup> At some point, patents would issue only to the most revolutionary technologies.<sup>111</sup> This standard would all but guarantee that less patents would be granted overall – especially to human generated inventions.<sup>112</sup> Moreover, judges and patent examiners doing obviousness analyses would struggle in determining what the level of skill in the art is for AI.<sup>113</sup> Unlike humans who can be defined by the degrees, training, or work experience, AI is an intangible program that exists in a server. Inconsistencies in application of the definition would lead to a lack of equal justice for all.

Because of the threat of an increasingly impossible patentability standard, the best possible solution is to leave the “person of ordinary skill in the art” definition unaltered for AI generated inventions, but expand the universe of applicable prior art by changing the definition of “analogous” art. Under the common law today, the only prior art considered during a non-obviousness analysis is “analogous art.”<sup>114</sup> Whether a reference in the prior art is “analogous” is a question of fact that can be shown in two ways: “(1) whether the art is from the same field of endeavor, regardless of the problem addressed, [or] (2) if the reference is not within the field of the inventor’s endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.”<sup>115</sup> This standard makes sense for human inventors because humans specialize in certain fields of science. They are expected to be aware of all the prior art in their field of science and prior art from other fields of science which directly relate to the problem they are trying

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107. CTR. FOR THE FOURTH INDUS. REVOLUTION, *supra* note 87, at 12.

108. *Id.*

109. *Id.*

110. *Id.*

111. *Id.*

112. *Id.*

113. *See id.*

114. *In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992).

115. *Id.* at 658–59.

to solve (likely found during the research process). In the case of inventive AI, however, the “analogous” art definition should be expanded.

Since AI can theoretically access and parse an unlimited number of fields of science, the standard for “analogous” prior art should be “references that would be considered by state of the art AI.” Bringing more prior art into the obviousness inquiry through this definition increases the patentability standard, but does not make it impossible to satisfy. That is because “a patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art.”<sup>116</sup> In order to find obviousness, a court must still “identify a reason that would have prompted a person of ordinary skill in the art to combine the elements as the new invention does.”<sup>117</sup> This motivation to combine may come from some teaching, suggestion, or motivation to combine found within the prior art, or secondary considerations that would prove instructive.<sup>118</sup> Such secondary considerations could include “[w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions . . . .”<sup>119</sup>

The increased patentability standard brought about by expanding the universe of considered prior art for AI generated inventions is ideal because the current standard is too low to be applied to AI. With such a low patentability standard, there could be a flood of “junk patents” and patents granted to non-practicing entities (patent trolls) employing inventive AI.<sup>120</sup> Granting junk patents and patents to non-practicing entities can impede business and economic growth.<sup>121</sup> Such an outcome goes directly against the purpose of the patent system which is designed to promote economic growth and advance social goals including creation of jobs and promotion of health.<sup>122</sup>

## VI. CONCLUSION

The United States Patent and Trademark Office request for public comment on issues related to AI and patents is a well-timed and well-intentioned effort. Patent laws can have tremendous impacts on

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116. KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 418 (2007).

117. *Id.* at 401.

118. *Id.* at 399.

119. *Id.* at 402.

120. CTR. FOR THE FOURTH INDUS. REVOLUTION, *supra* note 87, at 12.

121. *Id.*

122. *See generally* NATIONAL RESEARCH COUNCIL, A PATENT SYSTEM FOR THE 21ST CENTURY (Stephen A. Merrill et al. eds., 2004).

innovation, society, and the economy, so it is important to keep these rapidly developing issues at the forefront as we usher in the age of AI.<sup>123</sup> This commentary puts forth a number of changes to patent law that will “promote . . . the useful arts” in the United States for years to come.

Current patent laws seem more than capable of resolving inventorship and ownership issues for AI that is akin to an automated tool. The current law’s usefulness will come to an end, however, when fully autonomous AI capable of invention enters the fray. Given the speed at which technology is developing, Congress should be prepared to address this challenge by adopting a new type of intellectual property right. When fully autonomous AI emerges in a robust form, Congress should amend the Patent Act to recognize a *sui generis* “AI-Patent” right. This new intellectual property right will balance the goals of the patent system with the public interest in preventing anti-competitive trade practices. A framework which provides a more limited five-year patent term to AI-inventions and requires the patentee to actually practice the invention in a commercial market will achieve this balance. This framework would unequivocally resolve inventorship and ownership issues by issuing patents only to those entities employing the autonomous AI. This new form of intellectual property right would support the purposes underlying the patent system: it would provide an exclusionary right to incentivize innovation, and it would disseminate information to the public for the advancement of science.

With regard to prior art, abuse of the current patent system via mass-publication of AI generated data seems inevitable unless the USPTO promulgates rules to curb the practice. Under such rules, prior art would be excluded during examination of a patent application if an applicant were to provide direct or circumstantial evidence that the prior art in question was the result of a mass prior-art generation by AI. The USPTO should consider putting forth these rules as a preventative measure before abusive practices become commonplace.

When an AI infringes a patent independent of human involvement, the end user of the AI should be held liable. The end user is the actual cause of the AI infringement and stands to gain the biggest benefit from the infringing activity of the AI. Courts should establish a judicial affirmative duty of care for end users of inventive AI. This affirmative duty would require end users to get opinions of competent experts regarding the likelihood of infringement before employing an inventive AI. Two issues that need to be resolved in the future are how plaintiffs should go about proving direct infringement by AI, and how they should

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123. CTR. FOR THE FOURTH INDUS. REVOLUTION, *supra* note 87, at 14.

establish jurisdiction in AI infringement cases (in order to properly state a claim).

Finally, the non-obviousness standard for patentability should be altered for inventions generated by fully autonomous AI. Instead of changing the definition of a “person of ordinary skill in the art,” which could lead to undesirable consequences, courts should instead adopt a broader definition of “analogous” art for AI-generated inventions. Such a definition would raise the standard for patentability for AI-generated inventions but would not be impossible to satisfy.