

How the U.S. Can Make Subject Matter Eligibility More Predictable and Free Artificial Intelligence Innovation

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I. INTRODUCTION

Beginning in the 1950's in Britain, Alan Turing, a renowned mathematician often credited with identifying artificial intelligence, believed that machines could carry out mental processes very similar to, though notably different than, the human mind.¹ This was largely thought of as a science fiction fantasy at the time, but nearly seventy years later, his vision seems to be coming true.² Artificial Intelligence (“A.I.”) has now evolved to the point that it has given “machines [the] ability to learn from experience and perform cognitive tasks,” capabilities once only thought to belong to the human brain.³ With this once fictitious field quickly becoming a reality, new challenges with protecting A.I. innovation have arisen in patent law, especially in predicting subject matter eligibility. This Article will address and propose solutions to some of the most pressing challenges to A.I. innovation.

A.I. is arguably the future of many industries, but inconsistent patent eligibility decisions in the industry have sparked unpredictable patent standards which, if not clarified, will likely disrupt the future of the industry.⁴ Patents are currently inconsistent in this area, and clear guidelines are necessary to ensure the U.S. continues “[t]o promote the [p]rogress of [s]cience and the useful [a]rts”⁵ in the field of A.I.

As discussed below, A.I. is relevant and will continue to develop more personalized solutions, programmed to consider individual situations and reference past data to predict an outcome.⁶ However, since the *Alice v. CLS Bank* Supreme Court decision in 2014, software and computer implemented A.I. patents have faced strict scrutiny in determining subject matter eligibility.⁷ A.I. and computer-based patents are often considered abstract ideas which requires further inquiry to determine whether the

1. Patrick Kiger, *How Artificial Intelligence Is Totally Changing Everything*, HOW STUFF WORKS (Dec. 19, 2019) <https://science.howstuffworks.com/artificial-intelligence.htm> [<https://perma.cc/5NFF-JN2S>].

2. *Id.*

3. *Id.*

4. Kay Firth-Butterfield & Yoon Chae, *Artificial Intelligence Collides with Patent Law*, WORLD ECON. FORUM 4 (Apr. 2018), http://www3.weforum.org/docs/WEF_48540_WP_End_of_Innovation_Protecting_Patent_Law.pdf.

5. U.S. CONST., art. I, § 8, cl. 8.

6. *See generally*, Ben Hattenbach & Gavin Snyder, *Rethinking the Mental Steps Doctrine and Other Barriers to Patentability of Artificial Intelligence*, 19 COLUMBIA SCI. & TECH. L. REV. 313, 315 (2018).

7. Ali Talip Pinarbasi, *Effects of the Alice Preemption Test on Machine Learning Algorithms*, IP WATCHDOG (June 19, 2020), <https://www.ipwatchdog.com/2020/06/19/effects-of-the-alice-preemption-test-on-machine-learning-algorithms/id=122617> [<https://perma.cc/8NRN-5JN6>].

claim recites significantly more than the judicial exception.⁸ To overcome the hurdle of proving eligible subject matter for a patent, the patent must prove the invention meets a number of strict but unpredictable standards.⁹ Usually courts consider whether the idea is an abstract idea classified as a mental step and if it represents a measurable improvement over current technologies.¹⁰

While this industry may be the future, the speed of innovation has been stalled as the law currently rewards small improvements on current technologies over groundbreaking technology.¹¹ A.I. technology generated by A.I. itself raises new, unique issues with inventorship of the technology, as inventors are currently required to be human.¹² This is an example of another, more recent hurdle to patentability of A.I. inventions that must be addressed, and it foreshadows that A.I. will continue to provide unique issues patent law must adapt to and address.¹³

The difficulty of obtaining a patent on A.I. technology has and will continue to move companies toward seeking trade secret protection on A.I.¹⁴ While this is an option for those “abstract ideas” seemingly not patent eligible, it is important to understand the tradeoffs that come with keeping innovation a secret as opposed to patenting the innovation and disclosing to the public.¹⁵

This Article will begin by exploring the abilities of current A.I. technology, the effects of current law on innovation in the A.I. industry across different countries, how countries have dealt with the increasing applications in the field, the important applications of A.I., and how more predictable patentability might be achieved based on goals for the U.S. industry and modeling other countries.

8. *October 2019 Update: Subject Matter Eligibility*, USPTO (Oct. 2019), https://www.uspto.gov/sites/default/files/documents/peg_oct_2019_update.pdf [hereinafter *Subject Matter Eligibility*].

9. Firth-Butterfield & Chae, *supra* note 4, at 8.

10. Hattenbach & Snyder, *supra* note 6, at 313.

11. Pinarbasi, *supra* note 7.

12. Firth-Butterfield & Chae, *supra* note 4, at 9.

13. Firth-Butterfield & Chae, *supra* note 4, at 9.

14. Quinn Emanuel Urquhart & Sullivan, LLP, *April 2020: The Increasing Importance of Trade Secret Protection for Artificial Intelligence*, JD SUPRA (Apr. 27, 2020), <https://www.jdsupra.com/legalnews/april-2020-the-increasing-importance-of-64465/> [<https://perma.cc/YHB4-J74G>].

15. *Id.*

A discussion of patent law treatment of A.I. in the U.S., China, and Japan sets the stage for how each country has adapted to attempt to address this growing industry. From there, solutions and suggestions will be made on how the U.S. can improve treatment of A.I. to encourage more consistent guidelines and expectations for patent eligible subject matter in A.I. Clarity in these guidelines will ensure continued innovation in the A.I. space.

As far as solutions, the Article argues that the United States Patent and Trademark Office (USPTO) should consider updating the process for patent approvals in A.I. through more frequent meetings discussing A.I.-specific developments and a more specialized approach to A.I. patent eligibility and disclosure requirements in the form of a new exception. Additionally, more open communication with A.I. inventors in the form of regular USPTO reports or example case studies on A.I. patentability and a small group of specialized examiners for A.I. related technology would further address the lack of predictability. The goal must be to keep the U.S. relevant at the forefront of A.I. innovation by providing clear and predictable guidelines on expectations of A.I. patent applications and approvals.

A. A.I. Background

At its core, A.I. is the process of machines carrying out human-like functions, with the ability to think or feel as a human.¹⁶ The classification of A.I. is according to the level of proficiency in emulating human functions, ranging in seven levels from “Reactive Machines” to “Artificial Superintelligence (A.S.I.)”¹⁷ Inventors are currently at the second level, “Limited Memory.” In practice, however, scientists are working on technology that achieves the third and fourth levels, including self-aware A.I.¹⁸ A.S.I. will be the pinnacle of A.I. development; it will not only mimic the human thought process, but in fact “think” better than humans because it will possess greater memory and the ability to process data and make decisions more quickly.¹⁹ While the future of A.I. has the potential to change the world, for now A.S.I. and most of the predicted capabilities of A.I. are untapped.²⁰

16. Naveen Joshi, *7 Types of Artificial Intelligence*, FORBES (June 19, 2019, 10:54 PM), <https://www.forbes.com/sites/cognitiveworld/2019/06/19/7-types-of-artificial-intelligence/?sh=c0eb826233ee> [<https://perma.cc/AYB7-5WS8>].

17. *Id.*

18. *Id.*

19. *Id.*

20. *Id.*

This Article mainly refers to machine learning because it is, arguably, the type of A.I. technology used the most. Machine learning is the process by which machines learn of important concepts through large amounts of data structured for machines to understand.²¹ Deep learning is a step beyond machine learning where the computer receives data, but it does not need to be structured as the machine can understand it utilizing artificial neural networks that mimic the human neural structure.²²

While current A.I. technology seems rudimentary considering the theoretical possibilities,²³ it has already been used in drug development, “smart” home devices such as robotic vacuums, and even cellphones.²⁴ A.I. has been used to allow Barbie dolls to listen and respond to children in real time, work as a sous-chef to recommend food combinations and develop recipes, and even to review CT scans in record time to assist doctors in diagnosing cancer.²⁵ A.I. is present while a person watches Netflix or scrolls through social media; systems learn one’s behavior and interests and use this data to offer, for example, similar shows on Netflix, or similar products via Instagram advertisements.²⁶ A.I. can further monitor social media and ensure the platforms remain safe by constantly identifying hate words, phrases, and symbols in different languages before removing them.²⁷ This can be done much faster by A.I. than a human, or even an entire team of humans.²⁸

In the health care industry, A.I. is used to provide support for clinical decision making on data to provide treatment recommendations to clinicians.²⁹ IBM’s Watson made it easier to collect, store and reference data that can

21. Sasha Reeves, *8 Helpful Everyday Examples of Artificial Intelligence*, IOT FOR ALL (Aug. 10, 2020), <https://www.iotforall.com/8-helpful-everyday-examples-of-artificial-intelligence> [<https://perma.cc/44PS-SYH2>].

22. *Id.*

23. Joshi, *supra* note 16.

24. Hattenbach & Snyder, *supra* note 6, at 315.

25. Bernard Marr, *27 Incredible Examples of AI and Machine Learning in Practice*, FORBES (Apr. 30, 2018, 12:28 AM), <https://www.forbes.com/sites/bernardmarr/2018/04/30/27-incredible-examples-of-ai-and-machine-learning-in-practice/?sh=3ee152be7502> [<https://perma.cc/BX86-KZKL>].

26. Reeves, *supra* note 21.

27. Reeves, *supra* note 21.

28. Reeves, *supra* note 21.

29. Alicia Phaneuf, *Use Of AI in Healthcare & Medicine is Booming – Here’s How The Medical Field is Benefiting From AI in 2022 and Beyond*, BUSINESS INSIDER (Jan. 29, 2021, 12:47 PM), <https://www.businessinsider.com/artificial-intelligence-healthcare> [<https://perma.cc/VC4Q-6MQ7>].

be used to perform big data analysis to “determine treatment options for people with tumors who were showing genetic abnormalities.”³⁰ Google created DeepMind, a machine that can mimic thought processes of human brains.³¹ Not only can the machine beat humans at games, it also assists with decision support by reviewing large amounts of data on past electronic health records, diagnosing patients and recommend treatment.³² Further, the system has been tested in predicting outcomes of hospital visits which can “prevent readmissions and shorten the amount of time patients are kept in hospitals.”³³ A.I. in healthcare has just begun to impact the industry and it is expected to continue to grow—approximately 48% annually—over the next few years.³⁴

The A.I. applications listed above are just a few examples of how the technology will continue to have a large effect on many different industries. In fact, it is estimated that A.I. technologies contributed \$2 trillion to the global economy in 2018, and by some predictions, are expected to rise to \$15.7 trillion by 2030.³⁵

II. LAW REGARDING A.I. PATENTABILITY

A. U.S. Law Related to A.I. Subject Matter

In the U.S., the USPTO follows 35 U.S.C. Section 101 to provide guidance on what subject matter is patent eligible.³⁶ The Supreme Court created a two-step “machine transformation” test to clarify the application of 35 U.S.C. Section 101 which was introduced in *Mayo*,³⁷ and clarified for computing, software, and information technology in *Alice*.³⁸

In *Mayo*, the Supreme Court applied the two-step test.³⁹ The Court ruled that in order to patent an invention that falls within one of three judicial exceptions (abstract ideas, laws of nature and natural phenomena) recited in *Diamond*,⁴⁰ the invention must claim elements sufficient to ensure the

30. *Id.*

31. Marr, *supra* note 25.

32. Marr, *supra* note 25.

33. Phaneuf, *supra* note 29.

34. Phaneuf, *supra* note 29.

35. See Anand S. Rao et al., *Sizing the Prize: What’s the Real Value of AI for Your Business and How Can You Capitalise?*, PWC, <https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html> [https://perma.cc/Y4TG-RS8X].

36. 35 U.S.C. § 101.

37. See generally *Mayo Collaborative Servs. v. Prometheus Labs, Inc.*, 566 U.S. 66, 76-77 (2012).

38. *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 573 U.S. 208 (2014).

39. *Mayo*, 566 U.S. at 76-77.

40. *Diamond v. Diehr*, 450 U.S. 175, 185 (1981) (reciting laws of nature, natural phenomena and abstract ideas are not patentable).

use amounts to significantly more than the exception itself.⁴¹ The patent at issue was a drug for use in treating autoimmune diseases, specifically the correlation between patient blood concentration levels of the drug and effectiveness or potential harm.⁴² The process was determined to recite a law of nature which was well known in the field at the time of the invention.⁴³ The Court held that the claims did not do significantly more to describe the processes or add enough innovation beyond the correlation of drug dosage to effectiveness to qualify as a patent eligible process.⁴⁴

The Court in *Mayo* was concerned with extending application of patent eligibility to abstract ideas that were simply applying the idea.⁴⁵ By granting patents for these abstract ideas, the Court would be tying up the use of laws of nature and abstract ideas, therefore discouraging and possibly eliminating future discovery utilizing these ideas.⁴⁶ Rewarding with patents the inventors who discover basic phenomena might encourage discovery, however, these laws and principles are the “basic tools of scientific and technological work” and granting patents for such discoveries would prohibit the use in future inventions.⁴⁷ A similar concept will arise later in this Article when considering the balance between encouraging innovation and standardizing patent eligibility in A.I. while not “tying up” more basic laws and ideas and inhibiting future discovery.

Alice focuses on the second step of the test, as the claims at issue were directed to a third-party computer program to mitigate risk in transactions, which was known to be directed to a patent ineligible abstract idea from prior case law.⁴⁸ The focus here was on the Step 2B of the *Mayo* test, where generally, a method claim utilizing a generic computer for implementation will fail to transform the abstract idea into a patent-eligible invention.⁴⁹ For example, if the invention had improved “the functioning of the computer itself or effect an improvement in any other technology or technical field,” the invention may have added significantly more to the idea to prove patent eligibility.⁵⁰ The components of using the method on a computer

41. *Mayo*, 566 U.S. at 77.

42. *Id.* at 74.

43. *Id.* at 77.

44. *Id.*

45. *Id.* at 68.

46. *Id.*

47. *Id.* at 77 (quoting *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972)).

48. *Alice*, 573 U.S. at 209.

49. *Id.*

50. *Id.* at 210.

did not add significantly more to the abstract idea and is therefore not enough to make the abstract idea patent eligible.⁵¹

According to the Manual of Patent Examining Procedures (MPEP), the second step is directed to “searching for an ‘inventive concept.’”⁵² The term inventive concept has not been outlined in sufficient detail to determine whether the invention meets this requirement prior to examiner feedback.

Adapted from these cases and seen in Figure 1, the USPTO applies the two-step test by first determining whether a claim recites a judicial exception (Step 2A Prong 1 in Figure 1).⁵³ The PTO’s recommended examiner analysis separates abstract ideas into three categories: mathematical concepts, certain methods of organizing human activity and mental processes.⁵⁴ Usually, A.I. falls within the mathematical concepts or mental processes category of abstract ideas (Step 2A Prong 2).⁵⁵

The process continues to determine if the invention “recites” a judicial exception (Step 2A Prong 2).⁵⁶ For abstract ideas, which encompass A.I. inventions, the invention does not fail under Section 101 if the exception is integrated into a practical application.⁵⁷ The USPTO October 2019 Subject Matter Eligibility Update (2019 PEG) provides some examples of how this practical application can be accomplished including “an improvement in the functioning of a computer” or a “particular treatment of prophylaxis for a diseases or medical treatment.”⁵⁸

51. *Id.*

52. U.S. PATENT AND TRADEMARK OFFICE, Manual of Patent Examining Procedure, R-10.2019, § 2106.1 (June 2020).

53. *Subject Matter Eligibility*, *supra* note 8.

54. *Id.*

55. Unlike the U.S., the European Patent Office (EPO) guidelines are still under review and development, but currently A.I. is treated as a version of computer implemented inventions (CII’s). First, it is determined whether the invention meets EPO requirements for novelty, often as having a technical character, under Article 52(2)(c) of the European Patent Convention (EPC). Second, the invention is assessed for the presence of an inventive step based on its technical character and whether the invention serves a technical purpose. Classifying A.I. in the category of CII’s is unique to EPO and may prove an effective strategy in other countries. *IP Protection of Artificial Intelligence in Europe: Tailor-Made Solutions Required*, JONES DAY (Apr. 2020), <https://www.jonesday.com/en/insights/2020/04/ip-protection-of-artificial-intelligence-in-europe> [<https://perma.cc/4BQA-9CG7>]; *Patenting Artificial Intelligence and Machine Learning Innovations in Europe*, JONES DAY (Oct. 2018), <https://www.jonesday.com/en/insights/2018/10/patenting-artificial-intelligence-and-machine-lear> [<https://perma.cc/JF68-XSFT>].

56. Conner Hutchisson et al., *Machine Learning Patentability in 2019: 5 Cases Analyzed and Lessons Learned Part 1*, INTELL. PROPERTY LAW BLOG (Feb., 5, 2020), <https://www.intellectualpropertylawblog.com/archives/machine-learning-patentability-part1-2019-peg> [<https://perma.cc/WPM3-HW4R>].

57. *Id.*

58. *Subject Matter Eligibility*, *supra* note 8, at 11.

In Step 2B, if the claim recites a judicial exception, the USPTO considers whether the claim recites additional elements that amount to significantly more than the judicial exception and whether there is an “inventive concept.”⁵⁹ Exactly how technology can cross the barrier between abstract idea and significantly more than the judicial exception is unclear, and likely varies with examiners at the USPTO.⁶⁰ In the case of A.I., algorithms and mathematical formulas can often overcome the practical application hurdle by focusing the claims on the technical problems the invention solves or the specific improvements made by the invention.⁶¹ Even then A.I. invention should be centered around the algorithms and parameters in a machine learning application and the practical advantages of utilizing the algorithm should be clearly outlined.⁶²

It is important to note that 35 U.S.C. Section 101 is not the only barrier to determining patentability as 35 U.S.C. Sections 102, 103 and 112 also provide guidelines for subject matter eligibility, though Section 112 and how it relates to A.I. will not be addressed in this Article.⁶³

Another form of protection for A.I. inventions in the U.S. is trade secret law, a complement to patent protection.⁶⁴ A trade secret “is [1] information that has either actual or potential independent economic value by virtue of not being generally owned, [2] has value to others who cannot legitimately obtain the information, and [3] is subject to reasonable efforts to maintain its secrecy.”⁶⁵ All three elements must be present to gain trade secret protection,

59. 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 4, 50, 56 (Jan. 7, 2019).

60. Yuhei Okakita, *Patent Examination Practices Regarding AI-related Inventions: Comparison in the EPO, USPTO and JPO*, MUNICH INTELLECTUAL PROPERTY LAW CENTER MASTER THESIS, 22–23, 27 (2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3652173 [<https://perma.cc/3ZA3-G2LD>].

61. Shujing Hu & Tao Jiang, *Artificial Intelligence Technology Challenges Patent Law*, IEEE, 241, 241 (2019), <https://ieeexplore.ieee.org/abstract/document/8669605> [<https://perma.cc/D7B2-KAZY>].

62. Okakita, *supra* note 60, at 27.

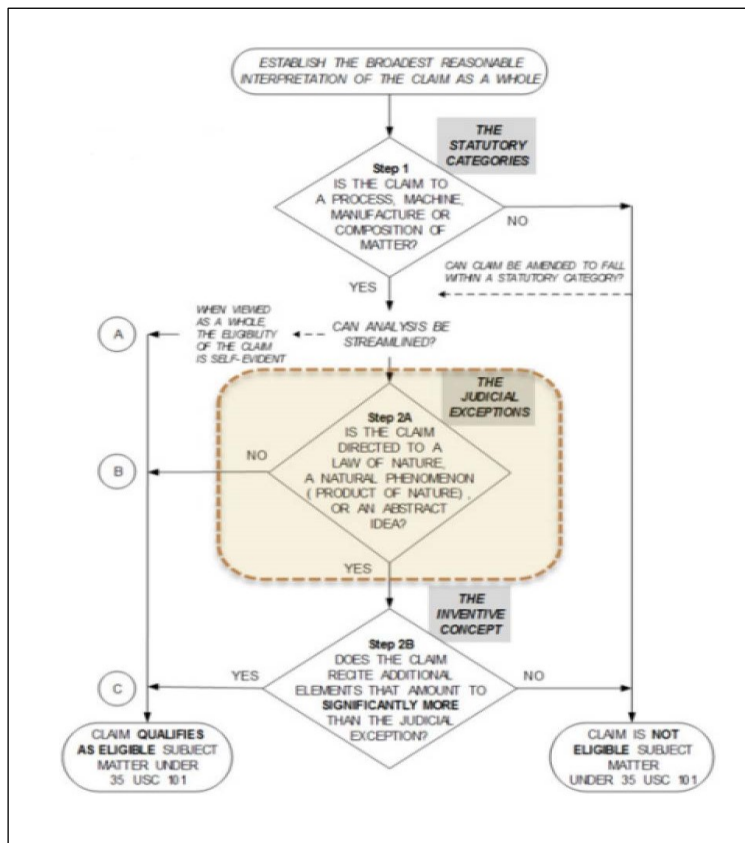
63. 35 U.S.C. § 112 relates to the patentability of a technology, specifically whether the description of the technology enables a person of skill in the art to make and use the technology. The patentee must also prove that they have enough disclosed to prove they understood the entire scope of the invention at the time of the filing of the application. § 112 addresses disclosure and enablement of the technology at issue. MPEP (9th ed. Rev. 10.2019 June 2020); *Can Patent My Invention?*, RICHARD’S PATENT L. FIRM, <https://www.richardspatentlaw.com/faq/can-i-patent-my-invention> [<https://perma.cc/4GNT-LQNE>].

64. *Trade Secret Policy*, USPTO, <https://www.uspto.gov/ip-policy/trade-secret-policy> [<https://perma.cc/784N-K2EJ>].

65. *Id.*

which can last indefinitely unless the trade secret fails to meet any of the aforementioned criteria at any point.⁶⁶ Trade secrets seem well suited for A.I. as it is ideal for technologies that cannot be independently discovered, quickly superseded, or difficult to describe.⁶⁷

FIGURE 1⁶⁸



Unlike a patent, which requires an inventor to disclose the patent to the public in exchange for the right to exclude others, trade secrets encourage

66. *Id.*

67. Jessica Meyers, *Artificial Intelligence and Trade Secrets*, AM. BAR ASS'N (Feb. 19, 2019), https://www.americanbar.org/groups/intellectual_property_law/publications/landslide/2018-19/january-february/artificial-intelligence-trade-secrets-webinar/ [<https://perma.cc/3EC3-YPJM>].

68. *Subject Matter Eligibility*, *supra* note 8.

complete secrecy around the invention, and trade secrets do not include protection against independent discovery or reverse engineering.⁶⁹ The definition of protectable information under trade secret law is incredibly broad, so where patent law does not recognize the subject matter as patentable, or where the algorithm involved in the A.I. is too complex to be adequately disclosed, trade secret protection may present a good alternative.⁷⁰ However, because patents (and not trade secrets) are by definition disclosed to the public, patenting of A.I. must be encouraged so that knowledge is disseminated and A.I. can more quickly reach its full potential.

B. U.S. A.I. Cases and Patent Trial and Appeal Board Decisions

Patent Trial and Appeal Board (PTAB) decisions on appeal from examiner verdicts provide insight into subject matter eligibility rejections through their opinions.⁷¹ In a case decided in 2019, PTAB considered an invention using A.I. technology and logic to determine whether machines need to be serviced and to predict machine equipment failure.⁷² The examiner explained the invention falls into the abstract idea exception, specifically, a method of organizing human activity based on the reading, assessing, presenting, classifying, collecting, and tallying data as recited in the patent application.⁷³ The PTAB disagreed and reversed, stating that the “claims address a problem specifically using several artificial intelligence classification technologies to monitor the operation of machines and to predict preventative maintenance needs and equipment failure.”⁷⁴

Here, the PTAB explained that the claims are directed at a specific problem, they were integrated into a practical application of determining machine failure with computational complexity.⁷⁵ As the additional elements are not mentioned in the opinion, it could simply be that the algorithms

69. *Trade Secret Policy*, *supra* note 65.

70. *Trade Secret Policy*, *supra* note 65.

71. Hutchisson et al., *supra* note 56.

72. The invention at issue described a method of monitoring machines and completing preventative maintenance of machines when notified of a predicted machine failure. Machine failure was determined by gathering and analyzing data relating to the machine status and operation, and classifying the data according to logic decision trees and neural networks to create a confidence interval of the potential operational failure. *See Ex Parte Adjaoute*, No. 2018-007443 (P.T.A.B. Oct. 10, 2019).

73. *Id.*

74. *Id.*

75. Hutchisson et al., *supra* note 56.

are applied in a meaningful way in the invention, beyond simply stating the algorithms.⁷⁶

Another recent PTAB decision discussed an invention of “a probabilistic programming compiler that generates data-parallel inference code,” which the examiner argued is a mathematical concept or mental process based on the identification of an algorithm and production of inference code.⁷⁷ The PTAB found that the examiner’s characterization of the invention as a part of the mathematical concept category of abstract ideas was incorrect because the specific algorithm or equation was not recited explicitly.⁷⁸ In regard to the mental process category, the PTAB also rejected the examiner’s argument as the inference algorithms and application to probabilistic programming is “computationally intensive and challenging.”⁷⁹ The language in the specification regarding the complexity of the claims was sufficient evidence that the method could not be performed in the human mind.⁸⁰

Here, the PTAB used the complexity of the algorithms as stated in the specification to support that the invention is not a mental process.⁸¹ The fact that it is not performed in the human mind supports the assertion that the method *cannot* practically be performed in the human mind.⁸² If a claim covers performance in the human mind with the use of generic computer components, the claim will be considered a mental process unless the claim cannot practically be performed in the human mind.⁸³ However, if a method is performed on a computer, that is not alone sufficient to determine the lack of a mental process, but the use of a computer may provide evidence to support an argument that it is not a mental process.⁸⁴

In *Intellectual Ventures I LLC*, a similar case determining whether a claim recites significantly more than a judicially excluded mental process, the Court of Appeals for the Federal Circuit reviewed an apparatus for detecting “undesirable files” stored on a computer to mark for deletion.⁸⁵ The Plaintiff argued that the patent improved the then-current process for detecting unauthorized files on a computer, but the court disagreed.⁸⁶ Although the patent allowed computers to organize and characterize files

76. Hutchisson et al., *supra* note 56.

77. Hutchisson et al., *supra* note 56.

78. Hutchisson et al., *supra* note 56.

79. Hutchisson et al., *supra* note 56.

80. Hutchisson et al., *supra* note 56.

81. Hutchisson et al., *supra* note 56.

82. Hutchisson et al., *supra* note 56.

83. Hutchisson et al., *supra* note 56.

84. Hutchisson et al., *supra* note 56.

85. *Intellectual Ventures I LLC v. Erie Indem. Co.*, 711 F. App’x 1012, 1014 (Fed. Cir. 2017).

86. *Id.* at 1015.

more efficiently than humans, the patent simply identified the files in the same manner that a human would use.⁸⁷ Overall, the invention failed to demonstrate an inventive concept beyond updating a human process in the same manner with a generic computer.⁸⁸

As demonstrated by the exemplary cases, the application of the judicial exceptions to patentable subject matter varies significantly between examiners and the PTAB, and even between similar cases in the Federal Circuit. This demonstrates that patentability of A.I. has been unpredictable and inconsistent. This demonstrates the necessity for additional guidance to ensure A.I. applications are appropriately analyzed for subject matter eligibility.

C. Discussion on Foreign Patent Law

I. Japanese Patent Law Relating to A.I. Technology

In Japan, A.I. is generally seen as a part of the subject matter covered in Japanese Patent Law (J.P.L.) Art. 2(3)(i) and J.P.L. Art. 2(4), which covers information as a result of a computer program or a computer program itself, such as a data structure, trained module or neural network.⁸⁹ The Japanese Patent Office (JPO) regularly publishes new guidelines and case examples specifically for A.I. technologies.⁹⁰ The lack of translation of Japanese Patent Law makes it difficult to understand the process completely, but the JPO is known to be one of the leading organizations in the treatment of A.I. patentability.⁹¹ Generally, the JPO leans on two requirements in determining the patentability of A.I. related inventions: (1) description requirements and (2) inventive step requirement.⁹²

The description requirements, outlined in Art. 36(4), require the disclosure of a correlation, how the program comes to a determination, and what can

87. *Id.* at 1016.

88. *Id.* at 1018.

89. Tokkyohō, [Patent Act], Law No. 121 of 1959, Art. 2(3)(i); (4) (Japan).

90. See e.g., *Newly Added Case Examples for AI-Related Technologies*, EXAMINATION STANDARDS OFF. JAPAN PAT. OFF. (Jan. 30, 2019), https://www.jpo.go.jp/e/system/laws/rule/guideline/patent/document/ai_jirei_e/jirei_tsuika_e.pdf.

91. *Public Views on Artificial Intelligence and Intellectual Property Policy*, U.S. PAT. & TRADEMARK OFF. (Oct. 2020), https://www.uspto.gov/sites/default/files/documents/USPTO_AI-Report_2020-10-05.pdf.

92. John Rogitz, *Japan Patent Office Case Examples on Artificial Intelligence Offer Guidance for Other Offices on Treating AI Inventions*, IP WATCHDOG (Feb. 28, 2019), <https://www.ipwatchdog.com/2019/02/28/jpo-examples-on-artificial-intelligence-offer-guidance-for-other-offices/id=106835/> [<https://perma.cc/2JCH-RYYM>].

be deduced from the correlation.⁹³ For example, if A.I. were used to determine the emotion in pictures of faces, one would have to correlate a smile with being happy, or a frown with being sad.⁹⁴ Additionally, the guidelines require that test results be used to prove adequate description.⁹⁵ When an A.I. algorithm is inherent in a computer function, the application should demonstrate test results or proof of validation of running the model.⁹⁶

The second requirement, an inventive step, appears to be less stringent with regard to technical inventiveness than is the case of the USPTO's inventive concept requirement.⁹⁷ Simply novel input and output data may be sufficient to establish inventiveness that qualifies for patent protection in Japan, though that does not appear to be sufficient in the U.S.⁹⁸ The inventive step requirement combined with the correlation and test results or validation from the system appear to be sufficient to prove patent eligible subject matter in Japan.⁹⁹ The general guideline on inventiveness, outlined in the Japanese Examination Guidelines for Patent and Utility Model, Part III, Chapter 2, Section 2, is whether a person skilled in the art would have easily created the invention.¹⁰⁰

In Japan, A.I. characterized as software has been treated as patent eligible if the processing is implemented using hardware resources.¹⁰¹ In other words, the software version of A.I. is largely viewed as patentable if the inventive steps are directly tied to hardware.¹⁰²

Japan does not include the practical application or inventive concept requirements prevalent in U.S. and, as will be explained, in Chinese patent law.¹⁰³ While the U.S. and China still lead in the number of A.I. patent applications, Japanese A.I. has begun to move towards recognition as a top international force in A.I.¹⁰⁴ According to a World Intellectual Property

93. *Id.*

94. *Id.*

95. *Id.*

96. *Id.*

97. *Id.*

98. *Id.*

99. *Id.*

100. *Case Examples Pertinent to AI-related Technology*, [Tokkyochō, Part III, Ch. 2, Sec. 2, https://www.jpo.go.jp/e/system/laws/rule/guideline/patent/document/ai_jirei_e/jirei_e.pdf [hereinafter Tokkyochō].

101. *WIPO Technology Trends 2019, Artificial Intelligence*, WIPO 96 (2019), https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf [hereinafter World Intellectual Property Organization].

102. *Id.*

103. Rogitz, *supra* note 92.

104. Bruce Berman, *10 Japanese Businesses are Among the Top 16 Artificial Intelligence Patent Holders, says WIPO Report*, IP CLOSEUP (Nov. 26, 2019), <https://ipcloseup.com/>

Organization (WIPO) research report, ten prominent Japanese companies are among the top twelve A.I. patent holders internationally.¹⁰⁵

The JPO provides many case examples of A.I. inventions and how to claim the invention in a way that makes them patent eligible.¹⁰⁶ In Case Example 36, the JPO analyzes a dementia stage estimation apparatus that translates a conversation into text to be fed to a trained neural network to determine the patient's dementia stage.¹⁰⁷ The JPO recognizes the pre-processing of conversation in order to improve estimation accuracy by the neural network is a sufficient inventive step.¹⁰⁸ Further, the highly accurate dementia stage estimation output brings about a significant effect which further supports patentability.¹⁰⁹

2. Chinese Patent Law Related to A.I. Subject Matter Eligibility

In China, the Patent Examination Guidelines are constantly changing because the nation's leaders seek to keep it at the forefront of international legal innovation.¹¹⁰ In China, the Chinese National Intellectual Property Administration (CNIPA) recognizes two types of inventions by means of A.I.: (1) inventions where the problem is raised and the scheme is worked out by a natural person and where it is then verified by A.I. and (2) inventions where the problem is raised by a natural person and the problem is solved and solutions are evaluated by A.I. independently.¹¹¹ China still does not recognize inventions created by A.I. independently, without human intervention.¹¹²

2019/11/26/10-japanese-businesses-are-among-the-top-16-artificial-intelligence-patent-holders-says-wipo-report/ [https://perma.cc/7LXH-DAAA].

105. World Intellectual Property Organization, *supra* note 101, at 32.

106. Tokkyochō, *supra* note 100, at 1.

107. Tokkyochō, *supra* note 100, at 40.

108. Tokkyochō, *supra* note 100, at 41.

109. Tokkyochō, *supra* note 100, at 41.

110. Liaoteng Wang, et al., *A Comparative Look at Patent Subject Matter Eligibility Standards: China Versus the United States*, IP WATCHDOG (June 12, 2020), <https://www.ipwatchdog.com/2020/06/12/comparative-look-patent-subject-matter-eligibility-standards-china-versus-united-states/id=122339/> [https://perma.cc/NU4V-JW2K].

111. Kang Quan, *What Are The Chinese Examination Standards For AI-related Inventions?*, MANAGINGIP (Aug. 20, 2020), <https://www.managingip.com/article/b1n06p9symf6mt/what-are-the-chinese-examination-standards-for-ai-related-inventions> [https://perma.cc/PM9C-3M5Q].

112. *Id.*

In February 2020, the CNIPA met to clarify rules and published guidelines for the patentability of A.I. to encourage innovation.¹¹³ The new guidelines focus on the technical solution of the A.I., including technical features and technical problems to be solved.¹¹⁴

On their face, Chinese examination standards relating to the subject matter eligibility of A.I. inventions are similar to those of the U.S. However, the Chinese patent agency has responded to the increase in A.I. innovation with more favorable application of the standards.¹¹⁵ Article 25.1 of the Chinese Patent Law, which provides a list of subject matter that will not be granted patents, is utilized to determine whether the claim of an A.I. invention is excluded as a “rule or method for mental activities.”¹¹⁶

Next, the CNIPA determines if the innovation belongs to a technical solution as dictated by Article 2.2 of the Chinese Patent Law, which outlines subject matter that is eligible for patent.¹¹⁷ According to the latest Examination Guidelines from the CNIPA, A.I. recites a technical solution if the algorithmic feature of the claim outlines a technical problem and the execution follows the process of solving the technical problem.¹¹⁸

Upon first glance Article 2.2 of the Chinese Patent Law defines patentable subject matter as “any new technical solution . . . or improvement thereof;” this alone does not demonstrate a more favorable patentability standard than the U.S.¹¹⁹ However, the CNIPA’s amendments to the Examination Guidelines over the past few years have ensured the Guidelines remain effective for fast developing technologies and new innovation.¹²⁰ As mentioned, the February 2020 amendment introduced new valuable guidance specifically for A.I. innovations.¹²¹

The continuing amendments that address developing technologies demonstrates the CNIPA’s willingness to expand patentability into the areas in which innovation is happening, whereas the U.S. has not shown the same trend towards more consistent patent standards in new industries.¹²² While there were significant policy reasons for the U.S. to scale back subject matter patentability in *Alice*, A.I. patents have become gradually

113. Aaron Winger, *CNIPA Announces Amended Patent Guidelines for Patent Applications Covering AI and Blockchain*, THE NAT’L L. REV. (Jan. 3, 2020), <https://www.natlawreview.com/article/cnipa-announces-amended-patent-guidelines-patent-applications-covering-ai-and> [<https://perma.cc/TV22-29QZ>].

114. *Id.*

115. Wang et al., *supra* note 110.

116. Quan, *supra* note 111.

117. Quan, *supra* note 111.

118. Quan, *supra* note 111.

119. Wang et al., *supra* note 110.

120. Wang et al., *supra* note 110.

121. Wang et al., *supra* note 110.

122. Wang et al., *supra* note 110.

more patentable over time.¹²³ In 2015, over sixty percent of software patents challenged under *Alice* had at least one claim rejected for lack of subject matter eligibility.¹²⁴ Each year since 2015, the number of patent rejections in the United States under *Alice* have decreased, but steps must be taken to ensure the trend continues.¹²⁵ In order to accomplish this without risking patent quality, more predictable guidance for subject matter eligibility should be provided that are dynamic enough to sustain the pace of innovation.

Of note, China's trend for patent eligibility across all fields in the past decade has favored inventors.¹²⁶ Some scholars argue that this pro-inventor trend in China causes increased quantity of patents, but at the expense of quality.¹²⁷ "Patent quality" is defined as the probability that a patent will survive a legal challenge to its validity.¹²⁸ In the last decade, CNIPA provided subsidies to patent applications, which incentives filing, but does not ensure the quality of Chinese patents.¹²⁹ China recognized the potential issue with patent quality, and as a result, on May 5, 2020, the CNIPA revised its stance on patent approvals.¹³⁰ CNIPA plans to increase patent quality by no longer offering subsidies for patent applications and implementing stricter novelty and inventiveness requirements in examination of applications.¹³¹

III. CHALLENGES TO PROTECTING A.I.

The USPTO began an initiative to collaborate with A.I. inventors to brainstorm and communicate about which additional guidelines would be helpful to both the industry and inventors to enhance the predictability and

123. Joseph Saltiel, *In the courts: five years after Alice - five lessons learned from the treatment of software patents in litigation*, WIPO MAG. (Aug. 2019), https://www.wipo.int/wipo_magazine/en/2019/04/article_0006.html [<https://perma.cc/8BMP-JS36>].

124. *Id.*

125. *Id.*

126. Wang et al., *supra* note 110.

127. Edward Walneck, *The Patent Troll or Dragon: How Quantity Issues and Chinese Nationalism Explain Recent Trends in Chinese Patent Law*, 31 ARIZ. J. OF INT'L & COMP. L. 436, 437 (2014).

128. Brian J. Love, et al., *Determinants of Patent Quality: Evidence from Inter Partes Review Proceedings*, 90 UNIV. OF COLO. L. REV. 68, 80 (2019).

129. Walneck, *supra* note 127, at 452.

130. Oliver Lutze & Lin Zhuo, *Switching Stances: China Policies to Focus Strongly on Patent Quality*, SPRUSON & FERGUSON (May 26, 2020), <https://www.spruson.com/patents/switching-stances-china-policies-to-focus-strongly-on-patent-quality/> [<https://perma.cc/5JBB-6QH2>].

131. *Id.*

reliability of patenting A.I. innovation.¹³² At the forefront of this conversation is increasing predictability of subject matter eligibility to ensure IP rights for appropriate A.I.¹³³ One consideration in evaluating subject matter eligibility, involves ensuring sufficient disclosure of the A.I. invention to allow the examiner to determine whether the invention outlines a technological improvement or significantly more than the abstract idea to transform it into patent eligible subject matter.¹³⁴

A. Considerations Related to Disclosure

These recent concerns with subject matter eligibility raise the issue of disclosure and the written description requirement of 35 U.S.C. Section 112.¹³⁵ In order to meet the written description requirement, A.I. that includes “claims to computer-implemented inventions” must provide sufficient disclosure of the hardware and software to prove the patentee had the full scope of the invention at the time of filing.¹³⁶ Specifically, the application must disclose the computer, the algorithm, and how it performs the claimed function in “sufficient detail” where someone of ordinary skill in the art could reasonably determine that the inventor understood and possessed the claimed subject matter.¹³⁷ “Sufficient detail” is mentioned many times throughout official and unofficial documents, though there appears to be no definition as to what disclosure is considered “sufficient.”¹³⁸

Some A.I. innovations may be hard to provide sufficient disclosure because “even though the input and output may be known by the inventor, the logic in between is in some respects unknown.”¹³⁹ This is why algorithms are often called “black boxes,” highlighting the necessity to rely on enablement under 35 U.S.C. Section 112(a), or the possibility of protecting IP with trade secrets.¹⁴⁰ Overall, the current law regarding disclosure has highlighted questions on how to effectively and consistently patent A.I. inventions

132. *Artificial Intelligence*, USPTO, <https://www.uspto.gov/initiatives/artificial-intelligence> [<https://perma.cc/4HP5-FSRB>]; Press Release, USPTO, USPTO releases report on artificial intelligence and intellectual property policy (Oct. 6, 2020), <https://www.uspto.gov/about-us/news-updates/uspto-releases-report-artificial-intelligence-and-intellectual-property> [<https://perma.cc/B2LK-7GSM>].

133. Press Release, USPTO, USPTO releases report on artificial intelligence and intellectual property policy (Oct. 6, 2020), <https://www.uspto.gov/about-us/news-updates/uspto-releases-report-artificial-intelligence-and-intellectual-property> [<https://perma.cc/B2LK-7GSM>].

134. *Public Views on Artificial Intelligence*, *supra* note 91, at 8–9.

135. 35 U.S.C. § 112.

136. *Public Views on Artificial Intelligence*, *supra* note 91, at 9–10.

137. *Public Views on Artificial Intelligence*, *supra* note 91, at 9.

138. *See, e.g., Public Views on Artificial Intelligence*, *supra* note 91, at 8–10.

139. *Public Views on Artificial Intelligence*, *supra* note 91, at 10.

140. *Public Views on Artificial Intelligence*, *supra* note 91, at 10.

and the USPTO has not provided sufficient guidance to solidify the application of the law.

B. Considerations Related to Patent Eligible Subject Matter

Under Section 101 patent eligibility, the abstract idea exception has been expanded to include ideas considered to be mental processes.¹⁴¹ Mental processes are considered to be anything that could be carried out in the human mind, including, for example, observation and opinion.¹⁴² Since expanding considerations under Section 101 eligibility, courts often invoke the mental steps category of abstract ideas when considering the patentability of algorithms and software.¹⁴³ This is a shift in how the abstract idea exception for patent eligibility is construed, from whether the claimed invention was performed mentally to a hypothetical determination of if it *could* be performed mentally.¹⁴⁴ Many courts have since ruled on the apparent expansion of the mental steps exception of patent eligibility, some of those rulings will be considered here.

The mental steps doctrine of patent eligibility has expanded to cover not only processes that are performed mentally but also processes that *can* be performed mentally, as demonstrated in *Intellectual Ventures I LLC*.¹⁴⁵ Specifically regarding A.I., much of the innovation began as improvements in efficiency by utilizing a computer to improve speed and accuracy of a process done manually prior to the invention.¹⁴⁶ There appears to be a trend toward evaluating and ultimately deeming A.I. patent applications ineligible based on whether it is a computer implementation of an abstract idea capable of being accomplished by the human mind.¹⁴⁷ This treatment of A.I. has made it increasingly difficult for inventors to obtain patents on A.I. inventions.¹⁴⁸

141. 2019 Revised Patent Subject Matter Eligibility Guidance, *supra* note 59.

142. 2019 Revised Patent Subject Matter Eligibility Guidance, *supra* note 59.

143. Robert Sachs, *The Mind as Computer Metaphor: Benson and the Mistaken Application of Mental Steps to Software*, FENWICK (Apr. 6, 2016), <https://www.bilskiblog.com/2016/04/the-mind-as-computer-metaphor-benson-and-the-mistaken-application-of-mental-steps-to-software/> [https://perma.cc/3CLP-XNFM].

144. *Id.*

145. *Id.*

146. Firth-Butterfield & Chae, *supra* note 4, at 8.

147. Firth-Butterfield & Chae, *supra* note 4, at 8.

148. Firth-Butterfield & Chae, *supra* note 4, at 8.

Generally, the U.S. has promoted and rewarded innovation in the form of small changes and improvements on existing technologies, and breakthroughs in innovation have been denied protection as there are no alternatives to implement the specific goal in the industry.¹⁴⁹ It is important that policy issues are considered, as there are arguments on both sides of protecting small improvements. If certain basic A.I. or software becomes patentable it will remove the ability to use the technology as a basis for further innovation in the future, especially in cases where the industry must be standardized to ensure products are compatible. On the other hand, rewarding small improvements encourages innovation as a whole when inventors believe a small invention may be patentable.

The U.S. support of small A.I. improvements in solving existing technological problems runs the risk of patenting “basic tools of scientific and technological work.”¹⁵⁰ This removes the patented subject matter from use in improvement in future innovation.¹⁵¹ It also removes patent eligibility for groundbreaking technology that may not have a current solution from which to judge technical improvements.

C. *Is Trade Secret Protection More Appealing?*

Under Section 112(a), the enablement requirement is met when the specification can teach the full scope of the claimed invention without undue experimentation to a person of ordinary skill in the art.¹⁵² Generally, the amount of detail needed in describing the invention is “related to the amount of knowledge in the state of the art, as well as the predictability of the art.”¹⁵³ For example, in an emerging field like A.I., where relatively little is known through “prior art” and the art is “unpredictable,” the application must include more details on “how to make and use” the invention to meet the requirements of enablement.¹⁵⁴

Specific to A.I., applications that wish to meet the disclosure requirement to A.I.-related inventions must provide claims with “sufficient detail of the hardware and software components to show that the inventor understood the entire technology at the time of the invention.”¹⁵⁵ There is some disagreement around whether there should be additional disclosure requirements specific to A.I., or if the current law, Section 112, works sufficiently for A.I.

149. Pinarbasi, *supra* note 7.

150. *Gottschalk*, 409 U.S. at 67.

151. *See* Pinarbasi, *supra* note 7.

152. *See* 35 U.S.C.S. § 112; *see also* *Amgen Inc. v. Sanofi*, 987 F.3d 1080, 1082 (Fed. Cir. 2021).

153. *Public Views on Artificial Intelligence*, *supra* note 91, at 10.

154. *Public Views on Artificial Intelligence*, *supra* note 91, at 10.

155. *Public Views on Artificial Intelligence*, *supra* note 91, at 9.

inventions.¹⁵⁶ Some indicate the current law is applicable to A.I. disclosure, while others believe there are unique challenges in A.I. that do not allow for full disclosure, as the inventor will often know the input and output but not the logic in between.¹⁵⁷ If the inventor is unable to provide enough detail to meet this requirement, they may rely on the enablement requirement, or abandon patent protection all together to seek trade secret protection.

Trade secret is generally seen as a weaker form of protection than patent law, as it does not prevent the discovery of the invention under trade secret protection by reverse engineering or independent creation.¹⁵⁸ There is also always a risk that the holder of the trade secret will be breached in some way, whether by theft or breach of confidentiality, to allow the secret to be passed on to third parties.¹⁵⁹

Given its inherent value, the portion of technology that applies A.I. to the model, or the internal step that applies parameters to the data, is the most eligible for trade secret protection.¹⁶⁰ One downside to pursuing trade secret protection is that there is no right to exclude others from using the technology if they discover it through trial and error.¹⁶¹ A problem particular to A.I. algorithms is that, given enough inputs and outputs, a third party could deduce and recreate what is happening inside the “black box.”¹⁶²

Another consideration is that the owner of the trade secret must make reasonable efforts to keep the information secret.¹⁶³ From a public interest perspective, with the exception of potential reverse engineering, utilizing trade secrets for A.I. often prevents the disclosure of new ideas, which has been seen to have a negative effect on overall innovation in an industry.¹⁶⁴

While the extent of the current use of trade secret protection in the A.I. industry is unknown, it is possible that a large percentage of A.I. intellectual property is held as a trade secret. Some advantages to trade secrets over

156. *Expectation Maximization in Patent Application Disclosures: Considerations with AI-Related Inventions*, JDSUPRA (June 5, 2020), <https://www.jdsupra.com/legalnews/expectation-maximization-in-patent-72900/> [<https://perma.cc/HTA7-DGZE>].

157. *Public Views on Artificial Intelligence*, *supra* note 91.

158. Quinn Emanuel Urquhart & Sullivan, LLP, *supra* note 14.

159. Quinn Emanuel Urquhart & Sullivan, LLP, *supra* note 14.

160. David Sanker, Ph.D. & Karon Fowler, *Patents vs. Trade Secrets for Inventions that Use Artificial Intelligence*, MORGAN LEWIS (2020), <https://www.morganlewis.com/-/media/3e56451e45534ffd81efbe05084a288b.ashx> [<https://perma.cc/U8C5-DAZK>].

161. *Id.*

162. *Id.*

163. *Id.*

164. Meyers, *supra* note 68.

patents include the lack of filing fees and time to prosecute a patent prior to being issued, the theoretically unlimited time for protection, and the lack of or restriction on subject matter eligible for trade secret protection.¹⁶⁵

Especially in the realm of A.I., trade secrets seem ideal as the industry is changing at a rate that patent protection is simply not efficient enough to keep up.¹⁶⁶ By the time A.I. inventions are granted a patent, it is likely the technology or technological improvement will change and need to be updated. Accordingly, given the challenges in patentable subject matter for A.I. under the *Alice* test, trade secrets have become a more enticing option for protecting IP.¹⁶⁷

IV. LESSONS FROM FOREIGN A.I. PROTECTION

A. Chinese Protection of A.I. Innovation

China has outpaced the U.S. in the number of A.I. patent applications, which shows the emphasis China places on technology development, specifically in A.I.¹⁶⁸ Although China currently has more patent applications, the U.S. remains ahead of China's A.I. development.¹⁶⁹ Given that China appears to be moving in a more favorable direction for inventors, the U.S. must make changes stay at the forefront of international innovation and encourage innovation and patent filing in the U.S.

One caveat worth noting is China has a reputation for not respecting intellectual property rights in general.¹⁷⁰ This belief seems to be deeply rooted in the U.S. in recent years, as China has become more serious in its intellectual property right protections in order to make it a more attractive venue for international patent applicants.¹⁷¹ China provides full patent rights similar to westernized countries like the U.S., though patent

165. *The Increasing Importance of Trade Secret Protection for Artificial Intelligence*, *supra* note 14.

166. *The Increasing Importance of Trade Secret Protection for Artificial Intelligence*, *supra* note 14.

167. *The Increasing Importance of Trade Secret Protection for Artificial Intelligence*, *supra* note 14.

168. *Nation leads the World in Applications for AI patents*, IPR DAILY (Dec. 23, 2019, 10:27 AM), <http://www.iprdaily.com/article/index/15338.html> [<https://perma.cc/2P9K-NKNS>].

169. George Leopold, *China Dominates AI Patent Filings*, ENTER. AI (Aug. 31, 2020), <https://www.enterpriseai.news/2020/08/31/china-dominates-ai-patent-filings/> [<https://perma.cc/4TPJ-3T5K>].

170. Dan Prud'homme, *3 Myths about China's IP Regime*, HARV. BUS. REV. (Oct. 23, 2019), <https://hbr.org/2019/10/3-myths-about-chinas-ip-regime> [<https://perma.cc/DXX6-XPSC>].

171. *Id.*

infringement remains a problem for the country.¹⁷² Clearly, the patent protection of China still has its shortcomings, but the country is moving in the right direction in updating their patent regime.¹⁷³

As explained earlier, Article 2.2 and 25.1 of Chinese Patent Law recites similar subject matter eligibility requirements to U.S. patent law, though China has experienced a recent shift to more transparency between CNIPA and inventors, which is viewed as favorable to inventors as it allows inventors to understand how CNIPA may scrutinize A.I. applications.¹⁷⁴ The transparency is accomplished through meetings of the CNIPA to promote clarity of A.I. requirements, which resulted in amendments to Chinese Patent Law.¹⁷⁵ The U.S. must shift to adopt some of the Chinese strategies on engaging with inventors and passing amendments specifically to promote consistency and transparency in the process of obtaining A.I. patents.

B. Japanese Protection of A.I. Innovation

Alternatively, Japan has lower numbers of A.I. patent applications, though they have recently put a large emphasis on the importance of A.I. innovation and publish regular guidelines and case examples.¹⁷⁶ A.I. technology development in Japan is now second only to the U.S., which given Japan's comparatively small size and recent improvements to the patent system, demonstrates the effectiveness of its patent eligibility review and frequent legislation around A.I. inventions.¹⁷⁷ The JPO has even discussed utilizing A.I. systems in screening patent applications, which is a great technological advancement for any government agency.¹⁷⁸

172. *Id.*

173. *Id.*

174. Wang et al., *supra* note 110.

175. Liaoteng Wang, et al., *A Comparative Look at Patent Subject Matter Eligibility Standards: China Versus the United States*, IP WATCHDOG (June 12, 2020), <https://www.ipwatchdog.com/2020/06/12/comparative-look-patent-subject-matter-eligibility-standards-china-versus-united-states/id=122339/>.

176. *See Recent Trends in AI-Related Inventions – Report*, JAPAN PAT. OFF. (Aug. 2021), https://www.jpo.go.jp/e/system/patent/gaiyo/ai/document/ai_shutsugan_chosa/report.pdf.

177. Tao Jiang & Shuijing Hu, *Intellectual Property Protection for AI-Related Inventions in Japan*, IEEE 286, 286–89 (Sept. 15, 2019), <https://icceexplore.ieee.org/document/8920777> [<https://perma.cc/HS7M-SESC>].

178. Ed Lauder, *The Japan Patent Office Deploying AI to Screen Patent Application*, AI BUS. (Apr. 24, 2017), https://aibusiness.com/document.asp?doc_id=760272&site=aibusiness [<https://perma.cc/7LVD-2M6A>].

As seen in Japan, exemplary A.I. cases showing how inventions would be analyzed at the USPTO, would be a welcome addition to attempt to clarify subject matter eligibility in the U.S. Some guidelines regarding subject matter eligibility at the USPTO exist already, such as Appendix 1 to the USPTO October 2019 Subject Matter Eligibility Update (2019 PEG), though these examples are mostly limited to Life Sciences and Data processing as a whole.¹⁷⁹ A specific A.I. document similar to this appendix would be helpful in providing sample A.I. embodiments and how they would be treated with respect to patent eligibility, especially as the community is navigating this new realm of A.I. eligibility.

On an international level, all countries mentioned are involved in WIPO, which brings together countries to discuss global IP trends, share ideas, and develop global IP agreements.¹⁸⁰ WIPO has recognized the emerging market for A.I., poses questions, and holds conversations with different agencies to discuss new problems and potential solutions.¹⁸¹ Some of WIPO's findings speak to the necessity of IP incentives to encourage A.I. innovation, and how the differences in the nature of A.I. technology might require changes to existing IP frameworks around the world.¹⁸² While this is a valuable step in understanding some issues surrounding the field and relevant policies from other major patent agencies, there must be follow-up action by the USPTO on WIPO's findings to demonstrate the USPTO understands the urgency of the matter.

C. *European Protection of A.I. Innovation*

Though not covered in detail above, the EPO has held various conferences on the patentability of A.I. under current laws, which has helped to provide insight into the process of evaluating the patent eligibility of A.I. subject matter. In this conference, the EPO discussed different broad areas of A.I., including core A.I. (software and algorithms), trained models and machine learning and A.I. in fields such as autonomous vehicles and healthcare, and theorized whether they could be patentable. While A.I. applications are always changing, a conference similar to the one held by the EPO would be useful to all countries to demonstrate some of the A.I. technologies that might be patentable under current law.

179. See generally *October 2019 Update: Subject Matter Eligibility*, USPTO App. 1 (Oct. 2019), https://www.uspto.gov/sites/default/files/documents/peg_oct_2019_app1.pdf.

180. See *Inside WIPO*, WORLD INTELL. PROP. ORG., <https://www.wipo.int/about-wipo/en/> [<https://perma.cc/2L4W-KGBU>].

181. *Artificial Intelligence and Intellectual Property Policy*, WORLD INTELL. PROP. ORG., https://www.wipo.int/about-ip/en/artificial_intelligence/policy.html [<https://perma.cc/C4SC-V2EZ>].

182. *Id.*

Additionally, under EPO patent law in countries like France and Germany, A.I. can be protected by an IP right called utility models or utility certificates, for which requirements vary but are generally less stringent than patents.¹⁸³ There is usually no substantive examination, and the registration is quick and cheaper, which makes them a valuable resource in protecting inventions, like A.I., that have the potential to become quickly outdated. Germany instated a “branch-off” utility model which allows an inventor to seek an enforceable IP right, usually granted within a few weeks, on a technology while the patent application is being examined.¹⁸⁴

German utility models are referred to as unexamined IP rights, as during the registration there is no determination as to novelty, inventiveness, or industrial application. While this is a good option for quickly and cheaply protecting IP rights, the protection can be cancelled as the examiner reviews the patent application for requirements of novelty, inventive step and industrial application.¹⁸⁵ Because a utility model is meant to be a placeholder for IP rights as the inventor awaits patent approval, it is only enforced for ten years instead of patent protection which can last up to twenty years.¹⁸⁶ In combination, this equals thirty years of protection for a technology during which the inventor can prohibit others from utilizing the invention, so there may be a policy argument that this is too long of a monopoly to provide to the inventor.

This utility model may increase innovation on the front end as inventors could get IP rights early in the process, but the model does not address the issue of subject matter eligibility facing the U.S. patent system. This may seem to be a quick fix for making A.I. IP rights more available, the technology will still be examined for the appropriate disclosure and subject matter eligibility. As such, this may not be the best strategy for reform of U.S. patent laws to accommodate the issues facing A.I. innovation.

183. *IP Protection of Artificial Intelligence in Europe*, *supra* note 55.

184. *IP Protection of Artificial Intelligence in Europe*, *supra* note 55.

185. *Utility Model Protection in Germany*, BARDHELE PAGENBERG, https://www.bardehle.com/uploads/tx_toco3bardehle_files/Utility_model_protection_Germany.pdf.

186. 2019 Revised Patent Subject Matter Eligibility Guidance, *supra* note 59; Natalie Raffoul & Brion Raffoul, *Utility Models and Industrial Designs – IP Rights Worth Considering*, IAM (Oct. 2, 2019), <https://www.iam-media.com/global-guide/iam-yearbook/2020/article/utility-models-and-industrial-designs-ip-rights-worth-considering> [<https://perma.cc/7JM5-SHHP>].

V. PROPOSED SOLUTION TO UNPREDICTABLE PATENTABILITY OF A.I. IN THE U.S.

The statutory law in the U.S. has remained largely unchanged since the Patent Act of 1952, which codified statutory patent law in Title 35 of the United States Code. While courts have updated the application and meaning of the law, it is difficult to keep up with applying the law to the technological advances that could not have been predicted almost seventy years ago. While the courts' interpretation of the law has evolved over time, the Supreme Court's recent intervention and establishment of the *Alice*/*Mayo* test demonstrates there must be additional guidance from the USPTO and engagement with the public to discuss how the country will proceed with evaluating A.I. inventions. This may warrant a change in statute language or the addition of language to address the increasing importance of the A.I. field and clarify some of the unpredictability of patentability with respect to both eligible subject matter and sufficient disclosure. While specifying the language would be ideal to submit to the USPTO, it may be beneficial for practitioners and inventors to analyze A.I. trends as discussed above and meet with the USPTO to discuss additions or changes to statutes that would promote transparency and predictability in A.I. subject matter eligibility.

Overall, it is critical that the path to patent protection for A.I. inventions is clarified and streamlined to encourage A.I. innovation and progress in the U.S.; Otherwise, inventors will bring their patents to foreign countries. Since the introduction of the *Alice* two-part test, the Supreme Court has offered little guidance on the USPTO guidelines for meeting patent eligibility requirements and left it to the lower courts and attorneys to learn through patent prosecution.¹⁸⁷

Where the algorithm is too complex or makes decisions based on prior experience, the technology is not patentable without an explanation of the technical application and how the invention works to improve an existing process. In such cases, trade secret protection seems to be the most viable solution to overcoming lack of patent eligibility, however, this brings about policy concerns relating to keeping the innovation from the general public. Alternatively, it is important to consider whether allowing patents on certain broad forms of A.I. would encourage a monopoly for large companies in the space to continue to innovate without the threat of competition.

In order to overcome some of the inconsistencies and barriers to patent protection for A.I. technology, the USPTO should consider following

187. John Richards, *Issues Surrounding Patenting of Inventions Relating to Artificial Intelligence in the US and Europe*, FIN.WORLDWIDE (Mar. 2019), <https://www.financierworldwide.com/issues-surrounding-patenting-of-inventions-relating-to-artificial-intelligence-in-the-us-and-europe#.X1KVNPhKhTY> [<https://perma.cc/HM36-NM3G>].

Japan in providing A.I. specific guidelines to practitioners and inventors. The more frequent the better, as the industry is one that is quickly evolving. This may be too daunting for a government agency to establish immediately, so perhaps first establishing general public meetings hosted by the USPTO would be sufficient. These meetings should discuss A.I. advancement as a way to inform practitioners what is on the horizon and how the USPTO may handle the innovation.

Not only is A.I. the future of many industries, but it also has the potential to grow from a \$2 trillion international market to a \$15.7 trillion market by 2030.¹⁸⁸ This statistic alone emphasizes the importance of the industry, and as much of this industry should be kept domestically through more straightforward patent issuing to encourage investment in innovation.

Some ways this might be accomplished beyond more frequent guidance and examples from the USPTO would be to establish specific examiners to review A.I. related technology to allow for the most streamlined patent issuing.¹⁸⁹ Additionally, these examiners should be trained in current A.I. technology which would afford more knowledge when determining whether the A.I. is an improvement on an existing solution, or something that would be understood by a person having reasonable skill in the art.

Variations in examiner treatment of patents during prosecution is a recognized challenge of the current patent process, and those variations will be even more pronounced in A.I. review until the industry is better understood. Until then, limiting the number of examiners reviewing A.I. or requiring training prior to review would be beneficial to both the consistency of patented A.I. generally at the USPTO and to inventors looking to file A.I. patents. The USPTO should draft guidance specific to examining A.I. technology and guidance should be available to examiners for further consistency in A.I. patentability.¹⁹⁰

A. New Exception for Treatment of A.I. Under Section 101

The U.S. should update its current patent laws to account for A.I. as its own category for analysis under an abstract idea in Step 2 of the *Alice*¹⁹¹/

188. Rao et al., *supra* note 35.

189. *Public Views on Artificial Intelligence*, *supra* note 91, at 18.

190. See generally *Public Views on Artificial Intelligence*, *supra* note 91, at 18. (exploring interested parties views on Artificial Intelligence law policy).

191. *Alice*, 573 U.S. at 215.

*Mayo*¹⁹² test. While it may be accurate to consider it an abstract idea, the mental processes or mathematical concept subcategories are not adequate to determine the inventiveness of the invention. As discussed, if there is a technological improvement from prior technology, or if the elements amount to significantly more than the exception of an abstract idea, then the A.I. is patentable under U.S. law.

These standards are vague, especially when it comes to A.I. where there may not be a standard to improve on or where the algorithm cannot be described in enough detail to prove it is significantly more than the abstract idea. Often A.I. is completely new and innovative, perhaps not able to claim an improvement over existing procedure based on the fact that one does not exist. This should not make it more difficult to obtain a patent, though it appears it does as the A.I. must then rely on another standard to prove patentability.

In the field of A.I., which is primarily related to learning from experience and performing cognitive tasks, it is counter intuitive to classify these improvements as mental processes or simple mathematical concepts. While at its core, A.I. may be performing tasks that the human mind can theoretically accomplish, the value of A.I. lies in the ability to look at large amounts of data to quickly and accurately come to a conclusion.¹⁹³

As an abstract idea, the U.S. law currently expects proof of a technical element or practical application of the invention prior to granting approval.¹⁹⁴ The current analysis for patent eligibility of A.I. as mental process or mathematical concept is not favorable to encourage innovation in A.I. and should be modified.

The solution should not involve updating Section 101 as a whole, but rather modifying the way A.I. is treated in the patent eligibility analysis. Updating Section 101 would be a major change to patent law, introducing potential changes in protection of existing patents. It would also cause another industry shift similar to America Invents Act (AIA) of 2011, which requires patents to be classified as pre-AIA or post-AIA to determine which law to examine the patent under.¹⁹⁵ To avoid major changes to patent law as a whole, an exception should be made for the analysis of patentability of A.I. innovation specifically.

A more effective system may be focused on the result of the A.I. and demonstrating that the input and output is directed to a technical or practical application. Given the requirement of a technical application or significantly

192. *Mayo*, 566 U.S. at 77–78.

193. Firth-Butterfield & Chae, *supra* note 4, at 6.

194. 2019 Revised Patent Subject Matter Eligibility Guidance, *supra* note 59.

195. *America Invents Act Changes*, FINNEGAN, <https://www.finnegan.com/imimag/content/1/1/v2/116002/fifinneg-america-invents-act-changes-brochure.pdf>.

more than the exception has not been defined, it would be beneficial to define based on the output of the A.I. Based on the definition of A.I., as “a branch of computer science simulating intelligent behavior in computers,”¹⁹⁶ the goal of A.I. is to mimic intelligent, often human behaviors. With this in mind, patent law should allow protection for these new innovations, whether the practical application or technical improvement is slight or simply based on greater accuracy or efficiency.

Additional support for allowing patentability of small innovation comes from the fact that the obviousness requirement under Section 103 would likely prevent the invention from issuing if the innovation is too slight. If the invention is too similar or straightforward from past inventions or obvious from the view of people of reasonable skill in the art, the patent will not pass the obviousness requirement. There are many safeguards to ensuring quality patents are issued in the U.S. and perhaps Section 101 should not be the place to determine patentability based on the size of the technical improvement of the A.I.

The one exception to allowing patent protection for A.I. that improves accuracy or efficiency would be ensuring that patents do not “tie up” basic A.I. concepts and ideas. As discussed in *Mayo*,¹⁹⁷ protecting basic ideas and tools would inhibit the use of these concepts in future discovery. This is where the analysis of the output would apply. If the output is sufficiently specific to solve a problem in a particular industry, it does not appear that this would tie-up any basic ideas in future innovation. A limitation on the claim based on a specific application of an algorithm should be sufficient to prove patentability. However, if the A.I. algorithm simply takes in input and organizes or classifies using a simple algorithm, it is not beneficial to allow patent eligibility and risk progression in the industry.

While this Article promotes patent eligibility analysis based on output of the A.I., it is also important to consider how the USPTO should handle disclosure, specifically when the algorithm is too complex to disclose in a way that meets current requirements under Section 112.¹⁹⁸ The description of the technology must be such that a person of reasonable skill in the art would be able to make and use the invention,

196. *Artificial Intelligence*, MERRIAM WEBSTER, <https://www.merriam-webster.com/dictionary/artificial%20intelligence> [<https://perma.cc/7J8X-UHA4>].

197. *Mayo*, 566 U.S. at 66, 71 (2012) (quoting *Gottschalk*, 409 U.S. at 67).

198. *See generally* 35 U.S.C. § 112.

which ultimately supports the policy argument for issuing patents, to make the technology available to future inventors to continue to innovate.¹⁹⁹

The best way to address the disclosure requirement is to provide enough information on the input, output, and the general algorithm processes or logic such that a person of reasonable skill in the art could at the very least attempt to reverse engineer the desired result. Perhaps similar to patent law in Japan, the U.S. might allow test results from running the A.I. that match the expected described output to prove that the A.I. has been adequately disclosed.²⁰⁰

Finally, the Federal Circuit should start to hear A.I. cases that appear to be unclear in the application of the *Alice/Mayo* test. This would not only provide further guidance to patentees on how to claim A.I. inventions in patenting and avoid issues in litigation, but also encourage the Supreme Court to step in to interpret the application of existing Section 101 laws and its application to A.I. technology.

Overall, the goal of new A.I. related patent law is to provide enough guidance and support A.I. patent eligibility to encourage inventors to file for a patent as opposed to attempt to protect their invention as a trade secret. This continues to be a popular option when there is no clear path to patent eligibility. Over time this will harm U.S. A.I. innovation in comparison to Japan and China where the patent agencies are updating and providing guidance contemporaneously with industry advancement.

B. Also on the Horizon: A.I. as an Inventor

The future of A.I. innovation appears to include addressing whether A.I. will be recognized as an inventor.²⁰¹ The USPTO has already reviewed and subsequently rejected a patent application with A.I., or a non-human, as the inventor.²⁰² Inventors are already coming up with creative ideas to overcome this limitation, such as a human inventor coming up with a small contribution to a claim of the invention so the human inventor can be listed on the application.²⁰³ Though untested at the USPTO or other patent agencies, this appears to be a potential work around for A.I. generated inventions to gain approval.²⁰⁴

199. *Id.*

200. Rogitz, *supra* note 92.

201. Firth-Butterfield & Chae, *supra* note 4, at 6.

202. David McCombs et al., *AI Invents But Can't Be an Inventor. So Now What?*, LAW (Aug. 31, 2020, 7:00 AM), <https://www.law.com/legaltechnews/2020/08/31/ai-invents-but-cant-be-an-inventor-so-now-what/> [<https://perma.cc/C98A-8SFB>].

203. *Id.*

204. *Id.*

Where practitioners find a way around listing A.I. as an inventor, the inventor is not accurately depicted on the patent which may prove problematic in the future when attributing inventions to humans who may not have intimate knowledge of the A.I. This shift to non-human inventors is likely to continue as A.I. becomes more sophisticated.²⁰⁵ Adding a new exception to patent law for the evaluation of A.I. inventions would allow the opportunity for the USPTO to address the looming question of how to treat A.I. as an inventor.²⁰⁶ If the USPTO refuses to provide guidance on the treatment of A.I. as an inventor, there may be no other option than to protect A.I. created inventions as a trade secret.²⁰⁷ This would remove a potentially large segment of future innovation from the public. Per current patent law, the inventor must be human, however, there does not seem to be an issue with adding A.I. as a potential inventor with proper guidance from the USPTO.

VI. CONCLUSION

The unpredictability of the USPTO issuance of A.I. patents has been a developing issue over the last decade. A.I. development trends as well as expected future economic impact in the magnitude of trillions of dollars over the next ten years necessitate a change for continued innovation in U.S. A.I. innovation.²⁰⁸ China and Japan have some noteworthy differences worth considering for application in the U.S. such as more regular patent agency meetings discussing A.I. specific developments, and a more specialized approach to A.I. patent eligibility and disclosure requirements. Additionally, external guidance to A.I. inventors in the form of regular USPTO reports or example case studies on A.I. patentability and a small group of specialized examiners for A.I. related technology would further address the problem with lack of predictability.

As a whole, A.I. is a new and quickly evolving industry that was once thought of only as a fiction of the imagination. Computers performing intelligent, human like cognitive tasks is a new reality in the near future, something that many thought to be impossible. While it is impossible to predict the future of A.I., the U.S. should begin implementing regular A.I. specific guidance, provide case examples outlining the examination of A.I.

205. *Id.*

206. *Id.*

207. *Id.*

208. Rao et al., *supra* note 35.

technology and create a new abstract idea exception specifically for A.I. It is important that the USPTO make efforts to regularly address and adapt to the changing technology to ensure the U.S. remains a strong leader in innovation and a desirable venue for international A.I. patent filings.