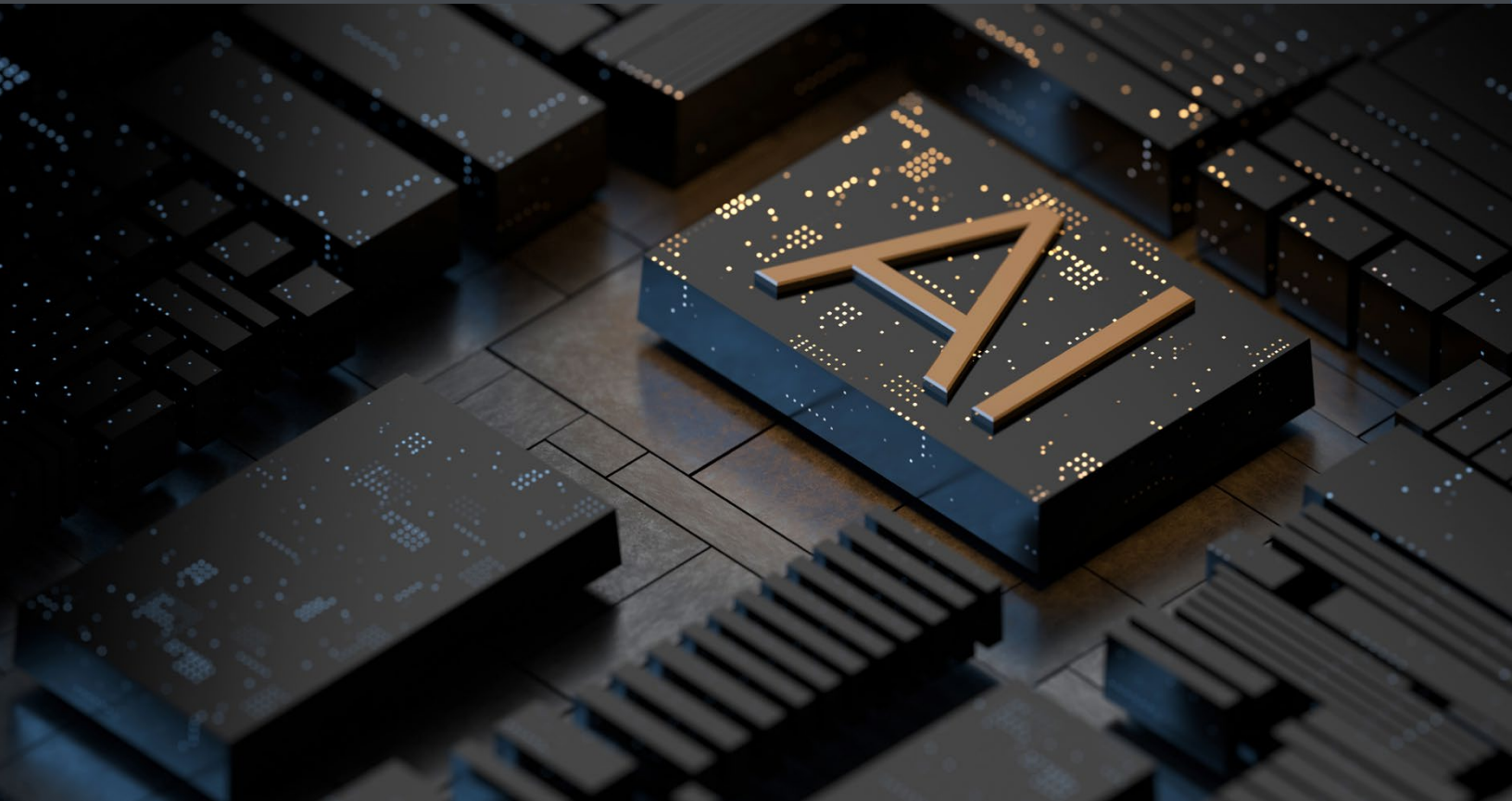


Can Artificial Intelligence Systems Make Patented Inventions?



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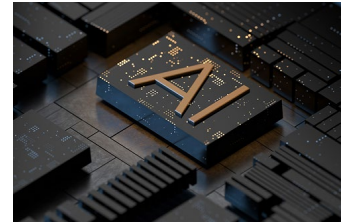
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INTRODUCTION

In 2018, a team led by Ryan Abbott, a University of Surrey law professor, and Stephen Thaler, a computer scientist from Missouri, started the Artificial Inventor Project—a project seeking intellectual property rights for inventions generated by an artificial intelligence (AI) device without a traditional human inventor.¹ In challenging the status quo, which requires listing a person as the inventor, Abbott and Thaler filed two patent applications related to a food container and a neural flame internationally, both listing an AI machine as the inventor.² In doing so, they brought an interesting question to the forefront: Can a patent be issued with an AI machine as the inventor?

The answer has been an almost unanimous no, with rare exceptions in some countries. For example, the world's first patent with an AI machine as the inventor was issued in South Africa in 2021. Other countries, however, have adopted different stances in considering AI inventorship.

This paper reviews the status of these applications in several major jurisdictions and discusses additional issues in AI technology that may not be sufficiently addressed by the existing patent laws.

CONVENTIONAL INVENTORSHIP OF PATENTS

The United States Patent and Trademark Office (USPTO)

In the United States, the exclusive right to new discoveries for limited times is granted by the Congress in the form of patent rights.³ The inventors—“whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof”—“may obtain a patent therefor, subject to the conditions and requirements of this title.”⁴



The use of the pronoun “whoever” in 35 U.S.C. § 101 indicates that the inventors should be natural persons, not machines. Indeed, “[t]he threshold question in determining inventorship is *who* conceived the invention,” not *what* conceived the invention, because “[conception] is the formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention.”⁵

The human requirement of inventorship is further elucidated in the procedural rules put in place to ensure the proper identification of inventorship for each patent. For example, an inventor is required to execute documents identifying himself or herself as the inventor.⁶ The person who executes the oath or declaration for an application must have reviewed and understood the contents of the application, including the claims.⁷ In the case of the inventor or joint inventor assigning the rights to a company, the assignment can “serve as an oath or declaration ... if the assignment as executed includes the information and statements” required for the oath or declaration and “[a] copy of the assignment is recorded.”⁸ The inventor

¹ See THE ARTIFICIAL INVENTOR, <https://artificialinventor.com/>.

² See *Patents and Applications*, THE ARTIFICIAL INVENTOR, <https://artificialinventor.com/patent-applications/>.

³ See U.S. CONST. art. I, § 8, cl. 8.

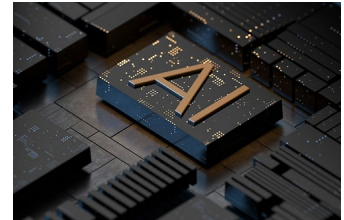
⁴ 35 U.S.C. § 101.

⁵ *Fiers v. Revel*, 984 F.2d 1164, 1168 (Fed. Cir. 1993); see also *Burroughs Wellcome Co. v. Barr Lab'ys, Inc.*, 40 F.3d 1223, 1227–28 (Fed.Cir.1994).

⁶ See 37 C.F.R. § 1.63(a).

⁷ See *id.* § 1.63(c).

⁸ *Id.* § 1.63(e).



also bears the duty to disclose to the USPTO all known information that is material to patentability of the invention, such as other patents or publications that describe similar or related concepts.⁹

The inability of the current patent system to accommodate non-human inventors is further illustrated by Dr. Thaler's creative attempts to fulfill the formal U.S. patent filing requirements. For example, Dr. Thaler and his team filed two applications—U.S. Application Nos. 16/524,350 and 16/524,532—on July 29, 2019, listing a single inventor in the Application Data Sheet (ADS) with the first name “Device for the Autonomous Bootstrapping of Unified Sentience (DABUS)” and the family name “Invention generated by artificial intelligence.”¹⁰ In lieu of the requisite declaration or oath, Dr. Thaler executed a substitute statement, which is allowed under 35 U.S.C. § 115(d), to state that the inventor DABUS was “under legal incapacity in view of the fact that the sole inventor is a Creativity Machine (i.e., an artificial intelligence), with no legal personality or capability to execute this substitute statement.”¹¹ Dr. Thaler further identified himself as the assignee of the entire right, title, and interest in the invention and signed the assignment document.¹²

The USPTO responded by indicating that the ADS did not identify each inventor by his or her legal name as required by the pertinent procedures.¹³ Dr. Thaler then filed two consecutive petitions, requesting supervisory review and reconsideration of the issue.¹⁴ The petitions were denied one after another, followed by a final written decision denying the request for reconsideration.¹⁵

In the final written decision, the USPTO pointed to the use of pronouns that are specific to natural persons in various statutes.¹⁶ The USPTO also highlighted the Federal Circuit decisions that have clarified that, to perform the mental act of inventing, inventors must be natural persons.¹⁷ In conclusion, the USPTO stated that a machine does not qualify as an inventor under the U.S. patent laws.¹⁸

The USPTO's final written decision was appealed to the District Court of the Eastern District of Virginia. The district court, after reviewing the statutory language (and also relying on the Supreme Court's construction of the term “individual” in the Torture Victim Protection Act), affirmed the conclusion that inventors must be natural persons.¹⁹ An appeal to the Federal Circuit is now pending.

⁹ *See id.* § 1.63(c).

¹⁰ In re Application of Application No.: 16/524,350.

¹¹ In re Application of Application No.: 16/524,350.

¹² *Id.*

¹³ *See id.*

¹⁴ *See id.*

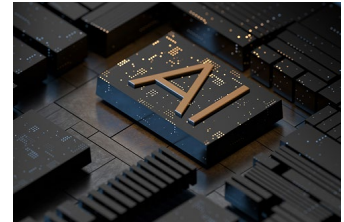
¹⁵ *See id.*

¹⁶ *See id.*

¹⁷ *See id.*

¹⁸ *See id.*

¹⁹ Memorandum Opinion, *Thaler v. Iancu*, Civil Action No. 20-cv-903 (E.D. Va. Sept. 2, 2021), ECF No. 33, *appeal docketed sub nom. Thaler v. Hirshfeld*, No. 2021-2347 (Sept. 24, 2021).



The European Patent Office

The requirements for inventorship in Europe are not as onerous as the requirements in the United States, but certain procedural rules are still required. For example, in accordance with Rule 19(1) of the European Patent Convention (EPC), a designation of the inventor shall state the family name, given names, and full address of the inventor.²⁰

Drs. Thaler and Abbott also filed their patent applications with the European Patent Office (EPO). In the request for grant of a European patent, the inventor field was initially left empty, but a later-filed designation of the inventor listed DABUS as the inventor.²¹

The EPO noted that the legal framework of the EPC provides for natural persons, legal persons, and bodies equivalent to legal persons acting in certain capacities but does not provide for non-persons as applicants, as inventors, or in any other role in the patent grant proceedings.²² In particular, where non-natural persons are concerned, legal personality is given only on the basis of legal fictions.²³ These legal fictions are either directly created by legislation or developed through consistent jurisprudence.²⁴ Therefore, AI systems or machines have no rights at present because they have no legal personality comparable to natural or legal persons.²⁵



Intellectual Property Office

The Intellectual Property Office of the United Kingdom

The patent applications suffered a similar fate after they were filed with the Intellectual Property Office of the United Kingdom on October 17, 2018, and November 7, 2019, respectively.²⁶ The filings stated that the inventor was an AI machine called DABUS and that Dr. Thaler had acquired the right to grant of the patents in question by “ownership of the creativity machine DABUS.”²⁷

Similar to its U.S. and European counterparts, Section 7 of the United Kingdom’s Patents Act 1977 states that “[a]ny person may make an application for a patent either alone or jointly with another” and “‘inventor’ in relation to an invention means the actual deviser of the invention and ‘joint inventor’ shall be construed accordingly.”²⁸ Here, the concept of the “actual deviser” is similar to the concept of “conception” in the United States—the word “actual” means that the natural person who “came up with the inventive concept” is the inventor.²⁹ Furthermore, in seeking consistency with the EPO, the British High Court concluded that “DABUS is not a person, whether natural or legal.”³⁰ In particular, “DABUS is not a legal person because (unlike corporations) it has not had conferred upon it legal personality by operation of law.”³¹ The Court of Appeal also affirmed the ruling of the High Court and dismissed the appeal.³²

²⁰ Rule 19(1) EPC.

²¹ See In Re EP 18 275 163; see also In Re 18 275 174.

²² *Id.*

²³ *Id.*

²⁴ *Id.*

²⁵ *Id.*

²⁶ See *Thaler v Comptroller-General of Patents, Designs and Trade Marks* [2020] EWHC 2412 (Pat) (21 Sept. 2020).

²⁷ *Id.*

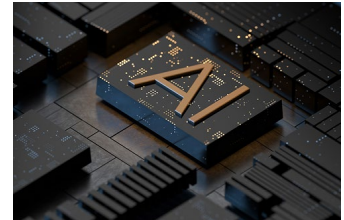
²⁸ *Thaler* [2020] EWHC 2412 (Pat).

²⁹ See *id.*

³⁰ *Id.*

³¹ *Id.*

³² *Thaler v Comptroller-General of Patents, Designs and Trade Marks* [2021] EWCA Civ 1374.



FAVORABLE OUTCOME FOR DABUS



Companies and Intellectual
Property Commission

a member of **the dti** group

The South African Patent Office

The world's first patent application listing DABUS as the inventor was granted by the Companies and Intellectual Property Commission in South Africa.³³ One of the contributing factors of the grant was that, in South Africa, patent applications are not formally examined—they can be granted if they meet the required formalities at a minimum.³⁴ The South African patent laws also lack a specific definition of “inventor.”³⁵

The Australian Patent Office

Similar to the South African patent laws, the Australian Patents Act 1990 has no definition of “inventor.”³⁶ The Federal Court of Australia found that none of the relevant provisions in the Patents Act 1990 or the Paris Convention excludes an inventor from being a non-human AI device or system.³⁷ Furthermore, the Patents Act 1990 focuses on the inventive step, which “uses a hypothetical and objective construct [that is] not at all concerned with the inventor’s mental processes as such.”³⁸ The Australian court thus concluded that an AI system can be an inventor but cannot be a patent applicant or be granted a patent.³⁹



Australian Government
IP Australia

AI SYSTEMS VERSUS OUTPUTS OF AI SYSTEMS

The DABUS AI machine is a form of neurocomputing that allows machines to generate new concepts along with their anticipated consequences.⁴⁰ In general, such AI systems work by ingesting large amounts of training data, analyzing the data for correlations and patterns based on a set of predetermined rules, and using these patterns to make predictions about future states. The outputs of such systems, such as the food container or the neural flame sought to be patented by Drs. Abbott and Thaler, can certainly be seen as ideas formed by the AI systems. However, the formation of the ideas—or rather, the analysis of correlations using existing data—cannot exist without the persons who have designed and trained the AI systems.

The patent laws in most countries currently allow a person who designs and trains an AI system, such as DABUS, to obtain patent rights in the AI system, thus preventing others from making and using the AI system itself. However, the output designs that are generated by the AI system cannot be patented because of the lack of proper inventors. Therefore, unless those outputs are kept as trade secrets, these ideas may—once they make their way into the public domain—be up for grabs by the public without any legal consequences.

³³ See 54 PAT. J. (July 2021)

https://iponline.cipc.co.za/Publications/PublishedJournals/E_Journal_July%202021%20Part%202.pdf.

³⁴ See <http://www.cipc.co.za/index.php/trade-marks-patents-designs-copyright/patents/>.

³⁵ See *What is a Patent*, CIPC, https://www.gov.za/sites/default/files/gcis_document/201504/act-57-1978.pdf

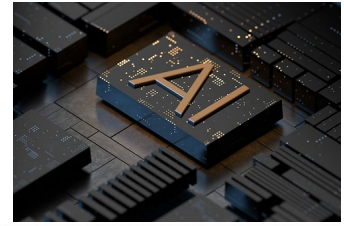
³⁶ See Patents Act 1990, Fed. Reg of Legis. (compiled 24 Feb. 2019), <https://www.legislation.gov.au/Details/C2019C00088>.

³⁷ See *Thaler v Commissioner of Patents* [2021] FCA 879.

³⁸ *Id.*

³⁹ See *id.*

⁴⁰ Stephen L. Thaler, *Vast Topological Learning and Sentient AGI*, 8 J. A.I. & CONSCIOUSNESS 81-111 (2021).



CONCLUSION

With the rapid proliferation of AI systems in today's smart devices, ranging from robots to cameras to medical devices and navigation systems (to list a few), these systems undoubtedly have, or will, come up with the "new and useful" processes, machines, or compositions of matter, or the "new and useful improvement[s] thereof," that constitute part of the requirements for obtaining patents in the United States and elsewhere. The difficulty remains in deciding whether such AI systems can be considered inventors, and thus whether those inventions can be protected by patents.

The disruptive filings of DABUS applications have prompted several major jurisdictions to clarify that AI systems do not qualify as "inventors" under the current legal frameworks. These applications have further revealed the inadequacy of the formal patent filing procedures for accepting non-human inventors—including forms that require first and last names to be specified. Whether the concept of inventorship should be extended to encompass AI systems is a deserving question that requires changes in both the substantive and procedural patent laws to be undertaken by legislatures around the world.

The current legal framework is similarly unclear as to how rights to the output of AI systems devised by human beings can be protected. The legislative bodies around the world may need to take a deeper look at the additional issues brought by AI systems and adapt the existing laws and regulations to account for the intricate relationship between the human beings who are behind the design and architecture of AI systems and the output of such systems.