Opinion Regarding the Recognition of Artificial Intelligence as 'Inventor' or 'Patent owner' under Patent Law

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1. Introduction

Artificial Intelligence (AI) technologies are among the most significant technological developments of the past decade, holding a promise for the considerable advance of human knowledge in many different areas.[1] One of the most interesting developments is the development of autonomous AI systems, with the ability to take independent decisions and to develop products independently (creative AI), without interaction with a human agent. These autonomous systems raise a wide spectrum of legal, social and ethical issues.[2]

One of the issues in this context is whether an AI system could be considered as an inventor or the owner of a patent, according to patent law. This is not simply a theoretical question: the number of patent applications for inventions involving AI systems is growing,[3] with patent authorities and courts in many countries around the world facing applications to recognize AI as an inventor under patent laws.

This paper expresses our position on the question whether an AI system should be recognized as an inventor or a patent owner under the Israeli patent law. We will first review the current legal situation and show that according to the current interpretation of patent laws, an AI system cannot be recognized as an inventor. This conclusion leads to two possible outcomes: one, that an invention developed by AI remains public domain, since theoretically, if there is no inventor – there cannot be a patent.[4] This situation could potentially result in a lack of incentive to develop AI

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[1] Matthew U. Scherer, *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies*, 29 HARV. J. OF L. & TECH 353 (2016).

[2] Jessica Fjeld et al., *Principled Artificial Intelligence: Mapping Consensus in Ethical and Rights-Based Approaches to Principles for AI* (BERKMAN KLEIN CENTER RSCH., Publication No. 2020–1, 2020).

[3] For example, a report by the USPTO reveals that between the years 2002-2018, the percentage of patent applications containing AI systems rose from 9% to nearly 16%. See: OFFICE OF THE CHIEF ECONOMIST, U.S. PATENT AND TRADEMARK OFFICE INVENTING, AI: TRACING THE DIFFUSION OF ARTIFICIAL INTELLIGENCE WITH U.S. PATENTS 2 (2020), https://www.uspto.gov/sites/default/files/documents/OCE-DH-AI.pdf. See also: WORLD INTELLECTUAL PROPERTY ORGANIZATION, TECHNOLOGY TRENDS 2019: ARTIFICIAL INTELLIGENCE, EXECUTIVE SUMMARY 13–7 (2019), https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf .

[4] Israeli law is an exception, as it does not require listing the inventor's name.

systems or lead to the invention's details being kept as a trade secret. Another possible outcome is that the existing law be given a creative interpretation, which would allow for the recognition of an AI system as an inventor; but such a recognition would undermine the basic assumption underlying patent law specifically, and intellectual property law in general: that proprietary protection acts as an incentive for creation and invention[5] – whereas machines cannot be incentivized to invent.

We argue, as we will elaborate below, that existing Israeli law does not allow for the recognition of an AI system as an inventor or as a patent owner under patent law. In addition, a wide range of policy and ethical considerations lead us to the conclusion that even if it were possible to recognize this situation legally, we ought to refrain from doing so. We shall further seek to present an alternative approach, basing proprietary protection on the models underlying AI systems, which are the product of combining the algorithm with the database, as long as these models meet the ethical requirements regarding the collection of data and human involvement. According to this approach, ownership of the invention and the patent rights will be accorded to the human involved in developing the algorithm and the database, and the involvement of the AI system in the invention will be explicitly stated.

2. AI Systems as Inventors: Overview

2.1 Technological Overview

AI is the ability of computerized means to complete tasks which in the past were exclusively associated with human intelligence, including inferences, recognition of patterns and meanings, the ability to generalize, implementation of knowledge in different fields, and learning from experience.[6] Machine learning (ML) is a subset of AI. Systems based on ML operate through statistical algorithms which are not based on a pre-determined set of rules, but rather on learning from a cluster of examples. The algorithms seek to imitate human cognitive tasks, inferring rules about the tasks by analyzing large quantities of data. In fact, the algorithm 'practices' on an existing database and in the process creates its own statistical model, in order to be able to complete the same task in the future with new, previously unencountered data.

An autonomous AI system is based on Deep Learning (DL), a sub-set of ML. In DL the computer 'learns by itself' (using examples and tests) which features it should examine, ascribing differing weight and importance to different features.[7]

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[5] Daphna Lewinsohn-Zamir, "Economic Considerations in the Protection of Inventions," 19 *Mishpatim* 143-184 (1989) [in Hebrew].

[6] Liran Antebi, "Artificial Intelligence and National Security in Israel," INSS, Memorandum 205, 2020 [in Hebrew].

[7] *Ibid.*

As yet, there are no completely autonomous AI systems in place, able to improve or modify the architecture of their neural networks, select the database for training, and create inventions, with no interaction with a human agent.[8] And yet, AI technologies are presently integrated into many systems, computerized systems in particular, exceeding human capabilities due to their ability to process data and information on a large scale. AI is currently used to solve complex problems in a growing number of industries and is therefore integrated into various products – including smart vehicles, consumer products, medical technologies, medications, and others.[9]

AI systems are not used exclusively in the creation of commercial products. An interesting example of a creation which is the product of an AI system, is a two-dimensional work of art (a painting) entitled "A Recent Entrance to Paradise"; this is part of a series of paintings in which an algorithm processes existing pictures and uses them to re-create new pictures expressing a fictional narrative about life after death. It is claimed that this art was developed by a 'Creativity Machine.' An application to recognize this work of art as protected by copyright was filed by Dr. Stephen Thaler to the U.S. Copyright Office (USCO), but the application was denied.[10] The grounds for denial cited by the USCO included the precondition for copyright protection of a work of art to be created by a human.[11]

Another prominent examples of the use of an AI system for creation, is the case of the DABUS (Device for Autonomous Bootstrapping of Unified Sentience) system.[12] Dr. Thaler has made several patent applications in countries around the world, seeking to register a patent for a change-shifting food container and a flickering light device, listing DABUS as the inventor of these inventions. We will discuss these applications in greater detail below.

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[8] Xiaoqiong (Jackie) Liu & Shlomit Yanisky-Ravid, *When Artificial Intelligence Systems Produce Inventions: The 3A Era and an Alternative Model for Patent Law*, 39 CARDOZO L. REV. 2215 (2018) ·See also: Dersh Jusyin, *When Artificial Intelligence Invents: Recalculating the Patent Act for AI-Generated Invention*, 73 RUTGERS U. L. REV. 185, 190–191 (2021).

[9] Daphna Getz and others, *Artificial Intelligence, Data Science and Smart Robotics Companies Survey – Stage B* (2018). See also: Jason D. Lohr & Hogan Lovells, *Managing Patent Rights in the Age of Artificial Intelligence,* LEGALTECH NEWS (August 18, 2016, 7:00 AM), https://www.law.com/legaltechnews/almID/1202765385194/.

[10] Letter from U.S. Copyright Off. Rev. Bd. to Ryan Abbott, re: Second Request for Reconsideration for Refusal to Register A Recent Entrance to Paradise (Correspondence ID 1-3ZPC6C3; SR # 1-7100387071) (Feb. 14, 2022), https://www.copyright.gov/rulings-filings/review-board/docs/a-recent-entrance-to-paradise.pdf

[11] *Ibid*, p. 5.

[12] U.S. Patent No. 10,423,875 (filed Jan. 2, 2015), https://patentimages.storage.googleapis.com/86/03/3f/34d1258f8af84e/US10423875.pdf.

2.2 Legal Overview - the handling of the issue of an AI system as an inventor by patent authorities and the courts

Patent authorities and the courts are the bodies effectively shaping the boundaries of intellectual property, thereby interpreting different regulations. In this section we shall review the ways in which different patent authorities and courts around the world have dealt with the question of whether an AI system could be considered an inventor under patent law. Based on this review, we shall demonstrate that the prevalent approach in the world toward the question is a legislative interpretation of patent law, and that in most the countries where the question has been examined (excluding South Africa, as will be detailed below), it has been determined that the legislation does not recognize an AI system as an inventor.

In August 2019, Dr. Thaler applied for patents entitled "Devices and systems for implementing increased attention,"[13] and "food container,"[14] with the Israel Patent Office (IPO). The application forms listed the name of the inventor as: "DABUS – Invention was autonomously generated by an artificial intelligence." It was further noted that the applicant is the owner of the invention owner by patent assignment of the inventor (i.e., the AI system).

The patent examiner denied Dr. Thaler's applications, in light of his interpretation of §1 of the Patent Law,[15] defining the "invention owner." The examiner initially noted that although linguistically the word "inventor" may refer to a system, a system is not a legal entity, and therefore is not eligible for any rights, including the right to own property. Additionally, a system is not competent to take legal actions under law, including assignment, contractual undertakings, presenting proof that the applicant is not the inventor, or entering into labor relations with an employer.

As for the possibility that Dr. Thaler be considered the "owner of the invention" by law, the examiner considered that patent eligibility to an invention is insufficient, and that the ownership of the invention must be "derived from the power of the inventor." In other words, the inventor must possess a legally-derived power to alter the current legal attitude toward the invention, and this condition is not met in this case.[16]

January 2022 saw a request to hold an *ex parte* hearing in front of the Registrar regarding these two applications. In the t hearing, held in August 2022, the plaintiff

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[13] Application 268604 'devices and systems for implementing increased attention' (7.8.2019), under patent file https://israelpatents.justice.gov.il/en/patent-file/details/268604.

[14] Application 268605 'food container' (7.8.2019), under patent file: https://israelpatents.justice.gov.il/en/patent-file/details/268605.

[15] Patent Law 1967 (hereafter: Patent Law) [in Hebrew].

[16] Letter from Saar Abramovich, Patent Examiner, to Dr. Reuven K. Mualem, representation for the applicant, regarding the denial of patent applications 268605, 268604, according to regulation 45 of the regulations (27.12.21), under patent file: https://israelpatents.justice.gov.il/en/patent-file/details/268604 [in Hebrew].

focused on the claim that in applications filed in Israel – unlike in other countries where parallel applications were filed – there is no obligation to list the name of the inventor. According to this argument, it should have been prima facie possible to examine the applications and recognize that the inventions are patent-eligible, if only the person applying had left the "inventor" field empty.[17] At the time of writing this opinion, the patent examiner has still not given out his decision on the matter.

Dr. Thaler's application to register DABUS as an inventor was filed with other patent authorities around the world. Below is a detailed account of the status of the applications in select countries.

Dr. Thaler applied to the UK Intellectual Property Office (UKIPO) as early as October 2018.[18] In his decision, the UK Deputy Director (acting for the Comptroller) stated that UK patent law suggests that the legislator assumed that an inventor would be human,[19] and therefore the law does not allow for recognizing DABUS system as an inventor.[20] The Deputy Director also noted that the role of the patent system is to encourage innovation by granting time-limited exclusive rights, in return for public disclosure; but since an AI system cannot be incentivized like a human, the rationale underlying patent law does not hold here. Dr. Thaler appealed the decision of the Comptroller by appealing to the Supreme Court of the United Kingdom. His appeal was rejected; the court ruled that Dr. Thaler is not eligible to present an application to register a patent for the invention, since the AI system created the inventions.

On the other hand, in July 2021 the Federal Court of Australia handed down a landmark ruling in Dr. Thaler's case in a court of the first instance, ruling that an AI system may be considered as an 'inventor' under Australian patent law. The court held that recognizing an AI system as an inventor is a recognition of reality,[21] and that any other ruling would result in ineffectiveness.[22]

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[17] P. 26 of the court proceedings of 2.8.2022, discussion of a one-sided application for patent 268605' 268604' under patent file: https://israelpatents.justice.gov.il/en/patent-file/details/268604.

[18] U.K. Patent Application No. GB1816909.4 (filed Oct. 17, 2018), https://www.ipo.gov.uk/p-ipsum/Case/ApplicationNumber/GB1816909.4; U.K. Patent Application No. GB1818161.0 (filed Nov. 7, 2018) https://www.ipo.gov.uk/p-ipsum/Case/ApplicationNumber/GB1818161.0.

[19] PATENTS ACT 1977, c. 37, § 7 ·Under the section entitled "Right to apply for and obtain a patent the criteria for applying and receiving a patent were laid out. Subsection 1 states that any person may file an application for a patent together and separately from another. Subsection 2 states the people who may be granted a patent, and notes that it may not be granted to the following: 1. An inventor or co-inventors 2. Any person who by the power of any legislation, convention or enforceable condition of any agreement made with the inventor before the invention, was eligible at the time of the invention 3. The heirs of any of the persons mentioned above. Subsection 3 defined 'inventor' as someone who has in fact invented the invention.

[20] Thaler, No. BL O/741/19 (U.K. Intell. Prop. Off. Dec. 4, 2019), https://www.ipo.gov.uk/p-challenge-decision-results/o74119.pdf.

[21] *Ibid*, paragraph 126.

[22] *Ibid*, paragraph 129.

The Australian Commissioner of Patents appealed the decision to the Full Court of the Federal Court. The appellate court, in an extended panel of five judges, accepted the appeal of the Commissioner in its entirety, overturning the decision.[23] After a broad historical review of Australian patent law and its intent, it was held that although the term 'inventor' is not explicitly defined under Australian patent law,[24] the reference to the inventor in § 15(1) of the law, is considered to bare the usual meaning of the word in English – i.e., the man responsible for inventing the invention.[25]

In the United State as well, the Patents Office (USPTO) denied Dr. Thaler's application to grant patents where the AI system was listed as the inventor,[26] based on the reasoning that the applications lack a human inventor.[27] An appeal against this decision was presented to the Appellate Court of the United States, and denied on similar grounds.[28] In the appeal Dr. Thaler claimed that the decision to refuse to register the AI system as an inventor contradicts the intent of patent laws, which is to support the advance of science and useful arts. The court rejected this claim, declaring it to be unfounded and speculative.[29]

The European Patent Office (EPO) also rejected the applications ssubmitted by Dr. Thaler to register patents for the inventions in which the DABUS system was registered as the inventor, and himself as its owner.[30] The rationale for rejecting the applications was that the person applying did not meet the requirement of listing the name of the inventor.[31] The decision was reaffirmed in December 2021, with the dismissal of Dr. Thaler's appeal.[32]

In October 2019 Dr. Thaler submitted an additional application to the German Patent and Trade Mark Office (DPMA). In the application form, DABUS was registered as the

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[23] *Commissioner of Patents v Thaler* [2022] FCAFC 62 (13 April 2022) (Hereafter: The Thaler affair – the appeal).

[24] *Patents Act 1990* (Cth), s 15.

[25] Re *Thaler* – the appeal, *supra* note 23, paragraph 100. Section 2.15 of the Australian Patent Law states that a condition for the registration of the patent is that the inventor hold Australian citizenship; from which we can already deduce the intent of the Australian legislator to limit inventorship to humans – since 'citizenship' is, by definition, a human legal status.

[26] U.S. Application No. 16/524,350 (filed July 29, 2019).

[27] Letter from Robert W. Bahr, Deputy Commissioner for Patent Examination Policy to FlashPoint IP Ltd., Decision on Petition in re of Application No.: 16/524,350 (Feb. 17, 2020), https://www.uspto.gov/sites/default/files/documents/16524350_22apr2020.pdf.

[28] **Thaler v. Vidal**, No. 21-2347 (Fed. Cir. 2022).

[29] *Ibid*, paragraph 1.

[30] Eur. Patent Application EP 18 275 163, 2019/45 Eur. Patent Bull. 297 (filed Oct. 17, 2018); Eur. Patent Application EP 18 275 174, 2019/45 Eur. Patent Bull. 261 (filed Nov. 7, 2018).

[31] Thaler, No. RJ/N35111-EP (Eur. Patent Off. Jan. 27, 2020), https://register.epo.org/application?documentId=E4B30B5J6102498&number=EP18275163&lng=en&npl=false; Convention on the Grant of European Patents art. 81 & r. 19(1), Oct. 5, 1973, art. 81, rule 19(1).

[32] Thaler, Case No. J 0008/20 – 3.1.01 (Eur. Pat. Off. Legal Bd. of App. Dec. 21, 2021); Thaler, Case No. J 0009/20 – 3.1.01 (Eur. Pat. Off. Legal Bd. of App. Dec. 21, 2021).

inventor, and it was noted that "the invention was created independently by artificial intelligence, in collaboration with Dr. Stephen L. Thaler."[33] The DPMA rejected Dr. Thaler's claim, reasoning that under German law an 'inventor' must be human. In February 2021, Dr. Thaler re-filed the application form, this time noting in the 'inventor' field: "Dr. Steven L. Thaler, who caused the AI DABUS to create the invention." The DPMA similarly rejected this version of the application, stating that since the patent laws of Germany mandate a 'requirement of humanity,' the submitter of an application must fill in under the 'inventor' the details of a human, and do so within the timeframe specified in the regulations. Dr. Thaler appealed the decision, turning to the German Federal Patent Court. The Federal Court accepted the appeal in the procedural sense,[34] and held that the amended application form should be recognized, with both human and AI system registered as co-inventors.[35] Although the court was not called to decide on the core issue – the recognition of the AI system as an inventor – the court addressed it and clarified that according to German law, the inventor must be human.[36]

In fact, the only country to grant Dr. Thaler's application to register a patent for inventions with the DABUS AI system listed as their inventor, was South Africa. The application was granted in July 2021,[37] thereby making South Africa the first country to approve a patent for an invention whose inventor is an AI system and whose patent holder is the system's owner.[38] Yet, a point should be made that the examination procedures conducted by South Africa's Companies and Intellectual Property Commission (CIPC) are not substantive ones, and it would therefore appear that the significance of the registration is unparalleled with that attributed to such a recognition of patent eligibility by other patent offices.[39]

In conclusion, the decisions of the patent authorities and the courts around the world in the case of Thaler and DABUS suggest that the governing approach to the question of recognizing AI systems as an inventor under patent laws, is that of legislative interpretation. This approach leads us to the conclusion that an inventor must be

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[33] Ger. Patent Application No. DE102019128120A1 (filed Oct. 17, 2019) https://register.dpma.de/DPMAregister/pat/PatSchrifteneinsicht?docId=DE102019128120A1&page=2&dpi=300&lang=en&full=true.

[34] Bundespatentgericht (BPatG), Nov. 11, 2021, 11W(pat)5/21, http://juris.bundespatentgericht.de/cgibin/rechtsprechung/document.py?Gericht=bpatg&Art=en&sid=d842ef62d4a4a3090810f84d3ada7a18&nr=42859&pos=0&anz=1&Blank=1.pdf. The decisions of the Ministry regarding the applications and the emended application are described in the verdict.

[35] *Ibid*, paragraph 1.

[36] *Ibid*, p. 10 paragraph 5a.

[37] S. Afr. Patent Application No. 2021/03242, 54(7 pt. II) Pat. J. 255 (filed May 13, 2021).

[38] *DABUS Gets Its First Patent in South Africa Under Formalities Examination*, IPWATCHDOG (July 29, 2021, 8:13 AM), https://www.ipwatchdog.com/2021/07/29/dabus-gets-first-patent-south-africa-formalities-examination/id=136116/.

[39] *Ibid*.

human, and therefore an AI system cannot be considered an inventor according to patent law.

3. Challenges arising from the Israeli Patent Law as a framework for discussing the recognition of AI systems as inventors or owners of an invention

We have shown above that the dominant approach to the issue of an AI system as an inventor, is the interpretative approach, which looks into existing patent regulations. In the upcoming section we shall introduce the way in which Israeli patent law addresses the identity of the inventor and that of the invention owner, and the requirements for patent eligibility.[40] In this context we will demonstrate the difficulties in interpreting Israeli patent law, arguing that an interpretative approach to patent law is not an appropriate framework for recognizing an AI system as an inventor and for registering a patent on AI-products.

3.1 Inventor and Invention holder

Section 1 of the Patent Law defines an invention holder thus: "The inventor or his proxies are those who have the right to the invention by law, by assignment or by contract." According to this section, a patent holder is "the man registered as the person to whom the patent was granted, or the person to whom the patent was assigned." Section 76 of the law states that the person filing an application to grant a patent will be seen as the patent holder, unless proven otherwise. The definition of 'inventor' therefore does not place restrictions on the inventor's identity, and it is not required that s/he must be human. Furthermore, § 38 suggests that one is not required to cite the name of the inventor on the patent application forms.[41] It appears, on its face, that the discussion regarding the identity of the inventor is therefore redundant. And yet, as we have shown above, the IPO does not tend to treat anyone who is not human as an inventor.

3.2 The conditions for an invention to be patent-eligible

Section 3 of the patent law outlines six cumulative conditions in order for an invention to be considered patent-eligible. These are further interpreted in the working guidelines of the IPO, as specified below. First, patent applications should be formulated as applications for a product or a process, and process applications should

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[40] Patent Law.
[41] Section 39 of the Patent Law states: "An inventor for whose invention a patent was requested, or his heirs, may demand that the inventor's name be mentioned in detail in the registry and in the patent certificate…"

include the steps or the stages for its execution.[42] Second, the invention should belong to some defined technological field. Third, the application should include a promise regarding the efficacy of the invention, though this does not have to be proven at the submission stage.[43] Further conditions address the demand for innovation,[44] for an inventive step (as will be detailed below) and industrial applicability.

The existing law raises certain complexities in the context of inventions incorporating computer software in general, and AI inventions in particular.[45] More precisely, patent law does not explicitly address computer software or their eligibility for patentholders. Furthermore, software is considered as a pure mental process – and as such ineligible for proprietary protection. And yet, a technological implementation of the same software (i.e., the occurrence of physical changes in the system) justifies the granting of a patent, and therefore the system as a in its entirety must be examined.[46] Given all this, identifying the technological field is subject to the requirement that the execution of the shall involve a tangible technological process.[47]

As mentioned above, one of the conditions for patent-eligibility is an inventive step compared to the knowledge of a 'person having ordinary skill in the art' (POSITA). [48] Such evaluation is based on the answer to the question, what would seem non-obvious to a person skilled in the art, having examined the general professional knowledge in the relevant field. The non-obviousness requirement is often considered

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[42] Section 6.2 of the Patent Authority work regulation 23.1/b "Appendix B – section 3 of the law – a patent-worthy invention" (10.2.2020) (hereafter: regulation 23.1/b)

[43] CA 665.84 **Sanufi ltd. vs. Unifarm ltd**., IsrSCR 41(4) 729 (1987) [in Hebrew]

[44] Section 3 of IPO's working guidelines 23.1/f "Appendix F – section 4 of the law – novelty" (17.2.2019). According to section 4 of the patent law, an invention will be considered novel as long as there is no publication dated earlier than the determining date of the application under examination and which reveals all the elements of the invention. If publication of a prior knowledge document is to deny the innovation of an application under examination, the information disclosed in it must allow a person skilled in the art to practically apply it.

[45] Section 7 of working guidelines 23.1b, *supra* note 42.

[46] Appeal (regional Tel Aviv) 501/80 **Rosenthal vs. Patent Registrar**, court decision 1984 (3) 441 (1980); Appeal (regional Jerusalem) 23/94 **United Technologies Corporation vs. Patents, Samples and Trade Signs Registrar** (Nevo 25.10.1994) [in Hebrew].

[47] Ibid, section 7. The working guidelines for examining a patent specify best practices the application of which might indicate that the invention is in a technological field in which a tangible process is occurring: If the execution of the invention manifests physical characteristics in addition to the usual actions of a computer-integrated system or any change in these characteristics; if the execution of the claimed invention causes the computer to act in a novel way; if the implementation of the invention leads to a further contribution beyond the obvious and requested streamlining of computerizing an automated process; i.e., if the implementation of the invention via the computer is fundamentally different from its implementation manually.

[48] The law does not define precisely who is an average person of skill; this concept was defined in the Supreme Court's ruling re: Hughes: "The average person of skill is a person […] familiar with the secrets of the relevant field, without employing an inventive mental ability. This fictitious figure (the 'reasonable' figure) might have different content in a professional or a scientific field, according to their technical or research character." Appeal 345/87, **Hughes Aircraft Company vs. State of Israel**, court ruling 44, 45 116-115 (1990). Section 5 of the working guidelines of the IPO 23.1/g "Appendix G – section 5 – innovative step" 13.1.2022.

to be the most complex hurdle for patent-eligibility[49]; its aim is to filter out invention of minor technological steps, granting patent protection only to inventions which advance significantly the field of research.[50] And yet, regardless of the issue of AI as an inventor, it has been claimed that the POSITA standard is arbitrary, and does not provide sufficient tools for examining unique inventions addressing new problems.[51] In the context of AI system as an inventor, further questions crop up: Who is the relevant 'person having ordinary skill' here – the code creator? The AI system itself? Another individual who contributed to the development of the invention? How can we determine what would be considered 'obvious' for an AI system with abilities to learn and improve constantly?[52]

Additional complexities arise from the size of the database that an AI system can handle in its actions, an ability dramatically exceeding that of humans.[53] The more the person of ordinary skill is creative and having broad knowledge, the greater the chances that the invention is considered obvious.[54] Assuming that the use of an AI system will become standard in the research field, evaluating the inventive step of an AI system compared to prior knowledge will require reviewing vast quantities of information in considering the obviousness test. This will elevate the lower limit of the test, rendering nearly any invention as obvious. The demise of the obviousness test means the end of patent laws, at least as they currently stand.[55]

3.3 Sufficiency of Description requirement

Another condition for registering a patent, as set in § 12 of the Patent Law, is disclosing all the details concerning the invention so that a person skilled in the art can execute the invention from its description; this condition is termed the *sufficiency of description* requirement[56].

The purpose of the *sufficiency of description* requirement is to determine that at the time of the application, the inventor did indeed have possession of the invention he sought to register, and to inform the public of the scope of the invention and its methods of execution, for instance, in order to enable its use once the patent expires

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[49] Justin Dersh, *When Artificial Intelligence Invents: Recalculating the Patent Act for AI-Generated Inventions*, 73 RUTGERS U. L. REV. 185, 200 (2021). (Hereafter: Dersh)

[50] Connor Romm, *Putting the Person in PHOSITA: The Human's Obvious Role in the Artificial Intelligence Era*, 62 B.C. L. REV. 1413, 1420 (2021).

[51] See: Shlomit Yanisky-Ravid & Regina Jin, *Summoning a New Artificial Intelligence Patent Model: In the Age of Pandemic*, MICH. STATE L. REV 26 (2021). (Hereafter: Yanisky-Ravid & Jin)

[52] WORLD ECON. F., ARTIFICIAL INTELLIGENCE COLLIDES WITH PATENT LAW p. 12 (Apr. 2018), https://www3.weforum.org/docs/WEF_48540_WP_End_of_Innovation_Protecting_Patent_Law.pdf.

[53] Ryan Abbott, *Everything Is Obvious*, 66 UCLA L. REV. 2 (2019).

[54] *Ibid*.

[55] *Ibid.*

[56] Section 12a of the Patent Law: section 4 of the working guidelines of Patent Law 23.1/l "Appendix L – section 12 of the law – the description of the invention in the application" (24.3.2021).

('enablement').[57] The sufficiency of description is examined in light of the body of professional knowledge in the relevant fields at the time of the application.[58]

And yet, in practice the description of the invention is often problematic and inefficient, especially when focusing on information technologies and software. Patents in this field have become so vague that they do not reveal any meaningful information, occasionally rendering it difficult to distinguish the patents from prior knowledge during the inventive step determination.[59] The difficulty exacerbates when we are dealing with AI systems characterized as 'black box,' where one cannot trace the inner workings of the system. It is therefore nearly impossible to meet the duty of disclosure, so that a person skilled in the art could execute the invention.[60] In such cases one cannot learn of the intent or conduct of those who created the system, and even they cannot predict which solutions the system will come up with, or which decisions it will make.[61] This further complexity, makes the recognition of an AI system as an inventor more challenging.

4. Ethical challenges to the recognition of an AI system as an inventor

4.1 General

The rapid advance of AI technologies raises a host of ethical issues. In this section we shall review the main ethical challenges, arguing that these lead us to the conclusion that in the absence of an appropriate response, we should not recognize an AI system as an inventor. We shall then make the case that these challenges should be part of a broader set considerations to be taken into account in regulating the issue before us.

4.2 Harming the basic principle of patent law – disclosure

The actions of AI systems are based on databases, algorithms, and models analyzing the data according to the algorithm. In other words, in order to understand why a system works as it does, one must be familiar with all these elements in order to recreate the computational process that led to the outcome.[62] In practice, however,

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[57] Dersh, *supra* note 49, p. 187.

[58] The section does indeed use the phrase "person of skill," but this does not indicate a different test than that of the "person of average skill" applied with regards to the inventive step requirement. See re: Hughes, *supra* note 48.

[59] Ebrahim Tabrez, *Artificial Intelligence Inventions & Patent Disclosure*, 125 PENN ST. L. REV. 188 (2020).

[60] Yanisky-Ravid & Jin, *supra* note 51, p. 8.

[61] Yavar Bathaee, *The Artificial Intelligence Black Box and the Failure of Intent and Causation*, 31 HARV. J. L. & TECH. 893 (2018).

[62] Harry Surden, *Ethics of AI in Law, in* THE OXFORD HANDBOOK OF ETHICS OF AI 719–36, 730 (Markus D. Dubber, Frank Pasquale & Sunit Das eds., 2020); (Hereafter: Surden); Andreas Tsamados et al*., The ethics of algorithms: key problems and solutions*, 37 AI & SOC. 215, 218 (2022) (Hereafter: Tsamados et al). Martin Ebers, *Regulating AI and Robotics: Ethical and Legal Challenges, in* ALGORITHMS AND LAW 37–99 (Martin Ebers & Susana Navas Navarro (eds.), 2020 (hereafter: Ebers), p. 48.

it is hard to reconstruct the activity of AI systems, and particularly the way in which they reach a certain output or produce a product. This is firstly because the overwhelming majority of AI systems are developed by private companies, and therefore the data, algorithms and models are kept as a trade/proprietary secret.[63] In addition, in autonomous systems the model develops independently by learning the data and is thus difficult to reconstruct.[64] A central claim therefore is that the inherent difficulty in explaining the work methods of AI systems, which are far from transparent,[65] harms the ability of the inventor to disclose the details of the invention and its methods of operation after the period of (limited) exclusivity; it thus undermines the assumption underlying patent law, that the invention is bound to become public domain eventually.[66]

4.3 Bias concerns

The use of AI systems raises concerns for bias or discrimination. More precisely, the concern is that the databases, algorithms and models perpetuate existing human bias. Furthermore, this is a system which deepens 'learning' through feedback, strengthening these biases. Therefore, instead of reducing built-in human biases, AI systems render these biases, to a certain extent, into automatic and even wider biases.[67] As mentioned above, since AI systems operate as a 'black box,' one cannot easily identify these biases in order to reduce them. Social considerations lead us to conclude that without addressing this challenge in patent laws, AI systems should not be recognized as an inventor, according to the present letter of the law.

5. The proposed framework for regulating proprietary protection of AI systems

5.1 Overview

Thus far, we have reviewed the existing legal situation regarding the question whether an AI system can be recognized as an inventor in patent law; we have also mapped out the legislative and ethical challenges of the issue. These led us to conclude that it is inappropriate to recognize AI systems as inventors or patent holders. Notwithstanding this, AI technologies hold a promise of considerable development of human knowledge in many areas. Creating an incentive for the development of an inventive AI system is therefore important if we are to encourage technological development in various fields, such as medicine, engineering and science.[68] In fact,

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[63] Surden, *supra* note 62, p. 731; Tsamados et al., *supra* note 62, p. 224

[64] Surden, *supra* note 62, p. 729; Tsamados et al., *supra* note 62, p. 218

[65] Surden, *supra* note 62, p. 731; Tsamados et al., *supra* note 62, p. 219.

[66] Appeal 217/86 **Mordechai Shechter vs. Abmatz ltd**., IsrSC 44 (2) 846, 852 (1990).

[67] Surden, *supra* note 62, p. 10; Ebers, *supra* note 62, p. 52.

[68] Alexandra George & Toby Walsh, *Artificial Intelligence is Breaking Patent Law*, 605 NATURE 616 (2022) (hereafter: George & Walsh).

preventing the possibility to protect the products of AI systems, may incapacitate us in the future to use AI for inventions, even when these systems will be able to offer more efficient solutions than those of humans.[69]

In order to avoid harming the development of innovation in the context of AI systems, we shall propose a unique framework for regulating AI products. This framework will respond to two main challenges, which in our view are key for creating an incentive appropriate for AI technology characteristics. The first challenge is the challenge of protecting Trained Models, implementing the algorithms operating on the databases of AI systems. The second challenge is the challenge of human involvement in the creative process.

5.2 Protecting Trained Models

As mentioned above, AI systems are composed of algorithms and models. An algorithm is the working method employed by the system to perform a certain task, and a model is the product of running the algorithm on a database. The issue of protecting algorithms through patents has been discussed at length in different countries,[70] and the basic approach is that algorithms should not be protected by patents. In addition, the protection of databases is controversial and differs between countries: the sources of the controversy lie in the tension between the desire to incentivize the creation of databases and that of allowing their use, as widely as possible.[71]

In Israel and in the US, copyright law is the most prominent framework for protecting information.[72] Israeli law specifically stipulates that literary creations are held to include collections, and that collections also include a collection of data – including a database.[73] The law also stipulates that the originality of the collection lies in the originality of selecting the data within it and their organization.[74] The courts in Israel have addressed the issue of copyright protection for databases only on select occasions and have treated the protection awarded to databases under copyright law

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[69] Ryan Abbott, *The Artificial Inventor Project*, WIPO: WIPO Magazine, (Dec. 2019) https://www.wipo.int/wipo_magazine/en/2019/06/article_0002.html; George & Walsh, *supra* note 68.

[70] John R. Allison & Ronald J. Mann, *The Disputed Quality of Software Patents*, 85 Wash. U. L. Rev. 297 (2007). See also: Mark A. Lemley, *Software Patents and the Return of Functional Claiming*, 2013 Wis. L. Rev. 905 (2013).

[71] Miryam Biton, "Protecting Databases in Israel in a Comparative Perspective," *Moznei Mishpat* 9 13 (2014) [in Hebrew]. *See* also: Estelle Derclaye & Martin Husovec, *Sui Generis Database Protection 2.0: Judicial and Legislative Reforms,* 44 Intell. Prop. Rev. 323–31 (2022) .

[72] Copyright Law 2007 (hereafter: copyright law); 17 U.S.C. § 101.

[73] Section 1 of the Copyright Law.

[74] Section 4 of the Copyright Law. See Also the Supreme Court's position in IsrSCR 8485/08 the **FA Premier League Limited vs. The Council for Regulating Gambling in Sports** (Nevo 14.3.2010) [in Hebrew].

as rather limited.[75] Certain databases may potentially enjoy protection under the Commercial Wrongdoings Law, as long as they meet the requirement for secrecy.[76] The requirement for secrecy limits the possibility of having protection exclusively for databases intended for internal usage, or for databases limited to a certain target audience, so as to keep their secrecy protected.

In Europe, however, the protection of databases was regulated by a directive issued in 1996.[77] The directive awards proprietary rights to the creators of databases for a period of 15 years, and where significant investment was made in these databases - the copyright can be further extended. The copyright essentially prevents others from using the raw data of the database, thereby protecting the raw data itself. According to the model, the database owner can control the active dissemination of the data, as well as their re-use.[78]

In our view, in context of inventive AI systems, the issue of model protection merits attention due to the great potential inherent to these systems.[79] Such protection would allow for the creation of incentives for research and development of the corner stones of AI systems,[80] and would incentivize data scientists to develop innovative models.[81] Such protection would similarly incentivize investors to invest in the development of AI systems, as it will allow them to enjoy a return on their economic investment.[82]

We therefore suggest the formulation of rules, designed to shape the ethical requirements from AI system developers in the context of data collection and the development of the model. First and foremost, a monitoring mechanism should be created, which would examine the existence of mistakes or the use of data in a way

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[75] *See* re: Premier League, ibid; as well as Tel Aviv (Regional court Tel Aviv) 1074/05 **Maariv Modiin Publishing ltd. vs. All You Need Company ltd**. (Nevo 11.7.2010); Capp (Regional Tel Aviv) 11667/09 **Bezeq the Israeli Communications Company ltd. vs. Dapei Zahav Company ltd**. (Nevo 13/9/2009); LCA 8304/09 **Bezeq the Israeli Communications Company ltd. vs. Dapei Zahav Company ltd.** (Nevo 1.12.2009); In the United States see *Feist Publications, Inc. v. Rural Telephone Service Co., Inc.*, 499 U.S. 340 (1991). In this matter the American courts ruled that the appropriate legal framework for discussing the protection of phonebook databases is copyright law, and that in order to be awarded legal protection for this data, one must prove originality and creativity in their collection.

[76] Section 5 of the Commercial Wrongdoing Law, 1999.

[77] Directive 96/9 of the European Parliament and of the Council of March 11, 1996 on the Legal Protection of Databases, 1996 O.J. (L 77) 20–8

[78] In February 2022 the Data Act was introduced, a new framework expected to go into effect during 2023. The framework is a central part of the European countries' preparation for the digital age, and it addresses the use of data created via the Internet of Things devices and addresses the facilitation and sharing of data between connected devices.

[79] Yanisky-Ravid & Jin, *supra* note 51.

[80] *Ibid*, p. 34.

[81] *Ibid.*

[82] *Ibid*, p. 35.

which creates discrimination or bias, alongside maintaining as full a description as possible, in order to meet the sufficient description and disclosure requirements.

5.3 Human involvement in the invention process

The great advantage of humans over AI systems is their ability to identify the problems requiring solutions and the questions that might lead to their solution (unlike AI, capable only of statistical inferences).[83] We therefore propose awarding protection, as mentioned above, only in cases where a human is involved in the invention (human-in-the-loop).

To go into greater detail, this involvement will be examined using three conditions:[84] the human has identified the problem that the AI system solves; the human is the first to develop the solution to the problem; and there is full disclosure of the AI system's contribution to the invention. Additionally, in order to address the complexity presented above regarding the evaluation of the inventive step, we propose exchanging the POSITA standard with 'a person equipped with an AI system' standard. namely, a person of average skill who is being assisted by an AI system to collect, organize and keep vast amounts of information, which is beyond the capacity of a human being.[85] Another possible standard is that of 'a skilled person using an ordinary AI tool in the art,' where the AI tool is an AI system incapable of generating its own inventions.[86] Furthermore, in order to meet the conditions for the duty of disclosure and the sufficient description requirement, we propose mandating the deposit of the model's code, similarly to the depositing of biological material according to the Budapest Convention.[87]

It would also be advisable to determine, within the suggested framework, a protection period shorter than the conventional twenty-year period under patent law. Given the rapid pace of technological advance, a more limited protection might suffice to enjoy the inherent economic benefits of the technology, on the one hand, while allowing for the rapid release of information into the public domain, on the other.[88]

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[83] Yuan Hao, The Rise of 'Centaur' Inventors: How Patent Law Should Adapt to the Challenge to Inventorship Doctrine by Human-AI Inventing Synergies 23 (Aug. 30, 2022) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4186684.

[84] *Ibid*, pp. 102 and ff.

[85] Ernest Fok, *Challenging the International Trend: The Case for Artificial Intelligence Inventorship in the United States*, 19 SANTA CLARA J. INT'L L. 51, 71–2 (2021).

[86] Yanisky-Ravid & Jin, *supra* note 51, p. 26.

[87] Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the purposes of Patent Procedure, 28 Apr. 1977. Section 12b of the Patent Law addresses inventions dealing with biological material (microorganisms); it determined that part of the invention or its methods of implementation may be described by reference to a deposit of the biological material which was made according to the Budapest convention. The reason is that it is often impossible to describe verbally the implementation of these inventions in a manner that would permit a person of skill to implement it. See Yanisky-Ravid & Jin, *supra* note 51, pp. 28-29.

[88] George & Walsh, *supra* note 68, p. 616.

6. Conclusion

AI technological advance is not the first occasion for patent laws to deal with a scientific-technological progress. The last years have seen the emergence of complex issues concerning genetic sequencing, human cloning technologies, and more. The main challenge lies in identifying the invention and in dealing with the question of whether it is patent-eligible. AI technologies present a unique challenge, the essence of which is identifying the inventor, and as a consequence, the appropriate extent of protection for the system and its products.[89]

In this paper we examined whether AI systems should be recognized as an inventor or invention holder under patent law. First, as explained above, Israeli patent law does not require the listing of the name of the inventor, and in practice there is nothing to prevent the developer of the system from being registered in the IPO as its owner. Then, we demonstrated that the current analysis is typically an interpretative framework of the term 'inventor' under patent law, and that in all jurisdictions where applications to register AI systems were substantively examined, both patent authorities and the courts rejected the application, holding that the applicable patent law requires the existence of a human inventor. Next, we expanded, arguing that patent eligibility conditions, as defined in Israeli patent law, also do not allow an AI system to be considered as inventor. Additionally, we argued that in this context ethical factors – which are currently not part of the patent validity requirement, or patent law in general – should also be considered; and in their absence, patent law is not the appropriate framework for the discussion.

Finally, we claimed that the assumptions underlying patent law indicate that the solution for this issue will not be found within the framework of the existing law. The aim of patent protection, which grants the invention holder time-limited exclusive rights, is to incentivize potential inventors to enrich public knowledge.[90] But the incentives at the core of the intellectual property mechanism are effective on humans and not on machines and are therefore not the appropriate framework for deliberating on AI systems as inventors.

AI technologies are now at the forefront of science; they are changing the nature of scientific research and the way in which inventions are being developed. We believe that the issue of protection of AI systems is an opportunity to examine the limits of intellectual property, while examining the social values underlying them. In this paper, we have assumed that the public interest is to encourage inventions and socially

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[89] *Ibid*, p. 617.
[90] Lewinsohn-Zamir, *supra* note 5, p. 144.

beneficial innovations.[91] We have therefore proposed a framework for a limited regulation of proprietary protection for models serving AI systems and which were developed with human involvement. The proposed framework takes into account the ethical aspects dealing with collecting and analyzing databases. We argue that such protection will allow incentivizing research and development of AI systems and innovative models, as well as offer incentives to investors to invest in the development of AI systems,[92] alongside expressing ethical and social considerations in the creation and fostering of innovation.

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[91] George & Walsh, *supra* note 68, p. 616.
[92] Yanisky-Ravid & Jin, *supra* note 51, p. 35.