

# Artificial Intelligence and Patent Law

December 12, 2024

Advances in artificial intelligence (AI) have raised novel questions for U.S. [patent law](#), just as AI has raised concerns in other branches of intellectual property law, including [copyrights](#) and the [right of publicity](#). Committees of both the [House](#) and [Senate](#) have expressed interest in these issues.

In 2024, the U.S. Patent and Trademark Office (USPTO) issued separate guidance documents addressing (1) whether inventions made *using* AI are patentable and (2) whether inventions *about* AI (i.e., new AI technologies) are patentable. This Legal Sidebar provides an overview of how USPTO guidance and case law have addressed both of these issues, differing stakeholder perspectives, and potential options for Congress.

## Can Inventions Made Using AI Be Patented?

One important issue for patent law is whether inventions made using AI can be patented. Although U.S. patent law currently requires a human inventor and does not allow patenting of inventions made solely by AI, patents can be granted on some inventions that human inventors make with AI assistance.

## Current Law Governing Inventorship and Joint Inventorship

The concept of inventorship in U.S. patent law traces some of its roots to the U.S. Constitution. Congress’s authority to establish patent protections—as well as copyrights—is founded on the Constitution’s [Intellectual Property \(IP\) Clause](#), which gives Congress the power “[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.” Thus, the IP Clause allows Congress to give copyright and patent protections to authors and inventors, respectively. Related to this shared constitutional foundation, the question of whether inventions made using AI may be patented is analogous to the question of whether creative works made using AI may be copyrighted—a question explored in a separate [Legal Sidebar](#).

The Patent Act requires that each application for a patent be [made or authorized](#) by the inventor(s), who must make an [oath or declaration](#) that they believe they are the inventor(s). The U.S. Court of Appeals for the Federal Circuit has [held](#) that inventorship requires *conception*, or mentally forming a complete idea for a particular new invention that skilled persons in the relevant field would be able to put into practice without excessive experimentation. As the U.S. Supreme Court has [explained](#), a person need not

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LSB11251

successfully *reduce to practice* (make or perform) an invention to be an inventor—although courts recognize that, in some situations, conception and reduction to practice may tend to occur [simultaneously](#).

If an invention has multiple (joint) inventors, all of them generally must [apply jointly](#) for the patent and make the required oath. As the Federal Circuit summarized in [Pannu v. Iolab Corp.](#), to qualify as a joint inventor, a person must (1) contribute in a “significant manner” to the invention, (2) contribute in a way that is not “insignificant in quality” compared with the whole invention, and (3) contribute more than an explanation of “well-known concepts and/or the current state of the art.” The Patent Act provides that joint inventors [need not](#) “work together or at the same time,” make the “same type or amount of contribution,” or contribute to every [claim](#) of the patent.

## ***Thaler v. Vidal*: Only Human Beings Can Be Inventors**

In 2022, the Federal Circuit held in [Thaler v. Vidal](#) that the Patent Act requires an inventor to be a natural person (i.e., a human being), and therefore an AI system may not be listed as the inventor on a patent. The plaintiff, Stephen Thaler, claimed that he developed an AI system that autonomously conceived of two inventions without human assistance. Thaler applied for patents on both inventions, listing the AI system (and not himself) as the inventor. USPTO determined the applications were incomplete because they failed to list a human inventor. Thaler sued for review of USPTO’s decision in the U.S. District Court for the Eastern District of Virginia, which [agreed](#) with USPTO’s conclusion.

On appeal, the Federal Circuit [held](#) that an inventor must be a natural person because the Patent Act [defines](#) an inventor as an “individual,” a term that the U.S. Supreme Court has [explained](#) normally refers to a human being. Thaler [argued](#) that the term “inventor” should encompass AI systems in order to serve constitutional and statutory goals of U.S. patent law: to incentivize innovation and public disclosure of new inventions. The court, however, held that these policy concerns could not override the clear meaning of the statutory text. The holding of *Thaler* is currently settled law throughout the United States, as the Federal Circuit has [exclusive jurisdiction](#) over intermediate appeals of patent suits and the Supreme Court [declined](#) Thaler’s petition to hear the case. (In an analogous lawsuit also brought by Thaler, a U.S. district court [held](#) in 2023 that creative works must have a human author to be copyrighted, a decision currently [on appeal](#) to the U.S. Court of Appeals for the District of Columbia.)

Thaler has also listed his AI system as the inventor on patent applications in other countries. The [Board of Appeal of the European Patent Office](#) and appellate courts in the [United Kingdom](#), [Australia](#), and [New Zealand](#) ruled that the inventions could not be patented in those jurisdictions since only humans may be inventors. The [South Africa](#) patent office granted Thaler’s application, but [commentators](#) note that South Africa’s laws do not define “inventor” or require substantive examination of patent applications.

## **USPTO Guidance for AI-Assisted Inventions: Human Beings Must Make “Significant Contribution” to Obtain Patents**

The *Thaler* court [acknowledged](#) it did not address “whether inventions made by human beings with the *assistance* of AI are eligible for patent protection.” In February 2024, USPTO addressed this question in its [Inventorship Guidance for AI-Assisted Inventions](#) (the AI Inventorship Guidance).

The AI Inventorship Guidance [states](#) that AI-assisted inventions may be patented so long as at least one natural person “significantly contributed” to the claimed invention. It [explains](#) that this standard is satisfied when at least one human being meets all three elements of joint inventorship under [Pannu](#), i.e., (1) making a significant contribution to conception (2) that is not insignificant in comparison with the full invention and (3) that does not merely involve explaining well-known concepts or current knowledge. The guidance [states](#) that human contributions pertaining only to reduction to practice are *not* sufficient for

inventorship, regardless of whether AI is involved. For patents with multiple [claims](#), the guidance [requires](#) a human being to make a significant contribution to each claim.

USPTO Director Kathi Vidal [characterizes](#) the AI Inventorship Guidance as “embracing the use of AI in innovation and focusing on the human contribution.” So long at least one human being meets the significant-contribution requirement described above, the guidance [allows](#) a patent to issue even if an AI system also makes a significant contribution—one that would make the AI system a co-inventor if it were a human being. Accordingly, the guidance [acknowledges](#) that tools, including AI systems, “may perform acts that, if performed by a human, could constitute inventorship under our laws.”

The AI Inventorship Guidance [provides](#) illustrations of how the “significant contribution” test would apply to AI-assisted inventions. It [states](#) that prompting, designing, building, or training an AI system “in view of a specific problem to elicit a particular solution” might constitute a significant contribution in some cases. On the other hand, the guidance asserts that [presenting](#) an AI system with only a “general goal or research plan” would not constitute inventorship. Likewise, the guidance would not consider a person who simply [owns or oversees](#) an AI system to be the inventor of inventions created using that system. USPTO elaborated further on the guidance with a separate set of examples, one for a [Transaxle for Remote Control Car](#) and the other for [Developing a Therapeutic Compound for Treating Cancer](#).

As a practical consideration for patent applicants, the guidance notes that, as part of their existing [duty to disclose](#) information that raises a “prima facie case of unpatentability,” applicants must inform USPTO of any evidence that the named inventor’s “purported contribution(s) was made by an AI system.” USPTO [states that](#) it does not “believe” this guidance will have a “major impact” on disclosure requirements.

## Stakeholder Views on USPTO Guidance for AI-Assisted Inventions

Dozens of stakeholders filed [public comments](#) expressing a mix of support and criticism for the AI Inventorship Guidance. Some, including the [American Bar Association Intellectual Property Section](#) (ABA IP Section), argued that only humans, not AI, are capable of the mental process of conception; that AI systems are simply tools used by human inventors; and that the guidance takes an overly restrictive view of what may constitute human inventorship in the context of inventions assisted by AI compared with other tools. The ABA IP Section argues that the *Pannu* “significant contribution” test is inappropriate for determining whether an invention has a human inventor. By contrast, the [Public Interest Patent Law Institute](#) argues that the guidance may be too lenient toward patenting AI-assisted inventions, including where the human contribution consists solely of developing or giving prompts to AI systems.

Some comments offered differing views on the new disclosure requirements, in particular. The [ABA IP Section](#), for example, opposes the guidance to the extent it requires patent applicants to disclose their use of AI tools. The [Alliance for Automotive Innovation](#), on the other hand, argued that USPTO should modify the guidance to include an express requirement that patent applicants explain how, if at all, AI assisted the invention process, to give USPTO a fuller record to inform fact-specific decisions.

## When Can Inventions in AI Technology Be Patented?

Apart from questions about AI and inventorship (which may implicate a variety of technological fields), the patentability of new AI technologies themselves is another significant legal issue. Although the Patent Act [broadly defines](#) types of inventions that may be patented, the Supreme Court has [long held](#) that “abstract ideas”—[such as](#) mathematical formulas or mental processes—may not be patented, even if they meet all the other patentability requirements (e.g., they are newly discovered, nonobvious, and adequately described in the patent application). Because some AI innovations might be characterized as nonpatentable abstract ideas, stakeholders have expressed [concern](#) that current limitations on patent

eligibility could harm AI innovation. This section reviews the current law of patent-eligible subject matter and explains how these concepts may apply to AI-related inventions.

## Current Law Governing Patent Eligible Subject Matter

*Patent-eligible subject matter* refers to the types of inventions that may be patented. [Section 101](#) of the Patent Act allows patents on “any new and useful process, machine, manufacture, or composition of matter.” Although this language has a wide scope, the Supreme Court has [held](#) that it has three implicit categorical exceptions: “laws of nature, natural phenomena, and abstract ideas” are *not* patent-eligible. For [example](#), Albert Einstein could not have patented his formula  $E = mc^2$  (a law of nature), nor could anyone patent a newly discovered wild plant (a natural phenomenon). These three types of nonpatentable discoveries are sometimes called the *judicially developed exceptions* to patent-eligible subject matter.

While these exceptions to patent-eligible subject matter are long-standing, their effective scope has waxed and waned [over time](#), depending on the trends in court decisions. Federal Circuit [decisions in the 1990s](#) construed the exceptions narrowly. Then, a series of Supreme Court decisions in the 2010s broadened the judicially developed exceptions to patent-eligible subject matter, effectively narrowing the scope of inventions eligible to be patented. Specifically, these Supreme Court cases rejected, as ineligible, patents on (1) a [business method](#) for hedging price-fluctuation risk; (2) a method for [calibrating the dosage](#) of a drug to treat autoimmune diseases; (3) isolated [human DNA segments](#); and (4) a method for [mitigating settlement risk](#) in financial transactions using a computer.

The Court’s decisions established a two-step process for determining whether a patent claims ineligible subject matter, sometimes [called](#) the *Alice/Mayo* test or *Alice/Mayo* framework. The [first step](#) of the test addresses whether the patent claims are “directed to” an ineligible concept (i.e., a law of nature, a natural phenomenon, or an abstract idea). To be directed to an ineligible concept, the focus of the claims [must](#) be a patent-ineligible concept, as opposed to a technological process. If the patent claims are not directed to an ineligible concept, then the claims are patent-eligible. If the claims are directed to an ineligible concept, then the invention is not patentable unless the patent claims have an “[inventive concept](#)” under the second step of the *Alice/Mayo* test. Step two considers whether the elements of each patent claim contain additional aspects that “transform” it into a patent-eligible application of an ineligible concept. Claim limitations that are conventional, routine, and well understood, [such as](#) implementing an abstract idea on a generic computer, cannot supply the inventive concept.

As a result of the *Alice/Mayo* test, [fewer inventions](#) are patentable, particularly in areas such as computer software, business methods, medical diagnostics, and biotechnology. For example, the Federal Circuit has applied *Alice/Mayo* to invalidate patents on a method to [diagnose fetal abnormalities](#) by detecting fetal DNA in maternal blood; a test to [diagnose a neurological disorder](#) by detecting a particular protein in bodily fluids; and a method for [manufacturing driveline shafts](#) in automotive vehicles.

Particularly relevant to inventions in AI is the Court’s 2014 decision in *Alice Corp. v. CLS Bank*. The patents at issue in *Alice* concerned methods and systems for mitigating “[settlement risk](#)” (i.e., the risk that only one party in a financial transaction will pay) using a computer as a third-party intermediary. In *Alice*, the Court held that these inventions could not be patented because they were [directed to](#) “the abstract idea of intermediated settlement, *i.e.*, the use of a third party to mitigate settlement risk.” Critically, the Court held that, although the method involved a computer (a “machine” under [Section 101](#)), this did not save its patent eligibility because “[generic computer implementation](#)” was insufficient to transform an abstract idea into a patentable invention. The claims on a computer system programmed to carry out the methods failed for the [same reason](#), as they described only “generic computer components configured to implement” the abstract idea.

## USPTO's 2024 Guidance on AI and Patent Eligibility

In a [2023 executive order](#), President Biden directed USPTO to “clarify” issues relating to AI and patents by issuing “additional guidance to USPTO patent examiners . . . which could include, as the USPTO Director deems necessary, updated guidance on patent eligibility to address innovation in AI and critical and emerging technologies.” This order came amidst ongoing efforts by USPTO to solicit stakeholder input and study patent issues relating to AI, including a 2019 [request for comments](#), two [reports](#) issued in 2020, and [public meetings](#) on AI issues held in 2022–2024. Among other things, USPTO’s work found that patent applications claiming AI technologies had [doubled](#) between 2002 and 2018, and that some stakeholders [worried](#) that “many AI inventions are at risk under the subject matter eligibility analysis because they can be characterized as” abstract ideas such as “certain methods of organizing human activity, mental processes, or mathematical concepts.”

In 2024, USPTO issued [updated guidance](#) on patent eligibility and AI inventions (the AI Eligibility Guidance), which—combined with [existing guidance](#)—governs how patent examiners assess the eligibility of AI inventions. This guidance supplements the existing guidance that USPTO issued [in 2019](#) to respond to the *Alice/Mayo* series of decisions and subsequent Federal Circuit cases. Under the 2019 guidance, the USPTO divides the first step of the *Alice/Mayo* test (whether the claim is “directed to” a judicial exception) into [two “prongs”](#): (1) whether the patent claim “recites” an abstract idea, law of nature, or natural phenomena; and (2) if so, whether the claim has additional elements that “integrate” the ineligible concept into a *practical application* of the judicial exception. The claim is patent-eligible if it either does not recite an ineligible concept *or* integrates it into a practical application.

The 2024 AI Eligibility Guidance [focuses](#) on these two aspects of the analysis. As to when a patent claim on an AI invention “recites” an abstract idea, the guidance gives several examples of AI inventions that are eligible because they “merely involve” abstract ideas, [such as](#) a claim on an application-specific integrated circuit (ASIC) for an artificial neural network comprising synaptic circuits, a microprocessor, and an array of “neurons” organized in a particular way. Under the guidance, this claim is patent-eligible because it is [directed to](#) specific “hardware components” and does not recite an abstract idea. In contrast, a claim on a general method of using a trained artificial neural network to detect anomalies in a data set is [ineligible](#). The AI Eligibility Guidance explains that this claim is directed to abstract ideas (the mental process of observation and anomaly detection) implemented on generic computer components and outside any particular technological context.

Other aspects of the AI Eligibility Guidance speak to when AI inventions may be eligible [because](#) they integrate an abstract idea into a practical application by “improv[ing] the functioning of a computer or improv[ing] another technology or technical field.” The guidance [states](#) that “many” AI inventions may be eligible for this reason, as when they claim “a specific application of AI to a particular technological field.” For example, the guidance explains that a general method of using a deep neural network to analyze a speech sample with multiple sources is [ineligible](#) because it claims a mathematical process. In contrast, a particular method of using a deep neural network to separate a mixed speech sample, generate separate waveforms for each speech source, and recombine them into a new mixed sample without unwanted sources is an [eligible](#) practical application of the abstract idea.

## Stakeholder Views on USPTO's AI Eligibility Guidance

While [some](#) stakeholders [appreciated](#) USPTO’s efforts to provide more clarity on how it will approach AI patent eligibility issues, [others](#) asserted that the 2024 AI Eligibility Guidance could have done [more](#) to clarify the application of the *Alice/Mayo* framework to AI inventions. Several stakeholders noted that the examples in the guidance were not as helpful as they could have been, either because they involved [unrealistic](#) fact patterns or because the hypothetical claims were all [either](#) clearly eligible or clearly ineligible. That said, many commentators observed that the USPTO’s task in providing guidance in this



area is “difficult” given the dearth of AI-specific case law and the ambiguities of the *Alice/Mayo* test itself.

Some groups (such as the [Council for Innovation Promotion](#)) expressed that the guidance was “problematic” in treating trained AI as a “generic computer” and discounting AI claim limitations, and so “may serve to make obtaining patents on AI inventions unnecessarily difficult.” Other groups (such as the [High Tech Inventors Alliance](#)) had “serious concerns” with the guidance from the other direction and urged USPTO to withdraw it, arguing that the guidance’s approach to the “practical application” prong conflicts with the reasoning of the *Alice* decision.

## Considerations for Congress

Congress could amend the Patent Act if it wishes to change or clarify the law of patentability for inventions made using AI, or the eligibility of inventions in the field of AI. For example, some stakeholders have [expressed support](#) for legislation expanding the scope of patent eligibility for AI technologies and other fields affected by the *Alice/Mayo* decisions. Introduced bills on this issue in the 118<sup>th</sup> Congress include [S. 2140](#) and Section 7 of [H.R. 8134](#). Congress could consider analogous legislation on inventorship, should it conclude that the AI Inventorship Guidance or subsequent case law is too lenient or too strict in allowing patents on AI-assisted inventions.

Alternatively, Congress could continue to monitor how USPTO’s guidance fares in practice to decide whether new legislation is needed. USPTO acknowledges that neither its [AI Inventorship Guidance](#) nor its [AI Eligibility Guidance](#) has the force of law. Rather, these documents seek to apply the existing legal requirements that Congress has set forth in the Patent Act, as interpreted by federal courts, to guide USPTO patent examiners in evaluating patent applications. Parties may challenge USPTO’s decisions to grant or deny patent applications in federal court, and USPTO’s guidance is [not legally binding](#) on courts hearing such challenges. Ultimately, USPTO’s guidance and federal court decisions on patentability both turn principally on the interpretation of the Patent Act, which Congress may amend should it disagree with conclusions reached by USPTO or the courts concerning AI inventions.

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