Cooley

Immaculate Conception: Inventorship in the Age of AI

October 23, 2024

Generative artificial intelligence (AI) has become an essential tool in the drug discovery process. Trained with input regarding target engagement and desired pharmacological properties, or prompted to identify compounds that can bind a target, AI systems can rapidly generate libraries of new small molecules and biologics for clinical development, cutting years off of the research and development (R&D) timeline. The utility of these systems is illustrated by the dozens of AI-assisted therapeutics currently being investigated in clinical trials.[1]

Like any pharmaceutical invention, life sciences companies need to file patent applications to protect AI-assisted therapeutics. The US Patent and Trademark Office (USPTO)[2] and the Federal Circuit[3] have confirmed that an inventor must be a natural person, and USPTO has issued guidance on determining inventorship for AI-assisted inventions.[4] See our previous client alerts discussing patent considerations for AI-related inventions and summarizing USPTO guidance.

The USPTO guidance and inventorship determinations have real-world consequences on the validity[5,6] and ownership of patents covering therapeutics developed using AI. This article will discuss a framework for determining inventorship for AI-assisted drug discovery programs and considerations for working within inventorship case law and USPTO guidelines, along with the duty of disclosure under 37 CFR 1.56.

Inventorship: The legal standard

A person "who conceived the subject matter … claimed in an application"[7] is an inventor and must be identified as such in the patent application. Conception requires a "definite and permanent idea" that provides a specific solution to a problem as it will be "applied in practice," and "not just a general goal or research plans [one] hopes to pursue."[8]

USPTO guidance focuses on the *Pannu* factors to determine whether an inventor has contributed to the conception of an AI-assisted invention.[9] According to these factors:

1. An inventor must contribute in some significant manner to the conception or reduction to practice of the invention.[10]
2. The contribution must not be "insignificant in quality" considering the full scope of the invention.
3. An inventor must do more than merely explain well-known concepts or the current state of the art.

Implications

Inventorship determination is already a complicated exercise and a ripe source for disputes. Adding AI systems to the equation further muddies the analysis. Questions regarding what actions constitute an inventive contribution (i.e., "conception") in AI-assisted inventions directly impact ownership of these inventions. USPTO guidance also "reminds" applicants of the duty to disclose evidence of improper inventorship under 37 CFR 1.56. Patent examiners are now empowered to request information related to inventorship even if the information is not material to patentability.[11] Here, we discuss considerations that are relevant for life sciences companies working with external third parties (such as collaborators or contract research organizations), as agreements in these contexts frequently allocate ownership in IP resulting from the collaboration based on the inventorship laws of the US.[12]

The framework

The USPTO guidance attributes significant contributions to conception to individuals based on the degree and nature of their activities in developing and training the AI system, prompting the system or modifying the AI-generated compounds.[13]

This guidance can be distilled into three questions that should be addressed at the outset of an AI-assisted drug development program:

1. **System and training type**: What kind of AI system is being used, and what level of training was required for development?
2. **Input**: What level of prompt engineering is needed?
3. **Output**: What is the output of the AI system, and what subsequent work was needed to arrive at the invention?

1. What kind of AI system is being used, and what level of training was required for development?

Whether an entity owns a particular AI system is not determinative of inventorship (and ultimately, ownership) in the output of that AI system. Instead, companies should first consider the nature of the AI system being used.[14] The examples provided in connection with the USPTO's guidance describe two flavors of AI systems – off-the-shelf AI systems developed to solve general knowledge problems[15] and bespoke AI systems developed and trained to solve specific problems (e.g., identifying a novel therapeutic that inhibits a specific enzyme).[16]

Training an AI system requires human interaction with the system, and this activity can constitute a "significant contribution" to the conception of an AI-assisted invention. The examples make clear that development and/or general training of an off-the-shelf AI system without a specific problem in mind or without intent to elicit a particular output from the AI system does not amount to a significant contribution to the output of such a system under the *Pannu* factors.[17] In contrast, developing and/or training a bespoke AI system to solve a specific problem may be considered a significant inventive contribution to the output of the AI.[18] This could be training the AI model to identify compounds with certain binding affinity while minimizing specific off-target effects or reducing toxicity. [19]Importantly, a person's involvement in developing and/or training a bespoke AI system can translate into inventorship not only in methods of using the AI system to generate the desired output, but also in the output itself, even when there were no additional modifications or testing required of the output. [20]

Companies should carefully consider language in external agreements and internal documentation that characterizes the development and training involved for an AI system. For external agreements with third parties, consider both who curates the training data for a bespoke AI system owned and controlled by the third party and the language in the agreement linking company personnel to these activities. If the system was generated for a general purpose, and there is no further optimization needed to utilize the system for the intended purpose, consider characterizing the system as such in the initial agreement, and see the sections below for additional considerations in characterizing the output of these off-the-shelf systems to avoid producing an AI-assisted invention without an inventor.

2. Input: What degree of prompt engineering is required?

In most instances, a human-generated prompt is required to elicit output once an AI system is trained.[21] This is a second point of human interaction that may amount to a significant inventive contribution. The practice of designing inputs for AI tools that will produce optimal outputs is referred to as "prompt engineering."[22] While USPTO guidance makes clear that prompt engineering can amount to a significant contribution to the conception of an invention,[23] the guidance and examples do not provide much instruction for what rises to the level of an inventive prompt.

What is clear from the examples is that recognizing a general problem and restating that problem as a general AI prompt is **not** a significant contribution to conception under the *Pannu* factors. In other words, an inventor should do more than ask an AI model to identify new therapeutics for a particular target.[24] Life sciences companies typically have more sophisticated end goals in mind, such as achieving a target profile involving multiple factors – including binding affinity, binding specificity, solubility, metabolism and toxicity. Prompts designed to elicit a particular type of response from the system, as well as selection of input datasets to be used as part of the prompt, may meet the requirements of a significant contribution to conception.[25]

Companies should be mindful of documentation addressing prompt engineering. When working with third parties, consider requiring that company employees develop the guidelines for the result to be achieved by the

prompt. Companies also should develop and maintain clear internal documentation systems identifying people responsible for prompt engineering and their specific contributions for each iterative interaction with the AI system.

3. What is the output, and is there subsequent work needed to arrive at the invention?

When working with an off-the-shelf AI system and utilizing generalized prompts, a person cannot simply take the output of the AI system and claim inventorship.[26] The guidance and examples indicate that human modification of an AI-generated compound to improve its properties can constitute a significant contribution. [27]

When using an off-the-shelf AI system, companies should carefully consider the scope of claims directed to a genus of AI-generated compounds. According to USPTO guidance, a general prompt to an AI system to provide a list of compounds for a general purpose and then directly claiming a genus of the output is unlikely to have human inventive contribution without further validation work. Instead, companies should consider tailoring claims to a narrower group of compounds that have been tested and confirmed to possess the desired properties for the therapeutic candidate.

Companies also should consider how the output is characterized in statements of work with third parties. If the company will need to perform additional validation work to select particular compounds from a longer list of third-party AI-generated outputs, consider describing the initial output as "candidate" compounds or other verbiage and indicating the additional (inventive) work needed, which will be performed by the company.

AI is here to stay and will continue to take a prominent role in drug discovery. We anticipate an increase in inventorship and ownership challenges during pharmaceutical litigation and even prosecution – where, for example, a competitor may rely on company publications regarding the use of generative AI in its drug discovery program to challenge inventorship. Documenting human contributions, including developing and training the AI model, along with any subsequent modifications or testing, will be critical to withstand such challenges.

Notes

1. Jayatunga, et al., "How successful are AI-discovered drugs in clinical trials? A first analysis and emerging lessons," Drug Discovery Today, June 2024; Hayden Field, "The first fully A.I.-generated drug enters clinical trials in human patients," CNBC, June 29, 2023.
2. Manual of Patent Examining Procedure (MPEP) 2109VII (e9 r10. 2019), "The Patent statute is replete with language indicating that an inventor is a natural person," citing 35 USC § 102(a) ("A person shall be entitled to a patent unless …").
3. *Thaler v. Vidal*, 43 F.4th 1207, 1213 (Fed. Cir. 2022), *cert denied*, 143 S. Ct. 1783 (2023).
4. Inventorship Guidance for AI-Assisted Inventions, 89 Fed. Reg. at 10,043, February 13, 2024.
5. *Stark v. Advanced Magnetics*, 119 F.3d 1551, 1553, 1556 (Fed. Cir. 1997).
6. 35 USC § 115, "An application for patent … shall include, or be amended to include, the name of the inventor for any invention claimed in the application."
7. *Sewall v. Walters*, 21 F.3d 411, 415 (Fed. Cir. 1994).
8. Id.
9. *Pannu v. Iolab Corp.*, 155 F.3d 1344, (Fed. Cir. 1988).
10. Making an invention (referred to as "reduction to practice") generally does not constitute an inventive contribution, unless the invention is in an unpredictable space (like many life sciences inventions). In such situations, the doctrine of simultaneous conception and reduction to practice finds that, e.g., conception of a specific compound does not occur until the compound is made and tested. See, e.g., *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1206 (Fed. Cir. 1991).
11. Inventorship Guidance for AI-Assisted Inventions, 89 Fed. Reg. at 10,050, February 13, 2024.
12. For example, if an employee from each entity is an inventor, the IP may be jointly owned by both entities by virtue of existing employment agreements. In contrast, if only inventors from one entity are named, the IP may be owned by only the entity employing the named inventor(s). We recognize that there are a multitude of alternative scenarios ascribing ownership of IP generated under collaboration and licensing agreements. This simple example is provided only to illustrate the importance of the considerations in the following paragraphs when entering into these agreements
13. Inventorship Guidance for AI-Assisted Inventions, 89 Fed. Reg. at 10,045, February 13, 2024.
14. Id at 10,049, stating "simply owning or overseeing an AI system that is used in the creation of an invention, without providing a significant contribution to the conception of the invention, does not make that person an inventor."
15. USPTO Inventorship Example 1, Scenarios 1 – 5, and Example 2, Scenario 1.
16. See USPTO Inventorship Example 2, Scenario 2.
17. See USPTO Inventorship Example 2, Scenario 1, and Example 1, Scenario 5, where both AI systems were

developed to solve a general knowledge problem. The people involved in this generalized development and training were not inventors on claims to methods of using these systems, nor claims to compounds that were the direct outputs of these systems.

18. See USPTO Inventorship Example 2, Scenario 2, where the design and build of a new AI model, training the model on specific datasets and training the model to accept different input formats were all factors culminating in a "significant" contribution to a claim directed to the compound output of the AI model.
19. See USPTO Inventorship Example 2, Scenario 2.
20. Id.
21. At least for now. See Oguz A. Acar, "AI Prompt Engineering Isn't the Future," Harvard Business Review, June 6, 2023 ("new AI language models like GPT4 already show great promise in crafting prompts – AI itself is on the verge of rendering prompt engineering obsolete").
22. McKinsey & Company, "What is prompt engineering?," March 22, 2024.
23. Inventorship Guidance for AI-Assisted Inventions, 89 Fed. Reg. at 10,048, February 13, 2024.
24. See USPTO Inventorship Example 1, Scenario 1, where the prompt was essentially "provide an original transaxel design"; see USPTO Inventorship Example 2, Scenario 1, where a prompt generated based on guidance from another person and using a routine method of expressing a chemical structure was not an inventive contribution.
25. See USPTO Inventorship Example 2, Scenario 1, where selection of a particular compound database and selection of the parameters that the output compound needed to meet were elements considered when evaluating inventive contributions.
26. Inventorship Guidance for AI-Assisted Inventions, 89 Fed. Reg. at 10,048, February 13, 2024.
27. USPTO Inventorship Example 1, Scenario 3, and USPTO Inventorship Example 2, Scenario 1.

Key Contacts

Dr. Jon Cousin Washington, DC	jcousin@cooley.com +1 202 728 7079
David Hopkins Colorado	dhopkins@cooley.com +1 720 566 4063
Dr. Jordan Phelan Washington, DC	jphelan@cooley.com +1 202 728 7066