In its Request for Comments published in the Federal Register at 84 Fed. Reg. 58,141 on October 30, 2019, the USPTO solicited comments regarding intellectual property protection for artificial intelligence (“AI”) innovation. In response, the Computer & Communications Industry Association (“CCIA”)1 and Internet Association (“IA”)2 submit the following comments.3 As explained below in greater detail, CCIA and IA believe that the existing legal framework is sufficient to address intellectual property issues related to AI, and no legislative or regulatory amendments are needed at this time. However, any report issued by the USPTO as a result of this inquiry should clearly state that fair use permits the ingestion of copyrighted material in the course of an AI process.

1. **Should a work produced by an AI algorithm or process, without the involvement of a natural person contributing expression to the resulting work, qualify as a work of authorship protectable under U.S. copyright law? Why or why not?**

A work produced by an AI algorithm or process, without the involvement of a natural person contributing to the resulting work, should not qualify as a work of authorship protectable under U.S. copyright law.

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1 CCIA is an international nonprofit membership organization representing companies in the computer, Internet, information technology, and telecommunications industries. Together, CCIA’s members employ nearly one million workers and generate approximately a quarter of a trillion dollars in annual revenue. CCIA promotes open markets, open systems, open networks, and full, fair, and open competition in the computer, telecommunications, and Internet industries. A complete list of CCIA members is available at http://www.ccianet.org/members.

2 IA represents over 40 of the world’s leading internet companies. IA is the only trade association that exclusively represents leading global internet companies on matters of public policy. IA’s mission is to foster innovation, promote economic growth, and empower people through the free and open internet. A complete list of IA members is available at https://internetassociation.org/our-members/.

3 CCIA and IA each submitted comments on November 12, 2019, in response to the USPTO’s request for comments on patents and AI inventions.
The Copyright Office currently refuses to register a work that was not created by a human being. It explains:

The copyright law only protects “the fruits of intellectual labor” that “are founded in the creative powers of the mind.” Trade-Mark Cases, 100 U.S. 82, 94 (1879). Because copyright law is limited to “original intellectual conceptions of the author,” the Office will refuse to register a claim if it determines that a human being did not create the work. Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 58 (1884).

The Copyright Office adds that it “will not register works produced by a machine or mere mechanical process that operates randomly or automatically without any creative input or intervention from a human author.” Id. at § 313.2.

Accordingly, if an AI algorithm or process creates a work that lacks expression from a natural person in the resulting work, the Copyright Office correctly would refuse to register the work. A court would uphold this refusal under the Supreme Court precedent cited in the Compendium.

Withholding copyright protection from a work resulting from an AI process for which there was no expressive contribution by a natural person is justifiable from a policy perspective; the AI algorithm, and the computer that runs it, does not require the economic incentive provided by copyright in order to create works. Indeed, AI is capable of quickly producing an enormous array of works. Recognizing copyright in such output could quickly create a minefield of legal issues, leading to litigation and uncertainty.

To be sure, the human creator of the software that runs the AI algorithm or process would receive a copyright in the expressive aspects of the AI software (and perhaps a patent for inventions in the AI software). We do not need copyright to incentivize the creation of AI-generated works by giving copyright to each generated work because copyright already incentivizes the creation of AI software that generates all manner of content.

2. Assuming involvement by a natural person is or should be required, what kind of involvement would or should be sufficient so that the work qualifies for copyright protection? For example, should it be sufficient if a person (i) designed the AI algorithm or process that created the work; (ii) contributed to the design of the algorithm or process; (iii) chose data used by the algorithm for training or

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5 The question of authorship of works created by an AI process has fascinated copyright scholars for decades, and the USPTO will find no shortage of law review articles discussing every aspect of it. See, e.g., Annemarie Bridy, Coding Creativity: Copyright and the Artificially Intelligent Author, 2012 STAN. TECH. L. REV. 5, available at https://digitalcommons.law.uidaho.edu/cgi/viewcontent.cgi?article=1163&context=faculty_scholarship.
otherwise; (iv) caused the AI algorithm or process to be used to yield the work; or (v) engaged in some specific combination of the foregoing activities? Are there other contributions a person could make in a potentially copyrightable AI-generated work in order to be considered an “author”?

Human contribution to the design of the AI algorithm or process should not be considered authorship of works resulting from the AI. Rather, that contribution could lead to authorship with respect to the software that implements the AI. If a work resulting from an AI process is modified or enhanced by a natural person, that modification or enhancement may reflect sufficient originality to rise to the level of authorship, as required by *Feist v. Rural Telephone*, 499 U.S. 340 (1991). A court applying traditional copyright principles to the facts of such a case would be able to determine whether there was enough expressive contribution by a human to rise to the level of authorship and whether the portions of a work that are reproduced in a particular case are protectable human creativity or unprotectable, AI-generated output. Of course, under 17 U.S.C. § 103, any copyright would extend only to the original elements contributed by the natural person.

With this framework in mind:

(i) The person who designs an AI algorithm or process that creates a work may own copyright in the computer software containing the algorithm or process—subject to the idea/expression dichotomy codified in 17 U.S.C. § 102(b)—but he or she does not own copyright in the work itself, which was “produced by a machine or mere mechanical process that operates randomly or automatically without any creative input or intervention from a human author.” *Compendium* § 313.2.

(ii) The person who contributes to the design of an AI algorithm or process is, if anything, one step removed from the person in (i), and may claim joint ownership of the computer software—but not the work itself—if the person intended to merge his or her original expression into the software as a “unitary whole.” *See* 17 U.S.C. § 101 (definition of “joint work”); *Childress v. Taylor*, 945 F.2d 500 (2d Cir. 1991).

(iii) The person who selects data used by an AI algorithm or process, for training or otherwise, may be the author of that “compilation” of data (if it exists in tangible form and the compilation is sufficiently creative to support a claim of copyright), but unless that data is represented in the work created by the algorithm or process, the person has not made any copyrightable contribution to that work, for which the data was simply raw material.
(iv) The person who causes an AI algorithm or process to be used to create a work, if simply the one who “hits the button” on the machine, should lack a claim of copyright in the work produced by the algorithm or process.

(v) The person who engages in “some specific combination of the foregoing activities” has no greater claim to copyright protection than the people described above.

3. **To the extent an AI algorithm or process learns its function(s) by ingesting large volumes of copyrighted material, does the existing statutory language (e.g., the fair use doctrine) and related case law adequately address the legality of making such use? Should authors be recognized for this type of use of their works? If so, how?**

The existing statutory framework and related case law concerning the fair use right, 17 U.S.C. § 107, clearly permit the ingestion of large amounts of copyrightable material for the purpose of an AI algorithm or process learning its function. Because of the importance of the lawfulness of ingestion to this inquiry and AI more generally, we will respond to this question in detail. Although fair use sufficiently addresses copyright concerns related to ingestion, other legal barriers remain, including the Digital Millennium Copyright Act, and causes of action outside of Title 17 such as the Computer Fraud and Abuse Act, trespass to chattels, and breach of contract. As these causes of action do not involve intellectual property, they are outside the scope of this inquiry.

A. **Fair Use**

AI algorithms and other processes often require the ingestion of large amounts of material. Assembling that material may entail converting it into a more useable format, e.g., translating image files into machine-readable files. In addition, backup copies of the materials will be necessary to protect against loss of data in the event of system failure. Temporary reproductions of portions of the material in a computer’s random access memory are a normal part of the process of training and AI algorithm. All these copies are not viewable or

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6 In the Google Library Project, Google made a digital scan of each book it borrowed from a research library, then used optical character recognition software to convert the scan machine readable text. *Authors Guild v. Google, Inc.*, 804 F.3d 202, 208 (2d Cir. 2015).

7 For example, HathiTrust created and maintained four text-only copies of its entire database (one on the primary server at the University of Michigan, another at the mirror server at the University of Indiana, and two encrypted backup tapes at two secure locations on the University of Michigan campus) for the purpose of balancing the load of user web traffic and serving as back-up in the case of a disaster. *Authors Guild v. HathiTrust*, 755 F.3d 87 (2d Cir. 2014).

8 These temporary reproductions may not constitute copies under the Copyright Act. See *Cartoon Networks LP v. CSC Holdings, Inc.*, 536 F.3d 121 (2d Cir. 2008).
consumable by the outside world. Because these non-expressive copies are not consumable by the public, they do not function as market substitutes for copies of the ingested works.

Numerous appellate courts have correctly found the mass copying of raw material to build databases for uses by AI processes to be fair use under 17 U.S.C. § 107. Authors Guild v. Google, Inc., 804 F.3d 202 (2d Cir. 2015); Authors Guild v. HathiTrust, 755 F.3d 87 (2d Cir. 2014); A.V. ex rel. Vanderhye v. iParadigms, LLC, 562 F.3d 630, 640 (4th Cir. 2009); Perfect 10 v. Amazon.com, Inc., 508 F.3d 1146, 1165 (9th Cir. 2007); Kelly v. Arriba Soft Corp., 336 F.3d 811, 818 (9th Cir. 2003). Judge Leval’s opinion in Google provides the clearest analysis of why the creation of an AI database, and its subsequent uses, are fair uses.

1. The Purpose and Character of the Use

The Google court stated that it “had no difficulty concluding that Google’s making of a digital copy of Plaintiff’s books for the purpose of enabling a search for identification of books containing a term of interest to the searcher involves a highly transformative purpose....” Google, 804 F.3d at 216. In reaching this conclusion regarding these copies, the court relied on HathiTrust, where the court found that “both the making of the digital copies and the use of those copies to offer the search tool were fair uses.” HathiTrust, 755 F.3d at 105. The Google court noted that the HathiTrust court had found that the downloading and storing of complete digital copies of books “was essential to permit searchers to identify and locate the books in which words or phrases of interest to them appeared.” Google, 804 F.3d at 217. The Google court quoted the HathiTrust court’s conclusion that “the creation of a full-text searchable database is a quintessentially transformative use...[a]s the result of a word search is different in purpose, character, expression, meaning, and message for the page (and the book) from which it is drawn.” Google, 804 F.3d at 217 (quoting HathiTrust, 755 F.3d at 97).

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9 Professor Matthew Sag characterizes acts of copying which do not communicate the author’s original expression to the public as “nonexpressive uses.” See, e.g., Matthew Sag, Copyright and Copy-reliant Technology, 103 NW. U. L. REV. 1607, 1624 (2009). Professor Edward Lee describes three kinds of uses: creational uses (uses of copyrighted works to create a technology); operational uses (uses that occur during the operation of the technology once it has been created); and output uses (the distribution or display of works as an output of the technology). Edward Lee, Technological Fair Use, 83 SO. CAL. L. REV. 797, 842-44 (2010).

10 The non-expressive uses of works for the creation of AI algorithm are analogous to the “intermediate copies” made during the course of software reverse engineering. Courts have found that fair use permitted the translation of machine-readable object code into human readable source code as an essential step in the development of noninfringing interoperable computer programs. In these cases, the source code was used internally and was never distributed to the public. See Sony Computer Entm’t v. Connectix Corp., 203 F.3d 596 (9th Cir. 2000); Sega Enters. Ltd. v. Accolade, Inc., 977 F.2d 1510 (9th Cir. 1992); Atari Games Corp. v. Nintendo of Am., Inc., 975 F.2d 832 (Fed. Cir. 1992).
The *Google* court then cited *A.V. ex rel. Vanderhye v. iParadigms, LLC*, 562 F.3d 630, 640 (4th Cir. 2009); *Perfect 10 v. Amazon.com, Inc.*, 508 F.3d 1146, 1165 (9th Cir. 2007); and *Kelly v. Arriba Soft Corp.*, 336 F.3d 811, 818 (9th Cir. 2003), as “examples of cases in which courts had similarly found the creation of complete digital copies of copyrighted works to be transformative uses when the copies served at different function from the original.” *Google*, 804 F.3d at 217 (quotations omitted). All three of these cases involved the creation of a database to which AI algorithms were applied. *Kelly* and *Perfect 10* involved search engines designed to find images on the World Wide Web. *iParadigms* involved a plagiarism detection service that enabled an instructor to find works from which a student paper may have been copied. The *Google* court explained that “[a]s with *HathiTrust* (and *iParadigms*), the purpose of Google’s copying of the original copyrighted books is to make available significant information about those books, permitting a searcher to identify those that contain a word or term of interest…..” *Google*, 804 F.3d at 217. See also *iParadigms*, 562 F.3d at 639-40 (“*iParadigms*’ use of plaintiffs’ works had an entirely different function and purpose than the original works…. *iParadigms*’ use of these works was completely unrelated to the expressive content and instead aimed at detecting and discouraging plagiarism.”).

The *Google* court also made clear that the commercial motivation of a provider of the AI database should not tilt the first factor against the provider: “[o]ur court has…repeatedly rejected the contention that commercial motivation should outweigh a convincing transformative purpose and absence of significant substitutive competition of the original.” *Google*, 804 F.3d at 219. See also *iParadigms*, 562 F.3d at 639. In short, the first fair use factor should always weigh in favor of the creator of an AI database.

2. **The Nature of the Copyrighted Work**

Neither the *Google* nor *HathiTrust* courts found the second fair use factor, the nature of the copyrighted work, to be dispositive. This is “because the secondary use transformatively provides information about the original, rather than replicating protected expression in a manner that provides a meaningful substitute for the original.” *Google*, 804 F.3d at 220. In other words, because the copying involved in the creation of a search database does not provide a meaningful substitute of the original, the nature of the original has little relevance. See also *iParadigms*, 562 F.3d at 641-42 (second factor does not weigh against *iParadigms* because its “use of the works in this case—as part of a digitized database from which to compare the similarity of typewritten
characters used in other student works—is...unrelated to any creative component.”) There could be cases where the nature of the works used, such as more factual works, might also support the finding of fair use. In any event, the second fair use factor does not tilt against non-expressive uses by AI database creators.

3. The Amount and Substantiality of the Portion Used

Uses in the creation of AI algorithms often require the copying of entire works. The HathiTrust court concluded its discussion of the third fair use factor by noting that “[b]ecause it was reasonably necessary for the [HathiTrust Digital Library] to make use of the entirety of works in order to enable the full-text search function, we do not believe the copying was excessive.” HathiTrust, 755 F.3d at 98. Likewise, the Google court found that “not only is the copying of the totality of the original reasonably appropriate to Google’s transformative purpose, it is literally necessary to achieve that purpose. If Google copied less than the totality of the originals, its search function could not advise searchers reliably whether the searched term appears in a book (or how many times).” Google, 804 F.3d at 221. See also iParadigms, 562 F.3d at 642 (endorsing the district court’s conclusion that iParadigms’ use of the entirety of original works was limited in purpose and scope as a digitized record for electronic comparison purposes only). In other cases, an AI database might be made up of individual words or inconsequential portions of larger copyrighted works and thus the third factor would be expected to weigh in favor of such uses as well. In general, this factor and the case law interpreting it have well-served innovation in AI.

4. The Effect of the Use on the Market for the Original

The HathiTrust court found that the fourth fair use factor supported a finding of fair use because the ability to search the text of a book to determine whether it includes a search term “does not serve as a substitute for the books that are being searched.” HathiTrust, 755 F.3d at 100. The HathiTrust court rejected the plaintiffs’ suggestion that HathiTrust impaired the emergence of a market for licensing books for digital search: “Lost licensing revenue counts under Factor Four only when the use serves as a substitute for the original and full-text-search does not.” Id. The Google court cited with approval HathiTrust’s conclusion that the search function does not substitute for the books being searched, Google, 804 F.3d at 223, and devoted the rest of its discussion of the fourth factor to snippet view. See also iParadigms, 562 F.3d at 644 (“Clearly no market substitute was created by iParadigms, whose archived student works do
not supplant the plaintiffs’ work in the ‘paper mill’ market so much as merely suppress demand for them, by keeping record of the fact that such works have previously been submitted.”).

The Google court dismissed plaintiffs’ assertion that the search function usurped their market for derivative uses. The court explained that “the copyright that protects Plaintiffs’ works does not include an exclusive derivative right to supply … information [contained in the works] through query of a digitized copy.” Google, 804 F.3d at 225. The court underscored this point: “Nothing in the statutory definition of a derivative work, or of the logic that underlies it, suggests that the author of an original work enjoys an exclusive right to supply information about that work of the sort communicated by Google’s search functions.” Google, 804 F.3d at 226. Given the absence of harm the Copyright Act is intended to prevent, the fourth fair use factor favors uses by AI database providers when those uses cause little or no harm to the legitimate markets of the originals.

5. The Four Factors Weighed Together

At the end of its fair use analysis, the Google court stated that “considering the four fair use factors in light of the goals of copyright, we conclude that Google’s making of a complete digital copy of Plaintiffs’ works for the purpose of providing the public with its search…functions…is a fair use and does not infringe Plaintiff’s copyrights in their books.” Google, 804 F.3d at 225. The reasoning of HathiTrust, Google, and iParadigms compels the conclusion that the uses necessary to make any AI database are fair use. Regardless of the nature of the content, providing AI functionality always has a different purpose and function from the content itself; copying entire works is often necessary to provide accurate operation of AI algorithms and processes; and such copying never substitutes for the original works.

To help prevent this issue from being relitigated in every case involving an AI database, the USPTO’s report should draw a bright line permitting uses related to the creation and operation of an AI database. Such clear guidance not only would conserve judicial resources, it would prevent erroneous decisions. Drawing a bright line permitting the copying necessary to enable and AI process would benefit innovators and the courts.

6. Recognition

The USPTO’s request asks whether authors should be recognized for the use of their works in AI processes. The Copyright Act does not recognize a moral right of attribution outside of 17 U.S.C. § 106A, and there is no reason for a right of attribution to apply in this
circumstance. Further, because the fair use right permits the use of a work in an AI process, there is no need for remuneration. The authors of works ingested in the course of AI processes have no expectation of remuneration, and remuneration would not in any way further the goals of the copyright system.

B. The Digital Millennium Copyright Act

Section 1201(a)(1)(A) of the Digital Millennium Copyright Act (“DMCA”) could interfere with the ingesting of both copyrighted and non-copyrighted material by prohibiting the circumvention of technological protections in order to obtain access to material, even when the subsequent use of the material is non-infringing. A person seeking access for non-infringing uses could apply for an exemption under Section 1201(a)(1)(C), but the exemptions are granted on a triennial cycle, and thus this relief from the DMCA’s restrictions may not be timely.

C. Other Limitations on Ingestion

A website operator has other legal tools for preventing a third party from gathering copyrighted and non-copyrighted material from its website, including the Computer Fraud and Abuse Act (“CFAA”), trespass to chattels, and contracts. These legal tools are not intellectual property protections, and thus appear to fall outside the scope of this inquiry.

4. Are current laws for assigning liability for copyright infringement adequate to address a situation in which an AI process creates a work that infringes a copyrighted work?

Current direct and secondary liability rules are adequate and sufficiently flexible to evaluate and assign liability in cases where programmers or users of AI software engage in acts that result in claims of copyright infringement. Such cases will inevitably be highly fact dependent, turning on the architecture and operation of the AI in question and the specific activities of those who create or use it.

5. Should an entity or entities other than a natural person, or company to which a natural person assigns a copyrighted work, be able to own the copyright on the AI work? For example: Should a company who trains the artificial intelligence process that creates the work be able to be an owner?

Works created autonomously by generative software do not meet the requirements for copyright authorship, except to the extent that a natural person has directly contributed identifiable, non-de minimis expression to them. In such cases, the copyright in the resulting

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11 See, e.g., EF Cultural Travel v. Explorica, 274 F.3d 577 (1st Cir. 2001).
13 See, e.g., Register.com v. Verio, 356 F.3d 393 (2d Cir. 2004).
work should vest as it would in any other copyrightable work containing public domain elements, according to the rules in 17 U.S.C. § 201. The copyright in the software that generated the work should vest as it would in any other copyrightable computer program, according to the rules in 17 U.S.C. § 201. However, the act of training an AI process does not constitute authorship with respect to the output, so ordinarily should not lead to copyright ownership in such output.

6. **Are there other copyright issues that need to be addressed to promote the goals of copyright law in connection with the use of AI?**
   
   Not currently.

7. **Would the use of AI in trademark searching impact the registrability of trademarks? If so, how?**

   The use of AI in trademark searching would improve the efficiency of the trademark registration process, but it would not produce any substantive change requiring a regulatory or legislative response. When evaluating a registration, examiners are required to engage in trademark searching to find conflicting marks. See Trademark Manual of Examining Procedure § 704.01. Advances in search technology, including through the development of AI, would allow examiners to conduct these searches faster and more accurately. This is particularly true with regard to design marks, because visual similarities are difficult to identify using traditional search techniques. However, because human examiners would remain responsible for conducting the searches and reviewing the results, adding AI-based search tools to the examiner’s (or registrant’s) toolbox would not have any substantive effect on the registrability of trademarks.

8. **How, if at all, does AI impact trademark law? Is the existing statutory language in the Lanham Act adequate to address the use of AI in the marketplace?**

   Generally speaking, AI does not impact trademark law. The existing statutory language and judge-made law of the Lanham Act is flexible, and the development of AI does not present any challenge that would require “future-proofing” the current regime. Any concerns about potential negative impacts of AI in the marketplace are highly speculative at this point. Courts should be trusted to consider any future issues (if any in fact arise) and develop the case law as they have done repeatedly with other emerging technologies. If AI-related trademark disputes do arise in the future, there is no reason to believe that courts would not be able to apply the Lanham Act and common law doctrines to impose remedies. The USPTO should therefore
exercise caution and refrain from preemptively attempting to fix a problem that does not currently exist.

9. **How, if at all, does AI impact the need to protect databases and data sets? Are existing laws adequate to protect such data?**

   Current law adequately protects data. Copyright protection can extend to compilations “formed by the collection and assembling of preexisting materials or data that are selected, coordinated, or arranged in such a way that the resulting work as a whole constitutes an original work of authorship.” 17 U.S.C. § 101. The copyright in the compilation does not extend to “the preexisting material employed in the work.” 17 U.S.C. § 103(b). The Supreme Court in *Feist v. Rural Telephone* clarified that the copyright in the compilation did not confer copyright in the facts contained in the compilation.

   Congress considered, and rejected, adoption of a *sui generis* form of protection for nonoriginal databases modeled on the EU Database Directive. There is no reason to renew that contentious debate. There are numerous legal tools for protecting elements of databases not within the scope of copyright. If the database compiler keeps the database secret, the compiler can rely on the Defend Trade Secrets Act, 18 U.S.C. § 1836 et seq., as well as state trade secret law. If the compiler places the database on a password-protected website, the compiler can rely on the CFAA as well as the DMCA (to the extent that any element of the database is subject to copyright protection). If the database is on a website that is not password-protected, the compiler can still rely on state causes of action such as trespass to chattels and breach of contract.

10. **How, if at all, does AI impact trade secret law? Is the Defend Trade Secrets Act (DTSA), 18 U.S.C. 1836 et seq., adequate to address the use of AI in the marketplace?**

   The developer of an AI algorithm could maintain it as a trade secret. The algorithm typically could be used commercially without losing its secrecy. The existing framework of trade secrecy laws, consisting of the federal Defend Trade Secrets Act, the Economic Espionage Act, and state trade secret law, is adequate to address the use of AI in the marketplace.

11. **Do any laws, policies, or practices need to change in order to ensure an appropriate balance between maintaining trade secrets on the one hand and obtaining patents, copyrights, or other forms of intellectual property protection related to AI on the other?**

   No changes to laws, policies, or practices are needed in order to maintain the balance between these different forms of protection. AI does not present unique challenges to the IP
system.\textsuperscript{14} For example, there is a trade-off between trade secret protection and patent protection in all fields of technology because of patent law’s disclosure requirement. There is no reason for this trade-off to be any different in the case of AI. Inventors must decide which approach best meets their business objectives.

At the same time, as noted in response to Question 3, we believe that any report USPTO prepares as a result of this inquiry should state clearly that the ingestion of copyrighted works in the course of an AI process is a fair use. A clear articulation that existing case law involving nonexpressive, transformative uses of copyrighted works applies in the context of AI processes will provide useful guidance to AI developers and courts.

\textbf{12. Are there any other AI-related issues pertinent to intellectual property rights (other than those related to patent rights) that the USPTO should examine?}

Not at this time.

\textbf{13. Are there any relevant policies or practices from intellectual property agencies or legal systems in other countries that may help inform USPTO’s policies and practices regarding intellectual property rights (other than those related to patent rights)?}

Not at this time.

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\textsuperscript{14} CCIA’s response to USPTO’s request for comments on patents and AI inventions concluded: “CCIA believes that existing law is generally capable of addressing issues related to artificial intelligence. Within that existing law, useful guidance could be provided regarding disclosure and enablement requirements, as well as setting forth a rule that inventions created by an AI are \textit{per se} obvious. This guidance and existing law are sufficient to ensure continued U.S. leadership in artificial intelligence.”