

1. What are elements of an AI invention? For example: If a person conceives of a training program for an AI, has that person invented the trained AI? If a person instructs an AI to solve a particular problem; has that person invented the solution (once it is solved by the AI)?

This question is tough to classify as AI is such a large topic. Breaking it down into constructs may help. I have attached a diagram of aspects of AI. When we discuss training we are talking about Machine Learning, a subset of AI. With regard to the hypothetical posed I reason that, akin to cDNA in Myriad, the existence of the final algorithm would not exist but for the data scientist (inventor) training the algorithm and adjusting the hyperparameters to return a result. The word algorithm has been a very scary word in front of examiners over the last decade, but in this sense we can think of it as a method of process. The inventor would most often have to identify a data set, manually adjust the data set by removing low correlated features through something like a Pearson's correlation. Then removing and adjusting any null parameters or filling any omissions with averages or likewise. Then with the processed and explored data set in hand they would undergo research of hyperparameters and selecting a learner that would work best—this is often a trial and error process over a long period of time. The hyperparameter tuning and adjustment such as ensemble learning are also additional processes.

The dialog and process above indicates an enormous amount of inventor involvement in Machine Learning's current state. This is not to say that some solutions can scale. However, the returning equation or solution for solving a long sought problem is not what can be ultimately captured... it is the method leading to the capture. Just like Mayo, you cannot capture DNA itself, but the method of inserting the DNA at a specific loci and the process for determining that loci is a human derived solution to a longstanding problem.

2. What are the different ways that a natural person can contribute to conception of an AI invention and be eligible to be a named inventor? For example: Designing the algorithm and/or weighting adaptations; structuring the data on which the algorithm runs; running the AI algorithm on the data and obtaining the results.

For a human to be an inventor I would return to 35 U.S.C. § 101 and approach it from a Scalia perspective. Focus on the word process and new and useful improvement of a process. We should take a liberal view on AI inventions as 102 and 103 should suffice in curtailing overly broad applications. All the examples provided above are patentable. The use of 101 should be reserved for any purely mathematical equation applications. My emphasis on the end result of a trained AI agent being that the end result itself is ripe for 101—however, reaching that end result, the process and methods involved are left for 102 and 103. This presents the implication on how does one enforce and protect their discovery if someone can simply utilize the trained function as it is not patentable. However, for the end function to be useful you would need to feed it the precise prepared data, pruned, explored, and adjusted, for the function to work as intended. The process of selecting the data, the steps of manipulating the data to produce a data set that a machine can interact with, and the process of applying and selecting hyperparameters would be capturable. This is of course a narrow patent, as I believe most AI patents will be quite narrow in regard as it will have to specify the precise parameters in the steps. This of course lessens the land share grab, but further provides for a more resilient and challengeable patent.

3. Do current patent laws and regulations regarding inventorship need to be revised to take into account inventions where an entity or entities other than a natural person contributed to the conception of an invention?

It has long been established that a human can only be an inventor. We can look to other areas of IP law such as copyright for guidance. The case of the chimpanzee taking a photo comes to mind. There the Court found that an animal cannot establish IP rights. Similarly, a machine cannot establish patent rights.

4. Should an entity or entities other than a natural person, or company to which a natural person assigns an invention, be able to own a patent on the AI invention?

See above.

5. Are there any patent eligibility considerations unique to AI inventions?

Yes, as many AI related inventions are going to fall squarely into a human doing what some would consider routine tasks of trial and error to discover a set of steps and methods that make a function work properly the issue of 101 will be squarely in the purview. I strongly disagree with this logic and see 101 as the greatest tragedy to our patent system. Sections 102 and 103 ought to be enough to ensure only novel, unique, and nonobvious patents make it through the UPSTO. Section 101 should be reserved for the extreme case when the inventor attempts to claim a pure mathematical formulae. If that mathematical formulae is to interact with machines, data, and adjusted, weighted, averaged, manipulated, and inserted into human derived computer readable syntax to produce a benefit for a specific set of data for a specific problem then we are out of the purview of 101.

6. Are there any disclosure-related considerations unique to AI inventions? For example, under current practice, written description support for computer-implemented inventions generally require sufficient disclosure of an *algorithm to perform a claimed function*, such that a person of ordinary skill in the art can reasonably conclude that the inventor had possession of the claimed invention. Does there need to be a change in the level of detail an applicant must provide in order to comply with the written description requirement, particularly for deep-learning systems that may have a large number of hidden layers with weights that evolve during the learning/training process without human intervention or knowledge?

Disclosure would remain the same and the inventor would have to disclose the embodiments of data, the processing techniques, and the algorithm, along with hyperparameter tuning and adjustments.

7. How can patent applications for AI inventions best comply with the enablement requirement, particularly given the degree of unpredictability of certain AI systems?

The unpredictability is with the end result—which cannot be claimed. What can be claimed are the known steps, methods, data sets, problem to be solved, and the like to reach the trained algorithm. Many algorithms operate as a black box as for instance with a multi-layer classifier with “hidden layers” sometimes numbering quite high. However, these are weighted averages and interact by adjusting for one another. The math of the interaction and process would be difficult to claim and I

would think borders on 101, however, the steps of inputs, the ensemble of learners, and the output applied to a specific problem would support a novel set of claims.

8. Does AI impact the level of a person of ordinary skill in the art? If so, how? For example: Should assessment of the level of ordinary skill in the art reflect the capability possessed by AI?

No.

9. Are there any prior art considerations unique to AI inventions?

Yes, precision in claim language and narrowly tailored will be a challenge for inventors and the USPTO. For instance on a k-NN regression learner a claim of k ranging from 5-5000 on a topic of identifying star clusters would be something that requires investigation by the examiner. The hyperparameter tuning should be of specific focus in the claims and in the examination.

10. Are there any new forms of intellectual property protections that are needed for AI inventions, such as data protection?

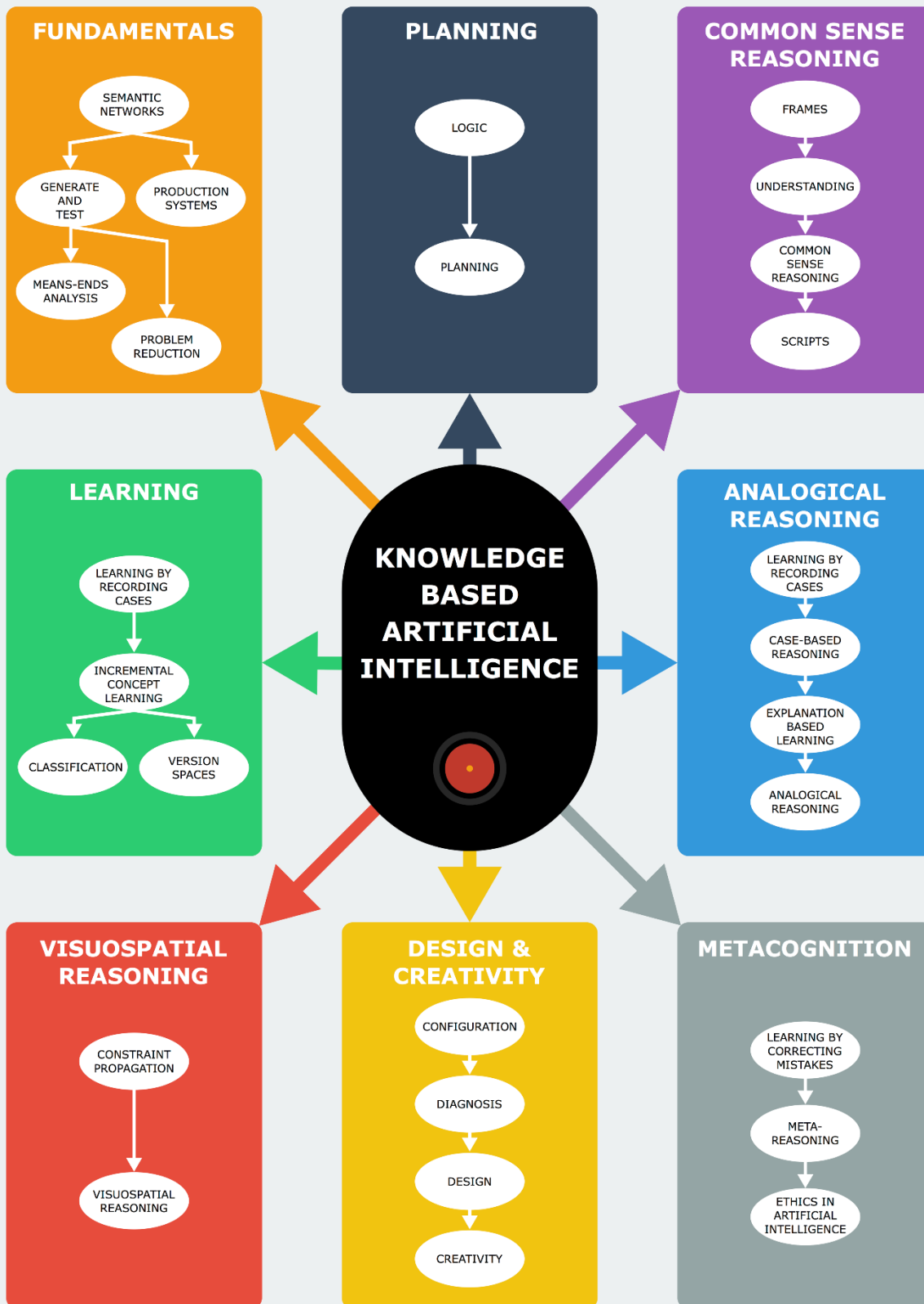
Personally identifiable data presents new issues. Issues under GDPR and CCPA are presenting tremendous issues for data scientists and the end result is unclear. I anticipate that successful deidentification of data and an accepted practice of such will show some promise.

11. Are there any other issues pertinent to patenting AI inventions that we should examine?

I would recommend investing resources in hiring attorneys versed in data science with computer science backgrounds to form a think tank as the office continues to receive AI patents. A case by case analysis and approach watching the examinations would assist in setting standards and clarity for both examiners and inventors.

12. Are there any relevant policies or practices from other major patent agencies that may help inform USPTO's policies and practices regarding patenting of AI inventions?

Some reports out of WIPO but generally not as nuanced as to be helpful.



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