

 PatentMind Netherlands	Maastricht University
© Yannis Skoulikaris, PatentMind Holding	<p>Jean Monnet module "IP in the Digital Single Market"</p> <h2>Current efforts to shape Artificial Intelligence IP policy with an emphasis on European law and practice</h2> <p>Jean Monnet specialized lecture, Yannis Skoulikaris, December 3, 2020</p>

1

 PatentMind Netherlands	<p>An example to demonstrate the topical issues:</p> <p>Consider an AI system that recognizes the mother tongue of a non-native English speaker</p>
Current efforts to shape Artificial Intelligence IP policy with an emphasis on European law and practice  © Yannis Skoulikaris, PatentMind Holding	<p>The AI system is trained with speech examples of non-native English speakers of different mother tongues</p> <p>After the success rate in recognizing the mother tongue of further examples (not used during training) reaches a predefined threshold, the system becomes operational and a European patent application is filed</p> <p>Should that be a patentable invention according to the EPC?</p> <p>What will the examiner ask the applicant during prosecution of this application?</p> <p>After a certain period of operation, applicant realizes that the system has developed an unpredicted clustering functionality, creating clusters of non-native speakers according to the origin of their English teachers. Two discernible clusters are created, one for British-English teachers, another for American-English teachers</p> <p>Applicant files a further European patent application, naming the AI system as inventor, arguing that it would be incorrect to name a human inventor, as no human involved had predicted such clustering functionality</p> <p>Should the EPO recognize an AI system as inventor?</p>

2



## agenda

- what is Artificial Intelligence (AI), what is so special about it ?
- which stakeholders are currently active in shaping AI policy? What are their interests and priorities?
- which policy shapers have AI Intellectual Property (IP) on their agenda? What are the issues under discussion?
- what do WIPO and the major patent offices say regarding these issues?
- focus on Europe: are the innovative AI elements patentable in the first place?
- how to decide on the EPC patenting requirements?
- the European approach in AI technology patenting

© Yannis Skoulikaris,  
PatentMind Holding

3



## definition, ingredients, state of affairs

what is AI, what is so special about it ?

- no dogmatic definition (however, there are definitions around...)
  - [English Oxford Living Dictionary](#): “The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.”
  - but, in order to grasp what is artificial intelligence, it helps to consider what is human intelligence
- better approach: what are the catalysts and ingredients of AI
  - big data, powerful computers and sophisticated algorithms
  - inductive vs deductive reasoning
  - training vs programming
- the interplay between the data collection and the programmer’s mind
- are we already there?
  - from Turing test via Chinese Room argument toward humanoid test

© Yannis Skoulikaris,  
PatentMind Holding

4



which stakeholders are currently active in shaping AI policy? What are their interests and priorities?

© Yannis Skoulikaris, PatentMind Holding

- developers vs implementers vs policy shapers
- ongoing normative process
- specialized industry, academia
  - Partnership on AI
- potential users: everyone
- issues: accountability, technology gap,
- general AI policy
  - EU, OECD, UNESCO, private institutions

5



which policy shapers have AI IP on their agenda? What are the issues under discussion?

© Yannis Skoulikaris, PatentMind Holding

AI IP policy

- governments, patent offices, WIPO<sup>1</sup>, ICC<sup>2</sup>
- professional IP organizations<sup>3</sup>, IP rights holders
- EU Commission<sup>4</sup>, European Parliament<sup>5</sup>
- governmental bodies<sup>6</sup>
- UNESCO<sup>7</sup>, OECD<sup>8</sup>

issues

- ethics, bias, accountability, tech gap
- inventorship
- patentability, technical effect, inventive step, skilled person, clarity, disclosure, extent of protection, infringement
- data ownership and protection, using copyrighted data for machine learning

6

		ethics, bias	accountability	inventorship	patentability	data ownership, protection
what do WIPO, major patent offices and other stakeholders say regarding these issues?  © Yannis Skoulikaris, PatentMind Holding	WIPO	revised issues paper	revised issues paper	revised issues paper	revised issues paper	revised issues paper
	EPO	–	–	human inventor only	as algorithms and computer programs	no protection for data
	USPTO	document on Public Views published	document on Public Views published	human inventor only	eligibility guidelines	eligibility guidelines
	UKIPO	call for views	call for views	human inventor only	call for views	call for views
	EU (COMM, EP)	COMM: Ethics Guidelines for Trustworthy AI	COMM: Ethics Guidelines for Trustworthy AI	EP: Report on IP rights for the Development of AI	EP: Report on IP rights for the Development of AI	EP: Report on IP rights for the Development of AI
	OECD	work group on trustworthy AI	work group on trustworthy AI	–	–	–
	UNESCO	recommendation on AI ethics	recommendation on AI ethics	–	–	–

7

		what does the European Patent Convention (EPC) say?
focus on Europe: are the innovative AI elements patentable in the first place?  © Yannis Skoulikaris, PatentMind Holding	Article 52	Patentable inventions
		(1) European patents shall be granted for any inventions, <b>in all fields of technology</b> , provided that they are new, involve an inventive step and are susceptible of industrial application.  (2) The following in particular <b>shall not be regarded as inventions</b> within the meaning of paragraph 1: (a) discoveries, scientific theories and <b>mathematical methods</b> ; (b) aesthetic creations; (c) <b>schemes, rules and methods for performing mental acts</b> , playing games or doing business, and <b>programs for computers</b> ; (d) <b>presentations of information</b> .  (3) Paragraph 2 shall exclude the patentability of the subject-matter or activities referred to therein only to the extent to which a European patent application or European patent relates to such subject-matter or activities <b>as such</b> .

8

 PatentMind Netherlands	what does the European Patent Convention (EPC) say?
focus on Europe: are the innovative AI elements patentable in the first place?  © Yannis Skoulikaris, PatentMind Holding	Rule 42 (part)  Content of the description  (1) The description shall: (a) specify <b>the technical field</b> to which the invention relates;  (b) indicate the background art which, as far as is known to the applicant, can be regarded as useful to understand the invention, draw up the European search report and examine the European patent application, and, preferably, cite the documents reflecting such art;  (c) disclose the invention, as claimed, in such terms that <b>the technical problem</b> , even if not expressly stated as such, and its solution can be understood, and state any advantageous effects of the invention with reference to the background art;

9

 PatentMind Netherlands	what does the European Patent Convention (EPC) say?
focus on Europe: are the innovative AI elements patentable in the first place?  © Yannis Skoulikaris, PatentMind Holding	Rule 43 (part)  Form and content of claims  (1) The claims shall define the matter for which protection is sought in terms of <b>the technical features</b> of the invention. Wherever appropriate, claims shall contain:  (a) a statement indicating the designation of the subject-matter of the invention and <b>those technical features</b> which are necessary for the definition of the claimed subject-matter but which, in combination, form part of the prior art;  (b) a characterising portion, beginning with the expression "characterised in that" or "characterised by" and specifying <b>the technical features</b> for which, in combination with the features stated under sub-paragraph (a), protection is sought.

10



what is so special about patenting **AI** technology?

focus on Europe: are the innovative AI elements patentable in the first place?

- European patent law → **data, mathematics, algorithms, mental acts, as such, are not patentable**
- AI “ingredients” → machine learning (simulating cognitive activity) using
  - **big amount of data**
  - **sophisticated algorithms**
  - **mental learning concepts**
  - immense computing power
  - fundamental change of computing paradigm (from deductive inference to inductive inference, i.e. from programming to learning)
- apparent **tension** between European patent law ↔ AI
- EPO patent examiner → AI is essentially algorithms and software, so **basic question → is a technical problem solved using technical features?**

© Yannis Skoulikaris, PatentMind Holding

11



how to decide on the EPC patenting requirements?

- innovative AI elements: sophisticated algorithms implemented in software, training using big data
- Europe → software invention is patent-eligible, provided the invention solves a **technical problem using technical features**
- Europe → **any invention, implemented in software, solving a technical problem is, in principle, patent-eligible. However, a patent protects the functionality, not the code**
- US, Asia patent laws → special provisions

© Yannis Skoulikaris, PatentMind Holding

12

	<h2>What do the EPC Guidelines say on AI?</h2>
<p>how to decide on the EPC patenting requirements?</p> <p>© Yannis Skoulikaris, PatentMind Holding</p>	<p>G II - 3.3.1 (version November 2019)</p> <p><b>Artificial intelligence and machine learning</b></p> <p>Artificial intelligence and machine learning are based on computational models and algorithms for classification, clustering, regression and dimensionality reduction, such as neural networks, genetic algorithms, support vector machines, k-means, kernel regression and discriminant analysis. <b>Such computational models and algorithms are <i>per se</i> of an abstract mathematical nature, irrespective of whether they can be "trained" based on training data.</b> Hence, the guidance provided in <a href="#">G-II, 3.3</a> generally applies also to such computational models and algorithms.</p> <p>Terms such as "support vector machine", "reasoning engine" or "neural network" may, depending on the context, merely refer to abstract models or algorithms and thus do not, on their own, necessarily imply the use of a technical means. This has to be taken into account when examining whether the claimed subject-matter has a technical character as a whole (<a href="#">Art. 52(1), (2) and (3)</a>).</p> <p><b>Artificial intelligence and machine learning find applications in various fields of technology.</b> For example, the use of a neural network in a heart-monitoring apparatus for the purpose of identifying irregular heartbeats makes a technical contribution. The classification of digital images, videos, audio or speech signals based on low-level features (e.g. edges or pixel attributes for images) are further typical technical applications of classification algorithms. Classifying text documents solely in respect of their textual content is however not regarded to be <i>per se</i> a technical purpose but a linguistic one (<a href="#">T 1358/09</a>). Classifying abstract data records or even "telecommunication network data records" without any indication of a technical use being made of the resulting classification is also not <i>per se</i> a technical purpose, even if the classification algorithm may be considered to have valuable mathematical properties such as robustness (<a href="#">T 1784/06</a>).</p> <p>Where a classification method <b>serves a technical purpose</b>, the steps of generating the training set and training the classifier may also contribute to the technical character of the invention if they support achieving that technical purpose.</p>

13

	<h2>What do the EPC Guidelines say on AI? (cont.)</h2>
<p>how to decide on the EPC patenting requirements?</p> <p>© Yannis Skoulikaris, PatentMind Holding</p>	<p>G II - 3.3 Mathematical methods (version November 2019)</p> <p>A mathematical method may contribute to the technical character of an invention, i.e. contribute to producing a technical effect that serves a technical purpose, <b>by its application to a field of technology and/or by being adapted to a specific technical implementation.</b></p> <p>The technical purpose must be a specific one.</p> <p>Whether a technical purpose is served by the mathematical method is primarily determined by the direct technical relevance of the results it provides.</p> <p>A mathematical method may also contribute to the technical character of the invention independently of any technical application when the claim is directed to a specific technical implementation of the mathematical method and the mathematical method is particularly adapted for that implementation in that its design is motivated by technical considerations of the internal functioning of the computer.</p>

14

	<h2>what will the EPO examiner ask/require?</h2>
<p>how to decide on the EPC patenting requirements?</p> <p>© Yannis Skoulikaris, PatentMind Holding</p>	<ul style="list-style-type: none"> <li>• is a <b>technical problem solved</b>? If so, what exactly is the technical problem?</li> <li>• how to show that this is <b>not a pure mathematical, business, cognitive, administrative and the like problem</b>?</li> <li>• which features in the claim contribute to solving the technical problem?</li> <li>• are all features contributing to solving the technical problem in the claim?</li> <li>• applicant <b>cannot rely</b> on features that do not contribute toward solving a technical problem in order to demonstrate inventive step</li> </ul>

15

	<h2>An example to demonstrate the European approach:</h2>
<p>the European approach on AI technology patenting</p> <p>© Yannis Skoulikaris, PatentMind Holding</p>	<p>Consider an AI system that recognizes the mother tongue of a non-native English speaker</p> <p>The AI system is trained with speech examples of non-native English speakers of different mother tongues</p> <p>After the success rate in recognizing the mother tongue of further examples (not used during training) reaches a predefined threshold, the system becomes operational and a European patent application is filed</p> <p>Is this a patentable invention according to the EPC?</p> <p>What will the examiner ask the applicant during prosecution of this application?</p> <p>After a certain period of operation, applicant realizes that the system has developed an unpredicted clustering functionality, creating clusters of non-native speakers according to the origin of their English teachers. Two discernible clusters are created, one for British-English teachers, another for American-English teachers</p> <p>Applicant files a further European patent application, naming the AI system as inventor, arguing that it would be incorrect to name a human inventor, as no human involved had predicted such clustering functionality</p> <p>How will the EPO react?</p>

16



the European approach on AI technology patenting

© Yannis Skoulikaris, PatentMind Holding

## the European approach on AI technology patenting

- treat AI technology claims exactly the same way as treating math algorithms and computer programs
- issues dealt with:
  - technical effect (in some cases)
  - inventorship (EP 18 275 174, oral proceedings<sup>9</sup>)
  - disclosure (T 0161/18 dated 20 May 2020<sup>10</sup>)
- issues that will probably arise:
  - technical effect (in further cases)
  - disclosure, reproducibility
  - simulation of cognitive processes (watch G1/19)
  - data claims (parallel to 3D printing)
  - use of copyrighted or otherwise restricted data for training

17



UKIPO call for views on AI technology patenting

© Yannis Skoulikaris, PatentMind Holding

## UKIPO call for views on AI technology patenting – Questions<sup>11</sup>

1. What role can/does the patent system play in encouraging the development and use of AI technologies?
2. Can current AI systems devise inventions?  
Particularly:
  - a) to what extent is AI a tool for human inventors to use?
  - b) could the AI developer, the user of the AI, or the person who constructs the datasets on which AI is trained, claim inventorship?
  - c) are there situations when a human inventor cannot be identified?
3. Should patent law allow AI to be identified as the sole or joint inventor?
4. If AI cannot be credited as inventor, will this discourage future inventions being protected by patents? Would this impact on innovation developed using AI? Would there be an impact if inventions were kept confidential rather than made public through the patent system?
5. Is there a moral case for recognising AI as an inventor in a patent?
6. If AI was named as sole or joint inventor of a patented invention, who or what should be entitled to own the patent?
7. Does current law or practice cause problems for the grant of patents for AI inventions in the UK?
8. Could there be patentability issues in the future as AI technology develops?

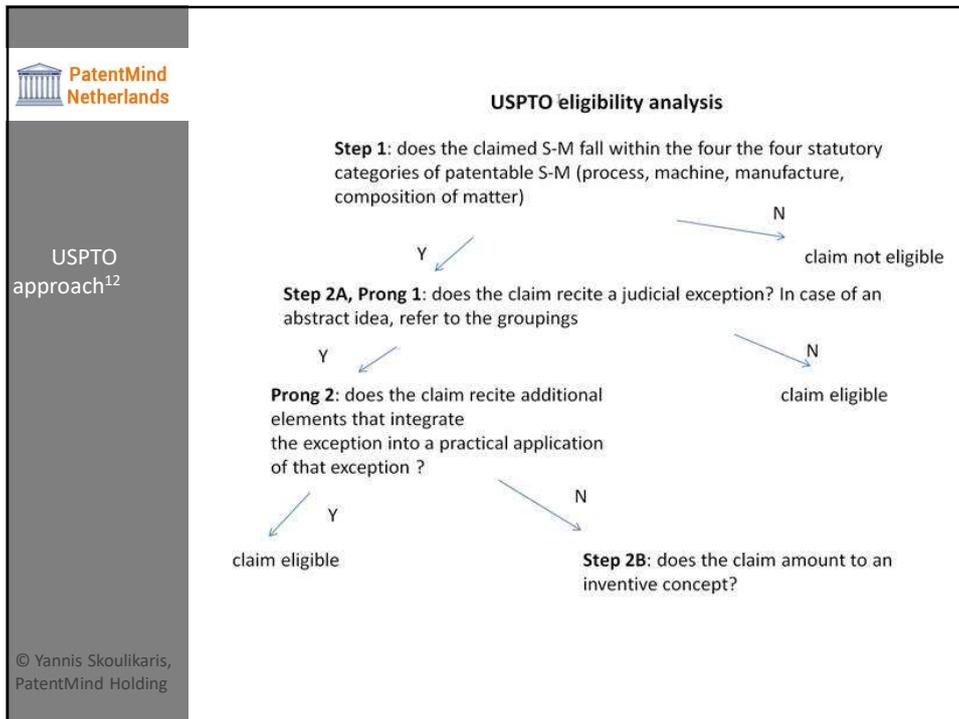
18

 <p>PatentMind Netherlands</p>	<p>9. How difficult is it to secure patent protection for AI inventions because of the list of excluded categories in UK law? Where should the line be drawn here to best stimulate AI innovation?</p>
<p>UKIPO call for views on AI technology patenting (cont.)</p> <p>© Yannis Skoulikaris, PatentMind Holding</p>	<p>10. Do restrictions on the availability of patent rights cause problems for ethical oversight of AI inventions?</p> <p>11. Does the requirement for a patent to provide enough detail to allow a skilled person to perform an invention pose problems for AI inventions? In answering this question, you may wish to consider:</p> <ul style="list-style-type: none"> <li>is it clear how much information would be sufficient for a skilled person to be able to work the invention?</li> <li>could there be uncertainty knowing when an AI could be obtained by a skilled person to achieve the specific purpose of a patent claim and when an AI would need to be specified in a patent application?</li> <li>what are the consequences if the details of AI algorithms need to be disclosed?</li> <li>if AI is making decisions in a black box:             <ul style="list-style-type: none"> <li>- Could there be a need to disclose more than a basic trained AI model, for example training data or the coefficient or weight of the model? If yes, is it clear how much information would be sufficient for a skilled person to be able to work the invention? Are special provisions needed for this information to be filed and stored?</li> <li>- What would be the effect if competitors could use data to quickly train a different AI model?</li> </ul> </li> </ul>

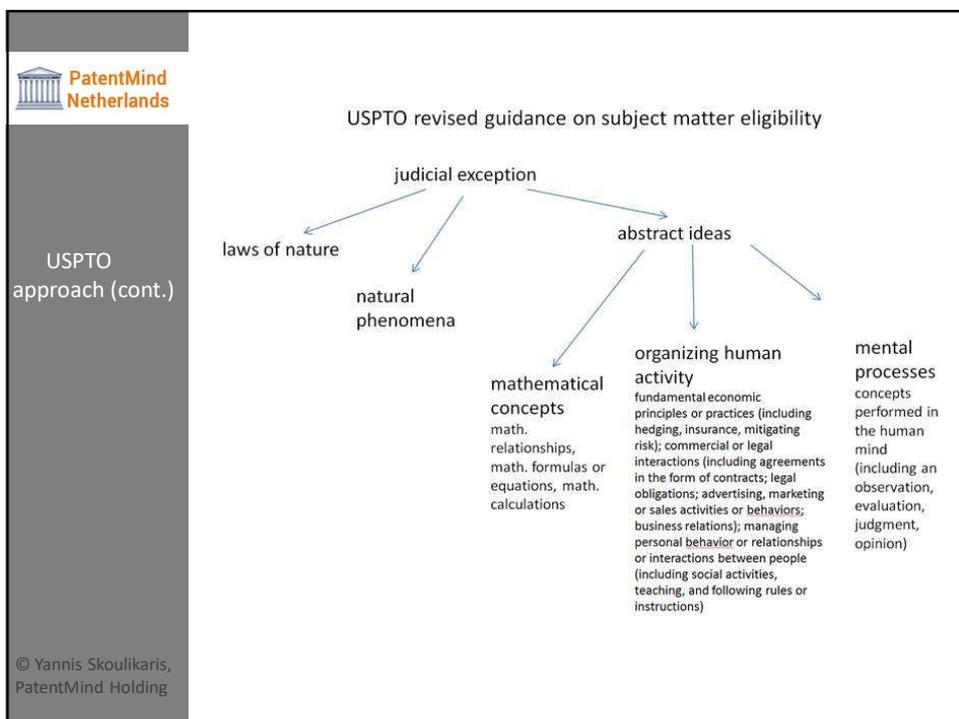
19

 <p>PatentMind Netherlands</p>	<p>- How would the skilled person know whether the invention could be repeated across the breadth of the patent claims or whether a claimed result could be achieved?</p>
<p>UKIPO call for views on AI technology patenting (cont.)</p> <p>© Yannis Skoulikaris, PatentMind Holding</p>	<p>12. In the future could there be reasons for the law to provide sufficient detail of an AI invention for societal reasons that go beyond the current purposes of patent law?</p> <p>13. Does or will AI challenge the level of inventive step required to obtain a patent? If yes, can this challenge be accommodated by current patent law?</p> <p>14. Should we extend the concept of “the person skilled in the art” to “the machine trained in the art”?</p> <p>15. Who is liable when AI infringes a patent, particularly when this action could not have been predicted by a human?</p> <p>16. Could there be problems proving patent infringement by AI? If yes, can you estimate the size and the impacts of the problem?</p>

20



21



22



© Yannis Skoulikaris,  
PatentMind Holding

## Sources

- 1 [https://www.wipo.int/about-ip/en/artificial\\_intelligence/conversation.html](https://www.wipo.int/about-ip/en/artificial_intelligence/conversation.html)
- 2 <https://iccwbo.org/global-issues-trends/innovation-ip/intellectual-property/>
- 3 <https://aippi.org/read-the-full-text-of-the-resolutions-passed-at-the-2020-aippi-world-congress-online/>
- 4 <https://ec.europa.eu/digital-single-market/en/news/trends-and-developments-artificial-intelligence-challenges-intellectual-property-rights-0>
- 5 <https://www.europarl.europa.eu/news/en/press-room/20201016IPR89544/parliament-leads-the-way-on-first-set-of-eu-rules-for-artificial-intelligence>
- 6 [https://www.plattform-i40.de/PI40/Redaktion/DE/Downloads/Publikation/Kuenstliche-Intelligenz-und-Recht.pdf?\\_\\_blob=publicationFile&v=6](https://www.plattform-i40.de/PI40/Redaktion/DE/Downloads/Publikation/Kuenstliche-Intelligenz-und-Recht.pdf?__blob=publicationFile&v=6)
- 7 <https://en.unesco.org/artificial-intelligence>
- 8 <https://www.oecd.org/going-digital/ai/>
- 9 <https://www.epo.org/news-events/news/2020/20200128.html>
- 10 <https://www.epo.org/law-practice/case-law-appeals/recent/t180161du1.html>
- 11 <https://www.gov.uk/government/consultations/artificial-intelligence-and-intellectual-property-call-for-views>
- 12 <https://www.uspto.gov/initiatives/artificial-intelligence>

23



© Yannis Skoulikaris,  
PatentMind Holding

## Questions, Comments, Suggestions

Yannis Skoulikaris  
[info@patentmindnetherlands.com](mailto:info@patentmindnetherlands.com)  
<https://patentmindnetherlands.com>

24