

Artificial Intelligence: Patentability and Inventorship in Europe

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Two topics for today:

- **EPO approach when assessing patentability of AI**
 - principles established for other computer-implemented inventions and mathematical methods still apply
 - principles distilled from EPO case law for AI inventions
- **EPO assessment of applications that identify an AI system as inventor**
 - not possible under current law

What is AI (system)?

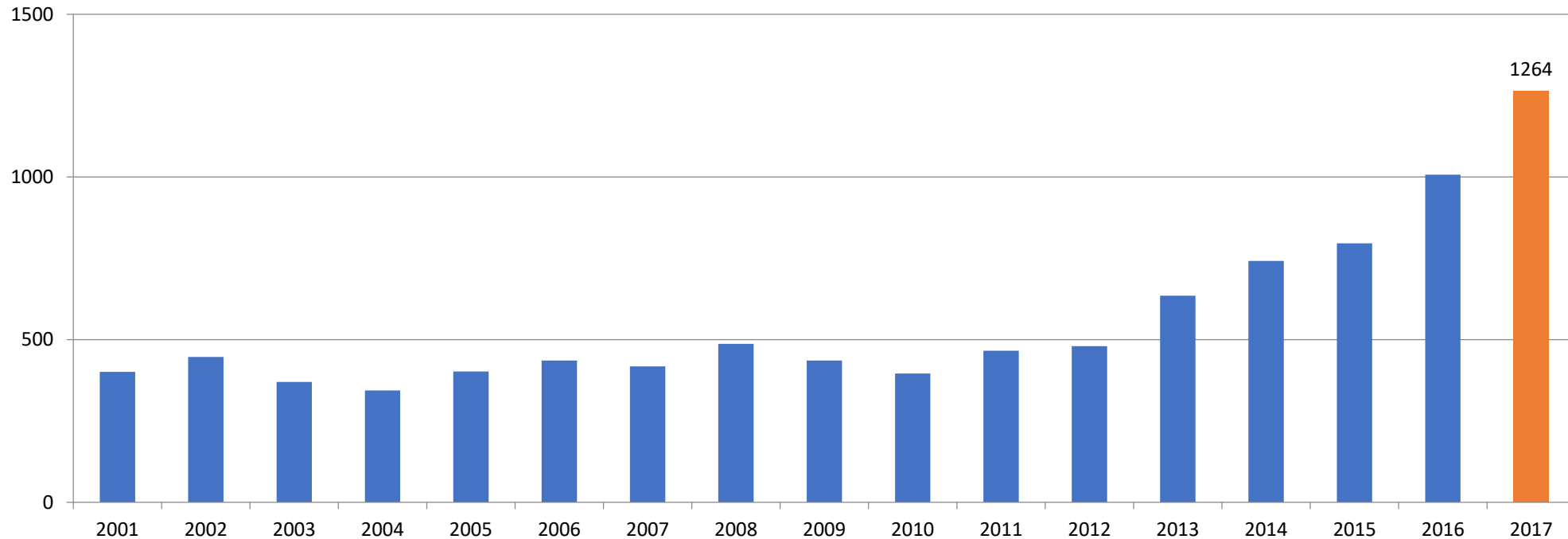
Definition: AI systems are **software systems** (and possibly also hardware) [...] that, act in the physical or digital dimension by **perceiving their environment** through **data acquisition**, **interpreting** the collected [...] data, **reasoning** on the knowledge, **or processing** the information, derived from this data and **deciding** the best action(s) to take to achieve a given goal. AI systems can [...] also **adapt their behaviour** by analysing how the environment is affected by their previous actions.

Definition adopted from “A definition of AI: Main capabilities and scientific disciplines”, High-level expert group on Artificial Intelligence set up by the European Commission, see <https://ec.europa.eu/digital-single-market/en/news/definition-artificial-intelligence-main-capabilities-and-scientific-disciplines>

EPO active in discussions on patent law-related aspects of AI

- [Discussions](#) with the Contracting States
- [Studies](#) with IP5 and an IP5 [task force](#) under the lead of the EPO
- [Academic study](#) on inventorship
- [Conferences](#) and workshops with users
- Regular update of the Guidelines for Examination
- Open communication on the relevant cases

Patent applications on AI (techniques) at the EPO



Source: EPO. The number of European patent applications in AI technologies corresponds to EP/WO families in the CPC class G06N7, G06N5, G06N99 /005 and G06N3, corresponding to core AI. In addition, a set of class symbols related to AI was compiled also, based on the description of the classification symbol. The results are presented by oldest filing date

Patentability of AI- related inventions at the EPO

Types of applications

- Implementation of AI
- Implementation by AI
- Invention by AI

Patentability issues

- Patentable subject-matter
 - As a rule “computer implemented invention”
- Sufficient disclosure
- Clarity of terminology
- Person skilled in the art
- Inventorship

EPO Guidelines on patenting AI

The screenshot shows the EPO website's navigation bar with the logo, search bar, and menu items like Home, Searching for patents, Applying for a patent, Law & practice, News & issues, Learning & events, and About us. The breadcrumb trail is Home > Law & practice > Legal texts > Guidelines for Examination.

General Part

- Part A – Guidelines for Formalities Examination
- Part B – Guidelines for Search
- Part C – Guidelines for Procedural Aspects of Substantive Examination
- Part D – Guidelines for Opposition and Limitation/Revocation Procedures
- Part E – Guidelines on General Procedural Matters
- Part F – The European Patent Application
- Part G – Patentability**
- Part H – Amendments and Corrections
- Index for Computer-Implemented Inventions

Guidelines for Examination

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3.3.1 Artificial intelligence and machine learning

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. Such computational models and algorithms are per se of an abstract mathematical nature, irrespective of whether they can be “trained” based on training data. Hence, the guidance provided in [G-II, 3.2](#) generally applies also to such computational models and algorithms.

EPO practice on computer-implemented inventions has been stable and predictable since G3/08 in 2010, when the EPO Enlarged Board of Appeal told us the principles to apply and the cases to follow.

2 'hurdles' to jump for patentability:

- ❑ **Technical character – this is a low hurdle, despite exclusions**
- ❑ **Inventive step – must be provided by technical features**

EPO's usual CII practice applies to AI/ML

AI “mixed-type inventions” and the two-hurdle approach

1st hurdle

Art. 52 (2) and
(3) EPC

- The claimed subject-matter must have a technical character
- But claims may contain a mix of technical and non-technical features

2nd hurdle

Art. 54, 56 EPC

- All features contributing to the technical character taken into account for assessment of inventive step
- ? Do(es) the mathematical method (steps) contribute to the technical character of the Invention ?
- Guidelines for examination G-VII, 5.4 “Problem and Solution Approach for claims comprising technical and non-technical features”

Patentability
of
AI and ML

EPO Guidelines G-II, 3.3.1 – AI & machine learning

- “Artificial intelligence and machine learning find applications in various fields of technology. 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.”

**We need a technical purpose or a solution to a technical implementation problem. Good mathematical efficiency is not enough.
What purpose the algorithm serves is important**

EPO appeal T0598/07 – example assessment of first ‘hurdle’

Relates to use of a neural network in heart monitoring apparatus for identifying irregular heartbeats. Claim recites:

- Heart monitoring apparatus comprising:
- *input means for receiving* an electrocardiograph signal from a patient in a monitoring phase;
- *preprocessing means*..
- *storage means*...
- *Kohonen neural network means*...
- [...further features defining neural network characteristics/function]

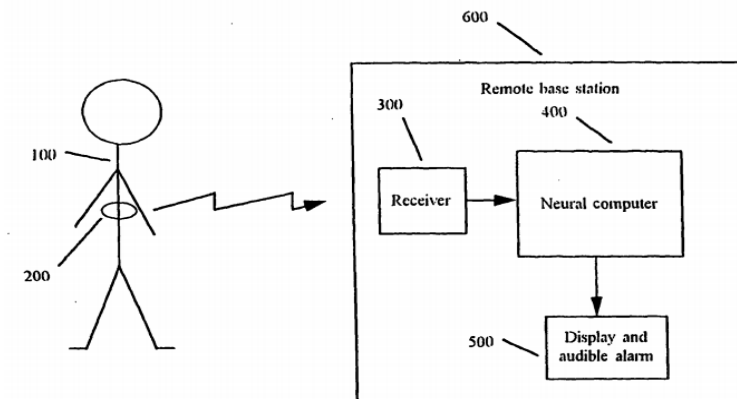


Fig 2

EPO appeal T0598/07 – assessment of second ‘hurdle’ for same claim: What does invention do? How does it work?

Heart monitoring apparatus/method

....receiving an electrocardiograph signal from a patient during a monitoring phase

...suppress noise and analyse the shape of each pulse of said electrocardiograph signal

...storing reference vectors for the identification of distinctive irregular heartbeats and reference vectors for monitoring regular heartbeats (comprising values representative of the shape of an irregular heartbeat or a regular heartbeat respectively)

...during the monitoring phase, ... [specific steps] to determine if said n dimensional vector lies within or outside said irregular heartbeat n dimensional volume to identify distinctive irregular heartbeats...”

EPO Guidelines G-II, 3.3 – Mathematical methods

Begins with: “*Mathematical methods play an important role in the solution of technical problems in all fields of technology.*”

Two ways to qualify:

“*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**,*

- *by its application to a field of technology and/or*
- *by being adapted to a specific technical implementation.”*

EPO Guidelines G-II, 3.3 – Mathematical methods

1. Specific Technical applications

- “When assessing the contribution made by a mathematical method to the technical character of an invention, **it must be taken into account whether the method, in the context of the invention, serves a technical purpose** (T1227/05, T1358/09)”
- **“The claim is to be functionally limited to the technical purpose”** – establishing a link between the technical purpose and the method steps

Examples of specific technical purposes in the EPO's Guidelines:

- ❑ Controlling a specific technical system or process (e.g. X-ray apparatus or steel cooling process)
- ❑ Digital audio, image or video enhancement or analysis (e.g. detecting persons in a digital image, estimating the quality of an audio signal)
- ❑ Separation of sources in speech signals; speech recognition
- ❑ Encoding data for reliable and efficient transmission or storage (error-correction coding or compression)
- ❑ Optimising load distribution in a computer network
- ❑ Providing a genotype estimate based on DNA analysis
- ❑ Providing a medical diagnosis by an automated system
- ❑ Simulating behaviour of defined technical items, or specific technical processes

Examples in healthcare - shown at EPO AI conference 2018

- EP3010585 - radiation treatment planning - determining treatment criteria and treatment parameters for patient-specific radiation therapy planning using patient information and prior clinical cases and a predictive model.

Claim 1 recites receiving and generating data and then “*presenting the first and second radiation treatment planning parameters via a user interface*”

- EP2421439 - recognising indications of hypoglycaemia, by analysing an EEG signal and determining a variation including either slowing of alpha wave activity or quickening theta wave activity.

Claims recite “*determining an indication of the presence of hypoglycaemia*”.

Patentability provided by limitation of claims to technical purpose

EPO Guidelines G-II, 3.3.1 – AI & machine learning

- “Where a classification method serves a technical purpose, 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.”

but...

- “Classifying text documents solely in respect of their textual content is ...not regarded to be a technical purpose but a linguistic one (T 1358/09).
- Classifying abstract data records without any indication of a technical use being made of the resulting classification, is also not a technical purpose, even if the classification algorithm may be considered to have valuable mathematical properties such as robustness (T 1784/06).”

Examples of non-technical applications

- Word processing & other linguistics
- Marketing/Advertising
- Financial/Commercial
- Administrative/Organisational
- Business planning/forecasting
- Abstract data processing

EPO Guidelines G-II, 3.3 – Mathematical methods

2. Specific Technical implementations

- “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.**”
- **Exploiting the capabilities or overcoming the constraints of the system**

EPO Guidelines – 2. Specific Technical implementations

- 1st example T 1358/09: classification of text documents. Vector representation of a document and the documents were classified by separating the vector space into a plurality of subspaces.
- Did not go beyond a particular mathematical formulation of the non-technical task of classifying documents
- 2nd example T 1925/11: adaptation of polynomial reduction algorithm – matched to word size of computer hardware
- 3rd example T2330/13: choice of the claimed bit strings and matrices and respective operations determined by technical considerations concerning how to efficiently perform the method steps in parallel



Reminder in EPO Guidelines G-II, 3.3

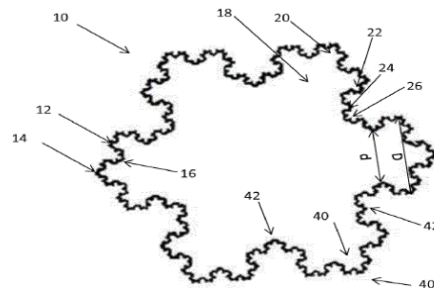
- *“If the mathematical method does not serve a technical purpose and the claimed technical implementation does not go beyond a generic technical implementation, the mathematical method does not contribute to the technical character of the invention.*
- *In such a case, it is not sufficient that the mathematical method is algorithmically more efficient than prior-art mathematical methods.”*

Applications naming AI as inventor

18 275 163.6

FOOD CONTAINER

A container (10) for use, for example, for beverages, has a wall (12) with an external surface (14) and an internal wall (16) of substantially uniform thickness. The wall (12) has a fractal profile which provides a series of fractal elements (18-28) on the interior and exterior surfaces (14-16), forming pits (40) and bulges (42) in the profile of the wall and in which a pit (40) as seen from one of the exterior or interior surfaces (12, 14) forms a bulge (42) on the other of the exterior or interior surfaces (12, 14). The profile enables multiple containers to be coupled together by inter-engagement of pits and bulges on corresponding ones of the containers. The profile also improves grip, as well as heat transfer into and out of the container.

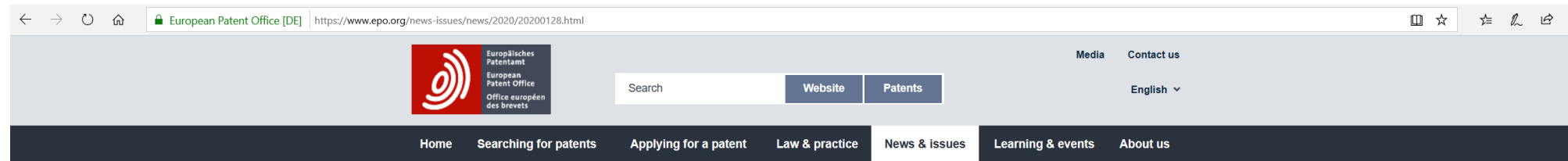


18 275 174.3

DEVICES AND METHODS FOR ATTRACTING ENHANCED ATTENTION

The present invention discloses devices and methods for attracting enhanced attention. Devices include: an input signal of a lacunar pulse train having characteristics of a pulse frequency of approximately four Hertz and a pulse-train fractal dimension of approximately one-half; and at least one controllable light source configured to be pulsatingly operated by the input signal; wherein a neural flame emitted from at least one controllable light source as a result of the lacunar pulse train is adapted to serve as a uniquely-identifiable signal beacon over potentially-competing attention sources by selectively triggering human or artificial anomaly-detection filters, thereby attracting enhanced attention.

EPO refuses applications indicating a machine as inventor



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Archive

EPO publishes grounds for its decision to refuse two patent applications naming a machine as inventor

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28 January 2020

The EPO has published its decision setting out the reasons for its recent refusal of two European patent applications in which an AI system was designated as the inventor. Filed by an individual in autumn 2018, the applications EP 18 275 163 and EP 18 275 174 were refused by the EPO following oral proceedings with the applicant in November 2019, on the grounds that they do not meet the legal requirement of the European Patent Convention (EPC) that an inventor designated in the application has to be a human being, and not a machine.

In both applications a machine called "DABUS", which is described as "a type of connectionist artificial intelligence", is named as the inventor. The applicant stated that he had acquired the right to the European patent from the inventor by being its successor in title, arguing that as the machine's owner, he was assigned any intellectual property rights created by this machine.

In its decisions, the EPO considered that the interpretation of the legal framework of the European patent system leads to the conclusion that the inventor designated in a European patent must be a natural person. The Office further noted that the understanding of the term inventor as referring to a natural person appears to be an internationally applicable standard, and that various national courts have issued decisions to this effect.

Legal provisions

Art. 62 EPC

The inventor shall have the right to be mentioned as such before the EPO.

Art. 81 EPC

The European patent application shall designate the inventor.

Art. 60 EPC

The right to a European patent shall belong to the inventor or his successor in title.

Rule 19 EPC

The designation shall state the family name, given names and full address of the inventor.

Case Law

J 7/99
J 8/82

The inventor must be a natural person.

If no formally correct designation is filed, the application will be refused (Art. 90(5) EPC).

EPO refuses applications indicating a machine as inventor

Reasons for the decision

- The application designates a machine as the inventor and therefore does not meet the formal requirements under the EPC (Article 81, Rule 19(1) EPC)
- In the context of inventorship reference is made only to natural persons.....a clear legislative understanding that the inventor is a natural person. The legislative history shows that the legislators of the EPC were in agreement that the term “inventor” refers to a natural person only.
- AI systems or machines have at present no rights because they have no legal personality comparable to natural or legal persons.
- AI systems or machines cannot have rights that come from being an inventor, such as the right to be mentioned as the inventor or to be designated as an inventor in the patent application.

Applicant has appealed so the Legal Board of Appeal will decide

WIPO has started a conversation on AI and IP policy

https://www.wipo.int/pressroom/en/articles/2020/article_0013.html

Thank you for listening

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