What is pantentable or copyrightable (and what is not) in SW, e.g. an AI generative system

STUDIO TORTA
Patents | Trademarks | Designs

Alessio D. Mangraviti

Partner
European and Italian Patent and Design Attorney
European Patent Litigator before the UPC

mangraviti@studiotorta.it

THE DUPLICITY OF SOFTWARE: INSTRUMENTAL CHARACTER *VS* EXPRESSIVE FORM

- The **instrumental character** of a software program is linked to the algorithm implemented by that program (i.e. its implemented functionalities), as well as to the purposes achieved thanks to that program.

  → Protection via **Patent**

- The **expressive form** of a software program is related to the way in which that program was written (e.g. the programming language used).

  → Protection via **Copyright**

BASIC REQUIREMENTS FOR PATENTABILITY

It can be the subject of patents for inventions
new inventions involving an **inventive step** and are suitable for
have an **industrial application**.

Concepts – From CII to AI

The rules of the game in Europe

- Article 52 of the European Patent Convention
  Patentable inventions

- (1) European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application.

- (2) The following in particular shall not be regarded as inventions within the meaning of **paragraph 1**:

- (a) discoveries, scientific theories and mathematical methods;

- (b) aesthetic creations;

- (c) schemes, rules and methods for performing mental acts, playing games or doing business, and **programs for computers**;

- (d) **presentations of information**.

- (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 **as such**.
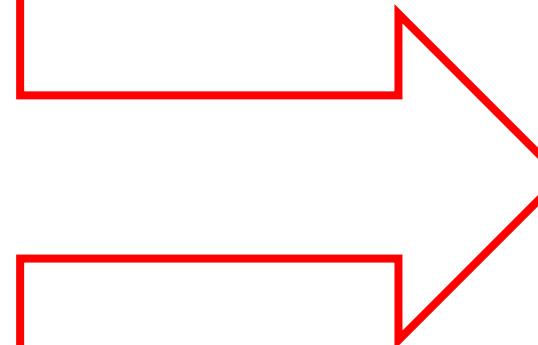
The problem in Europe

computer programs "per se"

mathematical methods "per se"
(e.g. a method to calculate the FFT y
(Fast Fourier Transform) y of an x-vector in
which...)

presentations of info "per se"

Non patentable

The solution in Europe

- A **software program is patentable** if it is provided with a technical nature, i.e. if it solves a technical problem by means of technical means.

- In order for a software program to be considered patentable, **the method or algorithm** implemented by that software must be of a technical nature.

- the patentability of a software depends on the **patentability of the method/algorithm implemented by that software**

SOFTWARE INVENTIONS

- COMPUTER PROGRAMS <u>AS SUCH</u> ARE CONSIDERED TO BE DEVOID OF ANY TECHNICAL CHARACTER, I.E. A MERE ABSTRACT CREATION

- COMPUTER PROGRAMS ARE PATENTABLE ONLY IF THEY HAVE A TECHNICAL CHARACTER, WHICH IN ITSELF MUST BE INVENTIVE

- THE TECHNICAL CHARACTER MAY BE DERIVED FROM A "FURTHER TECHNICAL EFFECT" PRODUCED BY THE PROGRAM WHEN RUN ON A COMPUTER, WHICH EFFECT GOES BEYOND THE "NORMAL" PHYSICAL INTERACTIONS BETWEEN PROGRAM AND COMPUTER

- EXAMPLES OF SUCH A "FURTHER TECHNICAL EFFECT" ARE THE CONTROL OF AN INDUSTRIAL PROCESS, THE PROCESSING OF DATA THAT REPRESENT PHYSICAL ENTITIES, OR THE CONTROL OF THE INTERNAL OPERATION OF A COMPUTER

SOFTWARE INVENTIONS

THE TWO QUESTIONS APPROACH:

1) IS THE CLAIMED SUBJECT-MATTER AS A WHOLE EXCLUDED FROM PATENTABILITY?

GENERALLY, THE RESPONSE IS YES ONLY IF THE CLAIMS RECITE A SERIES OF STEPS WHICH ARE:

- <u>PURELY</u> OF ABSTRACT NATURE, OR

- REFERRING <u>ONLY</u> TO SUBJECT-MATTER EXCLUDED FOR OTHER REASONS (METHODS FOR DOING BUSINESS, MATHEMATICAL METHODS, ETC).

THE RECITATION OF ONE OR MORE TECHNICAL ELEMENTS (MACHINE, COMPUTER COMPONENT, INVOLVED PHYSICAL ENTITY) RESULTS IN THE NO ANSWER, AND PASSAGE TO THE SECOND QUESTION.

SOFTWARE INVENTIONS

2) IS THE CLAIMED SUBJECT-MATTER NOVEL AND DOES IT INVOLVE AS A WHOLE AN INVENTIVE STEP?

THIS QUESTION INVOLVES A SERIES OF ACTIONS:
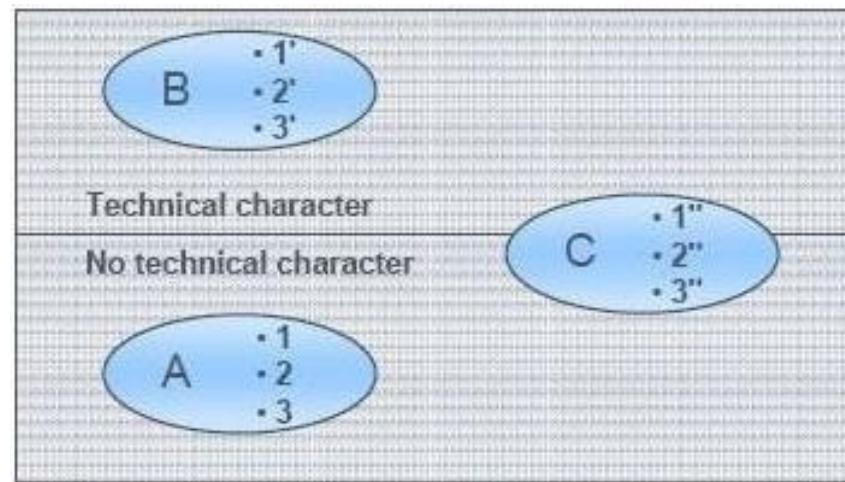
➤ IDENTIFICATION OF THE CLOSEST PRIOR ART;

➤ COMPARISON OF THE CLAIMED SUBJECT-MATTER WITH THE CLOSEST PRIOR ART WITH THE PURPOSE OF IDENTIFYING DISTINGUISHING FEATURES (IF NONE, REJECTION FOR LACK OF NOVELTY);

➤ IDENTIFICATION OF THOSE DISTINGUISHING FEATURES HAVING TECHNICAL CHARACTER (IF NONE, REJECTION FOR OBVIOUSNESS);

➤ EXAMINATION OF THE DISTINGUISHING FEATURES HAVING TECHNICAL CHARACTER FOR INVENTIVE STEP (NON-OBVIOUSNESS) ASSESSMENT WITH STANDARD CRITERIA.

SOFTWARE INVENTIONS

SUBJECT-MATTER A IS EXCLUDED FROM PATENTABILITY

SUBJECT-MATTER B _IS NOT_ EXCLUDED FROM PATENTABILITY
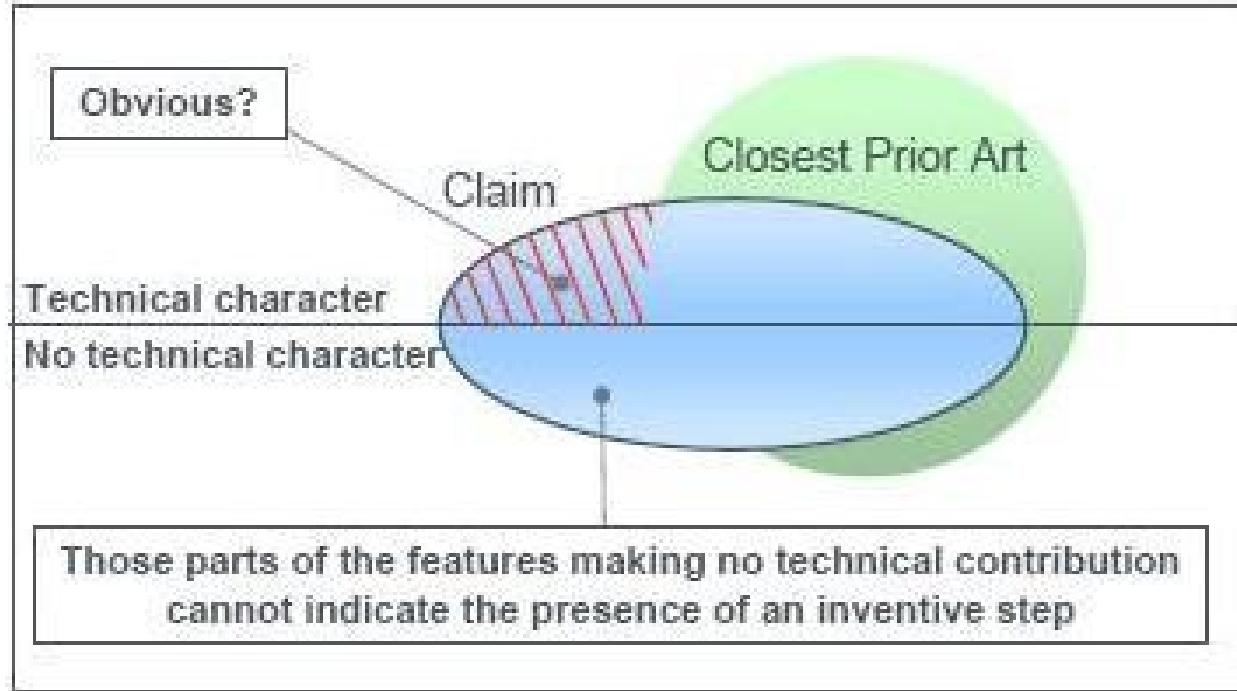
SUBJECT-MATTER C _IS NOT_ EXCLUDED FROM PATENTABILITY

AT LEAST ONE FEATURE HAS TECHNICAL CHARACTER

=> SUBJECT-MATTER HAS TECHNICAL CHARACTER

SOFTWARE INVENTIONS
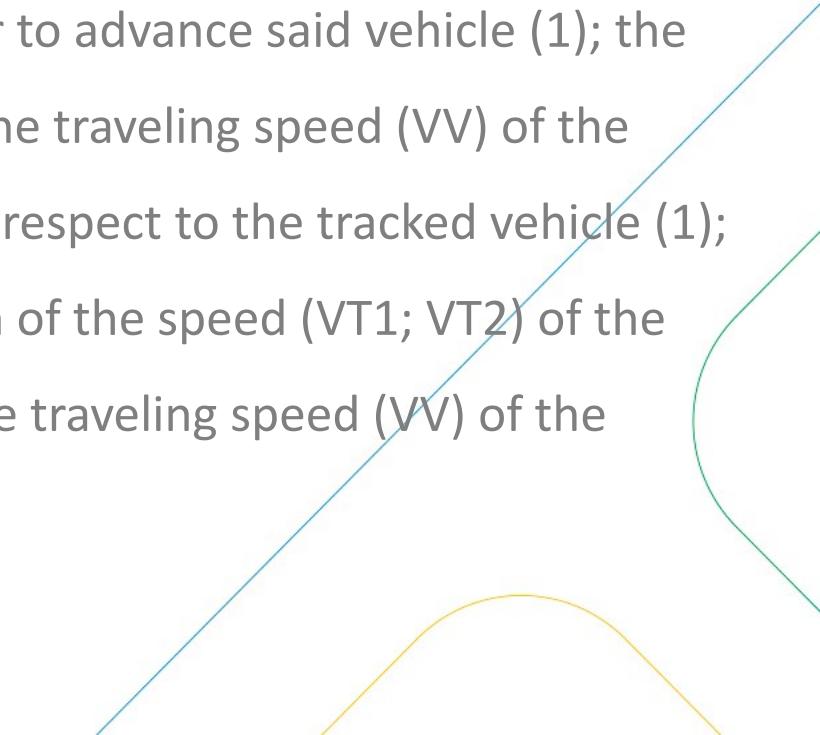
A NON-OBVIOUS <u>TECHNICAL</u> CONTRIBUTION OVER THE PRIOR ART IN THE TECHNICAL FIELD IS NECESSARY

# A European Patent concerning computer implemented invention (1)

EP 2 855 241 B1 Proprietor: PRINOTH S.p.A.
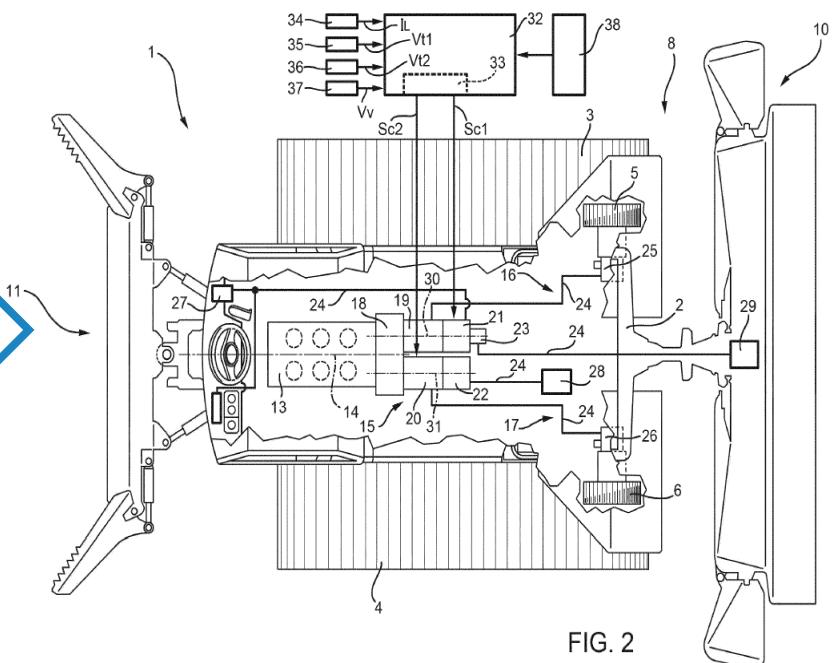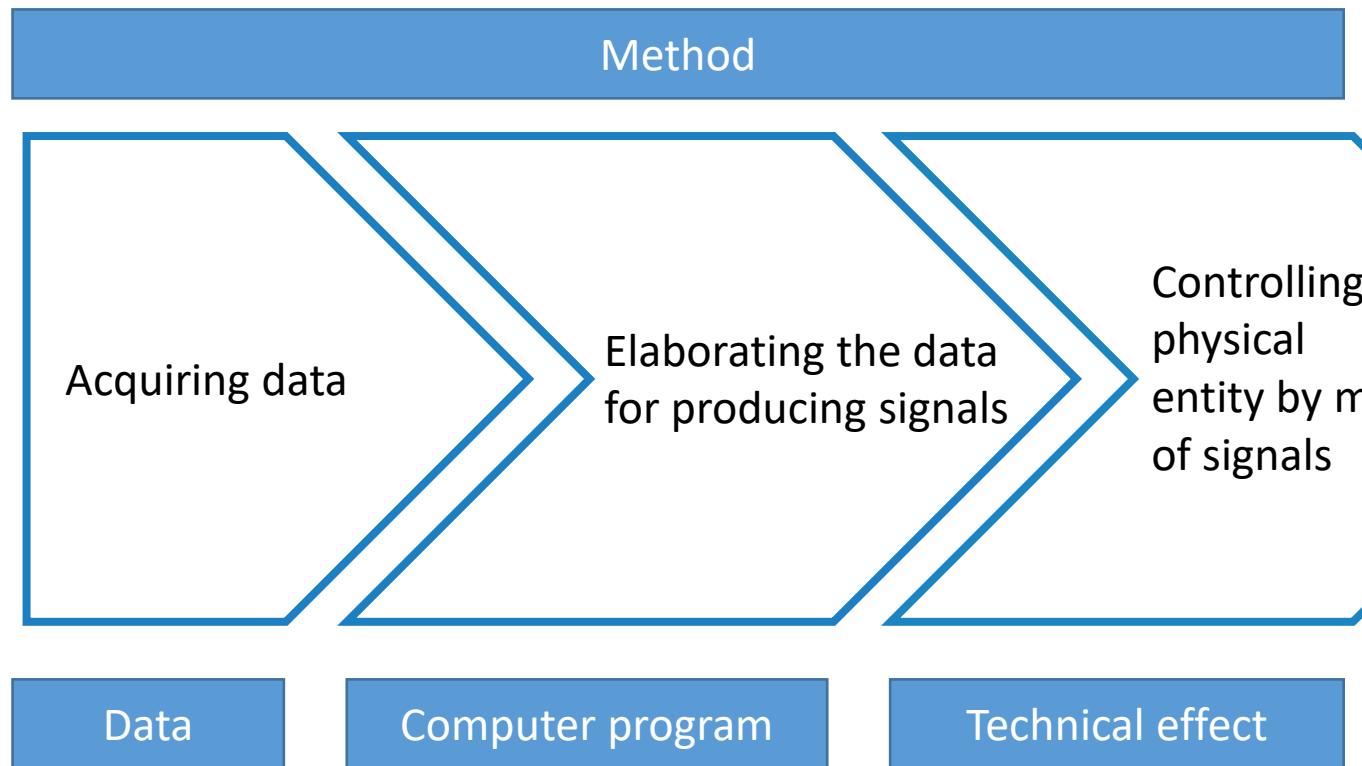
1. **Method of control** of a tracked vehicle, in particular a tracked vehicle for the preparation of ski slopes, or for the maintenance of woods, the tracked vehicle (1) comprising two tracks (3; 4) configured to be driven at respective speed (VT1, VT2) with respect to the tracked vehicle (1) in order to advance said vehicle (1); the control method being characterized by comprising the steps of **acquiring** the traveling speed (VV) of the tracked vehicle (1); acquiring the speed (VT1; VT2) of the tracks (3; 4) with respect to the tracked vehicle (1); **calculating** a range of expected values of traveling speed (VV) as a function of the speed (VT1; VT2) of the tracks (3; 4), and **varying the speed (VT1; VT2)** of the tracks (3; 4) when the traveling speed (VV) of the tracked vehicle (1) is outside the range of expected values.

A European Patent concerning computer implemented invention (2)

EP 2 855 241 B1 Proprietor: PRINOTH S.p.A.

Method

Acquiring data	Elaborating the data for producing signals	Controlling a physical entity by means of signals

Data	Computer program	Technical effect

FIG. 2

A European Patent concerning computer implemented invention (3)
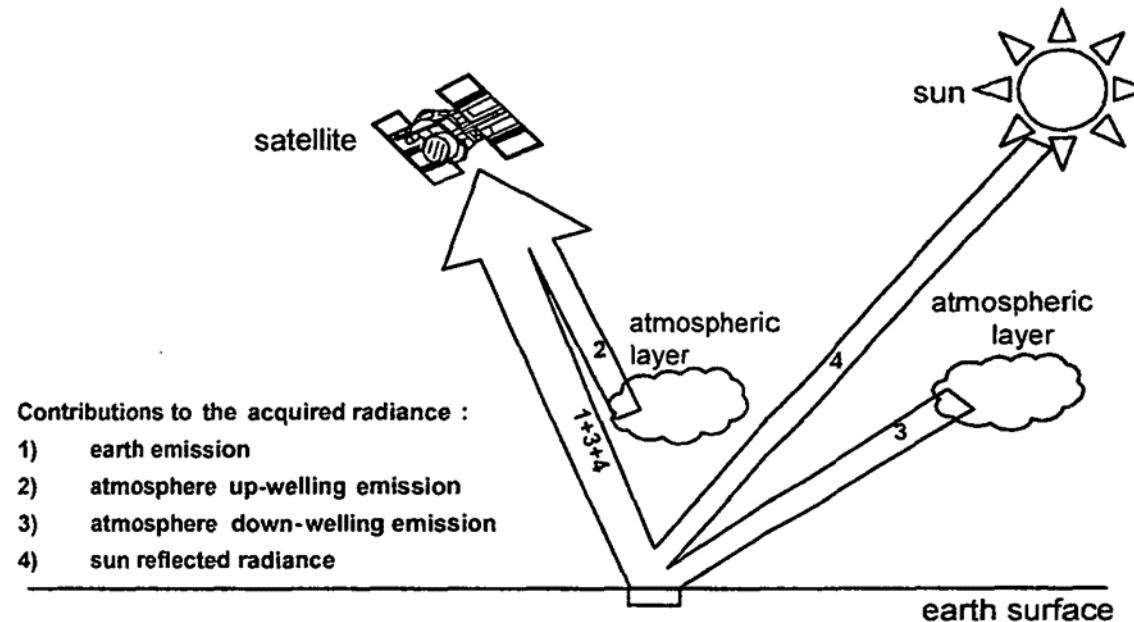
EP 2 855 241 B1 Proprietor: PRINOTH S.p.A.

8. A **computer program** configured to control a tracked vehicle (1) and directly loadable into a memory of the computer (33) to carry out the method steps of any one of claims 1 to 7 when the program is implemented by the computer (33).

9. A **program product** comprising a readable medium on which the program of claim 8 is stored.
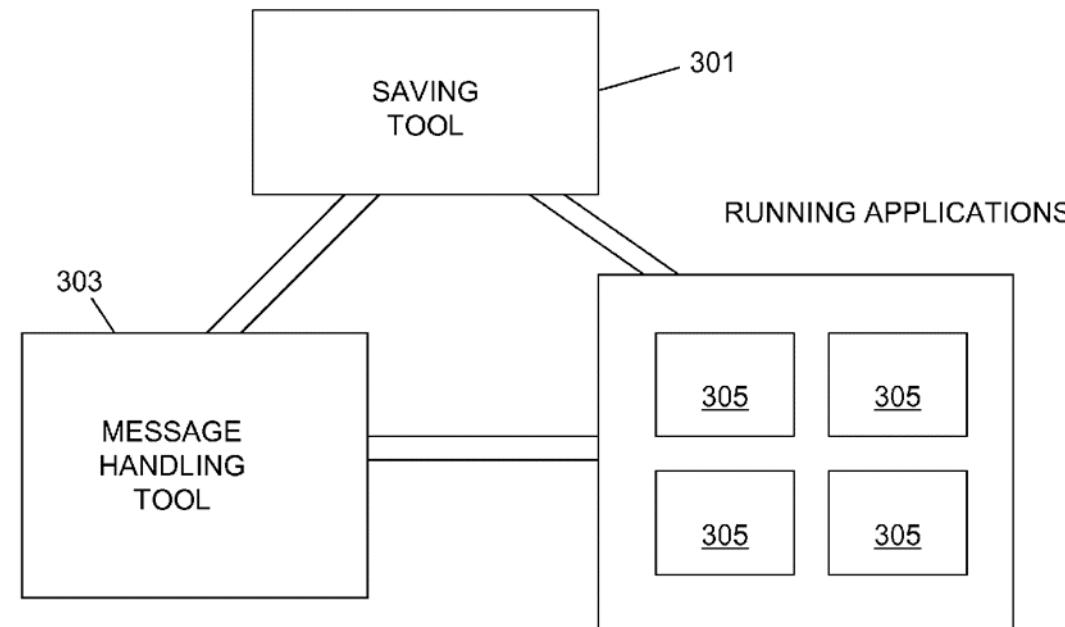
- Brevetto europeo – **EP 2 175 395 B1**

- Titolare: **TELESPAZIO S.p.A.**

- Titolo: *Automatic detection of fires on earth's surface and of atmospheric phenomena such as clouds, veils, fog or the like, by means of a satellite system*
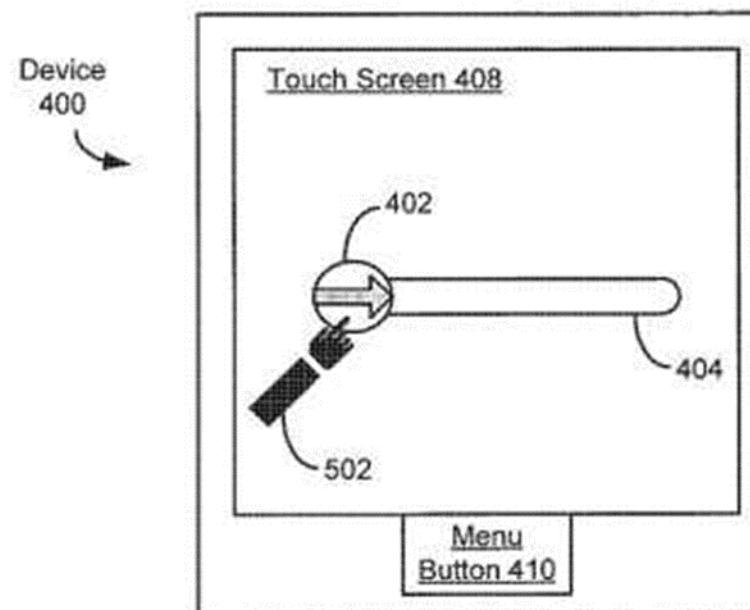
- Brevetto europeo – **EP 2 280 348 B1**

- Titolare: **IBM Corp.**

- Titolo: *Method and system for saving operational state of running applications when unexpected shutdown events occur*

- Brevetto europeo – **EP 1 964 022 B1**

- Titolare: **Apple Inc.**

- Titolo: *UNLOCKING A DEVICE BY PERFORMING GESTURES ON AN UNLOCK IMAGE*
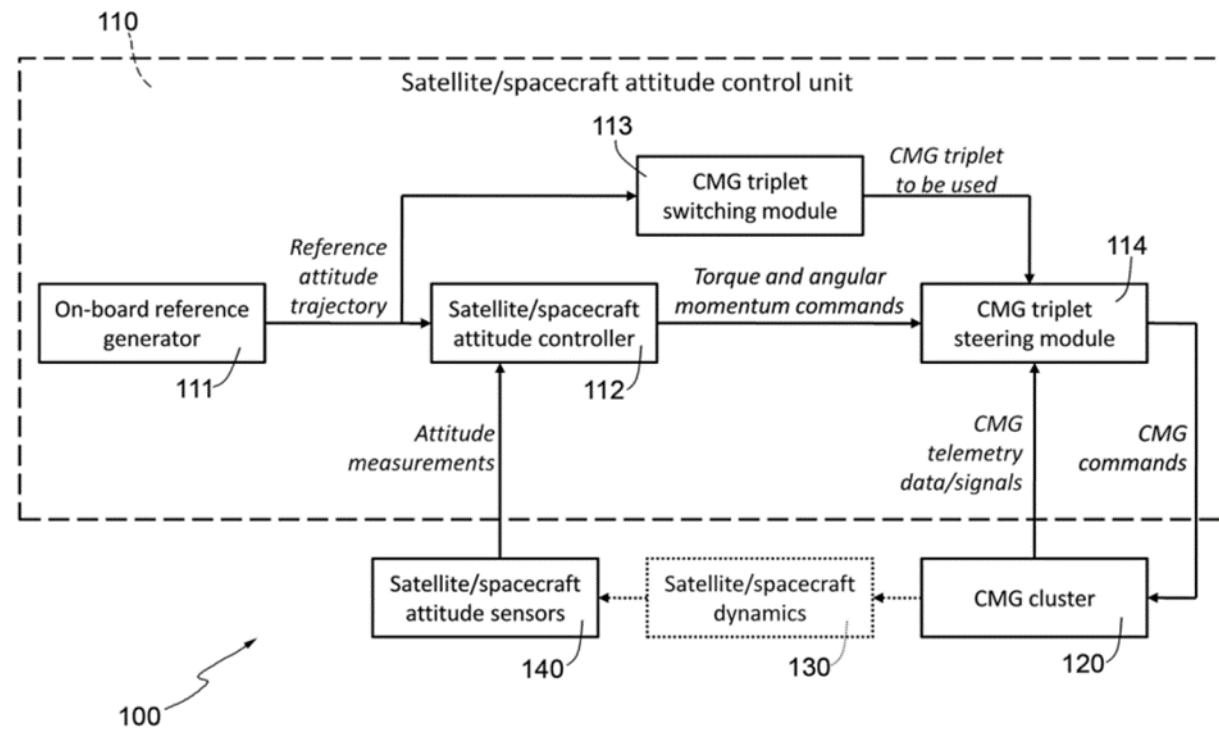
- Brevetto europeo – **EP 0 642 719 B1**

- Titolare: **FRAUNHOFER-GESELLSCHAFT ZUR FÖRDERUNG DER ANGEWANDTEN FORSCHUNG E.V.**

- Titolo: *PROCESS FOR REDUCING DATA IN THE TRANSMISSION AND/OR STORAGE OF DIGITAL SIGNALS FROM SEVERAL INTERDEPENDENT CHANNELS*

- Brevetto europeo – **EP 3 216 705 B1**

- Titolare: **THALES ALENIA SPACE ITALIA S.P.A. CON UNICO SOCIO**

- Titolo: *ATTITUDE CONTROL FOR AGILE SATELLITE APPLICATIONS*

Examples of software **without** technical character

Management software (e.g. a SAP application) to automatically manage bids for a tender (pure business method)

Program to execute the Fourier transform (pure mathematical method)

Program to display on a hotel concierge screen the occupied rooms, vacant rooms, rooms that need to be cleaned, rooms that are already cleaned, etc. (mere presentation of information)

Social app to make friends, meet new people, etc., e.g. with user proximity detection mechanisms (no technical character/effect, i.e. no technical problem solved)

Examples of software **with** technical character

Programs for audio/video encoding/decoding

Programs for signal processing in TLC systems, remote sensing systems (radar, SAR, optical, IR), etc.

Programs for image/video processing
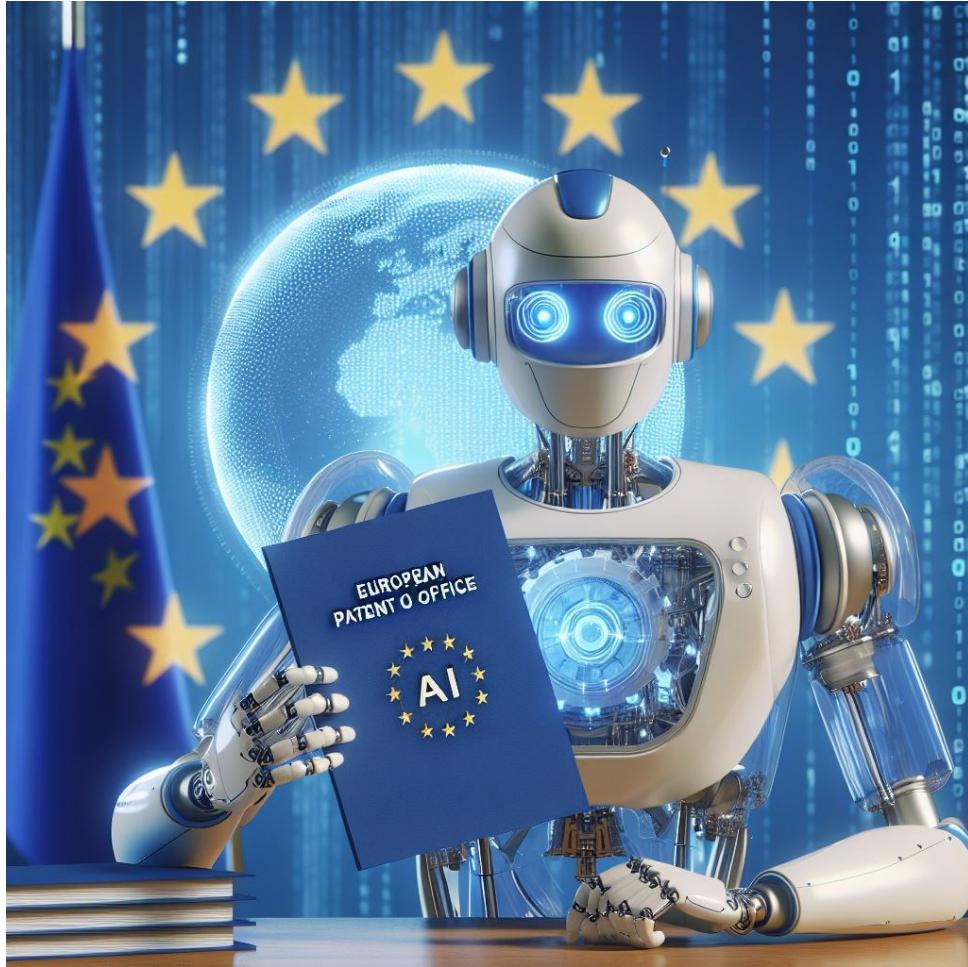
Programs to control the operation of a TLC system, a remote sensing system, etc.

Programs to control the internal functioning of a computer

Programs to control the operation of a car, aircraft, helicopter, satellite, industrial machinery, medical equipment, etc.

AI and Patentability

The EPO has responded to the emergence of AI in patent applications by refining its approach to patentability of inventions involving AI.

AI is considered a branch of computer science, and therefore, inventions involving **AI are considered "computer-implemented inventions" (CII).** In this context, the Guidelines for Examination in the EPO, F-IV, 3.9 define the term CII as inventions which involve computers, computer networks or other programmable apparatus, whereby at least one feature is realised by means of a program.

Figure 1: Number of European patent applications filed/granted per year in the four AI CPC classification codes (G06N3/5/7/20)

Patentability of AI in Europe – Hurdles

Technicality:

- it is not sufficient to have a computer to make AI patentable, because **AI is a mathematical algorithm**

- A computer may render AI *eligible* in Europe, but then it would hardly have novelty and inventive step

- The criteria for CII apply (G-II 3.3): When assessing the **contribution** made by a mathematical method **to the technical character** of an invention, it must be taken into account <u>whether the method, in the context of the invention</u>, **produces a technical effect serving a technical purpose**

PATENTING IN EUROPE

Solution
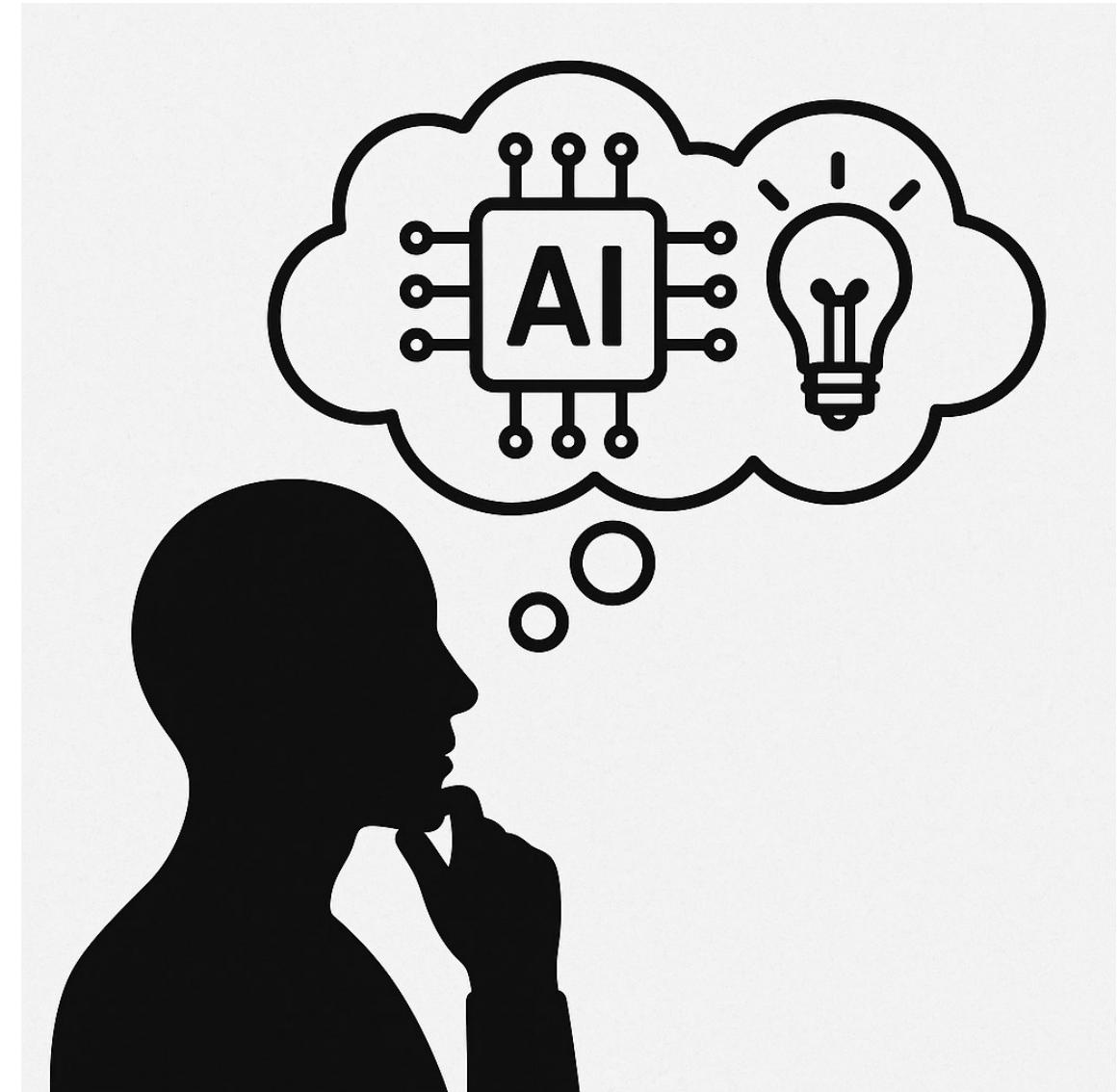
We need to ask ourselves: does the artificial intelligence method contribute to the *technical character* of the invention? Is it suited to

1. *specific **technical implementation*** (note that a generic technical implementation, for example programming, is not sufficient)?

2. ***technical application*** *in a given technical sector?*

By "technical application" we mean the solution of a **technical problem** in a **technical sector**.

The results achieved by the invention must **have technical relevance**.

The technical object must be **specific**; the generic control of a technical system is not sufficient, unlikely (see decisions T1225/05, T1029/06).
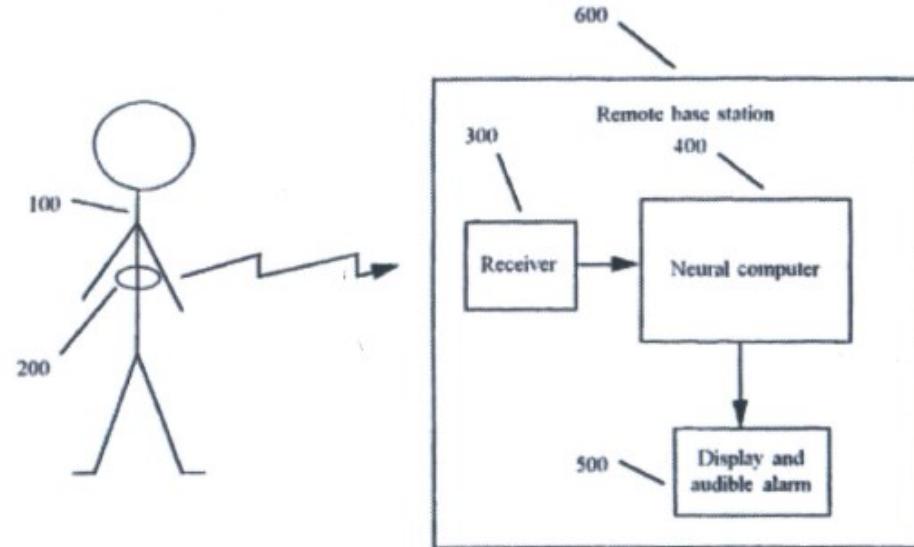
Examples of *technical application*

Dimension: Technical application

☑ Use of Neural Networks in heart monitoring apparatus for identifying irregular heartbeats

Remote base station
600
300
400
100
Receiver → Neural computer
200
500 → Display and audible alarm

Based on T 598/07

Source: EPO "The patentability of artificial intelligence and machine learning applications"
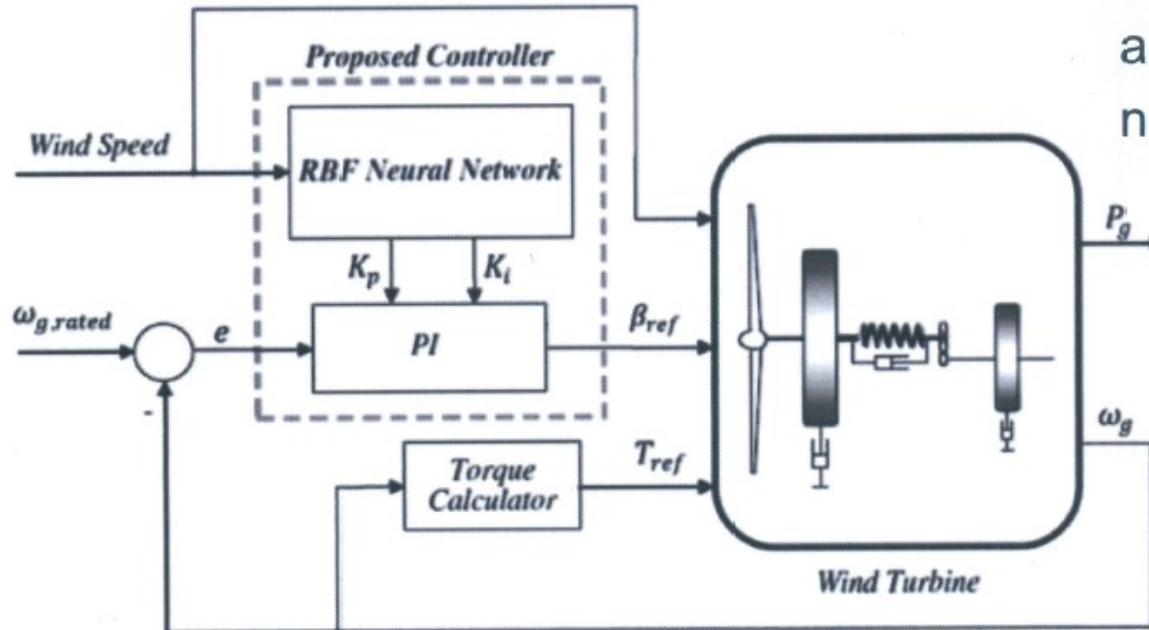
Examples of *technical application*


Dimension: Technical application

Method for controlling a turbine using a neural network
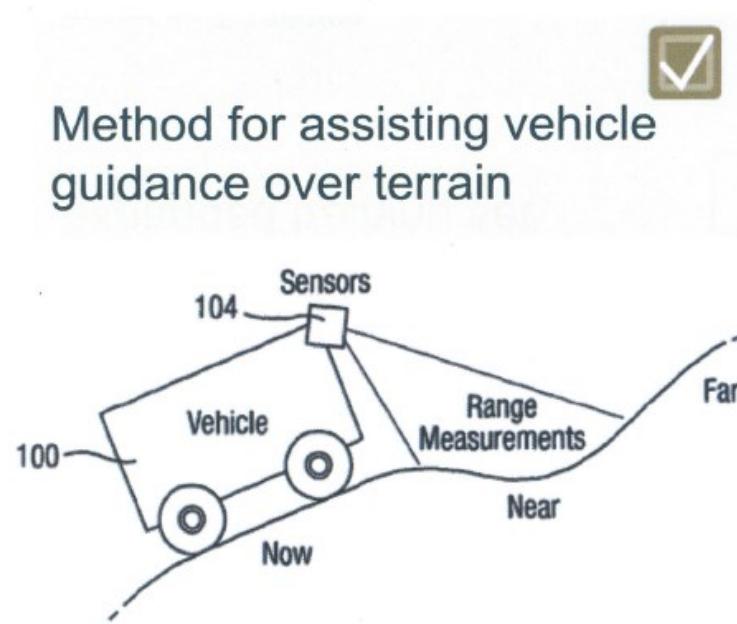
Based on EP2801000

Source: EPO "The patentability of artificial intelligence and machine learning applications"

Examples of *technical application*

Dimension: Technical application

✅ Method for assisting vehicle guidance over terrain

Fig. 3
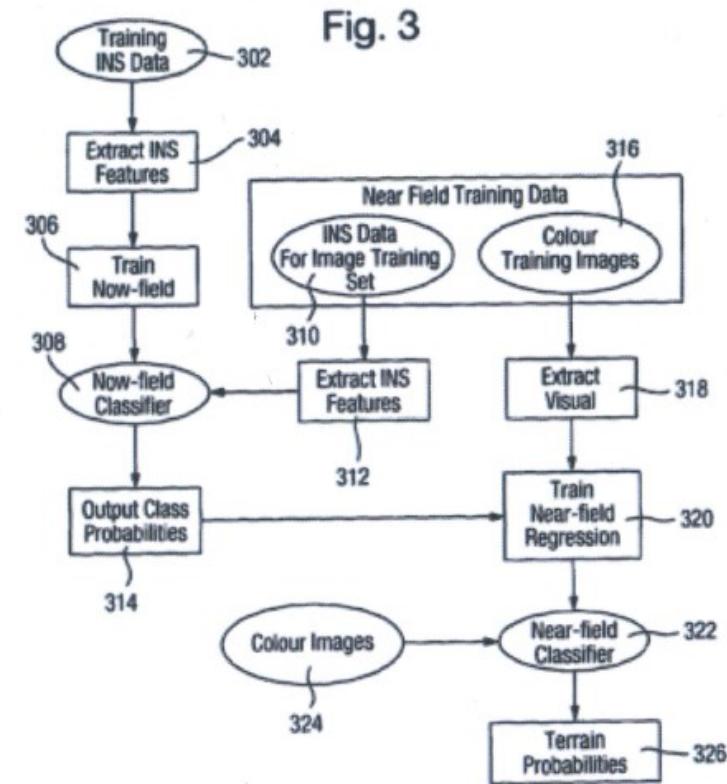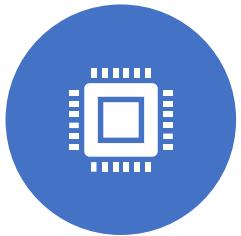
Based on EP2591443

Source: EPO "The patentability of artificial intelligence and machine learning applications"

Patentability of AI in Europe – Examples of technical applications

CONTROLLING A TECHNICAL SYSTEM OR PROCESS SUCH AS AN X-RAY APPARATUS OR A MECHANICAL TOOL;
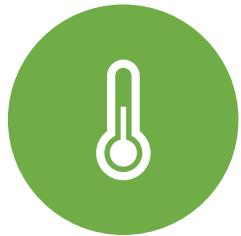
DIGITAL AUDIO OR IMAGE OR VIDEO ENHANCEMENT/**GENERATION**, E.G. REDUCING NOISE, DETECTING PEOPLE IN DIGITAL IMAGES, SPEECH RECOGNITION, FACIAL RECOGNITION, HYPER-REALISTIC SOUNDS GENERATION;

ENCODING/DECODING/COMPRESSING DATA FOR RELIABLE AND/OR EFFICIENT/SECURE TRANSMISSION OR STORAGE;

PROVIDING A MEDICAL DIAGNOSIS USING AN AUTOMATED SYSTEM FOR PROCESSING PHYSIOLOGICAL MEASUREMENTS;
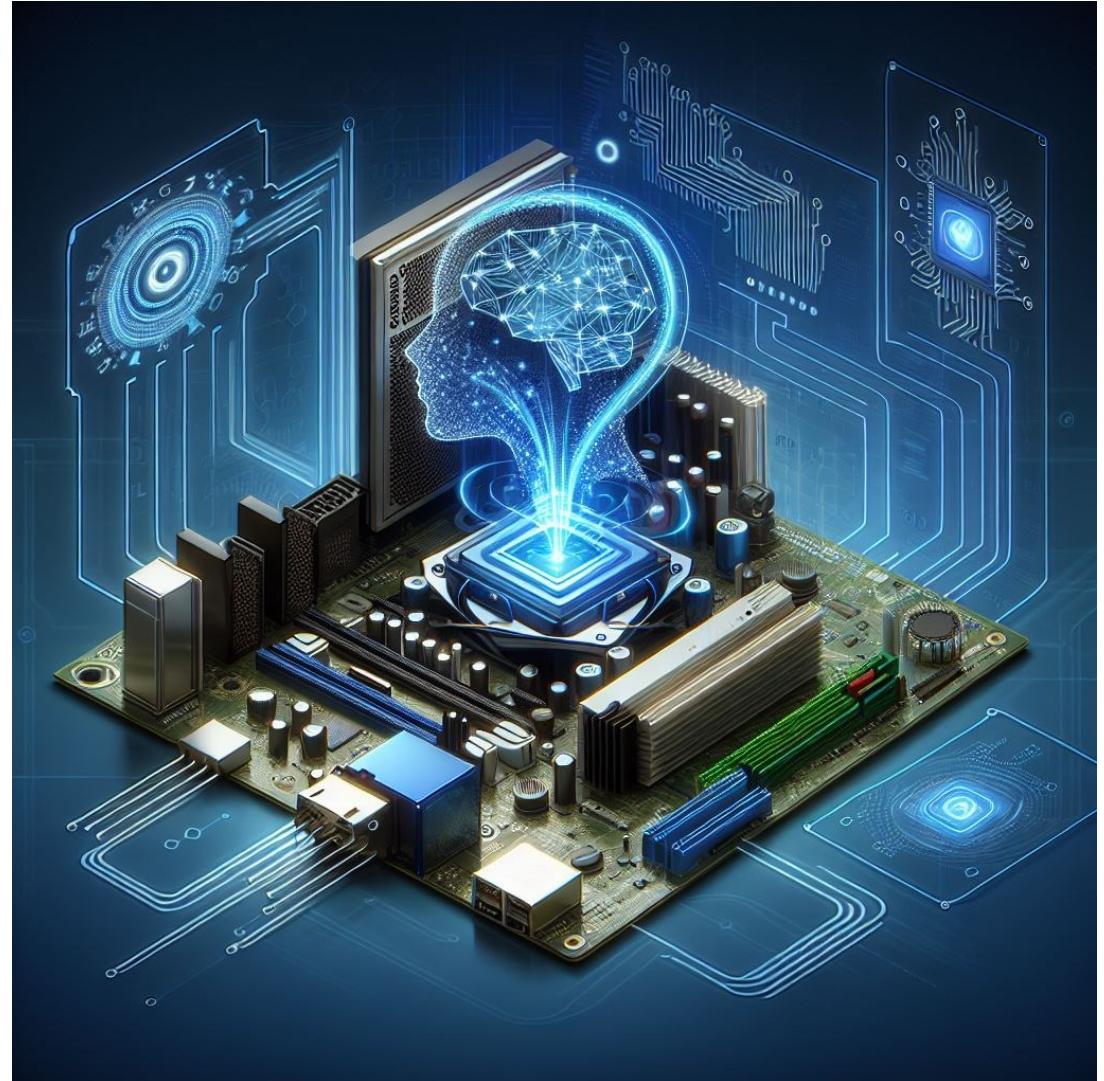
DERIVING THE BODY TEMPERATURE OF A SUBJECT FROM THE DATA OBTAINED FROM AN EAR TEMPERATURE DETECTOR.

Patentability of AI in Europe – Hurdles

- **Technical Implementation**:

- It is assessed whether the structure of the mathematical method **affects the internal functioning of the computer**, in particular <u>if it improves the hardware</u> on which the method is implemented, and <u>if the mathematical method is implemented on the basis</u> of technical considerations concerning the <u>internal functioning of the computer</u>.

Patentability of AI in Europe – Examples of technical implementation

- A mathematical method for distributing load in a computer network

- A **computer-implemented** method of **designing** an optical system using a mathematical formula for determining refractive indices and magnification factors so as to obtain **optimal** optical performance

- A cryptographic computation method with masking operations to protect the computation against power analysis

- A method for classifying records comprising mathematical steps, the classified records being **used in a billing procedure**

Source: EPO "The patentability of artificial intelligence and machine learning applications"

Patentability of AI in Europe – Examples of technical implementation

✓ Optimization of **load distribution** in a computer network;

✓ **Data masking** to protect the computation from power analysis attacks serves a technical purpose;

✓ Adapting an artificial intelligence model to **fit special hardware** applications that require **low processing**;

✓ **Reducing or optimizing certain model parameters** to generate faster computer outputs while maintaining or improving predictive accuracy.

Patentability of AI in Europe
What to focus on in a patent application

I.   Hardware

II.   Pre-processing of inputs and post-processing of outputs

III. Technical problems solved

IV.   Numerical Results

CHECKLIST
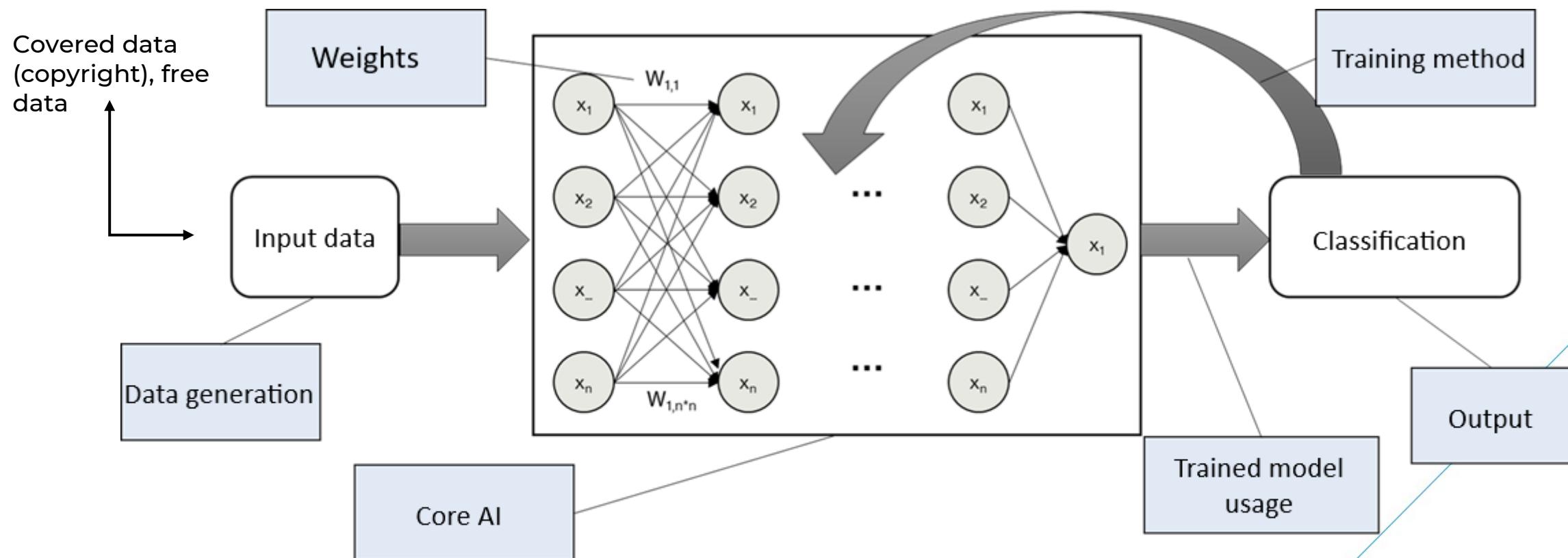
1. Are **technical means** present in the claim?

2. Is the **technical character** of the invention disclosed?

3. Is the claim **functionally limited to the technical purpose**?

4. Sufficient **link** between the technical purpose and the mathematical method steps?

5. Is the intended **technical use disclosed**?

6. Data resulting from a numerical **simulation** is specifically **adapted** for an intended **technical use**?

7. Does the claim encompass other **non-technical uses**?

AI and protectability

What can be protected?

How can it be protected?
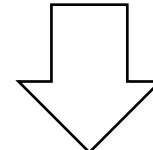
Patentability and sufficiency of description

Any patent application must explain the invention in a sufficiently clear and complete manner for the invention to be made by a technician in the field.
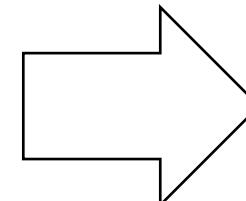
In the case of *software* and AI, <u>it is necessary to describe the invention with the greatest possible precision</u>

Trade-off between the owner's wishes and the requirements for the monopoly

For example:
- clarify the nature and format of the *input data*
- the nature of the *output data*;
- the architecture of the AI model;
- the training procedure of the AI model, (training *dataset*).
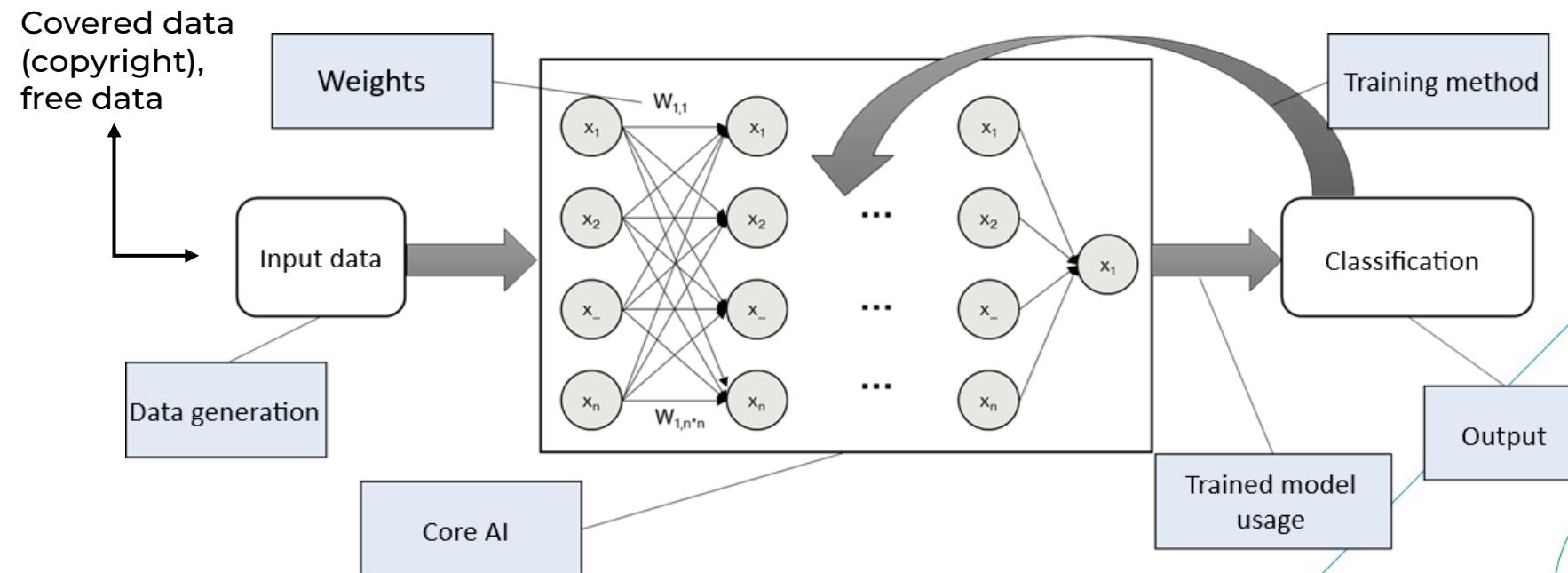
AI and protectability: Use of AI

Additional technical effect present when using the AI system

For example, the use of a neural network in a heart monitoring device in order to identify irregular heartbeats (technical problem) provides a technical effect.
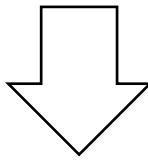
That is, AI is used in <u>its use</u> to solve a technical problem

Covered data (copyright), free data

Weights

$W_{1,1}$

x_1 x_1 x_1

x_2 x_2 x_2

x_- x_- x_1

x_n x_n x_n

$W_{1,n*n}$

Input data

Data generation

Core AI

Training method

Classification

Output

Trained model usage
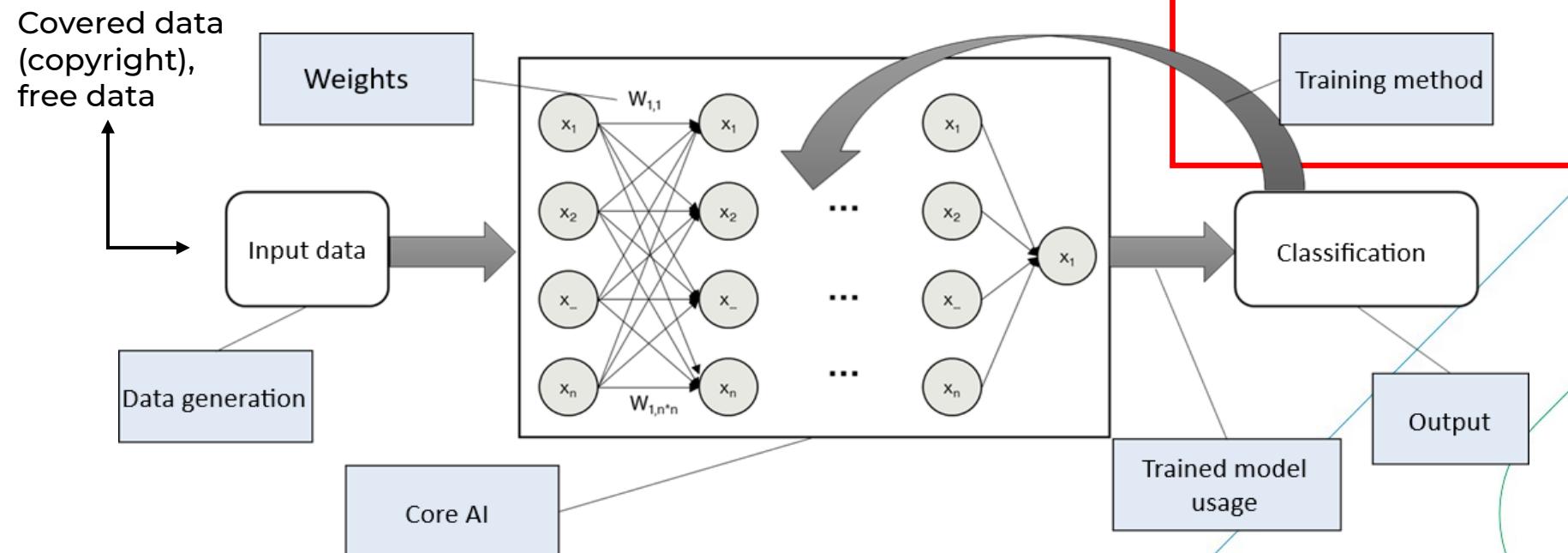
AI and protectability: AI training

On its own, it may <u>not</u> provide a technical effect

BUT if the use of an AI system provides a technical effect, then training the AI system inherently contributes to providing the technical effect

Covered data (copyright), free data

Weights

$W_{1,1}$

x_1 x_1

x_2 x_2 x_2

x_- x_- x_-

x_1

x_n x_n x_n

$W_{1,n*n}$

Input data

Data generation

Core AI

Training method

Classification

Trained model usage

Output
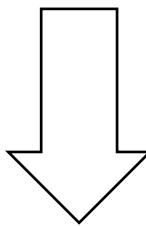
That is, if AI is used in <u>its use</u> to solve a technical problem, indirectly the training of the same contributes to the technical effect
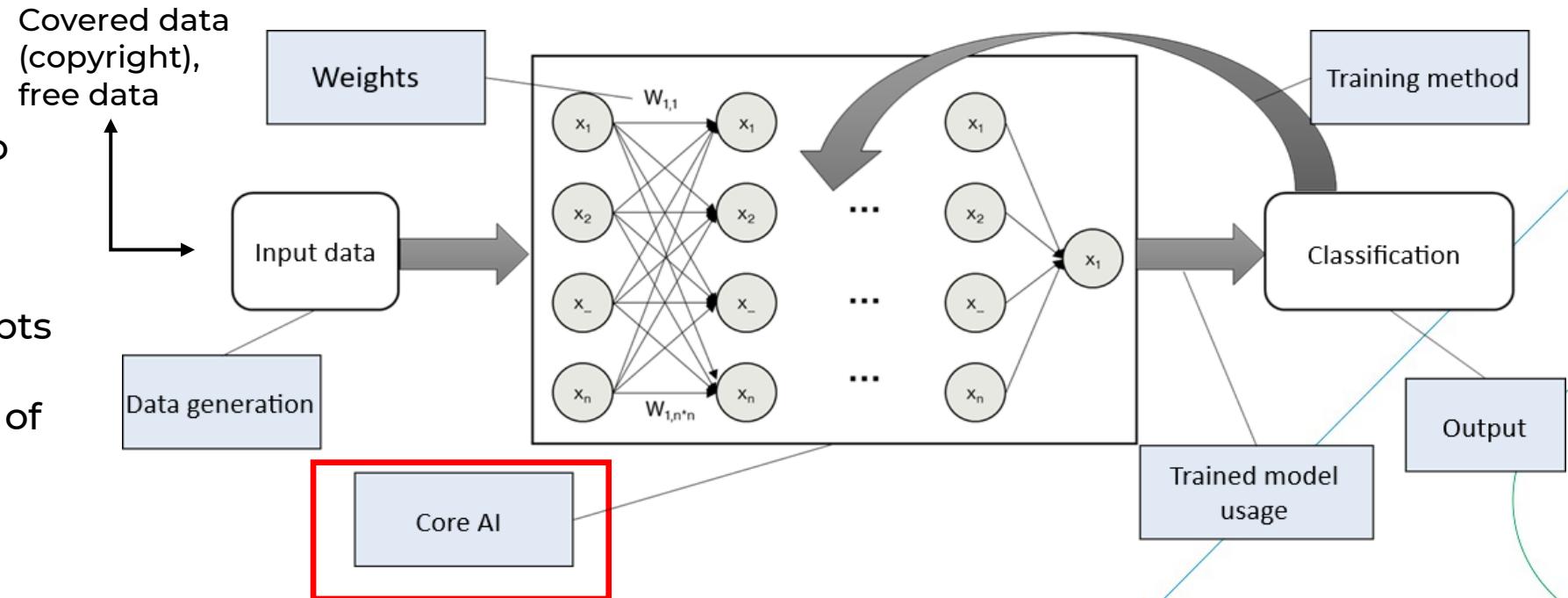
AI and protectability: Core AI

The algorithms and computational models on which AI systems are based are inherently abstract in nature (mathematical methods, excluded from patentability)

BUT there is a contribution to the technical effect if:
- Particularly suitable for a specific implementation (neural network that adapts according to the computational resources of the computer)
- Use of a new AI system in the context of a technical application.
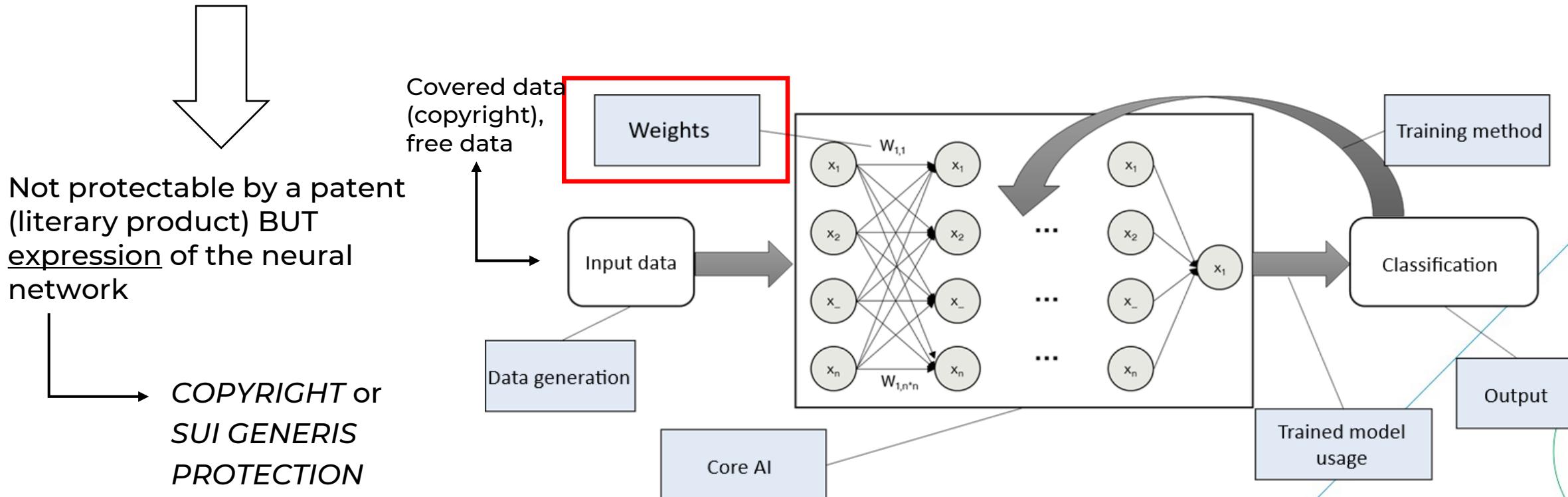
AI and protectability: Weights

The configuration of weights (symptom of the strength of a connection between neurons) produced at the end of the training of an AI system can be considered as a _database_

Not protectable by a patent (literary product) BUT _expression_ of the neural network

COPYRIGHT or _SUI GENERIS PROTECTION_

Covered data (copyright), free data

Weights

$W_{1,1}$

x_1 x_1 x_1

Training method

Input data

x_2 x_2 x_2 x_1

Classification

x_- x_- x_-

Data generation

x_n x_n x_n

$W_{1,n*n}$

Output

Trained model usage

Core AI

Numbers

Trend


AI-related EP patent applications
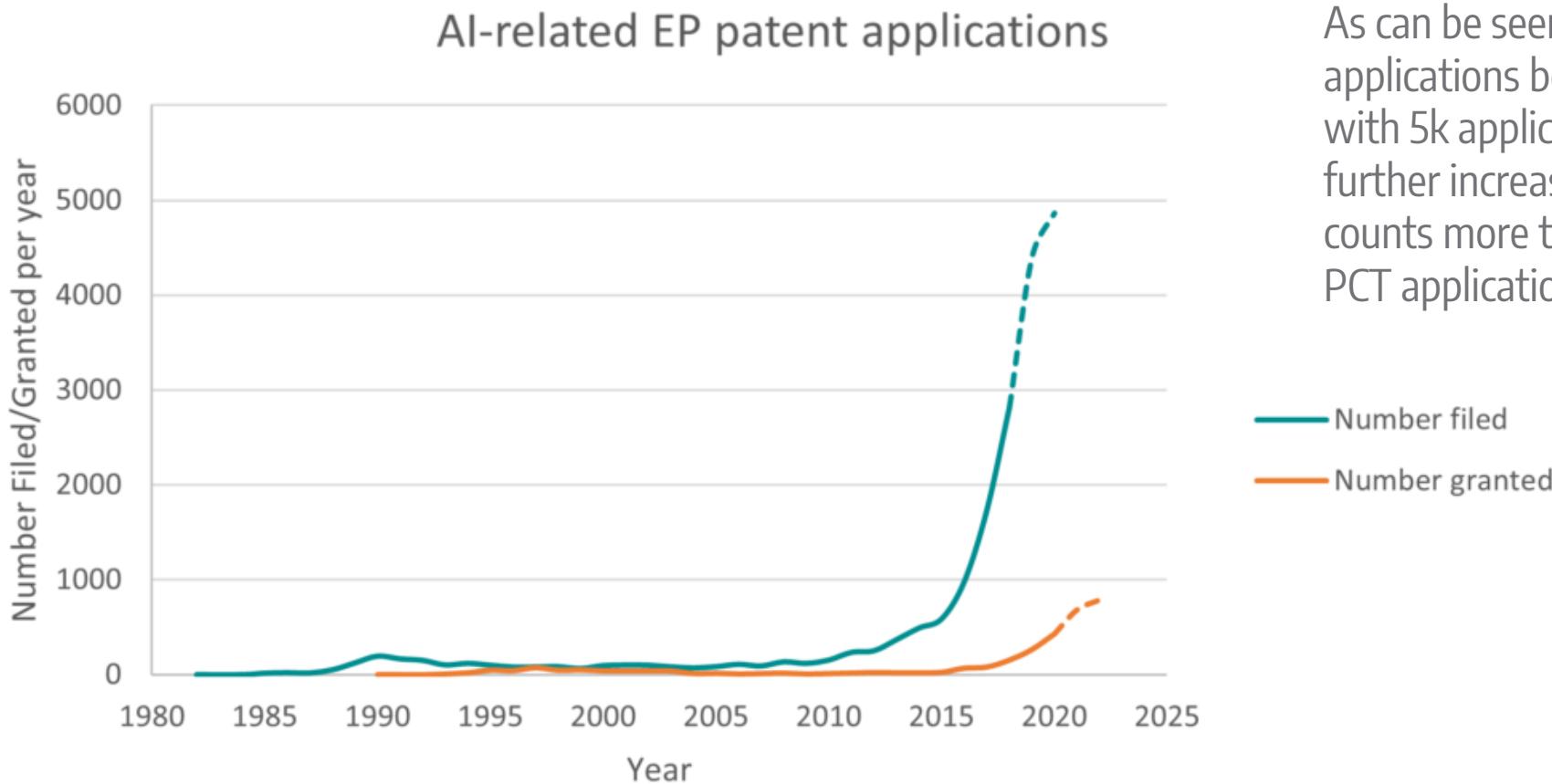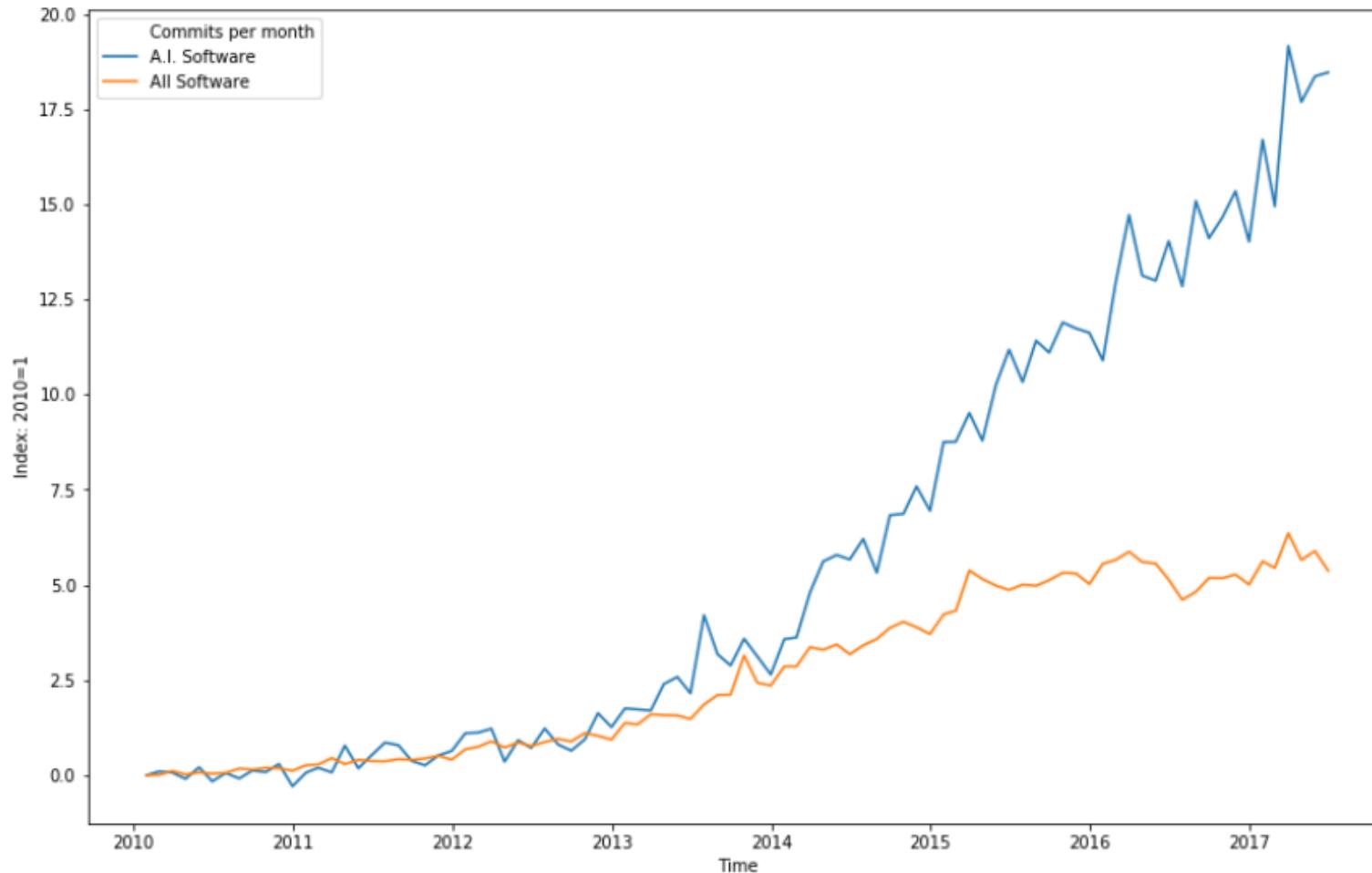
As can be seen, the rapid increase in AI-related applications being filed at the EPO continues, with 5k applications being filed in 2020 alone (a further increase is expected for 2021, which now counts more than 4k, still missing 3 months of PCT applications entering in EP).

Number filed

Number granted

Figure 1: Number of European patent applications filed/granted per year in the four AI CPC classification codes (G06N3/5/7/20)

AI vs "classic" *software*
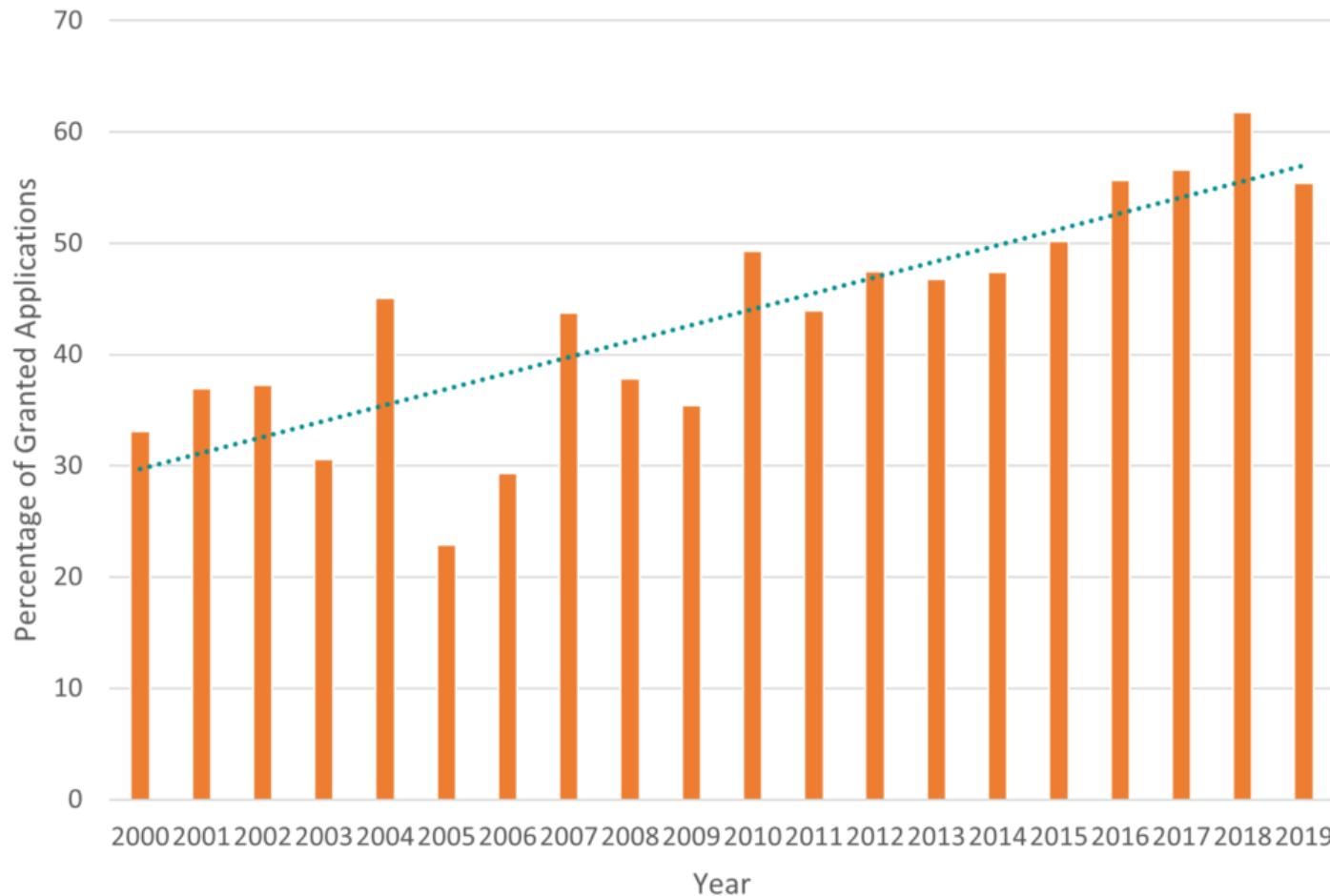
Source: OECD calculations based GitHub data from Google BigQuery and GitHub Search API, 2018.

Trend

Grant Rate - AI Applications 2000-2019
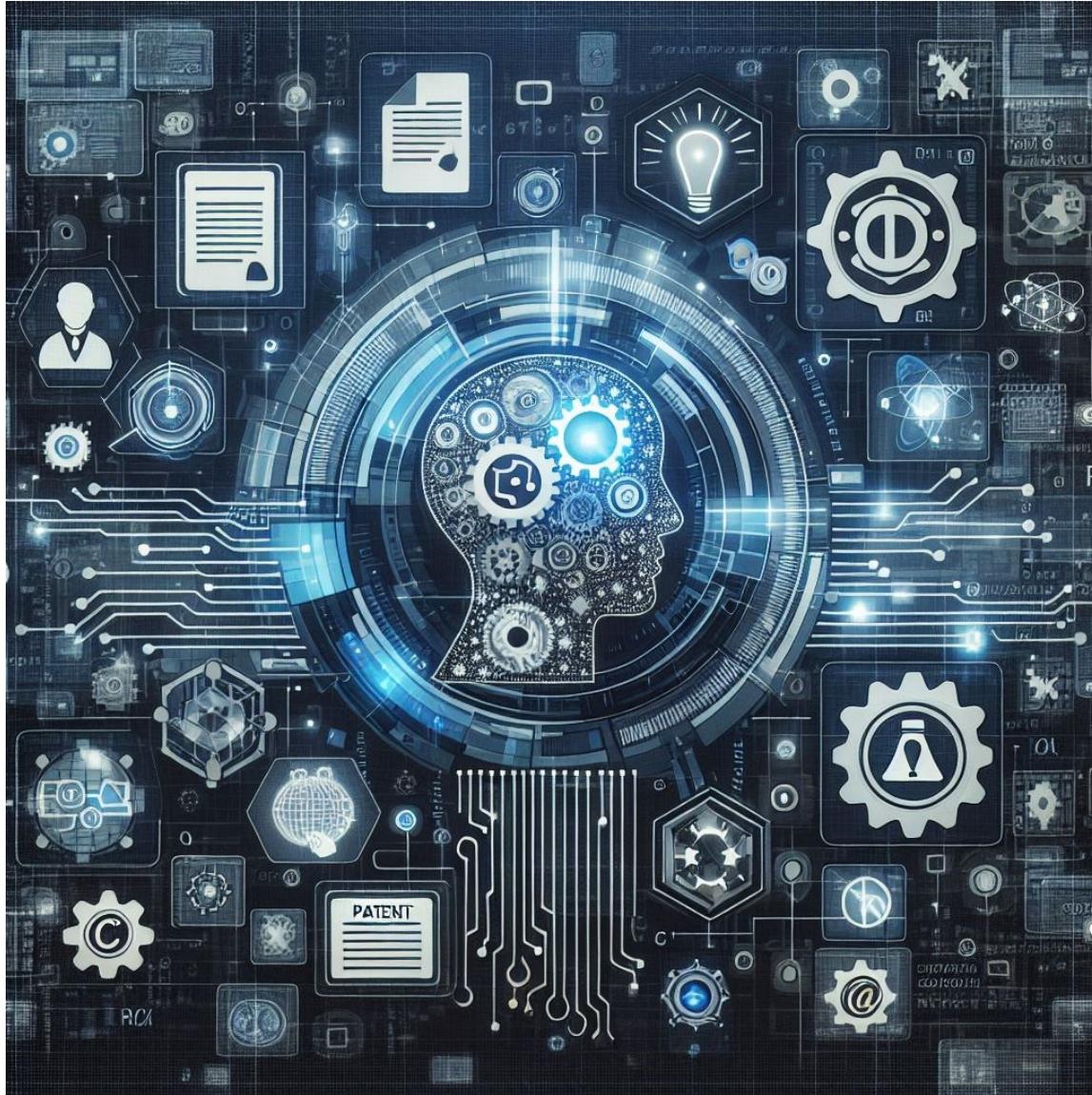
This positive increase in the likelihood of successful grant, combined with the increase in patent applications being filed each year, will continue to result in an overall increase in the number of AI granted patents year-on-year.

Figure 1: Number of European patent applications filed/granted per year in the four AI CPC classification codes (G06N3/5/7/20)

Q&A

Thank you!

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