

Patent protection of Artificial Intelligence at the EPO



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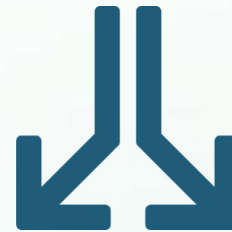
Basic requirements for granting a Patent



Eligibility: a priori exclusion by the law



Patentability: requirements
vis-à-vis the prior art



Absolute
novelty

Non-
obviousness

Basics on software eligibility at EPO

Inventions eligibility Art.52 EPC

(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 [...] shall not be regarded as inventions [...]:

Basics on software eligibility at EPO

Inventions eligibility Art.52 EPC

Mathematical methods

$$\bar{x} = \frac{1}{N} \sum_{i=1}^N x_i$$

Scientific theories, discoveries

$$E=mc^2$$



Business methods, playing games



As such
(all abstract activities)

Intellectual activities' methods



Presentation of information



When considered as a mere product of programming, which is an intellectual activity, it is considered **(as such)** ineligible.

Basics on software eligibility at EPO

Computer-implemented inventions

⇒ This is why the European Patent Office doesn't officially recognize "software patents", but it deals with "computer-implemented inventions":

inventions whose implementation implies the use of a computer or other programmable logic in a specific technology field.



Basics on software eligibility at EPO

Basic eligibility criteria

The invention must have a *technical character*, i.e. a *technical teaching*, that is an instruction addressed to a skilled person as to how to solve a particular *technical problem* (rather than, for example, a purely financial, commercial or mathematical problem) using particular *technical means*.

The word “technical” is however not definable (G 3/08).

Basics on software eligibility at EPO

Technical problems:

- ✓ Controlling an X-ray apparatus
- ✓ Optimising load distribution in a computer network
- ✓ Image denoising
- ✓ Compression of audio, image, video or sensor data
- ✓ Encrypting/decrypting electronic communications

Technical means:

- ✓ Sensors, ports, CPU's
- ✓ Data from physical sensors
- ✓ Data transmission means (internet, optical fibers)
- ✓ Visualization devices
- ✓ Actuators, e.g. motors, arms, transducers
- ✓ Applied algorithms

Examples of eligible methods

- A method for classifying records comprising mathematical steps, the classified records being used in a billing procedure (NO)
- A mathematical method for distributing load in a computer network (YES)
- A cryptographic computation with masking operations to protect the computation against power analysis (YES)
- A method for polynomial reduction operation by word shifts rather than bit shifts by the CPU (YES)
- Enhanced classifier for classification of digital images based on expanded training set - Artificial Intelligence (YES)

Basics on software eligibility at EPO

Further technical effect

Technical method

If the computer program specifies a method which itself produces a technical effect, e.g.

- Controlling the anti-lock braking system
- Determining emissions by an X-ray device
- Compressing video

Control of the computer

If the computer program controls the operation or functioning of the computer, e.g.

- Processor load balancing
- Memory management
- Compilers or builders for processing code at low level

Specific technical considerations

If the design of the program is based on specific technical considerations of the internal functioning of the computer, e.g.

- Algorithms adapted to the underlying architecture
- Security algorithms based on understanding of the internal functions

The computer program produces a further technical effect

Eligibility of AI

Examples of technical applications

- ✓ A method of designing an optical system to determine parameters for optimum optical performance
- ✓ Providing an estimate of the genotype based on an analysis of DNA samples and providing a confidence interval for this estimate to quantify its reliability;
- ✓ Providing a parameter useful for 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 methods

It is not enough to have a computer for the AI (method) to be patentable, because it is a mathematical algorithm:

- A computer can render it eligible in Europe, but, in this case, the AI must also have an **inventive step**.
- The criteria for computer-implemented inventions apply here: in considering a technical contribution associated with a mathematical or business method to the invention, one must consider whether the method, in the context of the invention, produces a **technical effect that serves a technical purpose**.

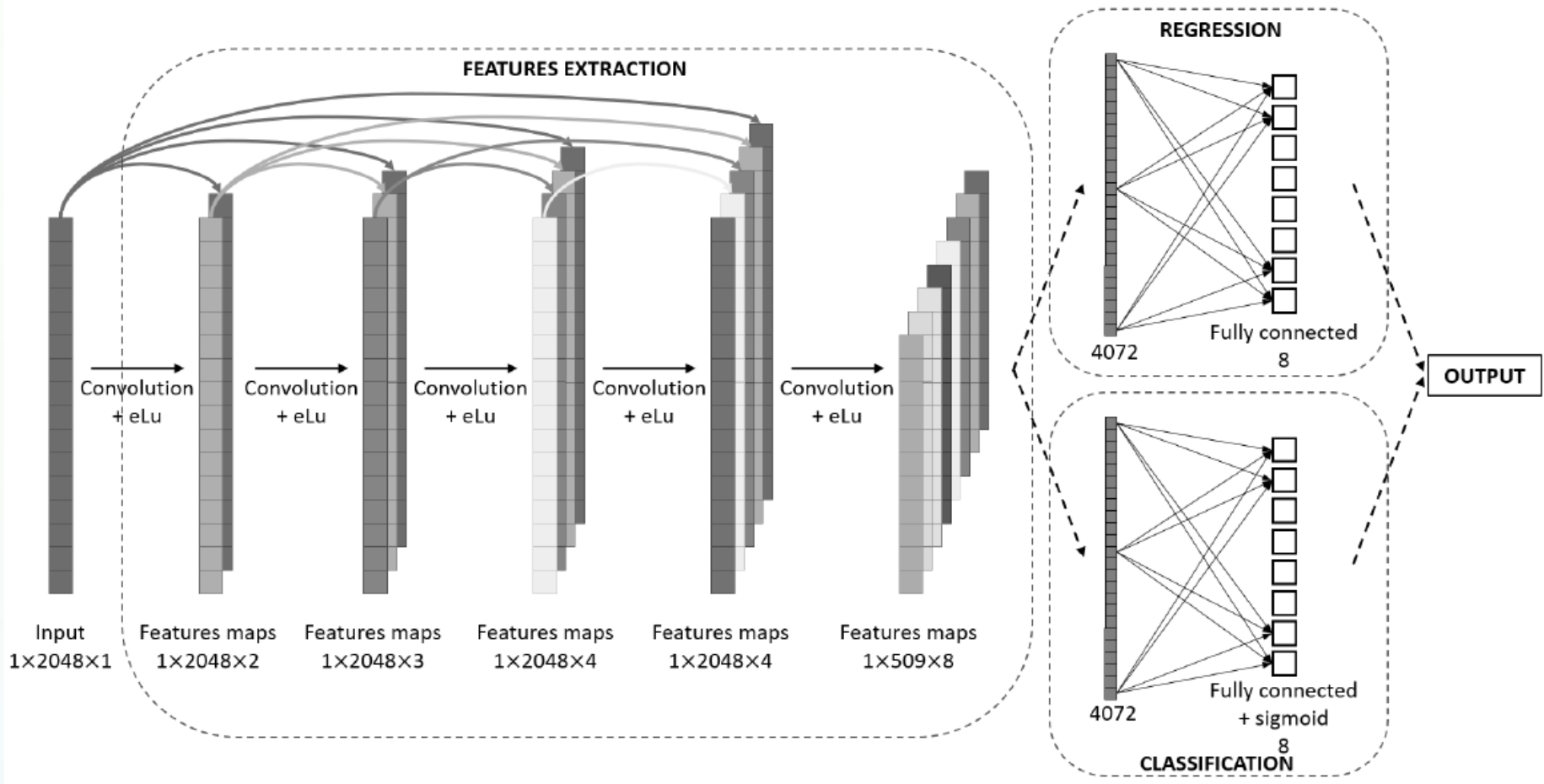
Patentability of AI

Example - EP3989126 B1

- ✓ **Technical purpose:** automatic identification and quantification of radioisotopes in gamma spectra (Applied AI);
- ✓ **Algorithm used:** Convolutional Neural Network (Deep Learning);
- ✓ **Inputs:** gamma spectra images and a predetermined number of isotopes that can be present in the gamma spectra;
- ✓ **Output:** classification and quantification for each of a predetermined number N of radioisotopes which are identifiable in said gamma spectrum image.

Patentability of AI

Example - EP3989126 B1



Patentability of AI

Example - EP3989126 B1

Claim 1 comprises:

- ✓ definition of input and output, data type;
- ✓ definition of the neural network;
- ✓ definition of training data
- ✓ different network branches;
- ✓ final concatenation of the branches;
- ✓ network cost functions.

Eligibility of IA methods

Problem solved:

The objective technical problem: to improve the automated detection and quantification of radioisotopes in gamma-spectrum images, calculated by the known D1 method.

Thanks to:

- A first branch with a classification neural network configured to linearly combine input data and apply a first non-linear activation function to the output neurons;
- A second branch with a quantification neural network configured to linearly combine input data and apply a second linear activation function to the output neurons.

Eligibility of AI methods

The description includes:

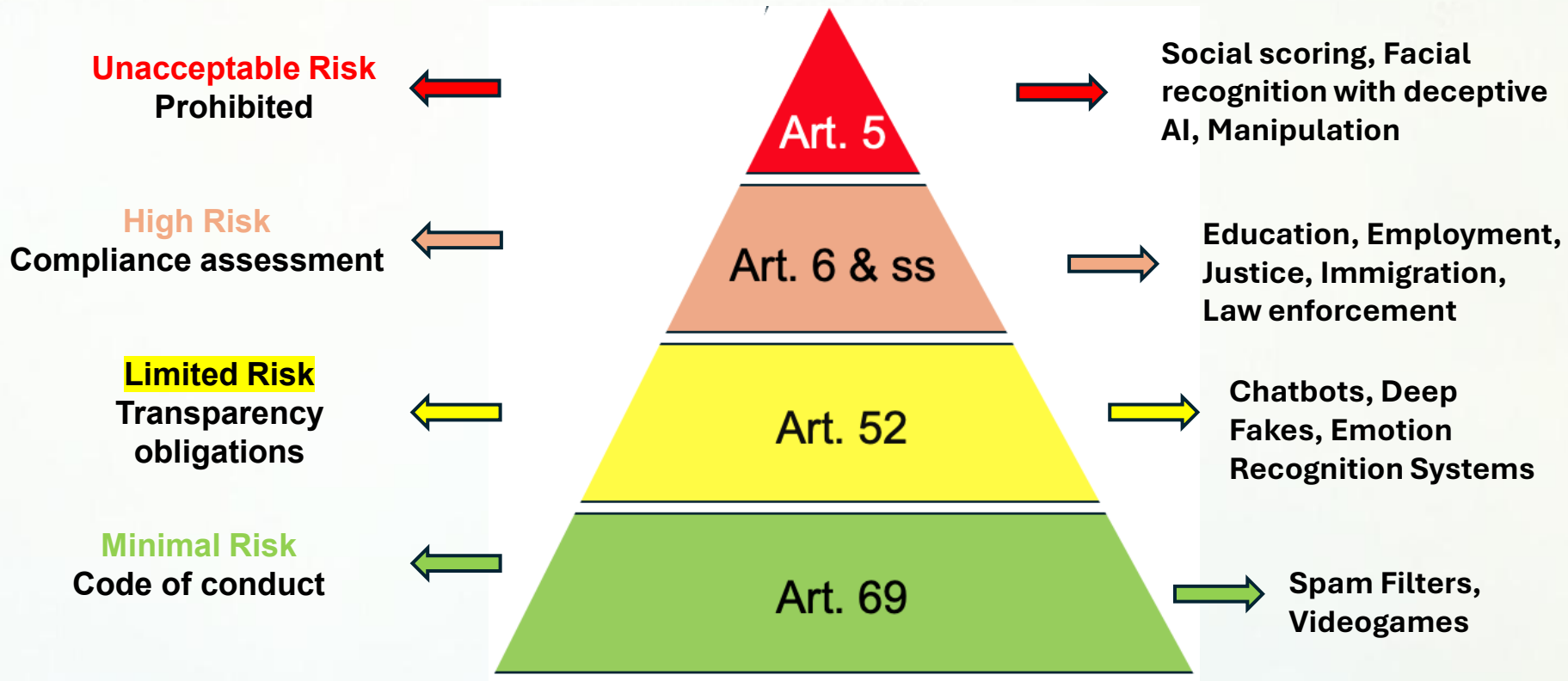
- Structure of the artificial neural networks used as classifiers, their topology, activation functions, final conditions or learning mechanism
- Example of training and validation datasets (how they are collected)
- Confusion matrices for training sets and production sets
- Percentages of false positives and/or negatives
- Comparative efficiency of the model for the specific application (e.g., computation times on specific computers)
- Results by varying the number of NN blocks or other NN parameters

Eligibility of AI methods

Other examples of eligible inventions:

- ✓ A method for designing an optical system, to determine its parameters for optimal optical performance
- ✓ Providing a genotype estimate based on an analysis of DNA samples and providing a confidence interval for this estimate to quantify its reliability
- ✓ Providing a quantitative element useful for medical diagnosis using an automated system for processing physiological measurements
- ✓ Deriving a subject's body temperature from data obtained by an ear temperature detector

EU AI Act: A risk-based approach



EU AI Act: A risk-based approach

- **Unacceptable Risk:** Subliminal manipulation, Exploitation of vulnerabilities of individuals resulting in harmful behavior, Biometric categorization of individuals based on sensitive characteristics, General purpose social scoring, Real-time remote biometric identification (in public spaces), Evaluation of a person's emotional state, Predictive policing, Scraping of facial images
- **High Risk:** AI applications that could have a negative impact on people's health and safety, their fundamental rights or the environment; AI systems related to safety components of regulated products, i.e., AI applications integrated into medical devices, lifts, vehicles or machinery; Law enforcement (such as assessing the reliability of evidence or analyzing crimes), migration, asylum and border control management (such as assessing a person's security risk or examining asylum, visa or residence permit applications); ...

EU AI Act – What does it mean for patents?

- Innovators should bear in mind the EU AI Act when drafting patent applications, ensuring there is a basis in the description to exclude or amend the product/scope of the claims at a later stage, if necessary.
- In the case of pending patent applications and granted patents, consideration should be given to how the EU AI Act must be applied through patent law.
- Conduct fundamental rights impact assessments (FRIA) aimed at mitigating possible harm from high-risk AI systems in relation to individuals' fundamental rights.

Patent protection of AI - Conclusions

- **The patentability of Artificial Intelligence follows the same rules as software patenting, with the addition of specific AI details (layers, input, output, training, performance).**
- **Artificial Intelligence is eligible for a patent when it relates to its technical application, whether hardware or software, and not to the algorithm itself.**
- **An analysis of the invention based on relevant case law is highly recommended, also in view of compliance with the AI Act.**



Andrea Perronace. European patent attorney with 24 years of experience. Andrea got a master in Physics in Rome and got a Ph.D. in Physical Chemistry in Paris, has worked for the European Commission in Brussels. Experienced on patent and design prosecution and litigation, epi full member in EPPC/ICT and LitCom working groups.



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