Examination of Patent Applications Related to Artificial Intelligence

Abstract

The purpose of this document is to provide guidance on the examination of patent applications related to Artificial Intelligence (AI) in the application of the Industrial Property Law and the Guidelines for the Examination of Patent Applications.

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Summary

1. Introduction

1.1. This document establishes specific criteria for examining patent applications involving inventions related to Artificial Intelligence (AI), in accordance with the Industrial Property Law (IPL, Law No. 9,279/96), Guidelines for the Examination of Patent Applications – Block I (Block I Guideline, INPI/DIRPA Ordinance No. 16/2024), Guidelines for the Examination of Patent Applications – Block II (Block II Guideline, INPI/PR Resolution No. 169/2016), the Guidelines for the Examination of Patent Applications involving Computer Implemented Inventions (Guideline of IIC, INPI/PR Ordinance No. 411/2020) and Guidelines on the applicability of the provisions of Article 32 of Law 9279/96 to patent applications (INPI/PR Resolution No. 93/2013).

1.2. The term Artificial Intelligence (AI) is treated in its broad sense to encompass computer systems, methods, and models developed to perform tasks that would normally require human intelligence. This includes, but is not limited to, fields such as machine learning, Natural Language Processing, Computer Vision, Expert Systems (based on rules or fuzzy logic), and evolutionary computing.

1.3. Considering that the most common way of implementing AI methods is through computer programs, inventions related to AI are considered a subgroup of Computer-Implemented Inventions.

1.4. To facilitate the analysis of invention patent applications, creations involving AI are classified into three main categories:

- **AI models and techniques:** Creations related to the specific development of AI models and techniques;
- **AI-based inventions:** Inventions in which AI is an integral part of the invention and part of the proposed solution to the state of the art problem;
- **AI-assisted inventions:** Inventions in which AI is used by a natural person as an aid in the search for a solution to a problem in the state of the art, where the AI used as a tool is not part of the solution;

1.5. Inventions generated autonomously by AI, without any human intervention, are not patentable subject matter, according to Art. 6 of the IPL, since the authorship of the invention must be attributed to a natural person. Thus, an invention that consists merely of activating an AI system as an autonomous solution generator, without any intellectual contribution from a natural person beyond the simple execution of the AI system, is not admissible. However, it is accepted that an AI system may be used by the author in an assisted manner, as an auxiliary tool in the process of arriving at an invention, in the case of an AI-assisted invention.

1.6. AI-assisted inventions presuppose human intervention at some stage of the process, whether in identifying a technical problem in the state of the art; in configuring the AI to achieve a specific objective; or in implementing and validating the solution proposed by the AI as a concrete and viable solution to technical problem identified; or

[1] See opinion no. 00024/2022 Specialised Federal Attorney's Office.

to provide an industrial applicability solution. Even if the AI system generates alternatives or hypotheses for a solution, the inventive concept and the definition of the solution to be protected must result from human intellectual work. Therefore, the assessment of inventive step, as per item 4.5, will focus on the technical effects obtained by the invention and not on the AI system used.

2. Matter Not Considered an Invention (Art. 10 of the IPL)

2.1. In general, any invention must demonstrate the technical nature of the problem to be solved by the proposed solution[2], and it is imperative that the invention:

- Solve a technical problem;
- Present a technical solution; and
- Produce a technical effect.

2.2. In AI-assisted inventions, since Artificial Intelligence is used as a tool and is not an integral part of the invention, the fact that AI is used to arrive at the invention is irrelevant for assessing whether the subject matter of the invention is excluded from protection under Art. 10 of the IPL.

Protection of training data

2.3. Machine learning is highly dependent on large amounts of data. However, databases are subject to intellectual property protection by copyright, pursuant to Art. 7, item XIII, and Art. 87 of Law No. 9,610/1998, and are outside the scope of patent protection.

2.4. Claims directed to databases, data sets, raw/isolated data or equivalents used for training, validation or testing of AI, among other purposes, are not accepted as they are considered to be the presentation of information, which is excluded from protection under Item VI of Art. 10 of the IPL, in which the provisions of item 1.21 of Block II of the Guidelines and section 2.4 of the IIC Guidelines are applied.

Consideration regarding the computer program itself

2.5. Computer programs themselves, i.e., the source code that implements an algorithm, are not considered inventions. However, a technical solution implemented by a computer program that results in a concrete technical effect may be considered an invention and treated as a computer-implemented invention (CII).

2.6. AI-based inventions, as well as AI models and techniques, when implemented by software, must be claimed as computer-implemented inventions (CIIs) and are subject to the same requirements and concepts set forth in the CII Guidelines, more specifically in section 2.3.

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[2] See INPI/DIRPA Ordinance No. 16/2024, item 2.07 and INPI/PR Resolution 169/2016, item 1.1.

Consideration of mathematical methods

2.7. If a process applies a mathematical concept to obtain a solution to a technical problem, such process may be considered an invention provided that the resulting effects are technical and not purely mathematical. [3]Methods that use mathematical concepts to solve a technical problem inserted into a technical field are considered inventions provided that they do not fall under other items of Art. 10 of the IPL [4].

2.8. Artificial intelligence combines mathematical techniques, models and methods based on statistics, linear algebra, calculus, probability theory, etc. to process large amounts of data and identify patterns and relationships between quantities present in the data. For example, in machine learning, training is seen as a mathematical optimisation problem in which one seeks to maximise or minimise a given objective function, subject to a set of constraints.

2.9. AI models and techniques, such as neural networks, genetic algorithms, support vector machines, regression methods, training methods, etc., when not applied to a technical field, are considered mathematical methods in the conception of Item I of Art. 10 of the IPL, and are therefore subject to the provisions of item 1.7 of Block II and section 2.1 of the IIC Guidelines. However, when such creations are applied in a technical field to solve technical problems, they may be considered inventions[5] .

Incidence on other excluded matters

2.10. AI-related creations that fall within the scope of subject matters excluded from protection under Art. 10 of the IPL, such as commercial, financial, educational, advertising, diagnostic, therapeutic, surgical methods, etc., are not considered excluded from protection solely because they combine AI techniques or because the results achieved are derived from such use. [6] [7]

3. Descriptive sufficiency and support for claims (Art. 24 and 25 of the IPL)

Specification

3.1. To comply with the provisions of Art. 24 of the IPL, the Specification must be clear and sufficiently detailed so that a person skilled in the art can reproduce the invention without undue experimentation[8].

3.2. In the context of creations involving AI, the condition of descriptive sufficiency must be analysed with attention to the fact that the description of AI algorithms/systems may fall within what is considered a "black box".

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[3] See INPI/PR Ordinance No. 411/2020, paragraph [011].
[4] See INPI/PR Resolution No. 169/2016, item 1.7.
[5] See INPI/PR Ordinance No. 411/2020, paragraph [013].
[6] See INPI/PR Resolution No. 169/2016, item 1.20.
[7] See items 3.13 to 3.16 of this regulation.
[8] See INPI/DIRPA Ordinance No. 16/2024, item 2.15.

3.3. The term “black box” is generally used to refer to a situation in which the intrinsic and internal details of parts of a process or product are not disclosed. In the case of AI systems, this term is also commonly used to refer to the difficulty of understanding, explaining, and describing how an AI model arrives at a given result.

3.4. Despite the difficulty in accessing the internal logic of an AI system, which is sometimes obscure, and the non-deterministic nature that AI solutions may present, where the reproduction of the invention is unlikely to achieve results that are quantitatively identical to those described in the application, it is understood that the condition of descriptive sufficiency can be met by describing the details necessary to elucidate the invention[9]

> **Example**: The invention refers to a system that captures sounds emitted by a running engine and, through an artificial neural network, identifies which component is faulty. The specification states that the system achieved 95% accuracy in identifying the defective part. However, even using the same data and parameter settings, models with slight variations in performance may be obtained, this can occur because neural network training involves random initialisation of the network weights. In this context, an implementation that does not exactly achieve the reported 95% accuracy does not imply a lack of descriptive sufficiency, provided that the technical solution is sufficiently described and can be reproduced by a person skilled in the art. The technical effect of the invention, in this case, does not lie in the numerical value of the accuracy achieved, but rather in the feasibility of the sound diagnosis method, performed automatically by the proposed system.

3.5. Thus, inventions related to AI must provide all the technical details necessary for a person skilled in the art to reproduce the proposed solution without undue experimentation. The breadth and depth required in the description of such details may vary depending on the nature and complexity of the invention.

3.6. When the details necessary for understanding or reproducing the invention by a person skilled in the art are not described, the application will be considered to be in disagreement with Art. 24 of the IPL.

> **Example**: The invention relates to an AI-based temperature control system for domestic refrigerators, capable of automatically adjusting the operation of the compressor according to the usage profile. However, the specification merely states that "the operation of the compressor is controlled by an AI model trained with historical refrigerator operating data," without specifying which variables are collected (such as internal or external temperature, frequency and duration of door opening, humidity, stored volume, among other possibilities), nor how this data is processed, nor which AI model is used or how it integrates with the control system. The absence of this information prevents a person skilled in the art from reproducing the invention without resorting to undue experimentation, implying a lack of descriptive sufficiency.

3.7. In AI models or techniques specially adapted to solve a specific technical problem, where the contribution to the state of the art lies in the AI model or technique itself, all elements of the AI models or techniques are considered necessary and must be described in detail. The omission of details may result in lack of descriptive sufficiency, in violation of Art. 24 of the IPL.

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[9] See INPI/DIRPA Ordinance No. 16/2024, items 2.06.

Example: The invention refers to a new hybrid neural network model developed for active noise cancellation applications in headphones, designed to operate with low latency and reduced energy consumption. The specification claims that the proposed hybrid model outperforms conventional neural networks in noisy and mobile environments and is particularly suitable for embedded execution on devices with limited computing resources. However, the report does not provide the model architecture, the functions and parameters used, or the training method adopted. As the technical contribution lies precisely in the new AI model adapted to the problem of real-time noise cancellation, the omission of these elements implies a lack of descriptive sufficiency.

3.8. In the case of AI-based inventions, it is necessary for a person skilled in the art to understand or reproduce the invention:

a) **Description of the data set:** The specification must contain a description of the data set that effectively enables the success of the AI system, or a data set that allows the invention to be reproduced must be provided or be accessible by common or public means. The application must contain a descriptive sufficiency of this data set, how the invention structures the relevant information and variables, and the origin and manner in which this data is obtained.

Example: The invention describes a method for determining cardiac output from peripheral blood pressure curves using an artificial neural network. However, the application does not provide a descriptive sufficiency of the data used to train the AI model. The wording merely states, in general terms, that the data should cover a wide variety of patients — with different ages, genders, biotypes and clinical conditions — but does not specify the origin or source of this data, the criteria used for its selection or exclusion, a concrete example of a representative data set, or the relevant features considered in the training. This lack of information is critical, as cardiac output and the shape of the blood pressure curve vary significantly according to physiological variables such as age, gender, and the patient's clinical condition. Without a precise definition of what data is needed to train the network, a person skilled in the art in the field has no means of adequately configuring a training set and is led to undue experimentation in an attempt to reproduce the results of the invention. Thus, the lack of concrete guidance on input data compromises the reproducibility of the proposed solution, makes it impossible to verify the alleged technical effects, and constitutes a violation of the requirement of descriptive sufficiency. [10]

b) **Correlation between input data and data generated by AI:** The application must clearly describe how the input data relates to the data generated by AI. When this relationship is not explicit or evident, the person skilled in the art must be able to minimally assume this relationship.

Example: The invention relates to a system for recommending the type of fertiliser suitable for the soil, where the specification states that the AI system "receives satellite images of the soil as input and generates fertiliser recommendations as output", without providing any description of how the information extracted from these images would be analysed or related to the agronomic features of the soil. The complete lack of explanation of the association between the images and the types of fertilisers indicated makes it impossible to understand the correlation between the input data and the data generated by the AI, making it impossible

[10] Case T0161/18 of the EPO Board of Appeal.

for a person skilled in the art to understand the logic of the system, implying a lack of descriptive sufficiency.

Example: The invention relates to a system that uses AI to estimate the sugar content of an apple from an image taken by the farmer, where the application does not provide any data proving that there is a relationship between the sugar content of the apple and a person's face, nor does it indicate that such a relationship is not known or deducible to a person skilled in the art. Therefore, this application would not meet the condition of descriptive sufficiency.

3.9. The following are non-exhaustive examples of other details that may be considered necessary and, depending on the invention and the AI algorithm claimed, should be included in the specification:

a) **Data set processing:** The procedures applied to the raw data prior to training, such as cleaning, normalisation, standardisation and coding of categorical variables, must be presented, preparing them for the model.

b) **Model algorithm and parameters:** Clearly indicate which AI algorithm or model is used, in addition to detailing essential parameters and hyperparameters, thus allowing a person skilled in the art to reproduce the invention presented without the need to experiment (undue experimentation) with different parameters or models to achieve a similar result. Non-exhaustive examples of AI algorithms or models may include: Feed-forward Neural Networks, Support Vector Machines (SVM), Genetic Algorithms, etc. Non-exhaustive examples of essential parameters and hyperparameters to be detailed may include: neural network connection architecture, activation functions, learning rate, number of layers, population size, crossover rate, mutation rate, number of generations, among others.

c) **Model training:** Describe the techniques used to train the model, including the division of data into training, validation and test sets, as well as the algorithms and optimisation parameters employed (reinforcement training, *overfitting* and *underfitting* prevention techniques, *dropout* methods, etc.).

d) **Model validation and evaluation:** Present the metrics used to evaluate the model's effectiveness and discuss the results obtained, associating them with the technical problem(s) solved by the invention.

e) **Interaction with other technical components:** Provide clear information on eventual interactions between the AI system and other technical components or subsystems relevant to the functioning of the solution.

3.10. Exceptionally, certain details of the AI and procedures adopted in the generation of the AI model may be omitted in the specification of the application, provided that the following requirements are simultaneously met:

I. the alleged contribution to the state of the art does not depend on what has been omitted;

II. the omitted information is already clearly established in the state of the art and is known by the person skilled in the art; and

III. the intended technical result does not depend on a specific omitted configuration.

Example: The invention relates to a steering system for autonomous vehicles that allows parking in narrow spaces in response to voice commands issued by the occupant. The specification states that AI is used to interpret voice commands, but does not specify which speech recognition model or technique is employed. The technical contribution, however, lies in the steering mechanism that allows the steering angle (the angle formed by the wheels in relation to the longitudinal axis of the vehicle) to be increased. As several AI speech recognition techniques are already well established in the state of the art and the choice of model by a person skilled in the art does not directly interfere with the functioning of the developed system, the omission would be admissible.

3.11. When AI is implemented by specialised hardware (e.g. ASICs, FPGAs, etc.), the specification must sufficiently describe the physical and construction elements, including architectural, connectivity and circuit details, as well as any processing mechanisms that support the functioning of the AI system.

3.12. For AI-assisted inventions, when it is stated in the Specification that the invention results from the use of AI to find the solution to a technical problem, the Specification must contain a descriptive sufficiency of how this solution found by AI materialises in the real world and how the invention can be realised[11].

a) The fact that AI proposes a solution that supposedly solves a technical problem does not in itself confirm that the expected technical effect will be achieved, as there may have been, for example, an algorithmic hallucination. Thus, the specification must show that the expected technical effects are in fact achieved by the proposed solution, ensuring descriptive sufficiency.

b) The need to present evidence of the technical effects achieved can be overcome when there is **reliability** in the result generated by the AI system, for example, when the effectiveness of the results was already known to a person skilled in the art at the time of filing.

Drafting of Claims

3.13. Claims in categories directed exclusively to the AI model or technique itself, or to the database (data set) will not be admitted as they fall under the prohibitions listed in Art. 10 of the IPL. Non-exhaustive examples include claims in the following categories: neural networks, genetic algorithms, training methods, training data, regression methods, decision trees, random forests, support vector machines, etc.

3.14. Claims should be drafted in such a way as to make the application clear in the initial part [13]of the claim, preferably in the category of application of the AI model or technique, making the specific application of the AI model or method evident. For example, "Face recognition method using a neural network characterised by..." or "Handwritten character recognition method using a support vector machine characterised by..."

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[11] See INPI/DIRPA Ordinance No. 16/2024, Item 2.13.
[12] See INPI/DIRPA Ordinance No. 16/2024, items 2.07.
[13] See INPI/DIRPA Ordinance No. 16/2024, items 3.04 (i).

3.15. If the claim is initially filed in a category directly related to the AI model, but incorporates technical features that use AI to solve a technical problem, this formulation will be considered inadequate, in view of Art. 25 of the IPL. In this situation, in accordance with clauses 3.13 and 3.14, the claim must be reformulated to fall within the appropriate category.

> **Example**: a claim relating to a method for face recognition, containing the technical features for solving the technical problem of face recognition, claimed as a "neural network training method for face recognition", must be reformulated as "Face Recognition Method using Neural Networks characterised by (...)".

3.16. It should be noted that in the reformulation of the claim referred to in item 3.15 above, the change of category does not constitute a violation of Art. 32 of the IPL, as such inadequacy is considered a "gross error" under the terms of item 2.4, subparagraph iii), of INPI/PR Resolution No. 93/2013.

4. Inventive Step (Art. 8 and 13 of the IPL)

4.1. Art. 8 of the Industrial Property Law (IPL) establishes that an invention is patentable when it meets the requirements of novelty, inventive step and industrial applicability. Art. 13 of the IPL complements this definition by determining that an invention has inventive step when it is not evident or obvious to a person skilled in the art in relation to the state of the art.

4.2. The technical expert, for the purposes of assessing inventive step in AI-related inventions, is considered to be a person or group of persons who have knowledge of both AI methods and techniques and the technical field in which AI is applied[14]. It is assumed that the technical expert has the ability to apply and experiment with usual routines related to data processing, model selection, and the use of AI techniques, as well as machine learning training strategies.

4.3. In AI-based inventions, when the AI system is claimed without details, as per item 3.10, it is considered obvious for the person skilled in the art to select any AI system in the prior art, and therefore, the assessment of inventive step will focus only on the contribution to the prior art that is external to the AI system.

4.4. When adding the use of AI to the solution of a problem known in the prior art, some situations stand out in the analysis of inventive step:

a) **Mere automation of known processes**: The mere automation through AI of a process previously performed manually or deterministically does not show

[14] See INPI/PR Resolution No. 169/2016, item 5.4, and INPI/DIRPA Ordinance No. 16/2024, item 2.14.

inventive step to the invention unless such automation results in an unexpected technical effect[15] [16] .

Example: a cancer level calculation device that calculates the possibility of a person having cancer, using a blood sample from the person, comprising a cancer level calculation unit that calculates the possibility of a person having cancer, in response to an input of measured values of marker A and marker B that were obtained through blood analysis of the person; the cancer level calculation unit includes a neural network that has been trained by machine learning using training data to calculate an estimated cancer level in response to the input of the measured values of marker A and marker B. The state of the art reveals that a doctor can estimate the cancer level based on markers A and B. In this case, the use of a neural network does not add an inventive step because it is merely processing automation.

b) **Mere combination of AI techniques:** it is common in the field of AI to combine known models and techniques in solving different problems and in different technical fields. The mere combination of known AI models and techniques [17], as well as their application in a different technical field [18] or the alteration of elements [19], confer inventive step on the invention only when such combinations produce a technical effect that is unexpected for the person skilled in the art.

Example (without inventive step): The application refers to a method for determining the coupling of sensors inside oil wells using genetic algorithms and artificial neural networks to determine the solution of physical design parameters with the highest possible energy efficiency and to determine uncertainties by means of propagation using, in parallel, the Monte Carlo technique. Although a neural network was not used for simulation in D1, the document suggests the use of a neural network. D1 describes the application of Monte Carlo techniques to genetic algorithms in the calculation of radio links for data transmission along oil wells. The document refers to neural networks as a possible application to the problem in question within a broader spectrum of solutions involving decision support techniques, including genetic algorithms and fuzzy logic. This possibility of combining the Monte Carlo technique with neural networks, already present in D1, although not developed in greater depth in that document, appears more clearly in D2, in which the Monte Carlo model and an analytical reservoir simulation model determined by a neural network are used in the risk analysis of oil wells. Therefore, the mere combination of different techniques, without presenting a differentiated technical effect in relation to the state of the art, does not add an inventive step to the application.

Example (with inventive step): The application refers to a method for determining the linkage of sensors inside oil wells using genetic algorithms and Artificial Neural Networks, to determine the solution of physical design parameters with the highest possible energy efficiency and to determine uncertainties through propagation using, in parallel, the Monte Carlo technique. [Unlike the state of the art, the invention integrates the Neural Network into an adaptive control module that adjusts, in real time, the configuration of each sensor based on the dynamic conditions of the well, such as pressure and temperature variations], and [feeds back the genetic algorithm with these adjustments to continuously recalculate the best linking routes]. Although a neural network was not used for simulation in D1, that document suggests the use of a neural network. D1 describes the application of Monte Carlo techniques to genetic algorithms in the calculation of radio links for data transmission along oil wells and mentions

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[15] See INPI/PR Ordinance No. 411/2020, paragraphs [034] and [035].
[16] See INPI/PR Resolution No. 169/2016, item 5.53.
[17] See INPI/PR Resolution No. 169/2016, items 5.24 to 5.30.
[18] See INPI/PR Resolution No. 169/2016, items 5.35 to 5.39.
[19] See INPI/PR Resolution No. 169/2016, items 5.46 to 5.50.

neural networks as a possibility, but [does not describe the real-time dynamic adaptation of sensor configurations or continuous feedback of the algorithm]. This functional interaction between neural network, adaptive control and genetic algorithm, producing immediate adjustments of sensor settings, results in greater energy efficiency and transmission reliability, constituting a non-obvious technical effect and, therefore, an inventive step.

c) **Mere replacement of AI models or techniques:** when replacing one AI model or technique with another of similar function, it must be assessed whether there has been a specific adaptation of the AI model or technique that leads to a new technical effect, whether unexpected or not obvious to the person skilled in the art[20].

Example (without inventive step): a method for predicting the welding features of a steel plate using a neural network model. The state of the art discloses a method for predicting the welding features of a steel plate using a mathematical model. In this case, replacing the mathematical model with a neural network model does not generate an unexpected technical effect and therefore does not add inventive step.

Example (with inventive step): a method for predicting the welding features of a steel plate using a neural network model integrated with a module for automatic adjustment of welding parameters in real time, in order to correct variations detected during the process. The state of the art discloses a method for predicting the welding features of a steel plate using a mathematical model. In this case, replacing the mathematical model with a neural network model with integrated automatic adjustment capability generates a non-obvious technical effect — immediate correction of parameters resulting in greater uniformity and lower defect rates — and therefore may add an inventive step.

d) **Parameter adjustment and optimisation:** Amending parameters of known AI models, such as the number of layers, number of neurons, learning rate, is generally a routine optimisation procedure known and obvious to a person skilled in the art, unless it is demonstrated that such amendments or selection of parameters (e.g., hyperparameter optimisation) would not be part of the usual experimentation routine of a person skilled in the art and produces an unexpected technical effect([21)].

Example (without inventive step): A method for classifying images in a convolutional neural network (CNN) model in which only the learning rate is changed from 0.01 to 0.005 to achieve greater accuracy. This change is within the scope of adjustments commonly made by any person skilled in the art and does not generate any technical effect beyond what is expected, thus not constituting an inventive step.

Example (with inventive step): A method for classifying images in a convolutional neural network model in which, after analysing the problem, the number of layers, the learning rate and the activation function were adjusted together by a specific optimisation procedure that takes into account the latency of the network in an embedded environment with limited memory resources. This procedure is not trivial for those skilled in the art and allows the network to be run with the same accuracy on hardware that is 50% less powerful, constituting a non-obvious technical effect and an inventive step.

Example (without inventive step): a method that uses a known CNN to identify leukocytes in peripheral blood images obtained by optical microscopy, in which the method increases the number of convolution filters in the first layer and reduces the rate of from 0.01 to 0.001 to

[20] See INPI/PR Resolution No. 169/2016, items 5.51 to 5.53.
[21] See INPI/PR Resolution No. 169/2016, items 5.32 to 5.34.

improve accuracy. These adjustments are routine and part of common hyperparameter optimisation practice in computer vision. A person skilled in the art would expect similar results, with no unexpected technical effect.

Example (with inventive step): a method or system for identifying leukocytes in samples with intense cell overlap and optical artefacts caused by slide preparation. The method describes an adaptive pre-processing module that, prior to CNN, analyses the cell density and light intensity of the image and automatically adjusts hyperparameters such as kernel size, network depth and learning rate, optimising them for each individual image. The method or system can substantially increase the accuracy rate on slides with extreme cell overlap, something that would not be achieved with fixed manual adjustments. The optimisation is conditioned by a biological and physical feature of the sample, not just generic trial and error, producing a new technical result that is not predictable for a person skilled in the art.

e) **Interaction with hardware:** AI inventions that offer a technical advantage resulting from a particular hardware implementation (e.g., parallel or distributed processing), in synergy with an AI algorithm, may be recognised as an inventive step when a technical effect is unexpected compared to the case where the AI algorithm runs on a generic processor[22]. In this case, the unexpected technical effect must be directly derived from the invention and not merely inherited from hardware known in the prior art.

Example (without inventive step): An image recognition system uses a standard convolutional neural network to classify biological samples. In the prior art, this same algorithm is executed on conventional CPUs. The application proposes to execute the same code on a state-of-the-art GPU, achieving a 60% reduction in processing time. The gain is a direct result of the GPU's greater parallel processing capacity, without any amendments to the interaction between the algorithm and the hardware. In this case, the technical effect is inherited from the known properties of the hardware and is predictable for a person skilled in the art, and therefore does not constitute an inventive step.

Example (with inventive step): An image recognition system for histopathological diagnosis uses a convolutional neural network adapted to dynamically and coordinately exploit multiple GPUs and an FPGA* module dedicated to high-resolution image pre-processing. The network architecture is designed to automatically reconfigure its topology and redistribute the convolutional layers among the devices according to the complexity of the images, reducing latency and enabling real-time analysis even for high-definition images. This performance gain is not only the result of the raw power of the hardware, but also of the functional synergy designed between the specialised hardware and the algorithm, resulting in a technical effect that is not obvious and unexpected when compared to running the same algorithm on a generic processor.

*An FPGA (Field-Programmable Gate Array) module is a reprogrammable digital chip that allows its internal architecture to be configured after manufacture. It performs operations in parallel, with low latency, making it ideal for tasks that require high performance, such as signal processing and AI acceleration. Unlike CPUs and GPUs, its internal logic can be tailored to the desired application. It is widely used in telecommunications, computer vision, and embedded systems.

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[22] See INPI/PR Ordinance No. 411/2020, paragraphs [021], [022] and [035].
[23] See INPI/PR Resolution No. 169/2016, items 5.52.
[24] See INPI/PR Ordinance No. 411/2020, paragraphs [022].
[25] See INPI/PR Ordinance No. 411/2020, paragraphs [035].

f) **Data processing:** The stages of processing or specific treatment of the data collected to be used by AI may confer inventive step to the invention when resources for obtaining the data, techniques for processing input data or for creating training data (e.g., configuration of the training environment, standardisation, normalisation, vectorisation) not obvious to a person skilled in the art are used. An invention that differs from the prior art only by the set of training data, where any difference in the results obtained lies solely in the quality, organisation or data volume, will be considered an obvious choice for a person skilled in the art. Similarly, the mere combination of known training data does not confer inventive step on the invention, as such amendments are considered obvious and without an unexpected technical effect.

Example (without inventive step): An AI system for recognising patterns related to eye diseases uses a deep learning model trained with retinal images. The alleged difference is the use of a new data set obtained by combining two already known public image banks, increasing the total volume of images available for training. As there is no technical change in the image acquisition or processing process, and the improvement in results is due solely to the quantity and organisation of data, this is an obvious choice for a person skilled in the art and does not constitute an inventive step.

Example (with inventive step): this same AI system now uses a deep learning model trained with retinal images obtained by a new adaptive capture method, which automatically adjusts lighting and focus based on the features of the patient's eye in real time. These images undergo pre-processing that includes colour normalisation to correct variations between different devices and vectorisation of vascular patterns to improve early detection of subtle anomalies. These data acquisition and processing steps are not obvious to the skilled person and produce a non-obvious technical effect — a proven increase in diagnostic sensitivity — constituting an inventive step.

4.5. Effects such as increased processing speed, ability to handle large volumes of data, improved estimation accuracy or error reduction, among others, are, in many cases, expected results from the simple application of AI models. When these effects result solely from the known use of these techniques — without a particular technical configuration, a specific adaptation to the technical problem or a non-obvious functional interaction with other components of the system — such effects, in themselves, do not confer an inventive step on the invention.

Example (with inventive step): A quality control system on a production line uses a machine learning model that not only inspects glass bottles but also correlates, in real time, the types of microcracks detected with the operating parameters of the moulding machine (e.g., mould temperature and air pressure). When it identifies a recurring pattern of a specific type of defect, the system automatically calculates and applies micro-adjustments to the machine parameters, correcting the root cause before a significant number of defective products are generated. This feedback architecture (feedback loop) between the defect detection and dynamic control of industrial equipment produces a non-obvious technical effect — proactive failure prevention — that goes beyond the expected benefit of simple automated inspection and may constitute an inventive step.

4.6. In the context of **AI-assisted** inventions, the use of AI as a tool to develop a new invention does not replace the human intellectual capacity necessary for inventive conception and realisation of the invention, and the use of AI is sufficient to confer

inventive step to the invention. The focus of the analysis of inventive step lies on the object actually claimed and the concrete technical effects provided by the invention, and not on the AI system used as a tool. The technical effect achieved must be the result of a solution whose technical content has been structured, validated and claimed by a natural person with effective intellectual activity. Human activity must go beyond the mere selection or activation of an AI system ("pressing a button"), and a real contribution to the conception of the invention is required.

If you have any doubts or if you require any further information or clarification, please do not hesitate to contact us at international@simoes-ip.com.