Appleyard Lees

Patenting AI: EPO to US & Japan.

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Innovation | Branding | Strategy | Solutions

European Patent Office

Computer implemented inventions & examination

Computer implemented inventions

A computer implemented invention (CII) involves use of a computer, computer network or other programmable apparatus, in which one or more features are realised wholly or partly by means of a computer program

Artificial Intelligence (AI) encompasses computers that exhibit behaviours perceived as intelligent by humans, including learning, reasoning, inferring and decision-making

Machine Learning (ML), a class of AI, gives the computer an ability to change behaviour according to experience

EPO examines inventions based on AI and ML as CIIs.

Examining AI & ML

Case Law of the Boards of Appeal limited regarding AI and ML, but extensive corpus of case law since G3/08 on CIIs is expected to apply similarly

Two-hurdle approach

1st hurdle: The claimed subject-matter must have **technical character**. Claims may contain a mix of technical and non-technical features.

2nd hurdle: Inventive step may only be supported by features which contribute to **technical character** i.e. those features which contribute to the solution of a **technical problem** by providing a **technical effect**, giving a **technical contribution**.

Types of AI patenting

Guidelines for Examination (revised November 2018) include illustrative examples for examination of AI and ML

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

‘Core AI’ – relates to algorithms as such and hence not patentable

Trained models/machine learning – claiming variations and ranges may be challenging

AI as a tool in an applied field – defined via technical effects.

EPO – refused & revoked

Computer implemented inventions & examination

Method for ranking of live web applications EP2437207A1

…receiving (130) at least one data stream, each having a content and associated with a corresponding one of the plurality of live web applications;
…evaluating (140) the content of the at least one data stream **using machine-learning algorithms**;
…ranking (150) the plurality of live web applications relative to each other...

‘no inventive step can derive just from the use of machine learning’ (T1510/10)

Related term suggestion for queries EP1587011A1

generating term clusters as a function of calculated similarity of term vectors… generated from search results;
…evaluating the term/phrase in view of terms/phrases in the term clusters to identify related term suggestions…

generating a trained classifier … by **using a statistical classification and machine learning tool**…

‘this algorithmic feature does not render the non-technical algorithm technical.’ (T 2418/12)

Automatic genotype determination EP0736107B1

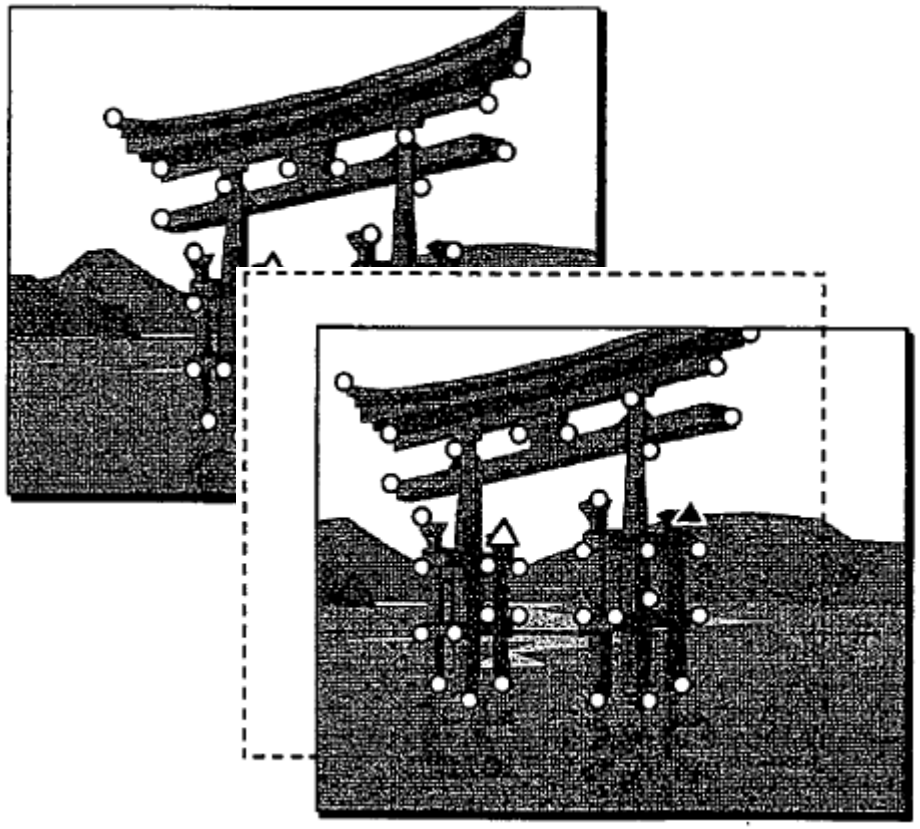
A method of determining the genotype at a locus within genetic material obtained from a biological sample…
A. reacting the material at the locus to produce a first reaction value indicative of the presence of a given allele at the locus;
C. **establishing a distribution set of probability distributions**…
F. wherein each allele is a single specific nucleotide.

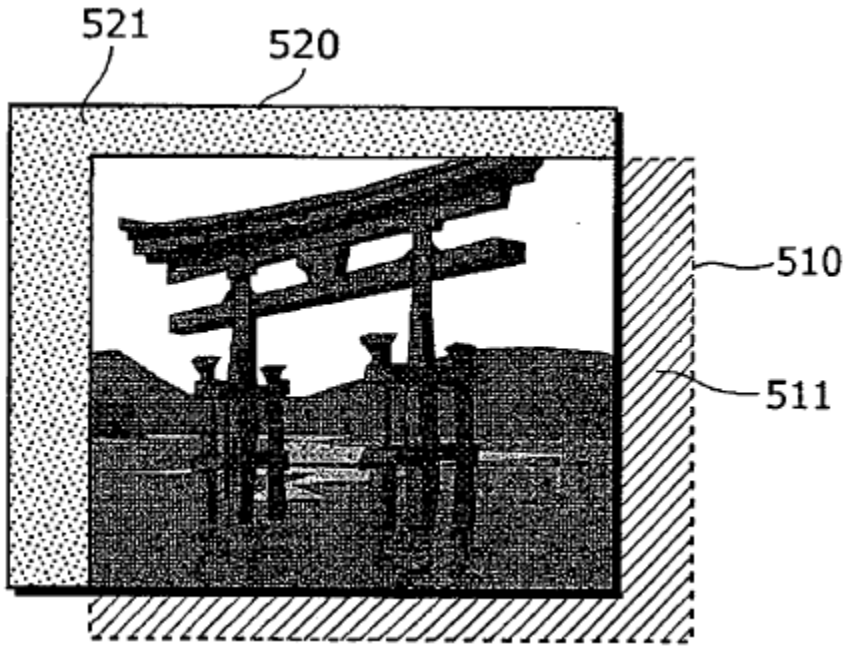
‘Inventive step to be evaluated merely on basis of general and broad wording of step A’

EPO – allowed

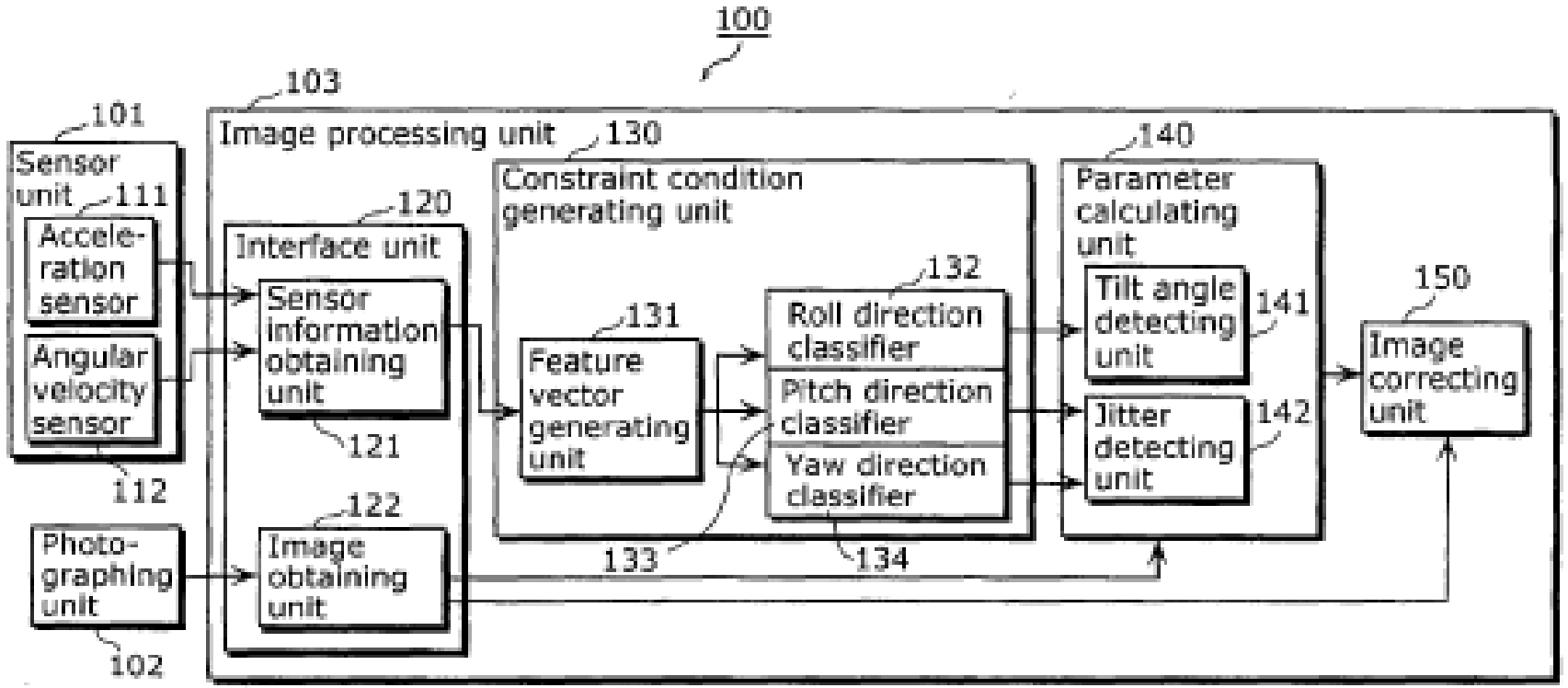
Computer implemented inventions & examination

Correcting large video jitter EP2214403B1





Claimed features



Reasons for grant

Movement of photographing device is identified based on:

- a result of previously-executed machine learning of a feature vector; and
- an actual movement of the photographing device;

allowing for:

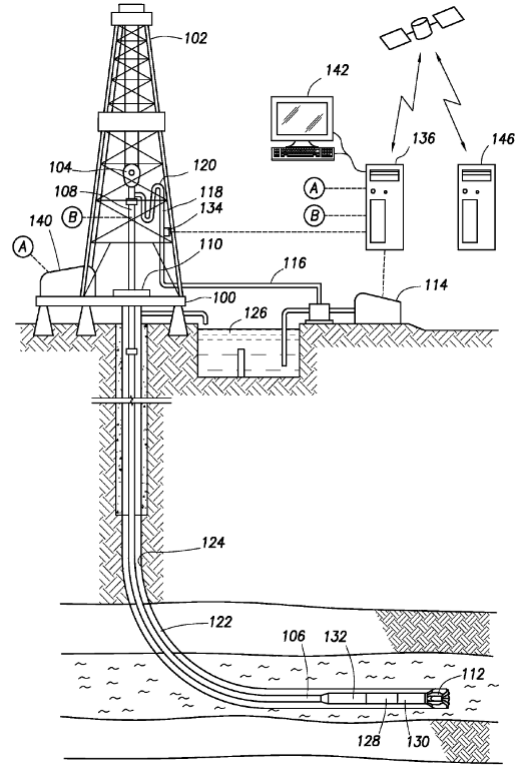
- a smaller search range to be used;
- increasing accuracy of the parameter (for example, a tilt angle of the image or an amount of translation); and
- reducing operation cost for the searching.

Predicting a drill string stuck pipe event EP2773848B1

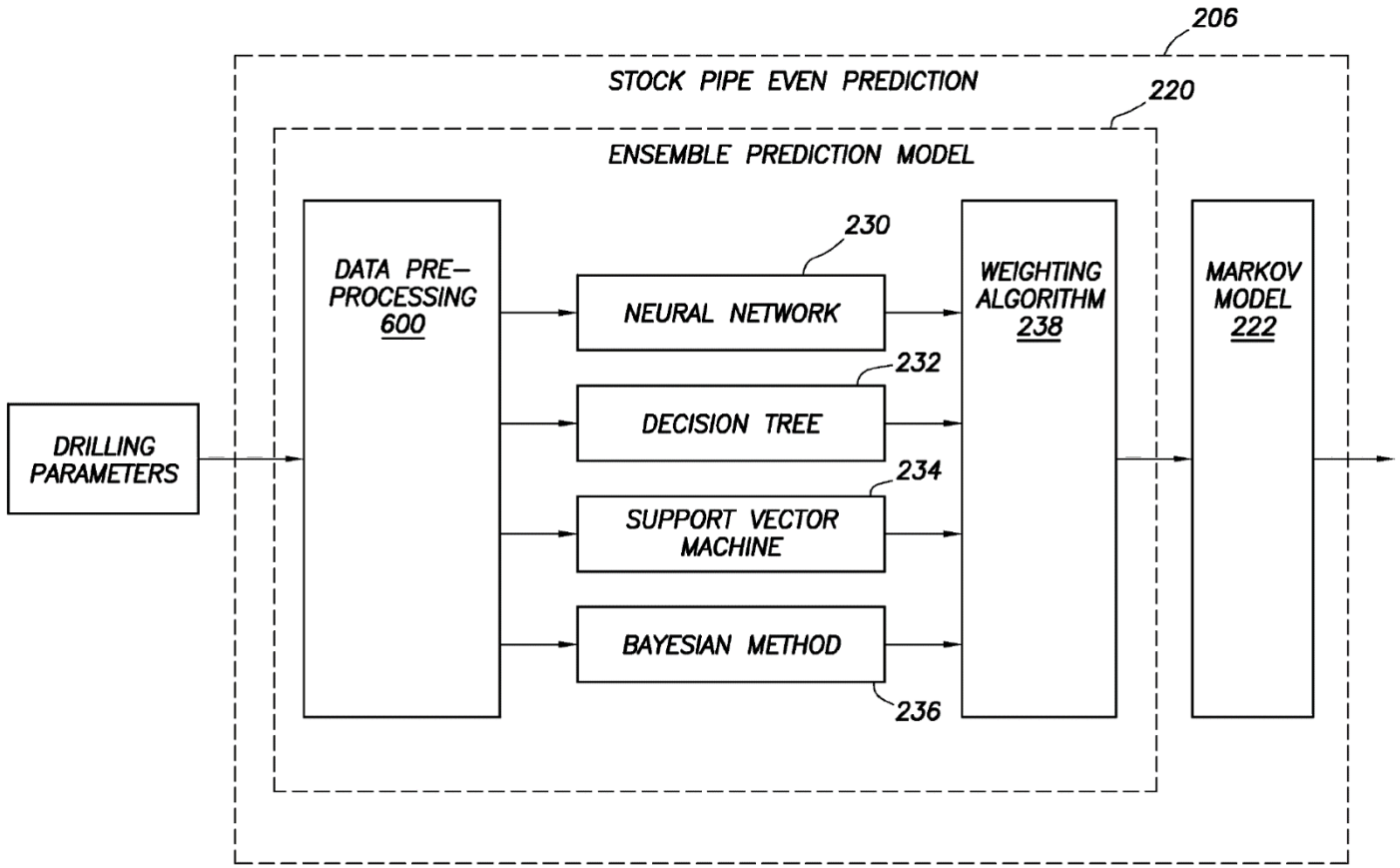
Technical problem:
Drill string becoming stuck in a borehole during drilling

Closest prior art:
Use of echo state networks for stuck pipe detection

An echo state network is a recurrent neural network with a sparsely connected hidden layer.



Claimed features



Reasons for grant

Technical effect of combination:

- increased accuracy; and
- decreased false positive indications.

[0031] Still referring to Figure 2, the ensemble prediction model 220 may itself comprise a plurality of distinct machine-learning algorithms operated in parallel. That is, the inventors of the current specification have found that while any one machine-learning algorithm may somewhat accurately predict the likelihood of future stuck pipe events, combining three or more distinct machine-learning algorithms may increase the accuracy and thus decrease false positive indications. More particularly still, the inventors of the present specification have found that in some situations a combination of four machine-learning algorithms operated in parallel provide a good balance of high accuracy versus system complexity. The four example machine-learning algorithms comprise a neural network 230, a decision tree 230, a support vector machine 234, and Bayesian methods 236. Each of the example machine-learning algorithms will be addressed in turn.

AI system for genetic analysis EP1222602B1

A method for diagnosing and recommending treatment

i. **Collecting hybridization information of an array of peptide nucleic acid probes comprising …**
ii. Transmitting hybridization information …
iii. Analyzing said hybridization information to generate a hybridization profile
iv. Determining the most likely pathological conditions suggested by the comparative analysis of hybridization profiles, using artificial intelligence routines …
v. Recommending methods of treatment.

Reasons for grant

Board of Appeal (T 1285/10)
Reviewed first instance decision on added matter & sufficiency
No TBA decision on inventive step
Obiter dictum observation that claims of requests

After remittance
Inventive, in view of use of hybridization information from an array of peptide nucleic acid probes.

Detection of visible defects EP2887055B1

Method of detection of visible defects in physical parts comprising:
- imaging a number of parts (50) without visible defects and a number of parts (50) with known visible defects, thereby obtaining a number N of sample images corresponding to a given part;
- combining said sample images for each part into an N-dimensional image for each part having N dimensions per pixel;
- performing a dimensionality reduction of said N-dimensional images.

Controlling a turbine using a recurrent NN EP2801000B1

i) the **input layer** (I) is formed from first vectors of neurons that describe sensor values (zt) and/or actuator values (at) at the instants (t),
ii) the **recurrent hidden layer** (V) is formed from second vectors of neurons that describe the hidden state (st) of the turbine (T) at the instants (t)…
iii) **the output layer** (0) is formed from at least one third vector of neurons that describe the rating signal (rt) or at least one portion of the sensor values (zt) and/or at least one portion of the actuator values (at) at the instants (t)...

USPTO

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Abstract ideas

New guidance (04 January 2019) on patent-eligible subject matter

A computer-implemented method of training a neural network for facial detection comprising:

collecting a set of digital facial images from a database;

applying one or more transformations to each digital facial image including mirroring, rotating, smoothing, or contrast reduction to create a modified set of digital facial images;

creating a first training set comprising the collected set of digital facial images, the modified set of digital facial images, and a set of digital non-facial images;

training the neural network in a first stage using the first training set;

creating a second training set for a second stage of training comprising the first training set and digital non-facial images that are incorrectly detected as facial images after the first stage of training; and

training the neural network in a second stage using the second training set.

Section 101 reform

New Director Iancu on Patentability of Algorithms at Senate Judiciary Committee Hearing:

This is one place where I believe courts have gone off the initial intent.

As a general proposition, human-made algorithms that are cooked up, invented as a result of human ingenuity are different from discoveries and mathematical representations of these discoveries.

Senators Coons & Tillis and Representatives Collins, Johnson and Stivers at Senate Judiciary Subcommittee on IP:

Today, US patent law discourages innovation in some of the most critical areas of technology, including artificial intelligence, medical diagnostics and personalized medicine.

Upgrading the patent eligibility test is critical if we want American innovation to continue to lead worldwide.

Sufficiency

The European patent application shall disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

Article 83 EPC

A detailed description of at least one example

A single example may not suffice if the claimed scope is broad

Lack of sufficiency cannot be remedied after the date of filing

Refusal in examination

Ground of opposition.

Reproducibility checklist

Presented by Joelle Pineau at the Posner Lecture at the Neural Information Processing Systems Conference (NeurIPS) 2018

Mandatory requirement for papers submitted to NeurIPS 2019.

Reproducibility checklist – algorithms

For all algorithms presented, check if you include:

A clear description of the algorithm;
An analysis of the complexity (time, space, sample size) of the algorithm; and
A link to downloadable source code, including all dependencies.

Reproducibility checklist – theoretical claim

For any theoretical claim, check if you include:

A statement of the result;
A clear explanation of any assumptions; and
A complete proof of the claim.

Reproducibility checklist – figures & results

For all figures and tables that present empirical results, check if you include:

A complete description of the data collection process, including sample size;
A link to a downloadable version of the dataset or simulation environment;
An explanation of how sample were allocated for training / validation / testing;
An explanation of any data that were excluded;
The range of hyper-parameters considered, method to select the best hyper-generator configuration and specification of all hyper-parameters used to generate results;
The exact number of evaluation runs;
A description of how experiments were run;
A clear definition of the specific measure or statistics used to report results;
Clearly defined error bars;
A description of results including central tendency (e.g. mean) and variation (standard deviation); and
The computing infrastructure used.

Japanese Patent Examination Handbook

Determination on the Description Requirements for the Description and Claims:

i. the condition where it can be recognized that there is a certain relation such as a correlation among the multiple types of data based on the disclosure in the description, or

ii. the condition where it can be presumed that there is a certain relation such as a correlation among the multiple types of data in view of a common general technical knowledge.

Explicitly identify correlation between a training dataset and an output, or

Present test results of a resulting model ‘unless an estimation result by AI can be a substitution for an evaluation on a product that has actually been made

Solution: reproducibility checklist.

EPO Conference on Artificial Intelligence

Claiming trained models/machine learning

Comparative examples and parameter ranges might be needed *and inventive step practices from other areas such as industrial chemistry might be relevant.*

It was suggested that the EPO could be more lenient regarding the technicality conferred by specific datasets and allow the "second use of a model" by analogy to second medical use claims in pharmaceutics.

Uses should not be considered equivalent if arrived at by different means.

Summary

Patenting AI: EPO to US & Japan

Computer implemented inventions

Problem: inventive step

Solution: technical effect, giving a technical contribution;

Problem: sufficiency

Solution: reproducibility checklist.

Questions?

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