

Patent Applications for AI-related Inventions in View of Examination Case Examples*

by Akira KISHI**

1 Introduction

In recent years, patent applications for inventions that use AI (Artificial Intelligence) to analyze, learn, and utilize data are increasing. As examination case examples pertinent to such AI-related inventions, examination case examples on the description requirements and inventive step were added to the Examination Handbook on January 30, 2019. In this article, we describe practical guidelines for patent applications for AI-related inventions based on the examination case examples added by the Japan Patent Office.

2 Examination Case Examples Pertinent to Description Requirements for AI-Related Inventions

Concerning the enablement requirement (Paragraph 4(i) of Article 36 of the Patent Act), which is one of the description requirements, the Japan Patent Office considers that multiple types of data contained in training data should have a certain relation therebetween in order to create a trained model having a certain level of estimation accuracy. The training data is a set of data on an example

question provided to AI and an answer thereto in supervised learning. AI outputs an estimated result (output data) based on the example question (input data), and updates a parameter or the like based on whether the estimated result matches the answer associated with the example question. The Japan Patent Office considers that, if there is a correlation between multiple types of data contained in training data, that is, between input data input into an estimation model (AI) and output data output from the estimation model, it is possible to create a trained model having a certain level of estimation accuracy when AI learns the correlation from the training data.

As an examination case example pertinent to the enablement requirement, a “body weight estimation system” (Case Example 49) is illustrated.

This body weight estimation system is intended to generate an estimation model through machine learning, by using, as training data, a feature amount representing a face shape of a person (for example, a face-outline angle), and actually measured values of a body height and a body weight of the person, and to output an estimated value of the body weight of the person based on the feature amount representing the face shape and the body height of the person, by using the generated estimation model.

In the detailed description of the invention, Fig. 1 defines an angle formed by a tangent line to a cheek and a tangent line to a jaw as the face-outline angle, and Fig. 2 shows statistical information indicating data plotted in a coordinate system in which the axis of abscissas represents BMI and the axis of ordinates represents the cosine of the face-outline angle.

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** Patent Attorney, 3rd Electrical/Information Division, Fukami Patent Office, p.c.

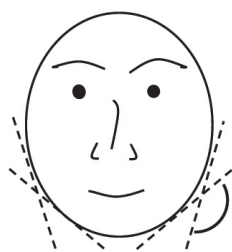


Fig.1
face-outline angle

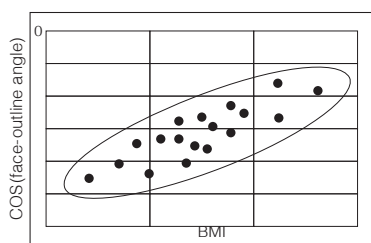


Fig.2
COS(face-outline angle)

The Japan Patent Office determines that the enablement requirement is satisfied by disclosing, in the detailed description of the invention, a correlation between multiple types of data (in this example, the face-outline angle and the BMI defined by the body height and the body weight) contained in training data, by using statistical information as shown in Fig. 2.

Although such a guideline is provided by the Japan Patent Office, since it is presumed that, in most AI-related inventions, a correlation can be found between multiple types of data contained in training data in view of common technical knowledge at the time of filing, we think that it is not necessary to indicate the presence of a correlation in the detailed description of the invention in such a case.

As data to be input into an estimation model, a plurality of data such as shape, size, and color are used as in image processing, and AI may find a feature based on the plurality of data. In this case, since the plurality of input data is multi-dimensional, it would be difficult to represent a correlation using a two-dimensional graph of input data and output data, as shown in Fig. 2 of Case Example 49.

It is also presumed to enhance support for the scope of a right by describing, in the detailed description of the invention, various variations of input data within the scope of the technical idea of the invention. As the number of combinations of input data and output data increases, it becomes more difficult to indicate a correlation therebetween. However, if the correlation between input data and output data is obvious in view of common technical knowledge at the time of filing, we think that it is not necessary to use a drawing to disclose the correlation. Thus, there is an advantage that the

specification can be enhanced by multiple variations.

In actual AI development, as a result of data mining, AI may find the effectiveness of a combination of input data and output data that has not been considered. That is, there may be a case where a correlation that has not been presumed based on common technical knowledge at the time of filing is found in the course of AI development. Although unpredictability between input data and output data in an estimation model seems to be effective to affirm the inventive step, if such unpredictability becomes excessive on the other hand, the correlation therebetween may fall beyond common technical knowledge at the time of filing. That is, from the viewpoint of the unpredictability between input data and output data in the estimation model, the inventive step and the presence of the correlation have a trade-off relation. Accordingly, when there is unpredictability between input data and output data in an estimation model, it would be necessary to describe a correlation in the detailed description of the invention, just as requested by the Japan Patent Office.

When the correlation between multiple types of data contained in training data cannot be represented using a drawing, it is also possible to attach data of a performance evaluation experiment on a generated trained model to indicate that sufficient estimation accuracy is achieved.

As an examination case example indicating a correlation using a performance evaluation experiment, a “method for estimating an allergy incidence rate of a test substance” (Case Example 50) is illustrated.

This method for estimating an allergy incidence rate of a test substance is intended to generate an artificial intelligence model through machine learning by using, as training data, a group of data including a combination of ellipticity, rugosity, and oblateness of a human X cell, and scoring data of an incidence rate of contact dermatitis, and to estimate the incidence rate of contact dermatitis with a certain accuracy from data that has not been used for learning, by using the generated artificial intelligence model. The detailed description of the invention indicates an experimental result proving

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that the artificial intelligence model can estimate the incidence rate of contact dermatitis with a certain accuracy.

When a generated trained model actually exists as described above, data of a performance evaluation experiment on the trained model may be attached to indicate that sufficient estimation accuracy is achieved.

The practical guidelines for the enablement requirement for AI-related inventions can be summarized as described below.

- When a correlation can be found between multiple types of data contained in training data in view of common technical knowledge at the time of filing, it is not necessary to indicate the presence of a correlation in the detailed description of the invention, and thus the specification can be enhanced by multiple variations.
- When no correlation can be found between multiple types of data contained in training data in view of common technical knowledge at the time of filing, it is necessary to indicate the presence of a correlation in the detailed description of the invention in order to satisfy the enablement requirement.
- When no correlation can be found between multiple types of data contained in training data in view of common technical knowledge at the time of filing, data of a performance evaluation experiment on a generated trained model may be attached to indicate that sufficient estimation accuracy is achieved.

3 Examination Case Examples Pertinent to Inventive Step of AI-Related Inventions

The most common AI-related inventions are those that apply AI to existing business operations and existing systems in the field of technology. That is, there are a large number of inventions of techniques that allow AI to perform a job that has been performed by persons in order to drastically

improve efficiency or obtain an output (estimated result) that has not been obtained. As an examination case example indicating such application of AI to an existing business operation or system in the field of technology, claim 1 of a “system for estimating a hydroelectric power generating capacity” (Case Example 34) is illustrated.

[Claim 1]

A system for estimating a hydroelectric power generating capacity of a dam, comprising: a neural network that is built by means of an information processor, the neural network having an input layer and an output layer, input data to the input layer containing a precipitation amount in an upstream region, a water flow rate of an upstream of a river, and a water inflow rate into the dam during a predetermined period between a reference time and a predetermined time before the reference time, output data from the output layer containing a hydroelectric power generating capacity in the future after the reference time; a machine learning unit that trains the neural network by using, as training data, actual values of the input data and the output data; and an estimation unit that inputs the input data to the neural network that has been trained by the machine learning unit with a current time being set as the reference time, and then calculates an estimated value of a future hydroelectric power generating capacity based on the output data of which reference time is the current time.

This system for estimating a hydroelectric power generating capacity is a system that receives a previous precipitation amount in the region upstream of the dam, a previous water flow rate of the river upstream of the dam, and a previous water inflow rate into the dam as inputs, and calculates the estimated value of the future hydroelectric power generating capacity of the dam, using the trained neural network. In contrast, a cited reference describes using a regression model instead of a neural network. Since it is a well-known technique to use a neural network instead of a regression model, the inventive step of the invention of claim 1 is denied.

Thus, the Japan Patent Office has determined that inventive step is highly likely to be denied for inventions that apply AI to existing business operations and existing systems in the field of technology.

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However, in actual AI development, there are a great number of inventions that merely apply AI to existing business operations and systems. What measures can be taken to acquire a patent right for such an invention?

For example, even in the case where AI is merely applied to an existing business operation or system, various contrivances have been made in the course of development. Accordingly, it is important to deeply investigate the course of development for achieving an invention, and find a feature having an inventive step. As noteworthy viewpoints on this occasion, the Japan Patent Office illustrates “modification of training data” and “preprocessing of training data”.

As the “modification of training data”, there are presumed cases where AI finds a set of input data and output data that is different from those estimated by persons, and where input data that cannot be directly used by persons for estimation is used by AI for estimation.

As an examination case example pertinent to the “modification of training data”, claim 2 of the “system for estimating a hydroelectric power generating capacity” (Case Example 34) is illustrated.

[Claim 2]

The system for estimating a hydroelectric power generating capacity according to claim 1, wherein the input data to the input layer further contains a temperature in the upstream region during the predetermined period between the reference time and the predetermined time before the reference time.

This system for estimating a hydroelectric power generating capacity is recognized to have an inventive step in that it exhibits a significant effect by newly using the temperature in the region upstream of the dam as input data to be used to estimate the hydroelectric power generating capacity.

In addition, as the “preprocessing of training data”, there is presumed a case where input data is preprocessed to be suitable for processing by AI.

As an examination case example pertinent to the “preprocessing of training data”, a “dementia

stage estimation apparatus” (Case Example 36) is illustrated.

[Claim 1]

A dementia stage estimation apparatus comprising: speech information obtainment means for obtaining speech information on a conversation between a questioner and a respondent; speech information analysis means for analyzing the speech information, and then specifying a speech section by the questioner and a speech section by the respondent; speech recognition means for converting, through speech recognition, the speech information on each of the speech section by the questioner and the speech section by the respondent into text and then outputting a character string; question topic specification means for specifying a question topic by the questioner based on the result of the speech recognition of the speech section by the questioner; and dementia stage determination means for inputting, to a trained neural network, the question topic by the questioner and the character string of the speech section by the respondent corresponding to the question topic in a manner associated with each other, and then determining a dementia stage of the respondent, wherein the neural network is trained through machine learning using training data so as to output an estimated dementia stage, in response to an input of the character string of the speech section by the respondent in association with the corresponding question topic by the questioner.

This dementia stage estimation apparatus adopts a new dementia stage estimation technique that associates the question topic by the questioner with the character string of the speech section by the respondent corresponding to the question topic and uses the associated data for evaluation, and is recognized to have an inventive step in that it exhibits a significant effect of improving estimation accuracy through machine learning of the associated data as training data.

Although the Japan Patent Office illustrates the “modification of training data” and the “preprocessing of training data” as features having an inventive step, we think that an inventive step can also be found from other viewpoints, such as a contrivance for determining

an estimated result obtained by an estimation model, and a contrivance during post treatment using an estimated result obtained by an estimation model.

Although the Japan Patent Office illustrates the “modification of training data” and the “preprocessing of training data” as features having an inventive step, we think that an inventive step can also be found from other viewpoints, such as a contrivance for determining an estimated result obtained by an estimation model, and a contrivance during post treatment using an estimated result obtained by an estimation model.

In view of the determination of the Japan Patent Office on inventive step, we think that, as long as a feature having an inventive step can be specified, it is not necessary to disclose the structure of a known AI model that does not have a feature in particular, or a specific learning method. That is, we think that an AI model may be treated as a black box, and thereby it is possible to acquire a right of which infringement can be determined more easily. Of course, when an AI model has a structure that exhibits an effect specific to its application, or when there is a learning procedure or the like that exhibits a significant effect according to the structure of an AI model, such information should be described in the detailed description of the invention for easier argument of an inventive step.

Practical guidelines for the inventive step of AI-related inventions can be summarized as described below.

- Inventive step is highly likely to be denied in inventions that apply AI to existing business operations and existing systems in the field of technology.
- In actual AI development, there are a number of inventions that apply AI to existing business operations and systems. In this case, it is important to deeply investigate the course of development for achieving an invention, and find a feature having an inventive step.
- As long as a feature having an inventive step can be specified, an AI model can be treated as a black box, and thereby it is possible to acquire a right of which infringement can be determined easily.

4 Conclusion

Through the fourth industrial revolution, patent applications have already been filed for many AI-related inventions. Although the Japan Patent Office provides guidelines for patent examinations for AI-related inventions by illustrating some examination case examples, the number of actual examples of such patent examinations is still small, and thus we feel that some unclearness remains. We will continue to watch patent examinations and judicial precedents for AI-related inventions.