

「Desirable claims
based on tech trends and
appropriate for
the enforcement phase」

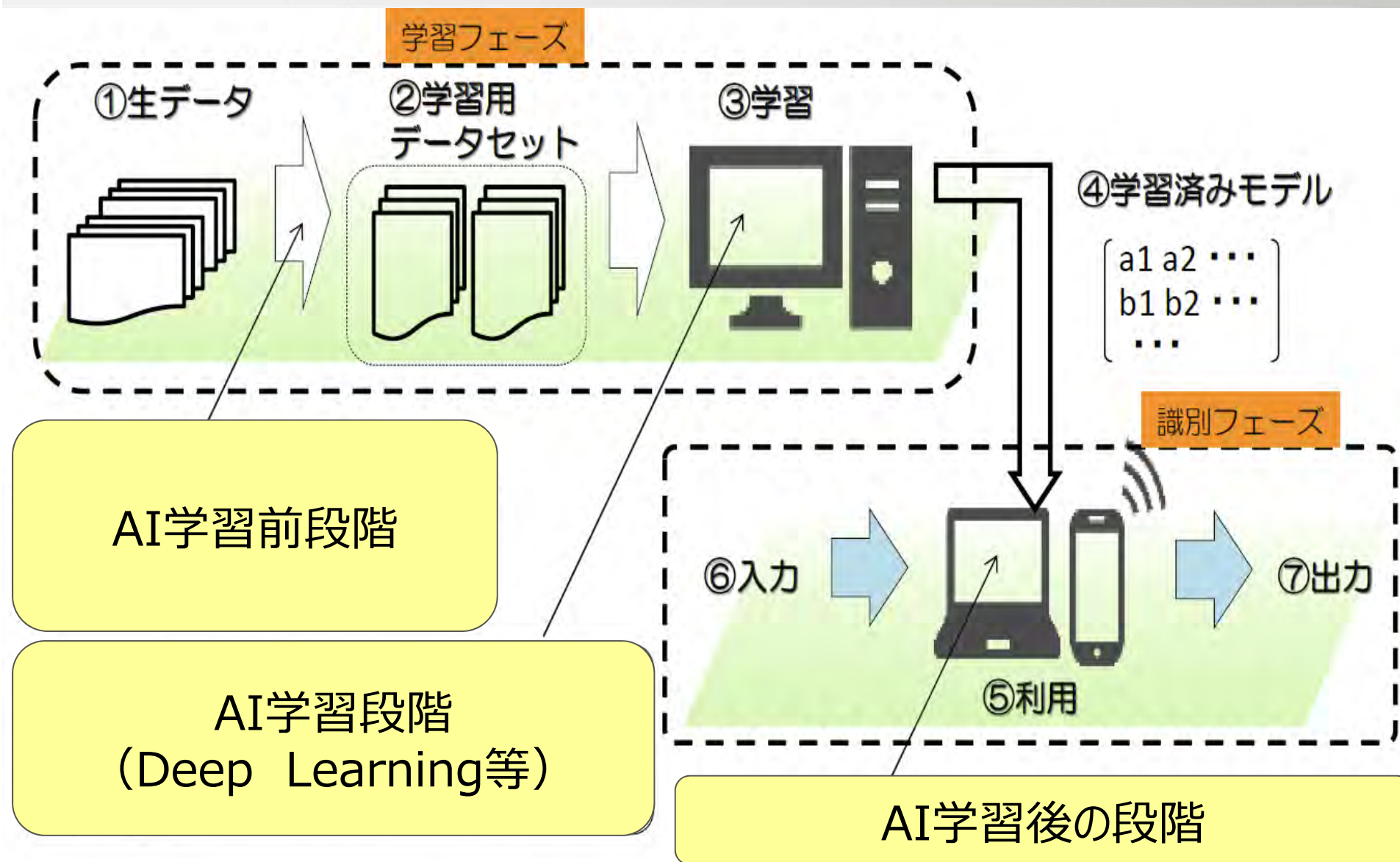
2019/11/20

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【AI-related Inventions】

Basic AI Processing



1 Inventions in previous phase of AI learning

- (1) Inventions related to data collection
- (2) Inventions related to learning data generation
 - ① cleansing
 - ② data augmentation
- (3) data/database structure

2 Inventions during AI learning

- (1) Inventions to enhance learning speed
 - (2) Inventions to improve learning accuracy
 - (3) Inventions related to learning using specific data
- etc.

Deep Tensor

PRESS RELEASE

Fujitsu Technology to Elicit New Insights from Graph Data that Expresses Ties between People and Things

Surpassing limits of conventional deep learning for machine learning technology that acquires knowledge, verifies effectiveness of in IoT, finance, and pharmaceutical fields
Fujitsu Laboratories Ltd.

Kawasaki, Japan, October 20, 2016 Fujitsu Laboratories Ltd. today announced the development of machine learning technology that enables highly accurate analysis of graph-structured data that expresses the relationships between people and things.

Fujitsu Laboratories has now developed new technology that allows existing deep learning technology, which has already achieved extremely high accuracy in image and voice recognition, to be applied to graph-structured data. Graph-structured data has a complicated structure and mixes a variety of data, such as different sizes and methods of expression, but by transforming different data to a uniform expression called a "tensor"⁽¹⁾, used in cutting-edge mathematics, it becomes possible to do highly accurate machine learning on graph-structured data using deep learning technology.

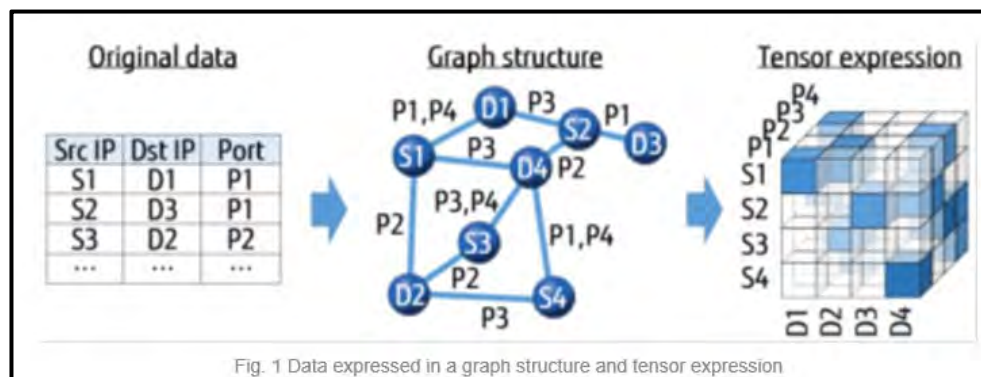


Fig. 1 Data expressed in a graph structure and tensor expression

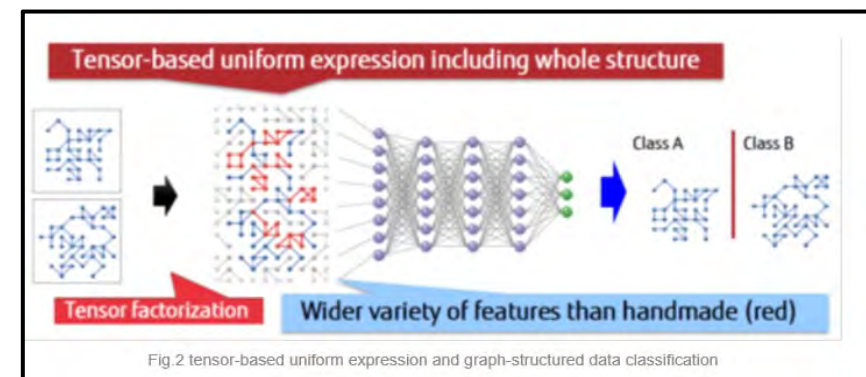


Fig. 2 tensor-based uniform expression and graph-structured data classification

Wide Learning

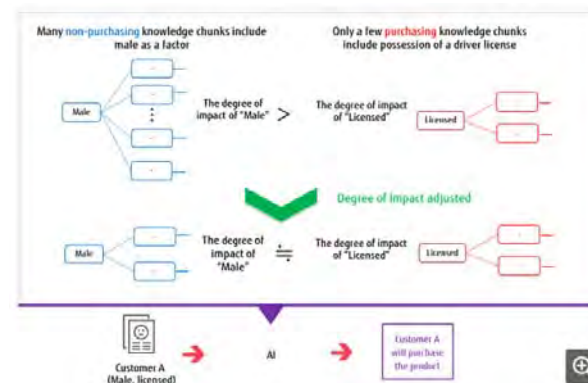
PRESS RELEASE

Fujitsu's New AI Technology "Wide Learning" Enables Highly Precise Learning Even from Imbalanced Data Sets

Fujitsu Laboratories Ltd.

Kawasaki, Japan, September 19, 2018 Fujitsu Laboratories Ltd. today announced the development of "Wide Learning," a machine learning technology capable of accurate judgements even when operators cannot obtain the volume of data necessary for training.

Fujitsu's Wide Learning technology enables judgements to be reached more accurately than was previously possible, and learning is achieved uniformly, no matter which hypothesis is examined, even when the data is imbalanced. It achieves this by first extracting hypotheses with a high degree of importance, having made a large set of hypotheses formed by all of the combinations of data items, and then by controlling for the degree of impact of each respective hypothesis based on the overlapping relationships of the hypotheses.



3 Inventions in later phase of AI learning

- (1) Trained model (parameter set)
- (2) Inventions for AI application
- (3) AI maintenance (e.g., quality control)
- (4) explainable AI

X A I : Explain Reason

Fujitsu Fuses Deep Tensor with Knowledge Graph to Explain Reason and Basis Behind AI-Generated Findings

Fujitsu Laboratories Ltd., Fujitsu Limited

Tokyo and Kawasaki, Japan, September 20, 2017

Fujitsu Limited and Fujitsu Laboratories Ltd. today announced that they have developed technology that shows the reason and academic basis for findings from AI that have been trained on large volumes of data. This is done by connecting the proprietary AI technology Deep Tensor⁽¹⁾, which performs machine learning on graph-structured data, with graph-structured knowledge bases called a knowledge graph⁽²⁾, which brings together expert knowledge such as academic literature.

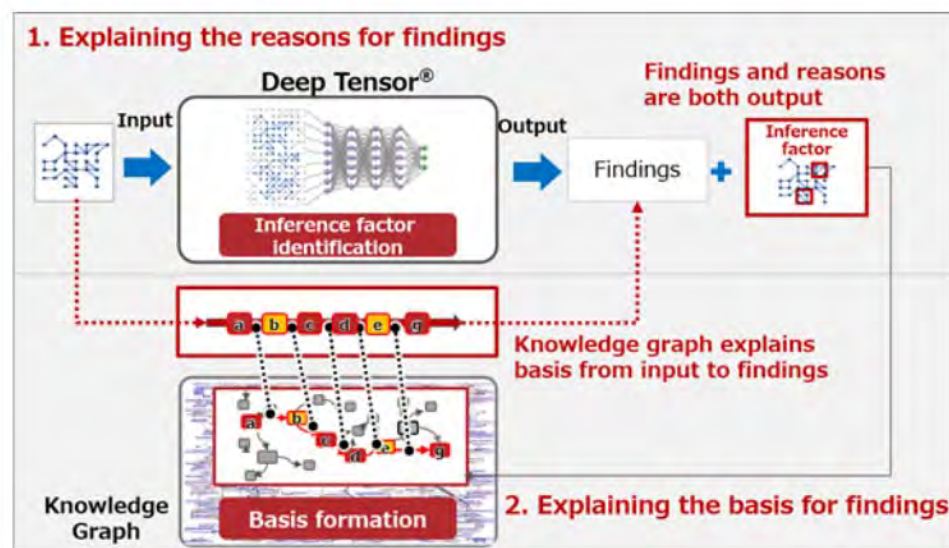


Figure 1 : Summary of the newly developed technology

Quality

PRESS RELEASE

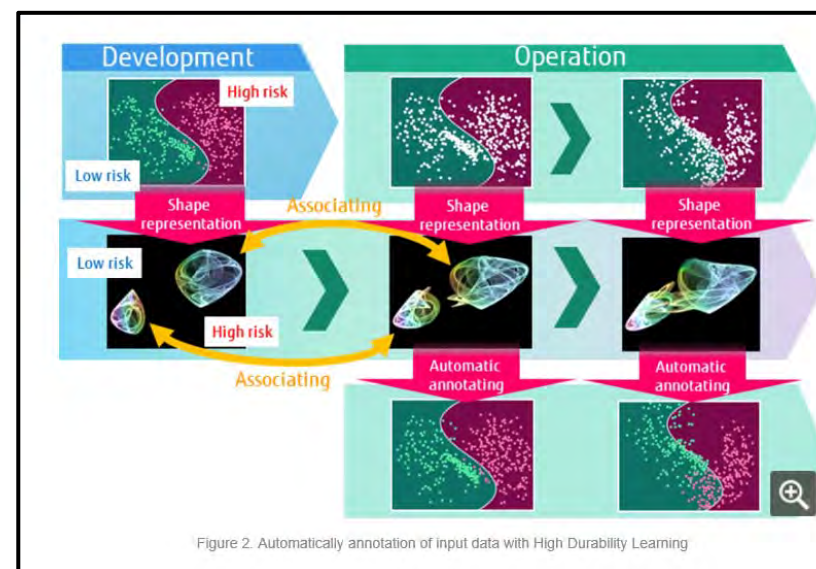
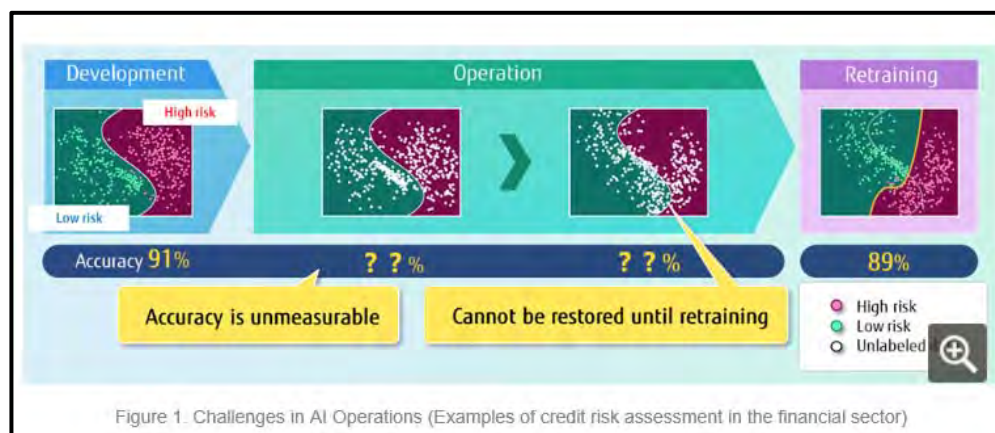
Fujitsu Develops Technology for Maintaining Stable, High-Accuracy AI Operations

Accurate annotation of changing data to automate AI accuracy estimation and restoration

Fujitsu Laboratories Ltd.

Kawasaki, Japan, October 25, 2019

Fujitsu Laboratories, Ltd., today announced the development of the world's first "High Durability Learning" technology that estimates the accuracy of AI and automatically restores AI models.



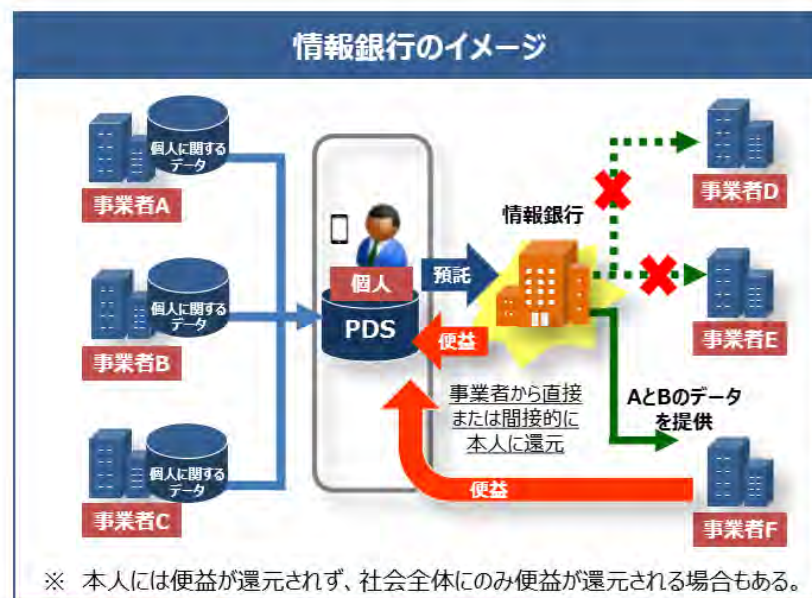
Application of AI (Expectation in Information Bank)

It is not easy for individuals to consider and decide how and where to provide their personal data.

The application of AI is expected as an personal AI agent.

2. 定義 (2) 情報銀行

情報銀行（情報利用信用銀行）とは、個人とのデータ活用に関する契約等に基づき、PDS等のシステムを活用して個人のデータを管理するとともに、個人の指示又は予め指定した条件に基づき個人に代わり妥当性を判断の上、データを第三者（他の事業者）に提供する事業。



内閣官房IT総合戦略室
AI、IoT時代におけるデータ活用
ワーキンググループ
中間とりまとめの概要

【Protection of AI-related Inventions】

Four points of high interest for users

① Predictability

Can be granted?

➡ **Decision to file or not to file**

② Transparency

Reason for grant in dossier information

➡ **Evaluation of other's patent**

③ Global

Different conclusions in patent prosecution?

➡ **Hurdle to Global business**

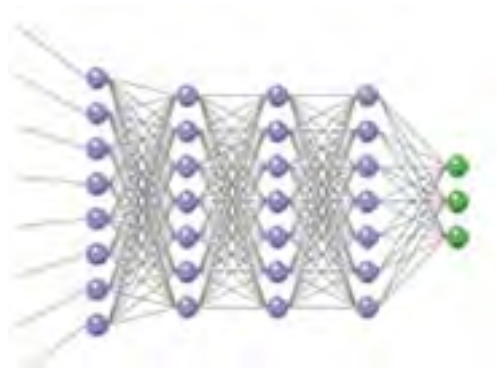
④ Business Contribution

Investment vs contribution to business -Enforceable?

➡ **IP useful/useless for business**

Subject Matter

- Inventions specifying processing/calculation in AI learning engine



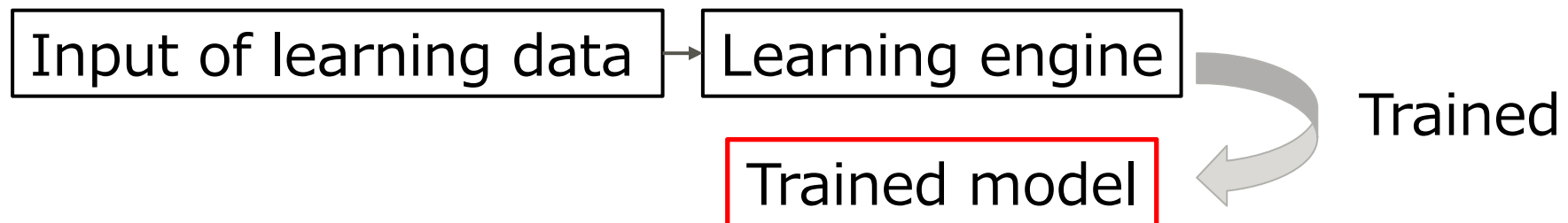
【Expectation】

Should not be rejected as “it is mere calculation.”

- Inventions related to AI processing engine (e.g., neural network computation and processing) are technical, resulting in the improvement of calculation efficiency and AI output accuracy, and therefore, contribute to the development of technology.
- In case the inventions cannot be granted in certain countries, the free implementation of invention would bring great disadvantage.

Protection for Trained Model (1/2)

- High needs for protection of trained model generated by inputting a huge amount of learning data



Trained model generated through learning might be identified by using actual “parameters.” But...

- Too narrow scope of patent
- Unclear scope of equivalence

From a practical viewpoint, the protection for the following claim is reasonable.

“Trained model (or program / medium having such program) generated through certain learning method”

Protection for Trained Model (2/2)

【Concern】 Trained model generated through certain learning method: how to evaluate infringement??

- Are the learning methods the same?
➡ inconsistency with case laws
- Comparison between model X and Y? ➡ difficulty in judgement
(how to evaluate identity/equivalence of model X and Y?)

Patent

Trained model **X** generated
through method **A**
(Learning system/program)

Suspicious object

Trained model **Y** generated
through method **B**
(Learning system/program)



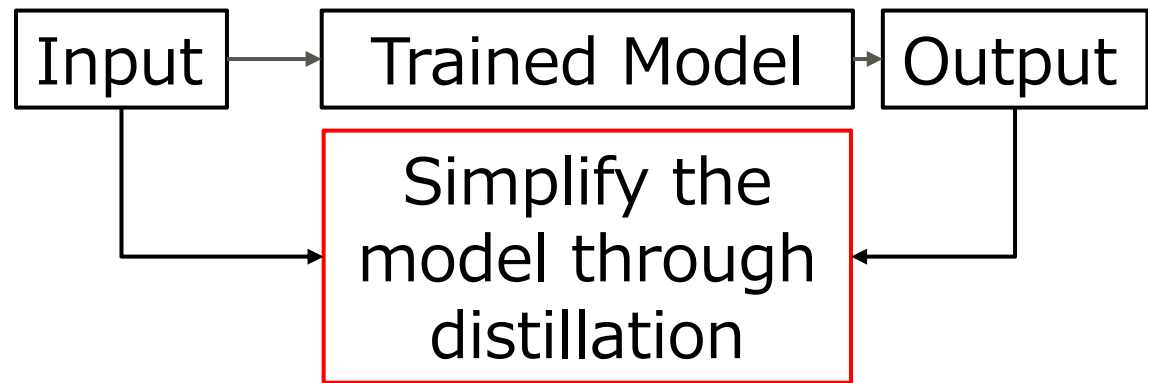
【Expected solution】

Protection for “a method for producing a learning model”

-> the method and product can be protected

Simplified Model through Distillation

- Distillation to simplify (lighten) a trained model



Ex) Complex model for face recognition: slow processing
-> Distillation enables speed-up of face recognition process

【Concern】

- Distillation model and trained model are equivalent??
- Distillation process is required in claims??

- Data structure claims can be granted in Japan

【Concerns】

1. What scope is protected??

more case examples needed

2. Uncertainty for enforcement

Data structure claims =

data structure + later data processing

① Generating data with the same structure?

② Generating data with the same structure

+ the same processing? Another processing intention relevant?

Good claim category is what can be protected globally.
“A method for producing/processing a learning data”
might be sufficient.

Written Description

- High interest in written description
 - Huge risk for rejection and invalidation depending on the degree of description in embodiment
 - Excessive disclosure would lose competitiveness

【Expectation】

Disclosure levels of AI engine vary depending on the point of inventions. For examples...

1. In case a novel feature is in selection of input/output for AI engine
2. In case a novel feature is Improvement of AI learning engine

- Detailed disclosure should not be required uniformly for AI-related inventions.
- Common case examples are required to show the relationship of the degree of disclosure and the point of inventions.

- **Non-obviousness for AI-related invention should not be denied just because “AI can be applied in various fields.”**
 - On the other hand, inventions of AI application to agriculture (where AI is not common) can be easily granted simply because “AI is not popular in this field”??
- For non-obviousness, all prior arts (e.g., prior arts in certain technological fields and those in AI) should be appropriately evaluated.
 - Team involving examiners familiar with AI.

- Some AI-related inventions focus on new findings through AI learning.
 - > Same as know-how (not disclosed in documents but empirically acquired)??
- High quality search for prior arts (non-patent literature etc.) is required.
- The definition of prior art in AI field should be reviewed.
- Inventions utilizing known-matters should not be granted.

Comments on AI-generated Inventions

■ AI-generated inventions could be classified depending on the level of human intervention

Level 1 : Human uses AI as a tool to create ideas

- current examination practice is sufficient

Level 2 : Human instructs AI and AI creates ideas

- the degree of instruction?

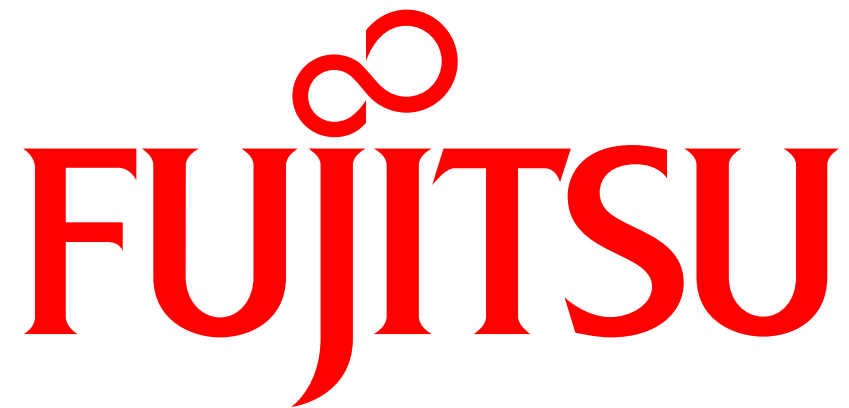
Level 3 : AI creates ideas without any instruction

Level 2 and 3:

AI is not a “natural person” who creates ideas. A person who creates ideas through AI and puts them into practice would be recognized as inventors.

In future??

Definitions of “inventors” might be reviewed through consideration on AI-generated inventions.



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