



北海道大学
HOKKAIDO UNIVERSITY

WIPO Conversation on IP and Frontier Technologies
Sixth Session, Panel 3

Patentability and PHOSITA in the AI Era (with a focus on inventive step)

September 21, 2022

Ichiro Nakayama

Graduate School of Law, Hokkaido University (Japan)

Types of AI-related inventions

	Description	Main issues
Type 1	Inventions of AI technologies created by humans to improve AI technologies	Patent eligibility
Type 2	Created by humans with the use of AI as a tool (1) AI-based inventions AI as an element of the inventions (2) AI-assisted inventions Use of AI in the inventive process	Disclosure requirements Inventive steps (Non-obviousness)
Type 3	Autonomously generated by AI Instruction by humans may be necessary e.g. “Generate something like ...”	Inventorship

Japan Patent Office (JPO)'s Examination Guidelines & Handbook

- Addressed the patentability issues on AI-related inventions
- Increased case examples in January 2019 concerning
 - ✓ Disclosure requirements
 - ✓ Inventive Step (Non-obviousness)

Newly Added Case Examples for AI-Related Technologies

January 30, 2019

Examination Standards Office

Japan Patent Office



Patent Eligibility

- Not a few AI-related inventions are **software**-related inventions
- If computer software is eligible for patent, so are AI-related inventions



Whether may software fall within the definition of “**invention**” or not?

Japanese Patent Act, Article 2 (1)

“**Invention**” in this act means the highly advanced creation of technical ideas utilizing the laws of nature.



Does software utilize the laws of nature?

Does computer software utilize the laws of nature?

➤ Examination Handbook , Annex B Chapter1, 2.1.1.2(1)

(i) When ... "information processing by the software is concretely realized by using hardware resources," said software is a "creation of a technical idea utilizing the laws of nature.



"a specific information processor or an operation method ... is constructed through cooperation of the software and the hardware resources"



Software-related inventions could be **patentable** (by careful claim drafting)
So could **AI-related inventions**

Disclosure Requirements

- No patent without disclosure
 - A patent is granted in exchange for disclosing an invention
- 
- AI as a **black box** gives no idea why AI produced the estimated results

Person having ordinary skills in the arts (PHOSITA)

may or may not understand

- ✓ How to work the invention
- ✓ How to solve a technical problem

Disclosure Requirements

➤ Enablement

Japanese Patent Act, Article 36 (4)

The statement of the **detailed explanation of the invention** ... shall be **clear and sufficient** as to **enable** any person ordinarily skilled in the art to which the invention pertains to work the invention; ...

➤ Support requirement

Japanese Patent Act, Article 36 (6)

The statement of the scope of **claims** ... shall comply with each of the following items:
(i) the invention for which a patent is sought **is stated in the detailed explanation of the invention;** ...

Description Requirement: Case Example 51

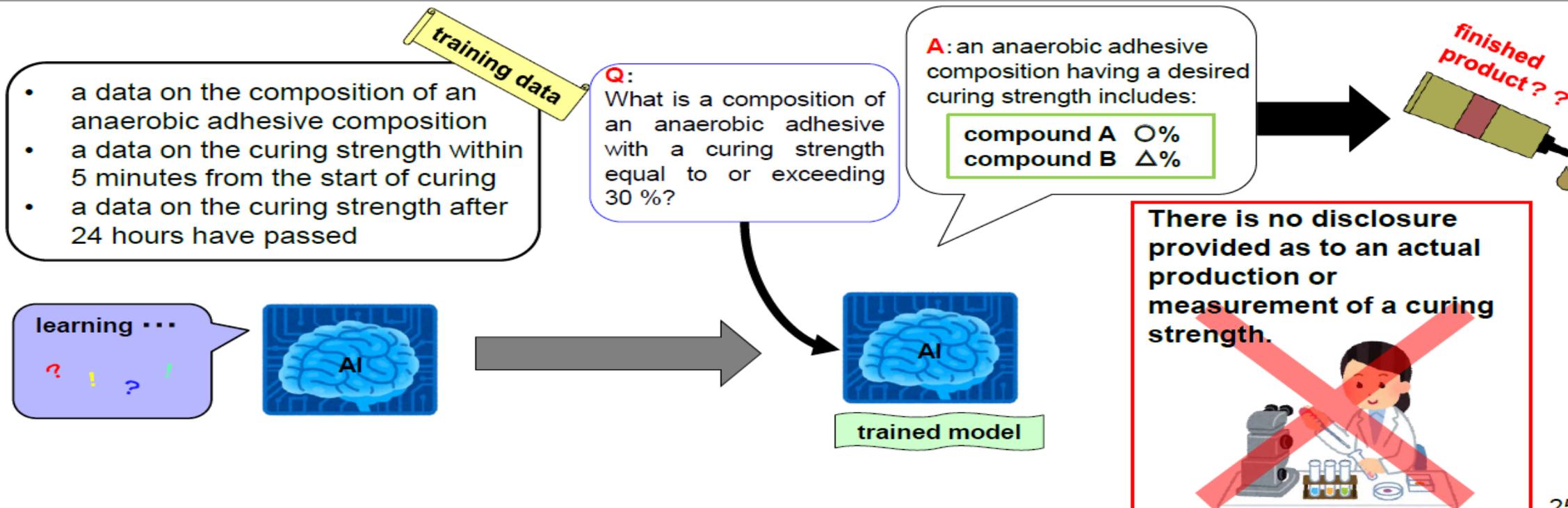
ANAEROBIC ADHESIVE COMPOSITION

Claim 1: violation of the support/enablement requirements

An invention of product is claimed. However, the invention is not evaluated using an actually-produced product and an estimation accuracy of a trained model is not verified. Further, it is not assumed that it is a common general technical knowledge at the time of filing that an estimation result by a trained model can be a substitution for an actual experimental result. Therefore, the description requirement is not satisfied.

[Claim 1]

An anaerobic adhesive composition comprising: a 0.08 - 3.2 mass % compound A, a 0.001 – 1 mass % compound B, and a residue containing an anaerobically curable (meth)acrylate monomer, wherein the anaerobic adhesive composition shows the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed, within 5 minutes from the start of curing.



Description Requirement: Case Example 51

ANAEROBIC ADHESIVE COMPOSITION



[Overview of the Description]

In an embodiment, in order to derive an anaerobic adhesive composition attaining such an object, a conventionally known component data of an anaerobic adhesive composition, a curing strength data within 5 minutes from the start of curing, and a curing strength data after 24 hours have passed were input to a neural network; and then a trained model was prepared in a manner that a component of the anaerobic adhesive composition and a ratio between the curing strength within 5 minutes from the start of curing and the curing strength after 24 hours have passed were associated with each other. Further, an estimation result is disclosed showing the possibility where an anaerobic adhesive composition containing an anaerobically curable (meth)acrylate monomer can be obtained using the trained model, which realizes the curing strength equal to or exceeding 30% of the curing strength after 24 hours have passed within 5 minutes from the start of curing, by adding a 0.08 - 3.2 mass % compound A and a 0.001 - 1 mass % compound B in combination.

(Notes) The description does not disclose any embodiment in which an anaerobic adhesive composition is actually produced within the above combination ratio and then the curing strength is measured. Further, there is no verification shown on the estimation accuracy of the trained model. Furthermore, it is not known that the curing strength is enhanced within 5 minutes after the start of curing, by adding any one of a compound A, a compound B, and the combination thereof. Meanwhile, a measurement method and condition are specifically disclosed to measure the curing strength within 5 minutes after the start of curing and the curing strength after 24 hours have passed.

[Overview of Reason for Refusal]

-Article 36(4)(i) (enablement requirement) / Article 36(6)(i) (support requirement)

It is the common technical knowledge at the time of filing that it is difficult to control an anaerobic adhesive composition so as to rapidly raise the curing temperature within 5 minutes or so after the start of curing, and that various conditions for production such as a type, combination, or combination ratio of polymer material, free radical initiator, or free radical reducing agent closely interact with each other.

The description only discloses that a trained model predicted that, as long as a composition meets the combination ratio prescribed in Claim 1, the composition has the curing strength equal to or exceeding 30% of the curing strength after 24 hours have passed, within 5 minutes from the start of curing. Further, the accuracy of an estimation value by the trained model is not verified, and there was no such a common technical knowledge at the time of filing that an estimation result by a trained model can be a substitution for an actual experimental result.

Any embodiment is not disclosed supporting the fact that the claimed composition shows the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed within 5 minutes from the start of curing, by actually producing a composition including a 0.08 - 3.2 mass % compound A, a 0.001 - 1 mass % compound B, and a residue containing an anaerobically curable (meth)acrylate monomer, and then measuring the curing strength.

Thus, it does not seem that the description provide a sufficient disclosure of the invention in a manner that a person skilled in the art can produce the anaerobic adhesive composition as in Claim 1 that shows the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed, within 5 minutes from the start of curing.

Claim 1 discloses an invention of an anaerobic adhesive composition comprising a 0.08 - 3.2 mass % compound A, a 0.001 - 1 mass % compound B, and a residue containing an anaerobically curable (meth)acrylate monomer, in which the curing strength of the composition is equal to or exceeds 30% of the curing strength after 24 hours have passed, within 5 minutes from the start of curing. Meanwhile, in view of the disclosure in the description and the common general technical knowledge at the time of filing, the description does not provide a sufficient disclosure so as to enable a person skilled in the art to recognize that an object of the present invention to provide an anaerobic adhesive composition showing the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed within 5 minutes from the start of curing can be attained.

Disclosure Requirements

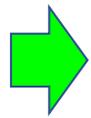
■ JPO's practice

- **AI's estimation alone** may **not** be **sufficient**
- Needs to verify AI's estimation in the description either by
 - ✓ Actual experimentation or
 - ✓ A common general technical knowledge

Inventive Step (Non-obviousness)

Japanese Patent Act, Article 29 (2)

Where, prior to the filing of the patent application, **a person ordinarily skilled in the art of the invention** would have been able to **easily make** the invention based on an invention prescribed in any of the items of the preceding paragraph, **a patent shall not be granted** for such an invention notwithstanding the preceding paragraph.



Protect inventions which would not be disclosed but for the inducement of a patent (**inducement theory**).

Inventive Step: Case Example 33

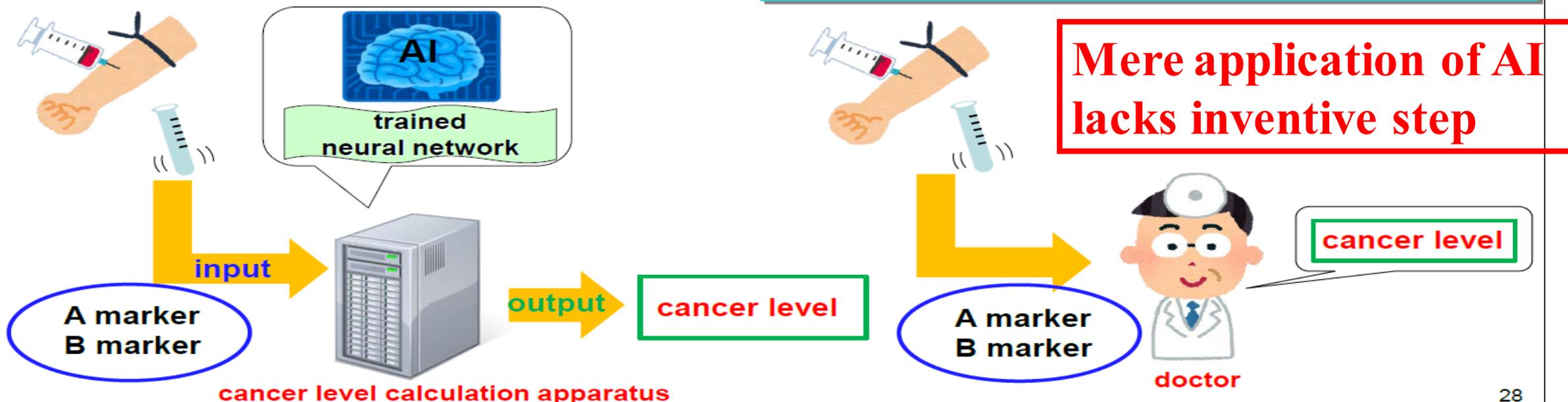
CANCER LEVEL CALCULATION APPARATUS

Claim 1: Mere a systemization of manually-operated tasks using AI and considered to be lack of inventive step.

[Claim 1] A cancer level calculation apparatus that calculates a possibility that a subject person has cancer, using a blood sample of the subject person comprising a cancer level calculation unit that calculates a possibility that a subject person has cancer, in response to an input of measured values of A marker and B marker that have been obtained through blood analysis of the subject person, the cancer level calculation unit including a neural network that has been trained through machine learning using training data to calculate an estimated cancer level in response to the input of the measured values of A marker and B marker.

[Cited Invention 1]

A cancer level calculation method of calculating a possibility that a subject person has cancer carried out by a doctor, using a blood sample of the subject person comprising a step of cancer level calculation, wherein a possibility that a subject person has cancer is calculated, using measured values of A marker and B marker that have been obtained through blood analysis of the subject person.



[Well-known Art]

It is well-known, in the field of machine learning, to calculate an output data representing a possibility that a subject person has a certain disease based on a prescribed set of input data on the subject person, using a trained neural network, which has been trained through machine learning with training data. The training data contains an input data that has been collected from multiple people, each of which consists of a prescribed set of input data (biological data etc.) on each person, and an output data representing a possibility that the person has the disease.

✗ Claim 1 lacks inventive step.

[Overview of Reason for Refusal]

The invention of Claim 1 and Cited Invention 1 are different from each other at the point below.

(Difference)

The invention of Claim 1 is a cancer level calculation apparatus that calculates a possibility that a subject person has cancer in response to an input of measured values of A marker and B marker, using a trained neural network through machine learning with training data. Meanwhile, Cited Invention 1 discloses a cancer level calculation method through which a doctor calculates a possibility that a subject person has cancer based on measured values of A marker and B marker.

The difference is assessed as follows.

.....

Both Cited Invention 1 and the well-known art relate to estimation of the possibility of illness, and they share a common problem to be solved. It is mere the exercise of the ordinary creativity of a person skilled in the art to systemize an estimation method carried out by a doctor in the medical field using a computer or the like.

In view of the factors above, a person skilled in the art can easily conceive of systemizing a calculation method of a possibility that a subject person has cancer, which has been carried out by a doctor, by applying the well-known art to Cited Invention 1, and calculating a possibility that a subject person has cancer in response to an input of measured values of A marker and B marker using a trained neural network through machine learning with training data.

Further, a person skilled in the art can readily anticipate the effects of the invention of Claim 1. Also, there are no obstructive factors found to apply the well-known art to Cited Invention 1.

Inventive Step

- JPO's practice
- **Mere application** of AI = exercise of the **ordinary creativity** by **PHOSITA**
 - ✓ May **deny inventive step**
 - ✓ **Same** practice as in **computer-implemented inventions**

Mere systemization of manually-operated tasks by computers may lack incentive step



PHOSITA is expected to use AI to the same extent as general-purpose computers.

Broader Implications

- 2 kinds of AI-related inventions

- a. **AI-based** inventions

- AI is an element of the inventions

- b. **AI-assisted** inventions

- AI is used in the inventive process and **not** an element of the claims

- e.g. Case example 51 anerobic adhesive composition



- Applicants may **not disclose the use of AI**

Broader Implications

- ✓ **No** incentives to disclose AI's estimation in AI-assisted inventions

They have to disclose either actual experimentation or a common general technical knowledge in order to satisfy disclosure requirements

- ✓ **Hardly know** the use of AI by applicants in their R&D process



- Many AI-related inventions created with the use of AI **without** disclosing it?
- Should **all applications, whether or not they disclose the use of AI**, be examined on the assumption that **PHOSITA would use AI**?

Justifying PHOSITA with AI

- Justifiable under inducement theory

No patent **incentives are necessary** for an invention that **PHOSITA would easily create by using AI**

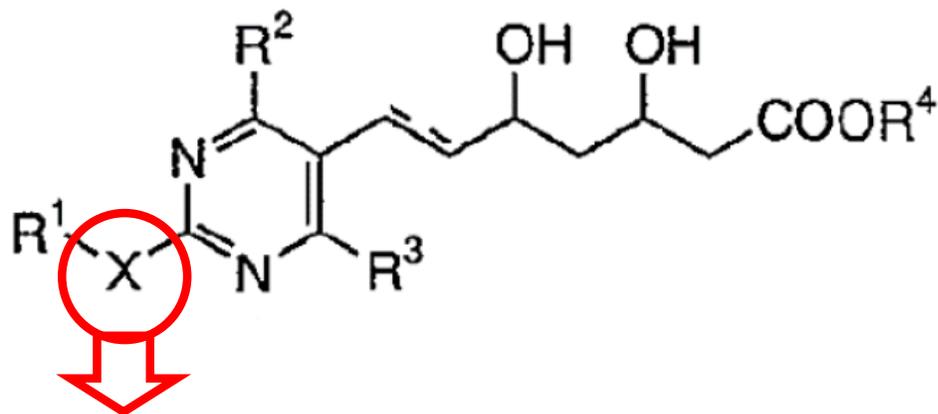
- Consistent with the notion of PHOSITA in practice

➤ Examination Guidelines, Part III Chapter 2 Section 2 2.

One of the conditions of **PHOSITA** is “A person who **is able to use ordinary technical means** for research and development (including document analysis, experiment, technical analysis, manufacture, etc)

Pyrimidine Derivative Case

- IP High Court, April 13, 2018, 2016 (Gyo-Ke) 10182, 10184
 - The Invention : a compound in pharmaceuticals



- Difference between the Invention and the main cited invention
- Described as **one** of more than **20 million alternatives** of the general formula in the sub-cited invention (Markush claims)

➡ *Does the combination of these inventions deny the inventive step?*

Pyrimidine Derivative Case

➤ IP High Court held

- If a compound was described in the form of **general formula in the prior art** and the general formula had an **enormous** number of alternatives, it was **impossible to extract** a specific technical idea embodied in a specific alternative and find it as a cited invention, unless there was a circumstance where the specific alternative should be positively or preferentially selected.
- In this case, since no circumstances could be found where the specific alternative out of more than 20 million alternatives should be selected, **inventive step** may **not be denied**.

AI's impacts on the holdings

- The development of AI may affect the court's holding
 - More than 20 million alternatives may be **enormous** for **humans** today but may **not be so** for **AI**

Cf. USPTO Manual of Patent Examining Procedures,
Section 2143 Examples of Basic Requirements of a Prima Facie Case of Obviousness

“**Obvious To Try**” – Choosing From a **Finite** Number of Identified, Predictable Solutions, With a Reasonable Expectation of Success

- ➔ ✓ **Infinite** numbers for **humans** may be **finite** number for **AI**
- ✓ **Easier** to establish “**Obvious to try**”

Expeditious Drug Repurposing Process

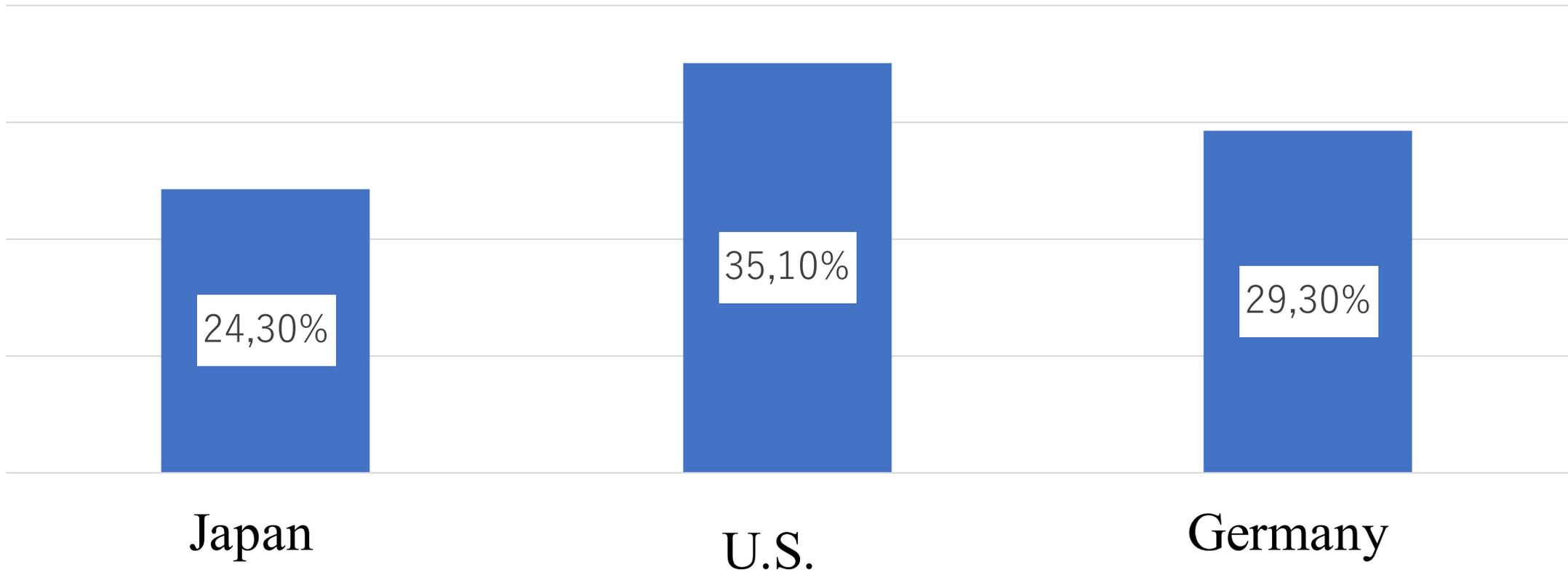
- The New York Times, “How A.I. Steered Doctors Toward a Possible Coronavirus Treatment” (April 30, 2020)
 - **Baricitinib** was designed to treat rheumatoid arthritis
 - A London-based start-up identified it as a possible coronavirus treatment **within 2 days** thanks to AI

AI may raise the threshold of inventive step

- **AI** may make it **easier** for **PHOSITA** to find a solution that they would hardly do by conventional technologies, which may **raise the threshold of inventive step**
- *However*, is it fair to say that **AI** may be “**ordinary technical means**” that PHOSITA would use ?

Is the use of AI widespread?

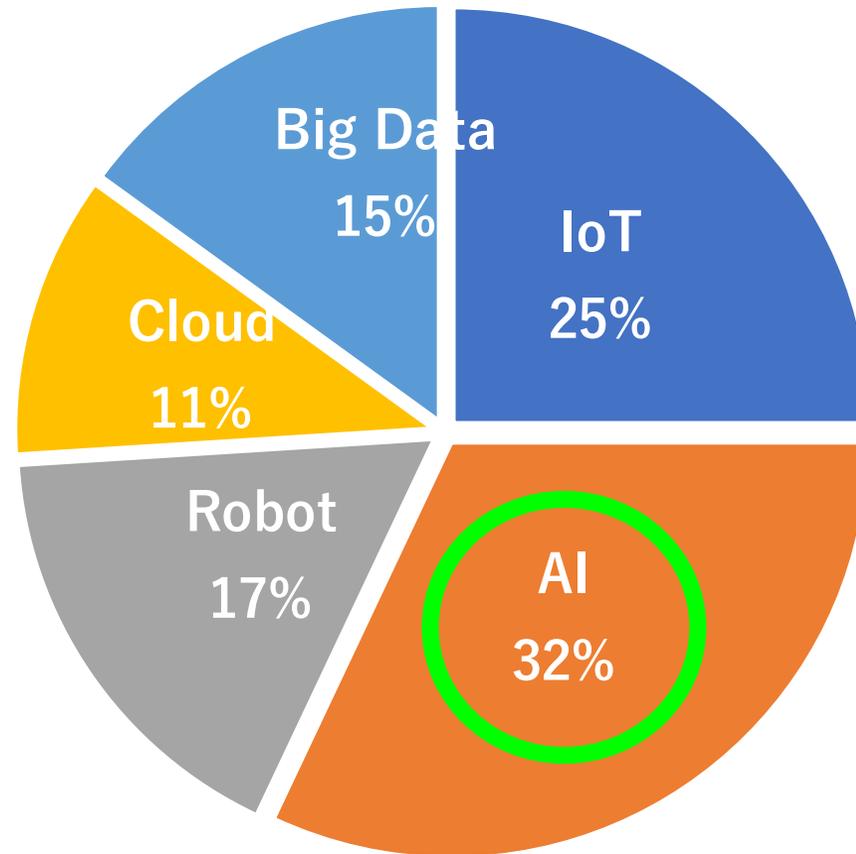
Use of AI in business (2021)



Source: created by author based on the Ministry of Internal Affairs and Communications, “Information and Communications in Japan White Paper 2021” (2021)

Is the use of AI widespread?

Top Priority Technologies to be introduced(2018)



Source: created by author based on the Ministry of Finance, “ Status Report of Use of Advanced Technologies such as IoT, AI, etc.” (2018)

PHOSITA with AI

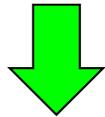
- Although AI has not been widely used at this moment of time, it is **forecasted to be widespread** in near future
 - Incentives in the market for introducing AI (outside the patent law)
 - ✓ To supplement the shortage of labor force
 - ✓ To make the business more efficient
- ➔ It may be **reasonable to expect PHOSITA to use AI**, regardless of whether applicants used it or not
- Not applicants but **PHOSITA determines the level of inventive step**

How is PHOSITA with AI taken into account in practice?

- Proposals to test **reproducibility** by AI

Ryan Abbott, *Everything is obvious*, 66 UCLA L. REV. 39 (2018)

1st step Determine the extent to which AI is used in the field



2nd step Identify specific AIs



e.g. Deep Mind (Google) and Watson (IBM)

3rd step Test reproducibility

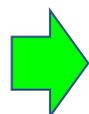
by investigating **whether specified AI would reproduce**
the invention within reasonable time

How is PHOSITA with AI taken into account in practice?

➤ Practical **difficulties**

- Inventive steps should be examined at the **filing (priority)** date
 - ✓ Need to **downgrade** AI's capabilities improved after the filing date
 - ✓ Training **data** should be **restricted** to data existed at the filing date

*It may **not** be **feasible** to reproduce such an AI.*

 *In **other fields** of technologies, patent examiners are **not** expected to conduct an experimentation in determining the inventive step.*

Why do they have to verify reproducibility of AI-related inventions?

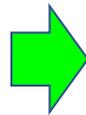
How is PHOSITA with AI taken into account in practice?

➤ PHOSITA = **legal fiction** ≠ real person

- Inquiry in inventive step

- ✓ does **not** aim at **scientific verification**

- ✓ **normative, legal** question in light of purposes of patent law

 Testing reproducibility by AI may **not** be necessary
Then, what alternatives?

Experts' opinion (likely to be submitted at later stages such as the lawsuits, invalidation trials, post-grant oppositions, etc.) ?

Concluding Remarks

■ PHOSITA with AI

- Justifiable under inducement theory
- Reasonable expectation due to market incentives for introducing AI
- May **raise the threshold of inventive step**

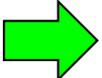
However,

- If the development of AI continues to raise the threshold of inventive step, do we have to worry that **no human inventors** could obtain patents, thereby **disincentivizing** them and **harming** innovation in the long run?

Concluding Remarks

NO. We don't have to worry so much.

- AI can keep generating outputs without incentives

 **No underproduction** of inventions (**No market failure**)

- Investments are still necessary, however
 - ✓ Inventions of AI technologies could be patentable
 - ✓ Other appropriation mechanisms to recoup investment
e.g. Leadtime, Secrecy, Brands,
Complementary assets (sales network, factories)