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Feature

Understanding "Juris-Informatics"

A new discipline that merges AI with law

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A new discipline that merges AI with law

Professor SATOH, Ken of National Institute of Informatics (NII) has proposed the term “Juris-informatics” to denote a new academic discipline that amalgamates artificial intelligence (AI) and law.
This field of study covers the application of AI to the legal profession, as well as the control of AI and its impact on society from a legal perspective.
In light of AI’s growing pervasiveness, we take a comprehensive look at the potential contribution and value of this new discipline.

[Feature]

Understanding "Juris-Informatics"

Interview

SATOH,Ken
Professor,
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Interviewer
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Editorial Writer,
The Yomiuri Shimbun

An Overall View of Juris-Informatics

Artificial intelligence (AI) is finding its way into more and more aspects of our lives. Yet even as it makes life more convenient, AI is giving rise to new, unprecedented problems. It is difficult for the law to keep up with the rapid and incessant advances of digital technology. A form of AI jurisprudence that merges AI research and legal studies is therefore sorely needed. To learn more, we interviewed Prof. SATOH, Ken of NII, the originator of "juris-informatics," an interdisciplinary field that meets this need. We covered the origins, current state, and prospects of this new discipline.

— How did your study of juris-informatics begin?

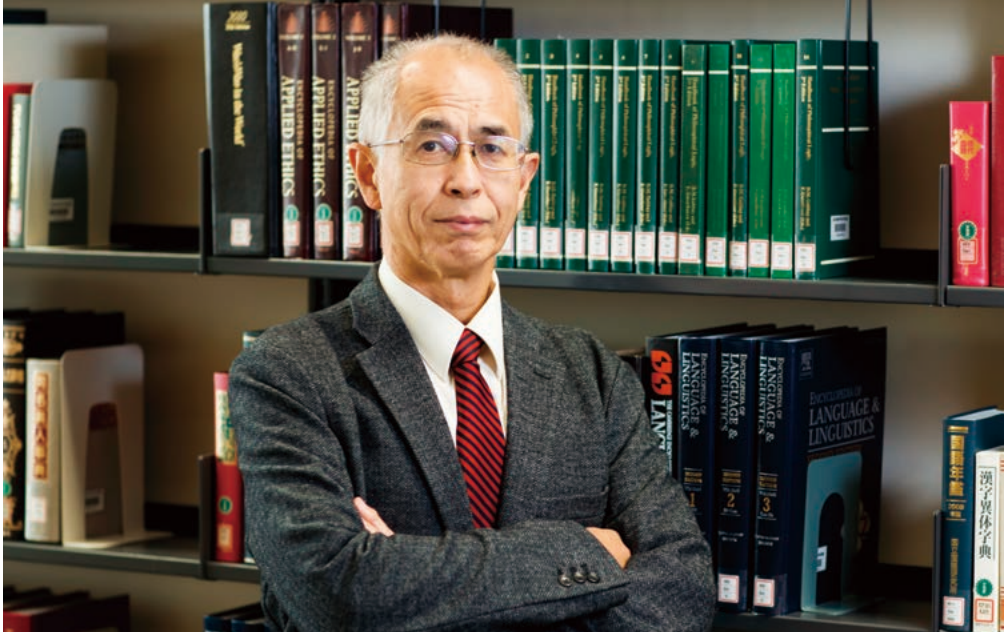
AI is already used for many things, like autonomous vehicles and machine translations on the Internet. As its use expands, there are growing concerns about accidents, privacy invasions, and other problems.

To keep AI under control as a society, it is legitimate that we put in place appropriate laws. It is quite difficult for legal professionals to understand the technical aspects of AI, however. So, I wondered if we might be able to use AI itself to help them control it. The idea was originally motivated by the desire to create a tool to help people in need.

Later, with the spread of deep learning, people pointed to the need to discuss its legal implications, to prepare for problems that robots might cause. This led to the idea of establishing a comprehensive field of research for addressing the challenges of controlling AI, incorporating both engineering and law.

— You describe this framework as "law by AI" and "law of AI."

"Law by AI" means the use of AI to support law, while "law of AI" means the use of law to control AI. Ultimately, our goal is to establish a proper academic system for training legal professionals who can understand advanced information technolo-



gy as well as law.

— I believe that you yourself studied law in graduate school to understand both disciplines?

I started at The University of Tokyo's School of Law in 2006. That's where I met Prof. OTA, Shozo, a pioneer in research on the use of AI in judicial systems. It was a very important encounter for me. Research on legal control of AI had only just begun, for example to sort out the responsibility for accidents involving self-driving cars, but hardly anyone was interested in this new field at the time.

— The question of whether the responsibility for an accident lies with the car maker, autonomous driving software, or car owner/user seems difficult.

From a technical standpoint, there needs to be some transparency, so that there are records that make it possible to trace the causes of accidents. Without any records, it's impossible to know who is responsible. That's why the first step legally is to demand some kind of transparency. The same issue arises when personal information is misused: If the personal information handling process is not transparent, we can't know who is responsible.

Does AI violate human rights?

— Is the legal sociology of AI something broader than just legal control?

Legal sociology is the study of how law affects society. So, it's concerned on one hand with the impact of AI once it has entered society, and conversely with how it is accepted and integrated into society. The common argument that AI will take away human jobs falls into this category.

— Traditionally, the law of AI is within the domain of liberal arts. So, how do engineers get involved in it?

The engineering side is vital for identifying the problems to be solved. The legal scholars then respond by devising solutions. If the two sides don't work together to pin down the essential nature of AI, the laws that we create will become useless as soon as new technologies emerge.

— Invasions of privacy are also a big challenge.

My biggest concern is the potential of AI to violate human rights. Take the case of Cambridge Analytica, the U.K. election consultancy that allegedly used Facebook profiles to send users campaign messages tailored to their preferences. Psychological manipulation, or rather human rights violations in electioneering, has drawn substantial criticism.

Suppose a government or a company uses an AI program to make certain decisions. One problem with deep learning is that any bias introduced into the training data will lead to biased decisions. If AI is fed with data that show a relationship between a particular race and crime rates, for example, people of that race may suffer employment discrimination. In a vicious cycle, the economic disadvantage and crime rate of that race are likely to increase further. In this way, AI could promote racial discrimination.

— Next, I want to ask you about law by AI. First, what is AI legal reasoning?

Basically, it is legal reasoning based on logic. PROLEG is a program I created to perform legal reasoning. Using the established facts of a case, it can make a legal judgment based on those facts and applicable legal provisions. I hope to expand the program to include fact-finding from evidence and provide total support for the work of judges.

— Does legal language processing handle legal document searches and the ordi-

> "From a legal standpoint, we need to demand transparency"

nary "natural language" used by humans?

That's right. Since 2014, I've been running the international Competition on Legal Information Extraction/Entailment (COLIEE). The competition tasks include short-answer questions from the Japanese bar exam, as well as finding judicial precedents relevant to new cases, based on a database of Canadian case law that is virtually all publicly available.

However, the thing I'm most interested in doing in this field is description generation. This involves converting the descriptions of cases written in natural language into a format suitable for input to a computer reasoning system, for the purpose of generating, as outputs, a judicial decision and the process of reasoning leading to that decision.

You can't hand down a decision without common sense

— Legal texts are archaic and hard to understand, and they use terminology that is uniquely difficult.

Legal texts can't really be processed using ordinary machine translation. For example, to understand the meaning of legal provisions precisely, you need to know about various related conditions and circumstances that are unwritten. It is not enough to simply look at the text of an article. Without looking broadly at textbooks and commentaries too, you can't create a system that works properly.

— This reminds me of the "frame problem," where to make sense of the world, a machine needs a vast quantity of background knowledge that extends without bound beyond the frame.

Suppose a woman on the edge of a road is about to be run over by a car. You push her down to save her life, but she falls into a ditch. As a result, her best clothes are ruined. Do you have to compensate her for the clothes? The legal term for this act of pushing the woman down is "benevolent intervention in another's affairs."

Typically, if you harm the other party when performing this kind of benevolent act, you may be liable for damages, but if the benevolent act is "to avoid imminent harm" (Article 698 of Japanese Civil Code), you are not liable for damages. The question of what exactly constitutes imminent harm is a very broad one. In the end, it difficult to make a judgment without a certain degree of "common sense." After all, legal provisions can only serve as pointers to understanding legal reasoning; actual interpretations take place in the minds of legal scholars and experts, and those interpretations change with the times.

— What is AI legal argumentation theory?

It is about studying how to support legal discussions involving multiple parties—for example, in collegial judgments by three judges, juries made up of multiple citizens, or when a variety of interested parties consult each other to strike an agreement.

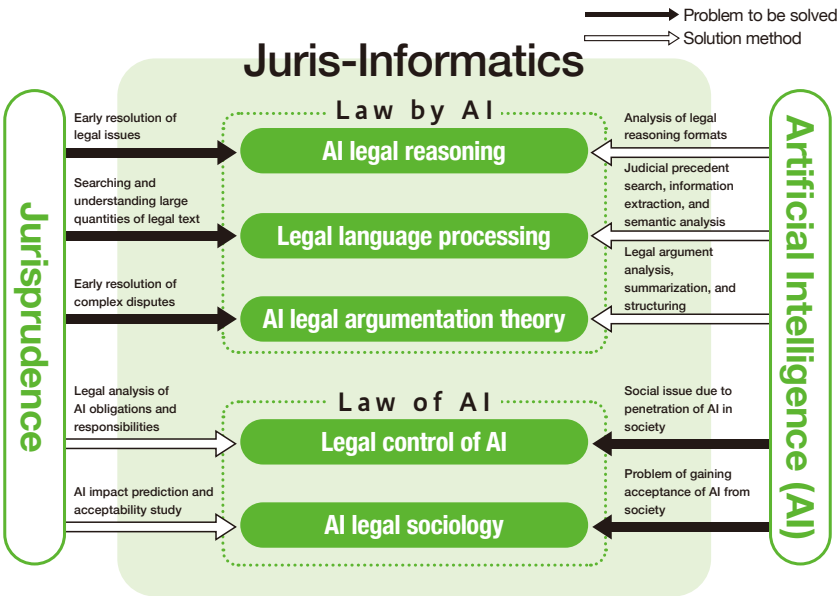
Voice recognition could be applied to the statements of discussion participants to chart who expressed what opinions, and to explore points of contention or confirm points of agreement, as in, "everyone agrees on this point," or "there are contrary opinions here, so more discussion is needed."

Very little law-related information in Japan is available in electronic format

— We are finally getting a complete picture of juris-informatics. Are there any challenges in advancing its various themes?

A big problem in Japan is that it

Research Field of Juris-Informatics



“We will see how ready the government is to take risks”

remains the case that very little legal data are available in electronic format. So even if someone wanted to promote machine learning to develop AI, there are no data for that. In Canada, most court decisions are digitalized and publicly disclosed. In Japan, however, judgments are basically written on paper, though they are open to the public in the sense that you can read them on paper if you go to a local court.

—— Why aren’t judgments digitalized?

In the judicial world, there is an obsession with “original documents,” which must be physical and tangible. That’s why judgments are recorded on paper. Another big problem is privacy; since written judgments contain real names, they need to be anonymized.

My biggest concern is that China or another power develops superior deep learning based on freely available judicial precedents, enabling rapid advances in AI technology. Japan would be left behind and find itself in a regrettable position. Even in Europe, it’s not possible to use data indiscreetly due to strict privacy protection. Technology might only progress rapidly in autocratic nations that do not respect privacy.

—— AI is already being used in business law. However, when a certain company inquired whether it’s legal to offer a service that uses AI to check contracts, the government responded that such a service might be in violation of the Attorneys Act.

This opinion would have the effect of hindering the development of AI-based businesses. Many years ago, there was a problem with a file-sharing application called Winny. It was a superb piece of software based on peer-to-peer (computer-to-computer) communication technology. After its developer was arrested, however, the technology died out in Japan, though he was ultimately found not guilty by the Supreme Court. This technology should have been freely available, but the government blocked its use, eventually killing it off. So, do we do like Japan and suppress new technologies preemptively to avoid social problems? Or do we do like America and tolerate a certain degree of risk by giving new technologies a chance to develop, only taking remedial action if problems arise? The question of which path to take will put the government’s resolve to the test.

—— Finally, do you have any plans to establish a research center in Japan?

To properly establish juris-informatics as a new academic system, we are now thinking of establishing a research center within NII that will bring together researchers from informatics and law, including researchers from outside institutions. We hope to have the center running by next fiscal year.

A Word from the Interviewer

Google and the other major U.S. digital giants, known as GAFA, are using the world’s de facto official language, English, and the wealth of data they have so far accumulated as a weapon to dominate the next phase of the global technology revolution, including automated translation, voice recognition, image recognition, and autonomous vehicles. In contrast, Japan is a laggard in digitalization. Without the electronic data essential for machine learning in the judicial world, juris-informatics will soon hit its limits. The Ministry of Justice is finally looking into making the 200,000 or so civil trial decisions rendered each year publicly available. We hope that a system will be created as soon as possible to facilitate the use of these data for research and business, based on a recognition that data constitute a public good.

YAMADA, Tetsuro

Editorial Writer,
The Yomiuri Shimbun

Joined the Yomiuri Shimbun after graduating from The University of Tokyo. In 2006, he studied at the Massachusetts
Institute of Technology (MIT) as a Knight Science Journalism research fellow. After working in the economics and science departments of the newspaper, and as a special correspondent at its Washington bureau, in 2018, he was appointed Science Department Chief. Since 2019, he has served as an editorial writer (on science and technology).

OTA, Shozo
Professor, School of Law, Meiji University
Professor Emeritus, The University of Tokyo
Attorney at Law

NITTA, Katsumi
Professor Emeritus/ Specially Appointed Professor (School of Computing), Tokyo Institute of Technology
Project Professor, Principles of Informatics Research Division, NII

Juris-Informatics

Law by AI
- ☐ AI legal reasoning
- ☐ Legal language processing
- ☑ AI legal argumentation theory

Law of AI
- ☐ Legal control of AI
- ☑ AI legal sociology

Applying AI to Trials: "Hopes" and "Fears"

Current State and Challenges in AI Utilization

The application of AI in the field of jurisprudence is advancing significantly in other countries. It is also likely to move closer to practical implementation in Japan in the years ahead.
How can AI help to make the judicial system more efficient and effective?
To discuss this question, we talked to two highly experienced researchers in this field, OTA, Shozo and NITTA, Katsumi.

Interviewer
IDA, Kanako
Editorial Writer, Asahi Shimbun

OTA, Shozo/After teaching at Nagoya University School of Law as a researcher in civil procedure law, taught legal sociology at The University of Tokyo Faculty of Law. Has engaged in interdisciplinary research on AI and law, law and economics, neurolaw, law and negotiation, law and statistics, alternative dispute resolution (ADR), lawyer's theory, civil procedure law, and law and evolutionary game theory. Recent publications include "Introduction to Law in the Age of Artificial Intelligence," Kobundo, 2020.

— Up to now, human lawyers have been at the forefront of our judicial system. My impression is that the idea of using AI in the legal system has received very little attention. How has research on the deployment of AI evolved?

NITTA: In Europe and North America, computer programs with legal knowledge to assist lawyers have been under development since the 1970s. Such software tools are known as "legal expert systems." In the 1980s, a project to develop such systems in Japan was also launched.

OTA: This initiative initially aimed at developing an advanced legal logic tool. I took part in this effort as a legal scholar in the early 1980s, but there was little interest among lawyers at that time. Even the use of Bayesian decision theory and Bayesian statistics to improve the accuracy of predictions while gaining new information and experience—an idea now taken for granted—was heretical at the time.

NITTA: In their early stages, legal expert systems converted laws and regulations into rules that could be understood by computers so that they could reach judgments for giving legal advice. Later, their capabilities expanded to making judgments based on reference to judicial precedents too. In recent years, work has progressed on trying to apply machine learning to databases of judicial precedents to try to improve the accuracy of decision predictions. What lawyers want is a function that can make difficult judgments that they can't figure out in their heads. I don't think such a system exists yet, however.

——What are some of the unique difficulties of applying AI to legal matters?

NITTA: Firstly, it's very difficult to create a system of rules. Machines cannot understand everyday vocabulary, common sense, or other kinds of information about the outside world. No matter how many rules are created within the context of laws and regulations, they will be insufficient when applied to real problems if there are no rules about the outside world. It is difficult to make judgments about various kinds of legal terms, such as tort (unlawful act) and negligence, because their scope of recognition differs from case to case.

Deep learning for highly accurate decisions

——What kind of impact are recent advances in deep learning making?

NITTA: We can now analyze large volumes of text data in detail to help make more accurate legal judgments. Deep learning also enables advanced services such as checking contract documents and giving detailed advice to clients based on reference to judicial precedents. This kind of "legal tech" is already in practical use, with dozens of law firms in Japan reportedly deploying it in some form. However, there is an ethical debate on whether the use of advanced technology in trials should be unrestricted. It is now technically possible, for example, to run a simulation to find out what juror attributes offer the greatest advantage in a jury trial. However, there is a question mark over whether such practices impact the fairness of trials.

OTA: In the U.S., there are companies that offer advice on which jurors to select and which to avoid in jury selection procedures, for a hefty fee. The strategy is to try to select the jurors who are most favorable to your side, based on social surveys. In Japanese lay judge trials, the prosecution and defense are each entitled to reject up to four jurors for any reason. Since lawyers have a duty to maximize the interests of their clients, they need to do whatever they can within the rules. In France, systems for predicting legal decisions became a controversial topic when the country introduced a law prohibiting predicting decisions regarding individual judges. Yet, the same law promotes the disclosure of judgment information after anonymizing the names of the parties to the dispute.

—In this year's ordinary session of the Diet, legal amendments were made to enable greater use of IT for civil court proceedings.

Creative judgments require breakthroughs beyond machine learning (NITTA)

NITTA: Court proceedings will become more efficient, as complaints and decisions that were previously handled in writing can now be handled digitally. Researchers are also likely to get access to a far more data.

OTA: I don't know why this has taken so long. It could have easily been done 10 years ago. Lawsuit documents are still being submitted by postal mail or fax. In Spain, courts are equipped with three or four video recorders. So when an appeal is filed, the higher court receives video recordings as part of the formal record of proceedings, along with digitalized evidence. Japan needs to stop relying on personal seals and paper.

Development of AI for "social justice"

—How will people respond to the application of AI to the judicial system?

NITTA: An early U.S. paper on legal expert systems reported that their development was motivated by the desire for greater social justice. It isn't fair that rich people can hire talented lawyers to obtain an advantage in court. It's important that everyone can readily access the court system and obtain a correct judgment. As an example, in a divorce mediation, a wife should not have to accept unfavorable terms just because she doesn't understand the law as well as the husband. If the adoption of AI can help to advance discussions by identifying points of contention in complex cases, it should help to speed up trials. Although it would be problematic to leave judgment processes entirely to AI, AI can be valuable if it is skillfully used as a supplementary tool.

OTA: I conducted a social survey on the use of AI in trials. I found attitudes to be ambivalent (inconsistent), with both strong hopes and concerns. When we

asked people about the following potential benefits of AI trials, they expressed positive anticipation for all of the following: "legal decisions will be made consistently nationwide, eliminating variation between courts and judges"; "fact-finding will be scientifically correct"; "the negative effects of false or inaccurate testimony and evidence will be eliminated"; "trials will be fair and neutral"; "trials will cost less"; "trials will take less time"; and "trials will not be affected by the competence level of individual lawyers." However, when we asked people, they expressed strong concerns about the following potential issues with AI trials: "flaws in AI trail systems could lead to miscarriages of justice"; "there is a risk that AI trial systems will be illegally manipulated from outside"; "trials may lose a sense of humanity"; "there is a risk that trials will be unable to adapt to social changes"; and "there is a risk that trials will be unable to adapt to changes in human values and ethics." From this, we learned that people feel conflicted about the promise of this new technology, simultaneously expressing hope and fear. To promote the spread of AI-assisted trials, it is essential to ease these concerns.

AI can be easily applied to mediation

—How are practical applications of AI likely to unfold in the coming years?

OTA: In cases of breach of contract and collection of sales proceeds, the contested circumstances and evidence tend to be similar, so a human judge will probably not be needed. It would be good enough if parties that feel disadvantaged can get a human judge to review their case on appeal. On the other hand, although AI would be capable of calculating lost earnings and compensation for damages, I imagine this would be very contentious. In calculating lost earnings for women, for example, AI might base its calculation on a lower wage (compared to men), due to statistics on women's wages. In other words, since AI learns from data about the past, it could reproduce negative legacies of the past. Even in America, the decisions of judges are often unconsciously (or consciously) rooted in discrimination based on race, gender, or other factors. This is why there are concerns about AI learning from the past in this way.

NITTA: In court cases, it is essential not only to draw a conclusion but also to present the reasoning behind the decision. The use of deep learning has the potential to facilitate very precise legal judgments, but humans will not be able to understand why a particular decision was reached just by looking at the internal parameters of the system. That is, deep learning might be able to lead us to correct decisions without us knowing the reasoning behind the decision. In a court of law, though, if a judgment is made without presenting the reasons, people will be left unconvinced and dissatisfied.

OTA: Nevertheless, although the reasons for actual court decisions are written in terms of requirement facts and legal syllogisms, cognitive neuroscience has demonstrated that actual decision-making process and the real reasons for decisions are rooted in some combination of unconscious and emotional impulses. This leads us back to the question of whether the requirement facts and syllogisms, which are only "judgments made in hindsight" or "*ex post* rationalizations," when a trial requires reasons, are really sufficient for a human judge.

—It seems that it will take quite a long time for "AI judges" to appear on the scene.

NITTA: The use of alternative dispute resolution (ADR) is recommended, whereby mediation, arbitration, and other out-of-court procedures are used first, as opposed to taking a dispute immediately to court. There is also discussion happening about ODR, or online ADR. In ODR, AI is expected to assist with information searching, responding automatically to simple consultations and advancing discussions. More advanced functions might include analyzing points of contention, formulating compromises based on the concessions made by both parties, and preparing a written agreement based on discussion.

OTA: The easiest way to start deploying AI is in mediation. Trials ultimately end in a public


If all human data can be analyzed, AI courts could emerge (OTA)

judgment that is unilateral and binding, but if judgments were made by AI, there would still be a lack of information to present that shows a judgment to be appropriate, so people would feel resistant to the process. In mediation, however, AI can present the parties with specific, concrete proposals, but if the parties fail to accept one of them, the process ends there. Or if they agree, the mediation is complete. Therefore, as long as the parties agree under the principle of private autonomy, no miscarriage of justice can occur. The AI could propose three or four solutions for the parties to choose from, based on judicial precedents and past dispute resolution cases, along the lines of, "this solution may be appropriate in this kind of dispute." I consider this use of AI very feasible.

In the end, people will still need to make decisions

—So, it is quite possible that AI could be used like that!

OTA: Yes, but there are still going to be decisions that only human judges can make. For example, when a new legal problem arises, such as how to think about copyright in the Internet age, only a flesh-and-blood human judge can decide the issue, for the simple reason that there are no judicial precedents for AI to learn from. Another point is that even decisions that seem obvious today can become strange as society changes. Although the period of exclusion under the Civil Code is 20 years, AI is unable to flexibly decide where to set the starting point when, say, an unlawful act is followed by aftereffects or a recurrence of the act. Just as the Supreme Court has sometimes overturned lower court decisions in line with judicial precedents, I believe that in the end, judgments must be made by humans. In other words, I think that so-called "hard cases" (cases that require legal policy value judgments) such as social changes, ethical changes, cultural changes, and political issues will inevitably need to be made by human judges. The rest will return to the principle of democratic society of review by the Diet and other political processes.

—I wonder if the decisions that AI will be able to make can change over time, if AI can take into consideration the socially accepted ideas of the time?

NITTA: If legal judgments are made by machine learning from a database of judicial precedents, as they are now, there is a risk that only conservative decisions that align with precedents will be possible. To enable more creative judgments when there is a significant change in social conventions, we need a breakthrough, to get beyond machine learning from a database of precedents.

OTA: If there were an AI computer with access to all kinds of news, chats, and emails, it might be able to grasp the trends of the times to predict public opinion three years ahead and make decisions based on that prediction. In our age of wearable computers and the capacity to analyze vast quantities of data about human beings, we may see the emergence of AI courts capable of anticipating worldwide trends. It's still a long way off, though…

NITTA: There is a fear that AI will get out of our control. It is said that sooner or later, the computing power of an ordinary PC will outstrip the total computing power of all human brains. However, the fact that we can analyze huge amounts of data does not necessarily mean we will be able to make smart judgments or correct decisions. It would be wonderful if AI could autonomously make correct value judgments, but there is no conceivable mechanism to make this a reality.

A Word from the Interviewer

How can AI be useful in the field of jurisprudence, where intelligence collides with anger, resentment, and other emotions? This question was convincingly answered by the two professors, who have been involved in this field of research since its earliest days. Given the accelerating application of IT in the judicial system, to develop databases of all legal judgments, for example, I felt a keen need to resolve the contradictions of the existing system, such as the lack of substantial access to court records. Even if AI becomes convenient to use, what unique value can flesh-and-blood human lawyers provide? Fostering legal professionals who can fulfill the needs of the AI era is also an urgent challenge.

IDA, Kanako

Editorial Writer, Asahi Shimbun

After graduating from the Department of Social Psychology at The University of Tokyo, joined the Asahi Shimbun. While employed there, in 2012, earned a master's degree (Socio-information and Communication Studies course) from The University of Tokyo Graduate School of Interdisciplinary Information Studies. After stints working in the newspaper's city department and as the Brussels bureau chief, is currently in charge of judiciary-related editorials. Author of "Discussions and Reports on the Lay Judge System" (Journal of Mass Communication Studies No. 82).

 Photography by KAKE, Makoto (pages 7-9)

Using AI for Legal Reasoning and Judgments

The Potential of PROLEG, a Legal Reasoning System

PROLEG, a legal reasoning system developed by a team led by Professor SATOH, Ken, makes use of artificial intelligence (AI) to infer the reasons used to arrive at a legal judgment. Since it incorporates a "logic programming language," PROLEG is an "explainable AI," as opposed to an unexplainable "black box." It is interesting to consider this technology in the light of whether the use of AI in the field of jurisprudence can be readily accepted.

SATOH, Ken
Professor, Principles of Informatics
Research Division, NII

Criminal trials start with the prosecution and defense laying out their evidence to establish the facts of the matter (fact-finding phase). Next, to decide on the illegality of the matter, there is a discussion about which provisions of which laws are relevant (subsumption phase). With all the material now assembled, in the final phase the judge makes a judgment of guilty or innocence decision (judgment phase).

In television courtroom dramas, decisions are sometimes reversed after an intricate mystery is unraveled. However, in ordinary civil trials, there is a significant variance in the arguments of the plaintiff and the defendant.

Although the term "facts" is used, the reality of the matter is unclear so it requires delicate levels of judgment. Thus, the first phase of fact-finding and the subsequent phase of subsumption remain to be handled by human prosecutors and defense lawyers.

The logic of PROLEG

In principle, the PROLEG framework developed by Prof. SATOH and his colleagues, covers the final "judgment phase" of trials, which is relatively easy for computers to handle. If PROLEG can someday handle a certain level of evidence-based fact-finding and application, we could call it an "AI judge" or "AI jury." For now, though, it's more appropriate to call it a "judgment support tool for legal experts" or a "decision expert system."

In trials that have unresolved areas of ambiguity, or "gray zones," meaning questions that cannot be settled in terms of black and white, a human decides on the basis that "based on a comprehensive consideration of the material presented so far, this is the most reasonable conclusion." Although the information is incomplete, computers can also search for conclusions that do not produce inconsistent results based on rules that cover general principles and exceptions.

As an example of a procedure, suppose that the tenant (lessee) of a rental apartment (B) subleased the apartment to a sister without consulting the landlord (A) (see the figure.) The landlord complained that the tenant had acted without his permission, and it led to the termination of the rental contract. The tenant feels that the landlord's action is unjustified for such a trivial action so he refuses to move out the apartment. Thus, the matter ends up in court.

Assuming that a valid rental contract exists and that the tenant is proved to have sublet the apartment to the sister, the logical structure of the legal case according to PROLEG is as follows.

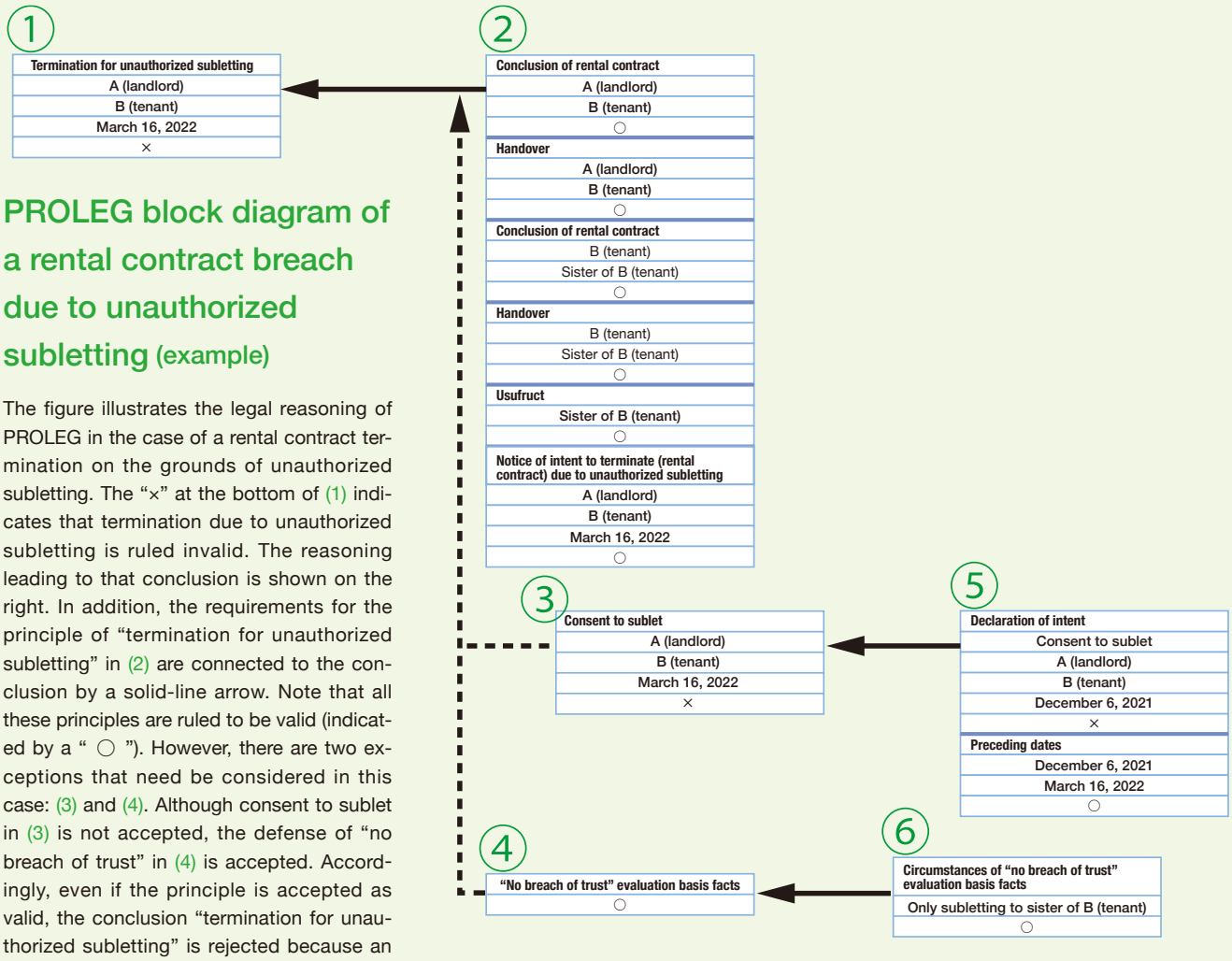
Legally, if a contract has been established, it cannot be terminated, with the exception that if there is any breach of contract the landlord can terminate it. → Subleasing constitutes a breach of contract. → The landlord can terminate the contract. However, there is an exception to this termination provision (an exception to an exception) too: if the landlord gives prior consent to the subleasing, the landlord cannot terminate the contract. → But the landlord did not give consent, so the landlord can terminate. There is also another exception: the contract can be terminated if the rela-

tionship of trust between tenant and landlord breaks down. → So, the case hinges on whether the tenant's action of subleasing to a sister is considered sufficient cause for violating the relationship of trust. Like this, PROLEG reaches a conclusion after checking all principles, exceptions, exceptions to exceptions, etc., to ensure that there are no omissions.

A lawyer might think, "This is what I do every day. As a professional with plenty of experience and knowledge of rental contract disputes, I know everything there is to know. I don't need to learn anything from a computer." However, this system can be very useful for new lawyers, for checking that no points of contention are overlooked, or that there are no errors in legal arguments, as well as for nonprofessionals, for exploring the prospects of a trial. The advantage of PROLEG is that it offers the know-how of a veteran lawyer to new lawyers and people with no legal expertise. In contrast to a general-purpose system that can handle a wide range of tasks, a system that features a high degree of knowledge in a specific field is known as an "expert system." As Prof. SATOH points out, "Expert systems can be highly effective, if they are applied to the appropriate field, without excessive expectations and with awareness of their limitations. Conversely, systems that try to be too versatile often fail." In other words, this system can be said to be solid rather than flashy.

Though PROLEG seems to be a genuinely useful tool, its use by legal professionals has not progressed much. Its use is still essentially limited to research and testing. The biggest obstacle to wider deployment is that facts and other data need to be entered in computer code, rather than in a natural language such as Japanese or English. This is a major hurdle for legal professionals who are unfamiliar with the program, so it is unsurprising that they feel unwilling to try it. Hopefully, we will see some improvement in this area soon.

At present, a pull-down method of selecting input items (instead of using computer codes) is being studied. Even with this method, however,



PROLEG block diagram of a rental contract breach due to unauthorized subletting (example)

The figure illustrates the legal reasoning of PROLEG in the case of a rental contract termination on the grounds of unauthorized subletting. The "×" at the bottom of (1) indicates that termination due to unauthorized subletting is ruled invalid. The reasoning leading to that conclusion is shown on the right. In addition, the requirements for the principle of "termination for unauthorized subletting" in (2) are connected to the conclusion by a solid-line arrow. Note that all these principles are ruled to be valid (indicated by a " ○ "). However, there are two exceptions that need be considered in this case: (3) and (4). Although consent to sublet in (3) is not accepted, the defense of "no breach of trust" in (4) is accepted. Accordingly, even if the principle is accepted as valid, the conclusion "termination for unauthorized subletting" is rejected because an exception is accepted. Blocks (2), (5), and (6) represent the legal facts of the case, determined in the fact-finding phase and application phase. (Explanation by SATOH, Ken)

it is difficult to determine how to formulate the Q&A procedure for the pull-down menus.

Professor SATOH elaborates, "Users want AI to work like a vending machine: just enter your case details in Japanese and receive an automatically generated judgment. It's hard to get them to use any system requiring more effort than that."

PROLEG references around 2,500 rules, consisting of norms derived from Civil Code and Supreme Court precedents. This scale makes it the largest system of its type anywhere in the world. And to make sure that the system works properly, a graduate student in law from The University of Tokyo School of Law is employed part-time, specifically to verify that PROLEG can accurately solve short-answer questions from the national bar exam.

However, since the text of a court's judgment does not necessarily describe the flow of logic and reasoning in detail, there are limits to the input of rules. The texts of court judgments nearly always contain some black-box areas that remain unclear. In the case of Supreme Court precedents, although specialist explanations are available, the question of how to broadly incorporate these judgments (and those of lower courts where such authoritative detailed analyses are not available) into a computer system is proving to be an intractable challenge, according to Prof. SATOH.

Extending a system like PROLEG will further expand its AI potential.

In theory, it may be possible to imitate the craft of expert legal professionals who gradually develop judgment criteria in their minds after looking at many judicial precedents, by importing massive numbers of precedents and subjecting them to machine learning. Suppose we enter a large number of cases in which a defendant was judged to have acted in legitimate self-defense and apply a computational model that imitates the neural networks of the brain to learn how the various judgment criteria were weighted, so as to maximize the accuracy rate in predicting acceptance/rejection of legitimate defense. Such a system should then be able to reliably predict judgments in new cases. Unfortunately, research on methods that require such a large quantity of training data has not advanced, because court judgments in Japan are not currently available in digital format.

Can AI make better judgments than humans?

When we use deep learning, all we can say about the result is that "computation generated this output." The massive calculation procedure leading to the result is so complex that the decision-making process becomes a black box. And even if we feel confident that our deep learning produces the correct result, would people really be convinced by a death penalty that is decided by an AI system? Since PROLEG can trace the flow of logic, however, we can always check the turning points in the reasoning process that lead to the judgment. This makes PROLEG a human-friendly system that enables people to understand court decisions.

Skepticism about the deployment of AI in the field of jurisprudence is likely to persist, however. It should be remembered that historically, jury systems arose only after there was a widespread consensus that ordinary citizens (not just professional judges) were capable of making correct legal judgments. Similarly, a time may come when it is widely agreed that AI can make legal judgments as effectively as humans.

On the question of confidence in the judicial system, I recall an interesting paper by Israeli researchers ("Extraneous factors in judicial decisions"). The study analyzed in detail how eight judges reviewed the bail decisions of over 1,000 prisoners. It found that when judges arrived at the office in the morning, they were initially generous in granting bail but became significantly more hesitant to grant bail just before midday. Immediately after lunch, the bail rate rose again, before declining again toward evening.

In other words, with psychological fatigue, the judges tended to revert unconsciously to a "default" judgment of "no bail." Or, more dramatically, whether a prisoner was granted bail was influenced less by the prisoner's behavior or rehabilitation potential than by the judge's blood sugar level. Most people would probably recognize the truth of this tendency from their personal experience. When we feel relaxed and unhurried, we tend to think more carefully about things and act more generously (granting bail). Conversely, when we feel hungry or irritated, we tend to jump more easily to harsh judgments (no bail). Given this reality, many prisoners would naturally prefer to have their cases reviewed by an AI system than by a human.

As the times have changed, things once considered obscene under the law are now considered unremarkable. It is also quite common that judgments made in the first instance are overturned in the second instance. It is no surprise that different judges have different ideas and values, and therefore come to different decisions, even when faced with exactly the same evidence. If an advanced AI system were deployed for judicial purposes in the future, would we see a greater convergence or consistency in legal judgments; or would there still be variations in judgments due to minor differences, just as we see now due to the diversity of views and opinions between individuals? It's hard to say, but **philosophical questions will no doubt emerge as the future of AI in jurisprudence takes shape over the coming years.**

Reporting and writing by YAMADA, Tetsuro, Editorial Writer, The Yomiuri Shimbun

Juris-Informatics

Law by AI

- AI legal reasoning
- Legal language processing
- AI legal argumentation theory

Law of AI

- Legal control of AI
- AI legal sociology

Dialogue

YOSHIOKA, Masaharu
Professor,
Division of Computer Science and Information Technology, Graduate School of Information Science and Technology/ Institute for Chemical Reaction Design and Discovery, Hokkaido University

×

KANO, Yoshinobu
Associate Professor,
Department of Behavior Informatics Faculty of Informatics,
Shizuoka University

How Well Can AI Perform on the Bar Exam?

Current state and challenges of legal language interpretation

Is artificial intelligence (AI) really capable of passing the bar exam? The Competition for Legal Information Extraction and Entailment (COLIEE) is an international legal document processing contest held annually since 2014. Participants tackle tasks involving the application of AI technology to the field of law. To get an overview of COLIEE and some of the challenges that its implementation has brought to light, we interviewed two of the competition organizers: YOSHIOKA, Masaharu (Professor at Hokkaido University) and KANO, Yoshinobu (Associate Professor at Shizuoka University).

YOSHIOKA, Masaharu / After working as an assistant at the National Center for Science Information Systems (later NII), moved to Hokkaido University, serving as an Associate Professor at the Graduate School of Engineering before assuming current position. Expertise and research interests include the application of knowledge processing technology to information retrieval and knowledge acquisition from document data and Linked Open Data, as well as the utilization of such data.

KANO, Yoshinobu / Assumed current position after working as a project researcher at The University of Tokyo and a PRESTO researcher at the Japan Science and Technology Agency (as well as a visiting researcher at NII). Specializes in fundamental technology for natural language processing and its applications. Research interests include the construction of natural (human) language processing models and their application to law, politics, medicine, communication, and other fields.

—— To begin, please explain what COLIEE is, and tell us about your research interests and how you got involved with COLIEE.

KANO: COLIEE is an international contest of AI systems for automatically answering short-answer questions about law in bar exams. Basically, participating teams from around the world compete in answering exam questions, aiming for the maximum accuracy and performance. The teams make their presentations at an international conference held each year.

COLIEE currently involves four separate tasks, Tasks 1 to 4. Tasks 3 and 4, the original two tasks, are to automatically answer yes/no questions on Japanese Civil Code from bar exams. The main questions are the latest questions of the year. These are provided together with past questions and their correct answers, the legal texts themselves, and the provisions of the Civil Code, for use in answering the questions. The questions are provided in Japanese, along with English translations.

Tasks 1 and 2, which use a database of Canadian case law, were added in 2018. Professor Randy Goebel and his colleagues at the University of Alberta, Canada, oversee these tasks. Apart from language, the major difference between the two sets of tasks is that one is based on Japanese statute law and the other on Canadian case law.*2

Tackling a challenge a decade ahead of large corporations

As an undergraduate, I studied physics, but since my master's, I have worked on natural language processing. Later, at NII, I worked on language processing in a variety of fields, such as generating automated answers in social studies and medical language processing. At the time, I also worked on the

"AI Wolf project," which aimed at automated playing of "Are You a Werewolf?".*3 In collaboration with other institutions and universities, NII also participated in the "Todai Robot Project," an AI project similar to COLIEE, aimed at automatically answering university entrance exam questions.*4 With this background, I was involved with COLIEE from its inception.

The challenge of using AI to automatically answer bar exam questions was extremely difficult in those days, so very few people seemed willing to even try it. Since we couldn't match large companies in terms of the funding and staffing needed to produce immediate results, I thought it would be better to work on something more essential and challenging that would take five or 10 years to bear fruit.

YOSHIOKA: I studied precision engineering at undergraduate level, and later design in graduate school. This involved investigations into "how do people make things?" and "what is design?" with a special focus on "knowledge in design." Later, in 1996, when I worked at the National Center for Science Information Systems (the predecessor of NII), I got interested in bibliographic information retrieval. That's when I thought it might be possible to do something interesting if we could incorporate large quantities of information from open sources. That's how I got started in research linking information retrieval and AI.

Focusing on information retrieval, I first participated in COLIEE as a competitor in 2016 and then as an organizer from 2017.

In the current COLIEE, Task 3 is focused on information retrieval, to find relevant provisions from Civil Code texts in response to given questions, while Task 4 is a question-and-answer task, requiring a Yes/No answer to given questions. I work mainly on the first part, the information retrieval part of Task 3, focused on searching for relevant provisions.

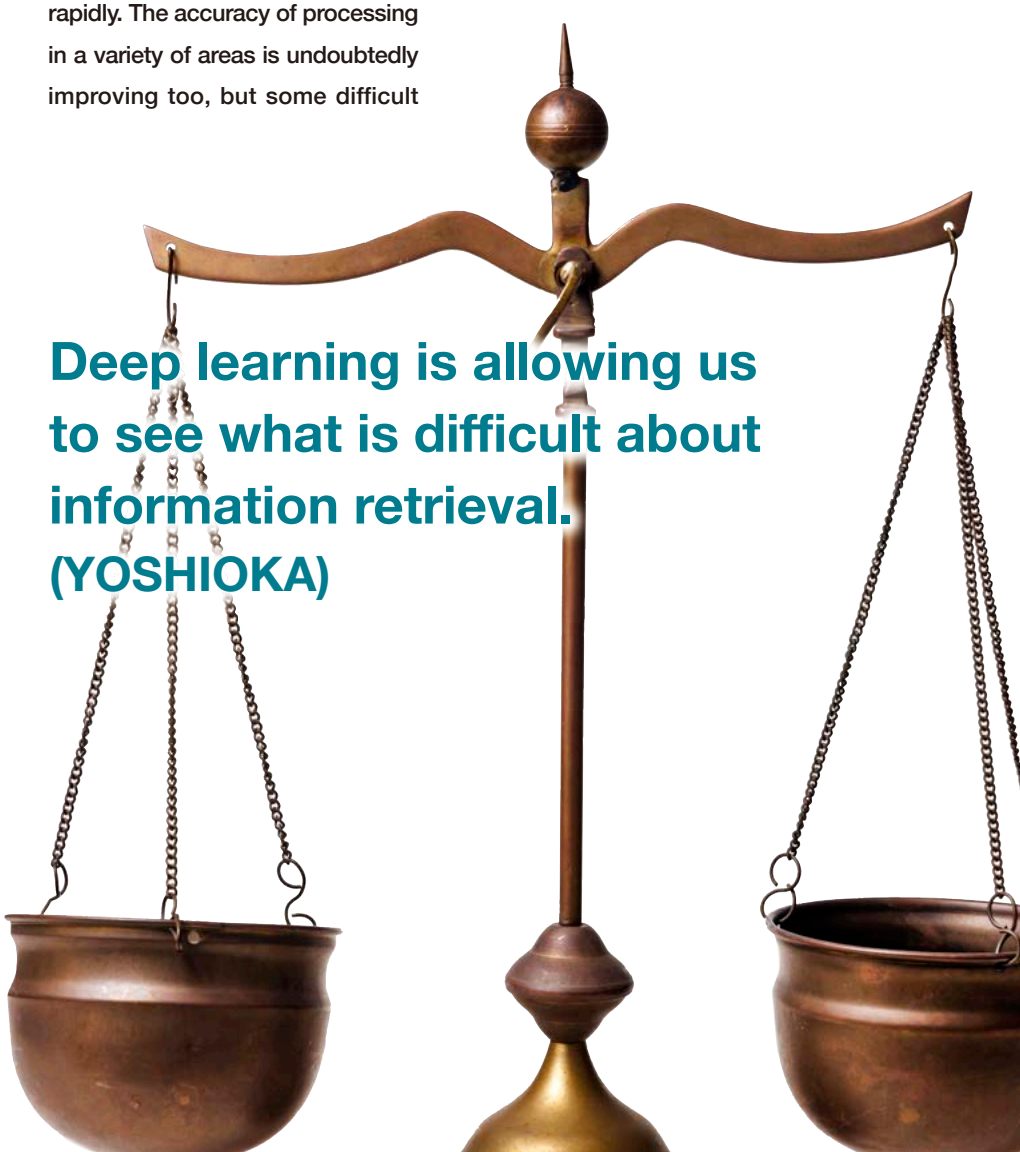
Difficulty of automated processing of legal language

—— What is the significance of COLIEE's role in natural language processing research? And what are the main difficulties in this field?

KANO: More and more researchers are working on language processing, and the research is advancing rapidly. The accuracy of processing in a variety of areas is undoubtedly improving too, but some difficult problems remain.

There are currently three main difficulties in natural language processing. First, there are many ambiguities and omissions in natural language, especially in spoken language. Second, AI lacks the kind of "common sense" that allows humans to carry on a conversation based on a premise that they understand intuitively. This is now a major challenge for COLIEE participants trying to generate automatic answers to bar exam questions. Last, it is quite difficult in practice to maintain a logical or consistent view of things in processing, especially legal language processing.

You might think that legal language is a highly suitable kind of natural language for automated processing because it needs to be as logi-



Deep learning is allowing us to see what is difficult about information retrieval. (YOSHIOKA)

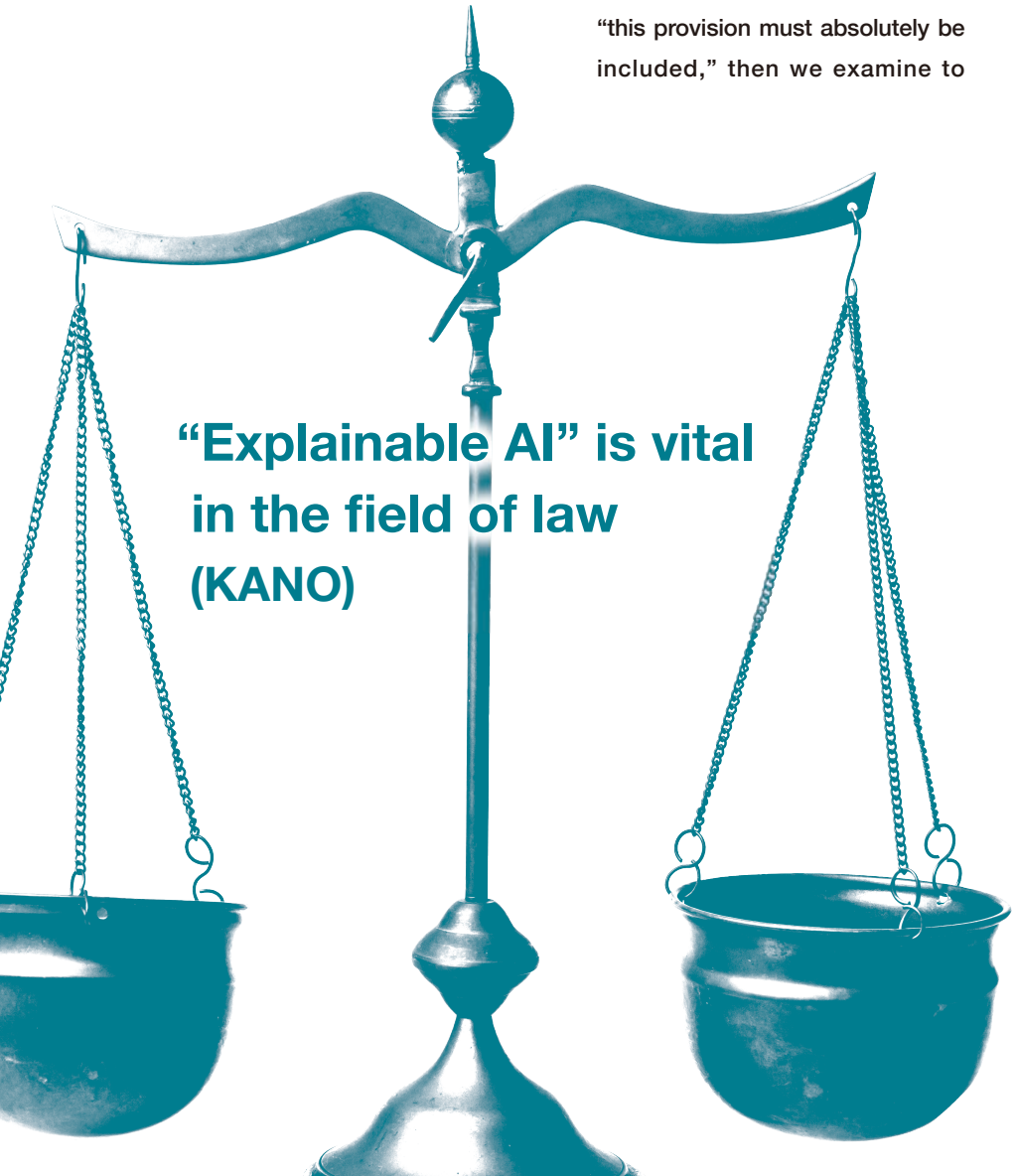
cal and unambiguous as possible by its very nature. However, there are many things that remain unwritten or unexpressed. At the same time, there is now a strong demand for automation-based support in the legal field.

When aiming for practical automation, it is important to start by clearly defining what the problem is, identifying the issues that need to be resolved. I believe that one of COLIEE's roles is to provide tasks that present difficulties from a variety of angles, to bring these issues to light.

YOSHIOKA: As mentioned, COLIEE's tasks are divided into two phases, a pre-process of finding the provisions relevant to the question, and the process of selecting the right answer. Initially, we assumed a streamlined system, from presentation of the question to the answer, but when we tried this approach, the precision of the first, information retrieval phase was not very good. If the selection at this stage is incorrect, then whatever answer is derived—whether right or wrong—will be meaningless.

The first step is therefore to conduct information retrieval. Then in the second phase, we test whether we can make a correct decision, assuming that "an ideal information retrieval system" exists. This is the two-stage setup.

Furthermore, the concept of "relevant provisions" in the first phase is also quite difficult. If we assume unwaveringly that at the very least "this provision must absolutely be included," then we examine to what extent other provisions are needed to supplement it. In fact, in Civil Code texts, the provisions of a particular matter may be related to each other in daisy-chain fashion, for example, stipulating that the provisions of one thing be "applied mutatis mutandis" to another provision, or that multiple conditions stipulated by another provision be met. On the other hand, in response to the word "minor," I think it would be excessive to use the provision "18 years of age shall be considered the age of legal majority" (Article 4 of the Civil Code) every time. It is difficult to make allowances for this.



"Explainable AI" is vital in the field of law (KANO)

What is COLIEE aiming at after deep learning?

—— What has been achieved and what issues have emerged in the past eight years of the COLIEE program, and what are the prospects for the future?

YOSHIOKA: Let me explain the procedure of Task 3, the information retrieval part. Unsurprisingly, the biggest change of the past eight years has been the emergence of deep learning.

To begin, I want to say something about the time before deep learning. Initially, COLIEE was about dealing with exam questions, so the questions were ultimately designed to be answered without any ambiguity. Nevertheless, some of the questions were essentially asking, "Do you know this provision?" while others were more specific. Naturally, the former questions were easier to answer, and from the standpoint of information retrieval, much of the language used was

similar and the texts were also very similar. For the latter, however, we attempted to change the expressions used in questions slightly, or replace words with synonyms, but these have not been successful solutions.

In the meantime, by the late 2010s, deep learning had become practically usable. For example, pre-trained language models such as BERT*5 had appeared. Previously, researchers had to create all their own training data, but with the advent of pre-trained models that learn similar words and concepts after reading a large volume of text, it became possible to perform accurate analysis with a relatively small quantity of training data. This made deep learning more accessible. In this way, it became possible to approach language processing so as to take semantic similarity into account. Of course, in some cases, it is better to match words exactly, but through a combination of these approaches, we seem to be getting closer to successfully addressing the problems that were difficult before deep learning.

In any case, as far as obtaining relevant provisions at the information retrieval stage, I think we are at least getting close to understanding "what needs to be done" or "where the difficulty lies."

KANO: The second half of Task 4, where the relevant provisions are applied to the question text to try and derive the correct yes/no answer, follows a similar flow to what Prof. Yoshioka just described.

AI's success rate in answering yes/no questions is 70%

Before deep learning, generally a rule-based approach was used. With classical language processing, the best results are obtained by comparing word delimiters, syntax, and individual words, and judging correctness based on the degree of matching. Later, with deep learning, better results could be produced if the training could be done with considerably large data sets.

Currently, we can generate correct answers to approximately 70% of questions. However, since there are only two possible answers, even throwing a dice achieves a 50% probability of success. We might conclude that after all the effort we put in, we end up with an extra 20% of accuracy. However, we should also note that, in practice, 10% of questions every year are very easy to get correct.

The next aspect of this technology is "explainable AI." Although deep learning has become widely used, it is difficult to understand what is going on "under the hood." If an automatic support system for legal trials that generates judgments without revealing the reasoning behind them were developed today, it would not be accepted. "Explainable AI" is now a hot topic in various fields of application, but it is especially vital in the field of law. We are currently grappling with the challenge of how to reflect this requirement in our competition evaluations, and we may even need to redesign our tasks. For example, although we have used simple yes/no questions up to now, we are thinking of making the questions harder for machines. With the yes/no format, you can always get half of the answers correct, so we are wondering whether it would be possible to devise tasks that allow us to learn more about how judgments are reached.

As for the future, we would like to see more participants, especially Japanese. There is also a move to start making Civil Code judicial precedents available to the public. When this happens, there will be a huge increase in the quantity of available data, which we hope will lead to a sharp rise in the number of people willing to take on the automatic processing challenge offered by COLIEE.

*1 COLIEE
COLIEE-2022 website:
https://sites.ualberta.ca/~rabelo/COLIEE2022/

*2 Japanese statute law/Canadian case law
Statute law refers to legal concepts based on written laws, such as the laws enacted by legislative bodies. Case law, in contrast, refers to legal concepts based on the accumulation of past court decisions.

*3 "Are You a Werewolf?"
A role-playing game in which players engage in conversation to try and identify a liar among ordinary people, or a werewolf among villagers.

*4 Todai Robot Project
An NII-centered joint project involving several businesses and universities, in which an AI robot, To-Robo-kun, is tasked with automatically answering university entrance exams questions.

*5 BERT
Bidirectional Encoder Representations from Transformers (BERT) is a leading deep learning methodology for natural language processing, unveiled in a paper by Jacob Devlin et al. of Google in October 2018.

Juris-Informatics

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- AI legal reasoning
- Legal language processing
- AI legal argumentation theory

Law of AI

- Legal control of AI
- AI legal sociology

The Legal System Surrounding AI

AI and the law

INATANI, Tatsuhiko
Professor,
Graduate School of Law,
Kyoto University

INATANI, Tatsuhiko / Graduated from The University of Tokyo (Faculty of Literature) and Kyoto University (Law School). Juris Doctor (Professional). Took up current position in March 2021. Conducted interdisciplinary research on corporate crime and criminal liability in relation to the development and use of AI. Recent publications include "Privacy Protection in Criminal Proceedings" (Kobundo).

Research in the field of juris-informatics examines the utilization of artificial intelligence (AI) for jurisprudence, as well as the legal control of AI. What kind of legal arrangements are needed to deal with the new problems and risks presented by AI? To find out, we asked INATANI, Tatsuhiko (Professor at Kyoto University), who has been investigating criminal liability in AI.

According to the Ministry of Internal Affairs and Communications' "White Paper on Information and Communications" (2021), 12.4% of companies in Japan have adopted IoT or AI systems or services for the collection and analysis of digital data, which rises to about 20% if those with the intention to do so are included. AI is already being implemented in autonomous vehicles and medical devices, for control of financial systems, and in various other applications. The more widespread the use of AI becomes, the greater the scale and severity of any accidents or malfunctions that occur. According to Prof. INATANI, however, it is difficult to determine appropriate judgments or punishments in the event of accidents caused by AI devices (AIDs) under our current criminal legal system. One reason for this is the "black box" nature of AI.

He explains, "Statistical optimization techniques such as deep learning are often used in the development phase of many AIDs. It is therefore impossible to know how individual data learning and programming actions affect the behavior of an AID. With conventional products, it's easy to predict the behavior of a device; if it used in this way, it will behave in that way. In contrast, AI systems tend to behave stochastically, so their inputs and outputs are unstable. In other words, they have a black-box nature.

Why does this black-box nature make it difficult to pursue the appropriate liability and punishment for accidents and disorders? According to Prof. INATANI, "The principle of negligence liability is fundamental in Japan. Negligence liability holds people accountable based on why they failed to control risks. However, since it is impossible to fully understand the behavior of AI, the results of an AI system are not predictable. Strictly speaking then, no punishment can be imposed. On the other hand, someone can be held liable for knowingly distributing a dangerous product of unknown behavior. Thus, under the current legal system, we have the irrational situation that AI developers could be seen as never liable, or else liable for any kind of failure."

Can DPAs be applied to the challenges of AI?

Many of the concepts underlying the modern legal system were established in the 19th and early 20th centuries, before sophisticated statistical analysis techniques were available. In this sense, AI very much lies beyond the expectations of current legal frameworks.

Professor INATANI therefore advocates a legal system modeled on

Under our current legal system, AI developers can never be liable for accidents, or they can be held liable every time

DPAs. As he explains, DPA stands for "deferred prosecution agreement," a scheme developed mainly in the U.S.A. for addressing corporate crime. Under a DPA, a company that has committed a criminal offense negotiates with prosecutors to defer criminal prosecution in return for collaborating to investigate the causes of the crime and making efforts to prevent recurrence.

"In addition to facing astronomical financial penalties, companies that are convicted of crimes under U.S. laws often have the certifications and licenses they need to do business revoked. It is almost a death sentence, so to speak. For this reason, imposing harsher penalties just makes it more likely that corporations will try to hide evidence. However, the purpose of punishing companies is not to destroy them, but rather to ensure that they establish appropriate corporate governance and compliance systems. This is the thinking behind the DPA scheme, and I believe this same approach could be used to tackle the problems arising from AI."

Under the DPA scheme, companies are meant to discover criminal activity within their organizations and voluntarily report it to authorities, to obtain a reduction or exemption from penalties. As DPAs have thus become an incentive, companies are reorienting themselves to try to resolve legal compliance problems on their own.

Professor INATANI says, "Since determining the negligence of an AI developer requires expertise, it is extremely difficult for judges to do so effectively. Dealing with multinational corporations also makes it hard for prosecutors to collect evidence. In the process of trying to realize Society 5.0 (Japan's vision of the future, which includes the use of big data), AI will inevitably penetrate every aspect of our lives. On the other hand, if AI accidents are unavoidable, it is important for companies and developers to make the utmost effort to limit the risks to a reasonable level and to improve any AI systems that give rise to problems." It's easy to foresee, however, that after a serious accident, victims and grieving families will want to see severe punishments handed out. Professor INATANI points out that any viable solutions need to be acceptable to all the parties concerned.

We need to set up a system of sanctions for companies that includes a DPA-like scheme

"Above all, we need to set up a system of sanctions against companies," he says. "We then need to add a DPA-like scheme to get companies to provide information, so that we can improve the entire AI ecosystem. The victims of AI accidents also need to be involved in criminal procedures in some way. This would give legitimacy to the system; it's vital that the system be seen as good."

Professor INATANI also thinks that establishing such a system will require widespread public acceptance, which will take time.

His research team is also running psychological experiments and cultural anthropological surveys to try and understand how people respond to accidents arising from operation of AIDs in terms of the emotions of blame and condemnation. These experiments and surveys are also being done in the U.K., to compare the standing and social acceptance of AIDs in the U.K. and Japan.

"The study is still in progress, but we've already noted some significant and interesting differences between the two countries. We formulated scenarios involving autonomous vehicles. For example, we asked several hundred people in each country "who is to blame" if a self-driving car hits a pedestrian while overtaking a bus. The British subjects tended to assign blame to the direct actor: the self-driving car or the developer. Japanese, on the other hand, tended to consider multiple factors, posing questions like "why was the bus stopped where it was?" and "doesn't the pedestrian bear some of the blame?"

Professor INATANI says that past research has revealed that due to differences in worldviews, people in the East and West tend to understand causality and view human beings differently. The results of this survey seem to support this finding.

Professor INATANI goes on, "In the course of our research, we are gradually learning about the differences in the sense of blame and condemnation that people experience and about the mechanisms behind those differences. In all countries, people are aware of this problem and recognize that the system needs to be comprehensively improved. As for what kind of legal environment we need to develop, I believe that the ideas I am proposing for a legal system suited to the AI age are likely to be globally acceptable."

According to Prof. INATANI, the more that AI is deployed and the more it becomes visible in the world, the more it will adapt to the environment and evolve. Given the dramatic changes that will occur, research to explore and perfect a global standard legal framework for AI systems will undoubtedly continue.

Can AI be Used to Resolve Online Disputes?

WATANABE, Mayu
Specially Appointed Associate Professor, Department of International Business Law, College of Law and Politics
Rikkyo University

WATANABE, Mayu / Ph.D. (Business Law). During a stint of overseas study at Stanford Law School in the doctoral program at Hitotsubashi University, became convinced of ODR's potential for promoting judicial innovation. Since then, has focused research on law and technology. Served as a member of the ODR Promotion Study Group and ODR Promotion Council of the Ministry of Justice, and is currently a director of the Japan Association for Online Dispute Resolution (JODR), a fellow of the National Center for Technology and Dispute Resolution (NCTDR) at the University of Massachusetts, and a board member of the International Council for Online Dispute Resolution (ICODR).

The use of AI in jurisprudence is expanding in North America

The day when artificial intelligence (AI) is used in our judicial system as a means of resolving legal disputes is likely not too far away. Online dispute resolution (ODR) is a fast-emerging feature of the worlds of law and AI. In both the U.S.A. and Canada, its use is already growing. To learn about the current state and challenges of ODR, we interviewed WATANABE, Mayu, a specially appointed associate professor at Rikkyo University who is investigating this new tool.

Online dispute resolution (ODR) is a mechanism in which parties or intermediaries use online technologies to try to diagnose, negotiate, and mediate a resolution to a dispute so that it does not end up in court. In addition to system design, it involves the development of digital technologies to support the exchange of information and the review/revision of laws and regulations.

Professor WATANABE explains, "The Ministry of Justice put together an action plan in March of this year (2022) and discussions aimed at implementation have just begun. As far as I know, no AI-based ODR is being used in Japan as yet."

The ultimate goal of the plan is a society in which anyone can receive effective support for resolving disputes via their smartphone. In the medium term, the goal is to implement the world's highest quality ODR system. How far ahead of Japan in ODR are Europe and North America?

To find out, this past fall Prof. WATANABE traveled to Canada, where the application of ODR is growing fast, to interview AI researchers at the University of Montreal. These researchers are developing AI tools that help people to decide how to deal with legal problems without depending on lawyers. For example, if a product you buy from an online retailer is broken and you need to seek compensation from the vendor, you can quickly access the information you need to resolve the matter by just answering a few questions.

Professor WATANABE explains, "Although it's not an advanced form of AI, this tool is already used in Canada. Legal services in Japan are fragmented, and people here often struggle to find the information they need and prepare documents for submission. If we had this kind of AI-based chat-like interaction in the early stages of a problem, fewer people would give up when they try to resolve legal matters."

The roots of ODR lie in the U.S.A. In the early 2000s, when eBay began selling a wide variety of products on the Internet, it faced the daunting task of handling huge numbers of complaints from both U.S. and international users. When it was no longer able to cope by adding staff, it deployed the first generation of ODR to assist with dispute resolution.

ODR research in the U.S.A. was initially focused on smoothing the resolution of e-commerce disputes, but it has expanded steadily into the judicial realm. In recent years, as the COVID-19 pandemic limited face-to-face proceedings, ODR was introduced in various state courts around the country. ODR is now deployed in over 100 legal jurisdictions in the U.S.A.

The challenge is how to use AI

The term ODR was used in an official Japanese government document for the first time in 2019. It appeared in a paragraph on "Promotion of IT in Judiciary Proceedings" in a "growth strategy follow-up." This strategy was aimed at responding to Japan's declining international business environment ranking, due to its slow pace of digital transformation. Japan is more than 10 years behind the rest of the world, and only halfway through proof-of-concept trials.

The level of technology needed for ODR in Japan is not inferior to that of other countries. Wi-Fi and smartphones are widely used, and the level of online and software development infrastructure is quite advanced. So, what are the barriers?

Professor WATANABE comments,

How to design an ODR system? Japan is weak at formulating visions

"There is a lack of vision about how to design ODR. More than technology, that's what we need to focus on."

One of the issues she raises is how AI is used. The more reference data available to the AI, the more accurate the support it can provide. It is therefore vital to have a database of dispute cases with detailed factual records. Domestic court judgments are now stored in digital format, which makes them more usable. However, there is no widely accessible database of settlement cases, so things remain in a black-box state.

The Civil Resolution Tribunal (CRT), the world's first online court (tribunal) in Canada, maintains a database of judgments and makes all documents, including proper names, publicly available. "The CRT prioritizes transparency over confidentiality of the personal information of the parties in dispute," says Prof. WATANABE. "The parties need to consent to public disclosure of their personal information, but they are generally not so reluctant to do this, because ODR is a significantly less expensive and faster way of resolving a dispute than a regular court trial, for which a lawyer must be hired."

Japanese people tend to be very concerned about their public reputation. For this reason, imitating this progressive Canadian approach to ODR may not work well here. It may be necessary to modify the system to suit Japan's culture, for example, by anonymizing the parties involved.

Two years ago, the Japan Association for Online Dispute Resolution (JODR) was formed. In the role of a director of JODR, Prof. WATANABE actively works on organizing conferences, collaborating with the University of Massachusetts, an international center for ODR research, and ODR-related personnel training. At JODR's inaugural event in February of this year (2022), a hologram (3D image) of a keynote speaker in San Francisco was projected on stage in front of the live audience at the venue in Tokyo. This hologram technology was used to give the participants a real sense of the potential of the advanced technology available to enhance ODR.

The holographic images clearly showed the facial expressions, gestures, and movements of the remote presenter. This technology allows a mediator who questions a witness located remotely to judge the truth (or falsity) of the emotions and statements expressed by the witness. Currently, the images are quite vivid, but the cost of equipment use is high. The key to greater penetration of this technology is lower cost and higher image quality.

When deploying new technologies such as AI, Japanese people tend to lose sight of the fundamental purpose or underlying theory. Reportedly, only 20% of people in Japan have access to satisfactory judicial services, due to high procedural and cost hurdles. Professor WATANABE stresses that the goal is "to open up greater access to justice" and "to prevent a judicial vacuum." We look forward to seeing the first AI-based ODR system up and running in Japan before too long.

NII NEWS TOPICS

Period: August 5 (Fri.) to November 4 (Thu.), 2022

More details about news items are available online.(in Japanese)
www.nii.ac.jp/news/2022

Facebook
https://www.facebook.com/jouhouken/

Twitter
https://twitter.com/jouhouken

YouTube
(Audio will play)
https://www.youtube.com/user/jyouhougaku

Bit (NII Character) Twitter
https://twitter.com/NII_Bit

NEWS RELEASE 2022

Nov. 8 "Center for Advanced Mobile Driven Research" (CAMDR) is established at NII: An innovative value creation platform for high-performance mobile 5G environments

Nov. 1 Development of a surveillance system using CT images of COVID-19 pneumonia: An ICT platform to enable R&D on immediate response to pandemics

Oct. 31 Number of institutions subscribed to SINET, a platform for supporting academic research in Japan, reaches 1,000

Oct. 26 World's first AI-based app for recognition of kuzushiji (cursive Japanese and Chinese characters), "miwo" wins Good Design Award 2022: Contributes to kuzushiji education and local historical research using old documents

Sep. 15 In addition to regular LINE stamps of "Info Dog Bit-kun," the official character of NII, LINE emojis will also be sold this year

Aug. 31 NII starts providing listing data about the flea market application "Mercari" to universities and other institutions free of charge: Aiming to contribute to the realization of a recycling-oriented society through research on analyzing consumer behavior and psychology in the second-hand distribution market

Aug. 18 NII starts providing data on word-of-mouth reviews of approximately 160,000 products and services free of charge for academic research purposes

Aug. 12 Development of AI to support pathological diagnosis of gastric biopsies: Support for addressing shortage of pathologists and ensuring cancer care

EVENT 2022

▶ www.nii.ac.jp/event/2022

- ☐ Nov. 21 Talk by Prof. Alexandre Guitton Monday on Multigateway demodulation in LoRa
- ☐ Nov. 11 [58th] "DX Symposium for Educational Institutions" (held online)
- ☐ Nov. 8 Online talk by Prof. Ai-Chun Pang on Edge Intelligence for Connected Cars
- ☐ Nov. 2 Onsite talk on "Music creation with Deep Learning Techniques" by Prof. Jean-Pierre Briot, The LIP6, Sorbonne University
- ☐ Nov. 1 24th Library Fair & Forum (booth exhibit and forum)
- ☐ Oct. 13 The following three of the six public lectures in "Frontiers of Informatics" at NII in FY2022:
  - Lecture 1 How to find a good combination: Why you should eat in order of what you like the best, FUJII, Kaito
  - Lecture 2 How do machines speak? ——Progress and challenges of speech synthesis ——COOPER, Erica
  - Lecture 3 (For high school students) Is it possible to digitize people? The deep relationship between intelligence and body, INAMURA, Tetsunari

AWARD 2022

Nov. 10 SATOH, Ken (Professor at Principles of Informatics Research Division) is selected as a FINALIST for the 2022 Alain Colmerauer Prize

Oct. 26 KOBAYASHI, Taisuke (Assistant Professor at Principles of Informatics Research Division) wins the SICE International Young Authors Award for IROS 2022

Sep. 6 UENO, Haruki (Professor Emeritus) is awarded the title of Fellow by the Asia-Pacific Artificial Intelligence Association

Sep. 2 ISHIKAWA, Yutaka (Professor at Information Systems Architecture Science Research Division) is awarded the title of Fellow by the Japan Society for Software Science and Technology

Sep. 2 TATSUTA, Makoto (Professor at Principles of Informatics Research Division) and his colleagues win the 26th Best Research Paper Award (2021) of the Japan Society for Software Science and Technology

Aug. 24 UENO, Haruki (Professor Emeritus) is awarded the title of Honor of JCKBSE2022 by JCKBSE

INFORMATION 2022

Oct. 13 NII Overview 2022 (English version) is published

Oct. 13 Registration opens for NII's 2022 "Frontiers of Informatics" public lectures

Sep. 27 "Remote Lectures and Programming Education Support for Educational Institutions" case study page released

Sep. 22 Started providing "Real-Time MRI Articulatory Movement Database" (rtMRIDB) Ver. 1

Sep. 15 PR magazine NII Today No. 96, "The Crystallization of Wisdom is Discoverable: CiNii research starts in earnest" is published

Sep.6 2nd call of 2022 "NII International Internship Program" Guideline for Candidates (Application deadline by Oct.24th 2022, at 17:00 JST)

Aug. 18 *NII Today* No. 92 (English version) is published

We welcome your comments!

Please feel free to share your comments about NII Today magazine with us. We look forward to hearing from you!

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NII Service Briefings

To help you get the most out of our academic research platform, we are holding briefings to explain our "SINET6" network infrastructure and "NII RDC" research data infrastructure. Participation is free but registration is required.

We will make videos of the briefings available later.

Schedule

* Briefings in Osaka have already been held.

Dec. 20 (Tue.) Tokyo, hybrid event

Registration deadline for venue participation: Dec. 16 (Fri.), 5:00 p.m.

Registration deadline for online participation: Dec. 20 (Tue.), 5:00 p.m.

Dec. 19 (Mon.) to Dec. 27 (Tue.)

Individual consultation week, online

Registration deadline: Dec. 16 (Fri.), 5:00 p.m.

NIIサービス説明会2022 Search

The arcives of NII Service Briefings are avarable only in Japanese.

Announcements

How to View 2022 "Frontiers of Informatics" public lectures

Registration is required to view lectures.

If you registered at Open House 2022:
Visit the web page below and log in using the email and password you registered at Open House 2022.

If you did not register at Open House 2022:
Visit the web page below and sign up for a new account.

https://event.nii.ac.jp/event/6044

As of November 2022, the first three of the 2022 public lectures had been published.
We will make announcements when each of the remaining lectures is posted. You can view the lectures using the ID and password you registered on the left.

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[Essay]

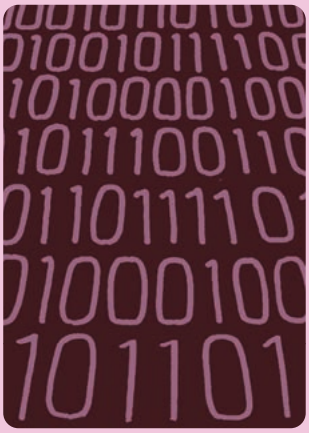
Will There be a Third Generation of Programmers in the Family?

A look at the computer generation gap

My two-and-a-half-year-old is becoming assertive in various ways, becoming gradually smarter and ever more adorable. As my child gets bigger and more capable, I am reminded that the children of today are growing up in an environment that is very different from the one I grew up in. I wanted to expand on this personal observation to reflect on how the world of computers and programming has changed over the past three generations.

My father-in-law, who passed away last year in his 70s, was also a programmer. When he studied electronics at university, he apparently worked with vacuum tubes. By the time he started working for a company, however, transistors had become the mainstream, so he had much to relearn. I assume that he learned programming as an adult. Since computers were so expensive at the time, he did not have exclusive access to one. Some of the computer code punch cards he used are still at my in-laws' house.

When I was a child in the 1990s, we always had a word processor at home as far back as I can remember. At some point during my late elementary school years, my father bought a desktop PC, which I was allowed to tinker with from time to time. Once, while in junior high school, I got the urge to write and run a computer program. I bought a book



on programming, but as I recall, I could not make much progress on my own, because the computer system was too difficult to use. I was only able to finally start programming seriously after I went to university to study computer science.

Today's generation of children live in homes that have about as many smartphones, tablets, and PCs as people, and most children can use these devices on their own. There are also numerous toys that imitate smartphones for babies, as well as toys that supposedly help young children to learn programming (from the age of four). Programming education is now compulsory at elementary and junior high schools, so more and more people are learning about programming. Perhaps for this reason, the quantity of educational materials, books, and classes on programming for children has increased, to the point that it is difficult to choose from the vast amount of available information. There are also full-featured programming environments such as Google Colaboratory that can be used in a web browser, making it easier for beginners to get started.

In the days of my father-in-law's generation, computers were shared by large companies. Then when my generation was growing up, we had one desktop computer per family. Now, for my child's generation, everyone has their own computing device. Thus, generation by generation, computers have become easier to access. The age at which people learn to program has gradually fallen, and the hurdles to programming have gotten lower. Since my own academic specialty is programming languages, I have had the opportunity to teach programming at university, as well as to junior and senior high school students. It is difficult for young children to learn text-based programming, however, and I feel that I have not yet developed sufficient expertise to successfully teach programming to them. I am therefore planning to learn how to do this from scratch, by trying programming for children with my child. So, will we have a third generation of programmers in the family? I look forward to finding out over the coming years.

Assistant Professor,
Information Systems Architecture Science Research Division, NII

TSUSHIMA, Kanae

Weaving Information into Knowledge
NII

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