Dialogue: Is Artificial Intelligence Versus Humans Reflected in *Shogi* as Well as Everyday Life?

AI Raises Again the Question of How Humans Should Live

Sakai Kuniyoshi, Professor at the University of Tokyo vs. Habu Yoshiharu, Professional *shogi* player
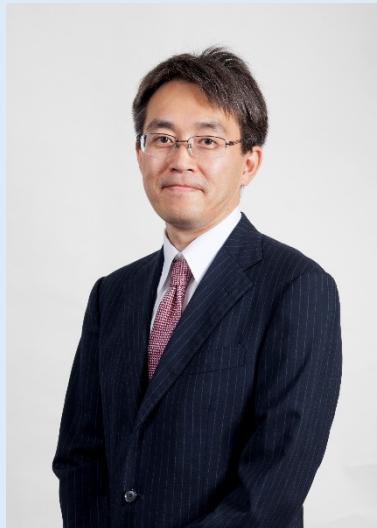
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AI Cuts a Path for New *Shogi* Moves

Habu Yoshiharu: AI (artificial intelligence) has been a popular conversation topic over the last few years. I think the long-awaited appearance of AI in visible forms, such as humanoid robots and automated driving, has been a large turning point for this trend. AI has also achieved developments in the world of board games, including chess, *shogi* and *go*. Recently, the fields which implement AI have expanded. What was once a fantasy has begun to show potential for successful real world application. People are pinning their hope on such potential for AI. However, they also seem to fear the possibility that AI will surpass them, otherwise known as the singularity.

Sakai Kuniyoshi: I'm a scientist who specializes in the language function of the brain. Thinking about AI leads to thoughts about what humans are. In other words, I'm thinking a lot about AI and paying attention to it, because ideas about AI overlap with thoughts about brain functions in many ways. Let me discuss the singularity later in this conversation, because many people misunderstand it.

Habu: Matches between AI and professional shogi players have gained a lot of attention. Because of this, opportunities for me to take part in similar AI-related projects have increased tremendously in twelve months. They have been puzzling me. [Laughs] AI failed to take off initially, but that changed in 2011, when it defeated professional shogi player Yonenaga Kunio in the first Den-o Sen Match, which pitted a human player against AI. I think professional shogi players also began to consider applying AI research findings to their game after that match.

We take unnecessary steps in both shogi and everyday life when we feel that we are in danger because of our defensive instinct. That's why professional shogi players repeatedly train to suppress such fear while developing their professional skills. In the meantime, AI sometimes presents new concepts and ideas that we are unable to develop because it lacks a defensive instinct or a sense of fear, which is why we can learn a lot from the records of shogi matches played by AI.

For example, in shogi there is a strategy called *aiyagura*. At one point, a computer software program discovered a strategy to beat it. Currently, there is no countermeasure for that strategy and as a result, very few professionals use aiyagura these days. A computer program could develop such a strategy because it thought in an inconsistent way. Humans think with continuity, moving one shogi piece when an opponent moves another way. But computer programs lack such consistent thinking. The computer used an unexpectedly simple solution.

Sakai: As you said, humans think of time chronologically. In shogi, positions change with each move on the board and each time we must rethink our strategy. I think that's the charm

of *shogi*.

AI has started to beat human players more frequently in shogi and go. But humans will truly lose to AI if they really give up as a result.

There were intellectuals who criticized the game of chess itself, saying chess was a low-level game when Garry Kasparov, the World Chess Champion at that time, lost a match against AI twenty years ago. We cannot justify their words, which are exactly the same as those in the "Fox and the Grapes," one of Aesop's fables. It is too superficial to discuss just a win or a loss in a match against AI without evaluating the substance of the game. Humans can learn from their mistakes.

What will happen if AI plays 100 matches against human players now, at this point where it has developed its ability and assumed greater prominence?

Habu: I wonder about that myself. After all, humans and computers conceive of time in different ways. Both humans and AI want to have as much time as possible, but shogi is played within a limited framework. In other words, players must maintain high quality judgments within a time-limit. I heard that AI shogi programmers order their programs to complete each match in one second in the learning stage. They require programs to undergo severe training that would exhaust human players immediately. I don't think 100 matches between humans and AI is realistic for that reason.

You just mentioned chess. The current World Chess Champion is a 26-year-old Norwegian named Magnus Carlsen. Moves analyzed through quick calculation are apparent in the chess playing styles of young people today because computers already existed when they were born. However, Carlsen plays in the exact opposite style. He plays chess by thinking about how to leave as many possibilities as possible. His style appears unrefined on the surface. But I noticed that Carlson is also sampling human elements, using computer software programs to his advantage. I think shogi will also advance into a period in which players hone their skills by taking computers into consideration.

The idea that humans play back a game after each shogi match has been on my mind. By doing so, the two players review and reflect on advantageous and disadvantageous moves after the end of their match. That cannot be done with a software program. In other

words, shogi attached importance to the examination of the process. From this point on, we will just grasp data. I wonder if that is really OK.

Sakai: That question is also related to education. Young people today may tend to find thinking tiresome. They try to find the answer to a question quickly, by searching online. People originally played shogi or engaged in studies because such processes were enjoyable, but now they try to gain results in the shortest possible time. I feel that studies lose their meaning when people do that.

There is a sense of regret in classrooms that schools have supported efficiency and competition. In the National Center Test for university applicants, we are also trying to emphasize the thinking process by incorporating questions requiring written answers, in addition to multiple-choice questions. I believe that this is important.

Will the Arrival of AI Change Civilization?

Habu: Looking back, AI experienced several periods of wax and wane over the last few decades. Researchers have told me that they want to move into a serious stage where they can obtain matching manpower and budgets. I'm hoping to witness the development of AI myself. What do you think about that, Mr. Sakai?

Sakai: People have been talking about the singularity in a way that provokes anxiety, saying things like, "AI will take jobs away from humans." As a person involved in science, I'd like to point out that such fears are groundless. It has been predicted that AI will surpass human beings in about thirty years. But this "singularity 2045" argument has no scientific grounds whatsoever. To rephrase it more accurately, the singularity is the point at which humans give up. For example, we can refrain from abandoning hope, saying that we are still better than AI, even if AI has surpassed us in certain abilities. The singularity will never take place as long as we keep addressing challenges. We don't really know what humans are in the first place. Trying to compare humans with AI under such conditions is in itself a meaningless way to hold a discussion.

Habu: I see. Human limitations are also limitations for AI.

Meanwhile, there is also a risk for humans. AI makes few mistakes because it is mechanical. Therefore, humans might leave all tasks to AI. Horrendous accidents can occur in such cases. Automated driving is the easiest example to imagine. Can AI really avoid a critical moment if an unanticipated event, such as an animal darting into the road while an AI-mounted car is in automated driving mode? I wonder about that, because the performance of AI is based on probability. AI just executes the actions it assumes to be correct, based on its study of many tests. In other words, AI cannot address cases that have not yet been tested.

Sakai: Faithfully following orders and not making mistakes are two different matters. We shouldn't forget that AI is operating based on probability.

The shift in responsibility that occurs when humans rely on AI is an extremely serious problem. Let's assume that a car in automated driving mode caused a traffic accident resulting in injury or death. I'm sure its owner will say he or she is blameless because the car was in automated driving mode and accuse the car. But who should the victim ask to take responsibility in cases where the automated driving program installed on the car is found to be error-free? The person who chose the automated driving mode may be questioned if it was an accident that a human driver could have avoided.

Humans may lose their ability for critical judgment if they rely too much on efficiency-based AI. It's a strange phenomenon in which people use their brains to avoid using their brains as much as possible. AI will absolutely cause civilization to decline if it is used in such a way.

Strange Discussions about the Singularity

Habu: One of the AI research sites that I visited for a certain TV program was a company involved in military affairs. AI is already used in modern warfare. Humans are monitoring that AI because they don't know if it will go out of control. I heard that many of those

watchmen become neurotic. To start, battlefields are not ordinary places. I heard that such people become sick after continuously watching actions which humans cannot understand, but AI does based its own judgments. It is possible that AI used in warfare could cause a catastrophe. I think that we must examine the risk for the human abuse of AI. That is not a science fiction story where AI starts operating freely and attacks humans. It's a matter of ethics on the human side. Google Inc., in the United States, set up an ethics division at its establishment. We can say that the company had great foresight.

Sakai: Such questions of ethics are also raised in discussions over the singularity. At the same time, the fear that AI may drive out humans precedes them. The issue is not limited to AI. Unfortunately, people who try to weaponize prominent products of science and technology appeared with such developments. Creating ethical regulations for AI and addressing all situations will remain important. However, the extreme argument that we should stop all AI studies because of this does not solve the problems.

Habu: I agree. Ray Kurzweil, a pioneer in the examination of various AI issues, including the singularity, advocates the Law of Accelerating Returns. The point of this Law is that studies in all fields reach a point of stagnation after advancing to a certain degree, but studies in other fields put windholes into the stagnant studies, causing society as a whole to move forward faster. I think peripheral studies will produce similar or equal results even if AI studies are suspended.

Sakai: Ridiculous arguments about the technological singularity include a forecast by Michael Osborne titled "The Future of Employment." It is a list of jobs that will disappear or be eliminated in the future because of AI. Osborne made a serious mistake by underestimating the original human abilities which jobs included. For example, the credibility of the list is in question because it contains watchmaking and camera repair that is supposed to require high levels of experience and skills.

The competency required in the service industry includes a capacity for arranging work matters efficiently and showing consideration to customers. There is absolutely no basis for

the assertion that AI can achieve such competency in the near future. Further, jobs performed by professionals show accuracy and attention to detail that rivals those found in jobs executed by machines.

Habu: There is also an aspect of confusion between specialized AI such as shogi software programs with general-purpose AI. Many judgments are incorporated in actions that we do casually. For example, a child old enough to attend kindergarten will recognize that a drone is different from the birds that he or she has seen up to that point without fail if he or she sees it fly several times. Such recognition seems to have a high level of difficulty. For example, AI recognizes a new cat photo as the photo of a cat after seeing many cat photos for its learning. This is the level that AI finally achieved about four years ago. In other words, humans learn and reason things simultaneously and unintentionally. But embedding those functions as algorithms is a considerably difficult task. As this shows, adapting and adjusting to things never before experienced and making choices and decisions are very difficult. Professor Sakai, please explain this.

Sakai: Humans can learn and reason at the same time because they can use different parts of their brains simultaneously. The child who saw a drone in the previous example advances reasoning about the differences of birds by shape and flying mode instantly while also learning the characteristics of the new object. Such recognition differs qualitatively by humans and AI.

AI has been developed by imitating the neural network in brains. The deep learning that has developed remarkably in recent years employs many middle layers like the visual areas of the brain. Advanced learning in sets of two layers has succeeded in this method. Still, the capacity of AI is far simpler and more limited, compared with that of actual human brains.

Incidentally, computers are not AI unless they are mounted with a special program. They are just calculators, like pocket calculators. We cannot call a mathematical demonstration a judgment, even if it is performed on a computer. In the meantime, sometimes a program hits a roadblock due to a human mistake beyond expectations. People call such a mistake a bug. We can predict mistakes on the human side to a certain extent

based on past experiences. But mistakes by AI may become difficult to predict on all levels when AI goes out of control. The question is whether it is OK for humans to leave important judgments to AI that has such a possibility. After all, this is also a problem on the human side.

Habu: I see. The University of Oxford's Future of Humanity Institute mentioned climate change, pandemics and economic confusion in the twelve risks that threaten human civilization that it published. These are just risks. AI was one of those twelve. We can think of many risks involved with AI, but AI has the potential to solve all of the other risks, including energy and food problems. We must consider about many issues, such as ethics and rule-making on the human side, but I think we should advance studies on AI going forward, because another person will start to develop AI even if someone calls for its suspension.

AI Raises the Question of How Humans Should Live with the Mind

Sakai: To replace the human mind with AI, we must solve the difficult problem of understanding the mind. We have not yet succeeded in scientifically grasping our consciousness and personality known as the mind. First, we have not been able to define it, because the mind functions in a cycle, preventing us from defining its general conditions. We cannot compare the human mind to something else because a criterion has not been established. As in the Liar Paradox, a definite base that guarantees that we are in a normal state of mind is difficult to discern within ourselves.

Habu: The placebo effect also demonstrates the wonders of the mind. I understand that it works with internal diseases. It is effective for mental illnesses in some cases, too. Phenomena science cannot fully express what take place in the mind.

Sakai: The human mind is extremely diverse. It has highly individualistic parts that are shaped through many experiences, in addition to portions that are determined by genetics.

In that case, whose mind should be adopted as the standard model becomes a question in AI design. Furthermore, there is a gap between the mind and the language of humans. What lies in the mind of other people is practically impossible to predict for that reason. AI cannot become a commodity just because it is similar to the human mind. What can we do with a developed family robot that quarrels with other family members and runs away from home just like a human? [Laughs]

Habu: Incidentally, do you think AI is likely to acquire a language? Books on natural language processing that I read were full of numerical formulas, contrary to my expectation of finding accounts on languages. That discovery causes me to wonder if languages can also be converted into algorithms. My impression is that automatic translation by computers has certainly improved its performance in recent years.

Sakai: You may be able to sense progress made by AI in linguistic expressions on the surface level. But it is humans who understand those expressions by supplementing portions that are missing. To begin with, AI, which is based on probability, statistics and learning, cannot grasp human languages theoretically. That is the case because grammatical judgments, which form the core of human languages, are completely independent from such factors. Noam Chomsky, an American linguist and philosopher, pointed that out in his book, "Syntactic Structures," just sixty years ago. Chomsky is well-known for having laid the foundations for natural language processing, which is pivotal to AI. But many researchers do not refer to this book. They are under the illusion that languages can be grasped easily.

Habu: Languages also convey feelings. I had the chance to interview a researcher who once instructed AI to write music. He told me he had thought about ordering the AI to write poems, in addition to music, but he wondered if that had any meaning. AI will produce works of some kind, but the meanings of poems lie in the lives and experiences of the poets reflected in them. He said that poems made by AI could be a mere list of letters.

Sakai: In that case, music written by AI seems like a mere list of notes, too. [Laughs] As that

case shows, AI again questions the value of language and art. Genuine AI studies are nothing less than a way to understand humans.

Habu: As you said, thinking about AI is the same as thinking about humans. AI is a mirror that shows how humans are. I believe that we can richly reinterpret the meaning of human life by studying AI.

*Translated from "Taidan: Jinko chino vs Ningen wa Shogi demo Nichijoseikatsu demo? —AI ga toitadasu Ningen ga ikiru imi (*Dialogue: Is Artificial Intelligence Versus Humans Reflected in *Shogi* as Well as Everyday Life? —AI Raises Again the Question of How Humans Should Live)," Chuokoron, *April 2017, pp. 116-124. (Courtesy of Chuo Koron Shinsha)* [April 2017]

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Born in Tokyo in 1964, Sakai graduated from the Department of Physics under the Faculty of Science at the University of Tokyo and completed a doctoral course at the Graduate School of Science (Ph.D.). He assumed the position of assistant professor/associate professor at the University of Tokyo, Graduate School of Arts and Sciences in 1997 and became a professor there in 2012. Sakai specializes in the brain science of language and functional neuroimaging.

HABU Yoshiharu
Professional *shogi* player

Born in Saitama Prefecture in 1970, Habu became the third professional *shogi* player in history that was still attending junior high school in 1985. Starting his professional shogi career in the fourth dan, Habu won his first title as the Ryuo Tournament Champion in 1989. He was the first player to take six professional shogi crowns in 1994, after capturing the title of Meijin (grandmaster). In 1996, Habu won seven professional championships. In 2008, he gained the lifetime title of 19th Meijin.