Expert Insights

Approximate Solutions and True Solutions

Noriko Arai, Ph.D.

Professor, National Institute of Informatics

Born in Tokyo. Hitotsubashi University Faculty of Law, graduated from University of Illinois, and completed her doctorate at the University of Illinois Graduate School of Mathematics. Ph.D. (Science).
Dr. Arai specializes in mathematical logic (proof theory) and artificial intelligence.
Following positions as Hiroshima City University assistant, and visiting researcher at Fields Institute for Research in Mathematical Sciences and the Princeton Institute for Advanced Study, she has been a professor at the National Institute of Informatics since 2006, and Director of the Research Center for Community Knowledge at the same institution since 2008. She was awarded a 2010 Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology. Project director of the Todai Robot Project "Can a Robot Get into the University of Tokyo?" since 2011.
Important works "Math is Language—Math Stories" (Tokyo Tosho Co., Ltd.), "How Computers Can Take Our Jobs" (Nikkei Publishing Inc.), "Can a Robot Get into the University of Tokyo?" (East Press), etc.

I don't like machines very much. I don't like riding in cars or on trains, and I chose a high school and university that I could commute to by bicycle.

However, of all the various types of machines around today, I think I most dislike appliances with artificial intelligence (AI) functions—'talking appliances' in particular. People are surprised to hear this coming from the leader of an artificial intelligence project, the Todai Robot Project. Naturally there is no microwave in my house. Microwave heating ruins tasty *sake* and makes *mochi* rice cakes lose their shape. It may be more work, but *sake* is better when warmed in hot water, and *mochi* is better when cooked on a grill.

I have friends who say microwaving is handy. Most dishes can be cooked just by following the directions of the appliance. Today's microwaves have dozens of pre-programmed recipe settings, letting you cook things like hamburgers and deep-fried shrimp just by doing as the appliance commands. Of course, microwaves can't actually deep-fry, so deep-fried foods are only simulacra of the genuine article, though reportedly very tasty nonetheless.

However, herein lies the issue. When an approximate solution to a problem is provided, many people at first notice how different it is from the true solution, feeling, for example, that *mochi* is better cooked with a grill. However, when they consider the labor required to achieve the true solution (cooking *mochi* with a grill), people often just get lazy and accept the approximate solution (microwaving the *mochi*). The thinking goes as follows: "I am clearly aware of the difference between the true solution and approximate solution, however on this occasion I have simply made a rational choice by considering the costs versus the benefits. Naturally, I will choose the true solution when I have to."

In his book, *Laws of Media*, the philosopher Marshall McLuhan makes the astute observation that this way of thinking is a flagrant misapprehension. Humans are shaped by the tools they produce, not the other way around. By using these tools, we inevitably become a new entity that complements them. Socrates also understood this. He refused to use the greatest invention in the history of mankind—writing. His choice was lamented by his student Plato, who wrote down Socrates' ideas. Plato's choice may have been rational, however we are unable to judge the value of what was lost by it since we are all the products of cultures from after Plato's time, so we have lost the ability to feel how different the world would be without writing. In the future, we will likely be shaped by microwaves, by smartphones, by Watson*1, and by Siri*2.

So, when I am asked in interviews about whether artificial intelligence will become able to feel emotions like humans do, I respond as follows: "When artificial intelligence becomes part of daily life, humans will lose the ability to feel emotions before artificial intelligence gains them, so we will likely no longer be very aware of the difference." Journalists must not understand this answer, because it has so far never appeared in any article.

*1 IBM and Watson are trademarks of International Business Machines Corporation, registered in many jurisdictions worldwide.
*2 Siri is a trademark of Apple Inc., registered in the U.S. and other countries.