Scott Hanselman: This is an ACM ByteCast, a podcast series from the Association for Computing Machinery, the world's largest education and scientific computing society. We talk to researchers, practitioners, and innovators who are at the intersection of computing research and practice. They share their experiences, the lessons they've learned, and their own visions for the future of computing. I'm your host today, Scott Hanselman.

Hi, I'm Scott Hanselman. This is another episode of Hanselminutes, in association with the ACM ByteCast. Today, I'm talking to Dr. Noriko Arai. She earned a law degree from Hitotsubashi University, and then a mathematics degree from the University of Illinois at Urbana-Champaign, and has a doctorate from the Tokyo Institute of Technology, and we're pleased to be chatting with her from Japan today. How are you, Dr. Arai?

Dr. Noriko Arai: I'm fine. Hello, Scott. It's very honored to be interviewed by ACM.

Scott Hanselman: I'm very glad. We're thrilled to have you. You're working on some very amazing things right now and you've also done some cool things in the past. I know that one of them was very popular and ended up in the news, so I want to lead with that. It was the Todai Robot Project. You created a robot that can actually get into the University of Tokyo. How would you have such an idea and come up with this idea?

Dr. Noriko Arai: It's a bit long story. Is that okay?

Scott Hanselman: Of course. That's why we're doing the podcast.

Dr. Noriko Arai: Okay. So before starting the Todai Robert Project, I wrote a book in 2010, I think, titled, *How Computers Can Take Our Jobs*. This book was born out of my academic journey that [inaudible 00:01:43] initially studied law and economics in my undergraduate and later delved into mathematical logic. In this book I made two predictions. First, by 2030, half of the jobs currently done by white collar workers will be replaced by computers, and the second was I predicted that the next AI boom would be soon being upon us, but it wouldn't be sparked by academia, but instead it would be driven by the tech giants.

These two predictions were also made in the highly read globally bestselling *Race Against Machine*, but my book preceded it by two years. By writing that book, I felt that I fulfilled my social responsibility as a researcher in mathematical logic, conceptualized both computers and AI, but the book didn't sell as well as I hoped. Most Japanese did not take seriously the idea that AI would take our jobs. I became so concerned with the reaction because I was so certain and I was so confident about my predictions, I wondered how I could make them aware of that issue.

So, it was just before Christmas of 2010. One day as an elevator door at my workplace opened, a young AI researcher stood before me and I just blurted out

and asked, "Do you think AI could pass the university if it took entrance exam by 2020?" And he replied, "I wouldn't be surprised if it did." That's how we started that project. If he said, "No, I don't think so," then probably I would have gave it up. But he didn't say no, so that was how I started that project.

Scott Hanselman: That's so interesting also that you are not just doing it because it can be done. You're bridging policy and education and computer science. Sometimes people who are researchers decide to do something just because I want to see if it's possible, but you also wanted to warn the people and let the people know so that they can prepare. This means that your research is spanning across discipline. You're bridging education, you're bridging policy, you're bridging computer science. But from the outside looking in, I feel maybe that academia is siloed and prevents or discourages that kind of creativity. Do you think that is true?

Dr. Noriko Arai: Yes, that's true. I think so, yes. Well, it is my nature. My background in the undergraduate is law and economies, so I'm so worried about the job market always, and politics, and after that I delved into mathematics, but not just mathematics, but foundation of mathematical logic, Alan Turing, [inaudible 00:05:06] Neumann and all those legends who are in the mathematical logic. So I felt like a member in that field. So that makes me responsible to make people understand what AI is and what kind of impact it would have. I feel like it was a social responsibility as a member of that field.

Scott Hanselman: Do you feel like every researcher has that sense of social responsibility or do you think that that's something we should make more researchers think about?

Dr. Noriko Arai: Probably. I was just fortunate to secure my professor job before the academia was dominated by the impact factor and the publish or perish, that mindset. So had I been five years younger, I'm not sure if I could have even landed a tenured position in academia or if I could have had children even. I understand young people tend to compete, try to solve the problems for the sake of problems or technology for the sake of technologies. I don't blame them. It's just the academia, it's so competitive and publish or perish mindset is overwhelmed.

Scott Hanselman: Even that phrase publish or perish, I don't like that. It doesn't feel good to say that out loud.

Dr. Noriko Arai: I don't either. If I was five years or 10 years younger, I might have been overwhelmed by that mindset and I didn't land like me today. I don't know.

Scott Hanselman: You are multidisciplinary in that you have a deep background in mathematics, a deep background in law, and you're focusing on your projects though are so practical and so pragmatic. You're trying to help others directly with things like researchmap and edumap and your projects. Is it hard to be a researcher and a practitioner? Because I feel like some academics are a little out of touch, but you're grounded in humanity.

Dr. Noriko Arai: True. There are researchers intellectually curious and innately inclined to tackle challenges. The true significance should not depend on whether the issue will be published or on the impact factor. So, what really matters is usefulness. I would say not the pragmatic or something like that, but usefulness, the simple usefulness to the society, whether that is for society today or in the near future or the distant future is only a matter of timing. As a mathematician, I was working for probably the society in the long distance future, but I am in software probably I work for the near future or today's future.

Scott Hanselman: When I talk to people who are in your position, venerable researchers, I get overwhelmed at the amount of work that you and your team have accomplished and you've accomplished as yourself. You're a researcher, you're a professor, you're a director, you're a founder of various initiatives. Does the work life balance become a challenge? How do you balance these different roles that you have to fill?

Dr. Noriko Arai: Everything is a hobby for me.

Scott Hanselman: I love that though, because you're excited about so many things. So it is a hobby. Life is a hobby.

Dr. Noriko Arai: I love to cook. I love to sew. I love to knit and I love to work. So it's simple. I cannot come up with any answer than because I am interested. I'm not that hard worker though because I sleep eight hours every day and I cook three times a day, so I'm not that hard worker.

Scott Hanselman: Well, it sounds like you've found balance though. You're intentional and you're deliberate and you focus on balance and you focus on life and humanity and that informs your work.

Dr. Noriko Arai: I am supposed to spend more time in writing research papers. I hate writing research papers because often I am done, often I have already crystallized the idea I had. Just it's there, so I don't need to feel like I have to explain people how it is because it's there and it's working. If you can come to the website, it's there. So I don't feel like I have to write the papers about it, but that's the most tedious thing I have to do so I do, but I hate writing the paper after I crystallize my research.

Scott Hanselman: Well, I think it's one of those things where you have to get the public or you have to get your coworker from point A to point D, E or F, and you've made the leap and they're asking you to walk them all the way to the end of the proof so that they understand how to get there and you're like, "Ah, don't you see? You can jump over here with me." And the way that you couldn't get the public to buy the book, so you created the project and then you got the robot to join the university and then pass the test and they go, "Why did no one tell us?" And you're like, "But I told you earlier, did you read the book?"

Dr. Noriko Arai: Well, actually I have to make it clear. A robot didn't cut the University of Tokyo. It passed 70% of the universities in Japan. In Japan the entrance examination is very competitive, but not Todai. I'm sorry. But [if] ChatGPT teamed up with Todai Robot, maybe it is possible. The difference between ChatGPT and Todai Robot, that we added our AI for English and the social sciences very similar to ChatGPT, and the ChatGPT has more dataset, so it must be much better. But for mathematics it's something different. It needs clear reasoning.

So for mathematics, we made the GOFAI, the good old-fashioned AI, from scratch. It took six years to make the dictionaries, but I would say it worked quite well. Its performance was incredible, unimaginable in the last century. Thanks for the computers. Nowadays, computers, that was a really exciting movement, but the proof that our machine produced was not understandable for humans. The machines think in their way, but it outputs the correct answer. So it works very differently from ChatGPT. So if these two team up, probably they can pass the University of Tokyo entrance exam now.

Scott Hanselman: ACM ByteCast is available on Apple Podcasts, Google Podcast, Podbean, Spotify, Stitcher, and TuneIn. If you're enjoying this episode, please do subscribe and leave us a review on your favorite platform. If these team up, and AIs are going to team up, and very large language models are going to become better and better, are you optimistic or pessimistic? Is this a good thing for society or a bad thing? Where do you fall on that?

Dr. Noriko Arai: Well, that's a very hard question, but from what I understand, these technologies will benefit I would say top five or 10% of very intelligent people. But for those who are very good at reading, writing and understanding media literacy and already an expert in some area, and if he or she want to use the LLM for his or her experience area, then it will be great because I myself use ChatGPT every day basis and it is very helpful for me. Not only ChatGPT, but Grammarly and the DPL and other things, but for those who doesn't read well or write well or who doesn't have any expertise, then the ChatGPT doesn't know what is right and wrong.

It is not trained in that way. It is trained to make smooth sentences without knowing what is right and wrong. So probably those people who want to use the ChatGPT made wrong sentences, mistakes here and there, but if he or she does not have enough media literacy or literacy itself, then he would say, "Oh, that's great. I can use this whole thing." That'd be very dangerous or that would be risky or costly for the society. So it's a mixture. Probably the top 5% that utilize it has the skill or talent to utilize ChatGPT or other LLMs, for them it's beneficial. And for other people it's not beneficial. So it's really hard to anticipate if it is a bad thing for the macro society or not.

Scott Hanselman: When I've talked to young people about it, as a person of a certain age, they say, "Well, you guys told us back in the 80s that we shouldn't use calculators on our math tests because the calculator will make us dumb and you're just doing

the same thing now to keep us from using this tool." But you still need to understand math before you get the calculator. The calculator doesn't just do it all for you. So I'm hearing you say that there's this base literacy that is so crucial of problem solving and understanding, and then you mentioned media literacy. Otherwise, whether you Google for something or you ask ChatGPT, your own biases may be reflected right back at you and you're going to get an answer that's not correct or appropriate.

Dr. Noriko Arai: Because the presence of Google doesn't make everybody happy. Everybody has a chance to Google and search to any digitalized knowledge, but it makes the society so, how do you say, unbalanced. It is better if you look back the 70's or 80's when everybody read the newspapers, during that time, probably people can communicate better at least. And now it is so hard for people to communicate with each other because they are sectioned and rich people get richer and poor people get poorer. So we cannot explain that. If we can access to any digitalized knowledge with help of Google and computers, it doesn't help people happier as a macro society.

Scott Hanselman: I'm curious when I'm hearing your perspective on the world and how you think about these things, are there any particular mentors or colleagues or people in your life who have inspired you to think about your career or your research in this way?

Dr. Noriko Arai: There are many heroes, in my field, Turing and [inaudible 00:18:49] and [inaudible 00:18:50]. So there are many heroes, and Steve Cook. I always keep eyes on Toniann Pitassi. She is an ACM fellow, and among my contemporaries, I always keep my eye on Toniann Pitassi. She is the first woman who chaired STOC, the Symposium Theory of Computing. That was great. And I met her I think in Toronto, the Fields Institute in 1997 I think. And she is very energetic and honest and highly talented. Nice [inaudible 00:19:40] and she constantly traveled to collaborate with renowned researchers worldwide. And it was Christmas in 2000. So yeah, I was spending Christmas with her and she and me were invited by the Complexity Seminar held at the Princeton and Institute for Advanced Studies, through Complexity Seminar, and spending time with her for two weeks, I realized I couldn't live like her and decided to seek for another path. One thing was I'm not as healthy as her. I'm more weak, how to say?

Scott Hanselman: I think she has a lot of energy. Toniann Pitassi, for the folks who may not be familiar, Toniann Pitassi is a specialist in computational complexity theory and she's at Columbia and she was named an ACM fellow in 2018 and she is a very energetic person.

Dr. Noriko Arai: And also I was based in Japan and that's far east of course. So I thought I cannot do like Toni, so I decided to seek for a different path. So 13 years later, she grabbed a paper when the New York Times covered the story of Todai Robot Project and brought it into the University of Toronto's computer science department to say, "Hey, Norika made it to the New York Times." So happy

hearing that story. She is like my compass, someone I refer to checking if I'm doing the right thing or on the right path. So I'm not competing with her. It's just, yeah, she is like a compass. And so I just check myself if I'm doing the right thing, can I proud of myself to Toni? And that's how I do it. Yes.

Scott Hanselman: I love that you use that word compass. That's very well said. To have a friend and a colleague who is a compass, they're an academic compass. They're your peer and they're also your mentor and they're your friend and your helper and they're letting you know if you're headed in the right direction. And it's good to have friends like that.

Dr. Noriko Arai: And also we're living in a very different way. It's just so academically achieved into an ACM fellow, that's not what I am seeking for, but still she is accomplished for me.

Scott Hanselman: That's lovely. I'm sure that she'll be happy to know that and be reminded of that as your friendship. I'm curious, what skills do you think are essential for a researcher in the AI space or a practitioner? Certainly a strong moral compass, a societal focus, but what are some skills or qualities that someone could have in this space to be good at AI research?

Dr. Noriko Arai: Be honest, and that's all. Because those people who are doing AI knows what they are doing. They're using probabilities and the statistics and they don't have any dataset telling you what is right or wrong and rely on the AI and big data, instead giving up the truth. The AI can sometimes tell you and show you very good, how to say, scenarios or maybe it can write a research paper for you. But at the same time, the researchers in AI, let's be honest what they're using, technology, they have to be always aware the limitations of AI in mind and be honest to the society. That's most important thing.

Scott Hanselman: Sometimes when I try to explain AI or very large language models to people who are not in the field, I say that it's like a sock puppet. You put the sock and you say like, "Hello, hello." But it's your arm. It's your hand. You're talking to it and it's going to come back and reflect to you. And if you're dishonest with the model, you will receive dishonesty back. So I really like your focus on honesty and being ethical and real to these AIs, otherwise we're definitely in trouble. So do you see that honesty in the intersection of science and policy and politics? Are we living in a time where everyone can be honest and science can be apolitical?

Dr. Noriko Arai: It's really depends on which countries you're talking about. Probably the US, that situation is apolitical. But in far east, like in Japan, in Korea, and probably in China, too much politics in academia, I think. And it's not sometimes, but always wrong. That is a problem, I think. It is really weird situation, probably back in 60's and 70's. By the way, I was born on the October 22nd in '62. So that is the day that Kennedy was speaking to the public that maybe the nuclear war will occur.

Scott Hanselman: In October 22nd, 1962 that was when Kennedy addressed the buildup of arms happening in Cuba in the beginning of the Cuban missile crisis. You were born there at that time, in that moment?

Dr. Noriko Arai: Yeah, that moment. So probably I would have died right after I was born, but luckily I'm here the year of 60. But at the time, probably the science was very political in many ways, in many countries like the Soviet Union and the US and China. But right now it's in a different way. It's apolitical in some countries and too much political in other countries, I would say.

Scott Hanselman: In our remaining time, I did want to ask a bit of a pointed question. I'm curious, have you faced any challenges specifically as a female researcher in the field of IT, specifically in Japan?

Dr. Noriko Arai: Okay. Japan ranks 121st in the world gender gap index. So we are behind countries like Angola and Myanmar. So it means that there's no women in Japan cruising without challenges. I cannot remember any year without sexual or power harassment when I was young and after I was promoted to a professor, it changed to pointless criticisms. The Todai Robert Project was often criticized in Japan for being selfish and selfishness is a very, very bad thing in Japan. And however it's natural for researchers to choose their theme selfishly, is that true? So, that's pointless. But I was really criticize that I'm being selfish.

Scott Hanselman: There's not much I can say there other than I respect your persistence and that you are still here. And we are happy that you are still here sharing with us. And I'm very honored to have you join us on this podcast.

Dr. Noriko Arai: Thank you very much.

Scott Hanselman: We have been chatting with Dr. Noriko Arai, and this has been an episode of Hanselminutes in association with the ACM ByteCast, and we'll see you again next week. ACM ByteCast is a production of the Association for Computing Machineries Practitioner Board. To learn more about ACM and its activities, visit acm.org. For more information about this and other episodes, please do visit our website at learning.acm.org/bytecast. That's B-Y-T-E-C-A-S-T, learning.acm.org/bytecast.