EPISODE 47. AI FOR EQUITY: BRIDGING GLOBAL HEALTH GAPS

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Garry Aslanyan [00:00:08] Hello and welcome to the Global Health Matters podcast. I'm your host, Garry Aslanyan. Whether you watched "2001: A Space Odyssey" movie or have recently experimented with ChatGPT, it's impossible to ignore the rapid rise of artificial intelligence in our daily lives. AI is often praised for its potential to transform healthcare. Yet how it will truly revolutionise the field remains unclear. In this episode, I am joined by two experts at the forefront of AI's integration into national health systems. Alexandre Chiavegatto Filho, professor of machine learning in health at the University of San Paolo, has been leading efforts to develop AI models tailored to Brazil's unique healthcare landscape. Jiho Cha, member of the National Assembly of the Republic of Korea and chairperson of the AI Future Strategy Special Committee brings insights into the policy and strategy shaping AI's role in healthcare. Together with Alexandre and Jiho, we will explore the promises, challenges, and current realities of AI in healthcare. Hi Alexander, hi Jiho, how are you today?

Jiho Cha [00:01:40] Good, how are you? I'm very good here in South Korea.

Alexandre Chiavegatto Filho [00:01:44] Doing good too, here from São Paulo, Brazil.

Garry Aslanyan [00:01:47] You guys are on different parts of the planet, so we are going to bring you all together and talk a little bit about this topic that really is very fascinating, and I really am looking forward to this discussion. When both of you started your careers, I assume artificial intelligence was more of a concept. People found them in the books or movies, but now it's a reality. So how did you end up working in this field? Maybe we'll start with Alexandre and then Jiho.

Alexandre Chiavegatto Filho [00:02:20] Sure, so I'm an economist by training, so I always wanted to improve decisions and decrease market imperfections and so on. And I always saw the rise of big data that we have now. So, I did my undergrad back in 2006, 2007 and then I saw the growth of data collection and the possibility of using this data collection to improve decisions. And healthcare is probably the area that collects more data around the world. It is estimated that around 30% of every data collected is from healthcare, and at the same time that it collects a lot of data, it's a very complex and hard area to make decisions. So ever since I was an undergrad, I saw health care as having a huge potential in to use this data growth for improving the disease. So, I started as a professor here at the University of São Paulo in the field that we call epidemiology, which now my students call it data science in healthcare. And then back in the day we didn't have data science. I think the term wasn't even coined back then, back when I started as a professor here in 2013. Always working on big data, seeing the increase of data, and then we started hearing about this thing called machine learning around 2014, 2015. Then I started running a few algorithms to see which area was this and if it worked. And it got me amazed, the first time that I ran a random forest algorithm, which is an algorithm that we still use today in healthcare. It did much better than the other options that we had. So, I got together with my PhD students back then, and I was a little bit worried that I was going crazy, I was not seeing something. So, I get them together, and then I told them, I've heard about this thing called machine learning. Do you want to try this algorithm? see if it works, see if I'm not going crazy, and then we'll talk about it. And then my two PhD students, who are brilliant, they are now professors at highly regarded universities here in Brazil, they got back to me a month later and they were like, professor, so this machine learning thing that you showed us, it's going to change everything. And I asked them, so are we moving fields? Are we going all in on this machine-learning thing? And they were like, absolutely, we're going all in on this. So ever since we've been in the field, here in our lab at the University of São Paulo, trying to adapt those algorithms into different diseases in different areas throughout Brazil and throughout the world.

Garry Aslanyan [00:05:26] What about you, Jiho?

Jiho Cha [00:05:30] I'm trained as a physician by profession, and then actually I cross the different disciplinary border. I studied anthropology and international development and international health, especially focusing on health system. And about 20 years ago, I was the humanitarian, working in the different vulnerable contexts. Since then, I have always focused on the needs in the field and what makes health vulnerability. Reflecting my previous years as a humanitarian actor, I keep encountering the failure of the interventions and the system failure, etc. And then I think it is deeply rooted in the inequality in the human intelligence system, so the health system or the other economic system they are largely based on the human intellectual system. But the education or administrative incapability in the vulnerable context or fragile country, it is very difficult to scale up this root cause of the human intelligence. And so it's why in the human crisis over some complete written problem the complete situation, the because of the government lack the governance model to scale up this system than I have encountered the artificial intelligence in 2016 I was very surprised when I first look at that and then I found it can be the game changer in the global health and especially in humanitarian health context, so that's my previous academic journey, and I crossed the border, the discipline border again, and learning artificial intelligence, machine learning, and collaborated with on one hand, AI engineers, on the other hand, I have worked with one of the biggest hospitals in South Korea. At that time, we developed a model of the cardiovascular disease prediction model. Using the microvascular pattern in our retina and along with the very simple patient data like gender and age or diabetes or hypertension and then we found its prediction accuracy is a bit better than the cardiac CT and with a very cost effective way so then I confirmed my idea on how this can be the very important game changer in the global setting. So, then I quickly move on artificial intelligence application in this field.

Garry Aslanyan [00:08:32] Jiho, you've indeed had a very fascinating career spanning from humanitarian work to developing AI prediction models for disease. It is clear you saw the potential of how AI can strengthen health systems early on. Alexandre, can I ask you briefly to help our listeners and I mean, me too, to clarify some terms. So, we've been using some terms so far, both of you. You know, things like artificial intelligence, big data, machine learning. For many, the extent they've been exposed to AI, it may be a ChatGPT and not more. So maybe you can give us a bit of a definition to help set that up for further discussion.

Alexandre Chiavegatto Filho [00:09:21] Sure. So, very briefly, artificial intelligence is basically machines, computers, algorithms, making decisions that we recognise as intelligent, making intelligent decisions through machines. There are two main ways for which a machine can make an intelligent decision. You either programme the machine or the computer with the exact rules to make this decision. So, you write it down, so a patient that comes to my office with these symptoms, with these demographic characteristics, with this and that, this patient probably has this disease, it's a set of rules that humans establish, it used to be called expert systems back in the day in healthcare. In machine learning, we call it now GOFAI, good old-fashioned AI, when you make those rules by yourself, so this is a way. The issue with this strategy is that us as humans, we have a lot of difficulty into explaining our intelligent decisions. We think we can explain why we made different decisions, even the simplest ones. In the end, we have a really hard time to explain it. For example, even explaining why we know the difference between a dog and a cat, for example, it seems very straightforward, every one of us looks at the dog, but we know it's a dog, we look at a cat, we know it is a cat but when we try to explain to set out rules, why one is a dog and the other is a cat, we have really a hard time doing it. For example, people will try to say, oh, so cats have pointy ears, for example. But some dogs have pointy ears, too. Or cats have whiskers, but some dogs have a little moustache, too, and so on. So, we find it very hard to explain even some of our

simplest and most basic decisions. So those expert systems, those good old-fashioned AI, haven't worked so well. And we have another strategy, which is, instead of writing down the rules, we guide the learning of those algorithms to learn, to actually understand the rules through examples. So, in this other possibility, the machines, the algorithms, the computers will learn the actual rules to make decisions through example, through data, which is an area that we call machine learning. Its why machine learning has grown so much and will keep on growing, especially in the most complex, in the hardest field that there is, which is healthcare. So, the artificial intelligence, two possibilities, you either hard code the rules, or you let the machines learn from rules. When the machine learns the rules it's what we call machine learning. Big data, for some time, we tried to define big data in terms of the size of the data that we had, so one terabyte would be big data and so on, but the size of the data we use increases every single year, so we stopped doing that. I like to define big data, as data big enough that you have to change your traditional ways of analysing data. You have now a data set that is so large that your traditional techniques are not suitable anymore or your traditional software doesn't open on Excel and so on. So, when your ways of analysing this data changes, it's what I call big data. The biggest change that we've had in the last few years, it's artificial intelligence. This growth of data has allowed those complex algorithms to finally have enough examples, enough information to learn intelligence or hard decisions. So, it's all, as you said, it's a little bit closed, artificial intelligence machine learning, big data. It's all connected, but they have different definitions.

Garry Aslanyan [00:14:07] It is somewhat better now. I feel a bit better, hopefully our listeners as well. Coming back to you, Jiho, you mentioned you really came to this as working as a medical doctor in humanitarian settings. Looking forward, how do you see AI impacting the most vulnerable populations, let's say in fragile or conflict affected areas?

Jiho Cha [00:14:31] I think we first need to address how conflict and crisis impact on the vulnerable population. Because then we can identify or intervene the best way to mitigate those kinds of interactions by the AI. For example, all other crisis does not only attack the human health directly, but it kinds of aggravates the function of the health system, the existing system, also on the other hand, more importantly, it can in those kinds of crisis, kind of aggravate governance or macro level socio economic, political system in depth project setting. So that have a secondary impact on the social inequality in that society, then finally impact on human health. So social determinants and health system can be the very important mediator to aggravate the vulnerability of the people in health. So, AI actually can impact on both of the pathways. It can directly impact on the health system function. But the AI, especially AI has a power health system. AI power health information system combined with the blockchain technologies and also kind of fintech technology can be very useful for the health financing model and the traditional AI health care and which make some automation of the diagnosis and et cetera. So those kinds of things can combine with the existing human resource in that context, so scale up the function of those human actor. So, for example, in certain fragile context, it is very difficult to find the doctors. If we facilitate model of the AI-based health system, this alerts practitioner or nurse working with the clinical decision support system of the AI, it can scale up the clinical capacity or capability of the health professional to cover the level of the doctors. But it can kind of build up the new health information system in the fragile setting and with using a smartphone as a computing basis, and also it can link with the health insurance model. And on the other hand, we should address the social determinants of health, how AI can impact on that. So economic kind of the marginalisation or loss of jobs, or can stress the model to strengthening economic livelihood of the crisis affected population, all those kind of pathways can be mediated by the AI and strengthened by the AI, so if we look at these two different kind of the impact on the scaling of health system, so it indirect or fundamental impact on some of the social determinants of health and it can be very helpful in the region of the crisis or fragile state which mostly lack of the sustainable governance to develop it.

Garry Aslanyan [00:18:03] Thanks for listing so many ways in which AI can support both the health system and address the social determinants of health in conflict settings. It has a huge potential to strengthen the human resource capacity by adding a greater intelligence to the decision-making of frontline workers. Alexandre, you wrote a paper where you said that the next great frontier of epidemiology will be the analysis of largest databases or big data. Maybe you can see how AI is transforming public health in Brazil now, and even your link to other parts of the world as well. Can you give us an insight into what's happening?

Alexandre Chiavegatto Filho [00:18:45] The change has already started, specifically in large urban areas of the world, but the area that we are most excited about here in our lab is to get those algorithms to work in remote areas of world, which is going to be a much larger challenge for those algorithms to work there, but it will also be where those algorithms will have the largest impact. We have hundreds and hundreds of cities here in Brazil where we have only one physician for the whole city. So, this physician has to make all the decisions about every single specialty in medicine for every single patient that this physician has in his or her city. In the future, this physician will have the best cardiologist in the world, the best pneumologist in world, right next to him or her, ready to answer any questions that this physician has. So, we think that this will dramatically improve quality of healthcare decisions in these remote areas of the world, reducing drastically the presence of inequality in healthcare, but in order to get those algorithms to these regions, we have been identifying three very large challenges. The first challenge is, do we collect enough data in these regions to help those algorithms make intelligent decisions? We have been seeing here in Brazil that we do collect enough data. Most of the countries of the world, at least newborn data and mortality data is collected for every single newborn and every single death. And we also have the electronic medical records which are becoming a thing throughout the world. So we are already collecting good and quality information even in remote areas of the world, the second challenge is what if I develop an algorithm that learns from examples from a large urban area, for example, from São Paulo, okay, which is a city that has collected data, healthcare data for years and years for millions of patients and so on, and that would in then learn to make intelligent decisions using these examples from São Paulo, will it work equally well in all those remote areas of the world, where the patients are extremely different, where you have different resources availability, where we have different risk factors, where the genetic background of those patients is different and so on. So, this has been our greatest challenge so far to make those algorithms work everywhere and it's the reason why it hasn't changed health care where it will be most needed. But we have been finding some very interesting results in that sense. And the third challenge is, how do we get those algorithms to those physicians in remote areas, where the internet is very unstable, where sometimes the electronic medical record is not happening yet, and so on. We have been developing apps, mobile apps, to give the physicians, because even though the hospitals in these remote regions maybe sometimes do not have an electronic medical record the physician has a smartphone, so we have been developing apps to in the future give those predictive algorithms results to those physicians even in those remote areas where the physician will talk to the app, where we will send the characteristics of the patient to the app, and the app will through what it has learned before, give the score that the physician wants. For example, what is the probability of this patient having this disease that I think he or she has? Or what is this severity of this case, and so on. When quality algorithms arrive to those hospitals, the physicians are often very happy about it, and the patients are very happy about it and so on. I think that the challenge will be to put those algorithms in remote areas where they will have a greater impact.

Garry Aslanyan [00:23:21] So I sense that we may see already inequity even within a country with this.
Alexandre Chiavegatto Filho [00:23:30] For sure, because of the history of data collection, we have much more data for rich patients throughout the world. So, you could have an issue here while the

algorithm learns to make intelligent decision only for rich patient because it's the examples that the algorithms have. Throughout the last years or the last decades, the electronic medical records have been a thing in richer parts of the world, so the algorithms will become better for this population and won't be as good for poorer patients because you have less examples, you have less data for this populations which have greatly different characteristics and risk factors and so on. So, we are indeed in a time where AI could increase inequalities in healthcare, but we have been working hard here in our lab to make sure that this won't happen for long.

Garry Aslanyan [00:24:37] So that's something you keep in mind in this work. Jiho, can I ask you that now you're a member of parliament in Republic of Korea. You are very passionate about preparing Korean health system to embrace AI. Why is this such a priority for you?

Jiho Cha [00:24:55] South Korea has relatively good accessibility to health care, not fully universal health care coverage, but comparing to the other countries, we have relatively sustainable health care accessibility and less health disparity, and also, we have enough number of doctors and also other health professionals. But I'm still thinking what can be the future of the South Korean health system or what will be future of global health system. And first future is all of us we are interested in the AI-powered health system not only for health care provision but health information system, finance system makes it more efficient and equitable to the people. And also, for the human resource, the lifelong education using the AI, or how AI integrates with the human health profession, that can be another kind of strength. But if I expand this, I consider the future system more than that, I imagine the future system, maybe health system without borders, because of this health care artificial intelligence combined with the human intelligence can cross the border and also South Korean AI company can expand their kind of the system approach to the somewhere in Indonesia or the other cases. So last research before I joined the South Korean parliament is that the health system analyses in Kiribati, which is a Pacific Island country, and especially which can be preventable or manageable by the AI technologies. So those kinds of health system weaknesses or gaps can be cured by the AI researchers and engineers which those kind of platform provide by the engineers or doctors or both of them in South Korea, we will encounter a repeated pandemic and also we will encounter climate change impact on our vulnerability which can aggravate the healthcare system. So those kinds of things we need to combine, and I think South Korea can be one of the public actors in AI research and industry, which can be applicable for this kind of extended health system powered by AI.

Garry Aslanyan [00:27:31] You have an inspirational vision for the realisation of AI-powered health system in Korea, not just for the benefit of your country, but also to the extent your health system beyond your borders to help other fragile settings in times of crisis through AI technologies. This is commendable. Alexandre, your lab has developed various machine learning models that apply in such areas like during COVID, oral health, obesity. Maybe you can share some predictive models that you used and one of the cases you can show. What's the crucial way to localise these models in their specific context?

Alexandre Chiavegatto Filho [00:28:18] For every single health issue that we have, that we're trying to tackle with machine learning, we have to make those algorithms learn to make those decisions, and in healthcare, the vast majority of data that we had from patients are what we call tabular data, structured data, which means that it's data that fits on a spreadsheet. So, for this kind of data, we have a few different algorithms which are state-of-the-art, which is what we call gradient-boosting algorithms, but even within those algorithms, we have like three different ways to make those algorithms learn. So, for each different case, we have to teach those algorithms to learn the rules, as I said, through examples and so on. More than that, what we have been focusing now is how to transfer this learning into remote

areas of Brazil. We have been developing algorithms that learn to make intelligent decisions here in Sao Paulo, which is fairly easy we have a lot of data, we have good quality exams and so on. So those algorithms learn to making intelligent decisions here in São Paulo and then we transfer this basic learning from São Paulo for the different regions of Brazil, and we have to do the fine tuning of those algorithms for the different realities that we have in Brazil. As you probably know, Brazil is one of the most diverse and unequal countries in the world. Our economic inequality is one of the largest in the world, and we also have pretty much every single race or every single ethnic background. We have a lot of Koreans here in São Paulo, Jiho, and a lot of diversity overall, either in terms of genetic characteristics or in terms of risk factor of food intakes and so on. So, our cities differ widely, so what we have been doing, we have been developing algorithms where we have a lot of data for the algorithm to learn the basics of this disease, of this health issue. You learn the basics where we have a lot of data and then we will fine tune it, we have been fine tuning it for the different realities of result, which is how human physicians do it, right. When a physician comes here to San Paulo from a small city, he or she comes here, to San Paolo, to learn a speciality, a medical speciality. This physician will learn here from the reality of São Paulo and when this physician comes back to his or her city, they will have to adapt the knowledge. They have to adapt to the different reality. So, it's what we've been doing here in Brazil, which has huge challenges. The first thing that I guess is exciting here in our lab is to make sure that these algorithms will work in those remote areas. The second thing that gets us excited is that we believe, and we have been seeing this, that an algorithm that learns to make intelligent decisions, throughout Brazil, throughout a diverse and an unequal country such as Brazil, this algorithm will have seen everything about this disease. We will have to see every single detail about this disease, and we believe that this is going to be the best algorithm in the world, and we have been finding that those algorithms work really well throughout the world, okay, so probably an algorithm that is trained on a very equal society, with very specific characteristics will not generalise so well, but an algorithm that learns from such a diversity will have seen everything about this disease. So we have been working a lot on that into training the algorithm on this diversity, and then we move this algorithm around, for example, to India, and we have seen that this algorithm that was trained in Brazil sometimes works even better in India than an algorithm that is trained only on local people from India, because this algorithm has really learned about the disease, has really understood the disease because it has seen everything about this disease. So, it's something that I guess is very excited to make it work in Brazil. And after we figure it out, it's a huge challenge. But after we figure it out, how to make it work in Brazil, we are confident that this algorithm is going to work throughout the world.

Garry Aslanyan [00:33:12] I'm sure many of our listeners have already learned a lot about AI. Thank you for sharing the experiences. Just to wrap up, what advice would you offer to researchers and policymakers who are looking into integrating AI into their health systems.

Jiho Cha [00:33:35] Simply speaking, the police maker or researcher should be aware, like Alexandre said, and future intelligence, what it will be, and so there will be two different intelligences in the near future. First one is the connected intelligence with the AI and human intelligence, and AGI, or ASI, artificial general intelligence, or artificial super intelligence so there will be these two kind of the intelligence will lead human society in near future so we should be aware our human resource or health system should be adapted to into the new intelligence model that will not be avoidable future, it will come and I am not sure it will not come next year, but it will come very soon, very soon. So, we need to prepare that, and separately, very simply speaking, my concern is that those kinds of AI transformation of the human intelligence or health system is led by the private sector. And it means the private sectors, especially in the big IT tech, and outside of our country, they lead this transformation. So public health researchers or international organisations, the policymakers or government public actors, we should address how to transform this kind of private lead innovation into more public interest. That is very

important. Otherwise, we will encounter very serious health inequity in your future. So that is all I wanted to emphasise.

Garry Aslanyan [00:35:29] It's clear that your government is strengthening its capacity to leverage both human and artificial intelligence effectively, ensuring their use serves the public good. Alexandre, what guidance would you give to other countries?

Alexandre Chiavegatto Filho [00:35:44] I would try to make sure that everyone that is going to work on AI has this in mind, that you have to make sure that it's going to work for everyone, that AI is not going to increase inequalities, to the contrary, we have a huge opportunity in our hands to decrease inequality, to decrease prejudices on healthcare, to identify and correct those inequalities that we have now in healthcare. But if you leave AI by itself, it's probably going to increase inequality if you do not think hard about it, because as I said, those algorithms will work more for the people that we have more data, which are the richest patients. So, everyone working on AI, I would urge everyone to make sure that those algorithms will have a great impact where they will be more important, which is in the remote and poorer regions of the world.

Garry Aslanyan [00:36:44] Thank you both for this insightful conversation. I learned a lot and good luck with your work.

Jiho Cha [00:36:52] Thank you so much.

Alexandre Chiavegatto Filho [00:36:53] Thank you very much for having me. It was a pleasure.

Garry Aslanyan [00:37:00] As Alexandre and Jiho highlighted, artificial intelligence has the potential to greatly enhance access to and the quality of healthcare services while also strengthening health system governance, particularly for remote and vulnerable populations. If developed responsibly by ensuring that algorithms and models are trained on diverse, locally relevant data, AI can help reduce health inequalities. However, without careful implementation, it also risks reinforcing existing disparities. With AI-driven transformation on the horizon, it is critical for policymakers to actively engage in shaping its development to ensure that AI is harnessed as a force for public good. Let's hear from one of our listeners.

Nisha Van Acoleyen [00:38:01] Hi, my name is Nisha Van Acoleyen, and I am one of the many listeners of the Global Health Matters podcast. I've been listening to this podcast for the past couple of months now and one of main reasons I enjoy it, is because it not only raises awareness about the most pressing global health challenges we face today, but it also provides a deep understanding of the root causes behind these issues. Hearing different insights from such a wide range of professionals from physicians and epidemiologists to journalists and psychologists, we really get to adopt an interdisciplinary perspective of global health, and as a current global health student myself, I find the stories shared incredibly inspiring. It's powerful to hear how each person has made a meaningful contribution to their field. Lastly, I just wanted to say that, Garry, you're an amazing interviewer. You're always asking the questions that I have wanted to ask. Thank you so much.

Garry Aslanyan [00:38:58] Thank you, Nisha, for your feedback. Our team spends a lot of time to ensure that the episodes cover a range of disciplines and highlights various stories. So, I'm so glad that this is helpful to you as a student. To learn more about the topic discussed in this episode, visit the episode's web page where you will find additional readings, show notes, and translations. Don't forget to get in touch with us via social media, email, or by sharing a voice message, and be sure to subscribe or follow

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