Interview with Dr. Sunit Das

UTMJ Interview Team (Anna Kurdina and Meghan Kerr)

Dr. Sunit Das

Dr. Sunit Das is a neurosurgeon and scientist at St. Michael's Hospital and the Keenan Research Centre for Biomedical Science, in addition to an Associate Professor in the Division of Neurosurgery at the University of Toronto. He holds degrees in English Literature from the University of Michigan, Philosophy from Harvard University, and attended Northwestern University for medical school. Dr. Das completed a PhD in Neurobiology at the National Institute of Neurological Disorders and Stroke as well as neurosurgical and post-doctoral training at Northwestern. His research and clinical interests revolve around primary tumours of the brain, and his lab is focused on elucidating cellular and molecular mechanisms that may be harnessed to improve therapies for these diseases.

UTMJ: Can you begin by introducing yourself and how you became interested in artificial intelligence (AI) and your research?

SD: I am a clinician scientist at St. Michael's Hospital. My practice focuses on adult neuro-oncology: I take care of patients that have either benign or cancerous tumours of the brain and spine. I also have a basic laboratory at SickKids focused on the biology of glioblastoma. If you think of where AI fits in there, it's not particularly obvious. For most people in medicine, AI is explored as a tool to further clinical activity or research, whereas I actually got into it quite differently. Before going to medical school, I had gotten a Master's degree in Philosophy and had a background in the humani-

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ties and philosophy. What interested me then were the fundamental questions about identity and self-identification. Those issues remained important to me as I was going into and through medicine. When I talk to people about what it is that neurosurgery means to me as a field, I find that I more often talk about it in terms of allowing self-actualization and how it is part of what I use as constructing my sense of self.

So, my interest in AI has come from that perspective. In other words, I am very interested in thinking about AI because it is going to have fundamental import for how we consider ourselves as clinicians and what we think is our role as caretakers of patients.

UTMJ: Can you speak more about what you are researching in regards to AI?

SD: Most of what I do is in the ethics of AI, so I'm familiar with the different ground efforts in medicine, law, and business to try to incorporate AI into the daily practice of life. To do so has remarkable implications for the way we think of ourselves in all of those professions. Especially for us in medicine, it has radical implications for what we believe are our roles and responsibilities and what we owe our patients. Those all become critical issues. Whenever you think about an AI that would be involved in clinical decision support, if we don't think about what those implications are in terms of how it changes our relationships with patients, my worry is that we will have our relationships washed away.

UTMJ: How have you seen AI change the way you and your colleagues practice?

SD: The difficulty with that question is that it implies that AI has actually become incorporated in daily practice, and I don't know that it has. It think there is a lot of excitement and energy towards making that be the case.

There have been great papers showing that we can create neural networks that do relatively well at diagnostics that involve pattern recognition. If you looked at the field of AI twenty years ago, it was very hard to get a neural network to identify a dog and distinguish it from a cat. Remarkably, a two year-old could do this, yet neural networks were incapable of it. If you put it in those terms, it's remarkable how far AI has come. In the last three years, there have been beautiful papers groups that have shown to create networks that are capable of diagnostics in dermatology, specifically in identifying malignant and non-malignant lesions. Additionally, in radiology, people have created algorithms that

have been able to see early signs of stroke in a CT scan before objective findings are able to be picked up by the human eye. If you look at the melanoma paper from the Stanford group, they claimed that their AI outperformed board certified dermatologists, although it's not exactly clear that's what happened. The radiology case is also quite fascinating. If you ask experienced neuroradiologists to look at early CT scans, they will come up with these fuzzy answers of 'this isn't quite right, I'm worried there may be something right here'. That fuzziness, which is hard to quantify verbally, is somehow remarkably predictive. The process by which the AI came to identify it as a stroke is radically different.

Those are probably the two fields where the idea of incorporating AI has been the closest to realization. People have talked about having an app where you are able to scan yourself and it would determine if any of the lesions you have are malignant. That would be remarkable. But reality has so far been pretty sobering - I'm writing a paper about this right now with two students from your medical school. The most ambitious attempt to embrace AI and bring it into clinical practice was an endeavour called Watson for Oncology. It was a joint effort between MD Anderson Cancer Center and Memorial Sloan Kettering Cancer Center and IBM Watson - and it was a total failure. It proved to be fundamentally unhelpful in terms of assisting clinicians, particularly oncologists, to make decisions and diagnoses.

If you inputted patient data into Watson for Oncology and asked for an output, a diagnosis, it wouldn't work in binaries, meaning it wouldn't say a person, for example, has ALL or doesn't. It would give you a probability that this person has ALL and a matching probability that this patient has maybe myelodysplastic syndrome, which is probably not so different than the way we perform diagnostics and create a differential. When you're a clinician, you start with a differential and move towards a diagnosis. You start with entities that in the onset likely aren't equally weighted and you ask biased questions and obtain biased tests - by biased, I mean questions you decide to ask based on what you think is going on. Then, those weights change by the results of the imaging or diagnostic tests. So, it's not that different and maybe it's simply teaching us that the way we perform as diagnosticians is a good approximation of reality. I think the experience with Watson for Oncology put a damper on the excitement that people had that AI is going to come into medicine and give us the answers.

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UTMJ: How else was the Watson for Oncology project unsuccessful?

SD: There were a few things about the Watson for Oncology endeavor that are worth making noting of. One was with the amount of money that was put in, they expected to receive binary answers. They didn't want a machine that was as good as a human—they wanted something better. The paper I am writing now proposes that this is actually an unrealistic expectation of reality. The second, which goes back to ethics, is if AI tells you these are the probabilities and you think 'no, I think this patient has this instead'- what do you do now as the clinician? In other words, if you have an algorithm that can't give you certainty and gives you information that increases the complexity of your decision, where does the weight of the responsibility lie? How does it change your responsibility to your patient?

UTMJ: Do you believe AI has begun to impact patient care?

SD: I think it's coming. There's a fantastic essay by Atul Gawande in The New Yorker on electronic medical record systems and how they are the bane of physician existence and how the promise of these EMRs has turned out to be unfulfilled. The amount of time that the EMR has added in terms of patient work and decreased in the amount of time to spend with patients. The cumbersomeness of the EMR compared to the paper record are things that I think people couldn't, or at least didn't, anticipate. How amazing would it be to have an AI that could intake the EMR and regurgitate something? Rather than a human being having to parse through a 20-page note to find the features that are most important, I can imagine an AI doing that. You think about broad areas like this that may be a little less glamorous, but it's something that AI can do remarkably and can have incredible impact for patient care, data storage, and research. You can imagine how adaptive clinical trials might be enhanced by having an AI that can grab information from the patient record that is actually relevant to questions that are important for outcomes.

I would challenge all of us to think about what is it that AI does, what it does better than humans, and how that could enhance our abilities as caretakers.

UTMJ: To clarify, you're speaking of its strength in terms or accentuating and enhancing what we're already able to do rather than replacing what we do?

SD: I think so. Siddhartha Mukherjee had a great essay in The New Yorker called AI vs MD. He brought up both the dermatology and radiology examples. The essay included interviews with a few seminal figures in the AI world. The general sentiment that was communicated was, 'radiologists better figure out something else to do'. I'm not sure that anything yet has proven AI so capable as to have such an apocalyptic view of the future of medicine. If you look so far at the ways that technology has influenced our role as physicians, there aren't many examples of places where technology has eclipsed or made what we do obsolete. Technology has changed how we practice. You guys will never do a peripheral blood smear. It's something I had to do as a medical student years ago. I would take a patient's sample, take it to the lab, do a smear, and look it under the scope and use that as a diagnostic tool. I learned to do it for my resident at the time who sat there for two hours teaching me to do one blood smear - it's something you guys won't have to do because it's automated. This advance has not made hematologists irrelevant. Similarly, an echocardiogram is able to give us more information than a stethoscope. Again, this advance has not made cardiologists irrelevant.

I think of these advances as adjuncts and ways of enhancing what we do. I don't yet imagine a future that is so apocalyptic to say that AI will displace us. Even if you take another example of robotic-assisted surgery - it's still robotic-assisted surgery. We haven't got to the point where they're calling the shots.

UTMJ: And if that were to happen, I certainly don't want to be the patient involved...

SD: You bring up a good point. Embedded within the contract that we have with patients is this idea that our patients can expect that we will always try to do what is right for them. That is at the heart of what the patient-doctor relationship involves. It's interesting - is that something you can program into AI? Would you simply consider that AI will always make the choice to do what is best? When we see doctors

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that make inappropriate decisions because of their ethical standards, as a profession, we consider that as the greatest crime that you could commit. Those are grounds for us to consider dismissal from our field. Would we hold an AI to that same standard? What would it mean to consider that standard for an AI?

UTMJ: How do we factor in compassion and empathy?

SD: For sure. It's valuable for us as a field and particularly as trainees to prepare for what AI would mean and to think for ourselves what we imagine AI to allow us as caretakers in the future. Still, I am hesitant to warn anyone off from our field becoming irrelevant because of it.

UTMJ: Do you believe that some areas of medicine will be influenced more than others?

SD: That's a great question. I'll say first of all, I imagine AI having a global value, in that you would hope it improves efficiency in what we do. Imagine something even as simple as a scribe. You may know in the US it's not uncommon to hire premedical students to be scribes during the patient encounter, and to record the conversation in a medically relevant way so that it can be inputted later, in order to free the physician performing the interview to 'be' with her patient. The work-around is valuable but remarkably inefficient. There's no reason why an artificial intelligence couldn't be a medical scribe - something as simple as that could have great value in terms of efficiency in a clinic.

You could also imagine applications like AI patient educators that could be valuable for patients who are undergoing chemotherapy, or patients who have had surgery. At St. Michael's, we give our patients this four-page discharge summary with all the warning signs of what they should look out for. I would love instead for my patients to have an app that they could have on their phone, that could guide them to answers for questions that probably come up quite often, and that we don't attend to because patients don't want to bother us with questions that seem meagre or irrelevant. It's interesting, if you look at the data, when you start hiring nurse practitioners into systems, two things happen. Number one is that the patient input into the system increases, meaning that when a patient sees a nurse practitioner, they're more commonly willing to call that individual than their doctor. They see them as more accessible, or maybe their time is less critical, in terms of wasting their time. The second is that you see patient satisfaction ratings go up. In other words, there's a benefit to patients

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as well. They're reaching out to someone because they've got a question, they would have thought that question not relevant enough or important enough to reach out to their doctor, but they reach out to a nurse practitioner. Imagine if we had adjuncts like that that were AIs? I can imagine at least constructing algorithms that could answer relatively basic questions for people - relatively basic for us, and not so basic for our patients who are going through treatment.

I do think that there are tremendous opportunities for continued advancement with assistance in surgery. Robots haven't entered many fields of medicine yet; OB and urology are probably the two that they've been the most effective at. We have been working with a local company to construct an AI that would be valuable for doing things like lead placement for deep brain stimulation, and that would be of assistance during needle biopsy for brain lesions - things where a robot can do something with precision and accuracy, and it's ideal for a machine to do it rather than a human. These are pretty simple things that I am noting. But imagine, rather than the idea of a dermatologist being replaced by an app, imagine instead that as a family doctor you had an app that if you saw a lesion that looked worrisome, you could use as an adjunct to your own considerations and then use as a decision-making tool of whether that patient needs to see a dermatologist. So things like improving remote medicine, improving access to specialty care that now are done through telemedicine or travel, you could imagine there may be ways of creating adjuncts to that through AIs.

UTMJ: What role do you foresee AI playing in either accentuating or diminishing health disparities and access to health care?

SD: That's a great question. The goal would be what I just alluded to, that particularly in a country like Canada where there's a wide dispersion of population across a huge geographic mass, thinking about health care models that have been used more traditionally in the US simply don't apply here. If you look at the US now, rural areas are shrinking, rural hospitals have been closing down, and there are now widening health disparities between rural and urban areas.

You can imagine AIs again being a way of having almost an extender of specialty services to help with decision-making in terms of whether or not you'd rather send someone from Sault Ste. Marie to Toronto because you know that they need to see a neurosurgeon, than send them from Sault Ste. Marie to Toronto because they may need a neurosurgeon. It may be that AIs are able to help with that. The way that we do it now is by creating networks that allow caregivers in Sault Ste. Marie to talk to me and my colleagues here in Toronto. But again, there may be ways of making that process more efficient and broad-reaching. The fear is that what we end up seeing is actually more akin to what capitalism manages to do, which is that gains in technology and advances in health care are driven by capital. I think the danger for that happening in AI is particularly great because these are endeavors that are being pushed through industry. They're not ones that are being pushed by government, they're not ones that are being pushed within academia - these are endeavors that are being advanced within profit-generating schemes. I think there's inherent to that the danger that disparities that are there already will only be broadened, rather than these tools being used to collapse some of those disparities.

UTMJ: Do you think that a lot of it will be through telemedicine or other reinventions of AI?

SD: It's amazing, I've seen a commercial for a group that's making a mobile robot, that actually facilitates the whole telemedicine process. The robot is at the bedside and the instructions can be keyed in by a remote user who can see the patient through the screen, and the robot can actually do a physical exam. You can imagine for something like a stroke intervention where we have a window of up to 24 hours for intervention for stroke care, how valuable something like this could be to actually identify whether someone would be a candidate for interventional therapy.

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UTMJ: Do you have any advice for medical students as they enter training and come across AI in practice?

SD: I will say first of all that what you are investing in, as a life, as a vocation, is remarkably special. It may not feel like it through the whole process, but medicine is a tremendous field to dedicate yourself to. There is a specialness and sacredness to the relationship that you will have with your patients that is remarkable. As part of human experience, the fact that it will be part of your life, I hope that you find it as amazing as I have.

When you think about what the point of something like AI is, my hope will be that you'll think of it as something that simply allows you to focus even more on that relationship - that it doesn't become something that deflects from it, or that it doesn't become something that fractures the bond that makes medicine special. I am sobered and to some degree eased by quotes that I can find from the early part of the 20th century, of physicians at that time saying that the advances of technology that are coming to medicine will destroy the relationship between patients and physicians. You can find quotes from 1908, and I'm sure you can find quotes from the 3rd century BCE of the same, meaning there has always been the fear that technology would be something that gets between us and what we do, and why we do it. It's interesting if you think to the extreme of what AI could do, it is a very brief history that as doctors we've actually meaningfully been diagnosticians, and even briefer that we have meaningfully been interventionalists. We've always been caretakers, from the beginning. And it's only been for a very brief time that that role of caretaker is something we've been able to add to with being able to offer our patients something perhaps more physically tangible. I don't know for sure how AI is going to change that. My hope is that it's going to make it so that the window of that part of the offering becomes even wider, but hopefully it doesn't change - it shouldn't change - what it means still for all of you is to be a caretaker. And that's a much longer tradition that you're in.