

Interview with Dr. Yunghan Au

UTMJ Interview Team (Mana Modares and Jeff Park)



Dr. Yunghan Au

Yunghan Au, PhD, MBA, was born in the United Kingdom and completed his undergraduate degree in biochemistry at Imperial College London. His PhD focused on protein structural biology, involving the use of nuclear magnetic resonance spectroscopy. At Princess Margaret Hospital in Toronto, Yunghan researched as a postdoctoral scientist studying the structures of proteins involved in transcriptional regulation. Following this, he pursued a career in scientific sales

back in the United Kingdom for four years. Yunghan went on to complete his MBA at the University of Cambridge in order to further pursue his interest in business. He came back to Canada to work for Lilly, GSK, and then AbbVie Canada in market access and health economics and outcomes research, articulating the value proposition of new drugs to public and private payers. Today, Yunghan serves as the VP of Medical Affairs for the Toronto-based company Swift Medical, which is the leading digital wound care management company, seeking to improve wound healing. Yunghan continues his work to incorporate Artificial Intelligence/Machine Learning in a smartphone application that enables wound care measurement and visualization.

UTMJ: What is your role in Swift Medical and how did you become involved with the company?

YA: I got into Swift [Medical] fairly serendipitously as my spouse, Sheila Wang, is a co-founder of the company and a medical graduate from [University of Toronto]. She participated in a Hacking Health event (a hackathon event that connects health care experts with IT experts) and Carlo Perez, who is the CEO, got wind of her idea of creating a

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wound care management application and the company was founded in 2014. As the company got larger, the demand for scientific evidence generation increased. Given my experience, joining the company was a good fit, and I have been at the company since the beginning of 2017. What we do for medical affairs is establish the clinical or economic evidence to support the use of products. We set up clinical studies to prove product functionalities, such as the accuracy of the measurements of the application. It could be internal product validation to looking at health care system impact; we look at the clinical benefit or the economic consequence of using such technology.

UTMJ: Could you please give us an overview of the project you are currently working on?

YA: Currently, one of the uses of the [application] is in skilled nursing facilities. If you run one of these facilities, you need to survey your residents for pressure ulcers and document their skin conditions. It's not only pressure ulcers or wounds, but also things such as diabetic foot ulcers or skin tears. This is a standardized assessment that is performed when a resident is admitted into a skilled nursing facility. The Swift application documents the wounds on the residents. One of the publications we are working on is to look at the application's impact on the reduction of pressure ulcers in a health care facility - how does taking a picture of a wound help its prevention? It's a centralized way to manage wounds and skin conditions. Using the app in combination with changing your quality of treatment practices, you can actually say 'we should be turning or repositioning residents more frequently', or applying other preventative measures. Clinicians might care for the most severe wounds in the organization, which is great, but you may lose sight of what's going on in the population. If we're talking about the business of preventing pressure injuries, then you want to see what's developing at an early stage to prevent wounds or ulcers from becoming higher stage problems. As a result, accurate measurement and photographic records then become very important in order to achieve this.

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Another thing we’re implementing is using the application as a telemedicine solution. So, it’s not only doing this remote monitoring of the patient population, but it’s also used to do remote consultation. We are working with T  l  sant   McGill, who manage a lot of the telemedicine infrastructure in Quebec. In this, we are working with the Cree Board of Health and Social Services in James Bay, who have a First Nations population whose diabetes prevalence is a lot higher than the national average. One of the complications often developing are diabetic foot ulcers, and in this remote community, there is poor access to specialists who can treat those wounds. The objective of this project is to use technology to remotely monitor that population and since all this information is digital, McGill can review the images coming through and make treatment recommendations that could change their treatment and by doing so, hopefully there is a clinical impact.

This is not an exhaustive list of what we’re working on because there are a lot of ways to use this technology in wound care.

UTMJ: What do you think are some major barriers when trying to implement AI technology in medicine?

YA: One of the challenges in AI is the ability to collect data: a purely physician-driven solution would limit the amount of data collected given the reality of wound care. The vision of AI in wound care is that one day individual patients and their caregivers could use the application, and the system would be able to give the diagnosis and maybe prognosis of the wound. The problem becomes collecting enough data to meet this challenge. Hence, data collection should be easy to see how wounds progress, so it is good that we have created a simple-to-use application that almost anyone can use. I think that’s a big challenge - to have a large enough dataset to see what is going on with wounds.

There are two main objectives of the applications of AI: the diagnosis of condition [distinguishing wound types], but also an indication to the prognosis of the wound – is the wound going to heal or not, and if it’s not healing, what is the issue that is keeping it from being healed? A third issue in terms of AI and machine learning is the quality of data you have to work with as well. There are examples where AI is applied to X-rays and radiological scans; with this type of image acquisition it is a lot more standardized

and there is a flattened [two-dimensional] picture of a chest X-ray, so if you have thousands of those images there is a lot of consistency to use for machine learning. How we see it is that if all of us take a photo of something, we’re going to come up with something different and the focus is going to be different. What we try to do as a company is to try to standardize photographic data collection so in terms of our application, our product solution is composed of three things: the application itself, the web-based dash, and the Swift marker - which is a blue dot. We’ve gone through getting regulatory approval for FDA health Canada approval for this marker because it’s going to be used on patients, but second of all, it’s there to standardize the image in terms of the size, the distance the camera is from the image, and the color of the image. By having this, we have standardized wound assessment and the photo. In terms of the area of wound care and AI that’s certainly what you want: to be able to train the machine on standardized data.

UTMJ: You mentioned earlier about the need to collect large amounts of data in order to train machines. You would certainly need to maintain a large user base to enable that. How would you go about educating new users, say patients and their caregivers, to use the technology?

YA: It’s a challenge at many sorts of different levels. In terms of who we are as a company, we look at it as a user-experience, user-interface type of problem. Carlo Perez, our CEO, has a computer engineering background and used to work at ATI - which is a computer graphics company - working to improve the user-interface. Also, our Chief Engineer worked on the visioning system on the Mars Rover. We try to make the app as simple to use as possible. That is the really the key to being able to put the technology into the patients’ hands. We are working to make the application as usable and intuitive as possible, so eventually it will be able to be used by patients and their family members. As mentioned, this is one of the barriers to getting a large data set. We have skilled nursing facilities and home health agencies, but the majority of people are being taken care of by their own family members. Trying to make the workflow as simple as possible is what we are focusing on. We have a bit of “Apple-mindset” in terms of design. You may have seen it in the office. How did Apple become so successful? Because they made the very difficult into something very simple. And we obviously believe in that philosophy. That’s how we think we will change health care technology to get this data set.

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UTMJ: From your experiences, how do you see the field of AI in medicine evolving?

YA: So first you want to ask yourself what the health care reality is in developed countries. In Canada, we are talking about health care spending that accounts for around 50% of government expenditure. Health care burden is only growing larger and is exceeding what can be dealt with the allocated budget. We have an increasing aging population and we need more practitioners. That being the case, I see the responsibility of health care shifting to individuals, family caregivers, and other health care providers, such as nurses and therapists. Canada is structured in a way that there are only so many physicians being trained each year. Unless the number of new physicians grows exponentially, and I don't think the health care system can necessarily afford that, we are going to have to deal with this reality. This is why I believe AI is going to be important. I think a part of AI as I alluded to earlier is this idea of the ability to get a diagnosis or prognosis. I think being able to use tools like AI will help health system triage better the population receiving health care.

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In US, there are potential health care policies for the recipients of Medicaid to do an aspect of caregiving to maintain their insurance under Medicaid. So essentially in the clinical world, the unskilled population is doing things that were traditionally reserved for nurses. And if that's the case, we need to arm these people with the tools to help them do basic caregiving and data collection.

UTMJ: Do you see any potential harms in this?

YA: I think that there are harms for sure. I feel that as soon as we get machines to do your decision-making for you, the question then becomes whether they are making the correct or incorrect calls. We start talking about false positives, false negatives, and so on. In the future, I think health care systems are going to have to evaluate things thoroughly in order to minimize patient risk.

I think another potential harm is a negative reaction to any sort of technology that we are seeing is always going to be this fear that machines are going to replace people's jobs.

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But I think that in accepting the health care reality that I articulated earlier, we are going to be left with this massive gap. How are we going to fill that gap? Are we going to allow the problem to just get worse? Or are we going to try to find a solution to the problem? I think there is going to be a fear of people losing their jobs, but where I think the game is at is augmenting the current practitioner's role to treat the patients more efficiently. I don't see the introduction of AI in medicine as a job-destroying thing. We want to be of help in that change to improve health given our reality.

UTMJ: Do you think medical students and doctors should take an interest in medical technology and is there a message that you would leave for the students?

YA: Absolutely. As I mentioned before, my wife was a medical student when she did Hacking Health. I think it is very much up to the next generation to become involved in technology by developing solutions, getting products out, and starting companies. One thing that I noticed in the health care system is that it is very slow to adopt technology. If you think about technologies like WhatsApp, Instagram, and photo-taking technology, we have had them for ten years now. Consumers use them every day en masse. Yet in the health care system, there seems to be an irrational impediment with technology. It is so obvious that we should be using technology as part of everyday practice.

UTMJ: The next generation has been brought up with high-speed internet computing. They know exactly what the benefits are, and I think it's up to people like yourselves to beat the drum and push technology forward.

YA: I think without increasing any sort of budget, our problems won't be solved by maintaining the status quo. It's going to be about adopting technology and applying them in intelligent and strategic ways. Say you get in a car acci-

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dent, what are you going to do? You are going to take your phone out, take a picture of the license plate, take the picture of the damage, and certainly the driver's license. You are going to try to resolve the issue using technology. With medicine, what would it take? What would it take to adopt that sort of technology? Obviously, we are very sensitive to patient health information and it should be guarded. But I think at the same time, we are fooling ourselves that this is not happening already. Physicians share photos using messenger apps.

I think we need to have a common-sense approach as to how technology is adopted in order to move things through quicker. I am not saying I am tired, but I just find it fantastically amazing that technology like this takes so much justification to get through. I would say that it would be justified if the technology incurs a high cost. If we were trying to push a high-cost solution to the market, I would have a problem. But if we were trying to push a technology where we have the tool right in our pocket to use for over six hours a day, that's another thing.