Behind the Breakthrough Podcast - University Health Network

Season 3 - Dr. Babak Taati

Transcript

BTB

This is behind the breakthrough, the podcast, all about groundbreaking medical research and the people behind it at Toronto's university health network, Canada's largest research and teaching hospital. I'm your host, Christian Coté and joining us on the podcast today, dr. Babak Taati, award winning scientist at UHN`s Toronto rehabilitation institute research center, called kite, which stands for knowledge, innovation, talent everywhere. Dr. Taati is pioneering the use of computer vision to more accurately and quickly diagnose elderly patients for a number of health issues, including pain management and preventing falls. Dr. Babak Taati, welcome to behind the breakthrough.

DR. BABAK TAATI

Thank you for having me.

BTB

Let's start you know, with a primer if you don't mind the concept of computer vision. What is that?

DR. BABAK TAATI

Computer vision is trying to teach computers the ability to analyze and process and understand images and videos. So to give you an example, object recognition is a prominent computer vision example. That's developing systems, algorithms and models that allow computers to see an image and discovering in it things, objects and the whereabouts of those objects in the image. Other examples of computer vision problems includes face recognition, facial expression analysis, tracking objects in videos, 3d reconstruction so building 3d model of an object or in environments from a monstrous set of images or a video and also image restoration. So having all the images or videos and trying to recover it.

BTB

So then walk us through like the thought process of how you and other you know, scientists, such as yourself in this field connected its potential to apply it to health care.

DR. BABAK TAATI

There are a number of different applications for computer vision systems in health care. Probably the most common one is automated analysis of medical imaging data, so, MRI, CT scans, x-rays, pet scan and so on. For example, to detect tumors or bleeding endoscopic videos. But my own area work is completely different. I use computer vision systems to analyze the movements of human body. So, for example, looking at videos of how people walk or facial movements and facial expressions. And this is for health and clinical assessments, for a medical diagnosis or for safety monitoring applications.

BTB

Help us then understand, Babak, what's the gap you're filling out there by using computer vision as opposed to other more traditional methods of analysis or detection?

DR. BABAK TAATI

There are a number of gaps. So for example, if you imagine for people with advanced dementia, using wearable sensors is not often possible. There might be problems with adherence following directions, whereas if you develop an ambient monitoring system that lets people to live their normal daily lives and go about their activities of daily living, and it just picks up things as they walk around their home or their place of living.

BTB

Got it! Ok, so let's turn to your pioneering work with computer vision and its applications first to elderly people with dementia who are in need of pain management. I understand there's a serious gap there, too, when caring for these residents. Talk to us about how you're applying computer vision to, I guess, diagnose or detect pain in the elderly with dementia?

DR. BABAK TAATI

So first, to give you some context, pain is very common in old age, and there's a lot of research showing that pain is underdiagnosed and undertreated in older adults. And this is especially the case for older people with dementia who might have difficulty verbally communicating that they're in pain. And one thing to note is that long term care residents are primarily older adults, and in Ontario, like in most other jurisdictions, the majority of long term care residents have dementia. So in Ontario, depending on the home, somewhere between 60 to 80 percent of residents have dementia. So because of the average age and the prevalence of dementia, the problem of undetected and undertreated pain is a major challenge in long term care. And trying to address this, one of the projects that have been working on over the past few years is trying to develop computer vision and artificial intelligence techniques to try to improve pain management. And this is something that I have been working on together with Dr. Thomas Hadjistavropoulos at the University of Regina, who's a psychologist and an expert in pain and pain management and especially pain and its assessment in older adults with dementia.

BTB

So, you know, you mentioned the scope and scale and the consequence for elderly residents where pain goes undiagnosed. I imagine there's also stressors on long term care staff when it comes to accurately detecting pain in someone with dementia?

DR. BABAK TAATI

Yeah. So agitation, aggression and sometimes violence are unfortunately common in long term care, and untreated pain is believed to be a source of that. Imagine if you're in pain that can be from an ulcer or a sprained ankle, an infection or whatever that goes undetected and untreated for weeks or months? So it's pretty natural to feel agitated at that point. And it could be something that can be treated with a few pills and sometimes even if it's something that is detected and treated in time, can prevent the condition from getting worse, for example, an infection getting worse. So agitation and aggression and violence are definitely among these stressors and I also want to point out that validated pain assessment tools are available. There are clinical assessments that people can perform that are based on observing facial expressions, body movements, vocalizations and moaning, crying and things like that. There are in fact two valid, clinically valid assessments for people with dementia and the second one, especially developed by Thomas and his team, is especially designed to be easier to train long term care staff to administer it. But the problem is that long term care homes are understaffed, so they don't have enough human resources to perform regular assessments. We've seen this understaffing problem being highlighted and really exacerbated during the pandemic.

BTB

Visually, could you paint a picture for us because you're not having a patient come and stand in front of a camera, right?

DR. BABAK TAATI

No, no, no.

BTB

Like that's purely in situ in the home?

DR. BABAK TAATI

Exactly. So the idea is to have the cameras, the use, these security cameras that are in long term care.

BTB

Ah, okay.

DR. BABAK TAATI

And automatically detect faces. And as people are sitting around watching TV, talking to each other or doing whatever they do, nothing happens. If they show expressions of pain for a sustained period of time, then the idea is that the system will alert care staff so they can go and intervene.

BTB

Is there a way you can explain to us, how does the computer vision software or whatever it is, detect it just through the CCTV cameras when someone is in pain?

DR. BABAK TAATI

So we use, for that, we use machine learning techniques. The way machine learning techniques work is, or I should say, the way supervised machine learning techniques work is that you show them lots and lots of examples. So you show them, in our case, images and videos of people. Older adults with dementia in various levels of pain and a deep learning model learns the patterns of facial expression that correspond with pain and the intensity of pain. So next time, when it sees a new unseen image of somebody, somebody that is not in the training set, it can generalize and estimate the level of pain in this new face.

BTB

How does it work in terms of..?

DR. BABAK TAATI

So, so the prototype that we have right now is that a light goes on in the nursing station and also an email is sent to whoever the account is set up to. So they get notified by light going on. And then they go check out and which room the lights, the notifications coming from.

BTB

Ah, okay.

DR. BABAK TAATI

But let me go back to the training of the machine learning model because like the way the model is trained is by looking at a lot of examples. So you can imagine that having access to a good training set is a really important prerequisite for having a model that performs well. And i want to say that pain detection is a very active area of research, and there are plenty of models that are published by other people. But the available datasets and there are two major ones that everybody uses are of younger and middle aged people without dementia. So as you can expect when you train a model to detect facial expressions of pain on faces of young, healthy people, if you test it on faces of older people who have dementia, their faces look different. Their expressions look different. And so the model doesn't work well, and we've experimentally shown that it doesn't work so well.

BTB

So Babak, what is your research, you've invested thus far in terms of results?

DR. BABAK TAATI

So you trained a machine learning model? Thomas and his team in Regina first collected a really large pool of data of over 100 people, older adults with and without dementia during normal conditions and also during painful conditions. And then all of this data got annotated frame by frame for the intensity of pain being expressed. And then we used deep learning models, convolutional neural network models to train a model that gets the highest accuracy in identifying pain and the level of pain in older adults with dementia. We have a state of the art machine learning model. I'm not going to go into the details, but to give you some numbers in the aggregate, our prediction is over 20 seconds. The agreement between our model's predictions and the ground truth labels that are manually annotated by psychologists is over 80 percent, 82 percent to be exact. And for comparison, the best available technique prior to this got 60 percent. So we are better by a large margin. So to answer your question, so far, we have a validated algorithm that gives you the best state of the art performance in the target population of older adults with dementia. We have the paper that is published, and we also released our pre-trained model for academic use. So other academics we're researching in this area can try out our model.

BTB

Do I have this correctly, then? What you're saying is thus far in terms of your results 82 percent of the time. Computer vision is accurately detecting when a patient, an elderly dementia patient, is in pain, in fact, because you go and then have them do the, the more comprehensive test, I imagine?

DR. BABAK TAATI

Yes, the correlation between our predictions in terms of intensity of pain and the label is that psychologist provided is 82 percent.

BTB

So next step for you. I understand you have a trial about to get underway in a long term care home to investigate further the use of computer vision to detect pain in residents. What can you tell us about that?

DR. BABAK TAATI

Yeah, we are doing this in two steps. The first step is that our colleagues in Regina are starting a live clinical validation of this technology. That means bringing people in the lab and testing the system in real time rather than on recorded video, which is what we've done so far. So live performance is obviously more challenging, but we're quite confident the next step is to implement this in true long term care homes and accurately measure the effect of the system in improving pain management. And I'm very excited about this and really looking forward to it.

BTB

When is this getting underway?

DR. BABAK TAATI

This is a little bit delayed because of the pandemic. We were hoping to start in 2021, but a little bit pushed back because of the pandemic. So stay tuned.

BTB

Okay. And I'm curious, have you had any reaction from the research field or long term care homes about this work?

DR. BABAK TAATI

Yeah, the reaction has always been very positive. We collected our data in long term care homes in Regina, and they were quite excited to help and also excited to learn that we were working on this technology. And they were eager to try it out when it was ready. And the participants and their families were all so excited and happy every time we've showcased the system. The reaction from the long term care community has always been quite positive, and that's not really surprising because the project was initiated by the community and from a real clinical need. And the project is co-led, as I mentioned by myself and a clinical collaborator. Matter of fact, all of my projects are co-led by me and my clinical colleagues. And finally, I want to say that along the way, we have taken input from the long term care community, care staff, residents, families and so on.

BTB

Another big issue in long term care is residents who fall frame the narrative for us again in terms of just how serious an issue this is?

DR. BABAK TAATI

So if you talk to people who work in long term care, they'll tell you that pain management and falls and consequences of falls, injury and sometimes even death are two of their main ongoing challenges. So we already talked about pain, and I'm glad you asked about falls. We're working on an ambient monitoring technology to monitor walking patterns and changes, engaging in people with dementia who live in long term care. And the goal is to have a system that can automatically detect and identify individuals who are at the high risk of falling in the short term. And again, similar to our pain management technology, the goal is to have a screening system and to notify care staff so they can intervene before someone falls. This is a joint project with Dr. Andrea Iaboni, who's a geriatric psychiatrist and a clinician researcher at kite. In terms of motivations for this project. There are some challenges in using standards for risk assessment tools, clinical assessments for the older adults with dementia population. So, for example, problems with following instructions. And so if you imagine that someone with advanced dementia, if you ask them to walk five

meters, turn and come back. If that person has difficulty with verbal communication, they might have difficulty following those instructions. The other problem with existing clinical fall risk assessment tool is that they often give you an assessment of fall risk in the long term. So a year, for example. And then finally, because of age, dementia and other cognitive or physical challenges in long term care, pretty much everyone in long term care is categorized as having a high falling risk. And that's not really an actionable knowledge if you know everyone is at a high risk of falling over the next year, which is a pretty long period.

BTB

So Babak what have you been able to report thus far in terms of your research in terms of again, triaging falls or preventing falls?

DR. BABAK TAATI

So, so far, we've developed an ambient monitoring system that has a camera that's installed in the hallway. First, we installed this in the specialized dementia unit at Toronto rehab we have collected data there for about a year and a half. Since then, we have ongoing data collection at lakeside long-term care, we've have had a number of publications showing feasibility and then also showing that ambient assessments of gaits during the first two weeks of stay after admission predict future falls in the short term. So in coming weeks and that having this information about gaits collected by ambient monitoring improves the fall risk prediction over existing clinical tools. And then. Most importantly, we've developed machine learning models that take as inputs, longitudinal changes in gates and also medication intake and all the other information that we have and then dynamically updates. Short term fall risks for, for each person. And if you imagine this information is now an actionable knowledge, if you know that this, this person and that person rather than everybody, this person and that person are at a higher following risk over the next months, then you have the opportunity that to go intervene, maybe the care staff can to review their medications. And maybe there's a medication, new medication that is affecting your gaits, or maybe they can do a physical checkup, and maybe they can even identify an underlying health problem that is causing the gait problems.

BTB

It's amazing. What, what's the next step for you and in terms of advancing this particular research?

DR. BABAK TAATI

Yes. So we've had data collection at lakeside going off for a while, it got interrupted because of the pandemic, but now we're back on. The idea is to use the data that we've collected, adds we're collecting at lakeside to externally validate the model that we developed using the Toronto rehab data. So we develop our fall detection, fall risk prediction model using the data at Toronto rehab and we will validate it externally on the lakeside data.

BTB

That's fantastic. And i understand you're also investigating the application of computer vision as a communication tool using facial recognition for, say, stroke patients and people with Parkinson's disease who have lost the ability to speak first. Talk to us about the unmet need.

DR. BABAK TAATI

The unmet need is that speech language pathologists require a lot of training. Nevertheless, the existing or official assessment tools are quite subjective. So what we want to do is to develop a clinically valid, accurate and most importantly, objective tool to monitor disease progression and also monitor response to treatments and interventions. And what we're working on is trying to develop an app or a web app that you can use daily for five minutes and it gives you a clinically valid assessment. And if you use it multiple times for several days, it gives you a trajectory of the progression of your disease or the response to medication. And once we have this technology, you can use it, for example, to investigate the efficacy of new treatments or to investigate the side effects of new pharmaceutical interventions and so on.

BTB

So how would the application work?

DR. BABAK TAATI

This is still a work in progress, but the idea is to have an app. We have a demo up at virtual-slt com so far, it's just for data collection, but the goal is to add functionality to this system, so it gives you live feedback. So the system you go, open up the webpage, it tells you to open up your mouth, it says go aah, go papa, papa, sympatico, sympatico a few standard tasks from the assessment and then at the end of it, it gives you a score. It gives you a score for speed, range of motion, facial symmetry and so on. And you use it, for every day and after a couple of weeks, it gives you a trajectory.

BTB

And so where would you see this going over the next couple of years?

DR. BABAK TAATI

On the academic front, so far, we've shown that we can use computer vision techniques to accurately track facial movement to distinguish between clinical populations, and that's useful for diagnosis. And also to automatically compute and extract features that correlates with perceptual clinical scores of symmetry velocity, a range of motion and so on. So the idea is to incorporate all of this into the app. So we have an app that has a simple and easy to use user interface that you go to the webpage or open it on your tablet, and it gives you a

simple, a few simple instructions and you can complete the daily assessment in five minutes.

BTB

Wow. And give us the translation here, Babak. Is this something that somehow in the future would allow people with, say, suffering stroke or Parkinson's? You've lost the ability to speak to somehow communicate?

DR. BABAK TAATI

Not by itself, but the idea is this will be an additional tool that is available to neurologists and to speech language pathologists to monitor how interventions that they are recommending are responding, how the person is responding to those interventions.

BTB

One more application of computer vision is for patients with sleep apnea. First off, talk to us about the challenges to accurate diagnosis and discerning which kind of sleep apnea a patient has, because I understand that's crucial to figuring out what choice of treatment should be?

DR. BABAK TAATI

Exactly so, sleep apnea is very common, but you might know that it is severely under-diagnosed and untreated and sleep apnea. And the resulting lack of sleep is linked to a whole slew of health problems from cardiovascular, memory problems and also motor accidents in car accidents and so on. The clinical assessment polysomnography in the lab is uncomfortable because you've got to attach a whole bunch of sensors to the person is expensive. In many jurisdictions, there's long wait times and also you get to sleep in an environment that is not really your own bed in your own home, so your sleeping patterns might differ. So what we're trying to do is to do, to develop a home assessment technology for at least for pre-screening. And what is important is to also be able to differentiate between different types of sleep apnea because, as you said, the treatment is different depending on the type of apnea.

BTB

So how do you apply, how are you applying computer vision to diagnosing sleep apnea?

DR. BABAK TAATI

The idea is to record infrared videos that are night vision videos basically, and develop computer vision and machine learning models that can process these videos and identify apneic episodes so episodes of apnea and hypoxia, and also differentiate between central and obstructive sleep apnea. And this is a project that I've been working on, together with Dr. Azadeh Yadollahi, who is another scientist at kite. To develop this, we collected a lot of

data in a polysomnography lab, and simultaneously we also recorded infrared video data. And this was our training sets for the machine learning model that can look at a video and try to predict the apneic episodes and their locations in time.

BTB

So give us a sense of the accuracy of the results you're, you've been yielding so far in terms of diagnosing, I guess, sleep apnea and discerning mind?

DR. BABAK TAATI

But you have a number of publications showing that this kind of validation of the system that we've developed, we can accurately detect apnea and hypoxia episodes. We can distinguish between central and obstructive apnea. And as you mentioned, there's that's important because the treatment options are different and we can also automatically detect people who have positional sleep apnea. That's people who for whom the majority of sleep apnea episodes are in the supine sleeping position so sleeping on their backs. And again, that's important because the treatment options for someone who has positional sleep apnea versus someone who does not is different.

BTB

So just give us a sense of what kind of results are you and the team seeing so far in terms of the accuracy of this method of detecting sleep apnea?

DR. BABAK TAATI

Pretty good results. So to give you an example for the technique for distinguishing between obstructive versus central apnea. We're getting an accuracy of about 95 percent.

BTB

So instead of translating this to where we would maybe see the computer vision method being used as a standard of care in clinical practice because this is way more convenient for the patient right there at home, they don't have all the electrodes hooked up to them. They get a decent night's sleep.

DR. BABAK TAATI

So we'll be hoping, at least in first steps, is to use this as a pre-screening tool. So use it to identify individuals who are particularly at a high risk and give them priority for polysomnography. And then in parallel, as Dr. Yadollahi and i are also working with a UHN physician, Dr. Mandeep Singh, and that's for a project to try to use this technology in hospital and surgical settings to monitor sleep apnea in pre and post-operative patients. This is something that we're just starting. I'm pretty excited about it. So hopefully in a few months we'll have some exciting results about that as well.

BTB

That's amazing. Finally, I understand there's an ethical component to your research where you want to ensure it's applied in such a way so as not to assume racial and cultural biases. Talk to us about that?

DR. BABAK TAATI

Yeah. There are multiple ethical issues in the context of ambient monitoring. There are questions about privacy, disparate impact and fairness. About privacy, obviously, there's a tradeoff between loss of privacy or perceived loss of privacy and potential benefits and gains. In terms of bias and fairness, there was a famous research out of MIT a few years ago that showed that face recognition models commercially available facial recognition models performed differently than tested on faces of men versus women and also on faces of people with light skin versus dark skin. And in our own, our own work, we've also shown that facial analysis models work less accurately when tested on faces of people with a cognitive or physical disability. So these are really important considerations when trying to use an existing tool in clinical environments and in terms of fair, machine learning and disparate impacts. So, for example, for our fall risk assessment or pain detection projects, having a high accuracy is not enough. You also want to have equal performance in different groups, for example, men and women, or equal performance, regardless of ethnicity or racial backgrounds.

BTB

You're listening to behind the breakthrough, the podcast all about groundbreaking. Medical research and the people behind it at Toronto's university health network, Canada's largest research and teaching hospital. I'm your host, Christian Coté, and today we're speaking with dr. Babak taati, award winning scientist at UHN's Toronto rehabilitation institute research Centre, called kite. Dr. Taati's research is made possible in part thanks to generous donor support. So if you'd like to contribute to Dr. Taati's groundbreaking medical research, please go to w ww.uhnfoundation.ca/podcast.

Now Babak you were born and raised in Tehran, Iran. Both parents and your brother are engineers so you went into the family business. You've got an engineering degree in 1997, followed by obligatory military service for 18 months. And then you left your homeland and came to Canada to pursue postgraduate studies in robotics. That decision to leave home and your family at age just 23, travel halfway around the world to restart your education here in Canada. Give us a sense, what was that like for you?

DR. BABAK TAATI

It was pretty exciting. I was really excited to come to Canada and to continue my education, and i was really happy about it.

BTB

What's interesting about your career trajectory is you really were going down the road of space robotics for the first quite a while. You went on to do a Ph.D. at Queen's. You worked at the national research council in Ottawa and then a startup company in Montreal. Talk to us about this epiphany that led you to pivot your career and apply your engineering skills to health care?

DR. BABAK TAATI

Yeah, I can't really say it was an epiphany. It's just kind of happened, but I'm really glad it did. A postdoc opportunity came up and I really liked the job and work and the idea of developing technology to help people and especially older people, and I went for it. It turned out great. I did my postdoc with Alex, Dr. Alex Mihailidis, and it was a really wonderful experience and he was a wonderful supporting mentor and still is. And it was a good learning experience to learn to translate my engineering skills to healthcare applications.

BTB

I'm curious, as you were thinking through this career change, did you have any doubts about doing this?

DR. BABAK TAATI

Not really. I always kind of like academia and being a researcher, but my backup plan was always to go back to industry. So there's not really much of a risk. And i thought it was worth a try, and I'm glad I did, and I'm really happy it worked out.

BTB

So talk to us about mentorship. You mentioned Dr. Mihailidis, the role that mentorship has played in guiding your career. Talk to us about that?

DR. BABAK TAATI

Yeah, it has had a tremendous role, i already mentioned, Alex. Dr. Mihailidis, and he's been awesome and supportive throughout the years. I've also been lucky to have mentorship and support from Dr. Geoff Fernie and Dr. Milos Popovic, who are both quite supportive and have really benefited greatly from being guided by all three of them. And it can be little things about day to day stuff of dealing with your research finances or how to recruit students, but it can also be bigger picture things giving him some suggestions about career directions, helping you think big, telling you about opportunities and so on.

BTB

So now what advice do you give younger students and fellows just starting out in the field?

DR. BABAK TAATI

My work is really applying, and I like applied research, so everybody in my lab is trained in a transdisciplinary environment, working with engineers, computer scientists and clinicians with various backgrounds. And we also work with stakeholders, long term care staff, families, older adults and also with industry partners. So for students and postdocs who work with me, who choose to work in our group, I really try to push them to think not just about the technical topics engineering, computer science, but also about translating their skills into practice, being able to communicate and collaborate with people from different fields, mostly clinicians, in our case. But it's not really general advice to everyone. Some other people might not like applied research, and they might enjoy working in a different lab. So it's more about choosing the lab and work environment that suits your interests and your career goals.

BTB

And when it comes to failure in research, what counsel do you give when it comes to that challenge?

DR. BABAK TAATI

Academia can be very nice and also very harsh at the same time. One day you get a lot of praise for some work, paper or projects. And then the next day, a paper or a grant under review comes back with harsh reviews and being rejected. And I guess the advisers have developed a thick skin and also try to use everything as a learning opportunity to get negative and harsh reviews, trying not to take it personally and see if you can use it to improve your work. But that's really easier said than done, and it can still be quite frustrating sometimes. And I guess that's okay too, some people have feelings.

BTB

We've talked about a number of the unmet needs and gaps in health care and how your research and computer vision is trying to fill or solve those gaps. So I imagine that, you know, the urgency for patients. And yet you also know that science takes time. How do you reconcile those opposing forces?

DR. BABAK TAATI

Yeah, it's, it's quite a challenge. I'm glad you brought this up. And I actually want to use this to give a shout out to our institute kite and also to age well, and let me tell you why. So first, kite is what I like about kite and what really makes it a unique research institute is that translation is really greatly valued in the institute. For translating a research project into commercial products where an open source software that is used for making a difference in people's lives and well-being and health care of older adults and people with a disability is really valued as much, if not more, than publishing an awesome science paper. And then, age well as you probably know, is a Canadian network that brings together researchers, developers and stakeholders to develop technologies for healthy aging. And they are also really big advocates and proponents of translation and commercialization and helping push

research projects that are proven and validated into the world and being commercialized or released for use. And I'm really grateful to them for supporting our work, both financially and also for providing a network that supports translation.

BTB

So you're a pure researcher. I'm curious, how do you keep patients top of mind as you pursue your daily research?

DR. BABAK TAATI

Yeah, that's a good question. They are the motivation for everything we do, our design philosophies, co-design and including stakeholders throughout research. And that starts from the get go. So that means inviting and involving people who will be end users of our technologies to our meetings and their inputs, informing our design process and incorporating their knowledge and perspective into our designs and iteratively refining our design and solutions to address their concerns and to meet their needs.

BTB

Simon Sinek is an author on leadership and motivation, who I love quoting this line of his reasons. People don't buy what you do. They buy why you do it. Why do you do what you do?

DR. BABAK TAATI

I don't have a good answer for this, I'm afraid. Other than saying it's complicated and involves many things, but obviously helping other people is a big part of that motivation and obviously doing good science is also a big part of that motivation. But I'm also happy to be in an environment that is supportive, and i have nice and smart colleagues and get the opportunity to have the opportunity to work with smart students and so on. So that's also a big part of it.

BTB

So that decision to pivot your career from robotics to health care, what do you think of that decision when you reflect on it today?

DR. BABAK TAATI

It could turn out quite well. I'm pretty happy. I really, truly like my job. And as i said, having the opportunity to work with smart based, supportive colleagues, brilliant students and to work on projects that i find meaningful is really quite rewarding.

BTB

And your family? What did they think of their son who left home all those years ago and what he's accomplished?

DR. BABAK TAATI

They're quite supportive. The one challenge is that they are literally around, across the world and my parents are getting older and they have their own health challenges, and they used to come visit Toronto once in a while, but now they can't. And with the pandemic, I haven't been able to go visit, so that's been quite challenging. So it kind of gives me a personal perspective on all this stuff we talk about aging population technology for aging.

BTB

So Babak, finally, what's your next priority? What's, what should we watch for?

DR. BABAK TAATI

Yeah. So I'm going to continue on research projects. That's what i enjoy doing. But also i, a couple of our projects have reached that mature stage that are now ready to be pushed out and released. So over the next few years, I'm also going to be working on trying to work with industry partners and on commercialization's. So stay tuned.

BTB

Yeah, that's great. So Dr. Babak Taati, award winning scientist at UHN's Toronto rehabilitation institute research center. Thanks for sharing your pioneering work and continued success.

DR. BABAK TAATI

Thank you.

BTB

Dr. Taati's research is made possible, in part thanks to generous donor support. If you'd like to contribute to Dr. Taati's groundbreaking medical research, please go to www.uhnfoundation.ca/podcast. And for more on the podcasts, go to our website. Www.behindthebreakthrough.ca and let us know what you think. We crave feedback. That's a wrap for this edition of behind the breakthrough, a podcast all about groundbreaking medical research and the people behind it at the university health network in Toronto, Canada's largest research and teaching hospital. I'm your host, Christian Coté. Thanks for listening.