Host: Robert Frederick
Here in America, more than a quarter-million Baby Boomers are turning 65 every month. How are we going to care for them? Robots.

Speaker: Maja Mataric
There aren't enough people for people. So if there aren't enough people for people, then that is where we also need to introduce technologies, and technologies that are actually fundamentally social.

Host: Robert Frederick
On this episode of The Conjectural, using robots for healthcare.

There are plenty of studies and plenty of data showing that it is far more expensive to treat someone medically — whether at the clinic, hospital, or emergency room — than by preventing the medical condition in the first place. That goes from maintaining a healthy lifestyle to avoiding type-2 diabetes to preventing a fall that might otherwise break a person's hip. Enter robots. Maja Mataric is a robotics researcher at the University of Southern California, Los Angeles.

Speaker: Maja Mataric
If you think about what is talked about almost exclusively in robotics today is about robotics as automation — as replacing human work. But there's this whole other world of what robotics can do, and that's augmentation, and we need to talk a lot more about that. So, it's very natural to talk about that when we think about the elderly, but we should be thinking about that across the age span.

Host: Robert Frederick
But with around ten-thousand Americans turning 65 every day — the Baby Boomers — the thinking really has been about making technology that augments the abilities of older people. Not helping them do the work of their jobs — they may be retired — but helping them do the activities of their daily lives. When we're not able to do those kinds of activities: dressing, bathing, eating, opening doors…

Speaker: Maja Mataric
…sitting back, not having motivation, being depressed, that's when things go bad. And that is, in fact, what happens to a lot of elderly people because they're coping with health challenges and often disabilities. So for example, if you've had a stroke, now you have diminished ability. This causes depression. This decreases motivation, and so on and then it's downhill. So, for example, the correlation between breaking a hip, going into an institution, and dying pretty soon thereafter is very strong.

Host: Robert Frederick
So why robots? With people living longer, there just aren't enough people to care for the elderly. But the robots have to be social because just having the data isn't enough — just knowing you did 10,000 steps a day — just the data — most people get bored after a few weeks. Knowing the data doesn't tend to change most people's behavior.

Speaker: Maja Mataric
If we look at the literature on behavior change — what drives us as humans — the social component is the only thing that reliably makes people change behavior. It makes people lose

weight. It makes people recover faster. But there aren't enough people for people. So if there aren't enough people for people, then that is where we need to also introduce technologies, and technologies that are actually fundamentally social.

Host: Robert Frederick
But not the technologies that we think of as social today — so, not your smartphone, tablet, computer, wall-sized smart television — so not social through screens, Mataric says.

Speaker: Maja Mataric
So there's a big question about screens as an interface. It is possible that screens are making us less — not more — social in a fundamental way that makes us healthier. And so that is where robotics could make a difference. This fundamental embodiment so where we're wired to interact with physical-bodied creatures like us — that's where socially assistive robotics could make a difference.

Host: Robert Frederick
By "socially assistive robotics," think of a robot that is programmed to talk with you, to encourage you to exercise, to monitor your activity and send alerts to people if you've fallen down or slow down. It sounds expensive.

Speaker: Maja Mataric
So, in my advanced stage of life, I've decided to do what everyone else is doing, which is do a startup. And I can say with confidence that yes, you can make these technologies affordable. But it all depends on what you're trying to do. If you want to manipulate the world physically and you have to have actuators to move things — that's much more expensive. The socially assistive and the monitoring and the data collection and alert stuff can be much more inexpensive. I mean, I think, you know, it can be on the order of a cell-phone level.

Speaker: Ruzena Bajcsy
I'm not as agile as I used to be. So, I mean, I just want to prevent trouble. So that's maybe where the age factor comes in.

Host: Robert Frederick
Ruzena Bajcsy is an electrical engineer and computer scientist at the University of California, Berkeley. Along with Mataric and another researcher we'll hear from a little later, she was speaking at a press conference at the annual meeting of the American Association for the Advancement of Science.

Speaker: Ruzena Bajcsy
When does the old age start? And my answer is that it is more in your mind. It's your mental attitude. And I am still working, and I am 90 — no, not 90, I am 83 years old. I'm 83 years old and I'm still teaching and doing research and learning, which is really a perpetual thing to do in our business.

Host: Robert Frederick
Bajcsy's work focuses particularly on measuring — that's key to her work.

Speaker: Ruzena Bajcsy
What I do, and what I have been doing all my life, is focusing on observations, non-invasive observations of your physical movement. How far can you reach? Can you close your bra? Can you wash your face. So there are all kinds of diseases — muscle diseases and joint diseases — that prevent you to do that. And it's not just old, but, of course, as you get old you're more prone to it. So I measure, then I use robotic mathematics to model based on those measurements — kinematics, dynamics — basically, I became a mechanical engineer at my old age. And then I predict based on those models what can you and you cannot do, so it's a diagnostic procedure that I developed.

Host: Robert Frederick
Then, based on what those diagnostics say, she works with mechanical engineers to build assistive devices. So for example, say you cannot open a jar.

Speaker: Ruzena Bajcsy
You cannot open a jar — you don't have enough torque. We will design for you a little "oomph" — but the key is that we want to also measure how much can you do, so that I don't give you, you know, too much torque so I break your wrist.

Host: Robert Frederick
And that concern about safety is why we don't have robots — for the most part — in our homes, except maybe for some toys and those robots that vacuum the floors. So if a robot is strong enough to pick you up when you fall down, then it is has the potential to be dangerous. Of course, once you've fallen down you might have broken something. So how to prevent a fall in the first place? Look for the warning signs.

Speaker: Marjorie Skubic
We were able to show that if your walking speed declines by about 5 centimeters per second over a week's period, that there's an 86% chance that you're going to fall within the next three weeks.

Host: Robert Frederick
Marjorie Skubic is an electrical and computer engineer at the University of Missouri - Columbia. Her work is in using robots to assist in diagnostics. I mean, it would be pretty hard for a healthcare worker to tell if a patient's walking speed

Speaker: Marjorie Skubic
declines by about 5 centimeters per second

Host: Robert Frederick
over a week's period without it, right? The key input into Skubic's system is a depth camera — you might have heard of such cameras on video gaming consoles, like the Kinect camera by Microsoft — same thing.

Speaker: Marjorie Skubic
That's where each pixel is a distance to the nearest object, right, so it's not like regular video that you might be thinking, that most people would think about. And we segment out the people in the scene to create, effectively, three-dimensional silhouettes. And using that, we can capture in-home gait information, walking speed, stride time, stride length. We can also calculate how long it takes someone to get from a sitting position to a standing position or standing to sitting. You can get

trunk sway as people move around. All of that feeds into fall-risk. And if you know that somebody is at risk of falling, you can get them help, so that you can can help prevent the fall, and that, of course, is the win.

Host: Robert Frederick
To get that win — to have robots helping the elderly by monitoring, or by giving them the physical "oomph" to open a jar, for example, or giving them the social, psychological "oomph" to stay active, fit, and caring for themselves — that's going to take a shift of how we think about healthcare, which, in this country, is mostly about treatment rather than about health*care* — caring for health, keeping people healthy.

Speaker: Marjorie Skubic
Right, if you can keep people out of nursing homes, if you can keep people out of the hospital, there's enormous cost-savings potential. So the people who have limited financial resources are exactly the people you want to help. So this is not targeting just the elite.

Host: Robert Frederick
And if what drives us as humans — the social component — is indeed the only thing that reliably makes people change behavior, then to change our healthcare behavior we need to be talking with one another about adding robots to the healthcare system and making ourselves ready for this change. Because with the aging population, there just aren't enough people to care for people.

You've been listening to *The Conjectural*, a show that's running an experiment. The data for this experiment? Your feedback to TheConjectural.com, where you can also give the support that makes this show happen, download a transcript, and subscribe. I'm Robert Frederick. Follow me on Twitter @TheConjectural. Thanks for joining us.