How AI-Powered Segmentation is Revolutionizing Cardiovascular Diagnostics Transcript

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Introduction and Guest Background

I know there's someone in the I know there's someone in the background. There we go, we're live. All background. There we go, we're live. All right, well welcome everybody. My name right, well welcome everybody. My name is Dr. Harvey Castro. I'm really is Dr. Harvey Castro. I'm really excited. This is actually a little excited. This is actually a little different. Usually Denae's here and different. Usually Denae's here and today he he needs a little break, so today he he needs a little break, so he's off the next 2 weeks, but we have he's off the next 2 weeks, but we have Ed Marx and then we have last year's Ed Marx and then we have last year's last week's guest, which I'm really last week's guest, which I'm really excited that she came. And today we have excited that she came. And today we have Yushi and I'm excited to hear that Yushi and I'm excited to hear that you're from Germany and I'll let you you're from Germany and I'll let you just introduce yourself and your just introduce yourself and your background and tell us about yourself.

background and tell us about yourself. >> Oh yeah. So >> Oh yeah. So um as you mentioned I'm from Germany. I um as you mentioned I'm from Germany. I did my undergrad there in medical did my undergrad there in medical engineering.

engineering. engineering. That's where I developed a passion about That's where I developed a passion about image processing. image processing. So the journey brought me to Singapore So the journey brought me to Singapore where I did my PhD in metabolic imaging where I did my PhD in metabolic imaging advanced AI-based image processing very advanced AI-based image processing very focused on segmentation, which is I focused on segmentation, which is I believe today's topic.

believe today's topic.

Why Precision Phenotyping Matters

Um Um Um So I'm currently a postdoc at the Oxford So I'm currently a postdoc at the Oxford University Radcliffe Department of University Radcliffe Department of Medicine Division of Cardiovascular Medicine Division of Cardiovascular Medicine.

Medicine. Medicine. So my focus is on So my focus is on precision phenotyping mainly on precision phenotyping mainly on imaging-based precision phenotyping to imaging-based precision phenotyping to understand, but also to advance kind of understand, but also to advance kind of like develop like develop tools for precision phenotyping tools for precision phenotyping >> Excellent.

>> Excellent. Wow, you've done a lot. I like how Wow, you've done a lot. I like how well-versed you are living in Singapore, well-versed you are living in Singapore, German.

German. German. I've had the pleasure of being in both I've had the pleasure of being in both countries last year as well. It was a countries last year as well. It was a lot of fun.

lot of fun. So let's just jump right in. So let's just jump right in. What personally excites you the most What personally excites you the most about your field? Like how are you you about your field? Like how are you you know you're doing a lot and what can you know you're doing a lot and what can you >> Yeah, I think it's the combination of >> Yeah, I think it's the combination of different expertise I had the chance to different expertise I had the chance to acquire during like my journey.

acquire during like my journey. So as I mentioned I started very So as I mentioned I started very passionate about

computer programming, passionate about computer programming, uh image processing uh image processing uh because like images were always uh because like images were always something very tangible, like you can something very tangible, like you can visualize them, so you can really visualize them, so you can really understand what you're working on.

understand what you're working on. Um Um Um So, yeah, that is where the the So, yeah, that is where the the transition between, I think, the transition between, I think, the engineering part and the AI development engineering part and the AI development part towards also understanding the part towards also understanding the human body and uh specifically for the human body and uh specifically for the current passion I have towards precision current passion I have towards precision treatment, I think is cuz like it really treatment, I think is cuz like it really enables to to look into details, changes enables to to look into details, changes over time. If you have longitudinal over time.

AI, Obesity, and Whole-Body Risk Assessment

If you have longitudinal data, you can really understand data, you can really understand kind of the medical part of it, like the kind of the medical part of it, like the biology biology biology from uh very visual point of view, and from uh very visual point of view, and then bridging that with the the then bridging that with the the technical skills. That that is, I think, technical skills. That that is, I think, something that excites me and that makes something that excites me and that makes me really like passionate about like me really like passionate about like merging two fields together.

merging two fields together. >> Yeah. Well, the exciting part about this >> Yeah. Well, the exciting part about this particular panel of all of us here is we particular panel of all of us here is we all have different spins. I know all have different spins. I know everybody's brains already like jumping everybody's brains already like jumping based on what you said. For me, based on what you said. For me, personally, I'm I'm always excited about personally, I'm I'm always excited about what's tomorrow. So, for me, what what what's tomorrow. So, for me, what what really you think is something that's really you think is something that's going to happen in 5-10 years from now going to happen in 5-10 years from now you're like, "Oh my gosh, Harvey, this you're like, "Oh my gosh, Harvey, this is going to change humanity. This is is going to change humanity. This is what's going to happen." I I'd love to what's going to happen." I I'd love to see what you're from your angle, what see what you're from your angle, what you see. No pun intended.

you see. No pun intended. >> Yeah. >> Yeah. >> Yeah. Um of course, yeah, this this answer is Um of course, yeah, this this answer is going to be very focused on um my uh my going to be very focused on um my uh my would call it my niche area. Um would call it my niche area. Um in that sense, I think in that sense, I think if we think about like huge hype if we think about like huge hype currently in terms of the obesity currently in terms of the obesity pharmaceuticals, right? And the pharmaceuticals, right? And the transforming landscape, how they transforming landscape, how they revolutionize kind of just not care revolutionize kind of just not care about obesity, but also cardiovascular about obesity, but also cardiovascular management. And I think um management. And I think um we are currently understanding that a we are currently understanding that a lot of diseases, for example, like heart lot of diseases, for example, like heart failure Um failure Um more and more multi-system diseases, and more and more multi-system diseases, and this kind of like this kind of like phenotyping segmentation, which is like phenotyping segmentation, which is like a kind of like a fundamental pillar of a kind of like a fundamental pillar of like looking into the whole body like looking into the whole body >> [snorts] >> [snorts] >> [snorts] >> um at a structural point of view, of >> um at a structural point of view, of course, then with advanced techniques, course, then with advanced techniques, you can also get like information more you can also get like information more on a qualitative imaging-based features, on a qualitative imaging-based features, but then but then um I think it is towards more precision um I think it is towards more precision medicine in that sense, understanding medicine in that sense, understanding body composition, and of course, then body composition, and of course, then having these AI tools enable that in having these AI tools enable that in terms of like discovery terms of like discovery uh in large data sets, cuz for example, uh in large data sets, cuz for example, these current medications show that they these current medications show that they have multi-system kind of multi-organ have multi-system kind of multi-organ like effects, right? So, like effects, right? So, um um um I think through these advanced tools, we I think through these advanced tools, we can really look into the whole body can really look into the whole body rather than isolated kind of look into rather than isolated kind of look into disease. Yeah.

disease. Yeah. >> Yes, you have all of our minds just >> Yes, you have all of our minds just going now with these concepts that going now with these concepts that you're bringing up. And just to give you you're bringing up. And just to give you a little brief background about me, I'm a little brief background about me, I'm a pediatrician with 15 years of clinical a pediatrician with 15 years of clinical experience, and I recently kind of dived experience, and I recently kind of dived right into entrepreneurship in this past right into entrepreneurship in this past year. And I guess I've kind of year. And I guess I've kind of come into this world as a bridge when it come into this world as a bridge when it comes to AI, kind of like a bridge comes to AI, kind of like a bridge between those that are at the forefront between those that are at the forefront of the tech and those who don't even of the tech and those who don't even know anything about the tech, but they know anything about the tech, but they surely will be impacted by it. So, you surely will be impacted by it. So, you know, one of the things that I thought know, one of the things that I thought of as you were speaking is of as you were speaking is you know, we Harvey talks about this, you know, we Harvey talks about this, when you think about the why, which is when you think about the why, which is the patient for a lot of us, or at least the patient for a lot of us, or at least one of the whys.

one of the whys. I I think of, you know, who benefits the I I think of, you know, who benefits the most from this technology, you know, who most from this technology, you know, who does it help the most in your opinion, does it help the most in your opinion, and and how can we best kind of make it and and how can we best kind of make it accessible to those who stand to benefit accessible to those who stand to benefit the most from it?

the most from it? >> Yeah. >> Yeah. >> Yeah. I think Yeah, there's I think there's I think Yeah, there's I think there's going to be a shift. I I just going to going to be a shift. I I just going to make an example for it. Um make an example for it. Um Uh Uh Uh let's say BMI is a very crude way, but let's say BMI is a very crude way, but it is a a risk assessment tool that goes it is a a risk assessment tool that goes into so many risk scores uh matrices, into so many risk scores uh matrices, and it is um and it is um mainly also because it's very mainly also because it's very accessible, right? And it's easy to accessible, right? And it's easy to measure, cheap. So, obviously these AI measure, cheap. So, obviously these AI tools which enable like high-resolution tools which enable like high-resolution segmentation, let's say from MRI data, segmentation, let's say from MRI data, might not be the way if you think about might not be the way if you think about a clinical screening tool. Um so, the a clinical screening tool. Um so, the question is always like how and where uh question is always like how and where uh what kind of research is needed to what kind of research is needed to bridge this kind of gap uh from bridge this kind of gap uh from discovery towards something that is discovery towards something that is really going to be useful in clinical really going to be useful in clinical practice. Uh if it's going to be practice. Uh if it's going to be prediction or diagnostic purpose, um the prediction or diagnostic purpose, um the road map will change and the road map will change and the utilization, of course. Uh so, yeah. I utilization, of course. Uh so, yeah. I think that's think that's pharmaceutical development, I think pharmaceutical development, I think there's also a huge uh use in terms of there's also a huge uh use in terms of like precision. So, I think one step like precision. So, I think one step would be would be um um um these tools would be more and more used these tools would be more and more used in pharmaceutical development, and then in pharmaceutical development, and then once once once they are established in that space, they they are established in that space, they can be maybe proven useful in clinical can be maybe proven useful in clinical kind of practice.

kind of practice. Yeah. Yeah. Yeah. >> Hey, um uh what are your thoughts from >> Hey, um uh what are your thoughts from an administration point or from just an administration point or from just your spin from your angle, Ed?

your spin from your angle, Ed?

Scaling AI for Clinical Practice and Remote Care

>> No, I I love this. Uh obviously we're >> No, I I love this. Uh obviously we're we're part of this uh podcast. We're we're part of this uh podcast. We're always uh always uh sort of thinking out in the future and sort of thinking out in the future and and how we can leverage technology and, and how we can leverage technology and, you know, bring about better care for you know, bring about better care for the community and people that we serve.

the community and people that we serve. So, no, I I think it's super fascinating So, no, I I think it's super fascinating

and and and and would love to see, you know, something would love to see, you know, something that like this at scale and helping that like this at scale and helping everyone. You know, I've been spending a everyone. You know, I've been spending a lot of time more recently in parts of lot of time more recently in parts of the country and parts of the world that the country and parts of the world that are much less populated. And and are much less populated. And and actually they they have a greater need actually they they have a greater need for these sort of capabilities. So, have for these sort of capabilities. So, have What are your thoughts around just the What are your thoughts around just the scalability making this available to scalability making this available to anyone whether they're in the big city anyone whether they're in the big city or you know, perhaps you know, out in or you know, perhaps you know, out in the in the in the in the in remote Bavaria the in the in the in the in remote Bavaria >> Yeah.

>> Yeah. Um Um Um I think I think scalability is something that that is scalability is something that that is like um like um moving from because we talked about moving from because we talked about segmentation and we talked about segmentation and we talked about non-imaging data that non-imaging data that forms the basis of discovery and then forms the basis of discovery and then as a tool um the question is can we find as a tool um the question is can we find proxies like molecular markers maybe proxies like molecular markers maybe that can also be like cheap uh or like that can also be like cheap uh or like anthropometric measurements for example anthropometric measurements for example you can proxy something that is you can proxy something that is uh um uh um captured in high quality data before.

captured in high quality data before. So, So, So, um um um the Yeah, I I I think this is a huge the Yeah, I I I think this is a huge question in terms of more remote areas question in terms of more remote areas where I think digitalize kind of care or where I think digitalize kind of care or like remote kind of access um like remote kind of access um through sending through sending kind of information kind of information um into remote areas um into remote areas might be challenging also if we talk might be challenging also if we talk about imaging data sharing data, right?

about imaging data sharing data, right? Um Um Um so so that I think that is also a big so so that I think that is also a big challenge in terms of like challenge in terms of like infrastructure.

infrastructure. infrastructure. >> Okay. >> Okay. >> Okay. >> Interesting. >> Interesting. >> Interesting. I'm not to put you on the spot. I'm I'm not to put you on the spot. I'm curious if anybody I'll just leave it to curious if anybody I'll just leave it to everybody open. Has anyone the new everybody open. Has anyone the new Midjourney Midjourney Midjourney uh device that they're promoting that uh device that they're promoting that they're talking about? If not, I can they're talking about? If not, I can kind of share with everybody.

kind of share with everybody. >> No. >> No. >> No. >> Okay, the reason that I mention it is >> Okay, the reason that I mention it is uh big picture uh big picture they created a ultrasound type of they created a ultrasound type of machine that you go in and you immerse machine that you go in and you immerse yourself in water and then it's able to yourself in water and then it's able to see your organs inside. And Midjourney see your organs inside. And Midjourney being able to regenerate what that image being able to regenerate what that image looks like, they're able to show you looks like, they're able to show you this is what's going on inside of your this is what's going on inside of your body.

body. body. What they're planning on doing, which I What they're planning on doing, which I think I think this is so smart. They're think I think this is so smart. They're going to start in San Francisco next going to start in San Francisco next year with their firm in Silicon Valley year with their firm in Silicon Valley area. But what's amazing is they're area. But what's amazing is they're going to put it into a longevity clinic going to put it into a longevity clinic and then that longevity clinic will have and then that longevity clinic will have you know, your peptides, your GLP-1s, you know, your peptides, your GLP-1s, your saunas, your red lights. But from a your saunas, your red lights. But from a what we're talking about right now, I what we're talking about right now, I think oh my god, here is amazing. You're think oh my god, here is amazing. You're you're coming in, you're getting data, you're coming in, you're getting data, you're interpreting that data, you're you're interpreting that data, you're hopefully doing more predictive hopefully doing more predictive analytics, and now you're doing analytics, and now you're doing prevention. And so that just blew my prevention. And so that just blew my mind. And so then hearing what you're mind.

Fat Distribution Research and Early-Life Risk

And so then hearing what you're doing, I'm thinking, oh my gosh, take doing, I'm thinking, oh my gosh, take that to the next level, add a 3D printer that to the next level, add a 3D printer ability, and boom, now we're actually ability, and boom, now we're actually printing personalized care for that printing personalized care for that Jump right in, your thoughts.

Jump right in, your thoughts. Anybody. Or we can keep going to the next one. Or we can keep going to the next one. Good. I can see Good. I can see >> No, it's very I was just a very >> No, it's very I was just a very thought-provoking, thought-provoking, thought-provoking, right? And very right? And very you know, very future-oriented, but I you know, very future-oriented, but I yeah, I think we're getting yeah, I think we're getting as we know, because of as we know, because of AI and great thinkers like I see that AI and great thinkers like I see that that I think we're going to see the that I think we're going to see the fruition of a lot of these things in in fruition of a lot of these things in in application a lot sooner than, you know, application a lot sooner than, you know, perhaps in the past whenever we waited perhaps in the past whenever we waited years and years and years. And I think years and years and years. And I think now, I mean, it's unfolding behind in now, I mean, it's unfolding behind in front of us in real time. So I'm front of us in real time. So I'm >> So let's jump in. You see, I'm sure >> So let's jump in. You see, I'm sure I know there's been some emails going I know there's been some emails going back and forth or texts.

back and forth or texts. Tell us more about what you're currently Tell us more about what you're currently working on that that you could share working on that that you could share with us that that you see advancements with us that that you see advancements in that side or things that you've seen in that side or things that you've seen in the field that the last couple of you in the field that the last couple of you know, wasn't even around.

know, wasn't even around. >> Yeah. Yeah. I I think I can start a >> Yeah. Yeah. I I think I can start a little bit about sharing um little bit about sharing um what I've been working on in Singapore.

what I've been working on in Singapore. So, uh So, uh the focus was the focus was uh adipose tissue. So, fat segmentation, uh adipose tissue. So, fat segmentation, fat distribution. Um fat distribution. Um So, I think uh So, I think uh as mentioned earlier, it's like as mentioned earlier, it's like we are at a very crude way of dealing we are at a very crude way of dealing with obesity, which is with obesity, which is such an important topic to to tackle in such an important topic to to tackle in terms of a public health terms of a public health uh challenge. So, uh challenge. So, I think that the way to go is also to I think that the way to go is also to There There's literature, obviously, to There There's literature, obviously, to understand that fat distribution is very understand that fat distribution is very important to take into consideration in important to take into consideration in terms of risk assessment, but also like terms of risk assessment, but also like uh uh uh the the the develop- development of the the the develop-development of specific diseases. So, precision risk specific diseases. So, precision risk assessment. Um [snorts] assessment. Um [snorts] I think that there's a lot of potential I think that there's a lot of potential in terms of AI solutions to enable that in terms of AI solutions to enable that in understanding fat distribution in understanding fat distribution better, but then also, as mentioned better, but then also, as mentioned earlier, we need to see how can we earlier, we need to see how can we bridge this challenge in terms of gold bridge this challenge in terms of gold standard assessment, fat distribution, standard assessment, fat distribution, to more like accessible solutions.

to more like accessible solutions. Um anthropometric measurements are Um anthropometric measurements are there, but they are quite limited. So, there, but they are quite limited. So, not sure um I think it's it's quite a not sure um I think it's it's quite a challenging pathway to see how we can challenging pathway to see how we can bridge that, but uh obviously AI bridge that, but uh obviously AI solutions are there and solutions are there and kind of paving the pathway for kind of paving the pathway for optimistic AI solutions.

optimistic AI solutions. >> [clears throat] >> [clears throat] >> [clears throat] >> No, I love it. I I I I Last year, I did >> No, I love it. I I I I Last year, I did a TED Talk on basically reactive a TED Talk on basically reactive medicine to proactive medicine. And And medicine to proactive medicine. And And this lines perfectly with what you just this lines perfectly with what you just said in that if we're able to catch said in that if we're able to catch people way early and predict, uh given people way early and predict, uh given that you you you have experience in that you you you

have experience in Singapore, you could relate to this.

Singapore, you could relate to this. Every citizen in Singapore they have Every citizen in Singapore they have their genes and they've done an their genes and they've done an experiment I don't want to say an experiment I don't want to say an experiment they're they're looking to experiment they're they're looking to say okay we have this data what do we do say okay we have this data what do we do with it and they've done a couple of with it and they've done a couple of things but one of the one I like to things but one of the one I like to highlight is they did highlight is they did hypercholesterolemia hypercholesterolemia hypercholesterolemia patients and now they're identifying patients and now they're identifying kids at birth saying hey this person kids at birth saying hey this person will have a heart attack in their 20s will have a heart attack in their 20s and 30s. This person will not live as and 30s. This person will not live as long. As a result what can we do as a long. As a result what can we do as a country and they're looking at the country and they're looking at the genetics calling these individuals genetics calling these individuals saying okay let's observe you let's see saying okay let's observe you let's see what we can do and let's put you on what we can do and let's put you on medicine before your heart has damage medicine before your heart has damage and I'm thinking wow so basically like and I'm thinking wow so basically like your research goes in line with that your research goes in line with that same theory. Now we're going away from same theory. Now we're going away from that that that reactive medicine and more to that reactive medicine and more to that proactive medicine and then on the proactive medicine and then on the personal side personal side unfortunately my dad died of a heart unfortunately my dad died of a heart attack and he literally had no warning attack and he literally had no warning signs he just had a heart attack. And on signs he just had a heart attack. And on the flip side of that my mom had the flip side of that my mom had thyroid cancer but she's an ultrasound thyroid cancer but she's an ultrasound tech and she was able to scan herself tech and she was able to scan herself and one day just luckily found it and to and one day just luckily found it and to me that's proactive because she found it me that's proactive because she found it early she got on medicine and she's early she got on medicine and she's alive today because of that if not she alive today because of that if not she wouldn't be here today.

wouldn't be here today. >> Yeah. >> Yeah. >> Yeah.

Ethics, Access, and the Future of AI in Medicine

>> When we have conversations like this you >> When we have conversations like this you know I get excited because this is such know I get excited because this is such an amazing future to look forward to an amazing future to look forward to where we can be more proactive about where we can be more proactive about just you know identifying things early just you know identifying things early identifying risk factors early and you identifying risk factors early and you know there's still a lot of tech that's know there's still a lot of tech that's in development.

in development. Well aside from like the accountability Well aside from like the accountability of the technology itself what do you all of the technology itself what do you all think are the big barriers or the think are the big barriers or the timeline to where we can realistically timeline to where we can realistically see this in our clinical practice?

see this in our clinical practice? >> Yeah. >> Yeah. >> Yeah. So I think one from since I'm coming So I think one from since I'm coming from a very research from a very research perspective well one thing I always want perspective well one thing I always want to keep in mind is how to exactly bring to keep in mind is how to exactly bring it into action and then we what is the it into action and then we what is the timeline timeline timeline developing this product and I think a developing this product and I think a big opportunity is always to see what is big opportunity is always to see what is currently there in the infrastructure currently there in the infrastructure and can we hop on it for example and can we hop on it for example um um um coming back to my domain area is like coming back to my domain area is like MRI imaging is the most standard way to MRI imaging is the most standard way to capture fat but then capture fat but then their routine imaging let's say their routine imaging let's say angiography images but where we could angiography images but where we could maybe also assess markers and I think maybe also assess markers and I think there's been recently also kind of very there's been recently also kind of very interesting work on interesting work on mammography data where they also can mammography data where they also can find associations or like risk find associations or like risk prediction value from from those images prediction value from from those images for cardiovascular events for cardiovascular events I think I think if there

are standard I think I think if there are standard screening protocols for certain screening protocols for certain conditions we can also not think a bit conditions we can also not think a bit broader with AI can we broader with AI can we get more information out of those in get more information out of those in which already are done on a clinical which already are done on a clinical routine and then transform them into routine and then transform them into >> Yeah I I appreciate >> Yeah I I appreciate this work coming out of Europe and as we this work coming out of Europe and as we know there's a lot of innovation coming know there's a lot of innovation coming out of Europe and places outside of the out of Europe and places outside of the United States and the United States and the and the frustration inside the United and the frustration inside the United States with technologies like this is States with technologies like this is that even when available that they're that even when available that they're not utilized proactively to the level not utilized proactively to the level that we'd all like to see because of the that we'd all like to see because of the economics of our health care system and economics of our health care system and it's very frustrating so I I was with it's very frustrating so I I was with some executives from from a organization some executives from from a organization called Chenmed here in the United States called Chenmed here in the United States and they do what we call value-based and they do what we call value-based care and they do want to be as proactive care and they do want to be as proactive as possible and what you're doing this as possible and what you're doing this is exactly the sort of technologies they is exactly the sort of technologies they would deploy to keep everyone would deploy to keep everyone proactively healthy because in the long proactively healthy because in the long run not only is it the right thing to do run not only is it the right thing to do for people but in the long run it saves for people but in the long run it saves a lot of money a lot of money but there's other you know the majority but there's other you know the majority of our health care system of our health care system uh where it's it's not like that today.

uh where it's it's not like that today. And so there's no incentive, And so there's no incentive, unfortunately, for unfortunately, for this capability of being super this capability of being super proactive.

proactive. proactive. But I I love it. And I hope it I'm But I I love it. And I hope it I'm hoping that with more technologies like hoping that with more technologies like what you're developing and doing what you're developing and doing research with research with will help, you know, overcome and and will help, you know, overcome and and push push push leaders into the realization that we leaders into the realization that we need to do this cuz one, it's the right need to do this cuz one, it's the right thing. And and number two, it really thing. And and number two, it really does economically does economically save a lot of money when you can be save a lot of money when you can be proactive in medicine. And that's why proactive in medicine. And that's why yeah, what Harvey talks about in yeah, what Harvey talks about in Singapore, which is nice, you know, Singapore, which is nice, you know, confined geographically confined geographically geographic small, they're able to do a geographic small, they're able to do a lot of these lot of these sort of things and just prove out the sort of things and just prove out the use cases. So I know I'm super I'm super use cases. So I know I'm super I'm super excited and and yeah, we're always excited and and yeah, we're always banging our heads around this. Like how banging our heads around this. Like how do we how do we bring these sort of do we how do we bring these sort of technologies to bear in our country when technologies to bear in our country when >> Yeah. And how does something like this >> Yeah. And how does something like this change how we're reimbursed? You know, change how we're reimbursed? You know, because that's always a conversation because that's always a conversation that is evolving and it's usually not a that is evolving and it's usually not a good conversation good conversation when it comes to the physician side of when it comes to the physician side of things. But you know, there's a lot of things. But you know, there's a lot of things to consider there on the things to consider there on the >> Yeah, I apologize. I have some >> Yeah, I apologize. I have some background noise. I'm going to let you background noise. I'm going to let you guys talk until they finish and I guys talk until they finish and I apologize.

>> That's the fun part of doing live shows, >> That's the fun part of doing live shows, Harvey. And I think we all deal with Harvey. And I think we all deal with that. I'm usually in a hotel room as you that. I'm usually in a hotel room as you as you can tell. And but but it's all as you can tell. And but but it's all good. It's it's it's super super good. It's it's it's super super fascinating. You know, she's so what fascinating. You know, she's so what what would be sort of your your vision what would be sort of your your vision for for for the research that you're doing, the the research that you're doing, the capabilities that you're developing?

capabilities that you're developing? How would you like in the ideal state How would you like in the ideal state when

you think about this, you know, when you think about this, you know, it's got to be your motivating factor, it's got to be your motivating factor, right? Like right? Like what is it that that you'd love to see what is it that that you'd love to see >> Okay, well, 1 to 3 years, I can >> Okay, well, 1 to 3 years, I can um so I need to be realistic, right?

um so I need to be realistic, right? Um Um Um 1 to 3 years, I 1 to 3 years, I I really think us so I really want to I really think us so I really want to shift the field in terms of body shift the field in terms of body composition, understanding how important composition, understanding how important is body composition, is body composition, um um um whole body kind of assessment with whole body kind of assessment with respect to specific diseases, respect to specific diseases, um um um and and and obviously my my focus is cardiovascular obviously my my focus is cardiovascular diseases and cardiometabolic diseases.

diseases and cardiometabolic diseases. Um Um Um I I I believe for my research, it's like the believe for my research, it's like the transition would be going from transition would be going from advancing the development of advancing the development of pharmaceuticals in the precision pharmaceuticals in the precision medicine approach to more specialized medicine approach to more specialized phenotypes. So, for example, if we think phenotypes. So, for example, if we think about um about um sarcopenic obesity, right?

sarcopenic obesity, right? Um so, we have like now this huge the Um so, we have like now this huge the these incretin-based agents, but then we these incretin-based agents, but then we we we know that they have huge benefits, we we know that they have huge benefits, but at the same time we are slowly only but at the same time we are slowly only now understanding how complex body now understanding how complex body composition actually is. Like there can composition actually is. Like there can be people who are obese, but at the same be people who are obese, but at the same time they have sarcopenia. So, they they time they have sarcopenia. So, they they have a loss of muscle muscle function.

have a loss of muscle muscle function. And then I think you going more into And then I think you going more into precision phenotyping, there are a lot precision phenotyping, there are a lot more subtypes. And I think one of the more subtypes. And I think one of the challenges the more data we have, challenges the more data we have, the more we understand how heterogeneous the more we understand how heterogeneous our population is, and the more our population is, and the more challenging it will become to to go into challenging it will become to to go into precision medicine. I think that that's precision medicine.

Human Plus AI, Governance, and Patient Communication

I think that that's kind of the challenge in with it. But kind of the challenge in with it. But then realistically, then realistically, um um um to advance the field, know, course, you to advance the field, know, course, you always have to anchor back to how always have to anchor back to how currently um the aftercare system works.

currently um the aftercare system works. And in that sense, I think a lot of And in that sense, I think a lot of these tools could be complementary. these tools could be complementary.

For example, if there is a general For example, if there is a general screening, and how do you want to screening, and how do you want to prescribe medication like guidelines? Um prescribe medication like guidelines? Um maybe there can be advancement with AI maybe there can be advancement with AI tools tools tools uh transitioning slowly into that uh transitioning slowly into that ecosystem ecosystem ecosystem to uh maybe first private assessments, to uh maybe first private assessments, but then of course, if we can prove but then of course, if we can prove uh through larger trials with uh uh through larger trials with uh collaboration with pharma companies that collaboration with pharma companies that we can really target people better we can really target people better through imaging. Maybe that is a way to through imaging. Maybe that is a way to to get that into clinical practice as to get that into clinical practice as well.

well. well. >> So, instead of spending time and >> So, instead of spending time and potentially risking your, you know, potentially risking your, you know, health deteriorating in the meantime, health deteriorating in the meantime, trial and error with different trial and error with different medications, you know more clearly off medications, you know more clearly off the bat what to treat your patient with.

the bat what to treat your patient with. Yeah. Yeah. Yeah. >> Yeah. >> Yeah. >> Yeah. >> And to piggyback on what you guys were >> And to piggyback on what you guys were saying, two things. One, saying, two things. One, to be able to do this for entrepreneurs, to be able to do this for entrepreneurs, our government needs to have some kind our government needs to have some kind of CPT code, something that they're of CPT code, something that they're going to get reimbursed for it. If not, going to get reimbursed for it. If not, they're not going to push for these they're not going to push for these things, unfortunately, and I get why.

things, unfortunately, and I get why. The second is the culture. I always talk The second is the culture. I always talk about that. We need to make sure that us about that. We need to make sure that us physicians, health care professionals physicians, health care professionals understand this technology and the understand this technology and the governance and all of those things are governance and all of those things are in line so that we can use them.

in line so that we can use them. And then the other part of this is the And then the other part of this is the workflow. If these things exist, but I workflow. If these things exist, but I have no idea and it's going to be 10 have no idea and it's going to be 10 more clicks for me to do it, am I going more clicks for me to do it, am I going to really do it?

to really do it? So, it's important to to do all of that So, it's important to to do all of that >> You know, we're we're talking a lot >> You know, we're we're talking a lot about this in terms of uh population about this in terms of uh population care and taking care of people who are care and taking care of people who are already obese in this specific example.

already obese in this specific example. But what about, you know, since we we're But what about, you know, since we we're talking about World Cup a little bit, talking about World Cup a little bit, what about from a proactive athlete what about from a proactive athlete point of view? Like have have you point of view? Like have have you thought about or seen use cases where thought about or seen use cases where this can help someone have optimal this can help someone have optimal performance?

>> Yeah, I think I haven't seen okay I I'm >> Yeah, I think I haven't seen okay I I'm not very well what is going on in that not very well what is going on in that field since that's not quite my area but field since that's not quite my area but I think obviously like uh I think obviously like uh body composition and like if I'm talking body composition and like if I'm talking about like uh about like uh body composition is not just like body composition is not just like looking at like the muscle mass, lean looking at like the muscle mass, lean mass but also like talking about uh mass but also like talking about uh metabolic health, we're talking about metabolic health, we're talking about like skeletal muscle health. So, I think like skeletal muscle health. So, I think this is a huge opportunity to look into this is a huge opportunity to look into general health general health like assessment, predictive modeling like assessment, predictive modeling medicine also more in sports medicine is medicine also more in sports medicine is more and more used in terms of um more and more used in terms of um making sure athletes are fine. Not sure making sure athletes are fine. Not sure if that's exactly what you were touching if that's exactly what you were touching on on on um but uh a huge topic currently also is um but uh a huge topic currently also is the biological aging and I think um the biological aging and I think um there there's also a huge market in there there's also a huge market in terms of looking into terms of looking into uh uh uh age kind of biological age based on your age kind of biological age based on your your body, right? And then your body, right? And then in the in that sense you can also see in the in that sense you can also see how fit is someone and compared to how fit is someone and compared to someone who is in his same chronological someone who is in his same chronological age.

age. age. >> Yeah. >> Yeah. >> Yeah. >> You compare it is it's it's yeah >> You compare it is it's it's yeah it's a different way of looking into it's a different way of looking into into medicine or health in general, I into medicine or health in general, I think.

think. think. >> Yeah, I mean I I I understand that's not >> Yeah, I mean I I I understand that's not your specific area but I your specific area but I as my head is spinning and I think about as my head is spinning and I think about the economics and how do we get this the economics and how do we get this into the mainstream and because at least into the mainstream and because at least in the United States because of the way in the United States because of the way we pay for health care, it's very hard we pay for health care, it's very hard to get great

technology like this into to get great technology like this into the mainstream and so sometimes it comes the mainstream and so sometimes it comes in through uh in through uh through the people who are very through the people who are very interested in longevity or their interested in longevity or their biological health or from an athlete biological health or from an athlete point of view and then it gets uh more point of view and then it gets uh more publicized and then we see more results publicized and then we see more results and then finally we're able to bring it and then finally we're able to bring it to bear for the population that really to bear for the population that really needs this sort of capability. That's needs this sort of capability. That's that's that's why I ask out of that's that's why I ask out of curiosity.

curiosity. curiosity. >> And also light to that I've been working >> And also light to that I've been working in that field. A, I've been working on in that field. A, I've been working on some digital twins for what you said on some digital twins for what you said on the athlete side and I'm helping some the athlete side and I'm helping some companies with this as well. Basically companies with this as well. Basically what big picture since I'm seeing it what big picture since I'm seeing it several companies doing something several companies doing something similar I could share. They're looking similar I could share. They're looking at the data analytics. What's on the at the data analytics. What's on the wearable? What's going on? And they're wearable? What's going on? And they're being proactive to saying, okay, this being proactive to saying, okay, this athlete woke up with the HRV of XYZ, athlete woke up with the HRV of XYZ, they did this and you're pushing them they did this and you're pushing them and it's hot outside and because of that and it's hot outside and because of that you're going to injure your player and you're going to injure your player and they have a big game in two days. And so they have a big game in two days. And so let's adjust or let's adjust or looking at the data analytics and looking at the data analytics and saying, hey, this patient this saying, hey, this patient this drug they're sweating XYZ certain drug they're sweating XYZ certain cortisol's and some electrolytes. We cortisol's and some electrolytes. We need to replenish some at this point and need to replenish some at this point and that point. And so it's becoming really that point. And so it's becoming really interesting in fine-tuning and then interesting in fine-tuning and then companies are working on that whole companies are working on that whole predictive analytics. Can we say if predictive analytics. Can we say if athlete will be at their peak but if athlete will be at their peak but if we're pushing them are we also seeing a we're pushing them are we also seeing a decline?

decline? decline? So it's interesting how this is So it's interesting how this is affecting sports and games like World affecting sports and games like World Cup.

Cup. Cup. >> And so more >> And so more What's that? What's that? >> I'm sorry. I'm just saying after injury. >> I'm sorry. I'm just saying after injury. Yeah.

Yeah. Yeah. >> Yeah. It's it seems like it the >> Yeah. It's it seems like it the applications are like acute as well. applications are like acute as well.

Like day-to-day they're kind of managing Like day-to-day they're kind of managing you know, athletes you know, athletes from one day to the next based on what from one day to the next based on what their composition is and that's that's their composition is and that's that's very interesting. And you know, I always very interesting. And you know, I always think about my patient population on the think about my patient population on the pediatric side and we know, you know, pediatric side and we know, you know, typically things tend to trickle down typically things tend to trickle down later on into pediatrics but you know, later on into pediatrics but you know, do you feel like some of this could do you feel like some of this could apply to the even younger population apply to the even younger population when we talk about proactive medicine, I when we talk about proactive medicine, I mean mean mean >> Yeah.

>> Yeah. >> Yeah. >> that's getting really proactive is >> that's getting really proactive is applying this technology to pediatrics. applying this technology to pediatrics. >> Yeah.

>> Yeah. >> Yeah. Yeah. Yeah. Yeah. So, So, So, um actually in Singapore I worked on a um actually in Singapore I worked on a birth offspring cohort and looking at birth offspring cohort and looking at fat distribution early stage um fat distribution early stage um so, so, so, um we actually see there that they fat um we actually see there that they fat distribution patterns. I'm not talking distribution patterns. I'm not talking about uh about uh obesity

a lot of times if people talk obesity a lot of times if people talk about fat they think about obesity and about fat they think about obesity and the disease onset is later but then the disease onset is later but then obviously there there there um metabolic obviously there there there um metabolic consequences before someone or even consequences before someone or even independent of general like fat independent of general like fat accumulation of uh adipose tissue. Um accumulation of uh adipose tissue. Um and that reflects also lifestyle and and that reflects also lifestyle and other factors. So, um other factors. So, um in that sense I've worked on this cohort in that sense I've worked on this cohort in Singapore where we looked at the in Singapore where we looked at the children and at the early stages already children and at the early stages already kind of fat distribution matters in kind of fat distribution matters in terms of their longitudinal like health terms of their longitudinal like health and metabolic markers. Of course, it's a and metabolic markers. Of course, it's a bit hard to have um prospective outcomes bit hard to have um prospective outcomes that measure in terms of cardiometabolic that measure in terms of cardiometabolic health uh that establish later in life health uh that establish later in life which we know are the chronic diseases which we know are the chronic diseases but we see trends for example for uh but we see trends for example for uh certain phenotypes having specific risk certain phenotypes having specific risk already developing potentially already developing potentially hypertension, elevated like lipids or hypertension, elevated like lipids or like uh glycemic measurements. So, like uh glycemic measurements. So, definitely um there is such definitely um there is such the in the data we can see that there's the in the data we can see that there's these things start very early in life.

these things start very early in life. So, that is even below puberty. So, that is even below puberty. Um Um Um however, the question is always um if we however, the question is always um if we know that, are we going to what can we know that, are we going to what can we do right? Yeah.

do right? Yeah. >> Right. >> Right. >> Right. >> Yeah. >> Yeah. >> Yeah. >> Mhm. >> Mhm. >> Mhm. Yeah. Yeah. Yeah. That is true. You know, we think okay That is true. You know, we think okay all this knowledge, this access to all this knowledge, this access to knowledge um allows us to be so knowledge um allows us to be so proactive but I could also see the other proactive but I could also see the other side of it and you know side of it and you know patients saying, "Well, I don't really patients saying, "Well, I don't really want to know. You know, I don't I don't want to know. You know, I don't I don't know it being almost kind of scared of know it being almost kind of scared of the pressure of what that does." You the pressure of what that does." You know, and especially as a child, I think know, and especially as a child, I think there's the one of the amazing things there's the one of the amazing things about pediatrics is the capacity for about pediatrics is the capacity for change and resilience to develop in change and resilience to develop in childhood. And so, it's kind of childhood. And so, it's kind of interesting, you know, if you have that interesting, you know, if you have that in your in your mindset from the in your in your mindset from the beginning that you have risk factors for beginning that you have risk factors for certain conditions, how does that certain conditions, how does that >> Ah, I love this question. It came up >> Ah, I love this question. It came up recently where all these countries are recently where all these countries are doing all these screen medical screening doing all these screen medical screening exams on some of the infants. And exams on some of the infants. And different countries will screen for different countries will screen for certain things, but it's such a good certain things, but it's such a good question.

question. question. If I today I don't know, some patients If I today I don't know, some patients are going to be like, "Well, I'd rather are going to be like, "Well, I'd rather not know if there's anything I can do not know if there's anything I can do for it." And then the other side of it for it." And then the other side of it is some of the parents are like, "No, is some of the parents are like, "No, I'd rather know, so now I can research I'd rather know, so now I can research and keep an eye out for what's out there and keep an eye out for what's out there and try to get on some clinical trial." and try to get on some clinical trial.

Closing Reflections on Balance and Impact

" It's really interesting and I I know It's really interesting and I I know medical school you and I probably went medical school you and I probably went through this and that, you know, we we through this and that, you know, we we went through some diseases and they're went through some diseases and they're like, "Yeah, this is a life sentence on like, "Yeah, this is a life sentence on this particular disease and you're going this particular disease and you're going to depress the patient if they still to depress the patient if they still have 30 years to live and you're

telling have 30 years to live and you're telling them that they're going to die." them that they're going to die." >> Yeah.

>> Yeah. >> Yeah. >> You know, ethically what do you do? Do >> You know, ethically what do you do? Do you tell them or not or why or, you you tell them or not or why or, you know, how do you do that counseling? So, know, how do you do that counseling? So, it's really really quite interesting.

it's really really quite interesting. And now with AI, with so many predictive And now with AI, with so many predictive analytics analogs, this guy always analytics analogs, this guy always talked about this technology this talked about this technology this particular technology, everybody seeing particular technology, everybody seeing the speed, you could have an algorithm the speed, you could have an algorithm to see our age, our hemoglobin, you want to see our age, our hemoglobin, you want to see our blood pressure. I mean, to see our blood pressure. I mean, there's so much information that can be there's so much information that can be extracted. And then I know you're big on extracted. And then I know you're big on the governance, so I'll I'll throw this the governance, so I'll I'll throw this one in there.

one in there. Being able to interview someone and Being able to interview someone and saying, "Hey, I'm getting this following saying, "Hey, I'm getting this following feed." And I know this is unethical and feed." And I know this is unethical and saying, "Hey, this person's got saying, "Hey, this person's got diabetes, this I don't want this person diabetes, this I don't want this person as an employee. I'm going to have to pay as an employee. I'm going to have to pay them more in health premiums." I mean, them more in health premiums." I mean, >> I think well, the first part is quite >> I think well, the first part is quite interesting because um I think there's a interesting because um I think there's a challenge in terms of if we challenge in terms of if we think of from a technical point of view think of from a technical point of view of the company, then as you mentioned, of the company, then as you mentioned, the AI has so many predictive values in the AI has so many predictive values in terms of proving that it can predict terms of proving that it can predict something. But then, from the health something. But then, from the health care perspective, um it is always the care perspective, um it is always the follow-up question, what can be done and follow-up question, what can be done and what is being communicated to the what is being communicated to the patient and uh I think patient and uh I think for a company that focus only on product for a company that focus only on product producing product that can predict producing product that can predict something very well something very well in isolation with in isolation with what is the entire health care system to what is the entire health care system to provide health care service, provide health care service, is an incomplete story. Of course, it is an incomplete story. Of course, it might be lucrative from a economic point might be lucrative from a economic point of view or from a business point of of view or from a business point of view. But I thought just to give an view. But I thought just to give an example, example, example, the since the topic is also like based the since the topic is also like based on image and image segmentation, like on image and image segmentation, like the retinal imaging, fundus imaging, uh the retinal imaging, fundus imaging, uh is is is uh uh uh marker nowadays marker nowadays established in the literature very established in the literature very strong to predict systemic diseases strong to predict systemic diseases known to be microvasculature in the eye, known to be microvasculature in the eye, and it is a very cost-effective uh and it is a very cost-effective uh non-invasive way to look into human non-invasive way to look into human health. And then, uh health. And then, uh if you look at literature, it basically if you look at literature, it basically predicts uh predicts uh you can build AI model based on those you can build AI model based on those images to predict all kind of diseases images to predict all kind of diseases from cardiometabolic diseases towards from cardiometabolic diseases towards neurodegenerative diseases and other neurodegenerative diseases and other diseases. Then, the question is this is diseases. Then, the question is this is a very interesting area, of course, um a very interesting area, of course, um to provide good service if we also have to provide good service if we also have the clinical care that can follow with the clinical care that can follow with I know I recently saw I know I recently saw some information coming out of some information coming out of They have it all over the US, but they They have it all over the US, but they were this one particular case was here were this one particular case was here in Texas where they're were able to do in Texas where they're were able to do routine uh retinal scans on individuals routine uh retinal scans on individuals and then be able to say, "Hey, this and then be able to say, "Hey, this actual person has uh pre-diabetic uh or actual person has uh pre-diabetic uh or diabetic glaucoma." And able to jump on diabetic glaucoma." And able to jump on [clears throat] it to say, "You know [clears throat] it to say, "You know what? Had this gone unchecked, it would what? Had this gone unchecked, it would have gone blind." And they were able to have gone blind." And they were able to catch all these patients because of the catch

all these patients because of the algorithm and family practice doctors algorithm and family practice doctors that have no real training in looking at that have no real training in looking at that or even if they could see the back that or even if they could see the back of the eye that well, don't understand.

of the eye that well, don't understand. Now the AI being able to analyze, Now the AI being able to analyze, create, and do that predictive analytics create, and do that predictive analytics and saying, "Oh, this is what's and saying, "Oh, this is what's happening now or about to happen." So, happening now or about to happen." So, so excited about this field. Uh so excited about this field. Uh I I'll I'll share a little hack I I'll I'll share a little hack internally. I'm getting uh access to internally. I'm getting uh access to some of these algorithms and you guys some of these algorithms and you guys are all going to laugh.

are all going to laugh. I know big brother-ish. My camera, I I know big brother-ish. My camera, I will turn it on. will turn it on. I will speak to it and it'll give me my I will speak to it and it'll give me my age, it'll give me my range of my voice.

age, it'll give me my range of my voice. Uh before I take stage, it'll analyze Uh before I take stage, it'll analyze and say, "Harvey, you are below your and say, "Harvey, you are below your average voice. Here are some exercises, average voice. Here are some exercises, here are some breathing things to get here are some breathing things to get you to your peak performance when you you to your peak performance when you take that stage." And so, I'm already take that stage." And so, I'm already kind of combining some of these kind of combining some of these >> And you know, we were talking about >> And you know, we were talking about these predictive technologies, things these predictive technologies, things that can potentially identify risk that can potentially identify risk factors well before they're clinically factors well before they're clinically detected. And you also think about, you detected. And you also think about, you know, in terms of access, is it ethical know, in terms of access, is it ethical to make them available to just some to make them available to just some people who can maybe, you know, people who can maybe, you know, afford the the type of technology that's afford the the type of technology that's available or is it something that we available or is it something that we need to kind of, you know, almost like need to kind of, you know, almost like try to to make sure it is accessible to try to to make sure it is accessible to everybody. If we're really thinking everybody. If we're really thinking about, you know, the cost of health care about, you know, the cost of health care long-term as well as you know, our our long-term as well as you know, our our disease states long-term. I mean, disease states long-term. I mean, wouldn't it serve us all well if wouldn't it serve us all well if everybody had access to it? And then, everybody had access to it? And then, you know, of course, we can't require you know, of course, we can't require people to do this type of testing or or people to do this type of testing or or can we? You know, going back to your can we? You know, going back to your question of who you would hire, you question of who you would hire, you know, is it something where know, is it something where maybe corporations or companies say, maybe corporations or companies say, "Hey, we offer this testing or this "Hey, we offer this testing or this technology for your benefit, but it's technology for your benefit, but it's also just something that um also just something that um you know, ensures that we're keeping our you know, ensures that we're keeping our workforce as healthy as possible." I workforce as healthy as possible." I mean, there's so many questions that mean, there's so many questions that come up just even from one single point come up just even from one single point of discussion. So, of discussion. So, >> Yeah.

>> Yeah. >> Yeah. I think from me from the technical point I think from me from the technical point of view, I mean, this is like the of view, I mean, this is like the ethical ethical ethical topic is always uh topic is always uh I mean, the the points you mentioned I mean, the the points you mentioned that there might be we might have some that there might be we might have some control in terms of like prospectively control in terms of like prospectively like developing those kind of programs.

like developing those kind of programs. Um but then from a technical point of Um but then from a technical point of view, if you build algorithms mostly on view, if you build algorithms mostly on uh uh uh yeah, retrospective data yeah, retrospective data in general overall. And then, those data in general overall. And then, those data also kind of bias in the algorithms that also kind of bias in the algorithms that we deploy might then work better on we deploy might then work better on specific groups. So, I think the ethical specific groups. So, I think the ethical I mean, it's a totally different I mean, it's a totally different conversation I would leave like a conversation I would leave like a or a separate uh episode. I don't want or a separate uh episode. I don't want to go deep into that, but I I I guess to go

deep into that, but I I I guess you guys I have watched previous you guys I have watched previous episode. Maybe you have touched it even.

episode. Maybe you have touched it even. Like the uh the bias from algorithms Like the uh the bias from algorithms which then enable good performance on which then enable good performance on specific population groups. Is it's specific population groups. Is it's going to be going to be uh based on ethnicity, age, sex, or uh uh based on ethnicity, age, sex, or uh all these factors? Um this is an ethic all these factors? Um this is an ethic problem in terms of the technology part problem in terms of the technology part which I'm thinking about when you You which I'm thinking about when you You that.

that. that. >> [laughter] >> [laughter] >> [laughter] >> Yeah. >> Yeah, she you'll you'll appreciate this. >> Yeah, she you'll you'll appreciate this.

And I I I've mentioned this to my And I I I've mentioned this to my colleagues before, but last week I was colleagues before, but last week I was at Arizona State University. At least in at Arizona State University. At least in the United States, it's the newest the United States, it's the newest medical school. They began in July.

medical school. They began in July. And I had the opportunity to be with the And I had the opportunity to be with the dean and and uh the other professors.

dean and and uh the other professors. And the graduates of this new class, And the graduates of this new class, they will not only have an MD medical they will not only have an MD medical degree, but they'll also have a master's degree, but they'll also have a master's in engineering in engineering and a degree in business and um and a degree in business and um specifically entrepreneurship.

specifically entrepreneurship. And I think it's reflective their And I think it's reflective their thinking of our discussion right now thinking of our discussion right now because because because you are at the intersection of, you you are at the intersection of, you know, medical practice, right? Working know, medical practice, right? Working with clinicians and then the science and with clinicians and then the science and the engineering. I mean, there's a lot the engineering. I mean, there's a lot of In all of our discussion behind of In all of our discussion behind everything we're talking about is a lot everything we're talking about is a lot of deep engineering capability. And I of deep engineering capability. And I think it's very interesting that these think it's very interesting that these this med school, and I think others will this med school, and I think others will follow. Um follow. Um they recognize this now and so they're they recognize this now and so they're training the future physicians and training the future physicians and future physician leaders to not only future physician leaders to not only understand medical, but also engineering understand medical, but also engineering and business. I I think it's quite and business. I I think it's quite remarkable. I don't I don't know if uh remarkable. I don't I don't know if uh Europe has followed suit yet. Maybe they Europe has followed suit yet. Maybe they have. Um but yeah, I think it's just have. Um but yeah, I think it's just really interesting given our discussion really interesting given our discussion that that uh we're thinking along these that that uh we're thinking along these lines.

lines. lines. >> Because you have to be able to >> Because you have to be able to understand what you're using even if understand what you're using even if you're not the one developing it. It's, you're not the one developing it. It's, you know, you have to have an you know, you have to have an understanding of it to know its understanding of it to know its >> And and I'll throw in some devil's >> And and I'll throw in some devil's advocate here. Um advocate here. Um if Dr. A knows a technology, can use it, if Dr. A knows a technology, can use it, leverage it, and can improve your leverage it, and can improve your health, and Dr. B, he loves medicine and health, and Dr. B, he loves medicine and is trying, but doesn't know, is trying, but doesn't know, then what doctor would you want? Do you then what doctor would you want? Do you want the one that can really leverage, want the one that can really leverage, create, think outside the box, leverage create, think outside the box, leverage AI, and I call it human plus AI where AI, and I call it human plus AI where it's going to elevate your game? Or you it's going to elevate your game? Or you want the doctor that's studying, but can want the doctor that's studying, but can limit himself only by the books he or limit himself only by the books he or she reads for that time? And as we know, she reads for that time? And as we know, medicine is doubling knowledge every 72 medicine is doubling knowledge every 72 days.

days. days. Back in the 1950s, medical knowledge Back in the 1950s, medical knowledge would double around every 50 years. And would double around every 50 years. And so it's really hard for the average so it's really hard for the average person to just be able to keep up. So person to just be able to keep up. So who would you want? And from an ethical who would you want? And from an ethical point of view, can you argue in saying, point of view, can you argue in saying, "Dude, you're creating malpractice.

"Dude, you're creating malpractice. You're actually hurting patients, and You're actually hurting patients, and >> Yeah, I think it sounds like the I mean >> Yeah, I think it sounds like the I mean I I guess the challenge is always like I I guess the challenge is always like as you mentioned like the knowledge is as you mentioned like the knowledge is moving so fast and not just moving so fast and not just the end users, but like let's even I the end users, but like let's even I believe you guys spend a lot of time believe you guys spend a lot of time outside your job to keep up with the outside your job to keep up with the tech also and um tech also and um So maybe it also changes the landscape So maybe it also changes the landscape for new job scopes where they they're for new job scopes where they they're going to be different. So I I guess it's going to be different. So I I guess it's a really nice a really nice thing to see these study programs that thing to see these study programs that Ed mentioned, but maybe there will be Ed mentioned, but maybe there will be also new opportunities for job scopes also new opportunities for job scopes where there there's an intersection where there there's an intersection between like these technical explain between like these technical explain people who understand the medicine and people who understand the medicine and the technical part to merge it with like the technical part to merge it with like practitioners that really focus on practitioners that really focus on patient care because I believe that also patient care because I believe that also takes totally separate effort in terms takes totally separate effort in terms of of of experience and and year long education.

experience and and year long education. So maybe there might be a way to So maybe there might be a way to not put all that workload on one person not put all that workload on one person because it sounds like it's going to be because it sounds like it's going to be too much at the end of the day.

too much at the end of the day. >> [laughter] >> [laughter] >> [laughter] >> Yeah. >> Correct. Well, I know we only have like >> Correct. Well, I know we only have like 20 minutes. So if there's any comments 20 minutes. So if there's any comments in in comments, uh free to let them know in in comments, uh free to let them know answer them and then if not, answer them and then if not, uh I wanted to really take advantage of uh I wanted to really take advantage of all three of us here. So, I really want all three of us here. So, I really want to maximize that last time. If you guys to maximize that last time. If you guys Ed or Doc have any questions, just jump Ed or Doc have any questions, just jump >> Well, I think wait, Harvey, you know, it >> Well, I think wait, Harvey, you know, it was very thought-provoking what what you was very thought-provoking what what you talked about.

talked about. And, you know, I I'd be interested in And, you know, I I'd be interested in issue your your sort of thoughts on issue your your sort of thoughts on that. Like, what what would be the ideal that. Like, what what would be the ideal So, let's say you conclude your research So, let's say you conclude your research and it shows uh this great potential and it shows uh this great potential we've been talking about how it's going we've been talking about how it's going to be so helpful. What would the ideal to be so helpful. What would the ideal sort of clinic or hospital look like in sort of clinic or hospital look like in the future that leverages the clinician the future that leverages the clinician and all of their knowledge and and all of their knowledge and capabilities as well as the technology?

capabilities as well as the technology? Like, how it like if you were the Like, how it like if you were the Minister of Health for Germany and and Minister of Health for Germany and and you knew about all these capabilities, you knew about all these capabilities, how might you sort of reconstruct health how might you sort of reconstruct health >> Oh, okay. Um I I I think so >> Oh, okay. Um I I I think so I think the most and I that is like also I think the most and I that is like also very personal observation to see that I very personal observation to see that I mean, in general, people want to feel mean, in general, people want to feel well cared for and I think um well cared for and I think um the main goal would be to the main goal would be to create an environment where patient care create an environment where patient care and time to explain also certain and time to explain also certain conditions. So, if we had problems if conditions. So, if we had problems if you don't understand certain things you don't understand certain things through precision phenotyping for through precision phenotyping for example, I think there's also example, I think there's also substantial need to be able to explain substantial need to be able to explain those

things also to to to the patient those things also to to to the patient to understand to understand uh what is happening. So, I think a uh what is happening. So, I think a landscape that really focus create this landscape that really focus create this space space space uh of uh of care and explanation and follow up which care and explanation and follow up which is enabled through AI taking over the is enabled through AI taking over the kind of tedious jobs running algorithms kind of tedious jobs running algorithms in the background and [snorts] then in the background and [snorts] then having experts to kind of bridge these having experts to kind of bridge these outputs to let's say an intermediate or outputs to let's say an intermediate or even directly also as a separate even directly also as a separate consultant to the patient.

consultant to the patient. Um so there might be a specific Um so there might be a specific consultant to kind of explain those new consultant to kind of explain those new biomarkers biomarkers biomarkers uh in in in a very simple way to uh in in in a very simple way to depending on who is talking to. I think depending on who is talking to. I think the focus that that would be ideal to to the focus that that would be ideal to to have a health assistant that really have a health assistant that really focus on on that kind of communication focus on on that kind of communication pipeline as well. Yeah.

pipeline as well. Yeah. >> Yeah, I you know, again, I know we're >> Yeah, I you know, again, I know we're we're international podcast. So uh we we're international podcast. So uh we don't want to focus just on the US.

don't want to focus just on the US. And that's why I asked the question, you And that's why I asked the question, you know, from your perspective, you know, know, from your perspective, you know, over in in Europe.

over in in Europe. But yeah, you know, that we're limited But yeah, you know, that we're limited in and I'm not a I I I'm afraid I'm in and I'm not a I I I'm afraid I'm coming across like as a downer on coming across like as a downer on America uh and I'm not. That's not my America uh and I'm not. That's not my intent. But we definitely have our intent. But we definitely have our shortcomings just like we have great shortcomings just like we have great things that we do. And and you know, things that we do. And and you know, when I'm part of a health system as an when I'm part of a health system as an executive, I'm able to get an full day.

executive, I'm able to get an full day. When I get a physical, it is a full day When I get a physical, it is a full day and I have 20 or 30 tests including the and I have 20 or 30 tests including the type of test that you're developing.

type of test that you're developing. And And And I get all this access and I get very I get all this access and I get very personalized briefing on my health care personalized briefing on my health care and all the different things I can do and all the different things I can do and I have a physician assigned to me I and I have a physician assigned to me I can meet with on a monthly basis going can meet with on a monthly basis going back through all the statistics that we back through all the statistics that we learned um through this process and and learned um through this process and and unfortunately, right? It's limited to unfortunately, right? It's limited to just, you know, a very small subset.

just, you know, a very small subset. That's why I was asking about That's why I was asking about scalability earlier whether it's scalability earlier whether it's geographic scalability or otherwise.

geographic scalability or otherwise. And and so that that's just the hard And and so that that's just the hard part is like how do we enable this great part is like how do we enable this great technology and these great insights that technology and these great insights that can help people? How do we enable it for can help people? How do we enable it for the masses? Um and so that's what I've the masses? Um and so that's what I've I'm my my are always spinning like that I'm my my are always spinning like that and that's sort of the heart of my and that's sort of the heart of my questions because I believe in the questions because I believe in the technology. I I understand completely technology. I I understand completely what it could do for people and I just what it could do for people and I just want to see everyone be able to take want to see everyone be able to take advantage of it.

advantage of it. >> And yes, she brings up a good point >> And yes, she brings up a good point about, you know, just how do we about, you know, just how do we communicate this to our patients as well communicate this to our patients as well because I'm thinking, you know, average because I'm thinking, you know, average patient visit time

patient visit time if even if I'm up to date on everything if even if I'm up to date on everything that's out there and able to leverage it that's out there and able to leverage it and able to talk my patient through it and able to talk my patient through it in a way that they can understand. I in a way that they can understand. I mean, how long would that clinic visit mean, how long would that clinic visit be? And you know, if we are here trying be? And you know, if we are here trying to provide access to care to every child to provide access to care to every child who needs it, then how does that happen who needs it, then how does that happen realistically? You know, there's already realistically? You know, there's already a physician shortage, you know, which is a physician shortage, you know, which is predicted to get worse over time and who predicted to get worse over time and who fills in the cracks? Like, what you fills in the cracks? Like, what you know, what where do we go from there?

know, what where do we go from there? Perhaps the solution is to kind of Perhaps the solution is to kind of almost have segmented parts of it where almost have segmented parts of it where there's a there's an expert who is there there's a there's an expert who is there to communicate the nuances and the to communicate the nuances and the details to the patients while we as the details to the patients while we as the clinicians are responsible for the clinicians are responsible for the understanding and maybe the synthesis of understanding and maybe the synthesis of the you know, plan or the options for the you know, plan or the options for the plan and you know, maybe that's the the plan and you know, maybe that's the direction it goes but there's you know, direction it goes but there's you know, so much so much there that I think we will learn along there that I think we will learn along the way.

the way. >> I love where this conversation is going. >> I love where this conversation is going. My favorite phrase is we don't know what My favorite phrase is we don't know what we don't know, right? And leveraging we don't know, right? And leveraging this technology, we're able to elevate this technology, we're able to elevate our health. And so, I'm always beta our health. And so, I'm always beta testing myself and I'm an end of one and testing myself and I'm an end of one and I'm literally creating a little mini I'm literally creating a little mini darts that is constantly there just darts that is constantly there just telling me this morning I got a text telling me this morning I got a text saying this is how much you slept, you saying this is how much you slept, you didn't go to sleep like you normally do, didn't go to sleep like you normally do, you stayed up because I was watching the you stayed up because I was watching the Columbia game last night. And then it Columbia game last night. And then it was saying here's your deep sleep and was saying here's your deep sleep and then here your status and here's why you then here your status and here's why you need to make sure tonight you get some need to make sure tonight you get some rest. Now, what's really interesting is rest. Now, what's really interesting is I know you guys will be like, "Harvey, I know you guys will be like, "Harvey, that's too much." But, that's okay. Uh I that's too much." But, that's okay. Uh I have it check all my wearables, all my have it check all my wearables, all my data. It has access to my emails, my data. It has access to my emails, my schedule, all of it. And schedule, all of it. And the day uh last a couple weeks ago I was the day uh last a couple weeks ago I was in Portugal, and I was in Boston the day in Portugal, and I was in Boston the day prior. And before that I was in uh prior. And before that I was in uh Stanford speaking. So, anyway, long Stanford speaking. So, anyway, long story short, I got a text from my my AI story short, I got a text from my my AI saying, "Harvey, is there any way you saying, "Harvey, is there any way you cannot travel today to Portugal? You're cannot travel today to Portugal? You're not rested. Your HRV is down. You're not rested. Your HRV is down. You're sleeping. You're aging yourself.

sleeping. You're aging yourself. Delay your flight 1 day, get some rest, Delay your flight 1 day, get some rest, and leave tomorrow." And I'm like, "Oh and leave tomorrow." And I'm like, "Oh my gosh, this is crazy that it's telling my gosh, this is crazy that it's telling me that I'm running myself hard." So, me that I'm running myself hard." So, anyway, I thought it didn't know what I anyway, I thought it didn't know what I didn't know. It's helping my health, and didn't know. It's helping my health, and I'm using it.

I'm using it. >> And what did you do? >> And what did you do? >> do? >> do? >> do? >> [laughter] >> I did what every responsible person >> I did what every responsible person would do.

would do. I still went to Portugal. I still went to Portugal. >> [laughter] >> [laughter] >> [laughter] >> Well, >> Well, >> Well, now I have to play devil's advocate a now I have to play devil's advocate a little bit. So, say like you're talking little bit. So, say like you're talking about, you know, when you get those um about, you know, when you get those um messages about how your voice is, you're messages about how your voice is, you're about to go on

stage. Say your voice to about to go on stage. Say your voice to you felt fine. Like you felt fine. You you felt fine. Like you felt fine. You you weren't picking up on it, but you weren't picking up on it, but your technology told you this.

your technology told you this. Is there a chance that it might even get Is there a chance that it might even get in your head, and you're like, "Oh my in your head, and you're like, "Oh my voice is not good. Maybe I'm not going voice is not good. Maybe I'm not going to sound as good. Maybe I'm my presence to sound as good. Maybe I'm my presence is not going to be as strong on stage is not going to be as strong on stage today." I mean, I guess there's that today." I mean, I guess there's that aspect of it, too, that, you know, aspect of it, too, that, you know, sometimes we have too much information, sometimes we have too much information, does it impact us in a way that we does it impact us in a way that we wouldn't have been impacted without it.

wouldn't have been impacted without it. You know, and and even like the fatigue You know, and and even like the fatigue things. Like if something's telling you, things. Like if something's telling you, "Hey, you're tired. You're tired." Then "Hey, you're tired. You're tired." Then do you start to feel more tired?

do you start to feel more tired? [laughter] [laughter] [laughter] >> [gasps] >> [gasps] >> [gasps] >> Great question. Uh Uh and I'll bring it >> Great question. Uh Uh and I'll bring it to home with patients. If our patients to home with patients. If our patients are wearing watches and the watch is are wearing watches and the watch is telling them, you know what? You're not telling them, you know what? You're not sleeping and they get so obsessed with sleeping and they get so obsessed with this thing that they start not sleeping this thing that they start not sleeping because they're trying to track because they're trying to track themselves, themselves, themselves, then for that particular person, maybe then for that particular person, maybe that's not the correct intervention. And that's not the correct intervention. And I really hate to say this, but it's all I really hate to say this, but it's all about that individual. How are they about that individual. How are they going to process that information? For going to process that information? For me, I'm like, dude, bring it. If I'm me, I'm like, dude, bring it. If I'm going to die in the tomorrow, tell me so going to die in the tomorrow, tell me so that I know.

that I know. Um Um Um that's just me, but other personalities that's just me, but other personalities like, oh no, Harvey, I would not want like, oh no, Harvey, I would not want any of this information. And so, I get any of this information. And so, I get the difference. Um but to me, I'm going the difference. Um but to me, I'm going to go back and say this other thing real to go back and say this other thing real quick.

quick. quick. To me, anytime there's any dispute with To me, anytime there's any dispute with anyone, it's about education. If you anyone, it's about education. If you boil it down, you're fighting with your boil it down, you're fighting with your spouse, fighting with your business spouse, fighting with your business partner, you're giving your opinion, partner, you're giving your opinion, that person's doing another person's that person's doing another person's opinion and you're educating each other opinion and you're educating each other hoping to find a resolution. And so, to hoping to find a resolution. And so, to me, it's all about that.

me, it's all about that. Education. Education. Education. >> when you are trying to find a >> when you are trying to find a resolution, it's not always about one resolution, it's not always about one person winning person winning the argument. It's not always that, you the argument. It's not always that, you know, one person is right in that know, one person is right in that situation, one person isn't. The situation, one person isn't. The education piece hopefully puts things education piece hopefully puts things together so you realize where the together so you realize where the compromise is, you know, you realize compromise is, you know, you realize that both people may that both people may be contributing valuable input and maybe be contributing valuable input and maybe there's a another solution in there there's a another solution in there after educating each other that actually after educating each other that actually is a third, you know, avenue to take.

is a third, you know, avenue to take. So, So, So, um I think that is a good point, too. um I think that is a good point, too. >> I think to loop that back to the initial >> I think to loop that back to the initial question about the um question about the um ideal situation, how this will transform ideal situation, how this will transform health care, is like, um health care, is like, um if there are specialists and there are if there are specialists and there are certain paths for patients, I think with certain paths for patients, I think with these AI solutions, it's also quite a these AI solutions, it's

also quite a great opportunity to kind of great opportunity to kind of bring in new uh opinions that merge and bring in new uh opinions that merge and find compromises. Uh, just just a find compromises. Uh, just just a thought based on the thought based on the the the the example you were giving.

example you were giving. >> Yeah. >> Yeah. >> Yeah. Yeah, I Yeah, I I Yeah, I I've just like I'm sort of I Yeah, I I've just like I'm sort of hesitant like when we do personal hesitant like when we do personal anecdotes cuz I know they're all anecdotes cuz I know they're all one-offs, but I I I recall So, I had a one-offs, but I I I recall So, I had a situation I'm a I'm an athlete number situation I'm a I'm an athlete number two in the in the country for my two in the in the country for my particular sport. And particular sport. And I remember going through a battery of I remember going through a battery of tests because I actually had a LAD um, tests because I actually had a LAD um, in a race. Um, and I finished the race in a race. Um, and I finished the race and I made still made made a team USA.

and I made still made made a team USA. But the the point and there's a lot of But the the point and there's a lot of tech involved, but what I'm trying to tech involved, but what I'm trying to get to is they did a ton of tests. A ton get to is they did a ton of tests. A ton of tests. A ton of tests.

of tests. And I again, I went through an all day And I again, I went through an all day battery of tests. battery of tests. And at the end and I'll and I'll never And at the end and I'll and I'll never forget this. It's Dr. Dermot McFeelan.

forget this. It's Dr. Dermot McFeelan. He's a He's a He's a star, you know, cardiologist that He's a star, you know, cardiologist that takes care of many high-profile takes care of many high-profile athletes. And he asked me one athletes. And he asked me one question question at the end of all that. He had this at the end of all that. He had this whole treasure trove of data. He asked whole treasure trove of data. He asked me one question. He said, "Why me one question. He said, "Why do you do you race for team USA?" race for team USA?" And I broke down crying.

And I broke down crying. And he said, "Go race." And he said, "Go race." I To this day, I To this day, I have no idea what the statistics, what I have no idea what the statistics, what all the data showed. He didn't He didn't all the data showed. He didn't He didn't need to tell me, you know. So, so need to tell me, you know. So, so there's that balance. It's great to have there's that balance. It's great to have the data and I'm a huge believer in it.

the data and I'm a huge believer in it. Um, but I love the fact how empathetic Um, but I love the fact how empathetic he was and how he just got to the heart.

he was and how he just got to the heart. Like, what's important to me? What's Like, what's important to me? What's important to the patient? It's not important to the patient? It's not always the data. It's like, what drives always the data. It's like, what drives you? What brings joy? Um, joy is not you? What brings joy? Um, joy is not necessarily having a ton of data. It necessarily having a ton of data. It could be for some people. And and so, could be for some people. And and so, it's up to that clinician at the end to it's up to that clinician at the end to realize, understand their patient and realize, understand their patient and what's best for them. What How do they what's best for them. What How do they want to receive news? And and so, who want to receive news? And and so, who knows? I could be at a 99% risk risk knows? I could be at a 99% risk risk factor to have another LAD during a factor to have another LAD during a race, but I'm having the time of my race, but I'm having the time of my life.

life. life. >> And that's that the what Harvey >> And that's that the what Harvey mentioned is the human plus AI mentioned is the human plus AI component. It's always together, you component. It's always together, you >> Exactly, and that's where I say, let the >> Exactly, and that's where I say, let the doctors be the empathetic, let us give doctors be the empathetic, let us give that compassion, and that compassion, and I know I'm going to sound a little crazy I know I'm going to sound a little crazy here, but I really think we have energy.

here, but I really think we have energy. I think we love on our patients, and I think we love on our patients, and we're in part giving that to our we're in part giving that to our patients, and we're helping elevate them patients, and we're helping elevate them because we care so much, and I know that because we care so much, and I know that sounds odd for some people out there, sounds odd for some people out there, but I really believe in that power of but I really believe in that power of touch. I tell nurses, do not call me by touch. I tell nurses, do not call me by my first name when we're in front of a my first name when we're in front of a patient. Not because I need to be called

patient. Not because I need to be called doctor, because I feel like you're going doctor, because I feel like you're going to take away that that emotional state to take away that that emotional state where the doctor and the patient says, where the doctor and the patient says, "Oh my god, Dr. Castro put his hand on "Oh my god, Dr. Castro put his hand on my shoulder and said, 'Everything's my shoulder and said, 'Everything's going to work out. Everything's going to going to work out. Everything's going to be fine. We got this.'" versus "Hey Joe, be fine. We got this.'" versus "Hey Joe, come on in, you know, like they just come on in, you know, like they just degrade I mean, again, it's not about degrade I mean, again, it's not about the name, but it's that power that Ed's the name, but it's that power that Ed's talking about, and I really think that's talking about, and I really think that's what we need to channel channel channel what we need to channel channel channel uh put channel into in the sense that uh put channel into in the sense that it's human plus AI, like you just said, it's human plus AI, like you just said, too.

>> And we do have a question if you want to >> And we do have a question if you want to lift it up from Jamal, and we can and lift it up from Jamal, and we can and just kind of talk about it. And we got just kind of talk about it. And we got like 5 more minutes.

like 5 more minutes. I think it'd be uh I think it will I think it'd be uh I think it will become as important as ever as the become as important as ever as the medical practitioner have peer-reviewed medical practitioner have peer-reviewed as content published and made accessible as content published and made accessible to AI. Since AI is leveraging knowledge to AI. Since AI is leveraging knowledge humans create, review, and validation's humans create, review, and validation's important to make sure we are not important to make sure we are not poisoning the knowledge well.

poisoning the knowledge well. Uh trying to read it off the thing. Uh trying to read it off the thing. Yeah, that's it. Yeah, that's it. So, yeah, totally agree. Uh because So, yeah, totally agree. Uh because that's one of the issues we're having that's one of the issues we're having right now. If AI is getting into our right now. If AI is getting into our medical literature, and let's just say medical literature, and let's just say some of it may be garbage, and it's not some of it may be garbage, and it's not being reinforced by the doctor saying, being reinforced by the doctor saying, you know, this is correct or not, then you know, this is correct or not, then we're putting garbage on top of and so we're putting garbage on top of and so that line of data could be totally off.

that line of data could be totally off. Uh that's why we need us. Uh that's why we need us. >> And is that where like our medical >> And is that where like our medical societies come in, you know, like the societies come in, you know, like the American Academy of Pediatrics, you American Academy of Pediatrics, you know, where we have standardized know, where we have standardized protocols for um treatment plans and protocols for um treatment plans and things like that. It's like there is things like that. It's like there is accountability within that the accountability within that the organization that hey, what the organization that hey, what the recommendations that we're putting out recommendations that we're putting out have been have been um reviewed, and and I think that's um reviewed, and and I think that's something where it something where it that has to be extended to AI and and that has to be extended to AI and and what's um available.

what's um available. It's on us to kind of as on an It's on us to kind of as on an organizational level at least be aware organizational level at least be aware of what's there and make sure that it's of what's there and make sure that it's >> All right, we got 5 more minutes, so >> All right, we got 5 more minutes, so let's end it in a high note in every let's end it in a high note in every person I'd like to just go around, and person I'd like to just go around, and then I don't want to ask the question.

then I don't want to ask the question. I'd I'd rather you add anything you want I'd I'd rather you add anything you want to add to the conversation to end this to add to the conversation to end this with. So, with. So, you guys want to start? Just anything you guys want to start? Just anything that comes to mind, just to kind of that comes to mind, just to kind of throw it out to let our audience know.

throw it out to let our audience know. So, So, So, who wants to start? who wants to start? >> Why I think iron sharpens iron, and I >> Why I think iron sharpens iron, and I love the fact that we have all these love the fact that we have all these great uh scientists, researchers, uh great uh scientists, researchers, uh entrepreneurs, innovators working with entrepreneurs, innovators working with clinicians and and I tech people or clinicians and

and I tech people or whatever, digital people, and and really whatever, digital people, and and really working together in a synergistic working together in a synergistic pattern to develop new therapies, to pattern to develop new therapies, to develop new discoveries that will just, develop new discoveries that will just, you know, help other people um in their you know, help other people um in their journey. So, I usually I'm I'm so happy journey. So, I usually I'm I'm so happy that you are are with us, that you were that you are are with us, that you were born, and that you're doing the things born, and that you're doing the things that you're doing, you have the insights that you're doing, you have the insights that you're doing, cuz I think you're that you're doing, cuz I think you're going to help change the world. So, going to help change the world. So, thank you.

thank you. Yeah. Yeah. Yeah. Usually, would you want to go next? Usually, would you want to go next? >> Yeah. >> Yeah. >> Yeah. Thanks a lot for the invitation. I I Thanks a lot for the invitation. I I think I haven't said that at the start.

think I haven't said that at the start. Um so, I'll said it at the end. Um so, I'll said it at the end. Um, yeah, um, great great opportunity to Um, yeah, um, great great opportunity to be here and um, be here and um, I I always like to have these kind of I I always like to have these kind of conversations. See also kind of how it conversations. See also kind of how it brings me forward. So, um, brings me forward. So, um, yeah, thanks a lot.

yeah, thanks a lot. >> I'll just make a comment about balance. >> I'll just make a comment about balance. You know, we're talking about all these You know, we're talking about all these amazing amazing amazing potential, you know, technologies that potential, you know, technologies that may become implemented, you know, in our may become implemented, you know, in our near future. But to take it back, you near future. But to take it back, you know, there's something also very know, there's something also very healing about going outside and, you healing about going outside and, you know, being in the sunshine and, you know, being in the sunshine and, you know, putting your bare feet in the know, putting your bare feet in the grass and putting good food in your grass and putting good food in your body. And I guess I just want to kind of body. And I guess I just want to kind of bring that back to our attention too.

bring that back to our attention too. It's like all of these things are It's like all of these things are amazing and I'm so so grateful to be amazing and I'm so so grateful to be having all these conversations, but it having all these conversations, but it also doesn't replace all the things that also doesn't replace all the things that we have known and experienced for we have known and experienced for centuries. So, just a reminder to keep centuries. So, just a reminder to keep that balance in mind.

that balance in mind. >> Great. And for me, I like to start at >> Great. And for me, I like to start at the bottom level and say everyone the bottom level and say everyone listening, whatever pearl, whatever you listening, whatever pearl, whatever you learn, share it with someone else.

learn, share it with someone else. Obviously, come to our podcast and Obviously, come to our podcast and listen. But more importantly, what can listen. But more importantly, what can you do with that knowledge that you you do with that knowledge that you learned today to help humanity? What can learned today to help humanity? What can I do as me that human plus AI? What did I do as me that human plus AI? What did I learn so I can elevate whatever that I learn so I can elevate whatever that is? And for us health care physicians, is? And for us health care physicians, it's going to be our patient. What can it's going to be our patient. What can we do to help that person?

we do to help that person? And with that positive note, I want to And with that positive note, I want to thank everyone on the panel. Thank you thank everyone on the panel. Thank you for coming and I really appreciate it.

for coming and I really appreciate it. And then we're going to end the podcast And then we're going to end the podcast and then I'm going to ask people to stay and then I'm going to ask people to stay just to make sure that it uploads. If just to make sure that it uploads. If we have someone in the background if we have someone in the background if they want to end the podcast, I they want to end the podcast, I