Struggling With Sleep? How AI Uses Your Sleep Data to Help Transcript

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Show Intro and Guest Introduction

All right. It's time for another show. And if Emerson, what is going on today? It is time. Well, you know, we're, w we were struggling again, instead of me being out, it's our guy, Robert, or you mean we've kind of had a rotation of chairs here.

I feel like we are playing musical chairs and I don't know what's going, but we have to survive without, uh, Mr. Miller today. It's going to be tough.

I know. We're not as pretty without him. But we do have a good guest. And I'm looking forward to that. we actually have Michael Korsbeck from Sleep Cycle.

He's gonna be coming on the show and talking about a really interesting AI that they've got. The number one sleep app on Apple. Their editor's choice for sleep.

You know, I think we're going to be looking forward to an interesting conversation of another innovator. So excited to see where this goes today. Well, it's amazing.

And that name sounds, his name, sounds very interesting. Is he, where is he from? I mean, he is from Sweden. We've got a PhD from, Sweden coming in today, you know another AI engineer.

I'm looking to a little time with him and I know we'll both learn a lot. Well, man, I'm looking forward to it. It's like we get these really amazing people and amazing products and it just makes for an amazing show.

So, you know, love that we're global, we are reaching Europe with you. We've had our friends from Britain. Now we've reached across the pond and up into Viking territory and looking to what we have today.

Let's do it then. All right. MedBridge Healthcare is a leading provider of sleep lab management services and home sleep apnea testing. Medbridge partners with hospitals, healthcare systems, and medical academic institutions to offer comprehensive, fully integrated services for sleep disorders.

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SleepCycle, AI, and the Data Scale

Welcome, everyone, once again, to another episode of Sleep Tech Talk, the sleep podcast with your host and friends, Emerson Kerr, Robert Miller, and me, Dr.

Gerald George Monecra. Folks, Once again another amazing show and we're really excited because we've got somebody that is overseas. But before we get to that, we just want to say a huge shout out to Each and every one of you, thank you so much for all the likes, all subscriptions, and especially all of the shares.

We just continue to grow and it's all thanks to you. A huge shout out to our sponsors. Be sure to check them out. Without whom, we cannot do this. And they have been tremendously instrumental in helping us grow as well.

So huge, shout-out to them. With that being said, Emerson, what is going on today? Jerry, we've got a special guest from Sweden today. We have Michael Korbgebeck.

I'm hoping I said that right. So I am going to claim Alabamian on butchering that. But Michael is currently the Chief Technology Officer at SleepCycle, where they formulate the strategic direction for research and development.

Previously worked as a research scientist at SleepCycle. Prior to his role at sleep cycle, Michael was a PhD student at Chalmers University of Technology, conducting research in machine learning and artificial intelligence with a focus on deep neural networks.

Michael also has experience as owner at Compiled, a software architect at Extenda and a Software Engineer at Areco. Additionally, worked as a software engineer at the Swedish Armed Forces, contributing to various projects involving software development and systems coordination.

Well, Michael, welcome to Sleep Tech Talk. We are so excited to have you on today. we talk about AI a lot on SleepTech Talk, it's something that is, you know, certainly the big buzzword in sleep in so many different ways.

One of the questions that we like to ask all of our guests is, how did you get into sleep? Because with your background, that is not the direction I would have pointed you in as a forecaster of anything.

So why sleep and how do you did get here? That's a very good question. First of all, thank you so much for inviting me here. I'm really happy to be in this setting because I think this is your audience.

It's perfect for this discussion right now because at SleepCycle we have long catered to consumers, but now we are really pushing more towards medtech and tech licensing, so adding partnerships to our repertoire.

So I thinks your audiences is perfect to having that discussion. So I love that. So yeah, how did I end up here? Oh, that's a very good question. I mean, I'm not sure myself, but I really like to follow my curiosity.

That's why I went into research, because that is really curiosity driven. But yeah I started out as a conscript and then somehow I got involved with R&D at the Swedish IRF Defense.

We actually did audio there, so we did some audio. sensors and stuff. That was really fun, but that was so many years ago. I forgot that I did that. But why did I go to sleep?

When I got my PhD, I focused on machine learning but it's more language. Towards the end, i did some projects with audio and I was looking for somewhere where I could apply my knowledge and do it where i could have real impact on real humans.

Sleep is You know this, sleep is extremely important for your health and for everything in your life. So I really love that. But on top of that, what we do at Sleep Psyche, so just a quick introduction to SleepPsych, we've been around since 2009. We have about 3.2 million active users, monthly active user, and every night we have 1 million users using Sleeppsyche.

I mean, that's an amazing data set to work with. I saw some other statistic, I think it was someone said they had 800 million hours of audio in their data sets and that is great, but that was one night for us.

So, it's a lot of data that we are processing and we're doing this in this huge sensor network of phones that have all around the world. We can do so many things with that data and again, just to kind of compare to some companies, OpenAI, they do a lot with data and they process so much.

They said that it was a few weeks back at their Dev Days, we process about 6 billion tokens a minute. I thought, wow, that's impressive, extremely impressive.

So how much do we process? We process about 4.5 petabytes of information every day. That's about 100 times more information than OpenAI is currently processing.

So now you really get an understanding of how many data we have at hand. For me, that was just like the perfect

fit. I could have impact on people's lives, really impact, good impact of their health, and also so much data that I can do.

you know, apply my knowledge to get real value. That's why I ended up here. Well, for the listeners who aren't sure what a HEPABITE is, give us some context on that.

So that I hate to pause such a great conversation, but that's, that has got to be massive beyond comprehension, probably. But give a sense of what that means.

And then maybe what can lead to, because I think, you we look at a lot of discussions around AI, it is all about the data. And the more of it, the we can see phenotypes and the different things that begin to just separate out groups of people.

So if you can give us a sense of what that means from a size standpoint, but then also what it also means towards predictive, maybe analytics and things of that nature.

Absolutely. So now it's my turn to apologize for my pronunciation. Petabytes, so it is a thousand terabytes.

Audio-Based Sleep Tracking and Apnea Detection

Another way of saying it, a lot of data. I mean, lots and lots of it. It's so much data that we would never be able to process it centrally. Something that you have to do in a decentralized manner.

for the fact that we completely go bankrupt in just one day but I mean we can't buy all of these data centers that OpenAI are buying or building but also for privacy.

So we really need to make sure that, we do everything in a private way. When it comes to What we can do with this data, so I mean we analyzed about three billion nights now, but that's just what we analysed.

We ask for permission, we have a consent to contribute to improve the world, I think we call it. So if you say yes to that, then we will have research data set, and that is really what are doing the research on.

And now we have a bit more than half a billion nights in that. And I can give you some examples of things that we've been able to do and what kind of data is in the dataset.

So for everyone that is included in a dataset, we an identifier so we can actually follow people over time. And we have a lot of people that have used SleepCycle for a very long time, so it's not rare that I talk to people.

I talked to someone today actually, a professor in Singapore who was a user and he had used sleep cycle since 2015, that's 10 years of data. So that type of longitudinal data on a massive scale is something that we used to produce two papers together with Rebecca Robbins at et al, if you know her.

She is at Harvard Medical. And one of them was about COVID. So we were able to go back in time and look at how COVID had been affected or had affected sleep so far.

Could see that there was a statistically significant increase in the number of hours slept in a number cities around the world. We looked at I think London, Los Angeles, Stockholm, and Seoul, I can see it all over the place.

We could see why, because it was really clear. I mean, can you guess why people sleep more during COVID than they did before? I couldn't even begin to guess.

Yeah. Lazy, tired, who knows? I have no idea. We had a lot more time on our hands. The insight was that we could see that this was more or less a step function.

As soon as the restrictions were put in place, people started to sleep more. And we can see it nicely in all of those

cities where you had restrictions put into place in that way.

While in Stockholm, I mean in Sweden, we were a bit more loose about all this, so we didn't really have any restrictions first. After a while, people started to work from home anyway.

So you can see that kind of gradual shift when people work, from. They don't commute and, and obviously, or apparently people need more sleep because they started the sleep more when they do it.

What you're saying is what the data showed that people slept more and that was because of need and we're shortening or because COVID you didn't have to go out and.

Otherwise, outside of this COVID thing, we are getting up or reducing our hours of sleep simply because of the requirements of work. Is that what you're saying?

I think that's a very plausible explanation, at least. It's difficult to prove that perfectly, but what we can see in the sports stat, yes. So that was quite intriguing, I Think.

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Now back to the show. I would agree. And so could you tell us a little bit more about the app and its usage in terms of people's health, overall health and wellness?

Because I think that's a big piece of this, especially with all the data that you've been able to acquire all these years. Absolutely. So going back to the SleepCycle app, first of all we are completely audio based.

We have been audio-based now since 2015. we started out being accelerometer based, we only measured movements by having the phone in bed, but in 2015 we moved to audio and that has really been the big thing for us.

Because audio is, I mean first we're able to do it in a way that's completely private, which is crucial. But secondly, it's extremely powerful. I mean, there's a reason why all animals have ears and there is a reasons why the stethoscope is like the symbol for health.

You can detect sleep. So we do that pretty well using breathing. We have some, uh, There are some other apps that also use audio, but they mainly work with movements so they can protect some movements.

And from that you can get, um, an okay sleep tracking but what we do we actually track your inhales your exhales your snores and then from that we can do some signal processing to to get both your breathing rate robustly throughout the night and also your breeding regularity and there's a connection between your regularities of breeding and sleep stage so from data we could actually do sleep staging together.

with movements at a fairly good accuracy. We end up in the range of 52 to 0.6 in Cohen's Kappa, which is pretty good. It's going to depend a bit on the environment.

So if you sleep alone and it's quite a new room, you get a very good score. if it's noisy and you are multiple people sleeping together. It's harder. I mean, we do a lot of work to get that to work, but it is harder, so that's one thing that we track your sleep.

We do sleep staging. On top of that, We track you snoring. So we have some people that only use sleep cycle because they want to track their snorings and understand how much they snore and also if there could be problems with your snores because we record clips from your SNORE sessions.

You can bring that along to your doctor. to let the doctor listen to how you snore. That's the use case that actually is being used. And then, of course, we are now pushing towards sleep apnea.

So we have developed technology to detect, if you're very similar to what Samsung and Apple Watch is doing, detect if have a sleep-apnea index over 15.

So that technology is something we now have developed and it's audio based and we are trying to get that FDA cleared. We're running a really large scale study right now.

It's going to be over 800 participants doing both audio and PSG at the same time. to be able to do that study. So we're going for that.

Global Sleep Patterns and Biometrics

And then finally, we are also detecting many other things, including sneezing and coughing and your breathing rate as a metric, because all of these are really interesting if you want to track your health.

The coughing is obvious, why it's an interesting signal. Breathing rate is also actually also a very interesting signal. And I think you have some respiratory background, so maybe you can back me up on this or tell me I'm wrong.

But as I understand it, your medium breathing rate is actually quite predictive for, for instance, COVID. So you see that since your body is, I mean, it's consuming the same amount of oxygen, no matter what, more or less, if you had a fever a little bit more.

But if you have lower, less efficient lungs, then you'll have to increase your breathing rate more or less to be able to compensate. So you can see about two breaths per minute, higher breathing rates in medium, if have COVID.

And you also see trends over time, says something about your fitness, and there's so much information in that signal. That's also something that we're working with.

Michael, that's absolutely fascinating. I think one of the things that I find really interesting about this type of subject is how we can begin to take that data and then look at it from gender and race and all of these subtypes.

Are you beginning to see that with this amount of data? Particularly one is gender because we talk about that a lot. It's become a bigger subject, especially in the last year with the academies focus on it and other leaders.

Are you seeing any differences there that really begin to give you some definition between the gender types? And then what about races around the country?

Because you mentioned Seoul and they're in Sweden and in Los Angeles. Do you see differences from that standpoint as well? Yeah, we definitely do. So there's big differences.

between sexes when it comes to, for instance, snoring. We can see, well, you may guess it, men tend to snore more than women. And we haven't really looked into breathing and breathing patterns and such and gender.

There might be something there. It could be an interesting study to do, but that's not something we have looked at in particular. However, when how people sleep around the world, that is something that we have done a lot with.

And it turns out there are huge differences, huge, differences. So one of them is Seoul. In Korea, compared to the Western world they sleep much less.

which is, I don't know how that works, by that is if there's a physiological reason for it, or they just don' have time to sleep. I'm not sure which one it is.

But there was a significant difference between them. Then on top of that, and maybe that could be part of the

explanation, many cultures sleep more than once.

So, when they sleep more than once, they may not track their sleep on both times and that will impact the duration per sleep session, of course. So we can see that, for instance, in Saudi Arabia is one of them where they tend to do that and famously in Spain as well, and then we see huge differences in how long you sleep, and I guess that will also impact what type of sleep you have and your sleep architecture.

But that's not something that we've been looking into, but it would be fascinating to do, definitely. Michael, you mentioned something I found very interesting, if you don't mind talking about it a little bit more.

I'm a certified personal trainer apart from the other t-shirts that I wear. And so you talked about the change in breathing at night based on fitness levels or even change and fitness level.

Could you talk a little bit more about that, please? I just found that fascinating to hear. Absolutely. So that's also one of those physiologically necessities almost that it has to be that way.

When you increase your fitness, you tend to get a more efficient lung. And when you do, we can see that quite clearly. You will decrease in your breathing rate during the night.

This is actually something I took from a discussion with Whoop. But it was from an article. Anyway, the information in breathing rate is very similar to information that you can get out of heart rate variability.

So those tend to have similar information, but when it comes to sleep tracking, breathing is more powerful. That at least is what I have understood. I mean, what can I say more about it?

I had some anecdotal evidence, me and the former CEO at SleepCycle called you one who is a great runner. When I tried the algorithm first, for me, I put a lower bound at the breath per minute.

And when he used the app, it was well below. So there's a pretty large variability in what breathing per minutes you have during the night. It tends to be tightly coupled to your cardiovascular fitness.

But it would be really interesting to do more research on that, I think. So if anyone listening to this right now is interested in doing that kind of research, please reach out.

This is actually data that we have collected for the whole world now for a while. We have anonymized data on breathing rate from all over the world, in addition to the coughing.

But currently we're not doing anything with the breathing. It could be interesting if you have a research idea. Well, Michael, thank you so much. We are out of time and we sincerely appreciate that.

So if people did want to reach out, whether it's regarding this research or anything else, where could they get more information about you or the company?

Absolutely. So you can email me at either research at sleepcycle.com if there is a research question or partnerships, if it's more of a partnership question.

And please check out our webpage for information about SleepCycle. Both look at our app and you can also go to a very interesting webpage if you want to look a coughing all over the world.

It's sleepcycle.com slash cough radar. Here you see maps of how people cough in the entire world and coughing trends. You can see that people more cough towards the winter and over Christmas there's a huge spike.

Always when you meet your relatives you tend to get sick I guess. So then you could see that in the trend lines all over the world. That's very interesting.

It's a fun activity to do. But it's fascinating.

Closing Remarks and Post-Show Discussion

We will have that information in The Show Notes. So thank you, Michael. And thank all of you. Thank you so much for all that you're doing, especially with the sharing of our show.

A huge thanks to our sponsors. Until next time, lights out. Wow, that was quite a show. It's time for some post cows. I mean, That was data, data data.

You know what, Jerry, it was, but you know, I think what's so cool. We kind of pick on each other about the whole endotypes and AI and things like that.

But when you look at the volume of data that sleep cycle is churning through every day, not just weekly or yearly, But every night, the number of patients from Europe, America, Asia, all over the world that they're collecting and looking at these different types and then out of that beginning to see some behaviors, everything from coughing to other things around, you know, sleeping and waking behavior based on what part of the word they are in.

That's absolutely fascinating. Based on COVID. That was wild, wasn't it? And who, you know, it kind of makes sense, but I think it's one of those things that's different when you can kind look at it from that analytical viewpoint to say, wow, okay, well, that makes since, who knew that it would be that kind impact?

When you're thinking of, I you said 1,000 terabytes of information, you know, a day, that is insane. You know to have that much information they're combing through and, you what are we ultimately going to learn as we look at this in the future about different types from gender to race, to nationality, he's already got some of that, but I think, in a future, there's gonna be some interesting mapping of these phenotypes and what we learn from sleep cycle, I'll think is going be fascinating.

You know, you're right, we do Josh with each other when it comes to these terms, but you made some good points earlier about how this could help us in terms of predictive analytics and that sort of thing.

And even talking about it now is that to be able to fine tune and better understand what's going on, because you mentioned that earlier, right? That all these studies were based on one type of individual.

that we had done in the past. Now we're able to actually see data on a nightly basis about all different types of people and be able filter through, drill down and figure out what's going on with what type of patient.

I think it's gonna make for a whole lot better medicine moving forward. I think so too, because that's one of the things that I get concerned about as we see proliferation of diagnostics that just seems to go unchecked, or people that are marginalized, particularly by gender or by race.

And I, think when we look at this big data, it allows us to really see, okay, where are those misses? And as see sleep medicine evolve to be more inclusive around gender and race, you know, does it inform us more to make better decisions?

You know I said that it's a conference at a while back. We know better so we should do better and I think the information that SleepCycle and others are generating really puts us in that position so that we can do greater patient care and that's ultimately why we do all this to begin with.

Well said Emerson and i think that is a great place to close. All right. Alright folks until next time. Cheers. Be sure to check out our clinical sponsor, Sleep Review Magazine.

More details in show notes.