WEBVTT

NOTE duration: ”01:04:20.906”

NOTE Confidence: 0.9138032

00:00:10.800 --> 00:00:11.300 Hello?

NOTE Confidence: 0.9725048

00:00:12.474 --> 00:00:13.855 Hi. Good afternoon, everyone.

NOTE Confidence: 0.98417693

00:00:14.235 --> 00:00:15.275 My name is Akash. I'm

NOTE Confidence: 0.98417693

00:00:15.275 --> 00:00:16.634 one of the PGY four

NOTE Confidence: 0.98417693

00:00:16.634 --> 00:00:17.695 neurology residents.

NOTE Confidence: 0.9826415

00:00:18.555 --> 00:00:19.755 Today, I have the pleasure

NOTE Confidence: 0.9826415

00:00:19.755 --> 00:00:21.454 of introducing doctor Zaveri.

NOTE Confidence: 0.9998358

00:00:21.994 --> 00:00:23.215 He received academic

NOTE Confidence: 0.99812096

00:00:23.595 --> 00:00:25.935 training in electrical engineering,

NOTE Confidence: 0.998075

00:00:27.000 --> 00:00:29.580 computer engineering, and biomedical engineering.

NOTE Confidence: 0.9403936

00:00:30.120 --> 00:00:31.820 He's the director of computational

NOTE Confidence: 0.9403936

00:00:31.960 --> 00:00:32.460 neurophysiology

NOTE Confidence: 0.9845649

00:00:32.840 --> 00:00:33.340 laboratory,

NOTE Confidence: 0.96667594

00:00:33.800 --> 00:00:35.159 the co director of the

NOTE Confidence: 0.96667594

00:00:35.159 --> 00:00:37.420 clinical neuroscience group for neuroanalytics

NOTE Confidence: 0.99959403

00:00:37.800 --> 00:00:38.620 here at Yale.

NOTE Confidence: 0.8600318

00:00:39.400 --> 00:00:40.860 His research interests

NOTE Confidence: 0.9998187

00:00:41.265 --> 00:00:42.325 lie at the intersection

NOTE Confidence: 0.9984487

00:00:42.865 --> 00:00:43.685 of neuroscience,

NOTE Confidence: 0.9887834

00:00:44.145 --> 00:00:45.445 engineering, and mathematics.

NOTE Confidence: 0.8965456

00:00:45.905 --> 00:00:47.105 So please help me welcome

NOTE Confidence: 0.8965456

00:00:47.105 --> 00:00:48.005 doctor Zverey.

NOTE Confidence: 0.9711148

00:00:53.870 --> 00:00:54.610 Hi, everyone.

NOTE Confidence: 0.9879069

00:00:54.989 --> 00:00:56.190 Thank you for the introduction,

NOTE Confidence: 0.9879069

00:00:56.190 --> 00:00:56.910 and thank you for the

NOTE Confidence: 0.9879069

00:00:56.910 --> 00:00:58.050 invitation to present.

NOTE Confidence: 0.95059025

00:00:58.910 --> 00:01:00.350 I hope I'm clear. You

NOTE Confidence: 0.95059025

00:01:00.350 --> 00:01:01.489 can hear me properly.

NOTE Confidence: 0.9464762

00:01:02.030 --> 00:01:02.530 And,

NOTE Confidence: 0.9865001

00:01:03.710 --> 00:01:04.910 I'll be talking about the

NOTE Confidence: 0.9865001

00:01:04.910 --> 00:01:06.130 YNN group.

NOTE Confidence: 0.9419993

00:01:07.444 --> 00:01:09.284 First, let's see. Make sure

NOTE Confidence: 0.9419993

00:01:09.284 --> 00:01:10.025 this works.

NOTE Confidence: 0.9738684

00:01:21.479 --> 00:01:23.399 I I don't see this

NOTE Confidence: 0.9738684

00:01:23.399 --> 00:01:23.899 working.

NOTE Confidence: 0.9988698

00:01:30.520 --> 00:01:31.020 Sorry.

NOTE Confidence: 0.8788328

00:01:37.334 --> 00:01:37.834 Okay.

NOTE Confidence: 0.99807596

00:01:43.575 --> 00:01:44.935 I'm curious if there's anyone

NOTE Confidence: 0.99807596

00:01:44.935 --> 00:01:45.915 here who knows,

NOTE Confidence: 0.9837129

00:01:46.455 --> 00:01:47.655 more about this than I

NOTE Confidence: 0.9837129

00:01:47.655 --> 00:01:48.155 do.

NOTE Confidence: 0.9920864

00:01:54.780 --> 00:01:56.380 Oh, it looks like one

NOTE Confidence: 0.9920864

00:01:56.380 --> 00:01:57.680 minute. Let me see.

NOTE Confidence: 0.9972676

00:01:58.619 --> 00:01:59.119 Okay.

NOTE Confidence: 0.9599158

00:01:59.500 --> 00:02:00.780 Let me try now. Got

NOTE Confidence: 0.9599158

00:02:00.780 --> 00:02:01.979 it. Okay. There was a

NOTE Confidence: 0.9599158

00:02:01.979 --> 00:02:03.674 menu on there. Okay. Sorry

NOTE Confidence: 0.9599158

00:02:03.674 --> 00:02:04.234 about that.

NOTE Confidence: 0.924577

00:02:05.034 --> 00:02:06.234 There was a display up

NOTE Confidence: 0.924577

00:02:06.234 --> 00:02:07.295 on on the screen.

NOTE Confidence: 0.9965115

00:02:08.075 --> 00:02:08.575 So

NOTE Confidence: 0.9832904

00:02:09.275 --> 00:02:10.394 as part of my disclosures,

NOTE Confidence: 0.9832904

00:02:10.394 --> 00:02:11.514 I'm a cofounder, one of

NOTE Confidence: 0.9832904

00:02:11.514 --> 00:02:12.254 three cofounders

NOTE Confidence: 0.9391231

00:02:12.555 --> 00:02:14.235 for Alva Health, a Yale

NOTE Confidence: 0.9391231

00:02:14.235 --> 00:02:15.660 spin out that's working on

NOTE Confidence: 0.9391231

00:02:15.820 --> 00:02:17.260 the early detection of stroke.

NOTE Confidence: 0.9391231

00:02:17.260 --> 00:02:18.300 I will not be discussing

NOTE Confidence: 0.9391231

00:02:18.300 --> 00:02:19.740 this company's work in this

NOTE Confidence: 0.9391231

00:02:19.740 --> 00:02:20.240 presentation.

NOTE Confidence: 0.9372504

00:02:24.220 --> 00:02:25.660 The presentation is on the

NOTE Confidence: 0.9372504

00:02:25.660 --> 00:02:27.419 YNN research group. This is

NOTE Confidence: 0.9372504

00:02:27.419 --> 00:02:29.095 a group that's co directed

NOTE Confidence: 0.9372504

00:02:29.095 --> 00:02:29.595 by,

NOTE Confidence: 0.90687144

00:02:30.215 --> 00:02:32.055 doctor Dennis Spencer, Tor Eid,

NOTE Confidence: 0.90687144

00:02:32.055 --> 00:02:32.715 and myself.

NOTE Confidence: 0.95391935

00:02:33.095 --> 00:02:33.894 I worked with,

NOTE Confidence: 0.9901213

00:02:34.294 --> 00:02:36.155 doctor Spencer for three decades

NOTE Confidence: 0.9901213

00:02:36.215 --> 00:02:37.894 now. I worked with Tor

NOTE Confidence: 0.9901213

00:02:37.894 --> 00:02:39.355 for more than two decades.

NOTE Confidence: 0.9919478

00:02:40.055 --> 00:02:41.894 And, about five years back,

NOTE Confidence: 0.9919478

00:02:41.894 --> 00:02:42.394 we

NOTE Confidence: 0.9954855

00:02:42.775 --> 00:02:44.230 realized we were, you know,

NOTE Confidence: 0.9954855

00:02:44.230 --> 00:02:44.710 at

NOTE Confidence: 0.9781858

00:02:45.030 --> 00:02:45.910 we we used to attend

NOTE Confidence: 0.9781858

00:02:45.910 --> 00:02:47.850 each other's meetings. We're collaborating

NOTE Confidence: 0.9781858

00:02:47.990 --> 00:02:49.270 very strongly. We decided to

NOTE Confidence: 0.9781858

00:02:49.270 --> 00:02:50.470 come together and form a

NOTE Confidence: 0.9781858

00:02:50.470 --> 00:02:51.830 research group that brings three

NOTE Confidence: 0.9781858

00:02:51.830 --> 00:02:53.510 labs together. The three labs

NOTE Confidence: 0.9781858

00:02:53.510 --> 00:02:54.889 are the computation neurophysiology

NOTE Confidence: 0.97976214

00:02:55.190 --> 00:02:55.690 lab,

NOTE Confidence: 0.9323016

00:02:56.145 --> 00:02:57.584 the Biosense lab, which is

NOTE Confidence: 0.9323016

00:02:57.584 --> 00:02:59.665 a hardware lab, and the

NOTE Confidence: 0.9323016

00:02:59.665 --> 00:03:00.785 third lab is the AID

NOTE Confidence: 0.9323016

00:03:00.785 --> 00:03:01.285 lab.

NOTE Confidence: 0.97643346

00:03:02.145 --> 00:03:03.665 We do three things in

NOTE Confidence: 0.97643346

00:03:03.665 --> 00:03:04.165 general,

NOTE Confidence: 0.9512979

00:03:04.865 --> 00:03:06.705 in this research group. One,

NOTE Confidence: 0.9512979

00:03:06.865 --> 00:03:07.905 you know, we do very

NOTE Confidence: 0.9512979

00:03:07.905 --> 00:03:09.905 clinical translation work. It's three

NOTE Confidence: 0.9512979

00:03:10.305 --> 00:03:11.444 our efforts are threefold.

NOTE Confidence: 0.9522133

00:03:12.000 --> 00:03:13.120 First, we do research on

NOTE Confidence: 0.9522133

00:03:13.120 --> 00:03:14.720 epilepsy. And here, we study

NOTE Confidence: 0.9522133

00:03:14.720 --> 00:03:15.220 epileptogenesis

NOTE Confidence: 0.94906265

00:03:15.600 --> 00:03:16.800 of the process by which

NOTE Confidence: 0.94906265

00:03:16.800 --> 00:03:18.500 the condition of epilepsy arises.

NOTE Confidence: 0.999267

00:03:19.040 --> 00:03:19.860 We study

NOTE Confidence: 0.739962

00:03:20.160 --> 00:03:20.660 ichthyogenesis,

NOTE Confidence: 0.9993262

00:03:20.960 --> 00:03:22.500 the process by which seizures

NOTE Confidence: 0.9993262

00:03:22.560 --> 00:03:23.060 arise.

NOTE Confidence: 0.93161225

00:03:23.520 --> 00:03:24.960 We work on localization of

NOTE Confidence: 0.93161225

00:03:24.960 --> 00:03:26.260 a seizure onset area,

NOTE Confidence: 0.9934767

00:03:26.645 --> 00:03:28.105 and we work on forecasting

NOTE Confidence: 0.9934767

00:03:28.165 --> 00:03:29.845 seizures minutes and hours ahead

NOTE Confidence: 0.9934767

00:03:29.845 --> 00:03:30.505 of time.

NOTE Confidence: 0.8878833

00:03:31.525 --> 00:03:33.205 Our works on, you know,

NOTE Confidence: 0.8878833

00:03:33.205 --> 00:03:35.385 patients with medically intractable epilepsy

NOTE Confidence: 0.9882224

00:03:35.845 --> 00:03:37.365 and in animal models of

NOTE Confidence: 0.9882224

00:03:37.365 --> 00:03:37.865 epilepsy.

NOTE Confidence: 0.97514385

00:03:38.165 --> 00:03:39.445 The second general area we

NOTE Confidence: 0.97514385

00:03:39.445 --> 00:03:40.645 work on is the development

NOTE Confidence: 0.97514385

00:03:40.645 --> 00:03:42.450 of neurotechnology. And here, we

NOTE Confidence: 0.97514385

00:03:42.450 --> 00:03:44.130 work on developing sensors, brain

NOTE Confidence: 0.97514385

00:03:44.130 --> 00:03:45.110 implantable sensors,

NOTE Confidence: 0.9864852

00:03:45.970 --> 00:03:48.290 electronics, brain monitoring system, and

NOTE Confidence: 0.9864852

00:03:48.290 --> 00:03:50.070 a brain computer interface device.

NOTE Confidence: 0.9992812

00:03:50.610 --> 00:03:51.510 And the third

NOTE Confidence: 0.89836663

00:03:51.890 --> 00:03:52.850 sort of work that, you

NOTE Confidence: 0.89836663

00:03:52.850 --> 00:03:54.130 know, doctor Spencer Tor and

NOTE Confidence: 0.89836663

00:03:54.130 --> 00:03:55.990 myself do is we mentor

NOTE Confidence: 0.9884571

00:03:56.295 --> 00:03:57.034 young investigators.

NOTE Confidence: 0.96211004

00:03:57.655 --> 00:03:59.415 We mentor a full breadth

NOTE Confidence: 0.96211004

00:03:59.415 --> 00:03:59.734 of,

NOTE Confidence: 0.93559486

00:04:00.215 --> 00:04:02.295 young invest investigators from high

NOTE Confidence: 0.93559486

00:04:02.295 --> 00:04:03.495 school students currently. And this

NOTE Confidence: 0.93559486

00:04:03.495 --> 00:04:04.534 year, we've taken on four

NOTE Confidence: 0.93559486

00:04:04.534 --> 00:04:05.435 high school students,

NOTE Confidence: 0.9729887

00:04:06.055 --> 00:04:08.135 undergraduate students, graduate students, medical

NOTE Confidence: 0.9729887

00:04:08.135 --> 00:04:09.754 students, postdoctoral fellows,

NOTE Confidence: 0.7604209

00:04:10.215 --> 00:04:10.715 and,

NOTE Confidence: 0.99513996

00:04:11.170 --> 00:04:12.070 junior faculty.

NOTE Confidence: 0.93729687

00:04:13.970 --> 00:04:15.170 I'm going to be discussing

NOTE Confidence: 0.93729687

00:04:15.250 --> 00:04:17.330 I'm gonna present five distinct

NOTE Confidence: 0.93729687

00:04:17.330 --> 00:04:18.850 areas that we're working in,

NOTE Confidence: 0.93729687

00:04:18.850 --> 00:04:19.970 and that's a fair amount

NOTE Confidence: 0.93729687

00:04:19.970 --> 00:04:21.650 to take in. And it

NOTE Confidence: 0.93729687

00:04:21.650 --> 00:04:23.350 may feel a bit disparate.

NOTE Confidence: 0.93729687

00:04:23.625 --> 00:04:25.065 And to help you organize,

NOTE Confidence: 0.93729687

00:04:25.065 --> 00:04:26.345 you know, to help organize

NOTE Confidence: 0.93729687

00:04:26.345 --> 00:04:28.105 presentation and the thoughts, I

NOTE Confidence: 0.93729687

00:04:28.105 --> 00:04:28.825 want you to keep in

NOTE Confidence: 0.93729687

00:04:28.825 --> 00:04:30.585 mind two sort of organizing

NOTE Confidence: 0.93729687

00:04:30.585 --> 00:04:31.645 thoughts if you wish.

NOTE Confidence: 0.9935872

00:04:32.025 --> 00:04:33.705 One is our focus is

NOTE Confidence: 0.9935872

00:04:33.705 --> 00:04:35.865 quite strongly on the network

NOTE Confidence: 0.9935872

00:04:35.865 --> 00:04:37.725 theory of epilepsy. We're influenced

NOTE Confidence: 0.9935872

00:04:37.785 --> 00:04:38.685 by this theory.

NOTE Confidence: 0.9811907

00:04:39.160 --> 00:04:39.820 And second,

NOTE Confidence: 0.97002035

00:04:40.520 --> 00:04:42.279 the development of neurotechnology that

NOTE Confidence: 0.97002035

00:04:42.279 --> 00:04:43.560 we engage in has the

NOTE Confidence: 0.97002035

00:04:43.560 --> 00:04:45.339 long term goal of developing

NOTE Confidence: 0.99081665

00:04:45.720 --> 00:04:47.400 a closed loop feedback control

NOTE Confidence: 0.99081665

00:04:47.400 --> 00:04:49.240 of brain networks. So keep

NOTE Confidence: 0.99081665

00:04:49.240 --> 00:04:50.620 these two thoughts in mind.

NOTE Confidence: 0.95154774

00:04:51.425 --> 00:04:52.865 First, on the theories of

NOTE Confidence: 0.95154774

00:04:52.865 --> 00:04:54.625 epilepsy, there are two general

NOTE Confidence: 0.95154774

00:04:54.625 --> 00:04:56.145 theories of epilepsy. One is

NOTE Confidence: 0.95154774

00:04:56.145 --> 00:04:57.904 the focal theory. And focal

NOTE Confidence: 0.95154774

00:04:57.904 --> 00:04:59.745 theory holds that activity in

NOTE Confidence: 0.95154774

00:04:59.745 --> 00:05:01.025 a discrete area of the

NOTE Confidence: 0.95154774

00:05:01.025 --> 00:05:03.104 cortex is aberrant. This is

NOTE Confidence: 0.95154774

00:05:03.104 --> 00:05:04.085 a seizure focus.

NOTE Confidence: 0.9993054

00:05:04.550 --> 00:05:06.150 At seizure onset, the focus

NOTE Confidence: 0.9993054

00:05:06.150 --> 00:05:07.370 recruits adjacent

NOTE Confidence: 0.9679702

00:05:07.670 --> 00:05:09.529 normal tissue in its aberrance,

NOTE Confidence: 0.9679702

00:05:09.750 --> 00:05:11.110 and this builds up into

NOTE Confidence: 0.9679702

00:05:11.110 --> 00:05:11.770 a seizure.

NOTE Confidence: 0.9486812

00:05:12.390 --> 00:05:14.230 This implicates a balance between

NOTE Confidence: 0.9486812

00:05:14.230 --> 00:05:15.910 excitation and inhibition, and that

NOTE Confidence: 0.9486812

00:05:15.910 --> 00:05:17.210 out of control excitation

NOTE Confidence: 0.99929696

00:05:17.910 --> 00:05:18.970 leads to seizure.

NOTE Confidence: 0.92402846

00:05:19.575 --> 00:05:21.095 The network theory, on the

NOTE Confidence: 0.92402846

00:05:21.095 --> 00:05:22.215 other hand, you know, was

NOTE Confidence: 0.92402846

00:05:22.215 --> 00:05:23.815 proposed by Susan Spencer, my

NOTE Confidence: 0.92402846

00:05:23.815 --> 00:05:24.795 postdoc mentor,

NOTE Confidence: 0.9570611

00:05:25.175 --> 00:05:26.375 and this was proposed more

NOTE Confidence: 0.9570611

00:05:26.375 --> 00:05:27.675 than two decades back.

NOTE Confidence: 0.99651915

00:05:28.535 --> 00:05:30.455 And it holds that seizures

NOTE Confidence: 0.99651915

00:05:30.455 --> 00:05:30.955 arise

NOTE Confidence: 0.94602734

00:05:31.335 --> 00:05:34.070 from large scale networks, aberrant

NOTE Confidence: 0.94602734

00:05:34.130 --> 00:05:34.950 brain network.

NOTE Confidence: 0.97689867

00:05:35.490 --> 00:05:36.770 And it goes on the

NOTE Confidence: 0.97689867

00:05:36.770 --> 00:05:37.970 paper goes on to define

NOTE Confidence: 0.97689867

00:05:37.970 --> 00:05:39.410 a few networks. But you

NOTE Confidence: 0.97689867

00:05:39.410 --> 00:05:41.410 can generally assume a network

NOTE Confidence: 0.97689867

00:05:41.410 --> 00:05:42.530 means you have at least

NOTE Confidence: 0.97689867

00:05:42.530 --> 00:05:44.370 two regions that are interacting

NOTE Confidence: 0.97689867

00:05:44.370 --> 00:05:45.190 with each other,

NOTE Confidence: 0.9726061

00:05:45.514 --> 00:05:46.555 and there may be more.

NOTE Confidence: 0.9726061

00:05:46.555 --> 00:05:47.595 And these are the nodes.

NOTE Confidence: 0.9726061

00:05:47.595 --> 00:05:49.514 So there's node a, which

NOTE Confidence: 0.9726061

00:05:49.514 --> 00:05:50.794 has a direct connection to

NOTE Confidence: 0.9726061

00:05:50.794 --> 00:05:52.635 node b, and node b,

NOTE Confidence: 0.9726061

00:05:52.635 --> 00:05:53.755 which has a connection back

NOTE Confidence: 0.9726061

00:05:53.755 --> 00:05:55.355 to node a. At least

NOTE Confidence: 0.9726061

00:05:55.355 --> 00:05:56.095 two nodes.

NOTE Confidence: 0.9858715

00:05:56.475 --> 00:05:57.675 But just keep that in

NOTE Confidence: 0.9858715

00:05:57.675 --> 00:05:58.794 mind. We are guided by

NOTE Confidence: 0.9858715

00:05:58.794 --> 00:06:00.255 the network theory of epilepsy.

NOTE Confidence: 0.9658126

00:06:00.960 --> 00:06:02.880 The second guiding principle is,

NOTE Confidence: 0.9658126

00:06:03.120 --> 00:06:04.500 you know, we're working towards

NOTE Confidence: 0.9658126

00:06:04.560 --> 00:06:05.920 a long term goal that's

NOTE Confidence: 0.9658126

00:06:05.920 --> 00:06:07.200 close to feedback control of

NOTE Confidence: 0.9658126

00:06:07.200 --> 00:06:08.720 brain networks. Now we're all

NOTE Confidence: 0.9658126

00:06:08.720 --> 00:06:10.080 familiar with close to feedback

NOTE Confidence: 0.9658126

00:06:10.080 --> 00:06:11.200 control. The minute you walk

NOTE Confidence: 0.9658126

00:06:11.200 --> 00:06:12.320 into a room and you

NOTE Confidence: 0.9658126

00:06:12.320 --> 00:06:14.000 adjust the thermostat because it's

NOTE Confidence: 0.9658126

00:06:14.000 --> 00:06:15.380 too warm or too cold,

NOTE Confidence: 0.9889658

00:06:15.735 --> 00:06:17.014 you are part of occlusal

NOTE Confidence: 0.9889658

00:06:17.014 --> 00:06:19.415 feedback control for controlling or

NOTE Confidence: 0.9889658

00:06:19.415 --> 00:06:21.095 regulating the temperature of that

NOTE Confidence: 0.9889658

00:06:21.095 --> 00:06:21.595 room.

NOTE Confidence: 0.9652532

00:06:22.055 --> 00:06:24.375 The occlusal feedback control system

NOTE Confidence: 0.9652532

00:06:24.375 --> 00:06:25.654 is has in general three

NOTE Confidence: 0.9652532

00:06:25.654 --> 00:06:26.854 aspects to it. There are

NOTE Confidence: 0.9652532

00:06:26.854 --> 00:06:28.294 sensors that are monitoring the

NOTE Confidence: 0.9652532

00:06:28.294 --> 00:06:29.995 phenomenon that's being controlled.

NOTE Confidence: 0.9656423

00:06:30.669 --> 00:06:32.449 There is real time analysis

NOTE Confidence: 0.9656423

00:06:32.509 --> 00:06:34.289 to achieve that feedback control.

NOTE Confidence: 0.9656423

00:06:34.349 --> 00:06:35.550 And then there's the output

NOTE Confidence: 0.9656423

00:06:35.550 --> 00:06:37.470 or intervention arm that achieves

NOTE Confidence: 0.9656423

00:06:37.470 --> 00:06:39.310 the, the the performs the

NOTE Confidence: 0.9656423

00:06:39.310 --> 00:06:39.810 intervention.

NOTE Confidence: 0.97873485

00:06:40.190 --> 00:06:41.310 It's not new to us

NOTE Confidence: 0.97873485

00:06:41.310 --> 00:06:42.669 in epilepsy either. There are

NOTE Confidence: 0.97873485

00:06:42.669 --> 00:06:43.789 two devices that we are

NOTE Confidence: 0.97873485

00:06:43.789 --> 00:06:46.145 familiar with. The NeuroPACE device

NOTE Confidence: 0.95830303

00:06:46.765 --> 00:06:48.605 is a skull implantable device

NOTE Confidence: 0.95830303

00:06:48.605 --> 00:06:50.945 that continuously meant monitors electrical

NOTE Confidence: 0.95830303

00:06:51.005 --> 00:06:52.464 activity of the brain

NOTE Confidence: 0.98614466

00:06:52.765 --> 00:06:54.365 and stimulates. So it closes

NOTE Confidence: 0.98614466

00:06:54.365 --> 00:06:56.145 the loop by electrically stimulating

NOTE Confidence: 0.9989687

00:06:56.580 --> 00:06:58.120 to try and control seizures.

NOTE Confidence: 0.9796927

00:06:58.740 --> 00:07:00.839 The NeuroVista device, which unfortunately

NOTE Confidence: 0.9796927

00:07:00.979 --> 00:07:02.339 did not cross the early

NOTE Confidence: 0.9796927

00:07:02.339 --> 00:07:03.560 feasibility stage,

NOTE Confidence: 0.9214427

00:07:04.819 --> 00:07:06.659 was chest implantable device, which

NOTE Confidence: 0.9214427

00:07:06.659 --> 00:07:07.879 monitored brain activity

NOTE Confidence: 0.8601006

00:07:08.580 --> 00:07:09.080 and

NOTE Confidence: 0.9855797

00:07:09.455 --> 00:07:09.955 gave,

NOTE Confidence: 0.9485665

00:07:10.415 --> 00:07:11.935 the patient an alert on

NOTE Confidence: 0.9485665

00:07:11.935 --> 00:07:13.535 a handheld device, sort of

NOTE Confidence: 0.9485665

00:07:13.535 --> 00:07:14.495 like a blue light, you're

NOTE Confidence: 0.9485665

00:07:14.495 --> 00:07:15.375 gonna have a good day.

NOTE Confidence: 0.9485665

00:07:15.375 --> 00:07:16.995 Red light, be careful today.

NOTE Confidence: 0.973533

00:07:17.775 --> 00:07:19.295 Unfortunately, that did not make

NOTE Confidence: 0.973533

00:07:19.295 --> 00:07:21.315 it past the early feasibility

NOTE Confidence: 0.973533

00:07:21.375 --> 00:07:22.175 stage. But you can just

NOTE Confidence: 0.973533

00:07:22.175 --> 00:07:22.895 kind of get a sense

NOTE Confidence: 0.973533

00:07:22.895 --> 00:07:23.730 of, you know, how the

NOTE Confidence: 0.973533

00:07:23.730 --> 00:07:24.930 sensing is done, how the

NOTE Confidence: 0.973533

00:07:24.930 --> 00:07:26.630 computation is done, and how

NOTE Confidence: 0.973533

00:07:26.850 --> 00:07:28.370 the the loop is closed

NOTE Confidence: 0.973533

00:07:28.370 --> 00:07:30.370 by either alerting someone or

NOTE Confidence: 0.973533

00:07:30.370 --> 00:07:31.510 electrically stimulating.

NOTE Confidence: 0.89740056

00:07:32.690 --> 00:07:34.050 The five projects that I'll

NOTE Confidence: 0.89740056

00:07:34.050 --> 00:07:35.330 talk about and I you

NOTE Confidence: 0.89740056

00:07:35.330 --> 00:07:36.630 know, this is,

NOTE Confidence: 0.9753003

00:07:38.505 --> 00:07:39.625 the work in the research

NOTE Confidence: 0.9753003

00:07:39.625 --> 00:07:40.745 group is quite broad. And,

NOTE Confidence: 0.9753003

00:07:40.745 --> 00:07:41.465 you know, these are the

NOTE Confidence: 0.9753003

00:07:41.465 --> 00:07:42.205 five projects.

NOTE Confidence: 0.8252014

00:07:42.585 --> 00:07:44.045 There's the NeuroProbe project,

NOTE Confidence: 0.96927804

00:07:44.505 --> 00:07:46.525 the Yale Brain Atlas project,

NOTE Confidence: 0.93769413

00:07:46.985 --> 00:07:48.845 the Seizure Forecasting project,

NOTE Confidence: 0.96653134

00:07:49.319 --> 00:07:50.780 a project on the network

NOTE Confidence: 0.96653134

00:07:50.840 --> 00:07:52.759 brain computer interface, so development

NOTE Confidence: 0.96653134

00:07:52.759 --> 00:07:54.439 of a network brain computer

NOTE Confidence: 0.96653134

00:07:54.439 --> 00:07:54.939 interface.

NOTE Confidence: 0.9603264

00:07:55.560 --> 00:07:56.919 And the fifth project is

NOTE Confidence: 0.9603264

00:07:56.919 --> 00:07:58.860 network analysis for epilepsy surgery.

NOTE Confidence: 0.9659071

00:07:59.560 --> 00:08:00.060 My,

NOTE Confidence: 0.8993688

00:08:00.520 --> 00:08:01.639 transition through these,

NOTE Confidence: 0.9826021

00:08:02.120 --> 00:08:03.159 projects is not gonna be

NOTE Confidence: 0.9826021

00:08:03.159 --> 00:08:04.745 very linear. I'll spend more

NOTE Confidence: 0.9826021

00:08:04.745 --> 00:08:05.865 time on the first couple

NOTE Confidence: 0.9826021

00:08:05.865 --> 00:08:07.805 projects, and then the remainder

NOTE Confidence: 0.9826021

00:08:07.865 --> 00:08:09.465 will go very quickly. So

NOTE Confidence: 0.9826021

00:08:09.465 --> 00:08:10.425 don't don't fret if you

NOTE Confidence: 0.9826021

00:08:10.425 --> 00:08:11.465 think I'm, you know, very

NOTE Confidence: 0.9826021

00:08:11.465 --> 00:08:13.165 slow and you're getting bored.

NOTE Confidence: 0.9826021

00:08:13.305 --> 00:08:14.665 It goes quite fast towards

NOTE Confidence: 0.9826021

00:08:14.665 --> 00:08:15.325 the end.

NOTE Confidence: 0.91836524

00:08:16.039 --> 00:08:17.660 The first project, the NeuroProbe

NOTE Confidence: 0.91836524

00:08:17.720 --> 00:08:19.319 project, this is done in

NOTE Confidence: 0.91836524

00:08:19.319 --> 00:08:20.840 the Biosense lab. This is

NOTE Confidence: 0.91836524

00:08:20.840 --> 00:08:22.600 a hardware lab, and this

NOTE Confidence: 0.91836524

00:08:22.600 --> 00:08:23.800 is currently funded by a

NOTE Confidence: 0.91836524

00:08:23.800 --> 00:08:24.759 u g three grant to

NOTE Confidence: 0.91836524

00:08:24.759 --> 00:08:26.060 doctor Spencer and myself.

NOTE Confidence: 0.9911604

00:08:27.000 --> 00:08:27.500 And,

NOTE Confidence: 0.93613774

00:08:27.880 --> 00:08:29.240 the genesis of this project

NOTE Confidence: 0.93613774

00:08:29.240 --> 00:08:30.555 here that it dates back

NOTE Confidence: 0.93613774

00:08:30.715 --> 00:08:31.755 a number of years ago.

NOTE Confidence: 0.93613774

00:08:31.755 --> 00:08:33.195 So, you know, more than

NOTE Confidence: 0.93613774

00:08:33.195 --> 00:08:34.795 four decades back, doctor Spencer

NOTE Confidence: 0.93613774

00:08:34.795 --> 00:08:35.295 invented

NOTE Confidence: 0.7869981

00:08:35.835 --> 00:08:37.375 the Spencer depth

NOTE Confidence: 0.93974036

00:08:37.835 --> 00:08:39.434 sensor probe, which is the

NOTE Confidence: 0.93974036

00:08:39.434 --> 00:08:40.875 depth electrode used for epilepsy

NOTE Confidence: 0.93974036

00:08:40.875 --> 00:08:42.654 intracranial EEG monitoring in epilepsy.

NOTE Confidence: 0.93974036

00:08:42.920 --> 00:08:44.540 And this is marketed worldwide

NOTE Confidence: 0.93974036

00:08:44.680 --> 00:08:45.980 and used by many centers.

NOTE Confidence: 0.93974036

00:08:46.120 --> 00:08:47.640 It's marketed and sold by

NOTE Confidence: 0.93974036

00:08:47.640 --> 00:08:48.140 AdTech.

NOTE Confidence: 0.99030024

00:08:48.920 --> 00:08:50.040 A second point in the

NOTE Confidence: 0.99030024

00:08:50.040 --> 00:08:51.880 development of our thoughts towards

NOTE Confidence: 0.99030024

00:08:51.880 --> 00:08:53.180 what we are doing now

NOTE Confidence: 0.99030024

00:08:53.240 --> 00:08:54.760 was around two thousand seven

NOTE Confidence: 0.99030024

00:08:54.760 --> 00:08:56.120 when we had received an

NOTE Confidence: 0.99030024

00:08:56.120 --> 00:08:58.004 SBIR grant with a small

NOTE Confidence: 0.99030024

00:08:58.004 --> 00:08:59.144 company in Colorado

NOTE Confidence: 0.99622655

00:08:59.845 --> 00:09:00.584 to add

NOTE Confidence: 0.96013707

00:09:01.125 --> 00:09:03.065 modalities to a depth electrode.

NOTE Confidence: 0.947026

00:09:03.605 --> 00:09:05.285 And that unfortunately did not

NOTE Confidence: 0.947026

00:09:05.285 --> 00:09:07.225 proceed because of the financial

NOTE Confidence: 0.947026

00:09:07.285 --> 00:09:08.565 crisis at that time and

NOTE Confidence: 0.947026

00:09:08.565 --> 00:09:09.865 the company changed direction

NOTE Confidence: 0.99833584

00:09:10.260 --> 00:09:11.220 and did not work with

NOTE Confidence: 0.99833584

00:09:11.220 --> 00:09:12.100 us on a on a

NOTE Confidence: 0.99833584

00:09:12.100 --> 00:09:13.080 phase two application.

NOTE Confidence: 0.99256414

00:09:14.020 --> 00:09:15.380 A third point in time

NOTE Confidence: 0.99256414

00:09:15.380 --> 00:09:16.740 was about ten years back

NOTE Confidence: 0.99256414

00:09:16.740 --> 00:09:17.880 when Emily Gilmore,

NOTE Confidence: 0.9136991

00:09:18.340 --> 00:09:20.100 doctor Spencer, Mark Reid from

NOTE Confidence: 0.9136991

00:09:20.100 --> 00:09:21.860 engineering, and I came together,

NOTE Confidence: 0.9136991

00:09:21.860 --> 00:09:23.080 and we applied to Connecticut

NOTE Confidence: 0.9136991

00:09:23.220 --> 00:09:23.720 Innovation.

NOTE Confidence: 0.9598127

00:09:24.304 --> 00:09:26.065 And we proposed building a

NOTE Confidence: 0.9598127

00:09:26.065 --> 00:09:26.884 depth electrode,

NOTE Confidence: 0.9790874

00:09:27.184 --> 00:09:28.725 which would have multiple modalities,

NOTE Confidence: 0.9790874

00:09:28.944 --> 00:09:30.485 pressure, temperature, oxygen,

NOTE Confidence: 0.9233216

00:09:30.865 --> 00:09:33.985 intracranial EEG, biosensing capabilities for

NOTE Confidence: 0.9233216

00:09:33.985 --> 00:09:35.605 glutamate, GABA, lactate.

NOTE Confidence: 0.9910018

00:09:36.144 --> 00:09:37.425 And we got very sensible

NOTE Confidence: 0.9910018

00:09:37.425 --> 00:09:39.199 reviews back from the reviewers.

NOTE Confidence: 0.9619516

00:09:40.059 --> 00:09:40.940 They made a lot of

NOTE Confidence: 0.9619516

00:09:40.940 --> 00:09:42.459 sense. They said we were

NOTE Confidence: 0.9619516

00:09:42.459 --> 00:09:44.160 too ambitious, too aggressive,

NOTE Confidence: 0.9784813

00:09:44.860 --> 00:09:46.779 and they suggested focusing on

NOTE Confidence: 0.9784813

00:09:46.779 --> 00:09:47.440 a single,

NOTE Confidence: 0.9127763

00:09:49.019 --> 00:09:50.860 condition and traumatic brain injury

NOTE Confidence: 0.9127763

00:09:50.860 --> 00:09:52.079 being the one they suggested.

NOTE Confidence: 0.9815567

00:09:52.635 --> 00:09:54.095 And to pick only modalities

NOTE Confidence: 0.9815567

00:09:54.235 --> 00:09:55.675 that had predicate devices with

NOTE Confidence: 0.9815567

00:09:55.675 --> 00:09:56.335 the FDA

NOTE Confidence: 0.9785168

00:09:56.715 --> 00:09:57.375 to sort

NOTE Confidence: 0.99684286

00:09:57.835 --> 00:09:59.115 of increase our chance of

NOTE Confidence: 0.99684286

00:09:59.115 --> 00:10:00.175 passing the FDA.

NOTE Confidence: 0.9637466

00:10:00.635 --> 00:10:02.095 So since then, we focused

NOTE Confidence: 0.9637466

00:10:02.155 --> 00:10:04.155 on, you know, TBI for

NOTE Confidence: 0.9637466

00:10:04.155 --> 00:10:06.235 this, probe. We will come

NOTE Confidence: 0.9637466

00:10:06.235 --> 00:10:08.059 back to the other modalities

NOTE Confidence: 0.9637466

00:10:08.120 --> 00:10:09.240 as well. We have interest

NOTE Confidence: 0.9637466

00:10:09.240 --> 00:10:10.600 in them. But our first,

NOTE Confidence: 0.9637466

00:10:10.920 --> 00:10:11.420 deliverable

NOTE Confidence: 0.96848524

00:10:11.800 --> 00:10:12.920 is sort of focused on

NOTE Confidence: 0.96848524

00:10:12.920 --> 00:10:14.520 TBI. So what's the problem

NOTE Confidence: 0.96848524

00:10:14.520 --> 00:10:15.480 we're working on? It's, you

NOTE Confidence: 0.96848524

00:10:15.480 --> 00:10:16.760 know, patients come into the

NOTE Confidence: 0.96848524

00:10:16.760 --> 00:10:18.460 NICU. They have a primary

NOTE Confidence: 0.96848524

00:10:18.520 --> 00:10:19.020 injury,

NOTE Confidence: 0.9674468

00:10:19.665 --> 00:10:21.105 and the that's not the

NOTE Confidence: 0.9674468

00:10:21.105 --> 00:10:22.065 issue. The issue is the

NOTE Confidence: 0.9674468

00:10:22.065 --> 00:10:23.665 secondary brain injury that may

NOTE Confidence: 0.9674468

00:10:23.665 --> 00:10:24.165 manifest.

NOTE Confidence: 0.9986146

00:10:24.785 --> 00:10:26.464 And, there's a need to

NOTE Confidence: 0.9986146

00:10:26.464 --> 00:10:26.964 monitor

NOTE Confidence: 0.94056857

00:10:27.505 --> 00:10:28.945 the brain to pick up

NOTE Confidence: 0.94056857

00:10:28.945 --> 00:10:30.225 signs of the secondary brain

NOTE Confidence: 0.94056857

00:10:30.225 --> 00:10:31.860 injury and to manage it.

NOTE Confidence: 0.94056857

00:10:32.100 --> 00:10:33.540 Otherwise, you know, because if

NOTE Confidence: 0.94056857

00:10:33.540 --> 00:10:35.320 it's detected early, it's reversible

NOTE Confidence: 0.94056857

00:10:35.380 --> 00:10:36.339 and managed and can be

NOTE Confidence: 0.94056857

00:10:36.339 --> 00:10:37.160 matched well.

NOTE Confidence: 0.99353933

00:10:37.779 --> 00:10:39.059 The current state of the

NOTE Confidence: 0.99353933

00:10:39.059 --> 00:10:40.760 art is to use multimodal

NOTE Confidence: 0.99353933

00:10:40.980 --> 00:10:41.720 brain monitoring,

NOTE Confidence: 0.999332

00:10:42.339 --> 00:10:42.839 which

NOTE Confidence: 0.97274566

00:10:43.220 --> 00:10:44.980 is, you know, you place

NOTE Confidence: 0.97274566

00:10:44.980 --> 00:10:45.480 multiple

NOTE Confidence: 0.98994046

00:10:46.574 --> 00:10:47.074 sensors

NOTE Confidence: 0.9370414

00:10:47.774 --> 00:10:49.054 in typically in the frontal

NOTE Confidence: 0.9370414

00:10:49.054 --> 00:10:50.894 lobe and this illustrates, you

NOTE Confidence: 0.9370414

00:10:50.894 --> 00:10:51.694 know, the picture on the

NOTE Confidence: 0.9370414

00:10:51.694 --> 00:10:53.054 right sorry, on the left

NOTE Confidence: 0.9370414

00:10:53.054 --> 00:10:53.554 illustrates

NOTE Confidence: 0.99100274

00:10:54.095 --> 00:10:55.454 the placement of probes and

NOTE Confidence: 0.99100274

00:10:55.454 --> 00:10:56.574 the, you know, measurement of

NOTE Confidence: 0.99100274

00:10:56.574 --> 00:10:57.475 multiple modalities.

NOTE Confidence: 0.9807675

00:10:58.730 --> 00:11:00.410 The current challenges with this

NOTE Confidence: 0.9807675

00:11:00.410 --> 00:11:02.269 are, one, each probe

NOTE Confidence: 0.92730993

00:11:02.730 --> 00:11:04.570 that's placed requires special sort

NOTE Confidence: 0.92730993

00:11:04.570 --> 00:11:05.550 of separate wiring,

NOTE Confidence: 0.8953827

00:11:06.089 --> 00:11:08.269 calibration, maintenance, and then multiple

NOTE Confidence: 0.8953827

00:11:08.329 --> 00:11:08.829 monitors.

NOTE Confidence: 0.98276854

00:11:09.209 --> 00:11:10.570 And the data are not

NOTE Confidence: 0.98276854

00:11:10.570 --> 00:11:12.250 synchronized or not collected in

NOTE Confidence: 0.98276854

00:11:12.250 --> 00:11:13.665 a manner that, sort of

NOTE Confidence: 0.98276854

00:11:13.665 --> 00:11:14.485 lend themselves

NOTE Confidence: 0.9811116

00:11:14.785 --> 00:11:16.865 necessarily to easy analysis on

NOTE Confidence: 0.9811116

00:11:16.865 --> 00:11:18.385 a single computer, on a

NOTE Confidence: 0.9811116

00:11:18.385 --> 00:11:20.465 single monitor. The data collected

NOTE Confidence: 0.9811116

00:11:20.465 --> 00:11:21.905 by disparate systems that have

NOTE Confidence: 0.9811116

00:11:21.905 --> 00:11:23.205 different a to d resolutions,

NOTE Confidence: 0.99602556

00:11:23.665 --> 00:11:25.985 different clocks, different different sampling

NOTE Confidence: 0.99602556

00:11:25.985 --> 00:11:26.485 frequencies.

NOTE Confidence: 0.94713414

00:11:27.270 --> 00:11:28.550 The equipment also takes up

NOTE Confidence: 0.94713414

00:11:28.550 --> 00:11:29.510 a fair amount of space

NOTE Confidence: 0.94713414

00:11:29.510 --> 00:11:30.470 and there is an issue

NOTE Confidence: 0.94713414

00:11:30.470 --> 00:11:32.310 with cable management, which takes

NOTE Confidence: 0.94713414

00:11:32.310 --> 00:11:33.610 a fair amount of nursing

NOTE Confidence: 0.94713414

00:11:33.670 --> 00:11:34.890 staff's time.

NOTE Confidence: 0.95409495

00:11:35.510 --> 00:11:37.290 The need is for fast

NOTE Confidence: 0.95409495

00:11:37.350 --> 00:11:39.350 accurate data to guide critical

NOTE Confidence: 0.95409495

00:11:39.350 --> 00:11:40.650 sort of patient care decisions.

NOTE Confidence: 0.95007896

00:11:41.175 --> 00:11:42.535 And if this is achieved,

NOTE Confidence: 0.95007896

00:11:42.535 --> 00:11:43.815 it can help with,

NOTE Confidence: 0.999128

00:11:44.295 --> 00:11:46.554 protecting against secondary brain injury.

NOTE Confidence: 0.9917525

00:11:47.095 --> 00:11:48.615 Our solution for this is

NOTE Confidence: 0.9917525

00:11:48.615 --> 00:11:49.975 sort of it's not very

NOTE Confidence: 0.9917525

00:11:49.975 --> 00:11:51.675 innovative. It's a single probe

NOTE Confidence: 0.9917525

00:11:51.815 --> 00:11:52.875 that integrates

NOTE Confidence: 0.9997487

00:11:53.255 --> 00:11:54.155 multiple modalities

NOTE Confidence: 0.9260807

00:11:54.615 --> 00:11:56.670 on a single implantable device.

NOTE Confidence: 0.96235263

00:11:57.230 --> 00:11:58.110 A single set of elect

NOTE Confidence: 0.96235263

00:11:58.190 --> 00:11:59.389 so, you know, the the

NOTE Confidence: 0.96235263

00:11:59.389 --> 00:12:01.170 scheme shown on the left

NOTE Confidence: 0.96235263

00:12:01.230 --> 00:12:03.089 is the brain implantable probe.

NOTE Confidence: 0.96235263

00:12:03.230 --> 00:12:04.670 The second component is this

NOTE Confidence: 0.96235263

00:12:04.670 --> 00:12:06.510 custom set of electronics, which

NOTE Confidence: 0.96235263

00:12:06.510 --> 00:12:07.570 we call the Neuralink.

NOTE Confidence: 0.998558

00:12:08.350 --> 00:12:10.029 And the third component is

NOTE Confidence: 0.998558

00:12:10.029 --> 00:12:10.610 a monitor

NOTE Confidence: 0.9995206

00:12:11.125 --> 00:12:12.745 that displays all the data

NOTE Confidence: 0.9995206

00:12:12.805 --> 00:12:14.585 that's received from that probe.

NOTE Confidence: 0.9039196

00:12:15.205 --> 00:12:16.885 The probe schematic is shown

NOTE Confidence: 0.9039196

00:12:16.885 --> 00:12:18.325 here, you know, measures pressure,

NOTE Confidence: 0.9039196

00:12:18.325 --> 00:12:20.245 oxygen, temperature, and integrating the

NOTE Confidence: 0.9039196

00:12:20.245 --> 00:12:21.845 EEG. It has equal or

NOTE Confidence: 0.9039196

00:12:21.845 --> 00:12:24.025 better sensitivity than predicate devices.

NOTE Confidence: 0.9444629

00:12:24.450 --> 00:12:26.370 It's a single point sort

NOTE Confidence: 0.9444629

00:12:26.370 --> 00:12:28.710 of synchronized sensor data stream.

NOTE Confidence: 0.9444629

00:12:28.929 --> 00:12:30.530 A single output connection comes

NOTE Confidence: 0.9444629

00:12:30.530 --> 00:12:31.330 out of this, goes to

NOTE Confidence: 0.9444629

00:12:31.330 --> 00:12:32.550 a single set of electronics.

NOTE Confidence: 0.98916095

00:12:33.010 --> 00:12:34.370 We don't need a surgeon

NOTE Confidence: 0.98916095

00:12:34.370 --> 00:12:35.830 or OR for placement.

NOTE Confidence: 0.99823755

00:12:36.290 --> 00:12:37.410 It can be done in

NOTE Confidence: 0.99823755

00:12:37.410 --> 00:12:38.070 the field.

NOTE Confidence: 0.9262549

00:12:38.554 --> 00:12:39.355 It can be done at

NOTE Confidence: 0.9262549

00:12:39.355 --> 00:12:39.934 the bed.

NOTE Confidence: 0.96066993

00:12:40.315 --> 00:12:42.075 And the solution can you

NOTE Confidence: 0.96066993

00:12:42.075 --> 00:12:42.875 know, it's an aspect of

NOTE Confidence: 0.96066993

00:12:42.875 --> 00:12:43.995 the solution that makes it

NOTE Confidence: 0.96066993

00:12:43.995 --> 00:12:45.434 portable, which could be of

NOTE Confidence: 0.96066993

00:12:45.434 --> 00:12:46.575 interest for the military.

NOTE Confidence: 0.96637607

00:12:47.675 --> 00:12:49.855 In addition to the modalities

NOTE Confidence: 0.96637607

00:12:49.995 --> 00:12:51.035 and what I've shown you

NOTE Confidence: 0.96637607

00:12:51.035 --> 00:12:52.500 on the probe, the electronics

NOTE Confidence: 0.96637607

00:12:52.559 --> 00:12:54.259 also measures scalp EEG,

NOTE Confidence: 0.9871043

00:12:55.040 --> 00:12:56.800 as a fifth modality. And

NOTE Confidence: 0.9871043

00:12:56.800 --> 00:12:57.839 in the future, we have

NOTE Confidence: 0.9871043

00:12:57.839 --> 00:12:59.380 in mind tying this envelope,

NOTE Confidence: 0.96120965

00:13:00.000 --> 00:13:02.100 cloud based system for advanced

NOTE Confidence: 0.96120965

00:13:02.160 --> 00:13:02.740 sort of,

NOTE Confidence: 0.96198535

00:13:03.679 --> 00:13:05.199 analysis that could be performed

NOTE Confidence: 0.96198535

00:13:05.199 --> 00:13:06.880 and data archival and research

NOTE Confidence: 0.96198535

00:13:06.880 --> 00:13:07.380 usage.

NOTE Confidence: 0.9274305

00:13:09.335 --> 00:13:10.775 The advantages of what we're

NOTE Confidence: 0.9274305

00:13:10.775 --> 00:13:12.175 proposing is, you know, multiple

NOTE Confidence: 0.9274305

00:13:12.375 --> 00:13:13.495 this table is constructed in

NOTE Confidence: 0.9274305

00:13:13.495 --> 00:13:14.695 a certain way that the

NOTE Confidence: 0.9274305

00:13:14.695 --> 00:13:15.815 metrics are listed on the

NOTE Confidence: 0.9274305

00:13:15.815 --> 00:13:17.655 left. The current practice is

NOTE Confidence: 0.9274305

00:13:17.655 --> 00:13:19.275 listed in the central column

NOTE Confidence: 0.9274305

00:13:19.575 --> 00:13:21.175 and the goal of our

NOTE Confidence: 0.9274305

00:13:21.175 --> 00:13:23.059 solutions listed on the right

NOTE Confidence: 0.9274305

00:13:23.140 --> 00:13:24.279 in the right column.

NOTE Confidence: 0.9157878

00:13:24.580 --> 00:13:25.860 And typically, in the current

NOTE Confidence: 0.9157878

00:13:25.860 --> 00:13:27.320 practice, you'll see multiple

NOTE Confidence: 0.9958732

00:13:28.339 --> 00:13:30.500 probes, multiple cranial access sites,

NOTE Confidence: 0.9958732

00:13:30.500 --> 00:13:33.380 multiple electronic devices, multiple monitors,

NOTE Confidence: 0.9958732

00:13:33.380 --> 00:13:34.679 multiple data streams,

NOTE Confidence: 0.9176377

00:13:35.084 --> 00:13:36.444 multiple sort of the location

NOTE Confidence: 0.9176377

00:13:36.444 --> 00:13:37.485 of sensors. There are multiple

NOTE Confidence: 0.9176377

00:13:37.485 --> 00:13:39.504 sensors. They're not exactly collocated.

NOTE Confidence: 0.9836721

00:13:40.204 --> 00:13:41.725 While if you look on

NOTE Confidence: 0.9836721

00:13:41.725 --> 00:13:43.564 the neuroprobe column, you know,

NOTE Confidence: 0.9836721

00:13:43.564 --> 00:13:45.084 this is all single. There's

NOTE Confidence: 0.9836721

00:13:45.084 --> 00:13:46.605 a single probe, a single

NOTE Confidence: 0.9836721

00:13:46.605 --> 00:13:48.225 access site, a single device,

NOTE Confidence: 0.8846784

00:13:48.699 --> 00:13:50.139 a single data stream, a

NOTE Confidence: 0.8846784

00:13:50.139 --> 00:13:51.660 single monitor, etcetera. So you

NOTE Confidence: 0.8846784

00:13:51.660 --> 00:13:52.559 see the advantages

NOTE Confidence: 0.6307279

00:13:53.420 --> 00:13:53.920 essentially

NOTE Confidence: 0.99062127

00:13:54.620 --> 00:13:55.920 reducing the complexity

NOTE Confidence: 0.9974179

00:13:56.300 --> 00:13:57.820 of the current practice to

NOTE Confidence: 0.9974179

00:13:57.820 --> 00:13:58.800 a single solution.

NOTE Confidence: 0.9456442

00:14:00.139 --> 00:14:01.660 Three rows from the end,

NOTE Confidence: 0.9456442

00:14:01.660 --> 00:14:02.505 you know, there is the

NOTE Confidence: 0.9456442

00:14:02.585 --> 00:14:04.265 cost per bed, equipment cost.

NOTE Confidence: 0.9456442

00:14:04.265 --> 00:14:05.485 So the cost for instrumenting

NOTE Confidence: 0.9456442

00:14:05.545 --> 00:14:06.905 a current system is roughly

NOTE Confidence: 0.9456442

00:14:06.905 --> 00:14:08.345 about hundred and seventy five

NOTE Confidence: 0.9456442

00:14:08.345 --> 00:14:09.625 k. We think we can

NOTE Confidence: 0.9456442

00:14:09.625 --> 00:14:11.645 bring this below fifty k.

NOTE Confidence: 0.9938653

00:14:13.225 --> 00:14:14.345 And, you know, as mentioned

NOTE Confidence: 0.9938653

00:14:14.345 --> 00:14:15.785 earlier, we have a portable

NOTE Confidence: 0.9938653

00:14:15.785 --> 00:14:17.005 version of our solution.

NOTE Confidence: 0.95218456

00:14:18.280 --> 00:14:19.720 In progress towards this, we've

NOTE Confidence: 0.95218456

00:14:19.720 --> 00:14:20.680 been, you know, we've the

NOTE Confidence: 0.95218456

00:14:20.680 --> 00:14:22.360 NIQG three grant has been

NOTE Confidence: 0.95218456

00:14:22.360 --> 00:14:23.900 active for three years now.

NOTE Confidence: 0.9334375

00:14:24.440 --> 00:14:26.520 We have developed pressure, temperature,

NOTE Confidence: 0.9334375

00:14:26.520 --> 00:14:28.760 oxygen, integrated EEG sensors. We've

NOTE Confidence: 0.9334375

00:14:28.760 --> 00:14:30.440 developed the three components, the

NOTE Confidence: 0.9334375

00:14:30.440 --> 00:14:32.625 probe, the electronics, the monitor.

NOTE Confidence: 0.8987825

00:14:33.085 --> 00:14:34.445 We match the performance of

NOTE Confidence: 0.8987825

00:14:34.445 --> 00:14:35.965 predicate devices. So, you know,

NOTE Confidence: 0.8987825

00:14:35.965 --> 00:14:37.005 in that sense, we can

NOTE Confidence: 0.8987825

00:14:37.085 --> 00:14:38.045 we we know we could

NOTE Confidence: 0.8987825

00:14:38.205 --> 00:14:40.225 our design beats predicate devices.

NOTE Confidence: 0.96182114

00:14:40.525 --> 00:14:41.745 We've addressed sterilization,

NOTE Confidence: 0.9945551

00:14:42.365 --> 00:14:44.225 packaging, shelf life issues.

NOTE Confidence: 0.9535216

00:14:44.660 --> 00:14:46.420 We've initiated sort of design

NOTE Confidence: 0.9535216

00:14:46.420 --> 00:14:48.760 for manufacturing, design control, QMS.

NOTE Confidence: 0.99598455

00:14:49.140 --> 00:14:50.500 These are things that are

NOTE Confidence: 0.99598455

00:14:50.500 --> 00:14:52.440 needed for medical device design

NOTE Confidence: 0.99598455

00:14:52.660 --> 00:14:53.320 and development.

NOTE Confidence: 0.9879966

00:14:53.780 --> 00:14:55.320 We've developed a patent portfolio

NOTE Confidence: 0.98724383

00:14:55.700 --> 00:14:57.835 strategy. We've completed two presubmissions

NOTE Confidence: 0.98724383

00:14:57.975 --> 00:14:59.335 with the FDA, both of

NOTE Confidence: 0.98724383

00:14:59.335 --> 00:15:00.555 which have gone quite well.

NOTE Confidence: 0.98655343

00:15:01.095 --> 00:15:02.215 We're running out of funds

NOTE Confidence: 0.98655343

00:15:02.215 --> 00:15:03.095 right now, but we still

NOTE Confidence: 0.98655343

00:15:03.095 --> 00:15:04.375 have to do work towards

NOTE Confidence: 0.98655343

00:15:04.375 --> 00:15:06.235 regulatory evaluation approval.

NOTE Confidence: 0.9854238

00:15:06.615 --> 00:15:08.295 And then at some point,

NOTE Confidence: 0.9854238

00:15:08.295 --> 00:15:09.175 if we have the funds,

NOTE Confidence: 0.9854238

00:15:09.175 --> 00:15:10.855 we will transition into an

NOTE Confidence: 0.9854238

00:15:10.855 --> 00:15:12.120 early feasibility study.

NOTE Confidence: 0.9217268

00:15:12.680 --> 00:15:13.640 A model of the probe

NOTE Confidence: 0.9217268

00:15:13.640 --> 00:15:14.360 is shown at the bottom

NOTE Confidence: 0.9217268

00:15:14.360 --> 00:15:15.080 and a model of the

NOTE Confidence: 0.9217268

00:15:15.080 --> 00:15:16.279 monitor shown at the bottom

NOTE Confidence: 0.9217268

00:15:16.279 --> 00:15:18.040 showing all the modalities and,

NOTE Confidence: 0.9217268

00:15:18.040 --> 00:15:19.320 you know, on a time

NOTE Confidence: 0.9217268

00:15:19.320 --> 00:15:20.140 lock screen.

NOTE Confidence: 0.97867125

00:15:21.160 --> 00:15:22.279 As we've done this in

NOTE Confidence: 0.97867125

00:15:22.279 --> 00:15:23.480 the lab, we've developed other

NOTE Confidence: 0.97867125

00:15:23.480 --> 00:15:24.600 sensors as well. You know,

NOTE Confidence: 0.97867125

00:15:24.600 --> 00:15:25.720 keep in mind our earlier

NOTE Confidence: 0.97867125

00:15:25.720 --> 00:15:26.940 interest in measuring

NOTE Confidence: 0.992506

00:15:27.705 --> 00:15:29.545 glutamate, GABA, lactate on the

NOTE Confidence: 0.992506

00:15:29.545 --> 00:15:30.525 probe as well.

NOTE Confidence: 0.9930909

00:15:30.905 --> 00:15:32.265 So we have a hardware

NOTE Confidence: 0.9930909

00:15:32.265 --> 00:15:33.245 lab. We've got,

NOTE Confidence: 0.851739

00:15:33.865 --> 00:15:35.465 Jesus, who's here in in

NOTE Confidence: 0.851739

00:15:35.465 --> 00:15:37.225 UA, who unfortunately we lost

NOTE Confidence: 0.851739

00:15:37.225 --> 00:15:38.925 in fall to Silicon Valley,

NOTE Confidence: 0.9986054

00:15:39.545 --> 00:15:41.065 have have done excellent work

NOTE Confidence: 0.9986054

00:15:41.065 --> 00:15:41.760 in the lab.

NOTE Confidence: 0.9453656

00:15:42.480 --> 00:15:43.680 On the left, you see

NOTE Confidence: 0.9453656

00:15:43.680 --> 00:15:44.420 a wafer,

NOTE Confidence: 0.9164606

00:15:45.680 --> 00:15:47.040 you know, that we develop

NOTE Confidence: 0.9164606

00:15:47.040 --> 00:15:48.400 these wafers in Yale clean

NOTE Confidence: 0.9164606

00:15:48.400 --> 00:15:49.920 room, in the Yale clean

NOTE Confidence: 0.9164606

00:15:49.920 --> 00:15:51.120 rooms, and we the this

NOTE Confidence: 0.9164606

00:15:51.120 --> 00:15:52.160 is the design for the

NOTE Confidence: 0.9164606

00:15:52.160 --> 00:15:53.140 oxygen sensor.

NOTE Confidence: 0.9387478

00:15:53.600 --> 00:15:55.120 And, they come out in

NOTE Confidence: 0.9387478

00:15:55.120 --> 00:15:56.415 a wafer of this nature.

NOTE Confidence: 0.9387478

00:15:56.574 --> 00:15:57.875 On the right, you see

NOTE Confidence: 0.8588413

00:15:58.255 --> 00:16:00.355 a a chip like structure,

NOTE Confidence: 0.8588413

00:16:00.654 --> 00:16:02.514 which has got microfluidic channels

NOTE Confidence: 0.9653581

00:16:02.815 --> 00:16:04.255 in which we use to

NOTE Confidence: 0.9653581

00:16:04.255 --> 00:16:05.855 test a second device that

NOTE Confidence: 0.9653581

00:16:05.855 --> 00:16:06.894 we make in the lab,

NOTE Confidence: 0.9653581

00:16:06.894 --> 00:16:08.014 which is called the silicon

NOTE Confidence: 0.9653581

00:16:08.255 --> 00:16:09.555 it's called silicon nanowires.

NOTE Confidence: 0.97199893

00:16:10.150 --> 00:16:11.590 Silicon nanowires were brought over

NOTE Confidence: 0.97199893

00:16:11.590 --> 00:16:12.870 from engineering because one of

NOTE Confidence: 0.97199893

00:16:12.870 --> 00:16:14.810 our collaborators there, Mark Reid,

NOTE Confidence: 0.96533453

00:16:15.270 --> 00:16:16.870 unfortunately passed away when we

NOTE Confidence: 0.96533453

00:16:16.870 --> 00:16:18.630 started this project. And his

NOTE Confidence: 0.96533453

00:16:18.630 --> 00:16:19.750 lab had developed this, and

NOTE Confidence: 0.96533453

00:16:19.750 --> 00:16:20.550 there was a chance that

NOTE Confidence: 0.96533453

00:16:20.550 --> 00:16:21.795 this was not gonna be

NOTE Confidence: 0.96533453

00:16:21.954 --> 00:16:23.475 carried on at Yale. So

NOTE Confidence: 0.96533453

00:16:23.475 --> 00:16:24.514 we brought that over from

NOTE Confidence: 0.96533453

00:16:24.514 --> 00:16:25.654 engineering into,

NOTE Confidence: 0.97218156

00:16:26.195 --> 00:16:27.875 our lab. And we've been

NOTE Confidence: 0.97218156

00:16:27.875 --> 00:16:29.475 successful at being able to

NOTE Confidence: 0.97218156

00:16:29.475 --> 00:16:29.975 recreate,

NOTE Confidence: 0.96194285

00:16:30.995 --> 00:16:32.454 these nanowire sensors.

NOTE Confidence: 0.9538686

00:16:32.834 --> 00:16:33.635 So the the, you know,

NOTE Confidence: 0.9538686

00:16:33.635 --> 00:16:35.175 the the two sort of

NOTE Confidence: 0.9538686

00:16:35.280 --> 00:16:36.800 sets of images here, the

NOTE Confidence: 0.9538686

00:16:36.800 --> 00:16:38.400 top one shows multiple silicon

NOTE Confidence: 0.9538686

00:16:38.400 --> 00:16:39.840 nanowires in a sensing area.

NOTE Confidence: 0.9538686

00:16:39.840 --> 00:16:41.040 The bottom one shows a

NOTE Confidence: 0.9538686

00:16:41.040 --> 00:16:42.260 single silicon nanowire.

NOTE Confidence: 0.9990759

00:16:42.560 --> 00:16:43.940 These are very tiny

NOTE Confidence: 0.9984642

00:16:44.320 --> 00:16:45.380 sensing areas.

NOTE Confidence: 0.9500464

00:16:45.840 --> 00:16:47.280 The key aspect about them

NOTE Confidence: 0.9500464

00:16:47.280 --> 00:16:48.880 is they're built on in

NOTE Confidence: 0.9500464

00:16:48.880 --> 00:16:49.875 the back end of of

NOTE Confidence: 0.9500464

00:16:49.875 --> 00:16:51.655 the sensor is the transistor.

NOTE Confidence: 0.97917795

00:16:52.035 --> 00:16:52.995 So as soon as the

NOTE Confidence: 0.97917795

00:16:52.995 --> 00:16:54.595 sensing performed on the sensing

NOTE Confidence: 0.97917795

00:16:54.595 --> 00:16:56.435 surface, the signal essentially is

NOTE Confidence: 0.97917795

00:16:56.435 --> 00:16:57.255 getting amplified.

NOTE Confidence: 0.9862976

00:16:57.635 --> 00:16:58.595 And so we can pick

NOTE Confidence: 0.9862976

00:16:58.595 --> 00:17:00.115 up very tiny signals with

NOTE Confidence: 0.9862976

00:17:00.115 --> 00:17:00.615 this.

NOTE Confidence: 0.9234086

00:17:01.395 --> 00:17:03.395 Some, results. So this was

NOTE Confidence: 0.9234086

00:17:03.395 --> 00:17:04.615 published last year,

NOTE Confidence: 0.9239712

00:17:04.950 --> 00:17:06.630 work done by Jesus, UA,

NOTE Confidence: 0.9239712

00:17:06.630 --> 00:17:07.369 and Wahoo,

NOTE Confidence: 0.9418983

00:17:08.149 --> 00:17:09.510 showing that we can measure

NOTE Confidence: 0.9418983

00:17:09.510 --> 00:17:10.890 GABA and PBS.

NOTE Confidence: 0.98833907

00:17:11.510 --> 00:17:12.570 And, we've,

NOTE Confidence: 0.980872

00:17:13.270 --> 00:17:15.190 you know, functionalized these sensors

NOTE Confidence: 0.980872

00:17:15.190 --> 00:17:15.690 for

NOTE Confidence: 0.9787621

00:17:15.990 --> 00:17:18.169 measuring GABA, glutamate, and lactate.

NOTE Confidence: 0.9787621

00:17:18.390 --> 00:17:19.690 And the limits of detection

NOTE Confidence: 0.9787621

00:17:19.750 --> 00:17:21.155 are in the femtomolar.

NOTE Confidence: 0.9774072

00:17:21.535 --> 00:17:22.655 That's ten to the minus

NOTE Confidence: 0.9774072

00:17:22.655 --> 00:17:23.155 fifteen.

NOTE Confidence: 0.9948027

00:17:23.695 --> 00:17:24.195 Well,

NOTE Confidence: 0.9770543

00:17:25.055 --> 00:17:26.735 you know, well beyond what

NOTE Confidence: 0.9770543

00:17:26.735 --> 00:17:28.115 our needs are for,

NOTE Confidence: 0.9588897

00:17:28.655 --> 00:17:30.255 measurements in the brain. So

NOTE Confidence: 0.9588897

00:17:30.255 --> 00:17:31.535 this is quite good. It's

NOTE Confidence: 0.9588897

00:17:31.535 --> 00:17:33.510 a very excellent progress. More

NOTE Confidence: 0.9588897

00:17:33.510 --> 00:17:34.010 recently,

NOTE Confidence: 0.9947718

00:17:34.710 --> 00:17:36.730 Jesus presented this work

NOTE Confidence: 0.932061

00:17:37.109 --> 00:17:38.790 with a photonic sensor that's

NOTE Confidence: 0.932061

00:17:38.790 --> 00:17:39.910 being developed in the lab

NOTE Confidence: 0.932061

00:17:39.910 --> 00:17:41.430 as well. So the photonic

NOTE Confidence: 0.932061

00:17:41.430 --> 00:17:43.670 sensor is shown a schematic

NOTE Confidence: 0.932061

00:17:43.670 --> 00:17:44.970 shown in the top left.

NOTE Confidence: 0.954177

00:17:45.430 --> 00:17:46.869 You have a signal part.

NOTE Confidence: 0.954177

00:17:46.869 --> 00:17:48.484 Normally in these sensors, you'd

NOTE Confidence: 0.954177

00:17:48.484 --> 00:17:50.005 have input light going in

NOTE Confidence: 0.954177

00:17:50.005 --> 00:17:51.445 from one edge and coming

NOTE Confidence: 0.954177

00:17:51.445 --> 00:17:52.665 out from the other edge.

NOTE Confidence: 0.954177

00:17:52.885 --> 00:17:54.585 We had in mind integrating

NOTE Confidence: 0.954177

00:17:54.645 --> 00:17:56.085 this into our depth select

NOTE Confidence: 0.954177

00:17:56.325 --> 00:17:58.405 into our neuroprobe device. So

NOTE Confidence: 0.954177

00:17:58.405 --> 00:17:59.925 we need to bend the

NOTE Confidence: 0.954177

00:17:59.925 --> 00:18:01.445 part to bring the light

NOTE Confidence: 0.954177

00:18:01.445 --> 00:18:02.725 back in the same direction

NOTE Confidence: 0.954177

00:18:02.725 --> 00:18:04.039 that you know, same point

NOTE Confidence: 0.954177

00:18:04.039 --> 00:18:04.700 where it

NOTE Confidence: 0.97469735

00:18:05.080 --> 00:18:06.200 entered. And, hence, you know,

NOTE Confidence: 0.97469735

00:18:06.200 --> 00:18:07.659 that's the structure for

NOTE Confidence: 0.9480759

00:18:07.960 --> 00:18:08.700 it. And

NOTE Confidence: 0.96242535

00:18:09.720 --> 00:18:11.580 it looks like these results

NOTE Confidence: 0.96242535

00:18:11.640 --> 00:18:12.619 are not loading.

NOTE Confidence: 0.9968239

00:18:13.400 --> 00:18:14.840 Okay. I I'm not sure

NOTE Confidence: 0.9968239

00:18:14.840 --> 00:18:16.380 why this is not loading.

NOTE Confidence: 0.95333624

00:18:19.395 --> 00:18:21.315 Okay. For some reason, these

NOTE Confidence: 0.95333624

00:18:21.315 --> 00:18:22.355 dots are not loading. You'd

NOTE Confidence: 0.95333624

00:18:22.355 --> 00:18:23.155 have to just take my

NOTE Confidence: 0.95333624

00:18:23.155 --> 00:18:24.775 word, that, you know, we've

NOTE Confidence: 0.95333624

00:18:24.994 --> 00:18:26.434 we've achieved some level of

NOTE Confidence: 0.95333624

00:18:26.434 --> 00:18:28.835 success with detecting GABA and

NOTE Confidence: 0.95333624

00:18:28.835 --> 00:18:30.355 glutamate. The limits of detection

NOTE Confidence: 0.95333624

00:18:30.355 --> 00:18:31.414 are listed about

NOTE Confidence: 0.8611765

00:18:31.720 --> 00:18:32.760 down to fifteen,

NOTE Confidence: 0.98658013

00:18:33.080 --> 00:18:34.380 nanomolar for GABA

NOTE Confidence: 0.9566126

00:18:34.680 --> 00:18:36.700 and twenty five micro picomolar

NOTE Confidence: 0.9566126

00:18:36.920 --> 00:18:37.660 for glutamate.

NOTE Confidence: 0.97809577

00:18:38.360 --> 00:18:39.640 These are early results that

NOTE Confidence: 0.97809577

00:18:39.640 --> 00:18:41.420 were just presented last month

NOTE Confidence: 0.97809577

00:18:41.560 --> 00:18:41.800 at,

NOTE Confidence: 0.9750844

00:18:42.440 --> 00:18:42.940 Photonics

NOTE Confidence: 0.93105614

00:18:43.240 --> 00:18:43.640 West,

NOTE Confidence: 0.95835274

00:18:44.120 --> 00:18:45.720 and, this will be sort

NOTE Confidence: 0.95835274

00:18:45.720 --> 00:18:46.840 of be worked up more

NOTE Confidence: 0.95835274

00:18:46.840 --> 00:18:47.535 into that.

NOTE Confidence: 0.9986952

00:18:48.415 --> 00:18:49.775 So in this area of

NOTE Confidence: 0.9986952

00:18:49.775 --> 00:18:50.175 work,

NOTE Confidence: 0.96035546

00:18:50.815 --> 00:18:52.815 the deliver deliverables we're working

NOTE Confidence: 0.96035546

00:18:52.815 --> 00:18:54.895 towards are, one, we think

NOTE Confidence: 0.96035546

00:18:54.895 --> 00:18:56.415 embedded within our solution is

NOTE Confidence: 0.96035546

00:18:56.415 --> 00:18:57.935 a low cost scalp EEG

NOTE Confidence: 0.96035546

00:18:57.935 --> 00:18:59.455 system, which will should be

NOTE Confidence: 0.96035546

00:18:59.455 --> 00:19:00.895 ready by q three of

NOTE Confidence: 0.96035546

00:19:00.895 --> 00:19:02.655 this year as a working

NOTE Confidence: 0.96035546

00:19:02.655 --> 00:19:03.155 prototype,

NOTE Confidence: 0.9897106

00:19:03.800 --> 00:19:05.900 fully functional scalp EEG system.

NOTE Confidence: 0.89621294

00:19:06.520 --> 00:19:08.280 We would also have a

NOTE Confidence: 0.89621294

00:19:08.280 --> 00:19:09.880 a working prototype for the

NOTE Confidence: 0.89621294

00:19:09.880 --> 00:19:12.040 pressure, g, temperature, and scalp

NOTE Confidence: 0.89621294

00:19:12.040 --> 00:19:13.980 EEG version of the NeuroProbe

NOTE Confidence: 0.89621294

00:19:14.119 --> 00:19:16.220 system. That's where they'll, implantable

NOTE Confidence: 0.89621294

00:19:16.359 --> 00:19:17.800 probe, the electronics, and the

NOTE Confidence: 0.89621294

00:19:17.800 --> 00:19:18.300 monitor.

NOTE Confidence: 0.99548614

00:19:18.875 --> 00:19:20.635 And then, we're waiting for

NOTE Confidence: 0.99548614

00:19:20.635 --> 00:19:21.755 more funding to come in

NOTE Confidence: 0.99548614

00:19:21.755 --> 00:19:23.515 to add in the oxygen

NOTE Confidence: 0.99548614

00:19:23.515 --> 00:19:24.015 sensor,

NOTE Confidence: 0.9787225

00:19:24.315 --> 00:19:25.675 which we will call sort

NOTE Confidence: 0.9787225

00:19:25.675 --> 00:19:26.715 of version two of the

NOTE Confidence: 0.9787225

00:19:26.715 --> 00:19:28.395 solution. And in the future,

NOTE Confidence: 0.9787225

00:19:28.395 --> 00:19:29.515 at some point, depending on

NOTE Confidence: 0.9787225

00:19:29.515 --> 00:19:30.494 funding that

NOTE Confidence: 0.9191518

00:19:30.875 --> 00:19:32.555 we receive and the progress

NOTE Confidence: 0.9191518

00:19:32.555 --> 00:19:33.115 we make,

NOTE Confidence: 0.9723179

00:19:33.799 --> 00:19:35.480 we would include other sensor

NOTE Confidence: 0.9723179

00:19:35.480 --> 00:19:35.980 modalities.

NOTE Confidence: 0.9592683

00:19:37.320 --> 00:19:38.440 As we've developed this, you

NOTE Confidence: 0.9592683

00:19:38.440 --> 00:19:39.480 know, as I mentioned, we've

NOTE Confidence: 0.9592683

00:19:39.480 --> 00:19:41.580 developed the silicon micro nanowire

NOTE Confidence: 0.9592683

00:19:41.720 --> 00:19:42.220 sensors,

NOTE Confidence: 0.9733971

00:19:42.679 --> 00:19:44.119 and this is a solution

NOTE Confidence: 0.9733971

00:19:44.119 --> 00:19:45.580 that's looking for a problem.

NOTE Confidence: 0.99941033

00:19:45.960 --> 00:19:47.340 So if you have

NOTE Confidence: 0.9917775

00:19:47.825 --> 00:19:48.484 a need,

NOTE Confidence: 0.99714875

00:19:49.025 --> 00:19:50.645 to measure analyte concentrations

NOTE Confidence: 0.97064847

00:19:51.345 --> 00:19:52.405 in any biofluid,

NOTE Confidence: 0.99855006

00:19:52.865 --> 00:19:53.665 you know, we have a

NOTE Confidence: 0.99855006

00:19:53.665 --> 00:19:55.445 technology that seems to deliver,

NOTE Confidence: 0.9795512

00:19:55.744 --> 00:19:57.025 you know, limits of detection

NOTE Confidence: 0.9795512

00:19:57.025 --> 00:19:58.325 down into the femtomolar

NOTE Confidence: 0.903015

00:19:58.625 --> 00:19:59.125 range.

NOTE Confidence: 0.97560006

00:19:59.505 --> 00:20:00.945 So this may be worth

NOTE Confidence: 0.97560006

00:20:00.945 --> 00:20:02.484 working out for other application

NOTE Confidence: 0.97560006

00:20:02.625 --> 00:20:03.700 areas, and we would be

NOTE Confidence: 0.97560006

00:20:03.700 --> 00:20:04.820 interested in talking to you

NOTE Confidence: 0.97560006

00:20:04.820 --> 00:20:05.640 if you've got,

NOTE Confidence: 0.94577205

00:20:06.100 --> 00:20:08.440 any any challenges in sort

NOTE Confidence: 0.94577205

00:20:08.660 --> 00:20:10.100 of doing let's say making

NOTE Confidence: 0.94577205

00:20:10.100 --> 00:20:11.300 a point of care device

NOTE Confidence: 0.94577205

00:20:11.300 --> 00:20:12.520 with those sort of capabilities.

NOTE Confidence: 0.96982604

00:20:13.140 --> 00:20:14.340 The team that's working on

NOTE Confidence: 0.96982604

00:20:14.340 --> 00:20:15.480 this is shown here.

NOTE Confidence: 0.8039354

00:20:16.365 --> 00:20:16.865 The

NOTE Confidence: 0.9918778

00:20:17.165 --> 00:20:18.445 students that have worked with

NOTE Confidence: 0.9918778

00:20:18.445 --> 00:20:20.865 us, Jennifer, Gloria, Tia,

NOTE Confidence: 0.8205075

00:20:21.805 --> 00:20:23.885 and Yue, Jesus, Wahoo, and

NOTE Confidence: 0.8205075

00:20:23.885 --> 00:20:24.385 Ronnie

NOTE Confidence: 0.9594119

00:20:24.685 --> 00:20:25.965 do a fair amount of,

NOTE Confidence: 0.9594119

00:20:26.045 --> 00:20:26.545 the

NOTE Confidence: 0.9406031

00:20:27.005 --> 00:20:29.085 the development, and Ronnie helps

NOTE Confidence: 0.9406031

00:20:29.085 --> 00:20:31.025 us with, the animal studies.

NOTE Confidence: 0.9406031

00:20:31.230 --> 00:20:32.270 The team shown in the

NOTE Confidence: 0.9406031

00:20:32.270 --> 00:20:33.950 upper right with Emily Gilmore,

NOTE Confidence: 0.9406031

00:20:33.950 --> 00:20:36.109 so Belinda May, Jennifer Kim,

NOTE Confidence: 0.9406031

00:20:36.109 --> 00:20:37.630 and Brad Duckrow are the

NOTE Confidence: 0.9406031

00:20:37.790 --> 00:20:38.990 that's the clinical team that's

NOTE Confidence: 0.9406031

00:20:38.990 --> 00:20:40.109 waiting for us to complete

NOTE Confidence: 0.9406031

00:20:40.109 --> 00:20:41.630 our tests so that they

NOTE Confidence: 0.9406031

00:20:41.630 --> 00:20:43.150 will, sort of work on

NOTE Confidence: 0.9406031

00:20:43.150 --> 00:20:44.515 this with for the early

NOTE Confidence: 0.9406031

00:20:44.515 --> 00:20:46.355 feasibility study at Yale. And

NOTE Confidence: 0.9406031

00:20:46.355 --> 00:20:47.315 the team shown at the

NOTE Confidence: 0.9406031

00:20:47.315 --> 00:20:48.435 bottom, which is,

NOTE Confidence: 0.73126304

00:20:49.234 --> 00:20:51.494 professor Belinda Srey and Kuyfmann

NOTE Confidence: 0.9447726

00:20:51.955 --> 00:20:53.575 are our data science experts.

NOTE Confidence: 0.9447726

00:20:53.715 --> 00:20:54.835 Because one of the other

NOTE Confidence: 0.9447726

00:20:54.835 --> 00:20:56.195 challenges that's going to emerge

NOTE Confidence: 0.9447726

00:20:56.195 --> 00:20:57.815 is we've got multiple modalities.

NOTE Confidence: 0.99922824

00:20:58.279 --> 00:20:59.179 We need to simplify

NOTE Confidence: 0.7801883

00:20:59.480 --> 00:21:00.380 the display

NOTE Confidence: 0.9478604

00:21:00.919 --> 00:21:02.919 and provide very clear cut,

NOTE Confidence: 0.9705724

00:21:04.600 --> 00:21:06.359 suggestions on what treatment should

NOTE Confidence: 0.9705724

00:21:06.359 --> 00:21:07.980 be followed for what particular

NOTE Confidence: 0.9705724

00:21:08.039 --> 00:21:08.539 situation.

NOTE Confidence: 0.95218307

00:21:09.000 --> 00:21:10.440 So that brings to conclusion

NOTE Confidence: 0.95218307

00:21:10.440 --> 00:21:12.385 the first project I'm presenting.

NOTE Confidence: 0.95218307

00:21:12.385 --> 00:21:13.505 I'm gonna go on that's

NOTE Confidence: 0.95218307

00:21:13.505 --> 00:21:14.645 the work of the Biosense

NOTE Confidence: 0.95218307

00:21:14.705 --> 00:21:16.244 lab. It's a hardware lab.

NOTE Confidence: 0.95218307

00:21:16.385 --> 00:21:17.265 I'm gonna go on. I'm

NOTE Confidence: 0.95218307

00:21:17.265 --> 00:21:18.465 gonna march through the other

NOTE Confidence: 0.95218307

00:21:18.465 --> 00:21:19.585 project, and then there'll be

NOTE Confidence: 0.95218307

00:21:19.585 --> 00:21:20.385 time at the end for

NOTE Confidence: 0.95218307

00:21:20.385 --> 00:21:21.585 questions and, you know, if

NOTE Confidence: 0.95218307

00:21:21.585 --> 00:21:23.345 you've got any. The second

NOTE Confidence: 0.95218307

00:21:23.345 --> 00:21:25.265 project is a multimodal brain

NOTE Confidence: 0.95218307

00:21:25.265 --> 00:21:26.760 atlas, which we're preparing for

NOTE Confidence: 0.95218307

00:21:26.920 --> 00:21:27.420 surgery

NOTE Confidence: 0.9127366

00:21:27.960 --> 00:21:29.960 planning. It's doctor Spencer, doctor

NOTE Confidence: 0.9127366

00:21:29.960 --> 00:21:31.260 Sivraj, you and myself.

NOTE Confidence: 0.93495405

00:21:31.640 --> 00:21:33.240 This is funded internally through

NOTE Confidence: 0.93495405

00:21:33.240 --> 00:21:34.540 the Swivelius Trust.

NOTE Confidence: 0.97372776

00:21:34.920 --> 00:21:36.119 We finally got our act

NOTE Confidence: 0.97372776

00:21:36.119 --> 00:21:37.560 together and submitted a grant

NOTE Confidence: 0.97372776

00:21:37.560 --> 00:21:38.805 to NIH last year,

NOTE Confidence: 0.9394985

00:21:39.445 --> 00:21:40.805 after several years of work

NOTE Confidence: 0.9394985

00:21:40.805 --> 00:21:42.485 on this project awaiting to

NOTE Confidence: 0.9394985

00:21:42.485 --> 00:21:44.025 see what the reviews are.

NOTE Confidence: 0.95900404

00:21:46.165 --> 00:21:47.365 And a few years back,

NOTE Confidence: 0.95900404

00:21:47.685 --> 00:21:49.125 we had a very good

NOTE Confidence: 0.95900404

00:21:49.125 --> 00:21:50.885 medical student from the UK,

NOTE Confidence: 0.95900404

00:21:50.885 --> 00:21:52.805 from King's College London, Harry

NOTE Confidence: 0.95900404

00:21:52.805 --> 00:21:54.325 McGrath, who spent time with

NOTE Confidence: 0.95900404

00:21:54.325 --> 00:21:54.660 us.

NOTE Confidence: 0.9539757

00:21:55.140 --> 00:21:56.100 And at that time, we

NOTE Confidence: 0.9539757

00:21:56.100 --> 00:21:57.380 challenged him, and he worked

NOTE Confidence: 0.9539757

00:21:57.380 --> 00:21:58.660 with doctor Spencer to create

NOTE Confidence: 0.9539757

00:21:58.660 --> 00:22:00.180 the Yale Brain Atlas. The

NOTE Confidence: 0.9539757

00:22:00.180 --> 00:22:01.540 Yale Brain Atlas has six

NOTE Confidence: 0.9539757

00:22:01.540 --> 00:22:02.420 hundred and ninety or six

NOTE Confidence: 0.9539757

00:22:02.420 --> 00:22:03.700 hundred and ninety six parsons

NOTE Confidence: 0.9539757

00:22:03.700 --> 00:22:04.740 depending on which version of

NOTE Confidence: 0.9539757

00:22:04.740 --> 00:22:05.640 it you use.

NOTE Confidence: 0.9976101

00:22:06.260 --> 00:22:06.760 It's

NOTE Confidence: 0.8756197

00:22:07.184 --> 00:22:08.705 to our attention no. Not

NOTE Confidence: 0.8756197

00:22:08.705 --> 00:22:10.325 that it's the highest resolution

NOTE Confidence: 0.9567777

00:22:10.945 --> 00:22:12.304 brain atlas that's built on

NOTE Confidence: 0.9567777

00:22:12.304 --> 00:22:13.445 anatomic landmarks.

NOTE Confidence: 0.9295282

00:22:14.144 --> 00:22:15.825 It's postulated. It's the m

NOTE Confidence: 0.9295282

00:22:15.825 --> 00:22:16.784 and I one fifty two

NOTE Confidence: 0.9295282

00:22:16.784 --> 00:22:18.565 brain postulated to the nearest,

NOTE Confidence: 0.81094885

00:22:19.585 --> 00:22:20.085 centimeter.

NOTE Confidence: 0.88906956

00:22:20.544 --> 00:22:21.904 We use essentially, we wanted

NOTE Confidence: 0.88906956

00:22:21.904 --> 00:22:22.740 to come up with

NOTE Confidence: 0.967324

00:22:23.700 --> 00:22:25.640 a resolution a cortical resolution

NOTE Confidence: 0.967324

00:22:25.700 --> 00:22:27.080 of one square centimeter.

NOTE Confidence: 0.8146774

00:22:27.619 --> 00:22:29.240 We has an intuitive nomenclature

NOTE Confidence: 0.96982974

00:22:29.619 --> 00:22:30.980 and coding structure, and colors

NOTE Confidence: 0.96982974

00:22:30.980 --> 00:22:32.420 are used to highlight sort

NOTE Confidence: 0.96982974

00:22:32.420 --> 00:22:34.280 of the gyri within specific

NOTE Confidence: 0.96982974

00:22:34.340 --> 00:22:34.840 regions.

NOTE Confidence: 0.9503835

00:22:36.595 --> 00:22:37.955 It's an atlas here. Why

NOTE Confidence: 0.9503835

00:22:37.955 --> 00:22:38.915 did we create it? We

NOTE Confidence: 0.9503835

00:22:38.915 --> 00:22:40.435 did that because we wanted

NOTE Confidence: 0.9503835

00:22:40.435 --> 00:22:42.535 an atlas based on anatomical

NOTE Confidence: 0.9503835

00:22:42.675 --> 00:22:43.175 landmarks

NOTE Confidence: 0.9891589

00:22:43.875 --> 00:22:45.555 rather than one that was

NOTE Confidence: 0.9891589

00:22:45.555 --> 00:22:46.855 generated through computation

NOTE Confidence: 0.9747636

00:22:47.315 --> 00:22:48.595 because we are interested in

NOTE Confidence: 0.9747636

00:22:48.595 --> 00:22:49.895 the network theory of epilepsy.

NOTE Confidence: 0.9747636

00:22:49.955 --> 00:22:51.075 We did not want an

NOTE Confidence: 0.9747636

00:22:51.075 --> 00:22:53.290 atlas that was created based

NOTE Confidence: 0.9747636

00:22:53.290 --> 00:22:54.750 on other network measures.

NOTE Confidence: 0.99185276

00:22:55.210 --> 00:22:56.650 We wanted one based on

NOTE Confidence: 0.99185276

00:22:56.650 --> 00:22:57.150 anatomy.

NOTE Confidence: 0.9740858

00:22:58.650 --> 00:23:00.490 And we were motivated to

NOTE Confidence: 0.9740858

00:23:00.490 --> 00:23:02.010 create an atlas at this

NOTE Confidence: 0.9740858

00:23:02.010 --> 00:23:03.070 resolution because

NOTE Confidence: 0.9339559

00:23:03.609 --> 00:23:05.390 when we place electrodes, intracranial

NOTE Confidence: 0.9339559

00:23:05.530 --> 00:23:07.150 electrodes for epilepsy surgery,

NOTE Confidence: 0.902587

00:23:08.315 --> 00:23:10.255 we use either depth EEG,

NOTE Confidence: 0.902587

00:23:10.315 --> 00:23:11.275 which are s e g

NOTE Confidence: 0.902587

00:23:11.275 --> 00:23:13.275 electrodes. This not gonna be

NOTE Confidence: 0.902587

00:23:13.275 --> 00:23:14.895 placed closer than ten millimeters

NOTE Confidence: 0.902587

00:23:15.035 --> 00:23:16.475 apart. We're going to respect

NOTE Confidence: 0.902587

00:23:16.475 --> 00:23:16.975 that,

NOTE Confidence: 0.9885261

00:23:17.915 --> 00:23:18.655 that resolution.

NOTE Confidence: 0.959193

00:23:19.035 --> 00:23:20.315 And if you use strip

NOTE Confidence: 0.959193

00:23:20.315 --> 00:23:21.600 and grid electrodes, which were

NOTE Confidence: 0.959193

00:23:21.600 --> 00:23:23.760 popular earlier, the center center

NOTE Confidence: 0.959193

00:23:23.760 --> 00:23:25.039 spacing for strip and grid

NOTE Confidence: 0.959193

00:23:25.039 --> 00:23:26.820 electrodes is also one centimeter.

NOTE Confidence: 0.9862019

00:23:27.359 --> 00:23:28.660 So we wanted to respect

NOTE Confidence: 0.9862019

00:23:28.720 --> 00:23:30.160 information that was being created

NOTE Confidence: 0.9862019

00:23:30.160 --> 00:23:31.059 at that resolution,

NOTE Confidence: 0.95770323

00:23:31.440 --> 00:23:32.880 and that's the resolution we

NOTE Confidence: 0.95770323

00:23:32.880 --> 00:23:34.875 created Satis on. We believe

NOTE Confidence: 0.95770323

00:23:34.875 --> 00:23:36.175 the simplified nomenclature

NOTE Confidence: 0.9831877

00:23:36.635 --> 00:23:38.415 helps with communication of neuroanatomy,

NOTE Confidence: 0.9891403

00:23:39.035 --> 00:23:40.795 and it facilitates sharing of

NOTE Confidence: 0.9891403

00:23:40.795 --> 00:23:42.255 multimodal research findings.

NOTE Confidence: 0.94918764

00:23:43.275 --> 00:23:44.795 Once we built the Atlas,

NOTE Confidence: 0.94918764

00:23:44.795 --> 00:23:46.415 we've also built other resources

NOTE Confidence: 0.94918764

00:23:46.475 --> 00:23:47.520 around it. So we,

NOTE Confidence: 0.96127737

00:23:48.080 --> 00:23:49.520 you know, define structural data,

NOTE Confidence: 0.96127737

00:23:49.520 --> 00:23:50.800 white matter connector, and cortical

NOTE Confidence: 0.96127737

00:23:50.800 --> 00:23:53.520 thickness. We've defined functional data,

NOTE Confidence: 0.96127737

00:23:53.520 --> 00:23:54.800 and I'll go through this.

NOTE Confidence: 0.96127737

00:23:54.800 --> 00:23:56.160 And all of this is

NOTE Confidence: 0.96127737

00:23:56.160 --> 00:23:57.760 on our website, and you

NOTE Confidence: 0.96127737

00:23:57.760 --> 00:23:59.359 can interact with it. And

NOTE Confidence: 0.96127737

00:23:59.359 --> 00:24:00.400 it's it's it's a bit

NOTE Confidence: 0.96127737

00:24:00.400 --> 00:24:01.695 slow, but it works quite

NOTE Confidence: 0.96127737

00:24:01.934 --> 00:24:03.855 reasonably well. And it's worth

NOTE Confidence: 0.96127737

00:24:03.855 --> 00:24:05.134 sort of interacting and and,

NOTE Confidence: 0.96127737

00:24:05.134 --> 00:24:06.595 you know, trying it out.

NOTE Confidence: 0.9378885

00:24:07.294 --> 00:24:08.575 And all the information I'm

NOTE Confidence: 0.9378885

00:24:08.575 --> 00:24:10.014 presenting, by and large, most

NOTE Confidence: 0.9378885

00:24:10.014 --> 00:24:11.774 of it is in our,

NOTE Confidence: 0.9921347

00:24:12.255 --> 00:24:14.355 GitHub repository that's also shared

NOTE Confidence: 0.8849424

00:24:14.815 --> 00:24:15.534 and on,

NOTE Confidence: 0.99973863

00:24:15.934 --> 00:24:16.914 another open

NOTE Confidence: 0.9545026

00:24:17.970 --> 00:24:19.270 repository, which is

NOTE Confidence: 0.8961885

00:24:19.730 --> 00:24:21.030 sort of listed below.

NOTE Confidence: 0.9678886

00:24:21.490 --> 00:24:22.850 So we worked up white

NOTE Confidence: 0.9678886

00:24:22.850 --> 00:24:24.309 matter connectivity using,

NOTE Confidence: 0.6443043

00:24:24.770 --> 00:24:26.070 human connect and project

NOTE Confidence: 0.95273954

00:24:26.850 --> 00:24:28.869 thousand sixty five subject template,

NOTE Confidence: 0.9613568

00:24:29.490 --> 00:24:31.845 and we worked up parcel

NOTE Confidence: 0.9613568

00:24:31.845 --> 00:24:33.525 to parcel connectivity. So this

NOTE Confidence: 0.9613568

00:24:33.525 --> 00:24:34.885 is six ninety parcels to

NOTE Confidence: 0.9613568

00:24:34.885 --> 00:24:35.945 six ninety parcels.

NOTE Confidence: 0.9592395

00:24:36.244 --> 00:24:37.605 So imagine a matrix of

NOTE Confidence: 0.9592395

00:24:37.605 --> 00:24:38.885 that size, six ninety six

NOTE Confidence: 0.9592395

00:24:38.885 --> 00:24:40.725 ninety space. We've got white

NOTE Confidence: 0.9592395

00:24:40.725 --> 00:24:43.365 matter streamlined connection strength, got

NOTE Confidence: 0.9592395

00:24:43.365 --> 00:24:45.765 white matter distance, Euclidean distance

NOTE Confidence: 0.9592395

00:24:45.765 --> 00:24:47.145 between all of these points.

NOTE Confidence: 0.9592395

00:24:47.205 --> 00:24:48.220 We've also worked up all

NOTE Confidence: 0.9592395

00:24:48.220 --> 00:24:49.419 the major white matter tracks

NOTE Confidence: 0.9592395

00:24:49.419 --> 00:24:50.700 and their mapping onto the

NOTE Confidence: 0.9592395

00:24:50.700 --> 00:24:51.200 parcels.

NOTE Confidence: 0.97437084

00:24:52.140 --> 00:24:53.580 This was done by Omar

NOTE Confidence: 0.97437084

00:24:53.580 --> 00:24:54.460 Chishti when he was an

NOTE Confidence: 0.97437084

00:24:54.460 --> 00:24:56.240 undergrad student here at Yale,

NOTE Confidence: 0.97437084

00:24:56.539 --> 00:24:57.200 in BME,

NOTE Confidence: 0.9879156

00:24:57.659 --> 00:24:58.619 and then he stayed on

NOTE Confidence: 0.9879156

00:24:58.619 --> 00:24:59.580 in the lab and worked

NOTE Confidence: 0.9879156

00:24:59.580 --> 00:25:01.184 with us. Alex King, who

NOTE Confidence: 0.9879156

00:25:01.184 --> 00:25:02.145 came to us from UC

NOTE Confidence: 0.9879156

00:25:02.145 --> 00:25:02.645 Berkeley,

NOTE Confidence: 0.92067605

00:25:03.025 --> 00:25:04.385 worked up a pipeline to

NOTE Confidence: 0.92067605

00:25:04.385 --> 00:25:05.905 map cortical thickness on the

NOTE Confidence: 0.92067605

00:25:05.905 --> 00:25:07.585 brain atlas. And this is

NOTE Confidence: 0.92067605

00:25:07.585 --> 00:25:09.265 again, from two hundred human

NOTE Confidence: 0.92067605

00:25:09.265 --> 00:25:10.244 connective subjects

NOTE Confidence: 0.960702

00:25:10.865 --> 00:25:11.924 and young adults.

NOTE Confidence: 0.99102306

00:25:12.240 --> 00:25:13.280 And you can see the

NOTE Confidence: 0.99102306

00:25:13.280 --> 00:25:13.780 thickness,

NOTE Confidence: 0.836658

00:25:14.160 --> 00:25:15.520 and this color bar is

NOTE Confidence: 0.836658

00:25:15.520 --> 00:25:16.800 shown on the right. It's

NOTE Confidence: 0.836658

00:25:16.800 --> 00:25:17.540 in millimeters,

NOTE Confidence: 0.92113996

00:25:18.080 --> 00:25:18.960 and you can see that

NOTE Confidence: 0.92113996

00:25:18.960 --> 00:25:21.280 this thin cortex is primary

NOTE Confidence: 0.92113996

00:25:21.280 --> 00:25:23.040 motor and sensory areas and

NOTE Confidence: 0.92113996

00:25:23.040 --> 00:25:25.040 thicker court cortex in other

NOTE Confidence: 0.92113996

00:25:25.040 --> 00:25:26.020 parts of the brain.

NOTE Confidence: 0.97057045

00:25:27.475 --> 00:25:29.315 Evan Collins, who started with

NOTE Confidence: 0.97057045

00:25:29.315 --> 00:25:30.375 us as an undergrad,

NOTE Confidence: 0.97505397

00:25:31.715 --> 00:25:33.234 and is currently finishing his

NOTE Confidence: 0.97505397

00:25:33.234 --> 00:25:34.455 PhD at MIT,

NOTE Confidence: 0.9672262

00:25:35.554 --> 00:25:37.475 then took a large open

NOTE Confidence: 0.9672262

00:25:37.475 --> 00:25:39.494 source repository known as NeuroSend,

NOTE Confidence: 0.99488825

00:25:39.955 --> 00:25:41.794 which has got information on

NOTE Confidence: 0.99488825

00:25:41.875 --> 00:25:43.014 from, you know,

NOTE Confidence: 0.93535304

00:25:44.150 --> 00:25:45.670 from fourteen thousand three hundred

NOTE Confidence: 0.93535304

00:25:45.670 --> 00:25:47.770 thirty one fMRI papers

NOTE Confidence: 0.85076207

00:25:48.470 --> 00:25:50.470 and with one thousand three

NOTE Confidence: 0.85076207

00:25:50.470 --> 00:25:51.850 hundred thirty four keywords.

NOTE Confidence: 0.9229408

00:25:52.230 --> 00:25:53.750 And he mapped that. That

NOTE Confidence: 0.9229408

00:25:53.750 --> 00:25:54.950 information exists on the m

NOTE Confidence: 0.9229408

00:25:54.950 --> 00:25:55.830 and I one fifty two

NOTE Confidence: 0.9229408

00:25:55.830 --> 00:25:57.109 brain. So he mapped that

NOTE Confidence: 0.9229408

00:25:57.109 --> 00:25:59.465 over into the brain atlas.

NOTE Confidence: 0.9229408

00:25:59.684 --> 00:26:00.565 So if you wish, you

NOTE Confidence: 0.9229408

00:26:00.565 --> 00:26:01.625 know, that's coming,

NOTE Confidence: 0.85046214

00:26:03.045 --> 00:26:03.705 so we

NOTE Confidence: 0.90327734

00:26:04.645 --> 00:26:06.405 we aggregated the information in

NOTE Confidence: 0.90327734

00:26:06.405 --> 00:26:07.465 the neurocent database

NOTE Confidence: 0.9016156

00:26:08.325 --> 00:26:10.085 to our dataset at that

NOTE Confidence: 0.9016156

00:26:10.085 --> 00:26:11.445 passive resolution. And, again, you

NOTE Confidence: 0.9016156

00:26:11.445 --> 00:26:12.325 can see you go up

NOTE Confidence: 0.9016156

00:26:12.325 --> 00:26:13.859 onto our website, you you

NOTE Confidence: 0.9016156

00:26:13.940 --> 00:26:15.080 click on a parcel,

NOTE Confidence: 0.96990347

00:26:15.380 --> 00:26:16.420 you can see all the

NOTE Confidence: 0.96990347

00:26:16.420 --> 00:26:17.940 keywords that come up tied

NOTE Confidence: 0.96990347

00:26:17.940 --> 00:26:19.460 to that parcel. In this

NOTE Confidence: 0.96990347

00:26:19.460 --> 00:26:20.760 case, you know, it's tactile,

NOTE Confidence: 0.96990347

00:26:21.059 --> 00:26:22.440 touch, pain, etcetera,

NOTE Confidence: 0.98854554

00:26:22.740 --> 00:26:24.020 are coming up. There's a

NOTE Confidence: 0.98854554

00:26:24.020 --> 00:26:25.160 second large repository,

NOTE Confidence: 0.9154752

00:26:26.585 --> 00:26:27.865 you know, that was built

NOTE Confidence: 0.9154752

00:26:27.865 --> 00:26:29.705 on the Neurosyn repository. It's

NOTE Confidence: 0.9154752

00:26:29.705 --> 00:26:31.545 called parcel query, which does

NOTE Confidence: 0.9154752

00:26:31.545 --> 00:26:32.045 more

NOTE Confidence: 0.88681066

00:26:32.425 --> 00:26:34.185 word process you know, sort

NOTE Confidence: 0.88681066

00:26:34.185 --> 00:26:35.785 of semantic smoothing and word

NOTE Confidence: 0.88681066

00:26:35.785 --> 00:26:36.285 embedding

NOTE Confidence: 0.9769042

00:26:36.744 --> 00:26:37.725 on the Neurosynth

NOTE Confidence: 0.9007889

00:26:38.105 --> 00:26:39.865 data. And we map that

NOTE Confidence: 0.9007889

00:26:39.865 --> 00:26:41.340 overall. So we call that

NOTE Confidence: 0.9007889

00:26:41.500 --> 00:26:43.100 parcel query. So, you know,

NOTE Confidence: 0.9007889

00:26:43.100 --> 00:26:44.700 neurosynt got mapped into parcel

NOTE Confidence: 0.9007889

00:26:44.700 --> 00:26:45.200 synth.

NOTE Confidence: 0.8684042

00:26:45.500 --> 00:26:47.659 Neuroquery got mapped into parcel

NOTE Confidence: 0.8684042

00:26:47.659 --> 00:26:48.159 query.

NOTE Confidence: 0.95259136

00:26:48.460 --> 00:26:49.900 And then Evan asked a

NOTE Confidence: 0.95259136

00:26:49.900 --> 00:26:51.340 couple of questions on, you

NOTE Confidence: 0.95259136

00:26:51.340 --> 00:26:52.140 know, he he was he

NOTE Confidence: 0.95259136

00:26:52.140 --> 00:26:53.865 was motivated by trying to

NOTE Confidence: 0.95259136

00:26:53.865 --> 00:26:55.785 understand the relationship between structure

NOTE Confidence: 0.95259136

00:26:55.785 --> 00:26:56.445 and function.

NOTE Confidence: 0.9644324

00:26:57.385 --> 00:26:58.425 I'm I'm showing you this,

NOTE Confidence: 0.9644324

00:26:58.665 --> 00:26:59.945 you know, just skim through

NOTE Confidence: 0.9644324

00:26:59.945 --> 00:27:00.685 his findings,

NOTE Confidence: 0.9988136

00:27:01.385 --> 00:27:02.025 just to give you a

NOTE Confidence: 0.9988136

00:27:02.025 --> 00:27:03.225 sense of what can be

NOTE Confidence: 0.9988136

00:27:03.225 --> 00:27:04.665 done with this repository that

NOTE Confidence: 0.9988136

00:27:04.665 --> 00:27:05.400 we've created.

NOTE Confidence: 0.9758373

00:27:06.119 --> 00:27:07.260 So we know,

NOTE Confidence: 0.9615106

00:27:07.640 --> 00:27:08.760 that the relationship, you know,

NOTE Confidence: 0.9615106

00:27:08.760 --> 00:27:10.700 we're interested in network measures.

NOTE Confidence: 0.9615106

00:27:10.920 --> 00:27:12.600 We're interested in studying networks.

NOTE Confidence: 0.9615106

00:27:12.600 --> 00:27:14.060 We know the connectivity

NOTE Confidence: 0.96677506

00:27:14.440 --> 00:27:16.040 is, you know, measured through

NOTE Confidence: 0.96677506

00:27:16.040 --> 00:27:18.165 white matter or structural connectivity

NOTE Confidence: 0.96677506

00:27:18.165 --> 00:27:19.205 or it could be measured

NOTE Confidence: 0.96677506

00:27:19.205 --> 00:27:20.965 through functional connectivity. So you

NOTE Confidence: 0.96677506

00:27:20.965 --> 00:27:22.745 could measure connectivity from fMRI

NOTE Confidence: 0.96677506

00:27:22.805 --> 00:27:24.565 time series or EEG time

NOTE Confidence: 0.96677506

00:27:24.565 --> 00:27:26.185 series or MEG time series.

NOTE Confidence: 0.99214774

00:27:26.645 --> 00:27:29.225 But the global correspondence between

NOTE Confidence: 0.99214774

00:27:29.525 --> 00:27:31.605 structure and functional connectivity is

NOTE Confidence: 0.99214774

00:27:31.605 --> 00:27:32.250 very poor.

NOTE Confidence: 0.9953847

00:27:33.290 --> 00:27:34.890 And Evan wanted to see

NOTE Confidence: 0.9953847

00:27:34.890 --> 00:27:36.990 if using these large repositories

NOTE Confidence: 0.99748

00:27:37.530 --> 00:27:38.750 improved our understanding

NOTE Confidence: 0.9991251

00:27:39.290 --> 00:27:40.970 of the relationship between structure

NOTE Confidence: 0.9991251

00:27:40.970 --> 00:27:41.630 and function.

NOTE Confidence: 0.9273162

00:27:42.330 --> 00:27:43.630 So this, complicated,

NOTE Confidence: 0.9953974

00:27:44.570 --> 00:27:46.590 table kind of lays out

NOTE Confidence: 0.9953974

00:27:46.650 --> 00:27:47.390 the poor

NOTE Confidence: 0.97710377

00:27:47.804 --> 00:27:49.565 relationship we see. The rows

NOTE Confidence: 0.97710377

00:27:49.565 --> 00:27:51.644 are thirteen different measures of

NOTE Confidence: 0.97710377

00:27:51.644 --> 00:27:52.705 structural connectivity

NOTE Confidence: 0.85954684

00:27:53.244 --> 00:27:54.605 pulled from the white matter

NOTE Confidence: 0.85954684

00:27:54.605 --> 00:27:55.904 connecting that we've created.

NOTE Confidence: 0.9351476

00:27:56.445 --> 00:27:57.744 So, you know, for example,

NOTE Confidence: 0.9351476

00:27:57.884 --> 00:27:59.085 SC count is, you know,

NOTE Confidence: 0.9351476

00:27:59.085 --> 00:28:00.764 structured connectivity based on a

NOTE Confidence: 0.9351476

00:28:00.764 --> 00:28:02.760 count of streamlines between two

NOTE Confidence: 0.9351476

00:28:02.760 --> 00:28:03.260 parsons.

NOTE Confidence: 0.94522256

00:28:04.120 --> 00:28:05.720 The columns, the three columns

NOTE Confidence: 0.94522256

00:28:05.720 --> 00:28:07.180 are three different evaluations

NOTE Confidence: 0.9326639

00:28:07.720 --> 00:28:09.100 of functional connectivity.

NOTE Confidence: 0.89242494

00:28:10.120 --> 00:28:10.860 The neurosynth

NOTE Confidence: 0.9938344

00:28:11.240 --> 00:28:11.740 version

NOTE Confidence: 0.87743014

00:28:12.200 --> 00:28:13.560 of of the database, the

NOTE Confidence: 0.87743014

00:28:13.560 --> 00:28:15.080 neuro query, and from resting

NOTE Confidence: 0.87743014

00:28:15.080 --> 00:28:15.820 state fMRI.

NOTE Confidence: 0.95184666

00:28:16.120 --> 00:28:16.920 And you can see in

NOTE Confidence: 0.95184666

00:28:16.920 --> 00:28:18.244 that, you you know, thirteen

NOTE Confidence: 0.95184666

00:28:18.305 --> 00:28:20.625 by three matrix there or

NOTE Confidence: 0.95184666

00:28:20.625 --> 00:28:22.484 that array that the values,

NOTE Confidence: 0.95184666

00:28:22.625 --> 00:28:24.225 the relationship between structure and

NOTE Confidence: 0.95184666

00:28:24.225 --> 00:28:25.525 function is very poor.

NOTE Confidence: 0.9606105

00:28:25.905 --> 00:28:27.825 This is again recreating what's

NOTE Confidence: 0.9606105

00:28:27.825 --> 00:28:29.265 known in the field. The

NOTE Confidence: 0.9606105

00:28:29.265 --> 00:28:30.725 global structure and function

NOTE Confidence: 0.98568547

00:28:31.025 --> 00:28:32.850 correspondence is very poor in

NOTE Confidence: 0.98568547

00:28:32.850 --> 00:28:33.590 terms of connectivity.

NOTE Confidence: 0.96276456

00:28:36.130 --> 00:28:37.490 I won't go through all

NOTE Confidence: 0.96276456

00:28:37.490 --> 00:28:38.929 of Evan's work. It's it's

NOTE Confidence: 0.96276456

00:28:38.929 --> 00:28:39.970 really it makes a very

NOTE Confidence: 0.96276456

00:28:39.970 --> 00:28:41.570 good reading. It was published

NOTE Confidence: 0.96276456

00:28:41.570 --> 00:28:42.790 in twenty twenty four.

NOTE Confidence: 0.95695376

00:28:43.170 --> 00:28:44.929 But the key takeaways are,

NOTE Confidence: 0.95695376

00:28:44.929 --> 00:28:46.365 you know, we use large

NOTE Confidence: 0.95695376

00:28:46.365 --> 00:28:48.205 scale data repositories to compute

NOTE Confidence: 0.95695376

00:28:48.205 --> 00:28:49.425 structure function correspondence

NOTE Confidence: 0.9309559

00:28:50.285 --> 00:28:52.605 and across functions, hundreds of

NOTE Confidence: 0.9309559

00:28:52.605 --> 00:28:53.105 functions.

NOTE Confidence: 0.894191

00:28:54.365 --> 00:28:56.205 So and then we showed

NOTE Confidence: 0.894191

00:28:56.205 --> 00:28:58.530 that global structure function have

NOTE Confidence: 0.894191

00:28:58.770 --> 00:28:59.670 imperfect correspondence.

NOTE Confidence: 0.98834574

00:29:00.610 --> 00:29:01.810 But then we find that

NOTE Confidence: 0.98834574

00:29:01.810 --> 00:29:02.790 cortical thickness

NOTE Confidence: 0.9997665

00:29:03.250 --> 00:29:03.750 does

NOTE Confidence: 0.9575163

00:29:04.370 --> 00:29:04.870 have,

NOTE Confidence: 0.95509434

00:29:05.890 --> 00:29:07.110 an impact here.

NOTE Confidence: 0.97203606

00:29:07.410 --> 00:29:08.450 And the plot shown in

NOTE Confidence: 0.97203606

00:29:08.450 --> 00:29:09.650 the bottom left is just

NOTE Confidence: 0.97203606

00:29:09.650 --> 00:29:11.365 for the parietal lobe. On

NOTE Confidence: 0.97203606

00:29:11.365 --> 00:29:12.725 the x axis, you see

NOTE Confidence: 0.97203606

00:29:12.725 --> 00:29:15.125 the structure function correspondence, if

NOTE Confidence: 0.97203606

00:29:15.125 --> 00:29:16.725 you wish. S f r

NOTE Confidence: 0.97203606

00:29:16.725 --> 00:29:18.105 squared just as a measure

NOTE Confidence: 0.97203606

00:29:18.245 --> 00:29:19.765 of how closely structure and

NOTE Confidence: 0.97203606

00:29:19.765 --> 00:29:20.904 function are correlated.

NOTE Confidence: 0.9672649

00:29:22.245 --> 00:29:23.765 Low values means it's very

NOTE Confidence: 0.9672649

00:29:23.765 --> 00:29:25.525 poor correspondence and higher values

NOTE Confidence: 0.9672649

00:29:25.525 --> 00:29:27.070 means it's better tied together.

NOTE Confidence: 0.9194548

00:29:27.370 --> 00:29:28.730 On the y axis is

NOTE Confidence: 0.9194548

00:29:28.730 --> 00:29:30.250 cortical thickness in the parietal

NOTE Confidence: 0.9194548

00:29:30.330 --> 00:29:31.370 in different parcels in the

NOTE Confidence: 0.9194548

00:29:31.370 --> 00:29:32.890 parietal lobe. And you can

NOTE Confidence: 0.9194548

00:29:32.890 --> 00:29:35.630 see that structure function correspondence

NOTE Confidence: 0.9978003

00:29:35.930 --> 00:29:36.430 increases

NOTE Confidence: 0.9933314

00:29:37.290 --> 00:29:38.110 as the parcels

NOTE Confidence: 0.9239109

00:29:38.490 --> 00:29:39.710 are for thinner parcels.

NOTE Confidence: 0.9929202

00:29:40.250 --> 00:29:41.310 The thinnest parcels

NOTE Confidence: 0.9778044

00:29:41.785 --> 00:29:43.305 have the best structure function

NOTE Confidence: 0.9778044

00:29:43.305 --> 00:29:43.805 correspondence.

NOTE Confidence: 0.96165234

00:29:44.265 --> 00:29:46.025 The thickest parcels have the

NOTE Confidence: 0.96165234

00:29:46.025 --> 00:29:47.645 poorest structure function correspondence.

NOTE Confidence: 0.99904907

00:29:48.025 --> 00:29:49.325 Just keep that in mind.

NOTE Confidence: 0.9645869

00:29:49.625 --> 00:29:50.745 The other things and he

NOTE Confidence: 0.9645869

00:29:50.745 --> 00:29:51.625 he did a lot of

NOTE Confidence: 0.9645869

00:29:51.625 --> 00:29:53.865 exploring of, the information that

NOTE Confidence: 0.9645869

00:29:53.865 --> 00:29:54.750 he had created.

NOTE Confidence: 0.9639296

00:29:55.130 --> 00:29:56.730 And, another plot that I'm

NOTE Confidence: 0.9639296

00:29:56.730 --> 00:29:57.770 showing here in the bottom

NOTE Confidence: 0.9639296

00:29:57.770 --> 00:29:58.510 right is,

NOTE Confidence: 0.94012004

00:29:59.370 --> 00:30:01.610 structure function. Two box plots

NOTE Confidence: 0.94012004

00:30:01.610 --> 00:30:03.210 are shown. One for high

NOTE Confidence: 0.94012004

00:30:03.210 --> 00:30:05.289 structure function parcels and the

NOTE Confidence: 0.94012004

00:30:05.289 --> 00:30:06.730 other for low structure function

NOTE Confidence: 0.94012004

00:30:06.730 --> 00:30:07.230 parcels

NOTE Confidence: 0.9477436

00:30:08.010 --> 00:30:10.054 against a measure of concreteness

NOTE Confidence: 0.9477436

00:30:10.275 --> 00:30:11.575 of the word the keywords.

NOTE Confidence: 0.951978

00:30:12.115 --> 00:30:13.955 And concreteness was scores that

NOTE Confidence: 0.951978

00:30:13.955 --> 00:30:15.975 we got from a paper,

NOTE Confidence: 0.9168749

00:30:17.155 --> 00:30:18.674 which had, you know, asked,

NOTE Confidence: 0.9197208

00:30:19.155 --> 00:30:21.015 users or subjects to provide

NOTE Confidence: 0.9014788

00:30:21.790 --> 00:30:22.930 a sort of rate words

NOTE Confidence: 0.9014788

00:30:22.990 --> 00:30:24.510 based on the involvement of

NOTE Confidence: 0.9014788

00:30:24.510 --> 00:30:25.010 sensors

NOTE Confidence: 0.99355584

00:30:25.310 --> 00:30:26.610 and motor responses.

NOTE Confidence: 0.9817817

00:30:27.070 --> 00:30:28.670 For example, touch would be

NOTE Confidence: 0.9817817

00:30:28.670 --> 00:30:30.510 a very concrete word, while

NOTE Confidence: 0.9817817

00:30:30.510 --> 00:30:31.870 a word like justice would

NOTE Confidence: 0.9817817

00:30:31.870 --> 00:30:32.850 be very abstract

NOTE Confidence: 0.93544865

00:30:33.310 --> 00:30:34.270 or would be very low

NOTE Confidence: 0.93544865

00:30:34.270 --> 00:30:35.710 on the concrete scale. So

NOTE Confidence: 0.93544865

00:30:35.710 --> 00:30:36.750 what this is showing is

NOTE Confidence: 0.93544865

00:30:36.750 --> 00:30:37.250 that

NOTE Confidence: 0.99943125

00:30:37.575 --> 00:30:38.475 concrete words

NOTE Confidence: 0.9983699

00:30:39.015 --> 00:30:39.515 had

NOTE Confidence: 0.88330173

00:30:39.975 --> 00:30:42.054 tighter or higher structure function

NOTE Confidence: 0.88330173

00:30:42.054 --> 00:30:42.554 correspondence

NOTE Confidence: 0.92894924

00:30:43.335 --> 00:30:45.575 while more abstract words had

NOTE Confidence: 0.92894924

00:30:45.575 --> 00:30:47.195 poor structure function correspondence.

NOTE Confidence: 0.98957855

00:30:48.054 --> 00:30:49.034 The main takeaways

NOTE Confidence: 0.9332733

00:30:49.414 --> 00:30:50.615 from the paper, again, worth

NOTE Confidence: 0.9332733

00:30:50.615 --> 00:30:51.840 reading. You know, the question

NOTE Confidence: 0.9332733

00:30:51.840 --> 00:30:53.280 was, is the structure function

NOTE Confidence: 0.9332733

00:30:53.280 --> 00:30:54.559 relationship the same throughout the

NOTE Confidence: 0.9332733

00:30:54.559 --> 00:30:56.160 brain, the same across different

NOTE Confidence: 0.9332733

00:30:56.160 --> 00:30:56.660 functions?

NOTE Confidence: 0.9177341

00:30:57.280 --> 00:30:59.700 And, Evan's take home messages

NOTE Confidence: 0.9177341

00:30:59.760 --> 00:31:01.679 were it exists on a

NOTE Confidence: 0.9177341

00:31:01.679 --> 00:31:02.179 gradient.

NOTE Confidence: 0.8559929

00:31:02.559 --> 00:31:04.900 It's strongest in primary sensory

NOTE Confidence: 0.8559929

00:31:05.040 --> 00:31:06.740 motor cortical areas for perceptual

NOTE Confidence: 0.8559929

00:31:06.799 --> 00:31:07.674 and motor functions.

NOTE Confidence: 0.9761448

00:31:08.294 --> 00:31:09.755 It's weakest in association

NOTE Confidence: 0.95335174

00:31:10.135 --> 00:31:12.155 cortex for complex cognitive function.

NOTE Confidence: 0.95335174

00:31:12.455 --> 00:31:13.735 And then we speculated a

NOTE Confidence: 0.95335174

00:31:13.735 --> 00:31:14.554 couple of things.

NOTE Confidence: 0.95844007

00:31:14.855 --> 00:31:16.135 The speculation is that the

NOTE Confidence: 0.95844007

00:31:16.135 --> 00:31:17.655 evolution of the human brain

NOTE Confidence: 0.95844007

00:31:17.655 --> 00:31:18.875 might help explain,

NOTE Confidence: 0.99785316

00:31:20.580 --> 00:31:21.320 this gradient.

NOTE Confidence: 0.95427555

00:31:22.100 --> 00:31:24.100 So essentially, you know, we're

NOTE Confidence: 0.95427555

00:31:24.100 --> 00:31:25.799 seeing a gradient between unimodal

NOTE Confidence: 0.95427555

00:31:25.940 --> 00:31:26.440 cortex

NOTE Confidence: 0.9915059

00:31:26.980 --> 00:31:29.480 to cortex that supports multiple

NOTE Confidence: 0.9915059

00:31:29.539 --> 00:31:30.039 functions.

NOTE Confidence: 0.95144784

00:31:30.419 --> 00:31:31.700 And one possible reason is

NOTE Confidence: 0.95144784

00:31:31.700 --> 00:31:33.220 that while direct connection between

NOTE Confidence: 0.95144784

00:31:33.220 --> 00:31:34.600 brain regions was sufficient

NOTE Confidence: 0.9462514

00:31:34.985 --> 00:31:36.425 for faculties such as vision

NOTE Confidence: 0.9462514

00:31:36.425 --> 00:31:37.945 and movement, as the brain

NOTE Confidence: 0.9462514

00:31:37.945 --> 00:31:39.565 developed more advanced capabilities

NOTE Confidence: 0.766993

00:31:40.105 --> 00:31:41.325 like complex cognition,

NOTE Confidence: 0.9689066

00:31:43.225 --> 00:31:44.985 these direct connections had maxed

NOTE Confidence: 0.9689066

00:31:44.985 --> 00:31:45.805 out the usefulness.

NOTE Confidence: 0.9847547

00:31:47.080 --> 00:31:48.200 And it's possible that the

NOTE Confidence: 0.9847547

00:31:48.200 --> 00:31:50.440 brain developed more indirect connections

NOTE Confidence: 0.9847547

00:31:50.440 --> 00:31:52.200 between regions to establish more

NOTE Confidence: 0.9847547

00:31:52.200 --> 00:31:52.700 advanced

NOTE Confidence: 0.9902994

00:31:53.320 --> 00:31:55.240 abilities. And we believe that

NOTE Confidence: 0.9902994

00:31:55.240 --> 00:31:57.340 these areas where this happened

NOTE Confidence: 0.9239718

00:31:57.800 --> 00:32:00.460 have poor structure function relationship.

NOTE Confidence: 0.91081876

00:32:01.915 --> 00:32:03.355 And it's a it's it's

NOTE Confidence: 0.91081876

00:32:03.355 --> 00:32:04.635 a good use of the

NOTE Confidence: 0.91081876

00:32:04.635 --> 00:32:06.095 brain atlas that we've created.

NOTE Confidence: 0.9652961

00:32:06.635 --> 00:32:07.595 We didn't create it for

NOTE Confidence: 0.9652961

00:32:07.595 --> 00:32:08.715 this purpose. We created it

NOTE Confidence: 0.9652961

00:32:08.715 --> 00:32:10.795 for epilepsy surgery, but we've

NOTE Confidence: 0.9652961

00:32:10.795 --> 00:32:12.155 mapped a lot of information

NOTE Confidence: 0.9652961

00:32:12.155 --> 00:32:13.435 onto it that can be

NOTE Confidence: 0.9652961

00:32:13.435 --> 00:32:14.235 used for a number of

NOTE Confidence: 0.9652961

00:32:14.235 --> 00:32:15.510 different studies. I'll show you,

NOTE Confidence: 0.9652961

00:32:16.070 --> 00:32:17.750 a couple other studies. The

NOTE Confidence: 0.9652961

00:32:17.750 --> 00:32:18.230 second,

NOTE Confidence: 0.88467443

00:32:18.710 --> 00:32:20.090 you know, this paper by

NOTE Confidence: 0.8906058

00:32:20.870 --> 00:32:22.390 sort of we've collaborated very

NOTE Confidence: 0.8906058

00:32:22.390 --> 00:32:24.010 strongly with, doctor Sivraju,

NOTE Confidence: 0.9870232

00:32:24.470 --> 00:32:25.430 and this is data from

NOTE Confidence: 0.9870232

00:32:25.430 --> 00:32:26.250 doctor Sivraju,

NOTE Confidence: 0.95690054

00:32:26.630 --> 00:32:28.710 his electrical stimulation mapping of

NOTE Confidence: 0.95690054

00:32:28.710 --> 00:32:29.210 language.

NOTE Confidence: 0.9835608

00:32:29.775 --> 00:32:30.175 And,

NOTE Confidence: 0.9450175

00:32:30.655 --> 00:32:32.495 Omar Chishti helped work up

NOTE Confidence: 0.9450175

00:32:32.495 --> 00:32:33.235 this analysis.

NOTE Confidence: 0.92208445

00:32:33.615 --> 00:32:35.075 And we were interested again.

NOTE Confidence: 0.96746254

00:32:35.535 --> 00:32:37.455 The BRAIN ATLAS allows us

NOTE Confidence: 0.96746254

00:32:37.455 --> 00:32:39.375 to combine data from multiple

NOTE Confidence: 0.96746254

00:32:39.375 --> 00:32:41.455 patients and do comparisons. It

NOTE Confidence: 0.96746254

00:32:41.455 --> 00:32:42.915 it it simplifies comparisons.

NOTE Confidence: 0.9166669

00:32:43.600 --> 00:32:45.279 So doctor Subraraju looked at

NOTE Confidence: 0.9166669

00:32:45.279 --> 00:32:47.440 six different tasks, auditory naming,

NOTE Confidence: 0.9166669

00:32:47.440 --> 00:32:48.259 visual naming,

NOTE Confidence: 0.9980968

00:32:48.559 --> 00:32:49.059 reading,

NOTE Confidence: 0.691488

00:32:49.360 --> 00:32:50.320 auditory compre

NOTE Confidence: 0.94001555

00:32:50.799 --> 00:32:51.299 comprehension,

NOTE Confidence: 0.98292613

00:32:51.600 --> 00:32:53.299 written comprehension, and repetition.

NOTE Confidence: 0.96851796

00:32:54.080 --> 00:32:55.600 And this is the mapping,

NOTE Confidence: 0.96851796

00:32:55.600 --> 00:32:56.480 if you wish, across the

NOTE Confidence: 0.96851796

00:32:56.480 --> 00:32:58.095 fifteen subjects we looked at

NOTE Confidence: 0.96851796

00:32:58.255 --> 00:32:59.534 onto the brain atlas for

NOTE Confidence: 0.96851796

00:32:59.534 --> 00:33:00.434 the six tasks.

NOTE Confidence: 0.9916577

00:33:01.135 --> 00:33:02.414 And then when we combine

NOTE Confidence: 0.9916577

00:33:02.414 --> 00:33:03.054 the tasks,

NOTE Confidence: 0.96868044

00:33:03.615 --> 00:33:04.735 if you look in the

NOTE Confidence: 0.96868044

00:33:04.735 --> 00:33:06.355 center, the b,

NOTE Confidence: 0.82650065

00:33:06.655 --> 00:33:07.155 subfigure,

NOTE Confidence: 0.98964775

00:33:08.335 --> 00:33:10.335 the red parcels are the

NOTE Confidence: 0.98964775

00:33:10.335 --> 00:33:12.355 ones where all six tasks

NOTE Confidence: 0.9651809

00:33:12.809 --> 00:33:14.009 lined up or, you know,

NOTE Confidence: 0.9651809

00:33:14.009 --> 00:33:15.470 were active in all patients.

NOTE Confidence: 0.9651809

00:33:15.690 --> 00:33:17.049 So we, you know, we

NOTE Confidence: 0.9651809

00:33:17.049 --> 00:33:18.649 identified this as a language

NOTE Confidence: 0.9651809

00:33:18.649 --> 00:33:19.149 core.

NOTE Confidence: 0.94246835

00:33:19.690 --> 00:33:21.769 And then the c sub

NOTE Confidence: 0.94246835

00:33:21.769 --> 00:33:22.669 figure shows

NOTE Confidence: 0.96012545

00:33:23.210 --> 00:33:24.330 task you know, the color

NOTE Confidence: 0.96012545

00:33:24.330 --> 00:33:25.450 code is going from zero

NOTE Confidence: 0.96012545

00:33:25.450 --> 00:33:26.490 to six depending on how

NOTE Confidence: 0.96012545

00:33:26.490 --> 00:33:27.230 many tasks

NOTE Confidence: 0.9673759

00:33:27.645 --> 00:33:29.405 activated that parcel. So this

NOTE Confidence: 0.9673759

00:33:29.405 --> 00:33:30.685 allows us a very easy

NOTE Confidence: 0.9673759

00:33:30.685 --> 00:33:32.685 way to understand the language

NOTE Confidence: 0.9673759

00:33:32.685 --> 00:33:34.125 core. And as we step

NOTE Confidence: 0.9673759

00:33:34.125 --> 00:33:35.585 away from the language core,

NOTE Confidence: 0.9673759

00:33:35.645 --> 00:33:36.845 how many you know, how

NOTE Confidence: 0.9673759

00:33:36.845 --> 00:33:38.765 much variability is there in

NOTE Confidence: 0.9673759

00:33:38.765 --> 00:33:40.845 language representation across the subjects

NOTE Confidence: 0.9673759

00:33:40.845 --> 00:33:41.585 we're studying.

NOTE Confidence: 0.9941411

00:33:42.060 --> 00:33:43.040 So this was another

NOTE Confidence: 0.9669333

00:33:43.420 --> 00:33:45.420 useful example for us to

NOTE Confidence: 0.9669333

00:33:45.420 --> 00:33:46.780 sort of demonstrate the prowess

NOTE Confidence: 0.9669333

00:33:46.780 --> 00:33:47.760 of the brain atlas.

NOTE Confidence: 0.94911206

00:33:48.380 --> 00:33:49.260 A third study that I'll

NOTE Confidence: 0.94911206

00:33:49.260 --> 00:33:50.140 show you, this hasn't been

NOTE Confidence: 0.94911206

00:33:50.140 --> 00:33:51.760 published. It's it's under review.

NOTE Confidence: 0.94200236

00:33:52.380 --> 00:33:54.140 Elizabeth Watson has, been in

NOTE Confidence: 0.94200236

00:33:54.140 --> 00:33:55.420 the lab since the first

NOTE Confidence: 0.94200236

00:33:55.420 --> 00:33:55.920 year.

NOTE Confidence: 0.7594845

00:33:57.075 --> 00:33:57.715 She just,

NOTE Confidence: 0.88024247

00:33:58.115 --> 00:33:59.875 is a just joined Yale

NOTE Confidence: 0.88024247

00:33:59.875 --> 00:34:01.075 School of Medicine. She's a

NOTE Confidence: 0.88024247

00:34:01.075 --> 00:34:01.955 first year in med school

NOTE Confidence: 0.88024247

00:34:01.955 --> 00:34:02.455 now.

NOTE Confidence: 0.9824179

00:34:02.835 --> 00:34:04.535 And, she took

NOTE Confidence: 0.87074584

00:34:04.915 --> 00:34:06.835 the partial synth information that

NOTE Confidence: 0.87074584

00:34:06.835 --> 00:34:08.455 came from Evan's study

NOTE Confidence: 0.8854173

00:34:08.835 --> 00:34:09.815 from this fMRI

NOTE Confidence: 0.7686389

00:34:10.114 --> 00:34:11.094 web scrape data,

NOTE Confidence: 0.9418688

00:34:12.219 --> 00:34:14.060 and the electrical stimulation data

NOTE Confidence: 0.9418688

00:34:14.060 --> 00:34:14.880 from Aditya

NOTE Confidence: 0.5969528

00:34:15.260 --> 00:34:16.239 is a dataset,

NOTE Confidence: 0.91567695

00:34:16.860 --> 00:34:17.980 on that was shown in

NOTE Confidence: 0.91567695

00:34:17.980 --> 00:34:19.440 the last column. And then

NOTE Confidence: 0.91567695

00:34:19.580 --> 00:34:21.520 also did a literature review

NOTE Confidence: 0.91567695

00:34:21.739 --> 00:34:23.500 of expert annotation and compared

NOTE Confidence: 0.91567695

00:34:23.500 --> 00:34:24.380 the two. And you can

NOTE Confidence: 0.91567695

00:34:24.380 --> 00:34:25.500 see that going from the

NOTE Confidence: 0.91567695

00:34:25.500 --> 00:34:26.475 parcel synth

NOTE Confidence: 0.9559477

00:34:27.035 --> 00:34:28.875 dataset, which is quite broad.

NOTE Confidence: 0.9559477

00:34:28.875 --> 00:34:30.815 That's the fMRI activation data.

NOTE Confidence: 0.9840698

00:34:31.275 --> 00:34:32.555 And on the other extreme,

NOTE Confidence: 0.9840698

00:34:32.555 --> 00:34:33.915 you have the electrical stimulation

NOTE Confidence: 0.9840698

00:34:33.915 --> 00:34:35.195 data from Yale from just

NOTE Confidence: 0.9840698

00:34:35.195 --> 00:34:36.715 fifteen subjects. You can see

NOTE Confidence: 0.9840698

00:34:36.715 --> 00:34:38.475 the literature meta analysis. So

NOTE Confidence: 0.9840698

00:34:38.475 --> 00:34:39.835 we're also working up a

NOTE Confidence: 0.9840698

00:34:39.835 --> 00:34:41.275 more detailed sort of literature

NOTE Confidence: 0.9840698

00:34:41.275 --> 00:34:41.775 analysis

NOTE Confidence: 0.97731334

00:34:42.200 --> 00:34:43.640 for other lobes and other

NOTE Confidence: 0.97731334

00:34:43.640 --> 00:34:44.600 functions. But this is to

NOTE Confidence: 0.97731334

00:34:44.600 --> 00:34:46.040 demonstrate that this can be

NOTE Confidence: 0.97731334

00:34:46.040 --> 00:34:46.620 a useful,

NOTE Confidence: 0.99939317

00:34:47.080 --> 00:34:49.020 framework on which to add

NOTE Confidence: 0.905656

00:34:49.480 --> 00:34:51.580 information from different sites, different

NOTE Confidence: 0.96400034

00:34:51.960 --> 00:34:53.660 sources, and do a comparison.

NOTE Confidence: 0.9189198

00:34:56.305 --> 00:34:57.265 I I, you know, titled

NOTE Confidence: 0.9189198

00:34:57.265 --> 00:34:58.325 this as, you know,

NOTE Confidence: 0.84902763

00:34:58.625 --> 00:35:00.145 Gale Brain Atlas for Surgical

NOTE Confidence: 0.84902763

00:35:00.145 --> 00:35:01.765 Decision Making for Hepatitis Surgery.

NOTE Confidence: 0.84902763

00:35:02.065 --> 00:35:03.505 Natalie Ackerman comes to us

NOTE Confidence: 0.84902763

00:35:03.505 --> 00:35:04.225 from Spain.

NOTE Confidence: 0.96541405

00:35:05.105 --> 00:35:06.945 She is an undergrad student

NOTE Confidence: 0.96541405

00:35:06.945 --> 00:35:08.625 who's working who's both a

NOTE Confidence: 0.96541405

00:35:08.625 --> 00:35:10.430 medical student and an engineering

NOTE Confidence: 0.96541405

00:35:10.570 --> 00:35:11.869 student at the same time.

NOTE Confidence: 0.96541405

00:35:11.930 --> 00:35:12.829 She's simultaneously

NOTE Confidence: 0.9285213

00:35:13.130 --> 00:35:15.070 doing two programs. And,

NOTE Confidence: 0.98713887

00:35:15.609 --> 00:35:16.730 as an engineer, I really

NOTE Confidence: 0.98713887

00:35:16.730 --> 00:35:18.329 appreciate that background. So very

NOTE Confidence: 0.98713887

00:35:18.329 --> 00:35:19.130 happy to have her in

NOTE Confidence: 0.98713887

00:35:19.130 --> 00:35:20.670 the lab. What she's working

NOTE Confidence: 0.98713887

00:35:20.810 --> 00:35:22.185 with us on is taking

NOTE Confidence: 0.98713887

00:35:22.185 --> 00:35:23.385 all the multimodal data that

NOTE Confidence: 0.98713887

00:35:23.385 --> 00:35:24.125 we've created

NOTE Confidence: 0.99167496

00:35:24.425 --> 00:35:25.625 and fusing it on the

NOTE Confidence: 0.99167496

00:35:25.625 --> 00:35:26.985 same on a single brain

NOTE Confidence: 0.99167496

00:35:26.985 --> 00:35:28.265 to help us with decision

NOTE Confidence: 0.99167496

00:35:28.265 --> 00:35:29.545 making. So these are two

NOTE Confidence: 0.99167496

00:35:29.545 --> 00:35:30.445 separate patients

NOTE Confidence: 0.9385155

00:35:30.985 --> 00:35:32.685 at two different points.

NOTE Confidence: 0.9334442

00:35:33.145 --> 00:35:34.265 Each one, you know, patient

NOTE Confidence: 0.9334442

00:35:34.265 --> 00:35:35.145 one is at one point

NOTE Confidence: 0.9334442

00:35:35.145 --> 00:35:35.945 and patient two is the

NOTE Confidence: 0.9334442

00:35:35.945 --> 00:35:37.890 second point during surgical decision

NOTE Confidence: 0.9334442

00:35:37.890 --> 00:35:39.270 making for epilepsy surgery.

NOTE Confidence: 0.992438

00:35:39.570 --> 00:35:41.170 We typically have two points.

NOTE Confidence: 0.992438

00:35:41.170 --> 00:35:42.130 So the first is we've

NOTE Confidence: 0.992438

00:35:42.130 --> 00:35:42.869 got noninvasive

NOTE Confidence: 0.99942136

00:35:43.329 --> 00:35:43.829 measures

NOTE Confidence: 0.9042721

00:35:44.210 --> 00:35:45.430 like scalp EEG,

NOTE Confidence: 0.8335612

00:35:46.530 --> 00:35:47.030 fMRI,

NOTE Confidence: 0.7835195

00:35:47.570 --> 00:35:48.070 PET,

NOTE Confidence: 0.8710681

00:35:49.969 --> 00:35:50.790 might have

NOTE Confidence: 0.91053534

00:35:51.410 --> 00:35:51.910 MEG.

NOTE Confidence: 0.9962618

00:35:52.825 --> 00:35:53.705 And we have to make

NOTE Confidence: 0.9962618

00:35:53.705 --> 00:35:54.985 a decision on in terms

NOTE Confidence: 0.9962618

00:35:54.985 --> 00:35:55.645 of lateralization,

NOTE Confidence: 0.9466321

00:35:56.105 --> 00:35:56.605 regionalization,

NOTE Confidence: 0.9473705

00:35:57.305 --> 00:35:58.905 and understanding, you know, making

NOTE Confidence: 0.9473705

00:35:58.905 --> 00:36:00.425 decisions on where to put

NOTE Confidence: 0.9473705

00:36:00.425 --> 00:36:02.344 intracranial electrodes if the patient's

NOTE Confidence: 0.9473705

00:36:02.344 --> 00:36:03.705 gonna go ahead with an

NOTE Confidence: 0.9473705

00:36:03.705 --> 00:36:04.844 intracranial surgery,

NOTE Confidence: 0.90561014

00:36:05.545 --> 00:36:06.844 or intracranial monitoring.

NOTE Confidence: 0.988999

00:36:07.550 --> 00:36:09.170 And that image shows,

NOTE Confidence: 0.9210278

00:36:09.710 --> 00:36:10.609 scalp EEG,

NOTE Confidence: 0.9456463

00:36:10.910 --> 00:36:12.210 cortical thickness evaluation,

NOTE Confidence: 0.7782964

00:36:12.510 --> 00:36:12.989 PET,

NOTE Confidence: 0.99176955

00:36:13.310 --> 00:36:13.810 evaluations,

NOTE Confidence: 0.9774789

00:36:14.270 --> 00:36:15.869 etcetera, collocated in the same

NOTE Confidence: 0.9774789

00:36:15.869 --> 00:36:16.670 brain. So you can kind

NOTE Confidence: 0.9774789

00:36:16.670 --> 00:36:18.530 of understand that this patient

NOTE Confidence: 0.9676779

00:36:18.910 --> 00:36:21.090 is showing primarily left temporal

NOTE Confidence: 0.9676779

00:36:21.150 --> 00:36:21.650 lobe,

NOTE Confidence: 0.9714703

00:36:22.375 --> 00:36:23.915 findings from all the noninvasive

NOTE Confidence: 0.9714703

00:36:24.135 --> 00:36:24.635 modalities.

NOTE Confidence: 0.9752075

00:36:25.015 --> 00:36:25.815 And you can see as

NOTE Confidence: 0.9752075

00:36:25.815 --> 00:36:27.095 the modalities, you know, more

NOTE Confidence: 0.9752075

00:36:27.095 --> 00:36:28.695 and more modalities overlap, we're

NOTE Confidence: 0.9752075

00:36:28.695 --> 00:36:29.895 getting closer to what was

NOTE Confidence: 0.9752075

00:36:29.895 --> 00:36:31.095 finally identified at the seizure

NOTE Confidence: 0.9752075

00:36:31.095 --> 00:36:32.535 onset area, which is in

NOTE Confidence: 0.9752075

00:36:32.535 --> 00:36:34.295 the left temporal lobe. On

NOTE Confidence: 0.9752075

00:36:34.295 --> 00:36:35.095 the right, we have a

NOTE Confidence: 0.9752075

00:36:35.095 --> 00:36:36.535 second patient where we brought

NOTE Confidence: 0.9752075

00:36:36.535 --> 00:36:37.035 in

NOTE Confidence: 0.97093165

00:36:37.539 --> 00:36:38.599 not just the noninvasive

NOTE Confidence: 0.9801254

00:36:38.900 --> 00:36:40.599 modalities, but also the intracranial

NOTE Confidence: 0.9801254

00:36:40.819 --> 00:36:42.440 measures that are collected.

NOTE Confidence: 0.9523532

00:36:43.059 --> 00:36:44.900 And, it also shows where

NOTE Confidence: 0.9523532

00:36:44.900 --> 00:36:46.839 the language mapping was before,

NOTE Confidence: 0.9593689

00:36:47.219 --> 00:36:47.960 where language,

NOTE Confidence: 0.9915124

00:36:48.339 --> 00:36:50.039 was established for this patient.

NOTE Confidence: 0.95736885

00:36:50.420 --> 00:36:52.065 It shows a prior resection

NOTE Confidence: 0.95736885

00:36:52.065 --> 00:36:54.065 area. It shows where a

NOTE Confidence: 0.95736885

00:36:54.065 --> 00:36:55.125 neuropace device

NOTE Confidence: 0.9302703

00:36:55.505 --> 00:36:57.025 electrode was placed and where

NOTE Confidence: 0.9302703

00:36:57.025 --> 00:36:58.325 stimulation is being performed.

NOTE Confidence: 0.9875886

00:36:58.625 --> 00:37:00.305 We're working up several examples

NOTE Confidence: 0.9875886

00:37:00.305 --> 00:37:01.685 along these lines to understand

NOTE Confidence: 0.9875886

00:37:01.744 --> 00:37:02.885 if this is useful

NOTE Confidence: 0.9918811

00:37:03.505 --> 00:37:05.344 for decision making and and

NOTE Confidence: 0.9918811

00:37:05.344 --> 00:37:05.844 discussion

NOTE Confidence: 0.9439662

00:37:06.230 --> 00:37:08.569 in, the epilepsy surgery conference.

NOTE Confidence: 0.85853416

00:37:08.869 --> 00:37:10.710 We are sort of at

NOTE Confidence: 0.85853416

00:37:10.710 --> 00:37:11.930 the start of this exercise.

NOTE Confidence: 0.989658

00:37:12.469 --> 00:37:13.670 We're also doing this in

NOTE Confidence: 0.989658

00:37:13.670 --> 00:37:15.430 a separate manner computationally, but

NOTE Confidence: 0.989658

00:37:15.430 --> 00:37:16.809 this this is more illustrative.

NOTE Confidence: 0.95225173

00:37:19.445 --> 00:37:20.645 In other work that's coming

NOTE Confidence: 0.95225173

00:37:20.645 --> 00:37:21.844 out of the Brain Atlas

NOTE Confidence: 0.95225173

00:37:21.844 --> 00:37:22.965 project, you know, we've got

NOTE Confidence: 0.95225173

00:37:22.965 --> 00:37:24.085 several papers. You can find

NOTE Confidence: 0.95225173

00:37:24.085 --> 00:37:25.605 them, that have been published.

NOTE Confidence: 0.95225173

00:37:25.605 --> 00:37:26.405 You can find them on

NOTE Confidence: 0.95225173

00:37:26.405 --> 00:37:27.065 our website.

NOTE Confidence: 0.9484617

00:37:27.525 --> 00:37:28.965 And then, the few others

NOTE Confidence: 0.9484617

00:37:28.965 --> 00:37:30.025 that are in the pipeline.

NOTE Confidence: 0.9484617

00:37:30.325 --> 00:37:31.945 I mentioned Elizabeth Watson's

NOTE Confidence: 0.8158571

00:37:32.680 --> 00:37:34.920 literature review of language literature

NOTE Confidence: 0.8158571

00:37:34.920 --> 00:37:35.420 review.

NOTE Confidence: 0.7213989

00:37:36.040 --> 00:37:37.320 Yi Xiaow has submitted paper

NOTE Confidence: 0.7213989

00:37:37.320 --> 00:37:38.300 on quote, quote,

NOTE Confidence: 0.9495714

00:37:38.760 --> 00:37:39.005 quote, quote, quote, quote, quote,

NOTE Confidence: 0.9495714

00:37:39.005 --> 00:37:39.029 quote, quote, quote, quote, quote,

NOTE Confidence: 0.9495714

00:37:39.029 --> 00:37:39.053 quote, quote, quote, quote, quote,

NOTE Confidence: 0.9495714

00:37:39.053 --> 00:37:39.077 quote, quote, quote, quote, quote,

NOTE Confidence: 0.9495714

00:37:39.077 --> 00:37:39.101 quote, quote, quote, quote, quote,

NOTE Confidence: 0.9495714

00:37:39.101 --> 00:37:39.126 quote, quote, quote, quote, quote,

NOTE Confidence: 0.9495714

00:37:39.126 --> 00:37:39.150 quote, quote, quote, quote, quote,

NOTE Confidence: 0.9495714

00:37:39.150 --> 00:37:39.304 quote, quote, quote, quote, quote,

NOTE Confidence: 0.9495714

00:37:39.304 --> 00:37:40.460 quote, quote, quote, quote

NOTE Confidence: 0.8671712

00:37:46.385 --> 00:37:49.025 she's submitted a small, short

NOTE Confidence: 0.8671712

00:37:49.025 --> 00:37:51.364 communication on that. Brian Bozroy

NOTE Confidence: 0.8671712

00:37:51.505 --> 00:37:52.385 is working up on a

NOTE Confidence: 0.8671712

00:37:52.385 --> 00:37:53.684 transformer based framework

NOTE Confidence: 0.9817642

00:37:54.305 --> 00:37:56.464 for fMRI data on the

NOTE Confidence: 0.9817642

00:37:56.464 --> 00:37:58.305 brain atlas, which is revealing

NOTE Confidence: 0.9817642

00:37:58.305 --> 00:37:59.825 some pretty nice structure to

NOTE Confidence: 0.9817642

00:37:59.825 --> 00:38:02.260 us and information that, we

NOTE Confidence: 0.9817642

00:38:02.260 --> 00:38:03.540 had not seen before from

NOTE Confidence: 0.9817642

00:38:03.540 --> 00:38:04.040 fMRI.

NOTE Confidence: 0.9485509

00:38:04.980 --> 00:38:06.099 This team is is quite

NOTE Confidence: 0.9485509

00:38:06.099 --> 00:38:07.619 large. What's unique about this

NOTE Confidence: 0.9485509

00:38:07.619 --> 00:38:09.140 project is that we just

NOTE Confidence: 0.9485509

00:38:09.140 --> 00:38:10.739 have undergraduate students working on

NOTE Confidence: 0.9485509

00:38:10.739 --> 00:38:12.180 it. The top two rows

NOTE Confidence: 0.9485509

00:38:12.180 --> 00:38:13.935 are under we've had one

NOTE Confidence: 0.9485509

00:38:13.935 --> 00:38:15.295 medical student. I I guess

NOTE Confidence: 0.9485509

00:38:15.295 --> 00:38:16.895 now Elizabeth's joined Yale School

NOTE Confidence: 0.9485509

00:38:16.895 --> 00:38:17.855 of Medicine. So we have

NOTE Confidence: 0.9485509

00:38:17.855 --> 00:38:18.835 two medical students

NOTE Confidence: 0.85352314

00:38:19.295 --> 00:38:21.235 and one graduate student, Jishao.

NOTE Confidence: 0.98360014

00:38:21.535 --> 00:38:23.475 The rest are undergraduate students,

NOTE Confidence: 0.99751496

00:38:23.775 --> 00:38:25.295 and they pretty much drive

NOTE Confidence: 0.99751496

00:38:25.295 --> 00:38:26.255 the project. It's a lot

NOTE Confidence: 0.99751496

00:38:26.255 --> 00:38:26.915 of fun.

NOTE Confidence: 0.9822912

00:38:27.300 --> 00:38:28.340 We meet three times a

NOTE Confidence: 0.9822912

00:38:28.340 --> 00:38:28.820 week,

NOTE Confidence: 0.9976167

00:38:30.340 --> 00:38:31.940 and they all take on

NOTE Confidence: 0.9976167

00:38:31.940 --> 00:38:32.440 different

NOTE Confidence: 0.9366118

00:38:32.820 --> 00:38:34.440 subprojects and work on them.

NOTE Confidence: 0.9662505

00:38:36.100 --> 00:38:37.640 That's the second project,

NOTE Confidence: 0.9993265

00:38:38.660 --> 00:38:40.280 that I wanted to present.

NOTE Confidence: 0.9871796

00:38:41.125 --> 00:38:43.205 The third project is, what

NOTE Confidence: 0.9871796

00:38:43.205 --> 00:38:44.985 we call our saliva project,

NOTE Confidence: 0.9511929

00:38:45.285 --> 00:38:47.145 or seizure forecasting project.

NOTE Confidence: 0.9958717

00:38:47.685 --> 00:38:48.405 And that's,

NOTE Confidence: 0.9337354

00:38:49.125 --> 00:38:50.005 you know, funded by an

NOTE Confidence: 0.9337354

00:38:50.005 --> 00:38:51.285 r o one, which we

NOTE Confidence: 0.9337354

00:38:51.285 --> 00:38:52.485 received a little over a

NOTE Confidence: 0.9337354

00:38:52.485 --> 00:38:53.225 year back,

NOTE Confidence: 0.9226004

00:38:54.325 --> 00:38:55.705 to the three of us,

NOTE Confidence: 0.9226004

00:38:56.000 --> 00:38:57.700 Torai, doctor Spencer, and myself.

NOTE Confidence: 0.93200016

00:38:58.000 --> 00:38:59.059 And our collaboration,

NOTE Confidence: 0.91240585

00:38:59.599 --> 00:39:01.040 is with Vikram Rao at

NOTE Confidence: 0.91240585

00:39:01.040 --> 00:39:02.559 UCSF and Maxine Borde at

NOTE Confidence: 0.91240585

00:39:02.559 --> 00:39:03.940 UGC Bern in Switzerland.

NOTE Confidence: 0.765603

00:39:04.719 --> 00:39:05.700 This project

NOTE Confidence: 0.9699142

00:39:06.079 --> 00:39:08.000 is strongly influenced by this

NOTE Confidence: 0.9699142

00:39:08.000 --> 00:39:09.335 result, which was published in

NOTE Confidence: 0.9699142

00:39:09.335 --> 00:39:10.234 two thousand eighteen

NOTE Confidence: 0.8421192

00:39:11.015 --> 00:39:12.934 by our colleagues, Maxine Board

NOTE Confidence: 0.8421192

00:39:12.934 --> 00:39:14.075 and Vikram Rao.

NOTE Confidence: 0.9984478

00:39:14.454 --> 00:39:16.395 And what this shows is

NOTE Confidence: 0.88429993

00:39:17.414 --> 00:39:18.454 an you know, a patient

NOTE Confidence: 0.88429993

00:39:18.454 --> 00:39:19.835 with a neuroPACE device

NOTE Confidence: 0.93895817

00:39:20.614 --> 00:39:21.734 being monitored, and this is

NOTE Confidence: 0.93895817

00:39:21.734 --> 00:39:22.855 a twenty second epoch, and

NOTE Confidence: 0.93895817

00:39:22.855 --> 00:39:24.270 there is this one epileptiform

NOTE Confidence: 0.93895817

00:39:24.410 --> 00:39:25.370 discharge. So you have a

NOTE Confidence: 0.93895817

00:39:25.370 --> 00:39:26.810 count of one, and you

NOTE Confidence: 0.93895817

00:39:26.810 --> 00:39:28.490 have multiple discharges in this

NOTE Confidence: 0.93895817

00:39:28.490 --> 00:39:29.450 twenty second epoch. You have

NOTE Confidence: 0.93895817

00:39:29.450 --> 00:39:30.590 a count of eighteen.

NOTE Confidence: 0.96677625

00:39:31.050 --> 00:39:32.090 And what they did is

NOTE Confidence: 0.96677625

00:39:32.090 --> 00:39:33.550 they took the detector counts,

NOTE Confidence: 0.9476223

00:39:33.930 --> 00:39:35.450 hourly detector counts, and plotted

NOTE Confidence: 0.9476223

00:39:35.450 --> 00:39:36.330 them. This is over two

NOTE Confidence: 0.9476223

00:39:36.330 --> 00:39:38.005 months, February and March, for

NOTE Confidence: 0.9476223

00:39:38.005 --> 00:39:38.925 a given patient. And you

NOTE Confidence: 0.9476223

00:39:38.925 --> 00:39:40.145 can see a very strong

NOTE Confidence: 0.96077925

00:39:40.525 --> 00:39:41.965 circadian or or twenty four

NOTE Confidence: 0.96077925

00:39:41.965 --> 00:39:43.245 hour cycle in there that's

NOTE Confidence: 0.96077925

00:39:43.245 --> 00:39:44.305 modulating the data.

NOTE Confidence: 0.98392093

00:39:44.685 --> 00:39:46.925 But also modulating it at

NOTE Confidence: 0.98392093

00:39:46.925 --> 00:39:48.685 another time scale is this

NOTE Confidence: 0.98392093

00:39:48.685 --> 00:39:50.340 other cycle that happens at

NOTE Confidence: 0.98392093

00:39:50.340 --> 00:39:50.840 certain

NOTE Confidence: 0.97017187

00:39:51.300 --> 00:39:52.180 times. And then when you

NOTE Confidence: 0.97017187

00:39:52.180 --> 00:39:53.780 average the data across the

NOTE Confidence: 0.97017187

00:39:53.780 --> 00:39:54.739 whole day and you look

NOTE Confidence: 0.97017187

00:39:54.739 --> 00:39:55.620 at it, this is for

NOTE Confidence: 0.97017187

00:39:55.620 --> 00:39:57.000 twelve months or one year,

NOTE Confidence: 0.97017187

00:39:57.140 --> 00:39:59.140 and this two months, embedded

NOTE Confidence: 0.97017187

00:39:59.140 --> 00:40:00.739 within this one year, you

NOTE Confidence: 0.97017187

00:40:00.739 --> 00:40:01.940 see the emergence of these

NOTE Confidence: 0.97017187

00:40:01.940 --> 00:40:03.700 cycles. Now these cycles are

NOTE Confidence: 0.97017187

00:40:03.700 --> 00:40:05.480 not known, not understood.

NOTE Confidence: 0.9067658

00:40:05.984 --> 00:40:07.605 These are multi day cycles

NOTE Confidence: 0.9833985

00:40:08.065 --> 00:40:09.025 that are seen in men

NOTE Confidence: 0.9833985

00:40:09.025 --> 00:40:10.464 and women, and they seem

NOTE Confidence: 0.9833985

00:40:10.464 --> 00:40:12.305 to govern the occurrence of

NOTE Confidence: 0.9833985

00:40:12.305 --> 00:40:12.805 seizures.

NOTE Confidence: 0.97225064

00:40:13.184 --> 00:40:14.704 In this particular patient, the

NOTE Confidence: 0.97225064

00:40:14.704 --> 00:40:15.744 seizures are marked as red

NOTE Confidence: 0.97225064

00:40:15.744 --> 00:40:16.545 dots and you can see

NOTE Confidence: 0.97225064

00:40:16.545 --> 00:40:17.904 the seizures occur on the

NOTE Confidence: 0.97225064

00:40:17.904 --> 00:40:18.404 upslope

NOTE Confidence: 0.99411154

00:40:18.860 --> 00:40:19.920 of this cycle

NOTE Confidence: 0.95205635

00:40:20.219 --> 00:40:22.140 at relative maxima or relative

NOTE Confidence: 0.95205635

00:40:22.140 --> 00:40:23.580 minima. And you can see

NOTE Confidence: 0.95205635

00:40:23.580 --> 00:40:24.700 towards here, you know, a

NOTE Confidence: 0.95205635

00:40:24.700 --> 00:40:25.980 lot of seizures clustering and

NOTE Confidence: 0.95205635

00:40:25.980 --> 00:40:27.040 happening on the upslope

NOTE Confidence: 0.99963003

00:40:27.340 --> 00:40:28.000 of this

NOTE Confidence: 0.9997501

00:40:28.300 --> 00:40:28.800 cycle.

NOTE Confidence: 0.92636466

00:40:31.035 --> 00:40:32.714 The way we approach this,

NOTE Confidence: 0.92636466

00:40:32.954 --> 00:40:34.714 in collaboration with Maxim and

NOTE Confidence: 0.92636466

00:40:34.714 --> 00:40:35.375 and Vikram

NOTE Confidence: 0.97912

00:40:36.075 --> 00:40:37.594 is to propose a project

NOTE Confidence: 0.97912

00:40:37.594 --> 00:40:38.974 in which we would take

NOTE Confidence: 0.97912

00:40:39.035 --> 00:40:41.055 daily or multiple saliva samples.

NOTE Confidence: 0.86520654

00:40:42.875 --> 00:40:44.555 Working with Tor, we put

NOTE Confidence: 0.86520654

00:40:44.555 --> 00:40:45.780 these saliva samples through a

NOTE Confidence: 0.86520654

00:40:45.780 --> 00:40:46.440 mass spec

NOTE Confidence: 0.9927888

00:40:47.140 --> 00:40:48.200 analysis and create

NOTE Confidence: 0.8734487

00:40:48.739 --> 00:40:50.180 a rich report sort of

NOTE Confidence: 0.8734487

00:40:50.180 --> 00:40:51.719 rich assay, if you wish,

NOTE Confidence: 0.9926861

00:40:52.020 --> 00:40:54.100 of organic acids, amino acids,

NOTE Confidence: 0.9926861

00:40:54.100 --> 00:40:55.719 steroids, hormones, etcetera.

NOTE Confidence: 0.9962142

00:40:56.340 --> 00:40:57.540 And then we put this

NOTE Confidence: 0.9962142

00:40:57.540 --> 00:40:59.000 through machine learning algorithms

NOTE Confidence: 0.9970373

00:40:59.380 --> 00:41:00.975 to try and understand if

NOTE Confidence: 0.9970373

00:41:00.975 --> 00:41:02.255 there are any changes in

NOTE Confidence: 0.9970373

00:41:02.255 --> 00:41:04.015 the saliva chemistry that is

NOTE Confidence: 0.9970373

00:41:04.015 --> 00:41:04.515 predictive

NOTE Confidence: 0.9739571

00:41:05.055 --> 00:41:05.875 of an episode.

NOTE Confidence: 0.9970563

00:41:07.295 --> 00:41:09.455 The two aims that we

NOTE Confidence: 0.9970563

00:41:09.455 --> 00:41:10.995 are pursuing in this application

NOTE Confidence: 0.92809254

00:41:11.695 --> 00:41:13.055 are one aim one is

NOTE Confidence: 0.92809254

00:41:13.055 --> 00:41:14.255 an at home study. It's

NOTE Confidence: 0.92809254

00:41:14.255 --> 00:41:16.489 conducted over four hundred and

NOTE Confidence: 0.92809254

00:41:16.489 --> 00:41:16.989 twenty

NOTE Confidence: 0.8741475

00:41:17.450 --> 00:41:18.730 days. And we this is

NOTE Confidence: 0.8741475

00:41:18.730 --> 00:41:19.930 the data we collect. So

NOTE Confidence: 0.8741475

00:41:19.930 --> 00:41:20.730 there are the piece of

NOTE Confidence: 0.8741475

00:41:20.730 --> 00:41:22.250 patients with RNS devices who

NOTE Confidence: 0.8741475

00:41:22.250 --> 00:41:24.010 collect the r the RNS

NOTE Confidence: 0.8741475

00:41:24.010 --> 00:41:24.510 information.

NOTE Confidence: 0.934929

00:41:24.890 --> 00:41:26.170 They have a wearable device

NOTE Confidence: 0.934929

00:41:26.170 --> 00:41:28.250 that's, you know, collecting acceleration

NOTE Confidence: 0.934929

00:41:28.250 --> 00:41:30.135 data. They maintain a diary

NOTE Confidence: 0.934929

00:41:30.135 --> 00:41:31.255 of the seizures and the

NOTE Confidence: 0.934929

00:41:31.255 --> 00:41:31.755 mood.

NOTE Confidence: 0.9860164

00:41:32.135 --> 00:41:32.795 They maintain,

NOTE Confidence: 0.99750835

00:41:33.175 --> 00:41:34.535 information on the meals they've

NOTE Confidence: 0.99750835

00:41:34.535 --> 00:41:35.035 had,

NOTE Confidence: 0.97878057

00:41:35.495 --> 00:41:36.775 the meds they're taking, and

NOTE Confidence: 0.97878057

00:41:36.775 --> 00:41:38.215 they take saliva samples three

NOTE Confidence: 0.97878057

00:41:38.215 --> 00:41:39.835 times a day before breakfast,

NOTE Confidence: 0.97878057

00:41:39.895 --> 00:41:41.675 before dinner, and before bed.

NOTE Confidence: 0.9122174

00:41:42.190 --> 00:41:43.790 We also in aim two,

NOTE Confidence: 0.9122174

00:41:43.790 --> 00:41:44.989 we are studying if you

NOTE Confidence: 0.9122174

00:41:44.989 --> 00:41:46.850 wish more the circadian structure

NOTE Confidence: 0.91904956

00:41:47.150 --> 00:41:48.210 of these variations.

NOTE Confidence: 0.96532524

00:41:48.989 --> 00:41:50.110 And this is done in

NOTE Confidence: 0.96532524

00:41:50.110 --> 00:41:51.710 the epilepsy monitoring unit in

NOTE Confidence: 0.96532524

00:41:51.710 --> 00:41:52.910 house, and this can be

NOTE Confidence: 0.96532524

00:41:52.910 --> 00:41:54.030 up to six days or

NOTE Confidence: 0.96532524

00:41:54.030 --> 00:41:55.469 so. And here we measure

NOTE Confidence: 0.96532524

00:41:55.469 --> 00:41:56.610 EEG acceleration.

NOTE Confidence: 0.95478743

00:41:57.435 --> 00:41:58.795 We keep note of the

NOTE Confidence: 0.95478743

00:41:58.795 --> 00:42:00.475 meal times, the medications they're

NOTE Confidence: 0.95478743

00:42:00.475 --> 00:42:02.094 on, and we take saliva

NOTE Confidence: 0.95478743

00:42:02.315 --> 00:42:03.755 several times a day before

NOTE Confidence: 0.95478743

00:42:03.755 --> 00:42:05.594 meals and including a three

NOTE Confidence: 0.95478743

00:42:05.594 --> 00:42:07.135 AM sample out of sleep

NOTE Confidence: 0.9917658

00:42:07.435 --> 00:42:08.655 and post seizures.

NOTE Confidence: 0.97026134

00:42:09.980 --> 00:42:10.780 I'll give you a sense.

NOTE Confidence: 0.97026134

00:42:10.780 --> 00:42:12.299 This is still very early

NOTE Confidence: 0.97026134

00:42:12.299 --> 00:42:13.260 in terms of where we've

NOTE Confidence: 0.97026134

00:42:13.260 --> 00:42:14.559 reached in terms of analysis

NOTE Confidence: 0.97026134

00:42:14.700 --> 00:42:16.160 and working with the data,

NOTE Confidence: 0.97026134

00:42:16.299 --> 00:42:17.579 but this will just give

NOTE Confidence: 0.97026134

00:42:17.579 --> 00:42:18.780 you a sense of what

NOTE Confidence: 0.97026134

00:42:18.780 --> 00:42:19.739 may come out of this

NOTE Confidence: 0.97026134

00:42:19.739 --> 00:42:20.239 project.

NOTE Confidence: 0.9954705

00:42:20.859 --> 00:42:21.359 The

NOTE Confidence: 0.7397039

00:42:22.155 --> 00:42:22.635 figure,

NOTE Confidence: 0.9507037

00:42:22.955 --> 00:42:23.995 the the sub figures on

NOTE Confidence: 0.9507037

00:42:23.995 --> 00:42:25.135 the left show

NOTE Confidence: 0.8977217

00:42:25.435 --> 00:42:27.035 three of our subjects that

NOTE Confidence: 0.8977217

00:42:27.035 --> 00:42:28.335 have neuro paced devices

NOTE Confidence: 0.9725926

00:42:28.635 --> 00:42:29.614 and the counts

NOTE Confidence: 0.9788014

00:42:29.915 --> 00:42:31.114 the detection counts of the

NOTE Confidence: 0.9788014

00:42:31.114 --> 00:42:31.614 detector.

NOTE Confidence: 0.9321102

00:42:31.995 --> 00:42:32.955 And you can see the

NOTE Confidence: 0.9321102

00:42:32.955 --> 00:42:34.155 top two subjects are in

NOTE Confidence: 0.9321102

00:42:34.155 --> 00:42:35.435 a subject three and six

NOTE Confidence: 0.9321102

00:42:35.435 --> 00:42:37.375 have strong multi day cycles.

NOTE Confidence: 0.98551065

00:42:38.030 --> 00:42:39.070 And the top part of

NOTE Confidence: 0.98551065

00:42:39.070 --> 00:42:40.349 the cycle is colored red.

NOTE Confidence: 0.98551065

00:42:40.349 --> 00:42:41.150 The bottom part of the

NOTE Confidence: 0.98551065

00:42:41.150 --> 00:42:42.450 cycle is colored blue.

NOTE Confidence: 0.9629705

00:42:42.830 --> 00:42:44.270 And the third subject, which

NOTE Confidence: 0.9629705

00:42:44.270 --> 00:42:45.469 is subject two, does not

NOTE Confidence: 0.9629705

00:42:45.469 --> 00:42:46.530 have these cycles.

NOTE Confidence: 0.9734424

00:42:47.869 --> 00:42:49.550 So we took saliva samples

NOTE Confidence: 0.9734424

00:42:49.550 --> 00:42:50.590 from the blue part of

NOTE Confidence: 0.9734424

00:42:50.590 --> 00:42:51.630 cycle and the red part

NOTE Confidence: 0.9734424

00:42:51.630 --> 00:42:53.025 of cycle and then put

NOTE Confidence: 0.9734424

00:42:53.025 --> 00:42:54.645 them in a binary classifier

NOTE Confidence: 0.9734424

00:42:54.704 --> 00:42:56.165 to say, can you distinguish

NOTE Confidence: 0.946192

00:42:56.704 --> 00:42:58.484 based on analyte concentration

NOTE Confidence: 0.96293473

00:42:59.585 --> 00:43:00.704 the high parts of the

NOTE Confidence: 0.96293473

00:43:00.704 --> 00:43:01.905 cycle from the low parts

NOTE Confidence: 0.96293473

00:43:01.905 --> 00:43:03.265 of the cycle? Because we

NOTE Confidence: 0.96293473

00:43:03.265 --> 00:43:05.184 know seizures come from that

NOTE Confidence: 0.96293473

00:43:05.184 --> 00:43:06.450 red part of the cycle,

NOTE Confidence: 0.96293473

00:43:06.530 --> 00:43:07.829 which we call a proictal

NOTE Confidence: 0.96293473

00:43:07.969 --> 00:43:08.469 state

NOTE Confidence: 0.9352279

00:43:09.010 --> 00:43:10.130 as opposed to the blue

NOTE Confidence: 0.9352279

00:43:10.130 --> 00:43:11.510 part, which is an antique

NOTE Confidence: 0.9352279

00:43:11.570 --> 00:43:12.930 state. Because if you could

NOTE Confidence: 0.9352279

00:43:12.930 --> 00:43:14.869 do this, then we could

NOTE Confidence: 0.9778283

00:43:15.570 --> 00:43:17.410 conceivably propose a test where

NOTE Confidence: 0.9778283

00:43:17.410 --> 00:43:18.530 you spit in a tube

NOTE Confidence: 0.9778283

00:43:18.530 --> 00:43:19.750 and you get a reading

NOTE Confidence: 0.9778283

00:43:19.890 --> 00:43:20.770 that you're gonna have a

NOTE Confidence: 0.9778283

00:43:20.770 --> 00:43:21.570 good day or a bad

NOTE Confidence: 0.9778283

00:43:21.570 --> 00:43:22.070 day.

NOTE Confidence: 0.99747163

00:43:23.105 --> 00:43:24.864 So this is very early

NOTE Confidence: 0.99747163

00:43:24.864 --> 00:43:25.364 analysis.

NOTE Confidence: 0.9259506

00:43:25.744 --> 00:43:27.344 We built a classifier. That's

NOTE Confidence: 0.9259506

00:43:27.344 --> 00:43:28.864 the ROC curve, but the

NOTE Confidence: 0.9259506

00:43:28.864 --> 00:43:30.065 numbers are here. We could

NOTE Confidence: 0.9259506

00:43:30.065 --> 00:43:31.744 correctly identify the two positive

NOTE Confidence: 0.9259506

00:43:31.744 --> 00:43:32.885 rates for the antiictal

NOTE Confidence: 0.9380694

00:43:33.265 --> 00:43:34.944 cycle is the antiictal time

NOTE Confidence: 0.9380694

00:43:34.944 --> 00:43:36.065 point is seventy eight point

NOTE Confidence: 0.9380694

00:43:36.065 --> 00:43:37.599 six percent and proactyl time

NOTE Confidence: 0.9380694

00:43:37.599 --> 00:43:38.900 point is sixty three percent.

NOTE Confidence: 0.9380694

00:43:39.040 --> 00:43:39.760 Now this is with a

NOTE Confidence: 0.9380694

00:43:39.760 --> 00:43:41.859 small subset of the analytes

NOTE Confidence: 0.9380694

00:43:42.080 --> 00:43:43.359 concentration that we expect to

NOTE Confidence: 0.9380694

00:43:43.359 --> 00:43:44.719 have. This was done very

NOTE Confidence: 0.9380694

00:43:44.719 --> 00:43:46.560 early on. We put this,

NOTE Confidence: 0.89420974

00:43:46.960 --> 00:43:48.080 we we ran the data

NOTE Confidence: 0.89420974

00:43:48.080 --> 00:43:49.599 from four control subjects and

NOTE Confidence: 0.89420974

00:43:49.599 --> 00:43:51.060 seven epilepsy subjects

NOTE Confidence: 0.9440727

00:43:51.385 --> 00:43:52.765 through the classifier,

NOTE Confidence: 0.971476

00:43:53.465 --> 00:43:54.665 and we found that twenty

NOTE Confidence: 0.971476

00:43:54.665 --> 00:43:55.864 nine percent of the samples

NOTE Confidence: 0.971476

00:43:55.864 --> 00:43:57.225 from the epilepsy patients were

NOTE Confidence: 0.971476

00:43:57.225 --> 00:43:59.465 in the procedure state, while

NOTE Confidence: 0.971476

00:43:59.465 --> 00:44:00.665 only two percent of the

NOTE Confidence: 0.971476

00:44:00.665 --> 00:44:02.265 samples from the control subject

NOTE Confidence: 0.971476

00:44:02.265 --> 00:44:03.480 were in the procedure state.

NOTE Confidence: 0.971476

00:44:03.719 --> 00:44:04.359 So I know it's a

NOTE Confidence: 0.971476

00:44:04.359 --> 00:44:05.640 bit of stretch, but essentially,

NOTE Confidence: 0.971476

00:44:05.640 --> 00:44:06.760 you know, the the group

NOTE Confidence: 0.971476

00:44:06.760 --> 00:44:07.820 has a lot

NOTE Confidence: 0.99765843

00:44:08.280 --> 00:44:10.119 of interest and expertise in

NOTE Confidence: 0.99765843

00:44:10.119 --> 00:44:11.020 studying neurochemistry.

NOTE Confidence: 0.8806477

00:44:11.640 --> 00:44:13.000 We've done that for many

NOTE Confidence: 0.8806477

00:44:13.000 --> 00:44:14.700 years. Doctor Spencer, Toride.

NOTE Confidence: 0.99624866

00:44:15.000 --> 00:44:15.960 We used to do brain

NOTE Confidence: 0.99624866

00:44:15.960 --> 00:44:16.460 microdialysis

NOTE Confidence: 0.91156673

00:44:16.760 --> 00:44:18.060 in our patients at Yale,

NOTE Confidence: 0.86261135

00:44:18.785 --> 00:44:20.645 going back several decades.

NOTE Confidence: 0.96656746

00:44:21.105 --> 00:44:22.305 We've done these studies in

NOTE Confidence: 0.96656746

00:44:22.305 --> 00:44:23.765 animal models of epilepsy.

NOTE Confidence: 0.93041843

00:44:24.305 --> 00:44:25.425 And we are now taking

NOTE Confidence: 0.93041843

00:44:25.425 --> 00:44:26.385 that, you know, a couple

NOTE Confidence: 0.93041843

00:44:26.385 --> 00:44:27.605 steps. So we are arguing

NOTE Confidence: 0.8959767

00:44:28.385 --> 00:44:29.345 inherent to this is that

NOTE Confidence: 0.8959767

00:44:29.345 --> 00:44:31.345 argument that saliva, which is

NOTE Confidence: 0.8959767

00:44:31.345 --> 00:44:32.805 a surrogate for blood,

NOTE Confidence: 0.95366305

00:44:33.270 --> 00:44:34.710 contains some of the information

NOTE Confidence: 0.95366305

00:44:34.710 --> 00:44:35.590 that we'd be picking up

NOTE Confidence: 0.95366305

00:44:35.590 --> 00:44:36.330 from neurochemistry

NOTE Confidence: 0.9870011

00:44:36.630 --> 00:44:37.290 in the past.

NOTE Confidence: 0.9781617

00:44:37.750 --> 00:44:39.110 And this is, you know,

NOTE Confidence: 0.9781617

00:44:39.110 --> 00:44:40.650 what we are working on.

NOTE Confidence: 0.9781617

00:44:40.870 --> 00:44:42.070 The team we've created is

NOTE Confidence: 0.9781617

00:44:42.070 --> 00:44:43.350 quite large in order to

NOTE Confidence: 0.9781617

00:44:43.350 --> 00:44:44.390 be able to collect these

NOTE Confidence: 0.9781617

00:44:44.390 --> 00:44:45.954 saliva samples at home or

NOTE Confidence: 0.9781617

00:44:45.954 --> 00:44:47.655 in the epilepsy monitoring unit.

NOTE Confidence: 0.9781617

00:44:47.714 --> 00:44:49.075 It's again, you know, led

NOTE Confidence: 0.9781617

00:44:49.075 --> 00:44:50.775 by some, there's an undergrad

NOTE Confidence: 0.9781617

00:44:50.915 --> 00:44:51.815 medical students.

NOTE Confidence: 0.96622956

00:44:52.835 --> 00:44:53.875 Different people have worked on

NOTE Confidence: 0.96622956

00:44:53.875 --> 00:44:55.174 the project at different time.

NOTE Confidence: 0.93501335

00:44:55.795 --> 00:44:57.155 There are four or five

NOTE Confidence: 0.93501335

00:44:57.155 --> 00:44:59.174 medical students here. Ami

NOTE Confidence: 0.9864411

00:45:01.190 --> 00:45:02.069 sort of has taken the

NOTE Confidence: 0.9864411

00:45:02.069 --> 00:45:03.450 lead in creating this team

NOTE Confidence: 0.9864411

00:45:03.670 --> 00:45:04.869 that goes in and takes

NOTE Confidence: 0.9864411

00:45:04.869 --> 00:45:06.150 saliva samples for us in

NOTE Confidence: 0.9864411

00:45:06.150 --> 00:45:06.809 the EMU.

NOTE Confidence: 0.82918924

00:45:07.190 --> 00:45:08.790 And our colleagues, Maxine Board,

NOTE Confidence: 0.82918924

00:45:08.790 --> 00:45:10.069 Vikram Rao, are shown here

NOTE Confidence: 0.82918924

00:45:10.069 --> 00:45:10.730 as well.

NOTE Confidence: 0.8476806

00:45:11.915 --> 00:45:12.955 And we want to thank

NOTE Confidence: 0.8476806

00:45:12.955 --> 00:45:15.195 all the EEMU staff. That's

NOTE Confidence: 0.8476806

00:45:15.195 --> 00:45:15.935 very helpful.

NOTE Confidence: 0.8110267

00:45:16.474 --> 00:45:16.974 Amadeo,

NOTE Confidence: 0.65029764

00:45:17.675 --> 00:45:19.295 Rebecca, sort of Brandy,

NOTE Confidence: 0.93243194

00:45:19.755 --> 00:45:21.435 and, Rebecca as a leadership

NOTE Confidence: 0.93243194

00:45:21.435 --> 00:45:22.474 in this and the nursing

NOTE Confidence: 0.93243194

00:45:22.474 --> 00:45:24.015 staff that's helped us tremendously,

NOTE Confidence: 0.8796285

00:45:25.195 --> 00:45:26.575 in collecting this data.

NOTE Confidence: 0.97584045

00:45:27.770 --> 00:45:29.210 So that's, you know, the

NOTE Confidence: 0.97584045

00:45:29.210 --> 00:45:30.910 the the fourth project is

NOTE Confidence: 0.9089381

00:45:31.369 --> 00:45:33.070 a brain computer interface project.

NOTE Confidence: 0.88684916

00:45:33.770 --> 00:45:35.050 This is funded I forgot

NOTE Confidence: 0.88684916

00:45:35.050 --> 00:45:36.090 to list the second grant.

NOTE Confidence: 0.88684916

00:45:36.090 --> 00:45:37.290 We put NIH, r o

NOTE Confidence: 0.88684916

00:45:37.290 --> 00:45:38.170 one, and we've got an

NOTE Confidence: 0.88684916

00:45:38.170 --> 00:45:40.170 NSF award on this. And

NOTE Confidence: 0.88684916

00:45:40.170 --> 00:45:41.530 here we're trying to build

NOTE Confidence: 0.88684916

00:45:41.530 --> 00:45:42.030 capability

NOTE Confidence: 0.9610303

00:45:42.775 --> 00:45:44.535 for monitoring and modulating brain

NOTE Confidence: 0.9610303

00:45:44.535 --> 00:45:46.715 networks. So essentially, this translates

NOTE Confidence: 0.9610303

00:45:46.855 --> 00:45:47.975 into a question. Can you

NOTE Confidence: 0.9610303

00:45:47.975 --> 00:45:48.955 build a BCI

NOTE Confidence: 0.999025

00:45:49.335 --> 00:45:51.015 that can monitor multiple points

NOTE Confidence: 0.999025

00:45:51.015 --> 00:45:51.755 in the brain

NOTE Confidence: 0.98881894

00:45:52.055 --> 00:45:52.555 and

NOTE Confidence: 0.9961748

00:45:53.335 --> 00:45:54.955 perform network analysis?

NOTE Confidence: 0.91945684

00:45:56.310 --> 00:45:57.750 So, you know, can we

NOTE Confidence: 0.91945684

00:45:57.750 --> 00:45:59.510 support large channel counts? By

NOTE Confidence: 0.91945684

00:45:59.510 --> 00:46:01.030 large, we mean it could

NOTE Confidence: 0.91945684

00:46:01.030 --> 00:46:02.310 be fifty, could be a

NOTE Confidence: 0.91945684

00:46:02.310 --> 00:46:02.810 hundred.

NOTE Confidence: 0.95062333

00:46:03.350 --> 00:46:04.950 And high data rates, can

NOTE Confidence: 0.95062333

00:46:04.950 --> 00:46:05.530 you support

NOTE Confidence: 0.97469103

00:46:06.070 --> 00:46:08.170 machine learning, deep learning, connectivity

NOTE Confidence: 0.97469103

00:46:08.310 --> 00:46:09.670 analysis on a brain computer

NOTE Confidence: 0.97469103

00:46:09.670 --> 00:46:11.055 interface device? Could it be

NOTE Confidence: 0.97469103

00:46:11.055 --> 00:46:12.494 software programmable so that the

NOTE Confidence: 0.97469103

00:46:12.494 --> 00:46:13.535 same hardware can be used

NOTE Confidence: 0.97469103

00:46:13.535 --> 00:46:14.594 for multiple indications

NOTE Confidence: 0.967244

00:46:14.895 --> 00:46:16.575 and not just be finely

NOTE Confidence: 0.967244

00:46:16.575 --> 00:46:18.655 developed for one indication? And,

NOTE Confidence: 0.967244

00:46:18.655 --> 00:46:19.855 you know, at the end,

NOTE Confidence: 0.967244

00:46:20.094 --> 00:46:21.375 my colleagues threw in this

NOTE Confidence: 0.967244

00:46:21.375 --> 00:46:21.875 one

NOTE Confidence: 0.9795567

00:46:22.175 --> 00:46:23.295 requirement. Could it last for

NOTE Confidence: 0.9795567

00:46:23.295 --> 00:46:24.675 years on a single battery?

NOTE Confidence: 0.9364042

00:46:26.710 --> 00:46:27.830 A first gen this is

NOTE Confidence: 0.9364042

00:46:27.830 --> 00:46:29.530 not vaporware. The first generation

NOTE Confidence: 0.9364042

00:46:29.590 --> 00:46:30.630 chip has been built at

NOTE Confidence: 0.9364042

00:46:30.630 --> 00:46:31.130 Yale

NOTE Confidence: 0.9830811

00:46:31.510 --> 00:46:32.010 by,

NOTE Confidence: 0.832359

00:46:32.550 --> 00:46:34.650 Rajeet Manur and Abhishek Bhattacharjee.

NOTE Confidence: 0.93894386

00:46:35.190 --> 00:46:36.410 They call it the halo,

NOTE Confidence: 0.9784765

00:46:37.190 --> 00:46:38.790 you know, hardware architecture for

NOTE Confidence: 0.9784765

00:46:38.790 --> 00:46:39.770 low power BCIs.

NOTE Confidence: 0.9526624

00:46:40.725 --> 00:46:42.165 And this chip has been

NOTE Confidence: 0.9526624

00:46:42.165 --> 00:46:43.925 built the way our chips

NOTE Confidence: 0.9526624

00:46:43.925 --> 00:46:45.305 in our cell phones work.

NOTE Confidence: 0.9526624

00:46:45.364 --> 00:46:47.065 It's got processing elements,

NOTE Confidence: 0.39201924

00:46:47.445 --> 00:46:48.505 system of compression,

NOTE Confidence: 0.85709405

00:46:49.605 --> 00:46:51.545 discrete wavelet transforms, nonlinear

NOTE Confidence: 0.95487165

00:46:51.845 --> 00:46:53.705 energy operator, fast Fourier transforms,

NOTE Confidence: 0.90917933

00:46:54.080 --> 00:46:55.840 cross correlation, band pass filters,

NOTE Confidence: 0.90917933

00:46:55.840 --> 00:46:57.780 support vector machines. So many,

NOTE Confidence: 0.91925013

00:46:58.400 --> 00:47:00.420 computational kernels that we perform

NOTE Confidence: 0.7255592

00:47:00.800 --> 00:47:02.020 on integrating EEG

NOTE Confidence: 0.9754659

00:47:02.320 --> 00:47:04.020 have been resolved into hardware

NOTE Confidence: 0.9754659

00:47:04.239 --> 00:47:05.200 to make them more efficient,

NOTE Confidence: 0.9754659

00:47:05.200 --> 00:47:06.160 and they work on different

NOTE Confidence: 0.9754659

00:47:06.160 --> 00:47:07.755 clock domains. We could get,

NOTE Confidence: 0.9754659

00:47:07.755 --> 00:47:10.075 you know, the the, power

NOTE Confidence: 0.9754659

00:47:10.075 --> 00:47:11.355 on this is on the

NOTE Confidence: 0.9754659

00:47:11.355 --> 00:47:12.575 order of fifteen milliwatts,

NOTE Confidence: 0.94343346

00:47:12.875 --> 00:47:14.154 which is still an a

NOTE Confidence: 0.94343346

00:47:14.154 --> 00:47:15.594 few orders of magnitude much

NOTE Confidence: 0.94343346

00:47:15.594 --> 00:47:16.555 higher than what we want

NOTE Confidence: 0.94343346

00:47:16.555 --> 00:47:17.674 it to be. So we

NOTE Confidence: 0.94343346

00:47:17.674 --> 00:47:18.795 are working now on the

NOTE Confidence: 0.94343346

00:47:18.795 --> 00:47:19.694 next generation.

NOTE Confidence: 0.9596641

00:47:19.994 --> 00:47:21.035 We've got funding for two

NOTE Confidence: 0.9596641

00:47:21.035 --> 00:47:22.569 more generations of chips. The

NOTE Confidence: 0.9596641

00:47:22.569 --> 00:47:23.690 next generation of chip is

NOTE Confidence: 0.9596641

00:47:23.690 --> 00:47:25.289 going to, propose is an

NOTE Confidence: 0.9596641

00:47:25.289 --> 00:47:27.049 architecture that's very different. It's

NOTE Confidence: 0.9596641

00:47:27.049 --> 00:47:28.890 a clock free circuit. So

NOTE Confidence: 0.9596641

00:47:28.890 --> 00:47:30.969 we have, expertise at Yale

NOTE Confidence: 0.9596641

00:47:30.969 --> 00:47:31.710 on asynchronous

NOTE Confidence: 0.94554514

00:47:32.489 --> 00:47:34.170 device design, and these are

NOTE Confidence: 0.94554514

00:47:34.170 --> 00:47:34.910 clock free,

NOTE Confidence: 0.914431

00:47:35.289 --> 00:47:35.789 chips.

NOTE Confidence: 0.9432543

00:47:36.765 --> 00:47:36.844 And,

NOTE Confidence: 0.99217767

00:47:37.645 --> 00:47:38.925 they run at a fraction

NOTE Confidence: 0.99217767

00:47:38.925 --> 00:47:40.645 of the power. The key,

NOTE Confidence: 0.9953549

00:47:41.085 --> 00:47:42.545 person for the asynchronous

NOTE Confidence: 0.94030017

00:47:42.844 --> 00:47:44.684 design is Rajit Manohar. Our

NOTE Confidence: 0.94030017

00:47:44.684 --> 00:47:45.885 other colleagues are shown here

NOTE Confidence: 0.94030017

00:47:45.885 --> 00:47:47.265 and the students and,

NOTE Confidence: 0.9171012

00:47:48.045 --> 00:47:49.885 who help with the development

NOTE Confidence: 0.9171012

00:47:49.885 --> 00:47:50.545 of devices

NOTE Confidence: 0.9218487

00:47:50.900 --> 00:47:52.500 and programming it, and Ronnie

NOTE Confidence: 0.9218487

00:47:52.500 --> 00:47:53.380 who helps us with the

NOTE Confidence: 0.9218487

00:47:53.380 --> 00:47:54.280 animal studies.

NOTE Confidence: 0.9346891

00:47:55.300 --> 00:47:56.420 So the last project, and

NOTE Confidence: 0.9346891

00:47:56.420 --> 00:47:57.140 this is just a couple

NOTE Confidence: 0.9346891

00:47:57.140 --> 00:47:59.140 of slides. So is, work

NOTE Confidence: 0.9346891

00:47:59.140 --> 00:48:00.820 that's been completed on network

NOTE Confidence: 0.9346891

00:48:00.820 --> 00:48:02.420 analysis that Tor and I

NOTE Confidence: 0.9346891

00:48:02.420 --> 00:48:04.200 worked on. And here,

NOTE Confidence: 0.85967565

00:48:05.315 --> 00:48:06.855 this is, you know,

NOTE Confidence: 0.9566034

00:48:08.114 --> 00:48:09.634 sort of just demonstrating information

NOTE Confidence: 0.9566034

00:48:09.634 --> 00:48:10.835 that we found. This is

NOTE Confidence: 0.9566034

00:48:10.835 --> 00:48:12.914 a patient with left anterior

NOTE Confidence: 0.9566034

00:48:12.914 --> 00:48:14.355 superior lateral temporal onset of

NOTE Confidence: 0.9566034

00:48:14.355 --> 00:48:15.795 seizures. There's a grid that's

NOTE Confidence: 0.9566034

00:48:15.795 --> 00:48:16.755 been placed. You don't see

NOTE Confidence: 0.9566034

00:48:16.755 --> 00:48:18.855 it. And the connectivity measures

NOTE Confidence: 0.9566034

00:48:18.994 --> 00:48:19.974 that we found

NOTE Confidence: 0.9995464

00:48:20.630 --> 00:48:21.770 are highlighted

NOTE Confidence: 0.9756346

00:48:22.150 --> 00:48:23.350 in in in the anterior

NOTE Confidence: 0.9756346

00:48:23.350 --> 00:48:24.630 part of the you know,

NOTE Confidence: 0.9756346

00:48:24.630 --> 00:48:26.090 in the right temporal lobe.

NOTE Confidence: 0.9756346

00:48:26.230 --> 00:48:27.430 This is where the highest

NOTE Confidence: 0.9756346

00:48:27.510 --> 00:48:29.110 and these this algorithm that's

NOTE Confidence: 0.9756346

00:48:29.110 --> 00:48:30.710 running up there is showing

NOTE Confidence: 0.9756346

00:48:30.710 --> 00:48:32.070 you that from any part

NOTE Confidence: 0.9756346

00:48:32.070 --> 00:48:33.690 of the area that's monitored,

NOTE Confidence: 0.9922369

00:48:33.989 --> 00:48:35.270 you can trace a path

NOTE Confidence: 0.9922369

00:48:35.270 --> 00:48:36.325 to these parts that have

NOTE Confidence: 0.9922369

00:48:36.325 --> 00:48:38.005 the highest connectivity. So there's

NOTE Confidence: 0.9922369

00:48:38.005 --> 00:48:39.525 a graded structure over a

NOTE Confidence: 0.9922369

00:48:39.525 --> 00:48:40.745 large part of cortex

NOTE Confidence: 0.997362

00:48:41.445 --> 00:48:43.125 that shows that this area

NOTE Confidence: 0.997362

00:48:43.125 --> 00:48:44.425 that's sort of connected

NOTE Confidence: 0.9566733

00:48:44.885 --> 00:48:46.005 and tied to the seizure

NOTE Confidence: 0.9566733

00:48:46.005 --> 00:48:48.025 onset area is several centimeters

NOTE Confidence: 0.9566733

00:48:48.165 --> 00:48:49.800 in size. And so we're

NOTE Confidence: 0.9566733

00:48:49.800 --> 00:48:51.480 we're working that up. And

NOTE Confidence: 0.9566733

00:48:51.480 --> 00:48:53.080 separate sort of aspect here,

NOTE Confidence: 0.9566733

00:48:53.080 --> 00:48:55.260 we have, created special issue

NOTE Confidence: 0.9927109

00:48:55.640 --> 00:48:56.760 on, you know, it's been

NOTE Confidence: 0.9927109

00:48:56.760 --> 00:48:57.960 twenty years since more than

NOTE Confidence: 0.9927109

00:48:57.960 --> 00:48:59.500 twenty years since Susan's paper

NOTE Confidence: 0.9927109

00:48:59.560 --> 00:49:00.860 on the network theory.

NOTE Confidence: 0.84361506

00:49:01.400 --> 00:49:02.940 It's a frontier special issue

NOTE Confidence: 0.87037396

00:49:03.945 --> 00:49:05.385 led by Klaus Leonard from

NOTE Confidence: 0.87037396

00:49:05.385 --> 00:49:06.364 University of Bonn,

NOTE Confidence: 0.95688844

00:49:06.665 --> 00:49:08.285 doctor Dan Spencer, and myself.

NOTE Confidence: 0.95688844

00:49:08.585 --> 00:49:10.025 It's close to wrapping up.

NOTE Confidence: 0.95688844

00:49:10.025 --> 00:49:11.625 Sixteen papers have been accepted.

NOTE Confidence: 0.95688844

00:49:11.625 --> 00:49:13.305 One remains in the review

NOTE Confidence: 0.95688844

00:49:13.305 --> 00:49:14.985 stages, and we expect an

NOTE Confidence: 0.95688844

00:49:14.985 --> 00:49:16.425 ebook to be generated from

NOTE Confidence: 0.95688844

00:49:16.425 --> 00:49:16.925 this,

NOTE Confidence: 0.99894094

00:49:17.545 --> 00:49:19.165 in in twenty twenty six.

NOTE Confidence: 0.96596056

00:49:19.859 --> 00:49:20.900 Finally, this is a list

NOTE Confidence: 0.96596056

00:49:20.900 --> 00:49:22.579 of collaborators whose work I've

NOTE Confidence: 0.96596056

00:49:22.579 --> 00:49:23.640 not touched on,

NOTE Confidence: 0.9595223

00:49:24.259 --> 00:49:26.259 collaborators in the epilepsy program

NOTE Confidence: 0.9595223

00:49:26.259 --> 00:49:28.579 in pediatrics and electrical and

NOTE Confidence: 0.9595223

00:49:28.579 --> 00:49:29.559 computer engineering.

NOTE Confidence: 0.99054825

00:49:31.475 --> 00:49:32.675 But otherwise, you know, these

NOTE Confidence: 0.99054825

00:49:32.675 --> 00:49:33.555 are the five projects I

NOTE Confidence: 0.99054825

00:49:33.555 --> 00:49:34.995 walked you through. I'm sorry

NOTE Confidence: 0.99054825

00:49:34.995 --> 00:49:36.355 to have, you know, taken

NOTE Confidence: 0.99054825

00:49:36.355 --> 00:49:37.655 you through so much material,

NOTE Confidence: 0.99054825

00:49:37.795 --> 00:49:38.755 but I hope you get

NOTE Confidence: 0.99054825

00:49:38.755 --> 00:49:39.475 a sense of the breadth

NOTE Confidence: 0.99054825

00:49:39.475 --> 00:49:40.355 of the work we're doing

NOTE Confidence: 0.99054825

00:49:40.355 --> 00:49:41.094 in the lab.

NOTE Confidence: 0.9956569

00:49:41.715 --> 00:49:43.094 It ranges from hardware,

NOTE Confidence: 0.9332312

00:49:43.869 --> 00:49:44.369 computation,

NOTE Confidence: 0.99818546

00:49:45.630 --> 00:49:46.609 work with patients,

NOTE Confidence: 0.9958144

00:49:46.910 --> 00:49:47.890 seizure forecasting,

NOTE Confidence: 0.9071517

00:49:48.510 --> 00:49:49.010 neurochemistry.

NOTE Confidence: 0.88354975

00:49:50.109 --> 00:49:51.950 It's a fairly broad set

NOTE Confidence: 0.88354975

00:49:51.950 --> 00:49:52.530 of work.

NOTE Confidence: 0.99921304

00:49:52.830 --> 00:49:53.869 Thanks very much for your

NOTE Confidence: 0.99921304

00:49:53.869 --> 00:49:54.369 attention.

NOTE Confidence: 0.82405543

00:50:02.505 --> 00:50:03.404 Doctor Mattson.

NOTE Confidence: 0.7820947

00:50:04.105 --> 00:50:05.644 That that was very impressive.

NOTE Confidence: 0.94721794

00:50:06.184 --> 00:50:07.065 I wanted to ask a

NOTE Confidence: 0.94721794

00:50:07.065 --> 00:50:08.265 little bit more about the,

NOTE Confidence: 0.97020257

00:50:09.000 --> 00:50:10.780 sensitivity and the method of

NOTE Confidence: 0.97020257

00:50:10.840 --> 00:50:12.620 analyzing the GABA and glutamate.

NOTE Confidence: 0.9895814

00:50:14.520 --> 00:50:16.540 Is that compared to microdialysis?

NOTE Confidence: 0.93222827

00:50:17.480 --> 00:50:18.840 Can you amplify that a

NOTE Confidence: 0.93222827

00:50:18.840 --> 00:50:20.620 bit? Yes. So,

NOTE Confidence: 0.9444205

00:50:22.040 --> 00:50:22.540 we,

NOTE Confidence: 0.9894066

00:50:24.464 --> 00:50:25.744 you know, the target for

NOTE Confidence: 0.9894066

00:50:25.744 --> 00:50:28.164 us was to achieve nanomolar

NOTE Confidence: 0.9562099

00:50:28.864 --> 00:50:29.924 limits of detection.

NOTE Confidence: 0.9699933

00:50:30.384 --> 00:50:31.825 And we with the first

NOTE Confidence: 0.9699933

00:50:31.825 --> 00:50:33.025 method that we've developed, the

NOTE Confidence: 0.9699933

00:50:33.025 --> 00:50:33.924 silicon nanowires,

NOTE Confidence: 0.9965574

00:50:34.305 --> 00:50:36.085 we are orders of magnitude

NOTE Confidence: 0.99778765

00:50:38.120 --> 00:50:39.180 better than that.

NOTE Confidence: 0.9607216

00:50:39.640 --> 00:50:41.560 So it would I don't

NOTE Confidence: 0.9607216

00:50:41.560 --> 00:50:42.440 know. I mean, Tor would

NOTE Confidence: 0.9607216

00:50:42.440 --> 00:50:43.320 be best placed to tell

NOTE Confidence: 0.9607216

00:50:43.320 --> 00:50:44.120 us how well that would

NOTE Confidence: 0.9607216

00:50:44.120 --> 00:50:45.180 compare with microdialysis

NOTE Confidence: 0.80419195

00:50:45.880 --> 00:50:46.380 and,

NOTE Confidence: 0.895698

00:50:47.560 --> 00:50:48.700 mass spec methods.

NOTE Confidence: 0.9992298

00:50:49.160 --> 00:50:50.620 But it would be sufficient

NOTE Confidence: 0.9992298

00:50:50.680 --> 00:50:51.580 for our purposes

NOTE Confidence: 0.9978719

00:50:51.960 --> 00:50:53.180 in terms of monitoring

NOTE Confidence: 0.94843435

00:50:54.174 --> 00:50:55.075 analyte concentrations,

NOTE Confidence: 0.91959345

00:50:55.454 --> 00:50:56.655 those three analytes in the

NOTE Confidence: 0.91959345

00:50:56.655 --> 00:50:58.655 brain. It's much more sensitive.

NOTE Confidence: 0.91959345

00:50:58.655 --> 00:51:00.494 It's like hundred times more

NOTE Confidence: 0.91959345

00:51:00.494 --> 00:51:02.335 sensitive with this method than

NOTE Confidence: 0.91959345

00:51:02.335 --> 00:51:03.934 with mass spec, actually. So

NOTE Confidence: 0.91959345

00:51:03.934 --> 00:51:05.714 it's it's really messing me.

NOTE Confidence: 0.9694642

00:51:06.620 --> 00:51:08.380 Yeah. So, it's it's very

NOTE Confidence: 0.9694642

00:51:08.380 --> 00:51:09.739 good technology, and we are

NOTE Confidence: 0.9694642

00:51:09.739 --> 00:51:11.100 very grateful that we could

NOTE Confidence: 0.9694642

00:51:11.100 --> 00:51:12.480 bring it over from engineering,

NOTE Confidence: 0.9970221

00:51:12.860 --> 00:51:15.420 recreate it, and achieve these

NOTE Confidence: 0.9970221

00:51:15.420 --> 00:51:15.920 results.

NOTE Confidence: 0.84554493

00:51:16.460 --> 00:51:18.380 So so real time measure

NOTE Confidence: 0.84554493

00:51:18.380 --> 00:51:19.500 versus versus

NOTE Confidence: 0.9996122

00:51:19.980 --> 00:51:20.480 Yes.

NOTE Confidence: 0.9336609

00:51:20.934 --> 00:51:21.414 We we we have we

NOTE Confidence: 0.9336609

00:51:21.414 --> 00:51:22.535 have when we write grant

NOTE Confidence: 0.9336609

00:51:22.535 --> 00:51:23.974 applications, the reviews force us

NOTE Confidence: 0.9336609

00:51:23.974 --> 00:51:24.855 to say real time in

NOTE Confidence: 0.9336609

00:51:24.855 --> 00:51:26.295 quotes because they say it

NOTE Confidence: 0.9336609

00:51:26.295 --> 00:51:27.734 takes five to ten minutes.

NOTE Confidence: 0.9336609

00:51:27.734 --> 00:51:30.075 But compared to one hour

NOTE Confidence: 0.9336609

00:51:30.214 --> 00:51:32.055 plus the offline analysis that's

NOTE Confidence: 0.9336609

00:51:32.055 --> 00:51:33.275 done for mass spec,

NOTE Confidence: 0.9870123

00:51:33.579 --> 00:51:34.619 which can take you know,

NOTE Confidence: 0.9870123

00:51:34.619 --> 00:51:35.579 sometimes it takes us weeks

NOTE Confidence: 0.9870123

00:51:35.579 --> 00:51:36.540 or months before we see

NOTE Confidence: 0.9870123

00:51:36.540 --> 00:51:37.119 a result.

NOTE Confidence: 0.9438776

00:51:37.579 --> 00:51:39.020 This, we can propose experiments

NOTE Confidence: 0.9438776

00:51:39.020 --> 00:51:40.219 where we are monitoring an

NOTE Confidence: 0.9438776

00:51:40.219 --> 00:51:40.719 animal.

NOTE Confidence: 0.98457974

00:51:41.099 --> 00:51:42.619 So what's your yeah. So

NOTE Confidence: 0.98457974

00:51:42.619 --> 00:51:43.339 can you speak a little

NOTE Confidence: 0.98457974

00:51:43.339 --> 00:51:44.480 bit more about the application

NOTE Confidence: 0.8333936

00:51:44.940 --> 00:51:45.900 side of things? How how

NOTE Confidence: 0.8333936

00:51:45.900 --> 00:51:47.280 would you apply this to?

NOTE Confidence: 0.91030747

00:51:47.635 --> 00:51:48.835 So as I mentioned, there's

NOTE Confidence: 0.91030747

00:51:48.835 --> 00:51:49.555 a lot of interest in

NOTE Confidence: 0.91030747

00:51:49.555 --> 00:51:50.995 the research group, particularly with

NOTE Confidence: 0.91030747

00:51:50.995 --> 00:51:52.675 doctor Spencer and Torreid on

NOTE Confidence: 0.91030747

00:51:52.675 --> 00:51:53.735 understanding neurochemistry.

NOTE Confidence: 0.9800726

00:51:54.755 --> 00:51:55.495 In animals,

NOTE Confidence: 0.8396849

00:51:56.355 --> 00:51:57.495 Torre and Ronnie

NOTE Confidence: 0.9258693

00:51:57.955 --> 00:52:00.070 do brain microdialysis and subcutaneous

NOTE Confidence: 0.9258693

00:52:00.290 --> 00:52:00.790 microdialysis.

NOTE Confidence: 0.9561369

00:52:01.330 --> 00:52:03.110 And we've established certain changes

NOTE Confidence: 0.9561369

00:52:03.170 --> 00:52:05.030 that happen with during epilepogenesis.

NOTE Confidence: 0.9646208

00:52:05.810 --> 00:52:07.010 And we have established in

NOTE Confidence: 0.9646208

00:52:07.010 --> 00:52:08.690 patients certain changes that we

NOTE Confidence: 0.9646208

00:52:08.690 --> 00:52:09.670 expect to see,

NOTE Confidence: 0.9820575

00:52:10.050 --> 00:52:11.410 in the seizure onset area

NOTE Confidence: 0.9820575

00:52:11.410 --> 00:52:13.250 and well connected areas in

NOTE Confidence: 0.9820575

00:52:13.250 --> 00:52:14.710 terms of glutamate concentrations.

NOTE Confidence: 0.9836091

00:52:15.344 --> 00:52:16.385 And in the lab we've

NOTE Confidence: 0.9836091

00:52:16.385 --> 00:52:17.605 observed in animals

NOTE Confidence: 0.9435333

00:52:17.905 --> 00:52:19.744 changes in gaba concentration levels

NOTE Confidence: 0.9435333

00:52:19.744 --> 00:52:21.125 and the occurrence of seizures.

NOTE Confidence: 0.95690256

00:52:21.425 --> 00:52:22.385 Now all of that is

NOTE Confidence: 0.95690256

00:52:22.385 --> 00:52:23.285 offline analysis.

NOTE Confidence: 0.9994289

00:52:23.744 --> 00:52:25.205 This allows us to bring

NOTE Confidence: 0.9085636

00:52:26.145 --> 00:52:27.344 capability into the lab where

NOTE Confidence: 0.9085636

00:52:27.344 --> 00:52:28.864 we can monitor in real

NOTE Confidence: 0.9085636

00:52:28.864 --> 00:52:30.730 time cause the seizures happen

NOTE Confidence: 0.9085636

00:52:30.730 --> 00:52:32.330 spontaneously. But at the same

NOTE Confidence: 0.9085636

00:52:32.330 --> 00:52:33.450 time we can work in

NOTE Confidence: 0.9085636

00:52:33.450 --> 00:52:34.750 an intervention arm

NOTE Confidence: 0.97604674

00:52:35.050 --> 00:52:36.110 based on neurochemistry,

NOTE Confidence: 0.9444929

00:52:36.810 --> 00:52:38.110 you know, analysis,

NOTE Confidence: 0.97905713

00:52:38.650 --> 00:52:39.950 not just based on electrophysiology.

NOTE Confidence: 0.9870634

00:52:40.650 --> 00:52:42.010 We're also very interested in

NOTE Confidence: 0.9870634

00:52:42.010 --> 00:52:42.670 tying electrophysiology

NOTE Confidence: 0.9868418

00:52:43.290 --> 00:52:44.985 and neurochemistry better together.

NOTE Confidence: 0.9764024

00:52:46.025 --> 00:52:46.685 The electrophysiology

NOTE Confidence: 0.89518845

00:52:47.065 --> 00:52:48.025 measurements are down to the

NOTE Confidence: 0.89518845

00:52:48.025 --> 00:52:49.065 millisecond, but we can we

NOTE Confidence: 0.89518845

00:52:49.065 --> 00:52:49.864 can work on them, you

NOTE Confidence: 0.89518845

00:52:49.864 --> 00:52:50.905 know, at the at the

NOTE Confidence: 0.89518845

00:52:50.905 --> 00:52:52.265 seconds or minutes or hour

NOTE Confidence: 0.89518845

00:52:52.265 --> 00:52:52.765 resolution.

NOTE Confidence: 0.9758876

00:52:53.225 --> 00:52:54.265 And it would be very

NOTE Confidence: 0.9758876

00:52:54.265 --> 00:52:55.225 valuable for us to be

NOTE Confidence: 0.9758876

00:52:55.225 --> 00:52:56.765 able to tie our electrophysiology

NOTE Confidence: 0.9548292

00:52:57.225 --> 00:52:58.205 measures to neurochemistry.

NOTE Confidence: 0.9306921

00:52:58.745 --> 00:53:00.369 Because when we measure spikes

NOTE Confidence: 0.9306921

00:53:00.369 --> 00:53:01.650 or we measure sharps or

NOTE Confidence: 0.9306921

00:53:01.650 --> 00:53:03.430 we measure other EEG phenomenon,

NOTE Confidence: 0.9306921

00:53:03.570 --> 00:53:04.930 we don't quite understand what

NOTE Confidence: 0.9306921

00:53:04.930 --> 00:53:05.890 that means in terms of

NOTE Confidence: 0.9306921

00:53:05.890 --> 00:53:07.109 excitation and inhibition.

NOTE Confidence: 0.94378084

00:53:07.489 --> 00:53:08.770 We make certain statements that

NOTE Confidence: 0.94378084

00:53:08.770 --> 00:53:10.390 we're not absolutely sure of.

NOTE Confidence: 0.94378084

00:53:10.530 --> 00:53:11.650 So we we want to

NOTE Confidence: 0.94378084

00:53:11.650 --> 00:53:12.609 bring the two closer to

NOTE Confidence: 0.94378084

00:53:12.609 --> 00:53:14.204 one. And in terms

NOTE Confidence: 0.94656384

00:53:14.665 --> 00:53:16.425 of real world application, you

NOTE Confidence: 0.94656384

00:53:16.425 --> 00:53:17.565 know, the microdialysis

NOTE Confidence: 0.9748694

00:53:17.944 --> 00:53:18.684 done over,

NOTE Confidence: 0.9802496

00:53:18.984 --> 00:53:20.425 you know, twenty five to

NOTE Confidence: 0.9802496

00:53:20.425 --> 00:53:21.405 to thirty years,

NOTE Confidence: 0.99848

00:53:22.984 --> 00:53:23.484 demonstrated

NOTE Confidence: 0.9883198

00:53:24.344 --> 00:53:26.665 particularly elevated glutamate in the

NOTE Confidence: 0.9883198

00:53:26.665 --> 00:53:27.165 network.

NOTE Confidence: 0.9882391

00:53:28.290 --> 00:53:29.890 And so this ties together

NOTE Confidence: 0.9882391

00:53:29.890 --> 00:53:30.390 with

NOTE Confidence: 0.7476215

00:53:30.930 --> 00:53:32.290 what a tennis talking about

NOTE Confidence: 0.7476215

00:53:32.290 --> 00:53:32.790 with

NOTE Confidence: 0.91014516

00:53:33.489 --> 00:53:35.489 network analysis because we know

NOTE Confidence: 0.91014516

00:53:35.489 --> 00:53:36.790 that if we can detect

NOTE Confidence: 0.95164657

00:53:38.610 --> 00:53:39.750 glutamate or

NOTE Confidence: 0.97228104

00:53:40.210 --> 00:53:41.350 the glutamate GABA

NOTE Confidence: 0.99651754

00:53:41.890 --> 00:53:42.390 ratio

NOTE Confidence: 0.99313897

00:53:42.915 --> 00:53:44.835 in areas that are highly

NOTE Confidence: 0.99313897

00:53:44.835 --> 00:53:45.335 connected,

NOTE Confidence: 0.7631739

00:53:46.114 --> 00:53:46.614 then

NOTE Confidence: 0.99640656

00:53:47.075 --> 00:53:48.355 that leads you to thinking

NOTE Confidence: 0.99640656

00:53:48.355 --> 00:53:50.135 about the brain computer interface

NOTE Confidence: 0.99852943

00:53:50.435 --> 00:53:52.135 modulation of those particular

NOTE Confidence: 0.9983988

00:53:52.675 --> 00:53:53.815 points in the network.

NOTE Confidence: 0.7898226

00:53:57.020 --> 00:53:58.160 Thanks, Doctor. Spencer.

NOTE Confidence: 0.9011248

00:54:06.700 --> 00:54:07.840 In terms of ICU

NOTE Confidence: 0.96368563

00:54:08.219 --> 00:54:09.980 monitoring, have you applied this

NOTE Confidence: 0.96368563

00:54:09.980 --> 00:54:11.395 to I mean, is that

NOTE Confidence: 0.96368563

00:54:11.395 --> 00:54:12.355 is that something that can

NOTE Confidence: 0.96368563

00:54:12.355 --> 00:54:13.235 be So that's what we're

NOTE Confidence: 0.96368563

00:54:13.235 --> 00:54:15.415 working with, with Emily Gilmore

NOTE Confidence: 0.96368563

00:54:15.635 --> 00:54:17.495 and Jen Kim and Bulent.

NOTE Confidence: 0.96368563

00:54:17.715 --> 00:54:18.215 Yeah.

NOTE Confidence: 0.99776864

00:54:18.755 --> 00:54:19.975 That's the target.

NOTE Confidence: 0.9091573

00:54:20.435 --> 00:54:22.135 Essentially, initially, we'll introduce

NOTE Confidence: 0.95582414

00:54:22.475 --> 00:54:22.975 a

NOTE Confidence: 0.9703567

00:54:23.315 --> 00:54:25.235 probe with pressure, temperature, oxygen,

NOTE Confidence: 0.9703567

00:54:25.235 --> 00:54:26.980 and integrating the EEG. But

NOTE Confidence: 0.9703567

00:54:26.980 --> 00:54:28.020 in the future, we would

NOTE Confidence: 0.9703567

00:54:28.020 --> 00:54:28.739 love to be able to

NOTE Confidence: 0.9703567

00:54:28.739 --> 00:54:30.739 integrate these modalities in there

NOTE Confidence: 0.9703567

00:54:30.739 --> 00:54:31.400 as well.

NOTE Confidence: 0.695729

00:54:34.340 --> 00:54:36.100 Hi, Hal. Great. Two and

NOTE Confidence: 0.695729

00:54:36.100 --> 00:54:37.480 of course, amazing stuff.

NOTE Confidence: 0.76919365

00:54:37.940 --> 00:54:39.140 The brain atlas, does it

NOTE Confidence: 0.76919365

00:54:39.140 --> 00:54:39.960 include support?

NOTE Confidence: 0.92776227

00:54:41.025 --> 00:54:42.385 So the shortcomings of brain

NOTE Confidence: 0.92776227

00:54:42.385 --> 00:54:43.744 atlas, we've done the new

NOTE Confidence: 0.92776227

00:54:43.744 --> 00:54:44.244 cortex,

NOTE Confidence: 0.92993385

00:54:44.545 --> 00:54:46.964 the hippocampus, amygdala, and insular.

NOTE Confidence: 0.95392716

00:54:47.344 --> 00:54:48.885 We have not done,

NOTE Confidence: 0.9992999

00:54:49.344 --> 00:54:50.164 other structures.

NOTE Confidence: 0.9063724

00:54:50.944 --> 00:54:52.464 Our thought you know, there

NOTE Confidence: 0.9063724

00:54:52.545 --> 00:54:53.424 there's a question that we've

NOTE Confidence: 0.9063724

00:54:53.424 --> 00:54:54.645 been asked about the thalamus

NOTE Confidence: 0.9063724

00:54:54.864 --> 00:54:56.325 is to take an existing

NOTE Confidence: 0.9003172

00:54:57.030 --> 00:54:58.870 thalamus sort of atlas and

NOTE Confidence: 0.9003172

00:54:58.870 --> 00:55:00.870 integrated within this. But we,

NOTE Confidence: 0.9003172

00:55:00.870 --> 00:55:02.170 you know, we we started

NOTE Confidence: 0.9003172

00:55:02.230 --> 00:55:03.190 with that and we worked

NOTE Confidence: 0.9003172

00:55:03.190 --> 00:55:03.850 with that.

NOTE Confidence: 0.9748367

00:55:04.150 --> 00:55:05.270 It's also sort of a

NOTE Confidence: 0.9748367

00:55:05.270 --> 00:55:06.950 project that's not funded. So

NOTE Confidence: 0.9748367

00:55:06.950 --> 00:55:08.230 we're waiting, we're hoping to

NOTE Confidence: 0.9748367

00:55:08.230 --> 00:55:09.670 get funding to build in

NOTE Confidence: 0.9748367

00:55:09.670 --> 00:55:10.570 these other components.

NOTE Confidence: 0.92913115

00:55:10.994 --> 00:55:12.535 We also want to understand

NOTE Confidence: 0.92913115

00:55:12.755 --> 00:55:14.134 white matter if you can,

NOTE Confidence: 0.9992446

00:55:14.515 --> 00:55:15.174 you know,

NOTE Confidence: 0.9256667

00:55:15.634 --> 00:55:16.914 parcel white matter in some

NOTE Confidence: 0.9256667

00:55:16.914 --> 00:55:18.454 manner, some logical fashion.

NOTE Confidence: 0.880303

00:55:18.835 --> 00:55:20.055 You'd like to do that.

NOTE Confidence: 0.8682122

00:55:24.239 --> 00:55:25.440 A lot of very interesting

NOTE Confidence: 0.8682122

00:55:25.440 --> 00:55:25.940 projects.

NOTE Confidence: 0.98755443

00:55:26.320 --> 00:55:27.780 For the seizure forecasting,

NOTE Confidence: 0.9381674

00:55:28.719 --> 00:55:29.920 you know, you have, an

NOTE Confidence: 0.9381674

00:55:29.920 --> 00:55:30.880 individual's data over a long

NOTE Confidence: 0.9381674

00:55:30.880 --> 00:55:31.680 period of time, and you

NOTE Confidence: 0.9381674

00:55:31.680 --> 00:55:32.960 have these peaks where they

NOTE Confidence: 0.9381674

00:55:32.960 --> 00:55:33.920 have a change into the

NOTE Confidence: 0.9381674

00:55:33.920 --> 00:55:34.960 number of spikes that they're

NOTE Confidence: 0.9381674

00:55:34.960 --> 00:55:36.239 having. And sometimes they get

NOTE Confidence: 0.9381674

00:55:36.239 --> 00:55:37.680 seizures with the upslips, and

NOTE Confidence: 0.9381674

00:55:37.680 --> 00:55:39.335 sometimes they don't. Has is

NOTE Confidence: 0.9381674

00:55:39.335 --> 00:55:40.135 there any way to sort

NOTE Confidence: 0.9381674

00:55:40.135 --> 00:55:41.815 of extrapolate or add in

NOTE Confidence: 0.9381674

00:55:41.815 --> 00:55:43.335 patient specific data? Maybe they're

NOTE Confidence: 0.9381674

00:55:43.335 --> 00:55:45.194 sleeping less, maybe they're intoxicated

NOTE Confidence: 0.9381674

00:55:45.335 --> 00:55:46.614 in some way or any

NOTE Confidence: 0.9381674

00:55:46.614 --> 00:55:47.974 like input that would show

NOTE Confidence: 0.9381674

00:55:47.974 --> 00:55:48.934 why one spike would get

NOTE Confidence: 0.9381674

00:55:48.934 --> 00:55:50.394 a seizure type one.

NOTE Confidence: 0.88932717

00:55:50.934 --> 00:55:52.954 Right. So I'd recommend reading

NOTE Confidence: 0.9814908

00:55:53.469 --> 00:55:55.489 work by our collaborators,

NOTE Confidence: 0.8847083

00:55:56.110 --> 00:55:57.469 Maxine Baud and Vikram Rao,

NOTE Confidence: 0.8847083

00:55:57.469 --> 00:55:58.830 who've looked into this a

NOTE Confidence: 0.8847083

00:55:58.830 --> 00:55:59.969 bit more than us.

NOTE Confidence: 0.9420258

00:56:00.270 --> 00:56:01.310 For our part, what we

NOTE Confidence: 0.9420258

00:56:01.310 --> 00:56:03.150 are hoping by capturing, we

NOTE Confidence: 0.9420258

00:56:03.150 --> 00:56:04.270 ask them to maintain a

NOTE Confidence: 0.9420258

00:56:04.270 --> 00:56:06.050 diary. We have an accelerometer,

NOTE Confidence: 0.9208552

00:56:06.350 --> 00:56:07.390 so we pick up the

NOTE Confidence: 0.9208552

00:56:07.390 --> 00:56:07.844 sleep,

NOTE Confidence: 0.9363986

00:56:08.484 --> 00:56:10.165 the amount of time, yes,

NOTE Confidence: 0.9363986

00:56:10.165 --> 00:56:11.844 the sleep. We keep track

NOTE Confidence: 0.9363986

00:56:11.844 --> 00:56:13.864 of the dietary intake.

NOTE Confidence: 0.9712559

00:56:14.965 --> 00:56:16.005 We keep track of the

NOTE Confidence: 0.9712559

00:56:16.005 --> 00:56:17.765 mood. We're hoping to pick

NOTE Confidence: 0.9712559

00:56:17.765 --> 00:56:19.125 up other information that will

NOTE Confidence: 0.9712559

00:56:19.125 --> 00:56:21.045 inform the seizure forecasting we

NOTE Confidence: 0.9712559

00:56:21.045 --> 00:56:21.925 want to do. So we

NOTE Confidence: 0.9712559

00:56:21.925 --> 00:56:22.965 have in mind building a

NOTE Confidence: 0.9712559

00:56:22.965 --> 00:56:23.550 model with

NOTE Confidence: 0.9888777

00:56:24.510 --> 00:56:25.630 all the data that we're

NOTE Confidence: 0.9888777

00:56:25.630 --> 00:56:27.070 collecting and then dropping the

NOTE Confidence: 0.9888777

00:56:27.070 --> 00:56:27.570 intracranial

NOTE Confidence: 0.92617023

00:56:27.870 --> 00:56:29.630 r and s data and

NOTE Confidence: 0.92617023

00:56:29.630 --> 00:56:30.989 seeing how well the non

NOTE Confidence: 0.92617023

00:56:30.989 --> 00:56:33.170 invasive measures can also forecast

NOTE Confidence: 0.9299218

00:56:34.190 --> 00:56:35.550 seizures. We also want to

NOTE Confidence: 0.9299218

00:56:35.550 --> 00:56:36.850 mention that that project

NOTE Confidence: 0.9802719

00:56:37.265 --> 00:56:38.625 could lend itself very well

NOTE Confidence: 0.9802719

00:56:38.625 --> 00:56:39.844 to other episodic,

NOTE Confidence: 0.96766406

00:56:40.305 --> 00:56:42.625 neurological, and psychiatric disorders, and

NOTE Confidence: 0.96766406

00:56:42.625 --> 00:56:43.925 we are looking for collaborations

NOTE Confidence: 0.9971475

00:56:44.465 --> 00:56:46.225 in other areas that may

NOTE Confidence: 0.9971475

00:56:46.225 --> 00:56:47.745 want to use the framework

NOTE Confidence: 0.9971475

00:56:47.745 --> 00:56:48.565 that we've created.

NOTE Confidence: 0.9404237

00:56:49.025 --> 00:56:51.530 We collect daily multiple samples

NOTE Confidence: 0.9404237

00:56:51.530 --> 00:56:52.650 of saliva per day. We've

NOTE Confidence: 0.9404237

00:56:52.650 --> 00:56:53.690 solved it to the point

NOTE Confidence: 0.9404237

00:56:53.690 --> 00:56:54.489 we can do this in

NOTE Confidence: 0.9404237

00:56:54.489 --> 00:56:56.010 a patient's home, bring them

NOTE Confidence: 0.9404237

00:56:56.010 --> 00:56:57.310 in to the lab,

NOTE Confidence: 0.98977613

00:56:57.610 --> 00:56:58.989 put them through the analysis,

NOTE Confidence: 0.7290638

00:56:59.690 --> 00:57:00.670 mass spec analysis,

NOTE Confidence: 0.99903

00:57:01.050 --> 00:57:03.070 which creates a very rich

NOTE Confidence: 0.9325911

00:57:03.405 --> 00:57:05.325 array of data, time series

NOTE Confidence: 0.9325911

00:57:05.325 --> 00:57:07.905 data of saliva analyte concentrations

NOTE Confidence: 0.9201846

00:57:08.364 --> 00:57:09.565 which are then put through

NOTE Confidence: 0.9201846

00:57:09.565 --> 00:57:11.405 machine learning. We built that

NOTE Confidence: 0.9201846

00:57:11.405 --> 00:57:12.625 entire architecture

NOTE Confidence: 0.9924059

00:57:12.925 --> 00:57:14.045 and it can be used

NOTE Confidence: 0.9924059

00:57:14.045 --> 00:57:15.185 for other disorders

NOTE Confidence: 0.97944254

00:57:15.830 --> 00:57:16.710 And, you know, we'd be

NOTE Confidence: 0.97944254

00:57:16.710 --> 00:57:18.070 open to talking to anyone

NOTE Confidence: 0.97944254

00:57:18.070 --> 00:57:19.030 who may have a use

NOTE Confidence: 0.97944254

00:57:19.030 --> 00:57:20.870 for it. But thanks for

NOTE Confidence: 0.97944254

00:57:20.870 --> 00:57:21.530 the question.

NOTE Confidence: 0.9955573

00:57:29.225 --> 00:57:30.365 Any other questions?

NOTE Confidence: 0.94638807

00:57:35.785 --> 00:57:36.985 Maybe can you talk about,

NOTE Confidence: 0.94638807

00:57:37.225 --> 00:57:39.065 sort of ischemia applications just

NOTE Confidence: 0.94638807

00:57:39.065 --> 00:57:40.105 for some of the stroke

NOTE Confidence: 0.94638807

00:57:40.105 --> 00:57:41.385 people in the audience for

NOTE Confidence: 0.94638807

00:57:41.385 --> 00:57:42.045 the microdialysis

NOTE Confidence: 0.23027968

00:57:42.505 --> 00:57:43.085 and molecular

NOTE Confidence: 0.8791902

00:57:44.720 --> 00:57:46.240 I was thinking about. Well,

NOTE Confidence: 0.8791902

00:57:46.240 --> 00:57:47.040 it it you know,

NOTE Confidence: 0.9994906

00:57:47.760 --> 00:57:48.800 we would love to get

NOTE Confidence: 0.9994906

00:57:48.800 --> 00:57:50.900 input in terms of design

NOTE Confidence: 0.9908782

00:57:51.760 --> 00:57:53.520 and what else we may

NOTE Confidence: 0.9908782

00:57:53.520 --> 00:57:54.420 want to measure.

NOTE Confidence: 0.99843764

00:57:54.960 --> 00:57:56.560 We've taken this project on

NOTE Confidence: 0.99843764

00:57:56.560 --> 00:57:58.180 as if we are

NOTE Confidence: 0.997681

00:57:58.695 --> 00:58:00.155 going to produce a delivered

NOTE Confidence: 0.7716771

00:58:00.535 --> 00:58:01.035 product.

NOTE Confidence: 0.94735414

00:58:01.495 --> 00:58:02.855 And that requires us to

NOTE Confidence: 0.94735414

00:58:02.855 --> 00:58:04.375 do very clear intake in

NOTE Confidence: 0.94735414

00:58:04.375 --> 00:58:05.975 terms of user needs, what

NOTE Confidence: 0.94735414

00:58:05.975 --> 00:58:07.735 requirements there are. Because every

NOTE Confidence: 0.94735414

00:58:07.735 --> 00:58:08.855 change that we make to

NOTE Confidence: 0.94735414

00:58:08.855 --> 00:58:10.715 it reverberates throughout the design

NOTE Confidence: 0.94735414

00:58:10.855 --> 00:58:12.215 in terms of how the

NOTE Confidence: 0.94735414

00:58:12.215 --> 00:58:13.620 electrode is gonna be placed,

NOTE Confidence: 0.94735414

00:58:13.780 --> 00:58:14.900 what modalities are going to

NOTE Confidence: 0.94735414

00:58:14.900 --> 00:58:16.180 be studied, how long it's

NOTE Confidence: 0.94735414

00:58:16.180 --> 00:58:17.160 going to be used,

NOTE Confidence: 0.9410383

00:58:18.020 --> 00:58:19.140 and, you know, who's going

NOTE Confidence: 0.9410383

00:58:19.140 --> 00:58:20.180 to place it, what sort

NOTE Confidence: 0.9410383

00:58:20.180 --> 00:58:21.320 of skill set exists.

NOTE Confidence: 0.98808795

00:58:21.620 --> 00:58:22.120 And

NOTE Confidence: 0.93976146

00:58:22.580 --> 00:58:23.380 so all of those things

NOTE Confidence: 0.93976146

00:58:23.380 --> 00:58:24.760 are taken into factor. But

NOTE Confidence: 0.93976146

00:58:24.900 --> 00:58:26.360 we've we've got a tremendous

NOTE Confidence: 0.93976146

00:58:26.500 --> 00:58:27.480 engineering team

NOTE Confidence: 0.9656645

00:58:27.975 --> 00:58:29.975 and we've got we've solved

NOTE Confidence: 0.9656645

00:58:29.975 --> 00:58:30.875 many challenges.

NOTE Confidence: 0.93129456

00:58:31.335 --> 00:58:32.295 You know, I skimmed through

NOTE Confidence: 0.93129456

00:58:32.295 --> 00:58:33.175 this but there are multiple

NOTE Confidence: 0.93129456

00:58:33.175 --> 00:58:34.535 challenges that we solved here

NOTE Confidence: 0.93129456

00:58:34.535 --> 00:58:35.895 in terms of integrating these

NOTE Confidence: 0.93129456

00:58:35.895 --> 00:58:36.395 sensors.

NOTE Confidence: 0.99872476

00:58:36.935 --> 00:58:38.535 So we'd be open to

NOTE Confidence: 0.99872476

00:58:38.535 --> 00:58:39.895 other suggestions in terms of

NOTE Confidence: 0.99872476

00:58:39.895 --> 00:58:41.515 using what we've already built

NOTE Confidence: 0.5938667

00:58:41.895 --> 00:58:42.395 which

NOTE Confidence: 0.94754267

00:58:42.740 --> 00:58:43.640 could be useful.

NOTE Confidence: 0.9660843

00:58:44.099 --> 00:58:45.380 You know, the prototype pressure

NOTE Confidence: 0.9660843

00:58:45.380 --> 00:58:46.359 temperature EEG

NOTE Confidence: 0.941494

00:58:46.660 --> 00:58:48.180 probe will be ready soon.

NOTE Confidence: 0.941494

00:58:48.180 --> 00:58:49.880 So and the EEG measurements

NOTE Confidence: 0.941494

00:58:49.940 --> 00:58:51.140 could be of value in

NOTE Confidence: 0.941494

00:58:51.140 --> 00:58:52.440 terms of electrical activity.

NOTE Confidence: 0.99501604

00:58:52.900 --> 00:58:54.740 It's a full resolution intracran

NOTE Confidence: 0.99501604

00:58:54.740 --> 00:58:55.240 EEG

NOTE Confidence: 0.8677702

00:58:55.825 --> 00:58:57.025 and the pressure and temperature

NOTE Confidence: 0.8677702

00:58:57.025 --> 00:58:58.005 could be a full use.

NOTE Confidence: 0.94822544

00:58:58.705 --> 00:59:00.065 We drop the blood flow

NOTE Confidence: 0.94822544

00:59:00.065 --> 00:59:00.565 sensors,

NOTE Confidence: 0.9986471

00:59:01.025 --> 00:59:02.225 and that's something that we

NOTE Confidence: 0.9986471

00:59:02.225 --> 00:59:03.185 could bring back into the

NOTE Confidence: 0.9986471

00:59:03.185 --> 00:59:03.685 picture

NOTE Confidence: 0.95467544

00:59:04.225 --> 00:59:05.205 if need be.

NOTE Confidence: 0.9486641

00:59:05.985 --> 00:59:07.425 And, you know, at another

NOTE Confidence: 0.9486641

00:59:07.425 --> 00:59:08.465 point in time, we're bringing

NOTE Confidence: 0.9486641

00:59:08.465 --> 00:59:09.685 in oxygen sensing

NOTE Confidence: 0.9655097

00:59:09.985 --> 00:59:10.965 back into this.

NOTE Confidence: 0.95456874

00:59:11.410 --> 00:59:12.450 Yeah. So we use quad

NOTE Confidence: 0.95456874

00:59:12.450 --> 00:59:14.130 volt monitoring already in our

NOTE Confidence: 0.95456874

00:59:14.130 --> 00:59:15.750 subarachnoid hemorrhage patients.

NOTE Confidence: 0.93520814

00:59:16.130 --> 00:59:17.650 But if we if we

NOTE Confidence: 0.93520814

00:59:17.650 --> 00:59:18.150 adapted

NOTE Confidence: 0.968333

00:59:18.450 --> 00:59:19.970 some of these monitors for

NOTE Confidence: 0.968333

00:59:19.970 --> 00:59:21.330 some of our larger stroke

NOTE Confidence: 0.968333

00:59:21.330 --> 00:59:22.610 patients, for instance, and think

NOTE Confidence: 0.968333

00:59:22.610 --> 00:59:24.545 about the number monitoring, but

NOTE Confidence: 0.968333

00:59:24.545 --> 00:59:25.585 put some of these microdialysis

NOTE Confidence: 0.9841542

00:59:25.984 --> 00:59:27.204 like, I think the chemistry

NOTE Confidence: 0.9853668

00:59:27.664 --> 00:59:28.785 for some of these patients

NOTE Confidence: 0.9853668

00:59:28.785 --> 00:59:30.144 could be really fun to

NOTE Confidence: 0.9853668

00:59:30.144 --> 00:59:31.525 think about. So I think

NOTE Confidence: 0.9853668

00:59:31.585 --> 00:59:32.565 we should brainstorm.

NOTE Confidence: 0.9692383

00:59:33.984 --> 00:59:35.424 I'm curious, like first of

NOTE Confidence: 0.9692383

00:59:35.424 --> 00:59:36.224 all, I just wanna say

NOTE Confidence: 0.9692383

00:59:36.224 --> 00:59:37.265 again what everybody else said,

NOTE Confidence: 0.9692383

00:59:37.265 --> 00:59:38.720 which is it's really, really

NOTE Confidence: 0.9692383

00:59:38.720 --> 00:59:39.760 cool to see all the

NOTE Confidence: 0.9692383

00:59:39.760 --> 00:59:41.119 amazing work you all have

NOTE Confidence: 0.9692383

00:59:41.119 --> 00:59:42.880 been doing together, and so

NOTE Confidence: 0.9692383

00:59:42.880 --> 00:59:43.380 collaborative

NOTE Confidence: 0.995739

00:59:43.760 --> 00:59:44.579 and important.

NOTE Confidence: 0.95959

00:59:45.680 --> 00:59:47.119 I was just curious in

NOTE Confidence: 0.95959

00:59:47.119 --> 00:59:48.480 the landscape, is there sort

NOTE Confidence: 0.95959

00:59:48.480 --> 00:59:50.000 of a raise to the

NOTE Confidence: 0.95959

00:59:50.000 --> 00:59:51.700 winner? Are there other groups

NOTE Confidence: 0.95959

00:59:51.825 --> 00:59:53.525 with similar devices,

NOTE Confidence: 0.99305946

00:59:53.825 --> 00:59:55.445 or are we kind of,

NOTE Confidence: 0.8700442

00:59:55.905 --> 00:59:57.425 you know, at a different

NOTE Confidence: 0.8700442

00:59:57.425 --> 00:59:59.105 place right now than just

NOTE Confidence: 0.8700442

00:59:59.105 --> 01:00:00.325 kinda in the broader

NOTE Confidence: 0.9947058

01:00:00.785 --> 01:00:02.945 global landscape on this? Right.

NOTE Confidence: 0.9958129

01:00:04.224 --> 01:00:06.645 So the competitive landscape is

NOTE Confidence: 0.99752593

01:00:08.550 --> 01:00:09.530 is interesting.

NOTE Confidence: 0.998061

01:00:10.470 --> 01:00:11.990 There are a few players

NOTE Confidence: 0.998061

01:00:11.990 --> 01:00:12.650 in the field.

NOTE Confidence: 0.9733598

01:00:13.190 --> 01:00:14.390 We are proposing a probe

NOTE Confidence: 0.9733598

01:00:14.390 --> 01:00:15.450 with the most modalities,

NOTE Confidence: 0.98942393

01:00:16.870 --> 01:00:17.850 and the solution

NOTE Confidence: 0.9733895

01:00:18.230 --> 01:00:19.190 in the sense that we

NOTE Confidence: 0.9733895

01:00:19.190 --> 01:00:20.630 are going from sensors all

NOTE Confidence: 0.9733895

01:00:20.630 --> 01:00:21.590 the way to display and

NOTE Confidence: 0.9733895

01:00:21.590 --> 01:00:22.090 analysis

NOTE Confidence: 0.9918452

01:00:22.470 --> 01:00:23.370 from a single

NOTE Confidence: 0.96639705

01:00:24.615 --> 01:00:25.735 source. For the all the

NOTE Confidence: 0.96639705

01:00:25.735 --> 01:00:27.175 other solutions need to piece

NOTE Confidence: 0.96639705

01:00:27.175 --> 01:00:29.595 together the probe with electronics,

NOTE Confidence: 0.96639705

01:00:29.655 --> 01:00:30.475 with a monitor,

NOTE Confidence: 0.99935466

01:00:30.855 --> 01:00:32.155 and it can be difficult

NOTE Confidence: 0.94363135

01:00:32.615 --> 01:00:33.975 for centers that don't have

NOTE Confidence: 0.94363135

01:00:33.975 --> 01:00:34.475 expertise,

NOTE Confidence: 0.99017835

01:00:34.775 --> 01:00:35.895 that don't have the expertise

NOTE Confidence: 0.99017835

01:00:35.895 --> 01:00:36.715 that we have.

NOTE Confidence: 0.93602705

01:00:37.950 --> 01:00:39.710 The probe that does have

NOTE Confidence: 0.93602705

01:00:39.710 --> 01:00:41.109 three modalities is made by

NOTE Confidence: 0.93602705

01:00:41.109 --> 01:00:42.350 a very good it's very

NOTE Confidence: 0.93602705

01:00:42.350 --> 01:00:43.390 good work. It's by a

NOTE Confidence: 0.93602705

01:00:43.390 --> 01:00:44.910 company called Raub Medic. It's

NOTE Confidence: 0.93602705

01:00:44.910 --> 01:00:46.750 from Germany, and it has,

NOTE Confidence: 0.93602705

01:00:46.750 --> 01:00:48.190 you know, it it has

NOTE Confidence: 0.93602705

01:00:48.190 --> 01:00:49.455 a presence in the US.

NOTE Confidence: 0.8522021

01:00:50.575 --> 01:00:52.095 What's unique about us is

NOTE Confidence: 0.8522021

01:00:52.095 --> 01:00:53.615 we have integrating the EEG

NOTE Confidence: 0.8522021

01:00:53.615 --> 01:00:54.835 and scalp EEG

NOTE Confidence: 0.98383

01:00:55.135 --> 01:00:56.095 right from the get go,

NOTE Confidence: 0.98383

01:00:56.095 --> 01:00:57.535 and it's all integrated throughout

NOTE Confidence: 0.98383

01:00:57.535 --> 01:00:58.195 the solution.

NOTE Confidence: 0.939302

01:00:58.495 --> 01:00:59.535 And we have a pipeline

NOTE Confidence: 0.939302

01:00:59.535 --> 01:01:00.575 where we are thinking for

NOTE Confidence: 0.939302

01:01:00.575 --> 01:01:02.015 other modalities, and we're working

NOTE Confidence: 0.939302

01:01:02.015 --> 01:01:03.155 on other modalities.

NOTE Confidence: 0.96470994

01:01:05.160 --> 01:01:06.520 Yeah. This is also an

NOTE Confidence: 0.96470994

01:01:06.520 --> 01:01:07.480 area where the number of

NOTE Confidence: 0.96470994

01:01:07.480 --> 01:01:08.839 NICUs around the world are

NOTE Confidence: 0.96470994

01:01:08.839 --> 01:01:10.700 increasing. Their use is increasing.

NOTE Confidence: 0.9974855

01:01:11.160 --> 01:01:11.660 So

NOTE Confidence: 0.97772765

01:01:12.200 --> 01:01:13.720 the market's not very big

NOTE Confidence: 0.97772765

01:01:13.720 --> 01:01:14.680 if you look at it

NOTE Confidence: 0.97772765

01:01:14.680 --> 01:01:16.700 from a perspective of commercialization,

NOTE Confidence: 0.989827

01:01:17.720 --> 01:01:19.180 but the market is unfortunately

NOTE Confidence: 0.989827

01:01:19.320 --> 01:01:19.820 growing

NOTE Confidence: 0.9256196

01:01:20.305 --> 01:01:20.805 and,

NOTE Confidence: 0.89541095

01:01:21.105 --> 01:01:22.385 it's something that is a

NOTE Confidence: 0.89541095

01:01:22.385 --> 01:01:24.165 worldwide market and tour.

NOTE Confidence: 0.93390936

01:01:24.465 --> 01:01:26.065 How easily can you introduce

NOTE Confidence: 0.93390936

01:01:26.065 --> 01:01:27.445 the chemistry in the world?

NOTE Confidence: 0.93390936

01:01:27.665 --> 01:01:29.125 I think that yeah.

NOTE Confidence: 0.9503378

01:01:30.225 --> 01:01:31.425 So that that is a

NOTE Confidence: 0.9503378

01:01:31.425 --> 01:01:32.625 bit difficult because of the

NOTE Confidence: 0.9503378

01:01:32.625 --> 01:01:33.765 path through the FDA.

NOTE Confidence: 0.9483351

01:01:34.160 --> 01:01:35.920 We've got to evaluate the

NOTE Confidence: 0.9483351

01:01:35.920 --> 01:01:37.460 the the regulatory strategy.

NOTE Confidence: 0.9753689

01:01:37.840 --> 01:01:39.360 We've got predicate devices for

NOTE Confidence: 0.9753689

01:01:39.360 --> 01:01:40.640 every other modality that we've

NOTE Confidence: 0.9753689

01:01:40.640 --> 01:01:41.140 incorporated.

NOTE Confidence: 0.9988367

01:01:41.680 --> 01:01:42.720 But when it comes to

NOTE Confidence: 0.9988367

01:01:42.720 --> 01:01:43.220 neurochemistry,

NOTE Confidence: 0.9514886

01:01:43.600 --> 01:01:45.140 there are no predicate devices

NOTE Confidence: 0.9514886

01:01:45.280 --> 01:01:46.240 for the kind of sensors

NOTE Confidence: 0.9514886

01:01:46.240 --> 01:01:47.785 we're building. And that's something

NOTE Confidence: 0.9514886

01:01:47.785 --> 01:01:48.985 we are evaluating. We are

NOTE Confidence: 0.9514886

01:01:49.065 --> 01:01:50.025 that's the, you know, reason

NOTE Confidence: 0.9514886

01:01:50.025 --> 01:01:51.305 that we are taking the

NOTE Confidence: 0.9514886

01:01:51.305 --> 01:01:51.805 electrochemistry

NOTE Confidence: 0.94555426

01:01:52.105 --> 01:01:54.045 approach using silicon nanowires,

NOTE Confidence: 0.9413968

01:01:54.345 --> 01:01:55.945 but Jesus is also building

NOTE Confidence: 0.9413968

01:01:55.945 --> 01:01:57.625 up an optical approach with

NOTE Confidence: 0.9413968

01:01:57.625 --> 01:01:59.465 the photonic sensor because that

NOTE Confidence: 0.9413968

01:01:59.465 --> 01:02:01.385 might provide an alternate path

NOTE Confidence: 0.9413968

01:02:01.385 --> 01:02:02.525 through the FDA

NOTE Confidence: 0.9454835

01:02:02.960 --> 01:02:04.480 and that's something we're working

NOTE Confidence: 0.9454835

01:02:04.480 --> 01:02:05.920 up. And we're at a

NOTE Confidence: 0.9454835

01:02:05.920 --> 01:02:07.279 pretty early stage there, but

NOTE Confidence: 0.9454835

01:02:07.279 --> 01:02:07.940 we're hopeful.

NOTE Confidence: 0.7388175

01:02:09.680 --> 01:02:11.460 And what's the last out

NOTE Confidence: 0.9673336

01:02:12.160 --> 01:02:12.740 of curiosity,

NOTE Confidence: 0.62899345

01:02:13.119 --> 01:02:13.619 these

NOTE Confidence: 0.9651087

01:02:14.079 --> 01:02:15.619 your sort of novel neurochemistry

NOTE Confidence: 0.98621446

01:02:15.920 --> 01:02:16.420 sensors,

NOTE Confidence: 0.8709489

01:02:16.734 --> 01:02:18.435 are they at all impacted

NOTE Confidence: 0.8709489

01:02:18.734 --> 01:02:20.575 by the presence of heme

NOTE Confidence: 0.8709489

01:02:20.575 --> 01:02:22.335 and iron or other things

NOTE Confidence: 0.8709489

01:02:22.335 --> 01:02:23.535 that may happen in some

NOTE Confidence: 0.8709489

01:02:23.535 --> 01:02:24.815 brain injured regions but not

NOTE Confidence: 0.8709489

01:02:24.815 --> 01:02:25.315 others?

NOTE Confidence: 0.95071864

01:02:25.855 --> 01:02:26.335 So,

NOTE Confidence: 0.9984895

01:02:27.454 --> 01:02:28.115 we use

NOTE Confidence: 0.9944933

01:02:29.440 --> 01:02:30.980 antibodies and aptamers

NOTE Confidence: 0.9648466

01:02:31.600 --> 01:02:33.520 to make very specific binding

NOTE Confidence: 0.9648466

01:02:33.520 --> 01:02:34.020 sites,

NOTE Confidence: 0.99833786

01:02:34.320 --> 01:02:36.000 and that helps make it

NOTE Confidence: 0.99833786

01:02:36.000 --> 01:02:36.820 more sensitive

NOTE Confidence: 0.9803503

01:02:37.120 --> 01:02:37.940 and specific.

NOTE Confidence: 0.99019074

01:02:38.560 --> 01:02:39.360 But it's not to say

NOTE Confidence: 0.99019074

01:02:39.360 --> 01:02:40.320 that we don't have to

NOTE Confidence: 0.99019074

01:02:40.320 --> 01:02:41.780 test more fully.

NOTE Confidence: 0.9313677

01:02:42.444 --> 01:02:42.944 And,

NOTE Confidence: 0.93254614

01:02:43.484 --> 01:02:45.105 that's both approaches have used,

NOTE Confidence: 0.93254614

01:02:45.244 --> 01:02:46.385 you know, functionalization

NOTE Confidence: 0.8856966

01:02:46.765 --> 01:02:48.925 using aptamers and antibodies. Use

NOTE Confidence: 0.8856966

01:02:48.925 --> 01:02:50.625 aptamers for glutamate and lactate

NOTE Confidence: 0.8856966

01:02:50.684 --> 01:02:52.385 and antibody for GABA.

NOTE Confidence: 0.9990205

01:02:53.325 --> 01:02:54.385 We are exploring

NOTE Confidence: 0.9821798

01:02:55.400 --> 01:02:57.160 an approach that would be

NOTE Confidence: 0.9821798

01:02:57.160 --> 01:02:58.040 free of this sort of

NOTE Confidence: 0.9821798

01:02:58.040 --> 01:02:58.540 functionalization,

NOTE Confidence: 0.9504675

01:02:59.080 --> 01:03:00.040 but that would mean that

NOTE Confidence: 0.9504675

01:03:00.040 --> 01:03:01.080 the testing would have to

NOTE Confidence: 0.9504675

01:03:01.080 --> 01:03:02.480 be much more thorough and

NOTE Confidence: 0.9504675

01:03:02.680 --> 01:03:04.060 yeah. So yeah.

NOTE Confidence: 0.87263966

01:03:04.440 --> 01:03:05.180 And then,

NOTE Confidence: 0.89428073

01:03:06.920 --> 01:03:07.960 if I may, a second

NOTE Confidence: 0.89428073

01:03:07.960 --> 01:03:08.460 question.

NOTE Confidence: 0.98311996

01:03:09.395 --> 01:03:10.595 The the size of these,

NOTE Confidence: 0.9538356

01:03:12.115 --> 01:03:13.655 obviously, you're thinking about clinical,

NOTE Confidence: 0.93519455

01:03:15.234 --> 01:03:16.835 implementation and so they're human

NOTE Confidence: 0.93519455

01:03:16.835 --> 01:03:17.875 sized. But do you have

NOTE Confidence: 0.93519455

01:03:17.875 --> 01:03:18.375 preclinical

NOTE Confidence: 0.919198

01:03:18.835 --> 01:03:20.355 sized devices as well to

NOTE Confidence: 0.919198

01:03:20.355 --> 01:03:21.474 work in to test in

NOTE Confidence: 0.919198

01:03:21.474 --> 01:03:21.974 models?

NOTE Confidence: 0.8689711

01:03:23.875 --> 01:03:24.375 Yes.

NOTE Confidence: 0.91718405

01:03:25.599 --> 01:03:26.640 Yes. So, you know, that's

NOTE Confidence: 0.91718405

01:03:26.640 --> 01:03:27.599 one of the strengths of

NOTE Confidence: 0.91718405

01:03:27.599 --> 01:03:28.720 the research group is that

NOTE Confidence: 0.91718405

01:03:28.720 --> 01:03:30.480 we've got Toraide and Roni

NOTE Confidence: 0.91718405

01:03:30.480 --> 01:03:32.000 Dar, and the eyed group

NOTE Confidence: 0.91718405

01:03:32.000 --> 01:03:33.599 does, you know, studies with

NOTE Confidence: 0.91718405

01:03:33.599 --> 01:03:34.099 rats.

NOTE Confidence: 0.9446064

01:03:34.560 --> 01:03:36.000 And the oxygen sensor we've

NOTE Confidence: 0.9446064

01:03:36.000 --> 01:03:37.200 developed, for example, has been

NOTE Confidence: 0.9446064

01:03:37.200 --> 01:03:38.085 tested in rats.

NOTE Confidence: 0.7527021

01:03:39.045 --> 01:03:39.945 And the

NOTE Confidence: 0.9578734

01:03:40.405 --> 01:03:42.565 silicon nanowire sensors, we've discussed

NOTE Confidence: 0.9578734

01:03:42.565 --> 01:03:44.085 testing it in animals as

NOTE Confidence: 0.9578734

01:03:44.085 --> 01:03:45.285 well, but we've not done

NOTE Confidence: 0.9578734

01:03:45.285 --> 01:03:45.785 that.

NOTE Confidence: 0.97345364

01:03:46.244 --> 01:03:47.445 Those can so we can

NOTE Confidence: 0.97345364

01:03:47.445 --> 01:03:49.145 make up, sort of

NOTE Confidence: 0.9035904

01:03:49.765 --> 01:03:51.125 holders and we we can

NOTE Confidence: 0.9035904

01:03:51.125 --> 01:03:52.210 we can come up with

NOTE Confidence: 0.9035904

01:03:52.210 --> 01:03:53.810 a way to introduce them

NOTE Confidence: 0.9035904

01:03:53.810 --> 01:03:55.510 into an animal. Yeah.

NOTE Confidence: 0.9694848

01:04:04.185 --> 01:04:05.705 Well, thank you very much.

NOTE Confidence: 0.9694848

01:04:05.705 --> 01:04:06.745 It's a few minutes past

NOTE Confidence: 0.9694848

01:04:06.745 --> 01:04:07.785 the hour. Thanks very much

NOTE Confidence: 0.9694848

01:04:07.785 --> 01:04:08.585 for your attention and your

NOTE Confidence: 0.9694848

01:04:08.585 --> 01:04:09.085 questions.