WEBVTT

NOTE duration: ”00:23:28.298”

NOTE Confidence: 0.9846165

00:00:00.080 --> 00:00:00.819 I'm gonna,

NOTE Confidence: 0.96374273

00:00:01.199 --> 00:00:02.480 kick it off partly because,

NOTE Confidence: 0.96374273

00:00:02.639 --> 00:00:03.860 I wanna sort of motivate

NOTE Confidence: 0.9915321

00:00:04.319 --> 00:00:05.220 some of the themes,

NOTE Confidence: 0.99585044

00:00:05.519 --> 00:00:06.799 and and directions of the

NOTE Confidence: 0.99585044

00:00:06.799 --> 00:00:08.980 CSCI that Nancy briefly mentioned.

NOTE Confidence: 0.89228123

00:00:09.360 --> 00:00:11.080 So, so I am a

NOTE Confidence: 0.89228123

00:00:11.080 --> 00:00:13.059 a faculty in immuno biology

NOTE Confidence: 0.89228123

00:00:13.119 --> 00:00:14.660 also with a secondary appointment,

NOTE Confidence: 0.9571267

00:00:15.105 --> 00:00:17.185 in biomedical engineering. And, I'm

NOTE Confidence: 0.9571267

00:00:17.185 --> 00:00:18.545 also an investigator of the

NOTE Confidence: 0.9571267

00:00:18.545 --> 00:00:20.305 new Chan Zuckerberg Biohub New

NOTE Confidence: 0.9571267

00:00:20.305 --> 00:00:20.805 York.

NOTE Confidence: 0.9753724

00:00:21.985 --> 00:00:22.485 So,

NOTE Confidence: 0.9844356

00:00:23.345 --> 00:00:24.465 first, I wanna talk a

NOTE Confidence: 0.9844356

00:00:24.465 --> 00:00:26.544 bit about our work, and

NOTE Confidence: 0.9844356

00:00:26.544 --> 00:00:27.585 then using that as a

NOTE Confidence: 0.9844356

00:00:27.585 --> 00:00:28.705 as a as a basis

NOTE Confidence: 0.9844356

00:00:28.705 --> 00:00:29.285 to motivate

NOTE Confidence: 0.9922153

00:00:29.920 --> 00:00:31.520 the directions and themes, at

NOTE Confidence: 0.9922153

00:00:31.520 --> 00:00:32.180 the CSCI.

NOTE Confidence: 0.96910477

00:00:32.800 --> 00:00:33.920 So one of the things

NOTE Confidence: 0.96910477

00:00:33.920 --> 00:00:35.040 we study in in in

NOTE Confidence: 0.96910477

00:00:35.040 --> 00:00:36.180 my lab, it's variation,

NOTE Confidence: 0.9826261

00:00:36.880 --> 00:00:38.340 in the human immune system.

NOTE Confidence: 0.9826261

00:00:38.479 --> 00:00:39.520 And it it's really a

NOTE Confidence: 0.9826261

00:00:39.520 --> 00:00:40.560 hallmark in the sense that

NOTE Confidence: 0.9826261

00:00:40.560 --> 00:00:41.860 you see that in different

NOTE Confidence: 0.6541002

00:00:42.315 --> 00:00:42.555 contexts.

NOTE Confidence: 0.95929086

00:00:43.195 --> 00:00:45.115 If in in for example,

NOTE Confidence: 0.95929086

00:00:45.115 --> 00:00:46.075 in terms of response to

NOTE Confidence: 0.95929086

00:00:46.075 --> 00:00:46.575 immunotherapy,

NOTE Confidence: 0.98229575

00:00:47.115 --> 00:00:48.235 you typically see a subset

NOTE Confidence: 0.98229575

00:00:48.235 --> 00:00:49.215 of patients respond,

NOTE Confidence: 0.9677119

00:00:49.835 --> 00:00:50.715 and you see that in

NOTE Confidence: 0.9677119

00:00:50.715 --> 00:00:52.795 vaccination and infection responses. For

NOTE Confidence: 0.9677119

00:00:52.795 --> 00:00:54.095 example, here, I'm showing,

NOTE Confidence: 0.9181896

00:00:54.635 --> 00:00:55.835 the is there a point

NOTE Confidence: 0.9181896

00:00:55.835 --> 00:00:56.335 zero?

NOTE Confidence: 0.30237466

00:00:56.730 --> 00:00:57.230 Of

NOTE Confidence: 0.96494186

00:00:59.770 --> 00:01:01.930 the mouse? Okay. Yeah. So

NOTE Confidence: 0.96494186

00:01:01.930 --> 00:01:04.030 so, yeah, you see extensive

NOTE Confidence: 0.96494186

00:01:04.090 --> 00:01:05.610 variation because of age, but

NOTE Confidence: 0.96494186

00:01:05.610 --> 00:01:07.050 also even within young individuals,

NOTE Confidence: 0.96494186

00:01:07.050 --> 00:01:08.010 you see these hundreds of

NOTE Confidence: 0.96494186

00:01:08.010 --> 00:01:09.470 folds of differences in antibody

NOTE Confidence: 0.96494186

00:01:09.530 --> 00:01:10.030 response

NOTE Confidence: 0.9147786

00:01:10.330 --> 00:01:11.069 to vaccination.

NOTE Confidence: 0.98123753

00:01:11.635 --> 00:01:12.935 And you also see,

NOTE Confidence: 0.9926396

00:01:14.115 --> 00:01:14.935 in autoimmunity

NOTE Confidence: 0.9593165

00:01:15.314 --> 00:01:16.834 in terms of both if

NOTE Confidence: 0.9593165

00:01:16.834 --> 00:01:17.875 somebody has a higher or

NOTE Confidence: 0.9593165

00:01:17.875 --> 00:01:19.155 lower risk for developing the

NOTE Confidence: 0.9593165

00:01:19.155 --> 00:01:20.275 disease and also in terms

NOTE Confidence: 0.9593165

00:01:20.275 --> 00:01:21.875 of having disease activities over

NOTE Confidence: 0.9593165

00:01:21.875 --> 00:01:23.155 time, you see very distinct

NOTE Confidence: 0.9593165

00:01:23.155 --> 00:01:25.560 patterns and trajectories within individuals.

NOTE Confidence: 0.9855344

00:01:26.020 --> 00:01:27.380 And, actually, many of you

NOTE Confidence: 0.9855344

00:01:27.380 --> 00:01:28.900 are wondering about questions about

NOTE Confidence: 0.9855344

00:01:28.900 --> 00:01:30.340 ourselves also. Right? But, actually,

NOTE Confidence: 0.9855344

00:01:30.340 --> 00:01:31.940 no general tools exist today

NOTE Confidence: 0.9855344

00:01:31.940 --> 00:01:33.459 to answer questions like, did

NOTE Confidence: 0.9855344

00:01:33.459 --> 00:01:34.500 I respond well to my

NOTE Confidence: 0.9855344

00:01:34.500 --> 00:01:36.020 last vaccine? Am I gonna

NOTE Confidence: 0.9855344

00:01:36.020 --> 00:01:37.620 develop autoimmunity in the future?

NOTE Confidence: 0.9855344

00:01:37.620 --> 00:01:38.520 What about allergy?

NOTE Confidence: 0.9723394

00:01:38.825 --> 00:01:39.944 And can my future health

NOTE Confidence: 0.9723394

00:01:39.944 --> 00:01:41.385 trajectory be predicted based on

NOTE Confidence: 0.9723394

00:01:41.385 --> 00:01:42.345 the status of of my

NOTE Confidence: 0.9723394

00:01:42.345 --> 00:01:43.944 immune system? And how well

NOTE Confidence: 0.9723394

00:01:43.944 --> 00:01:44.985 will I will I be

NOTE Confidence: 0.9723394

00:01:44.985 --> 00:01:46.745 responding to an intervention? Right?

NOTE Confidence: 0.9723394

00:01:46.745 --> 00:01:48.185 So these are questions that

NOTE Confidence: 0.9723394

00:01:48.185 --> 00:01:49.565 we actually don't have generalized

NOTE Confidence: 0.9723394

00:01:49.705 --> 00:01:51.165 tools right now to answer.

NOTE Confidence: 0.9840238

00:01:51.625 --> 00:01:51.865 So

NOTE Confidence: 0.94364685

00:01:52.500 --> 00:01:53.860 and so why do we

NOTE Confidence: 0.94364685

00:01:53.860 --> 00:01:55.700 have such variable responses? And

NOTE Confidence: 0.94364685

00:01:55.700 --> 00:01:57.620 and various factors, genetics and

NOTE Confidence: 0.94364685

00:01:57.620 --> 00:01:59.240 environmental exposure history,

NOTE Confidence: 0.9307376

00:01:59.940 --> 00:02:01.080 together shape,

NOTE Confidence: 0.9755012

00:02:01.380 --> 00:02:02.740 what we call a personal

NOTE Confidence: 0.9755012

00:02:02.740 --> 00:02:04.200 immune state within individuals.

NOTE Confidence: 0.9848045

00:02:04.755 --> 00:02:05.955 And these kinds of states

NOTE Confidence: 0.9848045

00:02:05.955 --> 00:02:07.575 can be actually quite temporally

NOTE Confidence: 0.9848045

00:02:07.715 --> 00:02:09.315 stable. So we often through

NOTE Confidence: 0.9848045

00:02:09.315 --> 00:02:10.755 years of looking at humans

NOTE Confidence: 0.9848045

00:02:10.755 --> 00:02:12.275 and the immune system, we

NOTE Confidence: 0.9848045

00:02:12.275 --> 00:02:13.735 actually often see a situation

NOTE Confidence: 0.9848045

00:02:13.794 --> 00:02:15.014 like here,

NOTE Confidence: 0.89234823

00:02:16.035 --> 00:02:17.415 where you see that two

NOTE Confidence: 0.89234823

00:02:17.475 --> 00:02:19.235 two individuals would have distinct

NOTE Confidence: 0.89234823

00:02:19.235 --> 00:02:20.130 set point states.

NOTE Confidence: 0.9684964

00:02:20.610 --> 00:02:21.570 And a key question is

NOTE Confidence: 0.9684964

00:02:21.570 --> 00:02:22.770 when you see something like

NOTE Confidence: 0.9684964

00:02:22.770 --> 00:02:23.730 this, when you look at,

NOTE Confidence: 0.9684964

00:02:23.970 --> 00:02:25.410 individuals in a population, it's

NOTE Confidence: 0.9684964

00:02:25.410 --> 00:02:26.790 whether these could result,

NOTE Confidence: 0.89012235

00:02:27.169 --> 00:02:28.770 right, in differences in some

NOTE Confidence: 0.89012235

00:02:28.770 --> 00:02:30.070 of the outcomes I mentioned.

NOTE Confidence: 0.89012235

00:02:30.210 --> 00:02:31.889 Auto d c autoimmune disease

NOTE Confidence: 0.89012235

00:02:31.889 --> 00:02:32.385 risk,

NOTE Confidence: 0.9479048

00:02:32.705 --> 00:02:34.144 disease activities, and how they

NOTE Confidence: 0.9479048

00:02:34.144 --> 00:02:35.364 respond, and so on.

NOTE Confidence: 0.95793074

00:02:35.665 --> 00:02:37.105 So, a number of years

NOTE Confidence: 0.95793074

00:02:37.105 --> 00:02:37.605 ago,

NOTE Confidence: 0.91489697

00:02:37.985 --> 00:02:38.944 that maybe more than a

NOTE Confidence: 0.91489697

00:02:38.944 --> 00:02:40.385 decade now, my lab published

NOTE Confidence: 0.91489697

00:02:40.385 --> 00:02:41.044 a study

NOTE Confidence: 0.9277063

00:02:41.345 --> 00:02:42.564 showing that, independent,

NOTE Confidence: 0.9862193

00:02:42.864 --> 00:02:44.224 we measure sort of the

NOTE Confidence: 0.9862193

00:02:44.224 --> 00:02:45.665 immune system fairly broadly at

NOTE Confidence: 0.9862193

00:02:45.665 --> 00:02:47.280 the time and show that

NOTE Confidence: 0.9862193

00:02:47.280 --> 00:02:49.120 independent of factors like age,

NOTE Confidence: 0.9862193

00:02:49.120 --> 00:02:49.620 sex,

NOTE Confidence: 0.9622102

00:02:50.160 --> 00:02:52.340 and preexisting immunity to influenza,

NOTE Confidence: 0.984981

00:02:52.800 --> 00:02:54.340 the response to the influenza

NOTE Confidence: 0.984981

00:02:54.400 --> 00:02:54.900 vaccine

NOTE Confidence: 0.97817856

00:02:55.200 --> 00:02:56.400 can be predicted based on

NOTE Confidence: 0.97817856

00:02:56.400 --> 00:02:57.520 the baseline state of the

NOTE Confidence: 0.97817856

00:02:57.520 --> 00:02:58.020 individual.

NOTE Confidence: 0.9758438

00:02:58.560 --> 00:03:00.720 And later on, we've used

NOTE Confidence: 0.9758438

00:03:00.720 --> 00:03:02.615 single cell technologies to sort

NOTE Confidence: 0.9758438

00:03:02.615 --> 00:03:03.815 of unravel the sort of

NOTE Confidence: 0.9758438

00:03:03.815 --> 00:03:05.014 the cellular basis of those

NOTE Confidence: 0.9758438

00:03:05.014 --> 00:03:05.514 signatures

NOTE Confidence: 0.87747884

00:03:05.895 --> 00:03:07.495 and also show using some

NOTE Confidence: 0.87747884

00:03:07.495 --> 00:03:08.775 of the data, collected by

NOTE Confidence: 0.87747884

00:03:08.775 --> 00:03:09.675 Hib c one

NOTE Confidence: 0.94672394

00:03:10.055 --> 00:03:11.575 that this could actually be

NOTE Confidence: 0.94672394

00:03:11.575 --> 00:03:13.014 be be generalized to other

NOTE Confidence: 0.94672394

00:03:13.014 --> 00:03:14.715 other cohorts and seasons,

NOTE Confidence: 0.94225955

00:03:15.095 --> 00:03:17.010 and even extended to, a

NOTE Confidence: 0.94225955

00:03:17.169 --> 00:03:18.209 vaccine that's very different from

NOTE Confidence: 0.94225955

00:03:18.209 --> 00:03:19.250 flu, in this case, yellow

NOTE Confidence: 0.94225955

00:03:19.250 --> 00:03:20.290 fever, which is a live,

NOTE Confidence: 0.94225955

00:03:20.290 --> 00:03:21.510 attenuated infection.

NOTE Confidence: 0.96143734

00:03:22.209 --> 00:03:23.329 And and further on, we

NOTE Confidence: 0.96143734

00:03:23.329 --> 00:03:24.209 show that this kind of,

NOTE Confidence: 0.96143734

00:03:24.769 --> 00:03:25.970 baseline set points,

NOTE Confidence: 0.94770545

00:03:26.370 --> 00:03:27.489 is relevant in the context

NOTE Confidence: 0.94770545

00:03:27.489 --> 00:03:28.150 of autoimmunities.

NOTE Confidence: 0.95091385

00:03:28.530 --> 00:03:29.329 So shown here is a

NOTE Confidence: 0.95091385

00:03:29.329 --> 00:03:30.230 lupus patient

NOTE Confidence: 0.99670106

00:03:30.885 --> 00:03:33.305 having varying disease activities over

NOTE Confidence: 0.9581027

00:03:33.605 --> 00:03:35.125 time, a single patient. And

NOTE Confidence: 0.9581027

00:03:35.125 --> 00:03:35.925 you can see that during

NOTE Confidence: 0.9581027

00:03:35.925 --> 00:03:37.525 some periods, this patient has

NOTE Confidence: 0.9581027

00:03:37.525 --> 00:03:39.785 high disease activity while others,

NOTE Confidence: 0.8634251

00:03:40.165 --> 00:03:41.865 this patient was relatively

NOTE Confidence: 0.7664952

00:03:42.245 --> 00:03:43.145 clinically quiescent.

NOTE Confidence: 0.952305

00:03:43.680 --> 00:03:45.120 So we show that by

NOTE Confidence: 0.952305

00:03:45.120 --> 00:03:46.960 looking at this specific baseline

NOTE Confidence: 0.952305

00:03:46.960 --> 00:03:48.480 immune set point during clinical

NOTE Confidence: 0.952305

00:03:48.480 --> 00:03:48.980 quiescence,

NOTE Confidence: 0.97989005

00:03:49.360 --> 00:03:51.140 it actually provides predictive information

NOTE Confidence: 0.97989005

00:03:51.200 --> 00:03:52.400 about the extent and the

NOTE Confidence: 0.97989005

00:03:52.400 --> 00:03:54.080 intensity of the flares in

NOTE Confidence: 0.97989005

00:03:54.080 --> 00:03:55.440 a subset of patients whose

NOTE Confidence: 0.97989005

00:03:55.440 --> 00:03:56.420 flares resemble

NOTE Confidence: 0.95479965

00:03:56.835 --> 00:03:58.195 how a healthy individual is

NOTE Confidence: 0.95479965

00:03:58.195 --> 00:03:59.475 responding to a vaccine in

NOTE Confidence: 0.95479965

00:03:59.475 --> 00:04:00.675 this case. So lupus is

NOTE Confidence: 0.95479965

00:04:00.675 --> 00:04:02.515 very heterogeneous. For other patients,

NOTE Confidence: 0.95479965

00:04:02.515 --> 00:04:03.395 we actually saw that this

NOTE Confidence: 0.95479965

00:04:03.395 --> 00:04:04.675 doesn't apply. So it points

NOTE Confidence: 0.95479965

00:04:04.675 --> 00:04:06.115 out to the points to

NOTE Confidence: 0.95479965

00:04:06.115 --> 00:04:07.955 the very specific nature of

NOTE Confidence: 0.95479965

00:04:07.955 --> 00:04:09.335 these set point variables.

NOTE Confidence: 0.97735065

00:04:09.939 --> 00:04:10.900 And then we as I

NOTE Confidence: 0.97735065

00:04:10.900 --> 00:04:12.099 mentioned, we use single cell

NOTE Confidence: 0.97735065

00:04:12.099 --> 00:04:13.780 technology to dissect the cellular

NOTE Confidence: 0.97735065

00:04:13.780 --> 00:04:15.060 basis of this and uncover

NOTE Confidence: 0.97735065

00:04:15.060 --> 00:04:16.660 a circuit involving multiple cell

NOTE Confidence: 0.97735065

00:04:16.660 --> 00:04:17.779 types. And I won't go

NOTE Confidence: 0.97735065

00:04:17.779 --> 00:04:19.060 into the details because this

NOTE Confidence: 0.97735065

00:04:19.060 --> 00:04:20.740 was published, but I wanna

NOTE Confidence: 0.97735065

00:04:20.740 --> 00:04:22.820 mention one, point that's important

NOTE Confidence: 0.97735065

00:04:22.820 --> 00:04:23.940 is that once we sort

NOTE Confidence: 0.97735065

00:04:23.940 --> 00:04:24.979 of figure out the cellular

NOTE Confidence: 0.97735065

00:04:24.979 --> 00:04:25.975 basis and what are the

NOTE Confidence: 0.97735065

00:04:25.975 --> 00:04:27.735 important states of cells to

NOTE Confidence: 0.97735065

00:04:27.735 --> 00:04:28.235 measure,

NOTE Confidence: 0.98082495

00:04:28.535 --> 00:04:30.214 we're actually able to reduce

NOTE Confidence: 0.98082495

00:04:30.214 --> 00:04:31.755 this down to ten parameters

NOTE Confidence: 0.98082495

00:04:31.815 --> 00:04:32.935 that we now can measure

NOTE Confidence: 0.98082495

00:04:32.935 --> 00:04:34.375 in blood. And and now

NOTE Confidence: 0.98082495

00:04:34.375 --> 00:04:35.574 we can start to monitor

NOTE Confidence: 0.98082495

00:04:35.574 --> 00:04:37.095 people using these ten parameters

NOTE Confidence: 0.98082495

00:04:37.095 --> 00:04:37.974 that are quite easy to

NOTE Confidence: 0.98082495

00:04:37.974 --> 00:04:39.095 measure and start to look

NOTE Confidence: 0.98082495

00:04:39.095 --> 00:04:39.835 at them longitudinally,

NOTE Confidence: 0.994265

00:04:40.800 --> 00:04:41.920 over time and and in

NOTE Confidence: 0.994265

00:04:41.920 --> 00:04:42.660 different populations.

NOTE Confidence: 0.98820955

00:04:43.520 --> 00:04:45.120 Now what about beyond classic

NOTE Confidence: 0.98820955

00:04:45.120 --> 00:04:46.880 immunity of infection and and

NOTE Confidence: 0.98820955

00:04:46.880 --> 00:04:48.560 and and vaccination? Right? So

NOTE Confidence: 0.98820955

00:04:48.560 --> 00:04:50.080 immune cells, as many of

NOTE Confidence: 0.98820955

00:04:50.080 --> 00:04:51.760 you know, they actually circulate

NOTE Confidence: 0.98820955

00:04:51.760 --> 00:04:52.960 around our body, many of

NOTE Confidence: 0.98820955

00:04:52.960 --> 00:04:54.295 them, and they can sense

NOTE Confidence: 0.98820955

00:04:54.295 --> 00:04:55.915 sort of deviation from homeostasis.

NOTE Confidence: 0.9545385

00:04:56.535 --> 00:04:58.214 And therefore, they actually are

NOTE Confidence: 0.9545385

00:04:58.214 --> 00:04:58.714 collecting

NOTE Confidence: 0.927004

00:04:59.015 --> 00:05:00.055 and processing a lot of

NOTE Confidence: 0.927004

00:05:00.055 --> 00:05:01.895 information about health and disease

NOTE Confidence: 0.927004

00:05:01.895 --> 00:05:03.575 and within our bodies. And

NOTE Confidence: 0.927004

00:05:03.575 --> 00:05:04.775 so given this fact, it's

NOTE Confidence: 0.927004

00:05:04.775 --> 00:05:06.615 not surprise surprising to to

NOTE Confidence: 0.927004

00:05:06.615 --> 00:05:07.820 sort of see that the

NOTE Confidence: 0.927004

00:05:07.820 --> 00:05:09.260 immune system basically,

NOTE Confidence: 0.9195425

00:05:10.060 --> 00:05:12.220 to my view, involving basically

NOTE Confidence: 0.9195425

00:05:12.220 --> 00:05:13.980 all, disease and conditions. So

NOTE Confidence: 0.9195425

00:05:13.980 --> 00:05:14.700 you can see that in

NOTE Confidence: 0.9195425

00:05:14.700 --> 00:05:15.200 neurodegeneration,

NOTE Confidence: 0.9993189

00:05:15.980 --> 00:05:16.720 in pain,

NOTE Confidence: 0.9281621

00:05:17.260 --> 00:05:18.960 in in definitely in aging,

NOTE Confidence: 0.9281621

00:05:19.180 --> 00:05:20.480 and metabolic health.

NOTE Confidence: 0.9462471

00:05:20.985 --> 00:05:22.104 And so so the the

NOTE Confidence: 0.9462471

00:05:22.104 --> 00:05:23.305 key question then boils down

NOTE Confidence: 0.9462471

00:05:23.305 --> 00:05:24.505 to what exactly is immune

NOTE Confidence: 0.9462471

00:05:24.505 --> 00:05:26.365 health. Can we actually measure,

NOTE Confidence: 0.98318

00:05:26.904 --> 00:05:27.945 the health of the immune

NOTE Confidence: 0.98318

00:05:27.945 --> 00:05:29.145 system and then using that

NOTE Confidence: 0.98318

00:05:29.145 --> 00:05:30.985 to link to specific outcomes

NOTE Confidence: 0.98318

00:05:30.985 --> 00:05:32.025 and understand how the immune

NOTE Confidence: 0.98318

00:05:32.025 --> 00:05:32.925 system orchestrate,

NOTE Confidence: 0.9202874

00:05:33.544 --> 00:05:34.525 proper responses?

NOTE Confidence: 0.9846043

00:05:35.039 --> 00:05:35.880 So to start to look

NOTE Confidence: 0.9846043

00:05:35.880 --> 00:05:37.440 at that, a number of

NOTE Confidence: 0.9846043

00:05:37.440 --> 00:05:38.560 years ago, we worked with

NOTE Confidence: 0.9846043

00:05:38.560 --> 00:05:39.699 colleagues at the NIH,

NOTE Confidence: 0.7998409

00:05:40.319 --> 00:05:41.539 who study various,

NOTE Confidence: 0.96243125

00:05:42.240 --> 00:05:44.080 rare monogenic diseases. So we

NOTE Confidence: 0.96243125

00:05:44.080 --> 00:05:45.120 convinced them to sort of

NOTE Confidence: 0.96243125

00:05:45.120 --> 00:05:45.860 come together

NOTE Confidence: 0.9844856

00:05:46.240 --> 00:05:47.520 and, look at all of

NOTE Confidence: 0.9844856

00:05:47.520 --> 00:05:49.404 those patients that hit diverse

NOTE Confidence: 0.92703336

00:05:49.865 --> 00:05:51.865 genetic pathways and then measure

NOTE Confidence: 0.92703336

00:05:51.865 --> 00:05:53.625 them using longitudinally in some

NOTE Confidence: 0.92703336

00:05:53.625 --> 00:05:54.825 of them using the same

NOTE Confidence: 0.92703336

00:05:54.825 --> 00:05:57.385 systems immunology tools and also

NOTE Confidence: 0.92703336

00:05:57.385 --> 00:05:57.885 matching,

NOTE Confidence: 0.94996136

00:05:58.745 --> 00:06:00.745 clinically healthy individuals. So a

NOTE Confidence: 0.94996136

00:06:00.745 --> 00:06:01.945 key question we ask is,

NOTE Confidence: 0.94996136

00:06:01.945 --> 00:06:03.885 given this these diverse conditions,

NOTE Confidence: 0.94996136

00:06:04.105 --> 00:06:05.520 can we actually detect and

NOTE Confidence: 0.94996136

00:06:05.520 --> 00:06:06.720 and and and sort of

NOTE Confidence: 0.94996136

00:06:06.720 --> 00:06:08.480 sense get these common deviation

NOTE Confidence: 0.94996136

00:06:08.480 --> 00:06:10.240 from health by looking across

NOTE Confidence: 0.94996136

00:06:10.240 --> 00:06:10.880 all these,

NOTE Confidence: 0.95116985

00:06:11.200 --> 00:06:11.700 conditions?

NOTE Confidence: 0.98740155

00:06:12.480 --> 00:06:13.920 So in terms of data,

NOTE Confidence: 0.98740155

00:06:13.920 --> 00:06:15.200 we collected a variety of,

NOTE Confidence: 0.98740155

00:06:15.520 --> 00:06:17.279 immune profiling and omics data,

NOTE Confidence: 0.98740155

00:06:17.279 --> 00:06:18.740 including circulating proteins,

NOTE Confidence: 0.9561311

00:06:19.225 --> 00:06:20.825 cell type specific gene expression

NOTE Confidence: 0.9561311

00:06:20.825 --> 00:06:22.665 profiles, and more recently also,

NOTE Confidence: 0.9561311

00:06:22.825 --> 00:06:24.185 a subset of patients, we

NOTE Confidence: 0.9561311

00:06:24.185 --> 00:06:25.725 have collected single cell data.

NOTE Confidence: 0.97935224

00:06:26.105 --> 00:06:27.385 And by looking at actually

NOTE Confidence: 0.97935224

00:06:27.385 --> 00:06:28.425 these people, some of these

NOTE Confidence: 0.97935224

00:06:28.425 --> 00:06:30.105 people over time, it was

NOTE Confidence: 0.97935224

00:06:30.265 --> 00:06:31.885 again, the same picture emerges

NOTE Confidence: 0.97935224

00:06:32.130 --> 00:06:33.810 despite the high penetrance and

NOTE Confidence: 0.97935224

00:06:33.810 --> 00:06:35.010 the high effect size of

NOTE Confidence: 0.97935224

00:06:35.010 --> 00:06:36.290 some of these DCs, how

NOTE Confidence: 0.97935224

00:06:36.290 --> 00:06:38.310 they affect health. The individual,

NOTE Confidence: 0.97935224

00:06:38.370 --> 00:06:39.730 it's typically the unit, actually.

NOTE Confidence: 0.97935224

00:06:39.730 --> 00:06:40.290 They if you look at

NOTE Confidence: 0.97935224

00:06:40.290 --> 00:06:41.250 the immune system as a

NOTE Confidence: 0.97935224

00:06:41.250 --> 00:06:43.010 whole, these individuals actually don't

NOTE Confidence: 0.97935224

00:06:43.010 --> 00:06:45.030 cluster necessarily into patient groups.

NOTE Confidence: 0.97935224

00:06:45.250 --> 00:06:46.290 So based on that, we

NOTE Confidence: 0.97935224

00:06:46.290 --> 00:06:47.635 sort of decided to sort

NOTE Confidence: 0.97935224

00:06:47.635 --> 00:06:48.835 of take two machine learning

NOTE Confidence: 0.97935224

00:06:48.835 --> 00:06:49.714 approaches to look at the

NOTE Confidence: 0.97935224

00:06:49.714 --> 00:06:51.075 data. On the left hand

NOTE Confidence: 0.97935224

00:06:51.075 --> 00:06:52.195 side, I'm showing you an

NOTE Confidence: 0.97935224

00:06:52.195 --> 00:06:53.735 approach where we look,

NOTE Confidence: 0.9664485

00:06:54.515 --> 00:06:55.555 look at each individual as

NOTE Confidence: 0.9664485

00:06:55.555 --> 00:06:56.835 a vector of numbers, basically

NOTE Confidence: 0.9664485

00:06:56.835 --> 00:06:58.055 a vector of their phenotypic

NOTE Confidence: 0.9664485

00:06:58.195 --> 00:07:00.509 profiles, molecular cellular profiles, And

NOTE Confidence: 0.9664485

00:07:00.509 --> 00:07:01.389 then we try to compute

NOTE Confidence: 0.9664485

00:07:01.389 --> 00:07:03.169 the relationships among these individuals

NOTE Confidence: 0.98809034

00:07:03.470 --> 00:07:04.750 and try to ask what

NOTE Confidence: 0.98809034

00:07:04.750 --> 00:07:06.349 kind of variation exists in

NOTE Confidence: 0.98809034

00:07:06.349 --> 00:07:08.270 these multimodal data. On the

NOTE Confidence: 0.98809034

00:07:08.270 --> 00:07:09.550 right, we're using a more

NOTE Confidence: 0.98809034

00:07:09.550 --> 00:07:11.389 supervised approach and ask, can

NOTE Confidence: 0.98809034

00:07:11.389 --> 00:07:12.530 we compute a probabilistic

NOTE Confidence: 0.98977405

00:07:13.069 --> 00:07:14.830 measure of whether somebody is

NOTE Confidence: 0.98977405

00:07:14.830 --> 00:07:16.585 healthy or not? Right? So

NOTE Confidence: 0.98977405

00:07:16.585 --> 00:07:17.705 based on so for that,

NOTE Confidence: 0.98977405

00:07:17.705 --> 00:07:18.745 we know the label of

NOTE Confidence: 0.98977405

00:07:18.745 --> 00:07:19.705 of everyone. So on the

NOTE Confidence: 0.98977405

00:07:19.705 --> 00:07:20.665 left side, we actually don't

NOTE Confidence: 0.98977405

00:07:20.665 --> 00:07:21.785 have the label of anybody.

NOTE Confidence: 0.98977405

00:07:21.785 --> 00:07:22.825 We don't know what disease

NOTE Confidence: 0.98977405

00:07:22.825 --> 00:07:23.785 they have and so on.

NOTE Confidence: 0.98977405

00:07:23.785 --> 00:07:25.865 Right? So the surprise was

NOTE Confidence: 0.98977405

00:07:25.865 --> 00:07:26.905 that when you look at

NOTE Confidence: 0.98977405

00:07:26.905 --> 00:07:27.885 the emergent

NOTE Confidence: 0.9317209

00:07:28.880 --> 00:07:29.940 axis of variation,

NOTE Confidence: 0.9934473

00:07:30.960 --> 00:07:32.080 coming out from the left

NOTE Confidence: 0.9934473

00:07:32.080 --> 00:07:33.300 approach, unsupervised

NOTE Confidence: 0.9955425

00:07:33.600 --> 00:07:34.100 approach,

NOTE Confidence: 0.8193984

00:07:34.560 --> 00:07:35.840 it came out with exactly

NOTE Confidence: 0.8193984

00:07:35.840 --> 00:07:36.740 the, same

NOTE Confidence: 0.8816945

00:07:37.120 --> 00:07:38.740 principle axis of variation

NOTE Confidence: 0.99138063

00:07:39.200 --> 00:07:40.560 as this probability of being

NOTE Confidence: 0.99138063

00:07:40.560 --> 00:07:42.320 healthy, basically. So in other

NOTE Confidence: 0.99138063

00:07:42.320 --> 00:07:43.620 words, even if you don't

NOTE Confidence: 0.9972758

00:07:44.065 --> 00:07:45.505 know who's healthy and who

NOTE Confidence: 0.9972758

00:07:45.505 --> 00:07:47.665 has what disease, there's natural

NOTE Confidence: 0.9972758

00:07:47.665 --> 00:07:49.345 variation in the population that

NOTE Confidence: 0.9972758

00:07:49.345 --> 00:07:51.285 resembles precisely this probabilistic

NOTE Confidence: 0.96401596

00:07:51.585 --> 00:07:53.025 measure of of being healthy.

NOTE Confidence: 0.96401596

00:07:53.025 --> 00:07:53.985 So in other words, we're

NOTE Confidence: 0.96401596

00:07:53.985 --> 00:07:55.505 learning immune health actually by

NOTE Confidence: 0.96401596

00:07:55.505 --> 00:07:56.400 learning from a lot of

NOTE Confidence: 0.96401596

00:07:56.479 --> 00:07:57.520 pathologies. Right? What are the

NOTE Confidence: 0.96401596

00:07:57.680 --> 00:07:59.040 those are negative examples, so

NOTE Confidence: 0.96401596

00:07:59.040 --> 00:08:00.320 to speak, of of what

NOTE Confidence: 0.96401596

00:08:00.320 --> 00:08:01.280 it means to be having

NOTE Confidence: 0.96401596

00:08:01.280 --> 00:08:02.580 a healthy immune system.

NOTE Confidence: 0.9733459

00:08:03.120 --> 00:08:04.400 So and then the question

NOTE Confidence: 0.9733459

00:08:04.400 --> 00:08:05.440 is, what does it mean?

NOTE Confidence: 0.9733459

00:08:05.440 --> 00:08:07.039 So when you plot, these

NOTE Confidence: 0.9733459

00:08:07.039 --> 00:08:08.639 individuals, so each dot is

NOTE Confidence: 0.9733459

00:08:08.639 --> 00:08:10.765 a person here, and each

NOTE Confidence: 0.9733459

00:08:10.765 --> 00:08:11.245 row,

NOTE Confidence: 0.99957657

00:08:11.645 --> 00:08:13.265 corresponds to a monogenic

NOTE Confidence: 0.9090272

00:08:13.725 --> 00:08:14.225 disease,

NOTE Confidence: 0.93685037

00:08:14.525 --> 00:08:16.045 group, you can see that's

NOTE Confidence: 0.93685037

00:08:16.045 --> 00:08:17.485 the clinically healthy group at

NOTE Confidence: 0.93685037

00:08:17.485 --> 00:08:18.685 the top, they span a

NOTE Confidence: 0.93685037

00:08:18.685 --> 00:08:20.045 huge range, and some of

NOTE Confidence: 0.93685037

00:08:20.045 --> 00:08:21.825 them actually extends well into,

NOTE Confidence: 0.97831964

00:08:22.410 --> 00:08:23.850 the the the sick patients.

NOTE Confidence: 0.97831964

00:08:23.850 --> 00:08:25.370 Right? So as I mentioned,

NOTE Confidence: 0.97831964

00:08:25.370 --> 00:08:26.490 what does it really mean,

NOTE Confidence: 0.97831964

00:08:26.730 --> 00:08:27.610 when you have such a

NOTE Confidence: 0.97831964

00:08:27.610 --> 00:08:28.730 wide range of of of

NOTE Confidence: 0.97831964

00:08:28.730 --> 00:08:29.950 this metric, basically?

NOTE Confidence: 0.97058564

00:08:30.650 --> 00:08:31.530 So then we look at

NOTE Confidence: 0.97058564

00:08:31.530 --> 00:08:32.730 this in an independent set

NOTE Confidence: 0.97058564

00:08:32.730 --> 00:08:33.390 of people.

NOTE Confidence: 0.9311144

00:08:33.850 --> 00:08:35.130 This is the Baltimore Healthy

NOTE Confidence: 0.9311144

00:08:35.130 --> 00:08:36.670 Aging cohort where they collected,

NOTE Confidence: 0.99990344

00:08:37.130 --> 00:08:37.630 data

NOTE Confidence: 0.99235433

00:08:38.205 --> 00:08:40.605 from, individuals across each decade

NOTE Confidence: 0.99235433

00:08:40.605 --> 00:08:41.645 of life. And what you

NOTE Confidence: 0.99235433

00:08:41.645 --> 00:08:42.845 can see when you compute

NOTE Confidence: 0.99235433

00:08:42.845 --> 00:08:44.225 this metric on these people

NOTE Confidence: 0.99235433

00:08:44.365 --> 00:08:45.745 is that there's a decline

NOTE Confidence: 0.99235433

00:08:45.805 --> 00:08:47.105 in the immune health metric

NOTE Confidence: 0.99235433

00:08:47.165 --> 00:08:47.985 as you go,

NOTE Confidence: 0.9680463

00:08:48.365 --> 00:08:49.105 get older.

NOTE Confidence: 0.98967123

00:08:49.485 --> 00:08:51.325 But, so suggesting that this

NOTE Confidence: 0.98967123

00:08:51.325 --> 00:08:53.184 is actually tracking healthy aging.

NOTE Confidence: 0.98967123

00:08:53.270 --> 00:08:54.390 But you can also see

NOTE Confidence: 0.98967123

00:08:54.390 --> 00:08:55.670 that on the y axis,

NOTE Confidence: 0.98967123

00:08:55.670 --> 00:08:57.690 there's significant remaining variation.

NOTE Confidence: 0.889352

00:08:58.790 --> 00:09:00.070 So given a a sixty

NOTE Confidence: 0.889352

00:09:00.070 --> 00:09:01.110 or seventy year old, there's

NOTE Confidence: 0.889352

00:09:01.110 --> 00:09:01.990 actually a a still a

NOTE Confidence: 0.889352

00:09:01.990 --> 00:09:02.730 y variation

NOTE Confidence: 0.9738983

00:09:03.270 --> 00:09:04.390 in in according to this

NOTE Confidence: 0.9738983

00:09:04.390 --> 00:09:05.590 health metric. So we look

NOTE Confidence: 0.9738983

00:09:05.590 --> 00:09:06.630 into that a bit, and

NOTE Confidence: 0.9738983

00:09:06.630 --> 00:09:07.910 and that actually can predict

NOTE Confidence: 0.9738983

00:09:07.910 --> 00:09:10.145 vaccine responses within the especially

NOTE Confidence: 0.9738983

00:09:10.145 --> 00:09:11.045 within the elderly.

NOTE Confidence: 0.9677947

00:09:11.585 --> 00:09:13.745 It also, correlates with with

NOTE Confidence: 0.9677947

00:09:13.745 --> 00:09:15.684 variables like BMI, for example.

NOTE Confidence: 0.9509309

00:09:16.065 --> 00:09:17.345 And then it also tracks,

NOTE Confidence: 0.9509309

00:09:17.585 --> 00:09:18.945 in other context, like whether

NOTE Confidence: 0.9509309

00:09:18.945 --> 00:09:20.245 the heart is working well

NOTE Confidence: 0.9509309

00:09:20.465 --> 00:09:22.410 and also tracking drug responses,

NOTE Confidence: 0.9509309

00:09:22.410 --> 00:09:23.770 in this case, RA patients

NOTE Confidence: 0.9509309

00:09:23.770 --> 00:09:25.850 responding or not to, a

NOTE Confidence: 0.9509309

00:09:25.850 --> 00:09:26.910 therapy, basically.

NOTE Confidence: 0.9701374

00:09:27.290 --> 00:09:28.649 So the picture I wanted

NOTE Confidence: 0.9701374

00:09:28.649 --> 00:09:29.690 to paint is that, of

NOTE Confidence: 0.9701374

00:09:29.690 --> 00:09:31.210 course, this is a one

NOTE Confidence: 0.9701374

00:09:31.210 --> 00:09:32.890 dimensional measure that we uncover.

NOTE Confidence: 0.9701374

00:09:32.890 --> 00:09:34.170 There are multiple dimension that

NOTE Confidence: 0.9701374

00:09:34.170 --> 00:09:35.690 one can uncover, especially one

NOTE Confidence: 0.9701374

00:09:35.690 --> 00:09:36.830 specific to disease.

NOTE Confidence: 0.9882731

00:09:37.205 --> 00:09:38.165 But this one seems to

NOTE Confidence: 0.9882731

00:09:38.165 --> 00:09:38.905 be emergent

NOTE Confidence: 0.99117696

00:09:39.285 --> 00:09:40.485 independent of whether we look

NOTE Confidence: 0.99117696

00:09:40.485 --> 00:09:41.445 at we can drop out

NOTE Confidence: 0.99117696

00:09:41.445 --> 00:09:42.725 different patients. We can even

NOTE Confidence: 0.99117696

00:09:42.725 --> 00:09:43.865 drop out all the healthy

NOTE Confidence: 0.99117696

00:09:43.925 --> 00:09:45.445 individuals in the cohort. We

NOTE Confidence: 0.99117696

00:09:45.445 --> 00:09:46.665 still get the same

NOTE Confidence: 0.9975631

00:09:48.165 --> 00:09:48.665 metric

NOTE Confidence: 0.93349254

00:09:48.965 --> 00:09:49.785 back, basically.

NOTE Confidence: 0.86975724

00:09:51.529 --> 00:09:53.209 This is It's a public

NOTE Confidence: 0.86975724

00:09:53.209 --> 00:09:53.709 service.

NOTE Confidence: 0.9771542

00:09:55.850 --> 00:09:56.809 Stop. My time is up.

NOTE Confidence: 0.9771542

00:09:56.809 --> 00:09:57.790 Right? Okay.

NOTE Confidence: 0.9853742

00:09:59.529 --> 00:10:00.029 Okay.

NOTE Confidence: 0.96251446

00:10:01.610 --> 00:10:02.910 So the

NOTE Confidence: 0.985299

00:10:03.225 --> 00:10:04.665 the the concept I'm getting

NOTE Confidence: 0.985299

00:10:04.665 --> 00:10:06.265 to is that, often when

NOTE Confidence: 0.985299

00:10:06.265 --> 00:10:07.304 we look at individuals in

NOTE Confidence: 0.985299

00:10:07.304 --> 00:10:08.524 the in the human population,

NOTE Confidence: 0.9651451

00:10:08.985 --> 00:10:10.265 there are obviously some of

NOTE Confidence: 0.9651451

00:10:10.265 --> 00:10:11.785 us who are maybe really

NOTE Confidence: 0.9651451

00:10:11.785 --> 00:10:12.665 at this end of healthy

NOTE Confidence: 0.9651451

00:10:12.665 --> 00:10:13.165 healthy,

NOTE Confidence: 0.9395671

00:10:13.625 --> 00:10:14.505 and then there are ones

NOTE Confidence: 0.9395671

00:10:14.505 --> 00:10:15.964 that we know with disease

NOTE Confidence: 0.9395671

00:10:16.105 --> 00:10:16.765 or pathology

NOTE Confidence: 0.9605498

00:10:17.250 --> 00:10:18.130 that are far off from

NOTE Confidence: 0.9605498

00:10:18.130 --> 00:10:18.770 the optimal,

NOTE Confidence: 0.9734659

00:10:19.170 --> 00:10:20.770 set point. But most of

NOTE Confidence: 0.9734659

00:10:20.770 --> 00:10:22.050 us, I think, are still

NOTE Confidence: 0.9734659

00:10:22.050 --> 00:10:23.809 healthy clinically, but inching towards

NOTE Confidence: 0.9734659

00:10:23.809 --> 00:10:25.270 some sort of pathology. Right?

NOTE Confidence: 0.99073076

00:10:25.730 --> 00:10:27.250 And so by by developing

NOTE Confidence: 0.99073076

00:10:27.250 --> 00:10:28.690 this kind of immune health

NOTE Confidence: 0.99073076

00:10:28.690 --> 00:10:29.809 metric and using the immune

NOTE Confidence: 0.99073076

00:10:29.809 --> 00:10:31.330 system as a sensor, I

NOTE Confidence: 0.99073076

00:10:31.330 --> 00:10:32.290 think we can start to

NOTE Confidence: 0.99073076

00:10:32.290 --> 00:10:33.715 really start to quantify,

NOTE Confidence: 0.9967571

00:10:34.495 --> 00:10:35.855 where someone may be at

NOTE Confidence: 0.9967571

00:10:35.855 --> 00:10:36.895 and so on. So that's

NOTE Confidence: 0.9967571

00:10:36.895 --> 00:10:37.795 one of the key

NOTE Confidence: 0.99890023

00:10:38.175 --> 00:10:39.295 challenges that we would like

NOTE Confidence: 0.99890023

00:10:39.295 --> 00:10:39.875 to tackle,

NOTE Confidence: 0.8982156

00:10:40.255 --> 00:10:41.215 both in my lab and

NOTE Confidence: 0.8982156

00:10:41.215 --> 00:10:42.815 also working together with other

NOTE Confidence: 0.8982156

00:10:42.895 --> 00:10:43.695 others in the in the

NOTE Confidence: 0.8982156

00:10:43.695 --> 00:10:44.195 CSCI.

NOTE Confidence: 0.9964701

00:10:44.975 --> 00:10:46.175 So so this concludes the

NOTE Confidence: 0.9964701

00:10:46.175 --> 00:10:47.715 part of the talk for

NOTE Confidence: 0.9964701

00:10:47.809 --> 00:10:48.949 talking a little bit about,

NOTE Confidence: 0.9757511

00:10:49.570 --> 00:10:50.769 science from my lab and

NOTE Confidence: 0.9757511

00:10:50.769 --> 00:10:51.970 and and how so now

NOTE Confidence: 0.9757511

00:10:51.970 --> 00:10:52.850 I'm gonna move sort of

NOTE Confidence: 0.9757511

00:10:52.850 --> 00:10:53.350 onto

NOTE Confidence: 0.9994429

00:10:53.809 --> 00:10:54.309 motivating

NOTE Confidence: 0.96816385

00:10:54.690 --> 00:10:56.209 some of the, the key

NOTE Confidence: 0.96816385

00:10:56.209 --> 00:10:57.970 themes at the CHEI. So

NOTE Confidence: 0.96816385

00:10:57.970 --> 00:10:59.250 I hope I've convinced you

NOTE Confidence: 0.96816385

00:10:59.250 --> 00:10:59.570 that,

NOTE Confidence: 0.98922366

00:11:00.485 --> 00:11:01.605 with the immune system and

NOTE Confidence: 0.98922366

00:11:01.605 --> 00:11:02.585 what it's sensing,

NOTE Confidence: 0.9635156

00:11:03.285 --> 00:11:04.565 we can really move beyond

NOTE Confidence: 0.9635156

00:11:04.565 --> 00:11:05.685 the genome, which in a

NOTE Confidence: 0.9635156

00:11:05.685 --> 00:11:07.145 way, it's a static information

NOTE Confidence: 0.97952664

00:11:07.525 --> 00:11:09.205 store of of what may

NOTE Confidence: 0.97952664

00:11:09.205 --> 00:11:09.865 be possible.

NOTE Confidence: 0.9628392

00:11:10.325 --> 00:11:11.765 But but the immune system

NOTE Confidence: 0.9628392

00:11:11.765 --> 00:11:13.860 is really sensing, detecting what's

NOTE Confidence: 0.9628392

00:11:13.860 --> 00:11:14.899 going on right now and

NOTE Confidence: 0.9628392

00:11:14.899 --> 00:11:15.779 and in the past as

NOTE Confidence: 0.9628392

00:11:15.779 --> 00:11:17.399 well and integrating that information.

NOTE Confidence: 0.9758353

00:11:17.779 --> 00:11:18.980 And it's it's it's I

NOTE Confidence: 0.9758353

00:11:18.980 --> 00:11:19.940 I would argue that that's

NOTE Confidence: 0.9758353

00:11:19.940 --> 00:11:21.220 why it's actually gonna tell

NOTE Confidence: 0.9758353

00:11:21.220 --> 00:11:22.899 us a lot more about

NOTE Confidence: 0.9758353

00:11:22.899 --> 00:11:24.179 both the status of the

NOTE Confidence: 0.9758353

00:11:24.179 --> 00:11:25.300 of the body right now,

NOTE Confidence: 0.9758353

00:11:25.300 --> 00:11:26.660 but also what's gonna happen

NOTE Confidence: 0.9758353

00:11:26.660 --> 00:11:27.795 in the future. Right? So,

NOTE Confidence: 0.9758353

00:11:27.795 --> 00:11:29.154 therefore, the the grand challenge

NOTE Confidence: 0.9758353

00:11:29.154 --> 00:11:30.274 is can we uncover the

NOTE Confidence: 0.9758353

00:11:30.274 --> 00:11:31.635 connection between the immune system

NOTE Confidence: 0.9758353

00:11:31.635 --> 00:11:32.295 and physiology

NOTE Confidence: 0.9577127

00:11:33.075 --> 00:11:34.835 and thereby predict and modulate

NOTE Confidence: 0.9577127

00:11:34.835 --> 00:11:36.295 personal immunity and health.

NOTE Confidence: 0.84828883

00:11:36.835 --> 00:11:37.554 So at the c h

NOTE Confidence: 0.84828883

00:11:37.714 --> 00:11:38.214 CSCI,

NOTE Confidence: 0.995316

00:11:39.395 --> 00:11:39.895 we

NOTE Confidence: 0.98135936

00:11:40.209 --> 00:11:41.490 help to develop and bring

NOTE Confidence: 0.98135936

00:11:41.490 --> 00:11:44.070 together both people and interdisciplinary

NOTE Confidence: 0.99688023

00:11:44.610 --> 00:11:47.649 approaches to monitor, predict, understand,

NOTE Confidence: 0.99688023

00:11:47.649 --> 00:11:49.890 and modulate personal immunity and

NOTE Confidence: 0.99688023

00:11:49.890 --> 00:11:51.250 health for the benefit of

NOTE Confidence: 0.99688023

00:11:51.250 --> 00:11:51.750 all.

NOTE Confidence: 0.9785657

00:11:52.545 --> 00:11:53.925 So to achieve this mission,

NOTE Confidence: 0.9785657

00:11:54.065 --> 00:11:55.425 we have some philosophies and

NOTE Confidence: 0.9785657

00:11:55.425 --> 00:11:56.785 and and and and and

NOTE Confidence: 0.9785657

00:11:56.785 --> 00:11:57.365 and pillars.

NOTE Confidence: 0.8534728

00:11:58.465 --> 00:11:59.585 So one is that,

NOTE Confidence: 0.9802462

00:12:00.385 --> 00:12:01.265 many of you heard of

NOTE Confidence: 0.9802462

00:12:01.265 --> 00:12:02.165 systems immunology,

NOTE Confidence: 0.9863857

00:12:02.945 --> 00:12:03.905 and some of you may

NOTE Confidence: 0.9863857

00:12:03.905 --> 00:12:05.459 think of it as immunology

NOTE Confidence: 0.9863857

00:12:05.519 --> 00:12:07.200 with lots of omics data.

NOTE Confidence: 0.9863857

00:12:07.200 --> 00:12:08.160 But I wanna argue that

NOTE Confidence: 0.9863857

00:12:08.160 --> 00:12:09.360 it it's more than that,

NOTE Confidence: 0.9863857

00:12:09.519 --> 00:12:10.019 actually.

NOTE Confidence: 0.9279013

00:12:10.320 --> 00:12:11.839 It it I think thinking

NOTE Confidence: 0.9279013

00:12:11.839 --> 00:12:13.040 the cyst immune system is

NOTE Confidence: 0.9279013

00:12:13.040 --> 00:12:13.620 a system,

NOTE Confidence: 0.974972

00:12:14.320 --> 00:12:15.600 and then and then designing

NOTE Confidence: 0.974972

00:12:15.600 --> 00:12:17.040 unique studies and and and

NOTE Confidence: 0.974972

00:12:17.040 --> 00:12:18.660 and and questions to address.

NOTE Confidence: 0.9973406

00:12:19.040 --> 00:12:20.339 For example, how

NOTE Confidence: 0.94537795

00:12:20.834 --> 00:12:22.755 do immune cells and also

NOTE Confidence: 0.94537795

00:12:22.755 --> 00:12:24.615 going up the hierarchy, multiple,

NOTE Confidence: 0.9445878

00:12:25.315 --> 00:12:27.175 populations of cells integrate information?

NOTE Confidence: 0.97127265

00:12:27.795 --> 00:12:28.915 And can we understand how

NOTE Confidence: 0.97127265

00:12:28.915 --> 00:12:30.615 the interactions among these components

NOTE Confidence: 0.97127265

00:12:30.834 --> 00:12:32.195 actually give rise to outcomes?

NOTE Confidence: 0.97127265

00:12:32.195 --> 00:12:33.290 Right? So that's a grand

NOTE Confidence: 0.97127265

00:12:33.290 --> 00:12:34.730 challenge in understanding something as

NOTE Confidence: 0.97127265

00:12:34.730 --> 00:12:36.110 complex as an immune system.

NOTE Confidence: 0.97127265

00:12:36.330 --> 00:12:37.370 And to address that, I

NOTE Confidence: 0.97127265

00:12:37.370 --> 00:12:38.649 think we need to think

NOTE Confidence: 0.97127265

00:12:38.649 --> 00:12:40.490 of unique approaches and and

NOTE Confidence: 0.97127265

00:12:40.490 --> 00:12:41.550 and and and study designs.

NOTE Confidence: 0.97127265

00:12:41.850 --> 00:12:43.370 And then the second aspect

NOTE Confidence: 0.97127265

00:12:43.370 --> 00:12:44.029 is people.

NOTE Confidence: 0.97423905

00:12:44.570 --> 00:12:46.214 We we want to enable

NOTE Confidence: 0.97423905

00:12:46.214 --> 00:12:46.875 and cultivate.

NOTE Confidence: 0.9477978

00:12:47.334 --> 00:12:48.735 So we wanna collaborate with

NOTE Confidence: 0.9477978

00:12:48.934 --> 00:12:49.815 at Yale, there's a lot

NOTE Confidence: 0.9477978

00:12:49.815 --> 00:12:50.954 of exciting,

NOTE Confidence: 0.95588094

00:12:51.654 --> 00:12:53.975 groups and also, programs such

NOTE Confidence: 0.95588094

00:12:53.975 --> 00:12:55.575 as HTI, YCIO, and the

NOTE Confidence: 0.95588094

00:12:55.575 --> 00:12:57.334 engineering school. We wanna bring

NOTE Confidence: 0.95588094

00:12:57.334 --> 00:12:58.855 together across Yale and the

NOTE Confidence: 0.95588094

00:12:58.934 --> 00:13:00.450 and also the world to

NOTE Confidence: 0.95588094

00:13:00.450 --> 00:13:01.970 push the frontiers of this

NOTE Confidence: 0.95588094

00:13:01.970 --> 00:13:02.450 field,

NOTE Confidence: 0.9472051

00:13:03.090 --> 00:13:03.970 and and and and and

NOTE Confidence: 0.9472051

00:13:03.970 --> 00:13:04.470 really,

NOTE Confidence: 0.9820217

00:13:05.090 --> 00:13:07.110 drive forward also this predictive

NOTE Confidence: 0.9820217

00:13:07.170 --> 00:13:08.150 immune cell engineering,

NOTE Confidence: 0.9529196

00:13:08.690 --> 00:13:09.970 theme that I'm gonna highlight

NOTE Confidence: 0.9529196

00:13:09.970 --> 00:13:11.090 and again for the benefit

NOTE Confidence: 0.9529196

00:13:11.090 --> 00:13:12.530 of all. And in terms

NOTE Confidence: 0.9529196

00:13:12.530 --> 00:13:14.050 of people, also education and

NOTE Confidence: 0.9529196

00:13:14.050 --> 00:13:15.815 training is another mission. We

NOTE Confidence: 0.9529196

00:13:15.815 --> 00:13:17.095 wanna develop a new generation

NOTE Confidence: 0.9529196

00:13:17.095 --> 00:13:18.875 of computational and systems immunologists,

NOTE Confidence: 0.9529196

00:13:19.095 --> 00:13:20.154 immune cell engineers,

NOTE Confidence: 0.89307964

00:13:20.535 --> 00:13:22.615 and technicians and engage citizens

NOTE Confidence: 0.89307964

00:13:22.615 --> 00:13:23.355 in research.

NOTE Confidence: 0.9872601

00:13:24.455 --> 00:13:25.654 And then on the science

NOTE Confidence: 0.9872601

00:13:25.654 --> 00:13:27.175 side, I'm listing sort of

NOTE Confidence: 0.9872601

00:13:27.175 --> 00:13:28.075 four pillars.

NOTE Confidence: 0.9719335

00:13:29.269 --> 00:13:30.149 Pillar one, I think I

NOTE Confidence: 0.9719335

00:13:30.149 --> 00:13:31.269 mentioned that already. It's it's

NOTE Confidence: 0.9719335

00:13:31.269 --> 00:13:33.029 don't forget physiology. Sometimes we

NOTE Confidence: 0.9719335

00:13:33.029 --> 00:13:34.230 get too hung up with

NOTE Confidence: 0.9719335

00:13:34.230 --> 00:13:35.509 measuring just the immune system,

NOTE Confidence: 0.9719335

00:13:35.509 --> 00:13:36.949 obviously, but I think we

NOTE Confidence: 0.9719335

00:13:36.949 --> 00:13:38.470 have to measure physiology at

NOTE Confidence: 0.9719335

00:13:38.470 --> 00:13:39.829 the same time. And second

NOTE Confidence: 0.9719335

00:13:39.829 --> 00:13:41.610 is utilize human immune variation.

NOTE Confidence: 0.9719335

00:13:41.670 --> 00:13:43.029 So human immune variation is

NOTE Confidence: 0.9719335

00:13:43.029 --> 00:13:44.704 often sometimes thought of as

NOTE Confidence: 0.9719335

00:13:44.704 --> 00:13:45.505 a as a as a

NOTE Confidence: 0.9719335

00:13:45.505 --> 00:13:46.065 as a as a as

NOTE Confidence: 0.9719335

00:13:46.065 --> 00:13:46.725 a roadblock.

NOTE Confidence: 0.98601586

00:13:47.105 --> 00:13:48.144 But in a way, it's

NOTE Confidence: 0.98601586

00:13:48.144 --> 00:13:49.184 the it's the only way

NOTE Confidence: 0.98601586

00:13:49.184 --> 00:13:51.445 to actually utilize natural variations,

NOTE Confidence: 0.98601586

00:13:51.505 --> 00:13:52.545 and it's a human it's

NOTE Confidence: 0.98601586

00:13:52.545 --> 00:13:54.464 an experiment, natural experiment that

NOTE Confidence: 0.98601586

00:13:54.464 --> 00:13:55.904 we can utilize and learn

NOTE Confidence: 0.98601586

00:13:55.904 --> 00:13:57.059 a lot using these new

NOTE Confidence: 0.98601586

00:13:57.059 --> 00:13:57.559 technologies.

NOTE Confidence: 0.90270364

00:13:58.420 --> 00:13:59.880 The pillar two is measure.

NOTE Confidence: 0.90270364

00:13:59.940 --> 00:14:01.559 Right? We knew new technologies,

NOTE Confidence: 0.95788103

00:14:02.580 --> 00:14:03.860 and and and so, therefore,

NOTE Confidence: 0.95788103

00:14:03.860 --> 00:14:05.559 the application and fine tuning

NOTE Confidence: 0.95788103

00:14:05.780 --> 00:14:06.980 and development of cutting edge

NOTE Confidence: 0.95788103

00:14:06.980 --> 00:14:08.900 immune monitoring and molecular profiling

NOTE Confidence: 0.95788103

00:14:08.900 --> 00:14:09.400 approaches

NOTE Confidence: 0.98435086

00:14:09.795 --> 00:14:10.695 are are central.

NOTE Confidence: 0.8835053

00:14:11.394 --> 00:14:12.595 And then the other pillar,

NOTE Confidence: 0.8835053

00:14:12.595 --> 00:14:14.035 it sells as as as

NOTE Confidence: 0.8835053

00:14:14.035 --> 00:14:14.535 tools.

NOTE Confidence: 0.97991234

00:14:14.915 --> 00:14:16.115 So I I mentioned briefly

NOTE Confidence: 0.97991234

00:14:16.115 --> 00:14:17.235 on how immune cells, some

NOTE Confidence: 0.97991234

00:14:17.235 --> 00:14:18.675 of them can traffic and

NOTE Confidence: 0.97991234

00:14:18.675 --> 00:14:20.274 can sense information. So how

NOTE Confidence: 0.97991234

00:14:20.274 --> 00:14:21.315 can we harness them as

NOTE Confidence: 0.97991234

00:14:21.315 --> 00:14:22.900 both natural sensors? Because some

NOTE Confidence: 0.97991234

00:14:22.900 --> 00:14:24.500 of them already are sensing

NOTE Confidence: 0.97991234

00:14:24.500 --> 00:14:25.700 things, but we don't have

NOTE Confidence: 0.97991234

00:14:25.700 --> 00:14:27.160 the full book to decode

NOTE Confidence: 0.97991234

00:14:27.380 --> 00:14:28.820 what it means. For example,

NOTE Confidence: 0.97991234

00:14:28.820 --> 00:14:29.780 I can see a certain

NOTE Confidence: 0.97991234

00:14:29.780 --> 00:14:30.840 T cell in the blood

NOTE Confidence: 0.97991234

00:14:30.980 --> 00:14:32.260 and and may may have

NOTE Confidence: 0.97991234

00:14:32.260 --> 00:14:33.700 information about the liver, about

NOTE Confidence: 0.97991234

00:14:33.700 --> 00:14:35.060 the kidney that we haven't

NOTE Confidence: 0.97991234

00:14:35.060 --> 00:14:36.180 been able to decode those

NOTE Confidence: 0.97991234

00:14:36.180 --> 00:14:36.980 yet. So that's what I

NOTE Confidence: 0.97991234

00:14:36.980 --> 00:14:38.535 call natural sensing. The other

NOTE Confidence: 0.97991234

00:14:38.535 --> 00:14:39.735 one, it's it's more ambitious,

NOTE Confidence: 0.97991234

00:14:39.735 --> 00:14:40.375 but at the same time,

NOTE Confidence: 0.97991234

00:14:40.375 --> 00:14:41.654 much more controllable. Right? Can

NOTE Confidence: 0.97991234

00:14:41.654 --> 00:14:43.115 we engineer these cells

NOTE Confidence: 0.9589791

00:14:43.575 --> 00:14:44.455 so that they go to

NOTE Confidence: 0.9589791

00:14:44.455 --> 00:14:46.214 specific locations, actually collect data

NOTE Confidence: 0.9589791

00:14:46.214 --> 00:14:47.575 for us? That's one. And

NOTE Confidence: 0.9589791

00:14:47.575 --> 00:14:48.774 second is one is once

NOTE Confidence: 0.9589791

00:14:48.774 --> 00:14:50.375 those data are collected, can

NOTE Confidence: 0.9589791

00:14:50.375 --> 00:14:51.880 we act? And third, it's

NOTE Confidence: 0.9589791

00:14:51.880 --> 00:14:53.480 eventually, can you actually make

NOTE Confidence: 0.9589791

00:14:53.480 --> 00:14:54.140 the cells,

NOTE Confidence: 0.98723495

00:14:54.520 --> 00:14:55.640 act by themselves? So I

NOTE Confidence: 0.98723495

00:14:55.640 --> 00:14:56.839 hope Wendell is gonna highlight

NOTE Confidence: 0.98723495

00:14:56.839 --> 00:14:58.120 some of the pioneering approaches

NOTE Confidence: 0.98723495

00:14:58.120 --> 00:14:58.760 that he has,

NOTE Confidence: 0.96673745

00:14:59.640 --> 00:15:00.600 done in his lab on

NOTE Confidence: 0.96673745

00:15:00.600 --> 00:15:02.040 that on that front. And

NOTE Confidence: 0.96673745

00:15:02.040 --> 00:15:04.035 the last pillar, it's compress

NOTE Confidence: 0.96673745

00:15:04.035 --> 00:15:05.395 and predict. Right? Because we

NOTE Confidence: 0.96673745

00:15:05.395 --> 00:15:06.455 generate lots of data,

NOTE Confidence: 0.9602676

00:15:07.155 --> 00:15:08.675 but data is just data.

NOTE Confidence: 0.9602676

00:15:08.675 --> 00:15:10.375 And and if without compressing

NOTE Confidence: 0.9602676

00:15:10.515 --> 00:15:12.195 and and transforming them into

NOTE Confidence: 0.9602676

00:15:12.195 --> 00:15:14.295 causal predictive models,

NOTE Confidence: 0.94951236

00:15:15.075 --> 00:15:16.695 we we we cannot really

NOTE Confidence: 0.94951236

00:15:16.890 --> 00:15:17.930 act on it, and also

NOTE Confidence: 0.94951236

00:15:17.930 --> 00:15:19.050 we cannot understand. So I

NOTE Confidence: 0.94951236

00:15:19.050 --> 00:15:20.090 hope it's we can develop

NOTE Confidence: 0.94951236

00:15:20.090 --> 00:15:21.050 models that can allow us

NOTE Confidence: 0.94951236

00:15:21.050 --> 00:15:22.890 to compress the data, transform

NOTE Confidence: 0.94951236

00:15:22.890 --> 00:15:24.570 them into tools, but also

NOTE Confidence: 0.94951236

00:15:24.570 --> 00:15:25.070 understanding.

NOTE Confidence: 0.9928059

00:15:26.890 --> 00:15:28.090 So with that, I wanna

NOTE Confidence: 0.9928059

00:15:28.090 --> 00:15:29.210 highlight just a few things

NOTE Confidence: 0.9928059

00:15:29.210 --> 00:15:29.850 in the last,

NOTE Confidence: 0.9998356

00:15:30.330 --> 00:15:31.070 five minutes

NOTE Confidence: 0.96912193

00:15:31.450 --> 00:15:32.971 that sort of highlights some

NOTE Confidence: 0.96912193

00:15:32.971 --> 00:15:34.305 of the efforts, we have

NOTE Confidence: 0.96912193

00:15:34.305 --> 00:15:35.425 started to push in these

NOTE Confidence: 0.96912193

00:15:35.425 --> 00:15:36.165 these directions.

NOTE Confidence: 0.9936157

00:15:36.625 --> 00:15:37.425 So on the on the

NOTE Confidence: 0.9936157

00:15:37.425 --> 00:15:38.705 AI front, if you think

NOTE Confidence: 0.9936157

00:15:38.865 --> 00:15:39.985 look look at the the

NOTE Confidence: 0.9936157

00:15:39.985 --> 00:15:41.105 immune system as a sort

NOTE Confidence: 0.9936157

00:15:41.105 --> 00:15:42.465 of a multiscale machine. Right?

NOTE Confidence: 0.9936157

00:15:42.465 --> 00:15:43.685 So going from molecules

NOTE Confidence: 0.9057833

00:15:44.145 --> 00:15:45.745 within cells like DNA, proteins,

NOTE Confidence: 0.9057833

00:15:45.745 --> 00:15:46.405 and RNA,

NOTE Confidence: 0.92854553

00:15:47.080 --> 00:15:48.540 Together, they they orchestrate

NOTE Confidence: 0.93737155

00:15:49.240 --> 00:15:50.680 the behavior of cells, and

NOTE Confidence: 0.93737155

00:15:50.680 --> 00:15:51.800 cells, of course, exist in

NOTE Confidence: 0.93737155

00:15:51.800 --> 00:15:53.240 different types states, and they

NOTE Confidence: 0.93737155

00:15:53.240 --> 00:15:54.600 they have different compositions and

NOTE Confidence: 0.93737155

00:15:54.600 --> 00:15:55.960 different tissues, and then so

NOTE Confidence: 0.93737155

00:15:55.960 --> 00:15:56.760 on. You can move up

NOTE Confidence: 0.93737155

00:15:56.760 --> 00:15:57.980 the the sort of chain

NOTE Confidence: 0.93737155

00:15:58.040 --> 00:15:59.000 all the way to the

NOTE Confidence: 0.93737155

00:15:59.000 --> 00:16:00.700 individual and then human population

NOTE Confidence: 0.9838186

00:16:01.415 --> 00:16:02.295 level. And when you think

NOTE Confidence: 0.9838186

00:16:02.295 --> 00:16:03.894 about machine learning and and

NOTE Confidence: 0.9838186

00:16:03.894 --> 00:16:04.394 AI,

NOTE Confidence: 0.9642684

00:16:04.855 --> 00:16:05.735 it machine learning and AI

NOTE Confidence: 0.9642684

00:16:05.735 --> 00:16:07.095 is actually a mapping problem.

NOTE Confidence: 0.9642684

00:16:07.095 --> 00:16:08.375 Right? So machine learning, you

NOTE Confidence: 0.9642684

00:16:08.375 --> 00:16:09.995 try to develop a mathematical

NOTE Confidence: 0.9642684

00:16:10.135 --> 00:16:11.975 model that can map certain

NOTE Confidence: 0.9642684

00:16:11.975 --> 00:16:13.175 types of input to an

NOTE Confidence: 0.9642684

00:16:13.175 --> 00:16:15.195 output. Right? So you've seen

NOTE Confidence: 0.9642684

00:16:15.350 --> 00:16:17.110 the phenomenal alpha four, for

NOTE Confidence: 0.9642684

00:16:17.110 --> 00:16:19.590 example, which maps sequences, protein

NOTE Confidence: 0.9642684

00:16:19.590 --> 00:16:20.090 sequences

NOTE Confidence: 0.9743698

00:16:20.470 --> 00:16:22.470 into structure, right, and map

NOTE Confidence: 0.9743698

00:16:22.470 --> 00:16:23.750 sequences into function. So if

NOTE Confidence: 0.9743698

00:16:23.750 --> 00:16:24.710 you have a mutation in

NOTE Confidence: 0.9743698

00:16:24.710 --> 00:16:26.470 the protein coding gene, we

NOTE Confidence: 0.9743698

00:16:26.470 --> 00:16:27.764 wanna predict, is it gonna

NOTE Confidence: 0.9743698

00:16:27.764 --> 00:16:29.365 be bad, for example. So

NOTE Confidence: 0.9743698

00:16:29.365 --> 00:16:30.404 you're quite familiar with these

NOTE Confidence: 0.9743698

00:16:30.404 --> 00:16:32.084 kinds of mapping functions. So

NOTE Confidence: 0.9743698

00:16:32.084 --> 00:16:33.045 the challenge in the in

NOTE Confidence: 0.9743698

00:16:33.045 --> 00:16:34.324 the immune system, it's it's

NOTE Confidence: 0.9743698

00:16:34.324 --> 00:16:35.764 it's the mapping problem across

NOTE Confidence: 0.9743698

00:16:35.764 --> 00:16:37.045 these scales, so to speak.

NOTE Confidence: 0.9743698

00:16:37.045 --> 00:16:37.925 Right? So in each one

NOTE Confidence: 0.9743698

00:16:37.925 --> 00:16:39.204 of these scales, you can

NOTE Confidence: 0.9743698

00:16:39.204 --> 00:16:40.665 sort of measure different features.

NOTE Confidence: 0.9931047

00:16:41.190 --> 00:16:42.390 So we often now see

NOTE Confidence: 0.9931047

00:16:42.390 --> 00:16:44.230 gene expression data. We often

NOTE Confidence: 0.9931047

00:16:44.230 --> 00:16:46.330 see cell composition and cell,

NOTE Confidence: 0.9750008

00:16:46.710 --> 00:16:48.470 phenotype data. But can we

NOTE Confidence: 0.9750008

00:16:48.470 --> 00:16:49.270 map those,

NOTE Confidence: 0.98936915

00:16:50.390 --> 00:16:51.530 features onto

NOTE Confidence: 0.9737221

00:16:52.390 --> 00:16:53.210 type ontogeny,

NOTE Confidence: 0.9610263

00:16:53.795 --> 00:16:55.255 onto dynamics and trajectory,

NOTE Confidence: 0.98405445

00:16:55.555 --> 00:16:56.995 and onto functions, right, and

NOTE Confidence: 0.98405445

00:16:56.995 --> 00:16:58.435 all the way to, the

NOTE Confidence: 0.98405445

00:16:58.435 --> 00:17:00.915 individual organismal level that, I

NOTE Confidence: 0.98405445

00:17:00.915 --> 00:17:02.855 I mentioned earlier today, basically.

NOTE Confidence: 0.98405445

00:17:02.915 --> 00:17:04.435 Right? And the challenge is

NOTE Confidence: 0.98405445

00:17:04.435 --> 00:17:05.234 data, actually.

NOTE Confidence: 0.97568566

00:17:05.875 --> 00:17:06.835 We talk about big data

NOTE Confidence: 0.97568566

00:17:06.835 --> 00:17:07.635 a lot these days, but,

NOTE Confidence: 0.97568566

00:17:07.635 --> 00:17:09.390 actually, we have relatively limited

NOTE Confidence: 0.97568566

00:17:09.390 --> 00:17:11.150 data, partly because they're expensive

NOTE Confidence: 0.97568566

00:17:11.150 --> 00:17:12.130 and and so on.

NOTE Confidence: 0.9203584

00:17:12.510 --> 00:17:13.710 So that's where, one of

NOTE Confidence: 0.9203584

00:17:13.710 --> 00:17:15.230 the efforts, we're teaming up,

NOTE Confidence: 0.9203584

00:17:15.230 --> 00:17:16.590 we're we're we're driving towards

NOTE Confidence: 0.9203584

00:17:16.590 --> 00:17:17.470 is this project called the

NOTE Confidence: 0.9203584

00:17:17.470 --> 00:17:18.690 human immunome project

NOTE Confidence: 0.86290246

00:17:18.990 --> 00:17:19.890 that sort of,

NOTE Confidence: 0.94077504

00:17:21.605 --> 00:17:22.405 sort of checks off this

NOTE Confidence: 0.94077504

00:17:22.484 --> 00:17:23.765 both these pillars in terms

NOTE Confidence: 0.94077504

00:17:23.765 --> 00:17:25.225 of leveraging the human,

NOTE Confidence: 0.9152088

00:17:25.685 --> 00:17:27.125 population in in in across

NOTE Confidence: 0.9152088

00:17:27.125 --> 00:17:28.244 the world in this case

NOTE Confidence: 0.9152088

00:17:28.244 --> 00:17:29.465 and connection to physiology,

NOTE Confidence: 0.94043225

00:17:29.925 --> 00:17:31.525 but also the measurement aspects

NOTE Confidence: 0.94043225

00:17:31.525 --> 00:17:32.965 that I mentioned. So we

NOTE Confidence: 0.94043225

00:17:32.965 --> 00:17:33.925 think that the time is

NOTE Confidence: 0.94043225

00:17:33.925 --> 00:17:35.299 ripe to do this given

NOTE Confidence: 0.9632762

00:17:35.600 --> 00:17:37.119 the public. It's it's becoming,

NOTE Confidence: 0.9590104

00:17:37.440 --> 00:17:38.799 really, in a in a

NOTE Confidence: 0.9590104

00:17:38.799 --> 00:17:40.240 way understand better about the

NOTE Confidence: 0.9590104

00:17:40.240 --> 00:17:41.119 the the the importance

NOTE Confidence: 0.9590104

00:17:41.119 --> 00:17:42.240 of the immune system, and

NOTE Confidence: 0.9590104

00:17:42.240 --> 00:17:43.200 technology is at a point

NOTE Confidence: 0.9590104

00:17:43.200 --> 00:17:44.080 where we we can really

NOTE Confidence: 0.9590104

00:17:44.080 --> 00:17:45.200 start to measure quite a

NOTE Confidence: 0.9590104

00:17:45.200 --> 00:17:46.559 lot. And and then, you

NOTE Confidence: 0.9590104

00:17:46.559 --> 00:17:48.159 know, the AI revolution that's

NOTE Confidence: 0.9590104

00:17:48.159 --> 00:17:48.960 going on. And so this

NOTE Confidence: 0.9590104

00:17:48.960 --> 00:17:49.700 is a project,

NOTE Confidence: 0.96431214

00:17:50.275 --> 00:17:51.955 that, I've been working together

NOTE Confidence: 0.96431214

00:17:51.955 --> 00:17:53.315 on, on the science side

NOTE Confidence: 0.96431214

00:17:53.315 --> 00:17:54.375 together with Shai,

NOTE Confidence: 0.95613766

00:17:54.675 --> 00:17:56.115 Shenor of Technion, for the

NOTE Confidence: 0.95613766

00:17:56.115 --> 00:17:57.155 past couple of years with

NOTE Confidence: 0.95613766

00:17:57.155 --> 00:17:58.355 contributions from a number of

NOTE Confidence: 0.95613766

00:17:58.355 --> 00:17:58.855 people.

NOTE Confidence: 0.9486764

00:17:59.475 --> 00:18:00.675 So the goal is really

NOTE Confidence: 0.9486764

00:18:00.675 --> 00:18:02.035 to map, this kind of

NOTE Confidence: 0.9486764

00:18:02.035 --> 00:18:03.555 personal immune states along major

NOTE Confidence: 0.9486764

00:18:03.555 --> 00:18:04.535 axis of variation

NOTE Confidence: 0.9580004

00:18:05.059 --> 00:18:06.500 across the world. And we

NOTE Confidence: 0.9580004

00:18:06.500 --> 00:18:07.720 wanna create an open,

NOTE Confidence: 0.97876585

00:18:08.179 --> 00:18:10.100 data resource, to empower both

NOTE Confidence: 0.97876585

00:18:10.100 --> 00:18:11.059 research and train the kind

NOTE Confidence: 0.97876585

00:18:11.059 --> 00:18:12.359 of AI model I mentioned.

NOTE Confidence: 0.97876585

00:18:12.500 --> 00:18:13.700 So we wanna sort of

NOTE Confidence: 0.97876585

00:18:13.700 --> 00:18:14.359 cut across

NOTE Confidence: 0.99909914

00:18:14.740 --> 00:18:15.240 populations

NOTE Confidence: 0.8406227

00:18:15.619 --> 00:18:16.919 in in terms of environment,

NOTE Confidence: 0.9612673

00:18:17.619 --> 00:18:18.760 across the whole lifespan,

NOTE Confidence: 0.89520055

00:18:19.265 --> 00:18:20.785 the gender and and geography,

NOTE Confidence: 0.89520055

00:18:20.785 --> 00:18:22.385 of of course. Initially, we're

NOTE Confidence: 0.89520055

00:18:22.385 --> 00:18:23.605 gonna focus on predisease.

NOTE Confidence: 0.9548036

00:18:24.545 --> 00:18:25.425 And I I think that's

NOTE Confidence: 0.9548036

00:18:25.425 --> 00:18:26.465 actually a huge area to

NOTE Confidence: 0.9548036

00:18:26.465 --> 00:18:28.065 fill because we we're gonna

NOTE Confidence: 0.9548036

00:18:28.065 --> 00:18:29.365 monitor these people longitudinally,

NOTE Confidence: 0.99704045

00:18:29.985 --> 00:18:30.725 as well.

NOTE Confidence: 0.9692809

00:18:31.105 --> 00:18:32.305 And so this actually needs

NOTE Confidence: 0.9692809

00:18:32.305 --> 00:18:33.185 to be a a truly

NOTE Confidence: 0.9692809

00:18:33.185 --> 00:18:35.270 global effort for both scientific,

NOTE Confidence: 0.9692809

00:18:35.490 --> 00:18:37.170 so leveraging the variation across

NOTE Confidence: 0.9692809

00:18:37.170 --> 00:18:38.530 the globe, and also for

NOTE Confidence: 0.9692809

00:18:38.530 --> 00:18:39.970 equity reasons. So so far,

NOTE Confidence: 0.9692809

00:18:39.970 --> 00:18:40.530 a lot of the kind

NOTE Confidence: 0.9692809

00:18:40.530 --> 00:18:41.490 of data I mentioned that

NOTE Confidence: 0.9692809

00:18:41.490 --> 00:18:43.490 we're collecting in academia and

NOTE Confidence: 0.9692809

00:18:43.490 --> 00:18:44.450 some companies, they tend to

NOTE Confidence: 0.9692809

00:18:44.450 --> 00:18:45.730 be mostly in the US

NOTE Confidence: 0.9692809

00:18:45.730 --> 00:18:47.010 and in EU. We have

NOTE Confidence: 0.9692809

00:18:47.010 --> 00:18:49.010 actually very little data, dense

NOTE Confidence: 0.9692809

00:18:49.010 --> 00:18:49.510 datasets,

NOTE Confidence: 0.9989056

00:18:49.845 --> 00:18:50.965 in other from other parts

NOTE Confidence: 0.9989056

00:18:50.965 --> 00:18:51.705 of the world.

NOTE Confidence: 0.9820804

00:18:52.005 --> 00:18:53.525 So just briefly, the way

NOTE Confidence: 0.9820804

00:18:53.525 --> 00:18:54.405 we're gonna do this will

NOTE Confidence: 0.9820804

00:18:54.405 --> 00:18:56.085 be we're gonna start with

NOTE Confidence: 0.9820804

00:18:56.085 --> 00:18:57.285 the phase one sort of

NOTE Confidence: 0.9820804

00:18:57.285 --> 00:18:58.405 ten sites or so across

NOTE Confidence: 0.9820804

00:18:58.405 --> 00:18:59.684 the world. We're gonna deploy

NOTE Confidence: 0.9820804

00:18:59.684 --> 00:19:00.405 the state of the art

NOTE Confidence: 0.9820804

00:19:00.405 --> 00:19:02.085 technology to enroll about ten

NOTE Confidence: 0.9820804

00:19:02.085 --> 00:19:03.690 thousand to fifteen thousand people

NOTE Confidence: 0.9820804

00:19:03.850 --> 00:19:04.889 and follow them over time

NOTE Confidence: 0.9820804

00:19:04.889 --> 00:19:05.850 and also give them a

NOTE Confidence: 0.9820804

00:19:05.850 --> 00:19:07.210 vaccine to probe them. And

NOTE Confidence: 0.9820804

00:19:07.210 --> 00:19:08.330 then with that data, we

NOTE Confidence: 0.9820804

00:19:08.330 --> 00:19:09.129 hope to be able to

NOTE Confidence: 0.9820804

00:19:09.129 --> 00:19:09.629 learn

NOTE Confidence: 0.9598474

00:19:09.929 --> 00:19:11.129 sort of a compression scheme,

NOTE Confidence: 0.9598474

00:19:11.129 --> 00:19:12.009 so to speak. Right? How

NOTE Confidence: 0.9598474

00:19:12.009 --> 00:19:13.049 how can we measure all

NOTE Confidence: 0.9598474

00:19:13.049 --> 00:19:13.850 of these ten to the

NOTE Confidence: 0.9598474

00:19:13.850 --> 00:19:15.609 seventh or so parameters, but

NOTE Confidence: 0.9598474

00:19:15.609 --> 00:19:16.649 with maybe a few thousand

NOTE Confidence: 0.9598474

00:19:16.649 --> 00:19:17.149 measurements

NOTE Confidence: 0.98796445

00:19:17.450 --> 00:19:18.730 that can still capture most

NOTE Confidence: 0.98796445

00:19:18.730 --> 00:19:19.470 of the variation

NOTE Confidence: 0.95424557

00:19:19.825 --> 00:19:20.645 in the population.

NOTE Confidence: 0.93869895

00:19:20.945 --> 00:19:21.905 And then we're gonna create

NOTE Confidence: 0.93869895

00:19:21.905 --> 00:19:23.585 this new monitoring kit that

NOTE Confidence: 0.93869895

00:19:23.585 --> 00:19:24.945 will be cheaper and and

NOTE Confidence: 0.93869895

00:19:24.945 --> 00:19:26.165 and simpler to deploy

NOTE Confidence: 0.9901788

00:19:26.545 --> 00:19:27.525 across the whole,

NOTE Confidence: 0.99875504

00:19:27.825 --> 00:19:29.185 many more sites to to

NOTE Confidence: 0.99875504

00:19:29.185 --> 00:19:30.225 scale up the number of

NOTE Confidence: 0.99875504

00:19:30.225 --> 00:19:31.445 people we can look at.

NOTE Confidence: 0.9046515

00:19:31.825 --> 00:19:33.105 So the goal right now,

NOTE Confidence: 0.9046515

00:19:33.105 --> 00:19:34.305 it it's it's it's really

NOTE Confidence: 0.9046515

00:19:34.305 --> 00:19:35.285 the the scaling

NOTE Confidence: 0.96619415

00:19:35.659 --> 00:19:37.020 down. It's really important because,

NOTE Confidence: 0.96619415

00:19:37.020 --> 00:19:38.460 otherwise, this is still a

NOTE Confidence: 0.96619415

00:19:38.460 --> 00:19:40.059 very, very expensive project. So

NOTE Confidence: 0.96619415

00:19:40.059 --> 00:19:40.779 based on the data we

NOTE Confidence: 0.96619415

00:19:40.779 --> 00:19:41.679 have so far,

NOTE Confidence: 0.9774423

00:19:42.299 --> 00:19:43.340 based on our and other

NOTE Confidence: 0.9774423

00:19:43.340 --> 00:19:43.840 studies,

NOTE Confidence: 0.9648536

00:19:44.140 --> 00:19:44.940 we think this kind of

NOTE Confidence: 0.9648536

00:19:44.940 --> 00:19:46.080 compression is possible.

NOTE Confidence: 0.97496265

00:19:46.619 --> 00:19:48.234 So this is just showing

NOTE Confidence: 0.97496265

00:19:48.234 --> 00:19:48.955 you that some of the

NOTE Confidence: 0.97496265

00:19:48.955 --> 00:19:51.054 sites, that that's under discussion,

NOTE Confidence: 0.9843391

00:19:51.674 --> 00:19:52.635 and and we hope to

NOTE Confidence: 0.9843391

00:19:52.635 --> 00:19:54.255 launch one, here at Yale,

NOTE Confidence: 0.99005485

00:19:54.635 --> 00:19:55.835 to to coordinate and to

NOTE Confidence: 0.99005485

00:19:55.835 --> 00:19:56.715 build this kind of site

NOTE Confidence: 0.99005485

00:19:56.715 --> 00:19:57.934 model that can be replicable

NOTE Confidence: 0.99954367

00:19:58.234 --> 00:19:59.215 across the world.

NOTE Confidence: 0.9187836

00:19:59.910 --> 00:20:00.950 The other pillar I wanna

NOTE Confidence: 0.9187836

00:20:00.950 --> 00:20:02.230 quickly highlight is cells as

NOTE Confidence: 0.9187836

00:20:02.230 --> 00:20:03.590 tools and which it's the

NOTE Confidence: 0.9187836

00:20:03.590 --> 00:20:05.270 Chan Zuckerberg Biohub's goal. It's

NOTE Confidence: 0.9187836

00:20:05.270 --> 00:20:06.470 the harness immune cells as

NOTE Confidence: 0.9187836

00:20:06.470 --> 00:20:08.390 natural and engineer sensors and

NOTE Confidence: 0.9187836

00:20:08.390 --> 00:20:08.890 modulators.

NOTE Confidence: 0.9921371

00:20:09.590 --> 00:20:10.330 We wanna

NOTE Confidence: 0.9630179

00:20:10.790 --> 00:20:12.390 take these cells eventually for

NOTE Confidence: 0.9630179

00:20:12.390 --> 00:20:14.410 early disease detection and prevention,

NOTE Confidence: 0.9630179

00:20:14.695 --> 00:20:16.615 sort of motivated by the

NOTE Confidence: 0.9630179

00:20:16.615 --> 00:20:18.535 immune health metric sensing I

NOTE Confidence: 0.9630179

00:20:18.535 --> 00:20:19.734 mentioned earlier. Right? So you

NOTE Confidence: 0.9630179

00:20:19.734 --> 00:20:21.095 can see that clinically healthy

NOTE Confidence: 0.9630179

00:20:21.095 --> 00:20:22.315 people, they have underlying

NOTE Confidence: 0.9739534

00:20:22.855 --> 00:20:24.455 potential pathologies that we can

NOTE Confidence: 0.9739534

00:20:24.455 --> 00:20:25.515 we can we can detect.

NOTE Confidence: 0.9739534

00:20:25.734 --> 00:20:26.695 So one of the ways

NOTE Confidence: 0.9739534

00:20:26.695 --> 00:20:27.915 it's it's you can actually

NOTE Confidence: 0.9852012

00:20:28.530 --> 00:20:30.050 engineer cells. You can sort

NOTE Confidence: 0.9852012

00:20:30.050 --> 00:20:31.170 of, like, guide them into

NOTE Confidence: 0.9852012

00:20:31.170 --> 00:20:32.070 specific locations

NOTE Confidence: 0.9655024

00:20:32.450 --> 00:20:33.970 and express certain sensors, and

NOTE Confidence: 0.9655024

00:20:33.970 --> 00:20:35.090 they can they can sort

NOTE Confidence: 0.9655024

00:20:35.090 --> 00:20:36.550 of collect data on tissues.

NOTE Confidence: 0.9655024

00:20:36.609 --> 00:20:37.330 And that would be a

NOTE Confidence: 0.9655024

00:20:37.330 --> 00:20:38.609 dream in in also from

NOTE Confidence: 0.9655024

00:20:38.609 --> 00:20:40.290 the basic science standpoint. Imagine

NOTE Confidence: 0.9655024

00:20:40.290 --> 00:20:41.744 you actually got tools now

NOTE Confidence: 0.9655024

00:20:41.744 --> 00:20:42.625 that you can go into

NOTE Confidence: 0.9655024

00:20:42.625 --> 00:20:44.165 the tissues without invasiveness

NOTE Confidence: 0.98495144

00:20:44.545 --> 00:20:45.425 and be able to collect

NOTE Confidence: 0.98495144

00:20:45.425 --> 00:20:46.325 data, basically.

NOTE Confidence: 0.9622439

00:20:47.025 --> 00:20:47.525 So,

NOTE Confidence: 0.9586029

00:20:48.305 --> 00:20:49.585 yeah. So this was also

NOTE Confidence: 0.9586029

00:20:49.585 --> 00:20:50.625 reminds me of the magic

NOTE Confidence: 0.9586029

00:20:50.625 --> 00:20:51.505 school bus in in case

NOTE Confidence: 0.9586029

00:20:51.505 --> 00:20:52.305 some of you have seen

NOTE Confidence: 0.9586029

00:20:52.305 --> 00:20:53.665 that episode. I remember that,

NOTE Confidence: 0.9586029

00:20:53.825 --> 00:20:54.625 when I when I watched

NOTE Confidence: 0.9586029

00:20:54.625 --> 00:20:55.585 it with my son many

NOTE Confidence: 0.9586029

00:20:55.585 --> 00:20:56.244 years ago.

NOTE Confidence: 0.9925587

00:20:56.705 --> 00:20:57.205 So

NOTE Confidence: 0.9645271

00:20:58.009 --> 00:20:59.769 the Biohub, it's it's a

NOTE Confidence: 0.9645271

00:20:59.769 --> 00:21:01.049 sort of a two pronged

NOTE Confidence: 0.9645271

00:21:01.049 --> 00:21:02.570 structure. One is a physical

NOTE Confidence: 0.9645271

00:21:02.570 --> 00:21:03.929 hub. So the main hub

NOTE Confidence: 0.9645271

00:21:03.929 --> 00:21:04.889 is in New York. There

NOTE Confidence: 0.9645271

00:21:04.889 --> 00:21:05.769 will be a component in

NOTE Confidence: 0.9645271

00:21:05.769 --> 00:21:07.210 New Haven. There's also the

NOTE Confidence: 0.9645271

00:21:07.210 --> 00:21:08.649 investigator program that will be

NOTE Confidence: 0.9645271

00:21:08.649 --> 00:21:09.690 spread out through the three

NOTE Confidence: 0.9645271

00:21:09.690 --> 00:21:11.210 universities. So the partners at

NOTE Confidence: 0.9645271

00:21:11.210 --> 00:21:12.990 Yale, Rockefeller, and Columbia.

NOTE Confidence: 0.9856213

00:21:13.475 --> 00:21:14.455 So an investigator,

NOTE Confidence: 0.9758201

00:21:15.155 --> 00:21:16.994 RFA just went out. So,

NOTE Confidence: 0.9758201

00:21:17.234 --> 00:21:19.015 I encourage, you to apply

NOTE Confidence: 0.9758201

00:21:19.075 --> 00:21:19.955 and also go to the

NOTE Confidence: 0.9758201

00:21:19.955 --> 00:21:21.635 webinar. If you have scientific

NOTE Confidence: 0.9758201

00:21:21.635 --> 00:21:23.234 questions, after the webinar, please

NOTE Confidence: 0.9758201

00:21:23.234 --> 00:21:24.215 feel free to contact,

NOTE Confidence: 0.896407

00:21:24.915 --> 00:21:26.615 Alisa and also myself.

NOTE Confidence: 0.9872111

00:21:27.259 --> 00:21:29.359 So and finally, please become

NOTE Confidence: 0.9872111

00:21:29.580 --> 00:21:30.940 look look at our website

NOTE Confidence: 0.9872111

00:21:30.940 --> 00:21:32.299 and consider becoming a member

NOTE Confidence: 0.9872111

00:21:32.299 --> 00:21:33.919 and join our contact list.

NOTE Confidence: 0.976191

00:21:34.460 --> 00:21:35.359 And you can also,

NOTE Confidence: 0.95292795

00:21:35.980 --> 00:21:37.100 check check us out on

NOTE Confidence: 0.95292795

00:21:37.100 --> 00:21:38.700 social media. And, also, you

NOTE Confidence: 0.95292795

00:21:38.700 --> 00:21:39.659 can check out the members

NOTE Confidence: 0.95292795

00:21:39.659 --> 00:21:41.419 and various other, information on

NOTE Confidence: 0.95292795

00:21:41.419 --> 00:21:42.725 the website. And And we

NOTE Confidence: 0.95292795

00:21:42.725 --> 00:21:43.925 have a seminar and Chalk

NOTE Confidence: 0.95292795

00:21:43.925 --> 00:21:45.205 Talk series. And for the

NOTE Confidence: 0.95292795

00:21:45.205 --> 00:21:46.244 past year and a half,

NOTE Confidence: 0.95292795

00:21:46.325 --> 00:21:47.685 we have both outside and

NOTE Confidence: 0.95292795

00:21:47.685 --> 00:21:48.665 internal speakers.

NOTE Confidence: 0.96525985

00:21:49.205 --> 00:21:50.565 It's been quite well attended

NOTE Confidence: 0.96525985

00:21:50.565 --> 00:21:51.845 and a lot of, interesting

NOTE Confidence: 0.96525985

00:21:51.845 --> 00:21:53.205 discussions, especially during the Chalk

NOTE Confidence: 0.96525985

00:21:53.205 --> 00:21:54.405 Talks because we encourage folks

NOTE Confidence: 0.96525985

00:21:54.405 --> 00:21:56.130 to come and interrupt and

NOTE Confidence: 0.96525985

00:21:56.130 --> 00:21:57.570 ask lots of questions, and

NOTE Confidence: 0.96525985

00:21:57.570 --> 00:21:58.450 that can lead to both

NOTE Confidence: 0.96525985

00:21:58.450 --> 00:22:00.230 new collaborations and also new

NOTE Confidence: 0.96525985

00:22:00.369 --> 00:22:00.869 understanding.

NOTE Confidence: 0.9957834

00:22:01.410 --> 00:22:02.470 So with that,

NOTE Confidence: 0.9542336

00:22:03.330 --> 00:22:04.850 yeah, send us any ideas

NOTE Confidence: 0.9542336

00:22:04.850 --> 00:22:05.510 and suggestions.

NOTE Confidence: 0.9974644

00:22:06.050 --> 00:22:07.170 I wanted to sort of

NOTE Confidence: 0.9974644

00:22:07.170 --> 00:22:08.609 end by saying that,

NOTE Confidence: 0.99078816

00:22:09.250 --> 00:22:10.930 CSCI, of course, cannot do

NOTE Confidence: 0.99078816

00:22:10.930 --> 00:22:11.655 what I

NOTE Confidence: 0.7694903

00:22:12.135 --> 00:22:13.115 propose alone.

NOTE Confidence: 0.9621223

00:22:13.415 --> 00:22:15.335 So we are, already actively

NOTE Confidence: 0.9621223

00:22:15.335 --> 00:22:16.695 engaged as you saw with

NOTE Confidence: 0.9621223

00:22:16.695 --> 00:22:18.135 both Yale colleagues and also

NOTE Confidence: 0.9621223

00:22:18.135 --> 00:22:19.734 partners around the world. So

NOTE Confidence: 0.9621223

00:22:19.734 --> 00:22:21.494 today, we're gonna highlight, each

NOTE Confidence: 0.9621223

00:22:21.494 --> 00:22:22.535 one of these pillars with

NOTE Confidence: 0.9621223

00:22:22.535 --> 00:22:23.734 the speak with the invited

NOTE Confidence: 0.9621223

00:22:23.734 --> 00:22:25.575 speakers. So first on pillar

NOTE Confidence: 0.9621223

00:22:25.575 --> 00:22:26.875 one would be, Ling

NOTE Confidence: 0.91218686

00:22:27.200 --> 00:22:28.559 and Steve. They will talk

NOTE Confidence: 0.91218686

00:22:28.559 --> 00:22:28.880 about,

NOTE Confidence: 0.83426833

00:22:29.359 --> 00:22:29.859 human,

NOTE Confidence: 0.9713456

00:22:30.240 --> 00:22:32.160 immunology and variation in response

NOTE Confidence: 0.9713456

00:22:32.160 --> 00:22:33.140 to COVID nineteen,

NOTE Confidence: 0.99442893

00:22:33.520 --> 00:22:35.119 and also vaccine and infection

NOTE Confidence: 0.99442893

00:22:35.119 --> 00:22:36.800 response signatures. In terms of

NOTE Confidence: 0.99442893

00:22:36.800 --> 00:22:37.940 measurement and monitoring,

NOTE Confidence: 0.93237823

00:22:38.400 --> 00:22:39.780 Wei Ka, who's a pioneer,

NOTE Confidence: 0.93237823

00:22:40.000 --> 00:22:41.359 in in in random laser

NOTE Confidence: 0.93237823

00:22:41.359 --> 00:22:43.304 technologies, she's gonna touch on

NOTE Confidence: 0.93237823

00:22:43.304 --> 00:22:44.365 deep tissue imaging.

NOTE Confidence: 0.9934314

00:22:44.984 --> 00:22:46.845 In terms of engineering cells,

NOTE Confidence: 0.9181028

00:22:47.145 --> 00:22:48.664 Wendell Lim is one of

NOTE Confidence: 0.9181028

00:22:48.664 --> 00:22:50.024 the pioneers, in this field,

NOTE Confidence: 0.9181028

00:22:50.024 --> 00:22:51.385 so he's gonna tell us

NOTE Confidence: 0.9181028

00:22:51.385 --> 00:22:52.524 about their efforts.

NOTE Confidence: 0.8402252

00:22:53.304 --> 00:22:55.145 And finally, in in AI

NOTE Confidence: 0.8402252

00:22:55.145 --> 00:22:56.524 and also AI models,

NOTE Confidence: 0.909331

00:22:56.984 --> 00:22:58.200 we're lucky to have, Deep

NOTE Confidence: 0.909331

00:22:58.200 --> 00:22:58.700 Jaitley,

NOTE Confidence: 0.9744442

00:22:59.000 --> 00:23:00.700 who's one of the early,

NOTE Confidence: 0.950531

00:23:01.720 --> 00:23:03.320 pioneers in deep learning on

NOTE Confidence: 0.950531

00:23:03.320 --> 00:23:04.840 generative models as well as

NOTE Confidence: 0.950531

00:23:04.840 --> 00:23:06.280 Maria who just, joined us

NOTE Confidence: 0.950531

00:23:06.280 --> 00:23:07.480 at Yale. She's gonna talk

NOTE Confidence: 0.950531

00:23:07.480 --> 00:23:09.260 about TCR specificity prediction.

NOTE Confidence: 0.999482

00:23:09.640 --> 00:23:10.520 With that, thank you for

NOTE Confidence: 0.999482

00:23:10.520 --> 00:23:11.179 your attention.

NOTE Confidence: 0.98677367

00:23:19.565 --> 00:23:20.385 Any questions?

NOTE Confidence: 0.9874113

00:23:23.325 --> 00:23:24.925 And visit us. And this

NOTE Confidence: 0.9874113

00:23:24.925 --> 00:23:26.065 is also where the CSCI

NOTE Confidence: 0.9874113

00:23:26.125 --> 00:23:26.625 seminar

NOTE Confidence: 0.9737533

00:23:26.925 --> 00:23:27.905 is being held.