WEBVTT

NOTE duration:"00:16:48.0280000"

NOTE language:en-us

NOTE Confidence: 0.906028389930725

00:00:00.000 --> 00:00:02.088 Like to introduce our next Speaker,

NOTE Confidence: 0.906028389930725

00:00:02.090 --> 00:00:03.185 Doctor Julie Womack.

NOTE Confidence: 0.906028389930725

00:00:03.185 --> 00:00:05.010 Doctor Womack is an associate

NOTE Confidence: 0.906028389930725

00:00:05.010 --> 00:00:07.167 professor at the Yale School of

NOTE Confidence: 0.906028389930725

00:00:07.167 --> 00:00:08.877 Nursing and a Health Sciences

NOTE Confidence: 0.906028389930725

00:00:08.877 --> 00:00:10.645 researcher at the West Haven, VA.

NOTE Confidence: 0.906028389930725

00:00:10.645 --> 00:00:13.245 She received her PhD in nursing from Yale

NOTE Confidence: 0.906028389930725

00:00:13.245 --> 00:00:15.455 University and completed at Post Doctoral

NOTE Confidence: 0.906028389930725

00:00:15.455 --> 00:00:17.520 Fellowship in Informatics at the VA.

NOTE Confidence: 0.906028389930725

00:00:17.520 --> 00:00:21.510 Doctor Womack, thank you for being here.

NOTE Confidence: 0.906028389930725

00:00:21.510 --> 00:00:24.750 Thank you and I can everyone hear me.

NOTE Confidence: 0.906028389930725

00:00:24.750 --> 00:00:27.099 I hope, um.

NOTE Confidence: 0.906028389930725

00:00:27.100 --> 00:00:29.417 So I'll be talking with you about

NOTE Confidence: 0.906028389930725

00:00:29.417 --> 00:00:31.459 the work that colleagues of mine

NOTE Confidence: 0.906028389930725

00:00:31.459 --> 00:00:34.275 and I are doing to adapt in LP

NOTE Confidence: 0.906028389930725

00:00:34.275 --> 00:00:36.163 pipeline machine learning algorithm

NOTE Confidence: 0.906028389930725

00:00:36.163 --> 00:00:39.960 to identify systems of coded 90.

NOTE Confidence: 0.906028389930725

00:00:39.960 --> 00:00:42.370 Next Symptoms are of crucial

NOTE Confidence: 0.906028389930725

00:00:42.370 --> 00:00:43.816 importance to patients.

NOTE Confidence: 0.906028389930725

00:00:43.820 --> 00:00:45.805 They are how an individual

NOTE Confidence: 0.906028389930725

00:00:45.805 --> 00:00:46.996 experiences their illness.

NOTE Confidence: 0.906028389930725

00:00:47.000 --> 00:00:49.556 For providers and symptoms are markers

NOTE Confidence: 0.906028389930725

00:00:49.556 --> 00:00:52.729 that can help to identify disease or

NOTE Confidence: 0.906028389930725

00:00:52.729 --> 00:00:55.513 to develop a list of differential.

NOTE Confidence: 0.906028389930725

00:00:55.520 --> 00:00:57.670 Recognition of symptoms has been

NOTE Confidence: 0.906028389930725

00:00:57.670 --> 00:01:00.090 an important component of coded 19.

NOTE Confidence: 0.906028389930725

00:01:00.090 --> 00:01:02.045 The symptoms consider this markers

NOTE Confidence: 0.906028389930725

00:01:02.045 --> 00:01:04.650 of the disease has changed overtime.

NOTE Confidence: 0.906028389930725

00:01:04.650 --> 00:01:06.310 Initially it was fever,

NOTE Confidence: 0.906028389930725

00:01:06.310 --> 00:01:08.385 cough and shortness of breath.

NOTE Confidence: 0.906028389930725

00:01:08.390 --> 00:01:10.460 These are still considered to

NOTE Confidence: 0.906028389930725

00:01:10.460 --> 00:01:12.116 be the primary symptoms,

NOTE Confidence: 0.906028389930725

00:01:12.120 --> 00:01:14.703 but this list has expanded to include

NOTE Confidence: 0.906028389930725

00:01:14.703 --> 00:01:17.099 others such as nasal congestion,

NOTE Confidence: 0.906028389930725

00:01:17.100 --> 00:01:18.760 sore throat, and osmia.

NOTE Confidence: 0.906028389930725

00:01:18.760 --> 00:01:20.835 Like you see a headache,

NOTE Confidence: 0.906028389930725

00:01:20.840 --> 00:01:22.500 dizziness, fatigue, muscle aches,

NOTE Confidence: 0.906028389930725

00:01:22.500 --> 00:01:24.160 chills and GI symptoms,

NOTE Confidence: 0.906028389930725

00:01:24.160 --> 00:01:26.260 including nausea, loss of appetite.

NOTE Confidence: 0.906028389930725

00:01:26.260 --> 00:01:30.130 Vomiting and diarrhea next week.

NOTE Confidence: 0.906028389930725

00:01:30.130 --> 00:01:32.506 In both Farzin Murs symptom based

NOTE Confidence: 0.906028389930725

00:01:32.506 --> 00:01:34.540 case detection and subsequent testing

NOTE Confidence: 0.906028389930725

00:01:34.540 --> 00:01:36.455 to guide isolation and Quarantine

NOTE Confidence: 0.906028389930725

00:01:36.455 --> 00:01:38.926 with keys and there was minimum

NOTE Confidence: 0.906028389930725

00:01:38.926 --> 00:01:41.096 evidence that asymptomatic cases were

NOTE Confidence: 0.906028389930725

00:01:41.096 --> 00:01:42.796 important routes of transmission.

NOTE Confidence: 0.906028389930725

00:01:42.796 --> 00:01:44.776 With COVID-19 there was potentially

NOTE Confidence: 0.906028389930725

00:01:44.776 --> 00:01:46.799 a sizable percentage of cases

NOTE Confidence: 0.906028389930725

00:01:46.799 --> 00:01:47.939 that are asymptomatic,

NOTE Confidence: 0.906028389930725

00:01:47.940 --> 00:01:50.327 and these have been shown to be

NOTE Confidence: 0.906028389930725

00:01:50.327 --> 00:01:52.670 important players in viral transmission.

NOTE Confidence: 0.906028389930725

00:01:52.670 --> 00:01:55.136 So symptoms alone are insufficient to

NOTE Confidence: 0.906028389930725

00:01:55.136 --> 00:01:58.090 identify cases of Coke in 19 or even

NOTE Confidence: 0.906028389930725

00:01:58.090 --> 00:02:00.840 to identify those who should be tested next.

NOTE Confidence: 0.906028389930725

00:02:00.840 --> 00:02:01.287 Furthermore,

NOTE Confidence: 0.906028389930725

00:02:01.287 --> 00:02:03.969 most of the symptoms experience with

NOTE Confidence: 0.906028389930725

00:02:03.969 --> 00:02:06.810 COVID-19 are not unique to code at 19,

NOTE Confidence: 0.906028389930725

00:02:06.810 --> 00:02:09.596 but rather are shared by respiratory viruses,

NOTE Confidence: 0.906028389930725

00:02:09.600 --> 00:02:10.788 other respiratory viruses

NOTE Confidence: 0.906028389930725

00:02:10.788 --> 00:02:11.976 and health conditions.

NOTE Confidence: 0.906028389930725

00:02:11.980 --> 00:02:14.908 Here's a graph of coded 19 testing within

NOTE Confidence: 0.906028389930725

00:02:14.908 --> 00:02:18.080 the VA Connecticut health care system.

NOTE Confidence: 0.906028389930725

00:02:18.080 --> 00:02:20.588 There the number of test is

NOTE Confidence: 0.906028389930725

00:02:20.588 --> 00:02:22.780 noted on the vertical axis.

NOTE Confidence: 0.906028389930725

00:02:22.780 --> 00:02:24.910 Dates are on the horizontal,

NOTE Confidence: 0.906028389930725

00:02:24.910 --> 00:02:26.618 the Green Line represents

NOTE Confidence: 0.906028389930725

00:02:26.618 --> 00:02:27.899 negative COVID-19 tests.

NOTE Confidence: 0.906028389930725

00:02:27.900 --> 00:02:30.318 The red line is positive tests

NOTE Confidence: 0.906028389930725

00:02:30.318 --> 00:02:31.930 and the baseline represents

NOTE Confidence: 0.906028389930725

00:02:32.003 --> 00:02:33.879 those with pending results.

NOTE Confidence: 0.906028389930725

00:02:33.880 --> 00:02:38.150 So out of the 1600s has done through May 7th,

NOTE Confidence: 0.906028389930725

00:02:38.150 --> 00:02:40.280 214 or 12% were positive.

NOTE Confidence: 0.906028389930725

00:02:40.280 --> 00:02:41.152 For COVID-19,

NOTE Confidence: 0.906028389930725

00:02:41.152 --> 00:02:43.768 these results suggest that the majority

NOTE Confidence: 0.906028389930725

00:02:43.768 --> 00:02:46.260 of those with symptoms may not,

NOTE Confidence: 0.906028389930725

00:02:46.260 --> 00:02:48.816 in fact have coded 19 next.

NOTE Confidence: 0.911584436893463

00:02:51.700 --> 00:02:54.016 But despite the limitations to using

NOTE Confidence: 0.911584436893463

00:02:54.016 --> 00:02:56.712 symptoms to diagnose so bad 19 or to

NOTE Confidence: 0.911584436893463

00:02:56.712 --> 00:02:58.816 identify those who need to be tested

NOTE Confidence: 0.911584436893463

00:02:58.816 --> 00:03:01.288 in Corentine symptoms are still an

NOTE Confidence: 0.911584436893463

00:03:01.288 --> 00:03:03.210 important component of the pandemic.

NOTE Confidence: 0.911584436893463

00:03:03.210 --> 00:03:05.590 I work with a number of investigators

NOTE Confidence: 0.911584436893463

00:03:05.590 --> 00:03:08.117 who are interested in using VA electronic

NOTE Confidence: 0.911584436893463

00:03:08.117 --> 00:03:10.727 health record or HR data to study

NOTE Confidence: 0.911584436893463

00:03:10.727 --> 00:03:12.995 different aspects of symptoms encoded 19.

NOTE Confidence: 0.911584436893463

00:03:13.000 --> 00:03:15.400 The first step for all of these projects

NOTE Confidence: 0.911584436893463

00:03:15.400 --> 00:03:18.191 is to develop a reliable approach for

NOTE Confidence: 0.911584436893463

00:03:18.191 --> 00:03:20.580 identifying these symptoms in the HR,

NOTE Confidence: 0.911584436893463

00:03:20.580 --> 00:03:22.746 a number of possible approaches exists.

NOTE Confidence: 0.911584436893463

00:03:22.750 --> 00:03:25.480 These include looking at. Problem with.

NOTE Confidence: 0.911584436893463

00:03:25.480 --> 00:03:28.305 ICD codes and inferring symptoms

NOTE Confidence: 0.911584436893463

00:03:28.305 --> 00:03:30.322 from prescription data. However,

NOTE Confidence: 0.911584436893463

00:03:30.322 --> 00:03:31.932 all of these approaches underestimate

NOTE Confidence: 0.911584436893463

00:03:31.932 --> 00:03:33.860 the number and type of symptoms.

NOTE Confidence: 0.911584436893463

00:03:33.860 --> 00:03:35.724 Discuss that a visit.

NOTE Confidence: 0.911584436893463

00:03:35.724 --> 00:03:37.588 Most documentation of symptoms

NOTE Confidence: 0.911584436893463

00:03:37.588 --> 00:03:39.839 takes place in clinical note.

NOTE Confidence: 0.911584436893463

00:03:39.840 --> 00:03:41.976 These documented symptoms can be extracted

NOTE Confidence: 0.911584436893463

00:03:41.976 --> 00:03:44.420 from text notes using natural language

NOTE Confidence: 0.911584436893463

00:03:44.420 --> 00:03:46.810 processing and machine learning algorithms,

NOTE Confidence: 0.911584436893463

00:03:46.810 --> 00:03:49.270 and then converted into structured data.

NOTE Confidence: 0.911584436893463

00:03:49.270 --> 00:03:52.780 For the purposes of analysis.

NOTE Confidence: 0.911584436893463

00:03:52.780 --> 00:03:55.093 So today I'm gonna talk a bit about the

NOTE Confidence: 0.911584436893463

00:03:55.093 --> 00:03:57.234 symptom extractor pipeline that we will

NOTE Confidence: 0.911584436893463

00:03:57.234 --> 00:03:59.450 adapt to identify COVID-19 symptoms in VA.

NOTE Confidence: 0.911584436893463

00:03:59.450 --> 00:03:59.982 Clinical note,

NOTE Confidence: 0.911584436893463

00:03:59.982 --> 00:04:02.110 I'm going to talk a bit about what

NOTE Confidence: 0.911584436893463

00:04:02.169 --> 00:04:04.287 that adaptation process will look like,

NOTE Confidence: 0.911584436893463

00:04:04.290 --> 00:04:07.006 and then I'm going to briefly describe

NOTE Confidence: 0.911584436893463

00:04:07.006 --> 00:04:09.736 projects that will build on it work next.

NOTE Confidence: 0.911584436893463

00:04:09.740 --> 00:04:11.972 The symptom extractor pipeline that we

NOTE Confidence: 0.911584436893463

00:04:11.972 --> 00:04:14.221 will use with originally developed by

NOTE Confidence: 0.911584436893463

00:04:14.221 --> 00:04:16.657 Guide Devita and colleagues from the VA,

NOTE Confidence: 0.911584436893463

00:04:16.660 --> 00:04:19.420 Salt Lake City health care system.

NOTE Confidence: 0.911584436893463

00:04:19.420 --> 00:04:23.123 Next It is a uema natural language

NOTE Confidence: 0.911584436893463

00:04:23.123 --> 00:04:26.015 processing pipeline that was assembled

NOTE Confidence: 0.911584436893463

00:04:26.015 --> 00:04:29.030 using B3 LP framework components.

NOTE Confidence: 0.911584436893463

00:04:29.030 --> 00:04:30.620 Both arena and be free.

NOTE Confidence: 0.911584436893463

00:04:30.620 --> 00:04:32.860 An LTR open source software.

NOTE Confidence: 0.911584436893463

00:04:32.860 --> 00:04:35.506 You we met short for unstructured

NOTE Confidence: 0.911584436893463

00:04:35.506 --> 00:04:37.270 information management architecture is

NOTE Confidence: 0.911584436893463

00:04:37.337 --> 00:04:39.785 an Oasis standard for content analytics.

NOTE Confidence: 0.911584436893463

00:04:39.790 --> 00:04:41.422 Originally developed at IBM.

NOTE Confidence: 0.911584436893463

00:04:41.422 --> 00:04:44.976 The VPN LP framework is a set of

NOTE Confidence: 0.911584436893463

00:04:44.976 --> 00:04:47.032 functionality zan components that

NOTE Confidence: 0.911584436893463

00:04:47.032 --> 00:04:49.693 provide Java developers the ability

NOTE Confidence: 0.911584436893463

00:04:49.693 --> 00:04:51.809 to create novel annotators,

NOTE Confidence: 0.911584436893463

00:04:51.810 --> 00:04:53.638 place annotators into pipelines,

NOTE Confidence: 0.911584436893463

00:04:53.638 --> 00:04:55.923 and include applications to extract

NOTE Confidence: 0.911584436893463

00:04:55.923 --> 00:04:57.570 concepts from clinical text.

NOTE Confidence: 0.911584436893463

00:04:57.570 --> 00:05:00.769 These are scale up and scale out

NOTE Confidence: 0.911584436893463

00:05:00.769 --> 00:05:02.705 functionality's developed with the

NOTE Confidence: 0.911584436893463

00:05:02.705 --> 00:05:04.669 expressed purpose of processing

NOTE Confidence: 0.911584436893463

00:05:04.669 --> 00:05:06.633 large numbers of records.

NOTE Confidence: 0.911584436893463

00:05:06.640 --> 00:05:08.595 Machine learning annotator was added

NOTE Confidence: 0.911584436893463

00:05:08.595 --> 00:05:11.933 at the tail end of the LP pipeline

NOTE Confidence: 0.911584436893463

00:05:11.933 --> 00:05:14.103 to enhance the pipeline's ability

NOTE Confidence: 0.911584436893463

00:05:14.103 --> 00:05:16.259 to identify through symptoms.

NOTE Confidence: 0.911584436893463

00:05:16.260 --> 00:05:18.115 This figure depicts the components

NOTE Confidence: 0.911584436893463

00:05:18.115 --> 00:05:19.970 of the Simpson extractor pipeline.

NOTE Confidence: 0.911584436893463

00:05:19.970 --> 00:05:22.196 As is typical of Uema Pipeline,

NOTE Confidence: 0.911584436893463

00:05:22.200 --> 00:05:25.256 this one is composed of a series of

NOTE Confidence: 0.911584436893463

00:05:25.256 --> 00:05:27.475 annotators where the output of one

NOTE Confidence: 0.911584436893463

00:05:27.475 --> 00:05:29.990 becomes the input of the next next.

NOTE Confidence: 0.892124772071838

00:05:32.190 --> 00:05:35.350 Annotators at the front end of the pipeline

NOTE Confidence: 0.892124772071838

00:05:35.350 --> 00:05:37.778 decompose text into document elements.

NOTE Confidence: 0.892124772071838

00:05:37.780 --> 00:05:40.360 The Specializer breaks the notes into

NOTE Confidence: 0.892124772071838

00:05:40.360 --> 00:05:42.510 sections, so she complaints history

NOTE Confidence: 0.892124772071838

00:05:42.510 --> 00:05:44.618 past medical history, medications, etc.

NOTE Confidence: 0.892124772071838

00:05:44.618 --> 00:05:47.072 Tokenizer then breaks up the notes

NOTE Confidence: 0.892124772071838

00:05:47.072 --> 00:05:49.640 further into component parts, including

NOTE Confidence: 0.892124772071838

00:05:49.640 --> 00:05:53.720 for example sentences or phrases next.

NOTE Confidence: 0.892124772071838

00:05:53.720 --> 00:05:56.597 The next part of the pipeline identified

NOTE Confidence: 0.892124772071838

00:05:56.597 --> 00:05:58.678 templated components of the notes

NOTE Confidence: 0.892124772071838

00:05:58.678 --> 00:06:00.633 that require an assertion logic

NOTE Confidence: 0.892124772071838

00:06:00.633 --> 00:06:03.099 different from that used in plain text.

NOTE Confidence: 0.892124772071838

00:06:03.100 --> 00:06:03.890 Note thanks.

NOTE Confidence: 0.925889611244202

00:06:06.780 --> 00:06:08.810 So we're all familiar with

NOTE Confidence: 0.925889611244202

00:06:08.810 --> 00:06:10.434 the straightforward soap note

NOTE Confidence: 0.925889611244202

00:06:10.434 --> 00:06:12.288 documentation as shown in this sample,

NOTE Confidence: 0.925889611244202

00:06:12.290 --> 00:06:14.090 so the subjective and object

NOTE Confidence: 0.925889611244202

00:06:14.090 --> 00:06:16.320 information from the patient is noted,

NOTE Confidence: 0.925889611244202

00:06:16.320 --> 00:06:18.889 and then assessments in plans are made.

NOTE Confidence: 0.925889611244202

00:06:18.890 --> 00:06:20.725 The symptom statements here are

NOTE Confidence: 0.925889611244202

00:06:20.725 --> 00:06:21.826 fairly straightforward positive.

NOTE Confidence: 0.925889611244202

00:06:21.830 --> 00:06:24.026 For shortness of breath and negative

NOTE Confidence: 0.925889611244202

00:06:24.026 --> 00:06:27.888 for pain, chest pain, and palpitation.

NOTE Confidence: 0.925889611244202

00:06:27.888 --> 00:06:30.914 Next Check boxes are one form that

NOTE Confidence: 0.925889611244202

00:06:30.914 --> 00:06:33.050 templated text can take obvious.

NOTE Confidence: 0.925889611244202

00:06:33.050 --> 00:06:35.438 Obviously this is not natural language,

NOTE Confidence: 0.925889611244202

00:06:35.440 --> 00:06:38.450 so the logic used to identify symptoms

NOTE Confidence: 0.925889611244202

00:06:38.450 --> 00:06:41.169 here must be very different from

NOTE Confidence: 0.925889611244202

00:06:41.169 --> 00:06:44.298 that used for a simple soap note.

NOTE Confidence: 0.925889611244202

00:06:44.300 --> 00:06:45.870 Here, the condition of interest

NOTE Confidence: 0.925889611244202

00:06:45.870 --> 00:06:48.368 is only true if there is a check

NOTE Confidence: 0.925889611244202

00:06:48.368 --> 00:06:50.102 next to the concept of inference.

NOTE Confidence: 0.925889611244202

00:06:50.110 --> 00:06:51.028 So for example,

NOTE Confidence: 0.925889611244202

00:06:51.028 --> 00:06:53.170 in the first section homeless is mentioned,

NOTE Confidence: 0.925889611244202

00:06:53.170 --> 00:06:55.432 but the computer needs to recognize

NOTE Confidence: 0.925889611244202

00:06:55.432 --> 00:06:57.910 that the individual is only homeless if

NOTE Confidence: 0.925889611244202

00:06:57.910 --> 00:07:00.660 there is a check mark next to that box.

NOTE Confidence: 0.925889611244202

00:07:00.660 --> 00:07:01.650 Next

NOTE Confidence: 0.924455165863037

00:07:03.720 --> 00:07:06.478 For slots and values there is a

NOTE Confidence: 0.924455165863037

00:07:06.478 --> 00:07:08.455 templated request. For information here.

NOTE Confidence: 0.924455165863037

00:07:08.455 --> 00:07:10.430 Information requested include percent service

NOTE Confidence: 0.924455165863037

00:07:10.430 --> 00:07:11.989 connected disability and individuals,

NOTE Confidence: 0.924455165863037

00:07:11.990 --> 00:07:13.172 religion, marital status,

NOTE Confidence: 0.924455165863037

00:07:13.172 --> 00:07:15.142 living situation, etc. Responses need

NOTE Confidence: 0.924455165863037

00:07:15.142 --> 00:07:17.900 to be placed next to the request.

NOTE Confidence: 0.924455165863037

00:07:17.900 --> 00:07:20.270 So for example, in line G,

NOTE Confidence: 0.924455165863037

00:07:20.270 --> 00:07:22.240 much is in the checkboxes.

NOTE Confidence: 0.924455165863037

00:07:22.240 --> 00:07:24.830 The computer needs to recognize

NOTE Confidence: 0.924455165863037

00:07:24.830 --> 00:07:27.420 that the individual has children

NOTE Confidence: 0.924455165863037

00:07:27.506 --> 00:07:30.098 only if a non 0 number is placed

NOTE Confidence: 0.924455165863037

00:07:30.098 --> 00:07:32.608 next to the slot for children.

NOTE Confidence: 0.924455165863037

00:07:32.610 --> 00:07:33.936 Next So again,

NOTE Confidence: 0.924455165863037

00:07:33.936 --> 00:07:36.588 this part of the pipeline identifies

NOTE Confidence: 0.924455165863037

00:07:36.588 --> 00:07:38.619 templated note sections and flag

NOTE Confidence: 0.924455165863037

00:07:38.619 --> 00:07:41.409 them so that the computer can use

NOTE Confidence: 0.924455165863037

00:07:41.409 --> 00:07:43.659 the appropriate logic to identify

NOTE Confidence: 0.924455165863037

00:07:43.659 --> 00:07:45.955 the presence of symptoms next.

NOTE Confidence: 0.924455165863037

00:07:45.955 --> 00:07:48.430 The term identification annotator is

NOTE Confidence: 0.924455165863037

00:07:48.430 --> 00:07:51.968 the dictionary look up portion of the

NOTE Confidence: 0.924455165863037

00:07:51.968 --> 00:07:54.914 pipeline and Dictionary of 92,000 concepts,

NOTE Confidence: 0.924455165863037

00:07:54.920 --> 00:07:57.938 or 100 and 22,000 symptom forms

NOTE Confidence: 0.924455165863037

00:07:57.938 --> 00:08:00.538 was created from unified medical

NOTE Confidence: 0.924455165863037

00:08:00.538 --> 00:08:03.996 language system or you M LS sources.

NOTE Confidence: 0.924455165863037

00:08:04.000 --> 00:08:06.538 Terms within this resource are tagged

NOTE Confidence: 0.924455165863037

00:08:06.538 --> 00:08:09.361 with a symptom category along with a

NOTE Confidence: 0.924455165863037

00:08:09.361 --> 00:08:11.832 set of 15 organ system sub categories.

NOTE Confidence: 0.924455165863037

00:08:11.840 --> 00:08:13.915 A Dictionary of idiosyncratic symptom

NOTE Confidence: 0.924455165863037

00:08:13.915 --> 00:08:16.764 phrases and symptoms not covered by the

NOTE Confidence: 0.924455165863037

00:08:16.764 --> 00:08:18.900 symptom dictionary is also employed next.

NOTE Confidence: 0.917411506175995

00:08:21.000 --> 00:08:23.275 In annotator was created specifically

NOTE Confidence: 0.917411506175995

00:08:23.275 --> 00:08:26.049 to identify potential symptoms by rules

NOTE Confidence: 0.917411506175995

00:08:26.049 --> 00:08:28.224 and patterns formed from annotations

NOTE Confidence: 0.917411506175995

00:08:28.224 --> 00:08:30.890 created by the dictionary look up

NOTE Confidence: 0.917411506175995

00:08:30.890 --> 00:08:32.598 and document decomposition next.

NOTE Confidence: 0.891623020172119

00:08:34.730 --> 00:08:36.405 The context assertion annotator was

NOTE Confidence: 0.891623020172119

00:08:36.405 --> 00:08:37.745 included to identifying negation,

NOTE Confidence: 0.891623020172119

00:08:37.750 --> 00:08:39.090 so patient denies pain.

NOTE Confidence: 0.891623020172119

00:08:39.090 --> 00:08:40.430 It identifies the subject.

NOTE Confidence: 0.891623020172119

00:08:40.430 --> 00:08:42.593 So is it the patient who reports

NOTE Confidence: 0.891623020172119

00:08:42.593 --> 00:08:44.449 the symptom or someone else?

NOTE Confidence: 0.891623020172119

00:08:44.450 --> 00:08:46.470 For example, in the family

NOTE Confidence: 0.891623020172119

00:08:46.470 --> 00:08:48.490 history section of the note.

NOTE Confidence: 0.891623020172119

00:08:48.490 --> 00:08:49.780 It identifies hypotheticals.

NOTE Confidence: 0.891623020172119

00:08:49.780 --> 00:08:50.640 For example,

NOTE Confidence: 0.891623020172119

00:08:50.640 --> 00:08:52.790 many medications are prescribed PRN,

NOTE Confidence: 0.891623020172119

00:08:52.790 --> 00:08:56.110 PRN pain, or PRN dizziness.

NOTE Confidence: 0.891623020172119

00:08:56.110 --> 00:08:57.946 It also identifies whether or not

NOTE Confidence: 0.891623020172119

00:08:57.946 --> 00:08:59.440 the symptom is occurring now,

NOTE Confidence: 0.891623020172119

00:08:59.440 --> 00:09:00.960 or if it is historical.

NOTE Confidence: 0.891623020172119

00:09:00.960 --> 00:09:03.074 So something that occurred in the past,

NOTE Confidence: 0.891623020172119

00:09:03.080 --> 00:09:04.616 so a note could say something

NOTE Confidence: 0.891623020172119

00:09:04.616 --> 00:09:06.019 like six weeks ago patient

NOTE Confidence: 0.891623020172119

00:09:06.019 --> 00:09:07.939 reported o'clock if we were only

NOTE Confidence: 0.891623020172119

00:09:07.939 --> 00:09:09.440 looking for current symptoms,

NOTE Confidence: 0.891623020172119

00:09:09.440 --> 00:09:11.150 the computer would need to

NOTE Confidence: 0.891623020172119

00:09:11.150 --> 00:09:12.860 recognize that this cough is

NOTE Confidence: 0.891623020172119

00:09:12.932 --> 00:09:14.798 not current and should not be

NOTE Confidence: 0.891623020172119

00:09:14.798 --> 00:09:16.860 flagged as a symptom of interest.

NOTE Confidence: 0.891623020172119

00:09:16.860 --> 00:09:17.300 Next

NOTE Confidence: 0.91840136051178

00:09:19.970 --> 00:09:22.610 Initially, the dictionary and rule based

NOTE Confidence: 0.91840136051178

00:09:22.610 --> 00:09:24.370 mechanisms produced approximately 9

NOTE Confidence: 0.91840136051178

00:09:24.435 --> 00:09:26.577 false sense dimensions for each tree.

NOTE Confidence: 0.91840136051178

00:09:26.580 --> 00:09:27.532 Symptom identified.

NOTE Confidence: 0.91840136051178

00:09:27.532 --> 00:09:29.912 An additional mechanism was needed

NOTE Confidence: 0.91840136051178

00:09:29.912 --> 00:09:32.728 to filter down the false positive.

NOTE Confidence: 0.91840136051178

00:09:32.730 --> 00:09:35.328 Tail end annotator that employs the

NOTE Confidence: 0.91840136051178

00:09:35.328 --> 00:09:37.999 machine learning model trains on 65

NOTE Confidence: 0.91840136051178

00:09:37.999 --> 00:09:40.164 features gleaned from the upstream

NOTE Confidence: 0.91840136051178

00:09:40.164 --> 00:09:42.670 annotators was developed for this purpose.

NOTE Confidence: 0.91840136051178

00:09:42.670 --> 00:09:45.568 This model uses support vector machine

NOTE Confidence: 0.91840136051178

00:09:45.568 --> 00:09:48.085 coupled with stochastic gradient descent

NOTE Confidence: 0.91840136051178

00:09:48.085 --> 00:09:50.635 as the classification algorithm next.

NOTE Confidence: 0.91840136051178

00:09:50.640 --> 00:09:52.244 The original performance metrics

NOTE Confidence: 0.91840136051178

00:09:52.244 --> 00:09:54.650 for the model were fairly good,

NOTE Confidence: 0.91840136051178

00:09:54.650 --> 00:09:57.338 so precision or positive convicted value

NOTE Confidence: 0.91840136051178

00:09:57.338 --> 00:10:00.421 with 0.8 recall or sensitivity with 0.7

NOTE Confidence: 0.91840136051178

00:10:00.421 --> 00:10:03.470 and the F measure was zero point 8.

NOTE Confidence: 0.91840136051178

00:10:03.470 --> 00:10:08.194 Next So our goal in this initial

NOTE Confidence: 0.91840136051178

00:10:08.194 --> 00:10:10.878 project is to adapt this symptom

NOTE Confidence: 0.91840136051178

00:10:10.878 --> 00:10:13.743 extraction pipeline to identify COVID-19

NOTE Confidence: 0.91840136051178

00:10:13.743 --> 00:10:16.708 symptoms in patients over time next.

NOTE Confidence: 0.91840136051178

00:10:16.710 --> 00:10:18.785 Our sample will include veterans

NOTE Confidence: 0.91840136051178

00:10:18.785 --> 00:10:21.410 from two well established VA cohort.

NOTE Confidence: 0.91840136051178

00:10:21.410 --> 00:10:23.440 The women veterans cohort or

NOTE Confidence: 0.91840136051178

00:10:23.440 --> 00:10:26.100 Windex and the VA birth cohort.

NOTE Confidence: 0.91840136051178

00:10:26.100 --> 00:10:29.286 We will include individual to tested

NOTE Confidence: 0.91840136051178

00:10:29.286 --> 00:10:32.705 positive for COVID-19 and we will include

NOTE Confidence: 0.91840136051178

00:10:32.705 --> 00:10:36.164 all of their notes from 2 weeks before

NOTE Confidence: 0.91840136051178

00:10:36.164 --> 00:10:39.470 the diagnosis through two weeks after.

NOTE Confidence: 0.91840136051178

00:10:39.470 --> 00:10:41.342 Give you a bit of information

NOTE Confidence: 0.91840136051178

00:10:41.342 --> 00:10:42.590 on the two cohorts.

NOTE Confidence: 0.91840136051178

00:10:42.590 --> 00:10:45.318 With it is a cohort of veterans identified

NOTE Confidence: 0.91840136051178

00:10:45.318 --> 00:10:47.937 from the roster of post 911 conflict.

NOTE Confidence: 0.91840136051178

00:10:47.940 --> 00:10:50.010 Information from the roster is

NOTE Confidence: 0.91840136051178

00:10:50.010 --> 00:10:52.080 available and include separate data,

NOTE Confidence: 0.91840136051178

00:10:52.080 --> 00:10:54.145 birth date of last deployment

NOTE Confidence: 0.91840136051178

00:10:54.145 --> 00:10:55.384 and armed forces,

NOTE Confidence: 0.91840136051178

00:10:55.390 --> 00:10:56.950 branching component roster data

NOTE Confidence: 0.91840136051178

00:10:56.950 --> 00:10:59.290 have also been linked to electronic

NOTE Confidence: 0.91840136051178

00:10:59.355 --> 00:11:01.941 health record data with its includes

NOTE Confidence: 0.91840136051178

00:11:01.941 --> 00:11:03.665 approximately 1.2 million individual.

NOTE Confidence: 0.91840136051178

00:11:03.670 --> 00:11:05.740 It represents a younger cohort.

NOTE Confidence: 0.91840136051178

00:11:05.740 --> 00:11:08.122 The mean age for women was

NOTE Confidence: 0.91840136051178

00:11:08.122 --> 00:11:10.709 29 an for men 30 years,

NOTE Confidence: 0.91840136051178

00:11:10.710 --> 00:11:13.188 as is typical in the VA.

NOTE Confidence: 0.907338380813599

00:11:15.420 --> 00:11:17.807 As a typical in the VA discovered,

NOTE Confidence: 0.907338380813599

00:11:17.810 --> 00:11:19.510 is primarily male, an white.

NOTE Confidence: 0.907338380813599

00:11:19.510 --> 00:11:21.394 However, it is important to remember

NOTE Confidence: 0.907338380813599

00:11:21.394 --> 00:11:23.658 that within the VA there is richer

NOTE Confidence: 0.907338380813599

00:11:23.658 --> 00:11:24.914 racial and ethnic diversity

NOTE Confidence: 0.907338380813599

00:11:24.914 --> 00:11:27.010 than in the general population,

NOTE Confidence: 0.907338380813599

00:11:27.010 --> 00:11:30.038 particularly among women next.

NOTE Confidence: 0.907338380813599

00:11:30.040 --> 00:11:33.370 The VA birth cohort is an EHR based cohort.

NOTE Confidence: 0.907338380813599

00:11:33.370 --> 00:11:34.850 It includes all veterans

NOTE Confidence: 0.907338380813599

00:11:34.850 --> 00:11:36.700 born between 1945 and 1965,

NOTE Confidence: 0.907338380813599

00:11:36.700 --> 00:11:38.920 so these are baby boomer better.

NOTE Confidence: 0.907338380813599

00:11:38.920 --> 00:11:42.079 Much older than those than most of those in

NOTE Confidence: 0.907338380813599

00:11:42.079 --> 00:11:45.206 with the total sample size is 4.2 million.

NOTE Confidence: 0.907338380813599

00:11:45.210 --> 00:11:48.243 The age range is 55 to 75 years and

NOTE Confidence: 0.907338380813599

00:11:48.243 --> 00:11:51.129 again it is majority white and male,

NOTE Confidence: 0.907338380813599

00:11:51.130 --> 00:11:54.178 but it is important to note that even

NOTE Confidence: 0.907338380813599

00:11:54.178 --> 00:11:57.431 though women are only 15% of this cohort,

NOTE Confidence: 0.907338380813599

00:11:57.431 --> 00:11:59.916 this represents almost half a

NOTE Confidence: 0.907338380813599

00:11:59.916 --> 00:12:01.420 million women next.

NOTE Confidence: 0.907338380813599

00:12:01.420 --> 00:12:03.826 In terms of our sample size,

NOTE Confidence: 0.907338380813599

00:12:03.830 --> 00:12:06.644 as of May 16th at 5:41 PM,

NOTE Confidence: 0.907338380813599

00:12:06.650 --> 00:12:08.400 the cumulative number of coded

NOTE Confidence: 0.907338380813599

00:12:08.400 --> 00:12:10.732 19 cases within the VA with

NOTE Confidence: 0.907338380813599

00:12:10.732 --> 00:12:12.268 approximately 12,000 next.

NOTE Confidence: 0.883646547794342

00:12:14.440 --> 00:12:16.933 So how are you gonna test and adapt our

NOTE Confidence: 0.883646547794342

00:12:16.933 --> 00:12:19.012 system pipeline as a first step will

NOTE Confidence: 0.883646547794342

00:12:19.012 --> 00:12:20.961 be to restrict the Simpson dictionary

NOTE Confidence: 0.883646547794342

00:12:20.961 --> 00:12:23.495 so that the terms included are only

NOTE Confidence: 0.883646547794342

00:12:23.495 --> 00:12:25.120 those pertinent to COVID-19 next.

NOTE Confidence: 0.892618954181671

00:12:27.190 --> 00:12:29.605 The next step is to run this

NOTE Confidence: 0.892618954181671

00:12:29.605 --> 00:12:30.640 restricted symptom extractor

NOTE Confidence: 0.892618954181671

00:12:30.702 --> 00:12:33.166 pipeline on all of the notes and to

NOTE Confidence: 0.892618954181671

00:12:33.166 --> 00:12:34.880 have clinicians review to result.

NOTE Confidence: 0.892618954181671

00:12:34.880 --> 00:12:37.135 7 conditions will review a

NOTE Confidence: 0.892618954181671

00:12:37.135 --> 00:12:39.390 random subset of 700 note.

NOTE Confidence: 0.892618954181671

00:12:39.390 --> 00:12:41.880 Conditions will first create guidelines

NOTE Confidence: 0.892618954181671

00:12:41.880 --> 00:12:44.370 for identifying positive and negative

NOTE Confidence: 0.892618954181671

00:12:44.437 --> 00:12:46.765 note based on their clinical knowledge

NOTE Confidence: 0.892618954181671

00:12:46.765 --> 00:12:49.158 and an initial review of 100 note.

NOTE Confidence: 0.892618954181671

00:12:49.160 --> 00:12:51.450 The guidelines will be revised.

NOTE Confidence: 0.892618954181671

00:12:51.450 --> 00:12:54.534 Intel Acampe of 0.85 for Inter

NOTE Confidence: 0.892618954181671

00:12:54.534 --> 00:12:56.590 rater reliability is achieved.

NOTE Confidence: 0.892618954181671

00:12:56.590 --> 00:12:58.575 Each condition will then review

NOTE Confidence: 0.892618954181671

00:12:58.575 --> 00:13:00.163 and evaluate a hundred-and-fifty

NOTE Confidence: 0.892618954181671

00:13:00.163 --> 00:13:01.978 notes out of the remaining 600

NOTE Confidence: 0.892618954181671

00:13:01.978 --> 00:13:04.030 nodes so that each node is reviewed

NOTE Confidence: 0.892618954181671

00:13:04.030 --> 00:13:05.610 by at least two clinicians.

NOTE Confidence: 0.892618954181671

00:13:05.610 --> 00:13:07.518 We will then compare reviewer assessments

NOTE Confidence: 0.892618954181671

00:13:07.518 --> 00:13:09.280 where the two reviewers disagree.

NOTE Confidence: 0.892618954181671

00:13:09.280 --> 00:13:13.264 The Pi will make the final decision next.

NOTE Confidence: 0.892618954181671

00:13:13.270 --> 00:13:15.720 The third step will be to compare

NOTE Confidence: 0.892618954181671

00:13:15.720 --> 00:13:17.545 the symptoms identified by the

NOTE Confidence: 0.892618954181671

00:13:17.545 --> 00:13:19.325 pipeline with those identified by

NOTE Confidence: 0.892618954181671

00:13:19.325 --> 00:13:21.438 the clinicians in these 700 notes,

NOTE Confidence: 0.892618954181671

00:13:21.440 --> 00:13:23.512 and we're targeting precision

NOTE Confidence: 0.892618954181671

00:13:23.512 --> 00:13:26.102 and recall at 0.8 next.

NOTE Confidence: 0.892618954181671

00:13:26.110 --> 00:13:28.105 If we do not achieve this goal,

NOTE Confidence: 0.892618954181671

00:13:28.110 --> 00:13:29.998 there are a number of approaches that we

NOTE Confidence: 0.892618954181671

00:13:29.998 --> 00:13:32.100 can use to improve pipeline performance.

NOTE Confidence: 0.892618954181671

00:13:32.100 --> 00:13:34.636 The first will be to augment the symptom

NOTE Confidence: 0.892618954181671

00:13:34.636 --> 00:13:36.330 terms identified by the dictionary.

NOTE Confidence: 0.892618954181671

00:13:36.330 --> 00:13:37.242 To do this,

NOTE Confidence: 0.892618954181671

00:13:37.242 --> 00:13:39.370 we will use topic modeling to identify

NOTE Confidence: 0.892618954181671

00:13:39.432 --> 00:13:41.556 relevant symptom terms in the note.

NOTE Confidence: 0.892618954181671

00:13:41.560 --> 00:13:43.684 Topic modeling is a machine learning

NOTE Confidence: 0.892618954181671

00:13:43.684 --> 00:13:45.914 techniques that can be applied to

NOTE Confidence: 0.892618954181671

00:13:45.914 --> 00:13:47.799 large corpora to discover themes,

NOTE Confidence: 0.892618954181671

00:13:47.800 --> 00:13:50.210 IE symptom topics that are

NOTE Confidence: 0.892618954181671

00:13:50.210 --> 00:13:51.174 semantically related.

NOTE Confidence: 0.892618954181671

00:13:51.180 --> 00:13:53.615 We can create Raina bidirectional

NOTE Confidence: 0.892618954181671

00:13:53.615 --> 00:13:55.076 encoder representations from

NOTE Confidence: 0.892618954181671

00:13:55.076 --> 00:13:57.540 Transformers or bird model on 10,000

NOTE Confidence: 0.892618954181671

00:13:57.540 --> 00:13:59.676 documents with keywords to boost the

NOTE Confidence: 0.892618954181671

00:13:59.739 --> 00:14:01.994 LP's ability to recognize synonyms

NOTE Confidence: 0.892618954181671

00:14:01.994 --> 00:14:03.798 related terms and misspelling.

NOTE Confidence: 0.892618954181671

00:14:03.800 --> 00:14:04.240 Finally,

NOTE Confidence: 0.892618954181671

00:14:04.240 --> 00:14:06.880 we can target the machine learning

NOTE Confidence: 0.892618954181671

00:14:06.880 --> 00:14:09.645 component of the pipeline and train

NOTE Confidence: 0.892618954181671

00:14:09.645 --> 00:14:12.375 and test support vector machine models

NOTE Confidence: 0.892618954181671

00:14:12.375 --> 00:14:15.109 with different configurations next.

NOTE Confidence: 0.892618954181671

00:14:15.110 --> 00:14:16.958 We're applying for funding for this

NOTE Confidence: 0.892618954181671

00:14:16.958 --> 00:14:19.540 project from the VA rapid response project.

NOTE Confidence: 0.892618954181671

00:14:19.540 --> 00:14:22.006 Calls were also submitting a proposal

NOTE Confidence: 0.892618954181671

00:14:22.006 --> 00:14:24.990 in response to why a sense called

NOTE Confidence: 0.892618954181671

00:14:24.990 --> 00:14:27.100 for intramural pilot gram next.

NOTE Confidence: 0.892618954181671

00:14:27.100 --> 00:14:29.332 Once we have adapted the pipeline

NOTE Confidence: 0.892618954181671

00:14:29.332 --> 00:14:30.820 to accurately identify COVID-19

NOTE Confidence: 0.892618954181671

00:14:30.886 --> 00:14:32.546 symptoms in VAEHR text notes,

NOTE Confidence: 0.892618954181671

00:14:32.550 --> 00:14:36.001 there are a number of projects that

NOTE Confidence: 0.892618954181671

00:14:36.001 --> 00:14:39.158 we are interested in pursuing next.

NOTE Confidence: 0.892618954181671

00:14:39.160 --> 00:14:41.122 The first project will focus on

NOTE Confidence: 0.892618954181671

00:14:41.122 --> 00:14:42.908 evaluating the risk of infection

NOTE Confidence: 0.892618954181671

00:14:42.908 --> 00:14:45.343 and death associated with SARS, Co.

NOTE Confidence: 0.892618954181671

00:14:45.343 --> 00:14:47.884 V2 and influenza in the six months

NOTE Confidence: 0.892618954181671

00:14:47.884 --> 00:14:50.780 following the index infection with COVID-19.

NOTE Confidence: 0.892618954181671

00:14:50.780 --> 00:14:53.132 So in 19 will be defined as a

NOTE Confidence: 0.892618954181671

00:14:53.132 --> 00:14:55.473 positive arc collected at least eight

NOTE Confidence: 0.892618954181671

00:14:55.473 --> 00:14:57.993 weeks after the index and affection

NOTE Confidence: 0.892618954181671

00:14:58.068 --> 00:15:00.306 and by the presence of symptoms.

NOTE Confidence: 0.892618954181671

00:15:00.310 --> 00:15:02.837 This project is led by Doctor Rupert,

NOTE Confidence: 0.892618954181671

00:15:02.840 --> 00:15:04.725 got an instruction Infectious Diseases

NOTE Confidence: 0.892618954181671

00:15:04.725 --> 00:15:07.887 at the West Haven BA and a yellow Haven.

NOTE Confidence: 0.892618954181671

00:15:07.890 --> 00:15:09.334 His mentors include doctors,

NOTE Confidence: 0.892618954181671

00:15:09.334 --> 00:15:10.056 Kathleen Aiken,

NOTE Confidence: 0.892618954181671

00:15:10.060 --> 00:15:13.756 Cynthia Branson name each up next.

NOTE Confidence: 0.892618954181671

00:15:13.760 --> 00:15:16.004 We're also interested in looking at

NOTE Confidence: 0.892618954181671

00:15:16.004 --> 00:15:17.500 symptoms versus symptom clusters,

NOTE Confidence: 0.892618954181671

00:15:17.500 --> 00:15:19.370 and their associations with Cobit

NOTE Confidence: 0.892618954181671

00:15:19.370 --> 00:15:20.866 19 testing and seropositivity.

NOTE Confidence: 0.892618954181671

00:15:20.870 --> 00:15:21.624 In particular,

NOTE Confidence: 0.892618954181671

00:15:21.624 --> 00:15:23.886 we are interested in exploring whether

NOTE Confidence: 0.892618954181671

00:15:23.886 --> 00:15:26.480 symptoms are symptom clusters differ by age,

NOTE Confidence: 0.892618954181671

00:15:26.480 --> 00:15:26.805 sex,

NOTE Confidence: 0.892618954181671

00:15:26.805 --> 00:15:29.405 race and be a region on the P

NOTE Confidence: 0.892618954181671

00:15:29.405 --> 00:15:30.960 on this project,

NOTE Confidence: 0.892618954181671

00:15:30.960 --> 00:15:34.266 and I'm working with doctors cut

NOTE Confidence: 0.892618954181671

00:15:34.266 --> 00:15:37.060 bacon brands and Justice next.

NOTE Confidence: 0.892618954181671

00:15:37.060 --> 00:15:38.524 Additional projects include

NOTE Confidence: 0.892618954181671

00:15:38.524 --> 00:15:40.964 Validating an approach to identifying

NOTE Confidence: 0.892618954181671

00:15:40.964 --> 00:15:43.183 COVID-19 infection in VA data for

NOTE Confidence: 0.892618954181671

00:15:43.183 --> 00:15:44.959 research in Qi purposes that include

NOTE Confidence: 0.894699275493622

00:15:45.021 --> 00:15:46.613 the combination of symptoms

NOTE Confidence: 0.894699275493622

00:15:46.613 --> 00:15:47.807 or symptom clusters,

NOTE Confidence: 0.894699275493622

00:15:47.810 --> 00:15:50.589 results of chest radiographs for CT scans,

NOTE Confidence: 0.894699275493622

00:15:50.590 --> 00:15:53.002 an arc testing were also interested

NOTE Confidence: 0.894699275493622

00:15:53.002 --> 00:15:55.725 in exploring whether or not we can

NOTE Confidence: 0.894699275493622

00:15:55.725 --> 00:15:57.460 use the adapted symptom extractor

NOTE Confidence: 0.894699275493622

00:15:57.460 --> 00:16:00.377 as the foundation for an EHR based

NOTE Confidence: 0.894699275493622

00:16:00.377 --> 00:16:02.522 bio surveillance system to identify

NOTE Confidence: 0.894699275493622

00:16:02.530 --> 00:16:04.520 the onset of new code.

NOTE Confidence: 0.894699275493622

00:16:04.520 --> 00:16:06.674 19 searches were interested in seeing

NOTE Confidence: 0.894699275493622

00:16:06.674 --> 00:16:09.310 whether or not this symptom extractor.

NOTE Confidence: 0.894699275493622

00:16:09.310 --> 00:16:11.488 Can be adapted to other electronic

NOTE Confidence: 0.894699275493622

00:16:11.488 --> 00:16:13.390 health records such as epics,

NOTE Confidence: 0.894699275493622

00:16:13.390 --> 00:16:15.182 into other electronic data

NOTE Confidence: 0.894699275493622

00:16:15.182 --> 00:16:16.974 sources such as Google.

NOTE Confidence: 0.894699275493622

00:16:16.980 --> 00:16:18.520 Finally, we're interested in

NOTE Confidence: 0.894699275493622

00:16:18.520 --> 00:16:20.060 looking at associations between

NOTE Confidence: 0.894699275493622

00:16:20.060 --> 00:16:21.789 symptoms and symptom clusters.

NOTE Confidence: 0.894699275493622

00:16:21.790 --> 00:16:26.050 With code 19 viral load next.

NOTE Confidence: 0.894699275493622

00:16:26.050 --> 00:16:27.826 All the work that I've described

NOTE Confidence: 0.894699275493622

00:16:27.826 --> 00:16:29.840 as the product of team science,

NOTE Confidence: 0.894699275493622

00:16:29.840 --> 00:16:32.045 members of the team are from Yale,

NOTE Confidence: 0.894699275493622

00:16:32.050 --> 00:16:33.314 the School of Nursing,

NOTE Confidence: 0.894699275493622

00:16:33.314 --> 00:16:34.894 and the school of Madison,

NOTE Confidence: 0.894699275493622

00:16:34.900 --> 00:16:37.366 George Washington University and OHSU next.

NOTE Confidence: 0.894699275493622

00:16:37.370 --> 00:16:38.327 Thank you much.

NOTE Confidence: 0.894699275493622

00:16:38.327 --> 00:16:40.560 Thank you very much for your time.

NOTE Confidence: 0.967540144920349

00:16:46.390 --> 00:16:48.026 Thank you very much.