WEBVTT

NOTE duration:"00:56:14"

NOTE recognizability:0.800

NOTE language:en-us

NOTE Confidence: 0.839396781666667

00:00:14.000 --> 00:00:16.358 And just swap your screen and

NOTE Confidence: 0.8393967816666667

 $00:00:16.360 \longrightarrow 00:00:17.640$  then we'll be done. Exactly.

NOTE Confidence: 0.8393967816666667

 $00:00:17.640 \rightarrow 00:00:18.876$  We have this all nicely prepared,

NOTE Confidence: 0.839396781666667

00:00:18.880 --> 00:00:22.880 of course. That's OK. Perfect. Super.

NOTE Confidence: 0.800566788571429

00:00:25.440 --> 00:00:26.518 OK, Well, thank you very much indeed.

NOTE Confidence: 0.800566788571429

 $00:00:26.520 \longrightarrow 00:00:28.158$  Sorry about that. That hiccup.

NOTE Confidence: 0.800566788571429

 $00:00:28.160 \longrightarrow 00:00:30.320$  No, nothing is quite as smooth as you hope.

NOTE Confidence: 0.800566788571429

 $00:00:30.320 \longrightarrow 00:00:31.370$  Thanks so much for that

NOTE Confidence: 0.800566788571429

 $00:00:31.370 \longrightarrow 00:00:32.000$  really generous introduction.

NOTE Confidence: 0.800566788571429

00:00:32.000 -> 00:00:32.918 You know, it's a really great

NOTE Confidence: 0.800566788571429

 $00:00:32.918 \rightarrow 00:00:33.800$  pleasure and honour to be here.

NOTE Confidence: 0.800566788571429

 $00{:}00{:}33{.}800 \dashrightarrow 00{:}00{:}35{.}000$  I really followed Phil's work

NOTE Confidence: 0.800566788571429

 $00:00:35.000 \rightarrow 00:00:36.200$  over many years as well,

 $00:00:36.200 \rightarrow 00:00:37.397$  really learned an awful lot from it.

NOTE Confidence: 0.800566788571429

 $00{:}00{:}37{.}400 \dashrightarrow 00{:}00{:}39{.}206$  So. So it's really great to be

NOTE Confidence: 0.800566788571429

 $00:00:39.206 \longrightarrow 00:00:40.878$  here and thanks for the thanks.

NOTE Confidence: 0.800566788571429

 $00:00:40.880 \longrightarrow 00:00:41.326$  That's it.

NOTE Confidence: 0.800566788571429

 $00{:}00{:}41.326 \dashrightarrow 00{:}00{:}43.110$  So the work I'm going to talk about

NOTE Confidence: 0.800566788571429

 $00:00:43.159 \rightarrow 00:00:44.755$  is joint with a number of people.

NOTE Confidence: 0.800566788571429

00:00:44.760 --> 00:00:45.522 So Chris Gagney,

NOTE Confidence: 0.800566788571429

 $00:00:45.522 \rightarrow 00:00:47.300$  who was a post doc in tubing

NOTE Confidence: 0.800566788571429

 $00{:}00{:}47.357 \dashrightarrow 00{:}00{:}49.293$  and is now a now works for a

NOTE Confidence: 0.800566788571429

00:00:49.293 --> 00:00:50.800 company called Hume in New York,

NOTE Confidence: 0.800566788571429

 $00{:}00{:}50{.}800 \dashrightarrow 00{:}00{:}52{.}684$  two research assistants in in tubing

NOTE Confidence: 0.800566788571429

00:00:52.684 --> 00:00:54.920 and Kevin Shen and Yannick Striker.

NOTE Confidence: 0.800566788571429

 $00:00:54.920 \longrightarrow 00:00:56.372$  And then I might also talk

NOTE Confidence: 0.800566788571429

 $00:00:56.372 \rightarrow 00:00:58.200$  about some work with two of my

NOTE Confidence: 0.800566788571429

 $00:00:58.200 \rightarrow 00:00:59.540$  other colleagues in Tubing and

NOTE Confidence: 0.800566788571429

 $00:00:59.540 \rightarrow 00:01:00.798$  Kevin Lloyd and Shin Sui.

- NOTE Confidence: 0.771251232857143
- 00:01:02.960 --> 00:01:04.628 So to introduce this,
- NOTE Confidence: 0.771251232857143
- $00:01:04.628 \longrightarrow 00:01:06.457$  imagine the following game.
- NOTE Confidence: 0.771251232857143
- $00{:}01{:}06{.}457 \dashrightarrow 00{:}01{:}09{.}342$  You're controlling this rather crude
- NOTE Confidence: 0.771251232857143
- $00:01:09.342 \longrightarrow 00:01:12.160$  refrigerator like a robot here,
- NOTE Confidence: 0.771251232857143
- 00:01:12.160 --> 00:01:14.792 and your job is to get to
- NOTE Confidence: 0.771251232857143
- $00:01:14.792 \longrightarrow 00:01:16.241$  this treasure chest here.
- NOTE Confidence: 0.771251232857143
- $00:01:16.241 \longrightarrow 00:01:18.488$  And there's a word for getting to
- NOTE Confidence: 0.771251232857143
- $00{:}01{:}18.488 \dashrightarrow 00{:}01{:}20.200$  the treasure chest worth worth
- NOTE Confidence: 0.771251232857143
- 00:01:20.200 --> 00:01:21.800 five points to our subjects.
- NOTE Confidence: 0.771251232857143
- $00:01:21.800 \longrightarrow 00:01:24.200$  There's a cost for falling into
- NOTE Confidence: 0.771251232857143
- $00:01:24.200 \longrightarrow 00:01:25.640$  these these things which Chris
- NOTE Confidence: 0.771251232857143
- $00{:}01{:}25.640 \dashrightarrow 00{:}01{:}27.200$  loves to call these lava pits.
- NOTE Confidence: 0.771251232857143
- $00:01:27.200 \longrightarrow 00:01:28.692$  There's this,
- NOTE Confidence: 0.771251232857143
- $00{:}01{:}28.692 \dashrightarrow 00{:}01{:}31.174$  this this is the Iceland version of
- NOTE Confidence: 0.771251232857143
- $00{:}01{:}31{.}174 \dashrightarrow 00{:}01{:}33{.}660$  this with the with the the volcanoes you
- NOTE Confidence: 0.771251232857143

 $00:01:33.660 \rightarrow 00:01:35.480$  have when you try to move north-south,

NOTE Confidence: 0.771251232857143

 $00:01:35.480 \longrightarrow 00:01:36.368$  east and West,

NOTE Confidence: 0.771251232857143

 $00{:}01{:}36{.}368 \dashrightarrow 00{:}01{:}37{.}552$  there are some blockages

NOTE Confidence: 0.771251232857143

 $00:01:37.552 \rightarrow 00:01:39.159$  shown by these brick walls.

NOTE Confidence: 0.771251232857143

 $00{:}01{:}39{.}160 \dashrightarrow 00{:}01{:}40{.}972$  And there's also an error chance

NOTE Confidence: 0.771251232857143

00:01:40.972 --> 00:01:42.970 of an error of a of a of an

NOTE Confidence: 0.771251232857143

 $00:01:42.970 \longrightarrow 00:01:43.960$  eighth when you try to move.

NOTE Confidence: 0.771251232857143

 $00:01:43.960 \longrightarrow 00:01:45.556$  So if you try to go north,

NOTE Confidence: 0.771251232857143

 $00{:}01{:}45{.}560 \dashrightarrow 00{:}01{:}46{.}590$  there's an eighth chance you'll

NOTE Confidence: 0.771251232857143

 $00{:}01{:}46.590 \dashrightarrow 00{:}01{:}48.152$  move in one of the other directions

NOTE Confidence: 0.771251232857143

00:01:48.152 $\operatorname{-->}$ 00:01:49.853 instead and then we have a discount

NOTE Confidence: 0.771251232857143

 $00{:}01{:}49.853 \dashrightarrow 00{:}01{:}51.029$  factor to try and encourage you

NOTE Confidence: 0.771251232857143

 $00:01:51.029 \longrightarrow 00:01:52.228$  to get to the goal quickly.

NOTE Confidence: 0.771251232857143

 $00:01:52.228 \dashrightarrow 00:01:54.384$  So the question then we pose our

NOTE Confidence: 0.771251232857143

 $00:01:54.384 \rightarrow 00:01:56.014$  subjects is which route would

NOTE Confidence: 0.771251232857143

 $00:01:56.014 \rightarrow 00:01:57.278$  you take given this?

 $00:01:57.280 \dashrightarrow 00:01:58.840$  So there's a three obvious routes.

NOTE Confidence: 0.771251232857143

 $00{:}01{:}58{.}840 \dashrightarrow 00{:}02{:}00{.}358$  I think there's this route that

NOTE Confidence: 0.771251232857143

 $00:02:00.358 \longrightarrow 00:02:01.636$  goes down here through all the

NOTE Confidence: 0.771251232857143

 $00:02:01.636 \longrightarrow 00:02:02.840$  lava hits to get to the reward,

NOTE Confidence: 0.771251232857143

 $00{:}02{:}02{.}840 \dashrightarrow 00{:}02{:}03{.}996$  the most direct route.

NOTE Confidence: 0.771251232857143

 $00{:}02{:}03{.}996 \dashrightarrow 00{:}02{:}06{.}111$  There's a route which goes as sort

NOTE Confidence: 0.771251232857143

 $00:02:06.111 \longrightarrow 00:02:08.013$  of the intermediate route which goes

NOTE Confidence: 0.771251232857143

 $00:02:08.013 \rightarrow 00:02:09.762$  around here and then goes close

NOTE Confidence: 0.771251232857143

 $00:02:09.762 \longrightarrow 00:02:11.703$  to this lava but not not the the

NOTE Confidence: 0.771251232857143

 $00:02:11.703 \rightarrow 00:02:14.040$  main bulk of lava to get to here like this.

NOTE Confidence: 0.771251232857143

 $00:02:14.040 \longrightarrow 00:02:15.624$  And then there's this long route

NOTE Confidence: 0.771251232857143

 $00:02:15.624 \longrightarrow 00:02:17.346$  that goes around here all the way

NOTE Confidence: 0.771251232857143

 $00{:}02{:}17.346 \dashrightarrow 00{:}02{:}19.034$  and then gets to the novel pit that

NOTE Confidence: 0.771251232857143

 $00{:}02{:}19{.}034 \dashrightarrow 00{:}02{:}20{.}834$  gets to the to the goal in that way.

NOTE Confidence: 0.771251232857143

 $00{:}02{:}20.840 \dashrightarrow 00{:}02{:}22.920$  So we administered this to

 $00:02:22.920 \longrightarrow 00:02:24.438$  to our subjects in the lab.

NOTE Confidence: 0.771251232857143

00:02:24.440 --> 00:02:26.099 I promised I wouldn't tell tell you

NOTE Confidence: 0.771251232857143

 $00:02:26.099 \rightarrow 00:02:28.116$  who they are because he's kind of

NOTE Confidence: 0.771251232857143

 $00:02:28.116 \rightarrow 00:02:29.676$  revealing about about your colleagues

NOTE Confidence: 0.771251232857143

 $00:02:29.676 \longrightarrow 00:02:31.495$  when you do this and you can see

NOTE Confidence: 0.771251232857143

 $00:02:31.495 \longrightarrow 00:02:33.320$  that there are subjects divided about 1/3,

NOTE Confidence: 0.771251232857143

00:02:33.320 --> 00:02:33.920 a third,

NOTE Confidence: 0.771251232857143

 $00:02:33.920 \longrightarrow 00:02:35.756$  a third maybe a few fewer.

NOTE Confidence: 0.771251232857143

 $00{:}02{:}35{.}760 \dashrightarrow 00{:}02{:}37{.}254$  So some people took this very

NOTE Confidence: 0.771251232857143

 $00:02:37.254 \rightarrow 00:02:38.920$  direct route to get to the goal.

NOTE Confidence: 0.771251232857143

 $00:02:38.920 \longrightarrow 00:02:40.500$  Another group took this intermediate

NOTE Confidence: 0.771251232857143

 $00:02:40.500 \longrightarrow 00:02:43.193$  one and you can see here the where

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 $00:02:43.193 \rightarrow 00:02:45.491$  they're being deviated off this route

NOTE Confidence: 0.771251232857143

 $00:02:45.491 \rightarrow 00:02:47.993$  by these by these random spots.

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00:02:48.000 - 00:02:49.380 And then some other subjects

NOTE Confidence: 0.771251232857143

 $00:02:49.380 \longrightarrow 00:02:50.760$  took all the way around.

 $00:02:50.760 \dashrightarrow 00:02:52.360$  And so the question for this talk is,

NOTE Confidence: 0.771251232857143

 $00{:}02{:}52{.}360 \dashrightarrow 00{:}02{:}54{.}943$  what is it that goes on in terms of

NOTE Confidence: 0.771251232857143

 $00:02:54.943 \rightarrow 00:02:57.236$  evaluating the risk associated with these,

NOTE Confidence: 0.771251232857143

 $00:02:57.240 \longrightarrow 00:02:57.864$  with these parts?

NOTE Confidence: 0.771251232857143

00:02:57.864 --> 00:02:59.112 And how do you make these?

NOTE Confidence: 0.771251232857143

 $00:02:59.120 \longrightarrow 00:03:00.716$  How do you make these choices?

NOTE Confidence: 0.771251232857143

 $00:03:00.720 \longrightarrow 00:03:01.434$  In this instance,

NOTE Confidence: 0.771251232857143

 $00:03:01.434 \longrightarrow 00:03:02.624$  we're very interested in the

NOTE Confidence: 0.771251232857143

 $00:03:02.624 \longrightarrow 00:03:04.080$  case that you're making choices,

NOTE Confidence: 0.771251232857143

 $00:03:04.080 \rightarrow 00:03:05.800$  not just a single choice,

NOTE Confidence: 0.771251232857143

 $00:03:05.800 \rightarrow 00:03:07.718$  but by committing to this path here,

NOTE Confidence: 0.771251232857143

 $00{:}03{:}07{.}720 \dashrightarrow 00{:}03{:}10{.}671$  you're successively adjusted.

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 $00{:}03{:}10.671 \dashrightarrow 00{:}03{:}12.848$  You have to adjust yourself so these

NOTE Confidence: 0.771251232857143

 $00:03:12.848 \longrightarrow 00:03:14.677$  many steps of risk that you get.

NOTE Confidence: 0.771251232857143

 $00{:}03{:}14.680 \dashrightarrow 00{:}03{:}15.320$  And I think that in,

 $00:03:15.320 \longrightarrow 00:03:16.776$  you know a lot of the work that

NOTE Confidence: 0.771251232857143

 $00{:}03{:}16.776 \dashrightarrow 00{:}03{:}18.473$  that that we and other people have

NOTE Confidence: 0.771251232857143

 $00:03:18.473 \rightarrow 00:03:19.758$  done in reinforcement learning is

NOTE Confidence: 0.771251232857143

 $00:03:19.812 \rightarrow 00:03:21.036$  thinking about sequential decision

NOTE Confidence: 0.771251232857143

 $00:03:21.036 \dashrightarrow 00:03:22.872$  problems where you don't only make

NOTE Confidence: 0.771251232857143

 $00:03:22.880 \longrightarrow 00:03:24.800$  one choice, you make many choices.

NOTE Confidence: 0.771251232857143

 $00{:}03{:}24.800 \dashrightarrow 00{:}03{:}26.265$  And when those choices are

NOTE Confidence: 0.771251232857143

00:03:26.265 --> 00:03:27.437 are infected by risk,

NOTE Confidence: 0.892384243333333

 $00{:}03{:}27{.}440 \dashrightarrow 00{:}03{:}29{.}215$  risk can accumulate on paths

NOTE Confidence: 0.892384243333333

 $00:03:29.215 \rightarrow 00:03:30.635$  in rather interesting ways.

NOTE Confidence: 0.892384243333333

 $00{:}03{:}30{.}640 \dashrightarrow 00{:}03{:}32{.}136$  And that really is the context of my

NOTE Confidence: 0.892384243333333

 $00:03:32.136 \longrightarrow 00:03:33.849$  talk of my talk to think about what

NOTE Confidence: 0.892384243333333

 $00:03:33.849 \rightarrow 00:03:35.544$  the consequences are of that and how we

NOTE Confidence: 0.892384243333333

 $00:03:35.544 \dashrightarrow 00:03:38.400$  should think about that as the whole.

NOTE Confidence: 0.892384243333333

 $00:03:38.400 \longrightarrow 00:03:39.351$  So the original,

NOTE Confidence: 0.892384243333333

 $00:03:39.351 \rightarrow 00:03:41.253$  some of the original thinking about

- NOTE Confidence: 0.892384243333333
- 00:03:41.253 --> 00:03:43.076 risk was actually came from the
- NOTE Confidence: 0.892384243333333
- $00{:}03{:}43.080 \dashrightarrow 00{:}03{:}44.272$  Bernoulli's thinking about what's
- NOTE Confidence: 0.892384243333333
- $00{:}03{:}44{.}272 \dashrightarrow 00{:}03{:}46{.}661$  what then became known as or what is
- NOTE Confidence: 0.892384243333333
- $00:03:46.661 \rightarrow 00:03:48.317$  known as the Saint Petersburg problem.
- NOTE Confidence: 0.892384243333333
- $00:03:48.320 \longrightarrow 00:03:50.312$  The way that you pose this is you're
- NOTE Confidence: 0.892384243333333
- $00{:}03{:}50{.}312 \dashrightarrow 00{:}03{:}52{.}054$  tossing a fair coin and then you
- NOTE Confidence: 0.892384243333333
- $00{:}03{:}52{.}054 \dashrightarrow 00{:}03{:}53{.}792$  look at the number of heads that
- NOTE Confidence: 0.892384243333333
- $00:03:53.792 \longrightarrow 00:03:55.514$  you get before you get a tail.
- NOTE Confidence: 0.892384243333333
- $00{:}03{:}55{.}520 \dashrightarrow 00{:}03{:}57{.}113$  So if you get one head before a tail,
- NOTE Confidence: 0.892384243333333
- $00:03:57.120 \longrightarrow 00:04:00.120$  you get to  $\notin 2$  or two monetary units.
- NOTE Confidence: 0.892384243333333
- 00:04:00.120 --> 00:04:01.712 If you get 2 heads, you get 4,
- NOTE Confidence: 0.892384243333333
- $00{:}04{:}01.712 \dashrightarrow 00{:}04{:}03.196$  three heads, 8 and so forth.
- NOTE Confidence: 0.892384243333333
- $00:04:03.196 \longrightarrow 00:04:04.922$  And the question is how much would
- NOTE Confidence: 0.892384243333333
- $00:04:04.922 \longrightarrow 00:04:06.754$  you be willing to pay me to give
- NOTE Confidence: 0.892384243333333
- $00:04:06.754 \rightarrow 00:04:08.397$  you an instance of this game.
- NOTE Confidence: 0.892384243333333

 $00{:}04{:}08{.}400 \dashrightarrow 00{:}04{:}10.672$  And the the reason why it's a problem

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 $00:04:10.672 \rightarrow 00:04:13.675$  or a paradox is that the expected value,

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 $00:04:13.680 \longrightarrow 00:04:15.927$  so the mean value of these of

NOTE Confidence: 0.892384243333333

 $00:04:15.927 \rightarrow 00:04:17.800$  this sequence of of outcomes,

NOTE Confidence: 0.892384243333333

 $00:04:17.800 \longrightarrow 00:04:19.739$  this mean value of of being

NOTE Confidence: 0.892384243333333

 $00{:}04{:}19.739 \dashrightarrow 00{:}04{:}21.658$  playing this game like this is

NOTE Confidence: 0.892384243333333

 $00:04:21.658 \rightarrow 00:04:23.363$  actually infinite because with a

NOTE Confidence: 0.892384243333333

 $00:04:23.363 \rightarrow 00:04:25.140$  probably over half you get  $\notin 2.00$ 

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 $00:04:25.140 \longrightarrow 00:04:27.520$  the probably of 1/4 you get  $\notin 4.00$ 

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00:04:27.520 --> 00:04:29.996 probably an 8 you get  ${\in}8$  and so forth.

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 $00{:}04{:}30{.}000 \dashrightarrow 00{:}04{:}31{.}880$  And so the sum value each of these,

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 $00:04:31.880 \longrightarrow 00:04:33.530$  each of these possibilities is

NOTE Confidence: 0.892384243333333

00:04:33.530 --> 00:04:35.499 worth  ${\ensuremath{\in}} 1.00$  and that would then

NOTE Confidence: 0.892384243333333

 $00:04:35.499 \rightarrow 00:04:37.555$  just go off to the off to Infinity.

NOTE Confidence: 0.892384243333333

 $00:04:37.560 \rightarrow 00:04:40.136$  And so the expected value is about

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 $00:04:40.136 \longrightarrow 00:04:40.872$  is Infinity,

- NOTE Confidence: 0.892384243333333
- $00{:}04{:}40{.}880 \dashrightarrow 00{:}04{:}42{.}399$  but the amount that most people think
- NOTE Confidence: 0.892384243333333
- $00:04:42.399 \dashrightarrow 00:04:44.080$  how much you'd be willing to pay most
- NOTE Confidence: 0.892384243333333
- $00:04:44.080 \rightarrow 00:04:45.329$  people will pay you know somewhere
- NOTE Confidence: 0.892384243333333
- $00:04:45.329 \longrightarrow 00:04:46.855$  between 4:00 and 8:00 EUR or four
- NOTE Confidence: 0.892384243333333
- 00:04:46.855 --> 00:04:48.557 and \$8 to play a game like this.
- NOTE Confidence: 0.892384243333333
- $00:04:48.560 \longrightarrow 00:04:49.480$  And so that's the paradox,
- NOTE Confidence: 0.892384243333333
- $00:04:49.480 \longrightarrow 00:04:51.520$  is to try and understand why.
- NOTE Confidence: 0.892384243333333
- 00:04:51.520 00:04:53.044 But I think the paradox becomes
- NOTE Confidence: 0.892384243333333
- $00{:}04{:}53.044 \dashrightarrow 00{:}04{:}54.831$  sharper or at least the task becomes
- NOTE Confidence: 0.892384243333333
- $00{:}04{:}54{.}831 \dashrightarrow 00{:}04{:}56{.}862$  sharper when you think of it in the
- NOTE Confidence: 0.892384243333333
- $00:04:56.862 \rightarrow 00:04:58.382$  sequential manner that it really
- NOTE Confidence: 0.892384243333333
- $00:04:58.382 \rightarrow 00:05:00.258$  is originally could also be posed.
- NOTE Confidence: 0.892384243333333
- $00:05:00.258 \longrightarrow 00:05:02.232$  So here you're tossing the first
- NOTE Confidence: 0.892384243333333
- 00:05:02.232 --> 00:05:04.118 coin and at stake is €2.00.
- NOTE Confidence: 0.892384243333333
- 00:05:04.120 --> 00:05:06.565 If you get a, if you get a a tail,
- NOTE Confidence: 0.892384243333333

00:05:06.565 --> 00:05:07.855 that's what you're going to walk

NOTE Confidence: 0.892384243333333

00:05:07.855 --> 00:05:09.078 away with is just two EUR.

NOTE Confidence: 0.892384243333333

 $00:05:09.080 \rightarrow 00:05:11.075$  On the other hand, if we're lucky,

NOTE Confidence: 0.892384243333333

 $00:05:11.080 \longrightarrow 00:05:11.932$  we get a head.

NOTE Confidence: 0.892384243333333

 $00{:}05{:}11.932 \dashrightarrow 00{:}05{:}13.480$  This is the world's smallest gold coin,

NOTE Confidence: 0.892384243333333

 $00:05:13.480 \rightarrow 00:05:16.440$  which is that Einstein, It's a Swiss coin.

NOTE Confidence: 0.892384243333333

 $00:05:16.440 \longrightarrow 00:05:18.240$  Then you get a head.

NOTE Confidence: 0.892384243333333

00:05:18.240 --> 00:05:20.715 That means that now you get stake is  $\notin 4.00.$ 

NOTE Confidence: 0.892384243333333

 $00{:}05{:}20.720 \dashrightarrow 00{:}05{:}22.005$  And again you're tossing this

NOTE Confidence: 0.892384243333333

 $00:05:22.005 \rightarrow 00:05:23.033$  coin and you're thinking,

NOTE Confidence: 0.892384243333333

 $00:05:23.040 \longrightarrow 00:05:24.036$  you know what's going to happen.

NOTE Confidence: 0.892384243333333

 $00{:}05{:}24.040 \dashrightarrow 00{:}05{:}25.594$  I get a head or a tail.

NOTE Confidence: 0.892384243333333

00:05:25.600 --> 00:05:26.144 I'm lucky.

NOTE Confidence: 0.892384243333333

 $00:05:26.144 \rightarrow 00:05:28.320$  I'll get a head and then now the

NOTE Confidence: 0.892384243333333

00:05:28.384 --> 00:05:30.712 stake becomes  ${\in}8$  and so forth and then

NOTE Confidence: 0.892384243333333

 $00:05:30.712 \longrightarrow 00:05:33.128$  you get a tail and then and then in

 $00:05:33.128 \rightarrow 00:05:35.400$  this instance you'd walk away with the  $\notin 8$ .

NOTE Confidence: 0.892384243333333

 $00{:}05{:}35{.}400 \dashrightarrow 00{:}05{:}37{.}528$  And so you can imagine that as you're

NOTE Confidence: 0.892384243333333

 $00:05:37.528 \rightarrow 00:05:39.270$  getting you know essentially more and

NOTE Confidence: 0.892384243333333

 $00:05:39.270 \longrightarrow 00:05:41.724$  more money is at stake as you do this.

NOTE Confidence: 0.892384243333333

 $00{:}05{:}41.724 \dashrightarrow 00{:}05{:}43.697$  I'm sure many of you are familiar

NOTE Confidence: 0.892384243333333

 $00{:}05{:}43.697 \dashrightarrow 00{:}05{:}46.115$  with the balloon adaptive risk task,

NOTE Confidence: 0.579155921428571

 $00:05:46.120 \longrightarrow 00:05:47.376$  the balloon adaptive risk,

NOTE Confidence: 0.579155921428571

00:05:47.376 --> 00:05:48.947 the bot task, which has something

NOTE Confidence: 0.579155921428571

00:05:48.947 --> 00:05:50.201 very similar where you're pumping up

NOTE Confidence: 0.579155921428571

 $00:05:50.201 \dashrightarrow 00:05:51.714$  a balloon and you know at some point,

NOTE Confidence: 0.579155921428571

00:05:51.720 --> 00:05:52.808 you know one pump is going to make

NOTE Confidence: 0.579155921428571

 $00:05:52.808 \dashrightarrow 00:05:53.878$  it burst and you lose everything.

NOTE Confidence: 0.579155921428571

 $00:05:53.880 \longrightarrow 00:05:55.238$  And the question is when do you,

NOTE Confidence: 0.579155921428571

 $00{:}05{:}55{.}240 \dashrightarrow 00{:}05{:}56{.}020$  when do you quit?

NOTE Confidence: 0.579155921428571

 $00{:}05{:}56{.}020 \dashrightarrow 00{:}05{:}56{.}995$  And the Saint Petersburg problem,

 $00:05:57.000 \rightarrow 00:06:00.834$  it's you have to pay before you ever start.

NOTE Confidence: 0.579155921428571

 $00{:}06{:}00{.}840 \dashrightarrow 00{:}06{:}02{.}595$  OK. So the plan for the talk is talk

NOTE Confidence: 0.579155921428571

 $00{:}06{:}02.595 \dashrightarrow 00{:}06{:}04.637$  a bit about risk aversion in general,

NOTE Confidence: 0.579155921428571

 $00:06:04.640 \rightarrow 00:06:06.000$  how it comes up,

NOTE Confidence: 0.579155921428571

00:06:06.000 --> 00:06:08.040 talk about the measure of risk,

NOTE Confidence: 0.579155921428571

 $00:06:08.040 \rightarrow 00:06:10.070$  which I think is a particularly useful

NOTE Confidence: 0.579155921428571

 $00{:}06{:}10.070 \dashrightarrow 00{:}06{:}12.554$  measure for the sort of work that that we do.

NOTE Confidence: 0.579155921428571

 $00{:}06{:}12.560 \dashrightarrow 00{:}06{:}14.079$  And I think also that it applies

NOTE Confidence: 0.579155921428571

 $00{:}06{:}14.079 \dashrightarrow 00{:}06{:}15.240$  also in animal cases too.

NOTE Confidence: 0.579155921428571

 $00:06:15.240 \rightarrow 00:06:16.710$  And I'll give you a little example

NOTE Confidence: 0.579155921428571

 $00:06:16.710 \longrightarrow 00:06:18.276$  of that at the end of my talk,

NOTE Confidence: 0.579155921428571

00:06:18.280 --> 00:06:19.876 I hope if I have time,

NOTE Confidence: 0.579155921428571

 $00:06:19.880 \longrightarrow 00:06:22.190$  so talk about tail risk in

NOTE Confidence: 0.579155921428571

 $00:06:22.190 \longrightarrow 00:06:22.960$  sequential problems,

NOTE Confidence: 0.579155921428571

00:06:22.960 --> 00:06:24.585 then talk about risk of

NOTE Confidence: 0.579155921428571

 $00:06:24.585 \longrightarrow 00:06:25.560$  those online behaviour.

- NOTE Confidence: 0.579155921428571
- 00:06:25.560 --> 00:06:27.385 So thinking about our subjects
- NOTE Confidence: 0.579155921428571
- $00:06:27.385 \longrightarrow 00:06:29.581$  making their choices in the in
- NOTE Confidence: 0.579155921428571
- $00:06:29.581 \longrightarrow 00:06:31.335$  that little maze that you know
- NOTE Confidence: 0.579155921428571
- $00:06:31.335 \longrightarrow 00:06:33.330$  with the with the robot and the
- NOTE Confidence: 0.579155921428571
- $00:06:33.395 \longrightarrow 00:06:35.355$  and the lava pits and so forth,
- NOTE Confidence: 0.579155921428571
- $00:06:35.360 \longrightarrow 00:06:36.440$  say a word about risk,
- NOTE Confidence: 0.579155921428571
- $00:06:36.440 \longrightarrow 00:06:37.385$  averse offline planning.
- NOTE Confidence: 0.579155921428571
- 00:06:37.385 --> 00:06:39.980 So the idea is if you're in an
- NOTE Confidence: 0.579155921428571
- $00:06:39.980 \longrightarrow 00:06:41.595$  environment in which risk is,
- NOTE Confidence: 0.579155921428571
- $00:06:41.600 \rightarrow 00:06:43.080$  which is replete with risk,
- NOTE Confidence: 0.579155921428571
- $00:06:43.080 \rightarrow 00:06:44.669$  then maybe there are things that you
- NOTE Confidence: 0.579155921428571
- $00:06:44.669 \dashrightarrow 00:06:46.836$  can do ahead of time to try and mitigate it.
- NOTE Confidence: 0.579155921428571
- $00:06:46.840 \longrightarrow 00:06:48.322$  Maybe that's going to change the
- NOTE Confidence: 0.579155921428571
- 00:06:48.322 --> 00:06:49.975 way you go about thinking about
- NOTE Confidence: 0.579155921428571
- $00:06:49.975 \dashrightarrow 00:06:52.158$  the about the aspects of the world,
- NOTE Confidence: 0.579155921428571

 $00:06:52.160 \longrightarrow 00:06:53.975$  doing some offline planning to

NOTE Confidence: 0.579155921428571

 $00:06:53.975 \rightarrow 00:06:55.427$  prepare yourself correctly and

NOTE Confidence: 0.579155921428571

 $00{:}06{:}55{.}427 \dashrightarrow 00{:}06{:}57{.}220$  then think about what that looks

NOTE Confidence: 0.579155921428571

00:06:57.220 --> 00:06:59.754 like in the context of of risk,

NOTE Confidence: 0.579155921428571

00:06:59.754 --> 00:07:02.239 risk diversion and risk sensitivity.

NOTE Confidence: 0.579155921428571

 $00:07:02.240 \longrightarrow 00:07:03.311$  And then also as I say if I have

NOTE Confidence: 0.579155921428571

00:07:03.311 --> 00:07:04.319 a chance I'll talk a word,

NOTE Confidence: 0.579155921428571

 $00:07:04.320 \rightarrow 00:07:06.686$  say a word about a some modelling

NOTE Confidence: 0.579155921428571

 $00{:}07{:}06.686 \dashrightarrow 00{:}07{:}09.910$  we've done of a some lovely data on

NOTE Confidence: 0.579155921428571

 $00:07:09.994 \rightarrow 00:07:13.090$  how mice do apparently risk sensitive

NOTE Confidence: 0.579155921428571

 $00{:}07{:}13.090 \dashrightarrow 00{:}07{:}15.560$  exploration with some data from

NOTE Confidence: 0.579155921428571

 $00:07:15.560 \dashrightarrow 00:07:20.278$  whatabi Yoshida Mitsuko's work in <br/>in Harvard.

NOTE Confidence: 0.579155921428571

 $00:07:20.280 \longrightarrow 00:07:20.640$  OK,

NOTE Confidence: 0.579155921428571

 $00:07:20.640 \longrightarrow 00:07:22.440$  so decision making and risk.

NOTE Confidence: 0.579155921428571

00:07:22.440 --> 00:07:23.600 So as you all know,

NOTE Confidence: 0.579155921428571

 $00:07:23.600 \rightarrow 00:07:26.368$  risk is a very critical aspect of decision

- NOTE Confidence: 0.579155921428571
- $00:07:26.368 \rightarrow 00:07:29.055$  making and it comes up anytime that
- NOTE Confidence: 0.579155921428571
- $00:07:29.055 \rightarrow 00:07:31.640$  we have uncertain or probabilistic outcomes.
- NOTE Confidence: 0.579155921428571
- $00:07:31.640 \longrightarrow 00:07:33.285$  So here you know you're here in
- NOTE Confidence: 0.579155921428571
- 00:07:33.285 --> 00:07:33.755 Saint Petersburg,
- NOTE Confidence: 0.579155921428571
- $00:07:33.760 \rightarrow 00:07:35.839$  we're spinning a coin in other contexts,
- NOTE Confidence: 0.579155921428571
- $00{:}07{:}35{.}840 \dashrightarrow 00{:}07{:}37{.}358$  we have other sorts of ways
- NOTE Confidence: 0.579155921428571
- $00:07:37.358 \longrightarrow 00:07:38.117$  of generating these,
- NOTE Confidence: 0.579155921428571
- $00:07:38.120 \longrightarrow 00:07:40.640$  these these probabilities.
- NOTE Confidence: 0.579155921428571
- 00:07:40.640 --> 00:07:41.810 Obviously whole industries
- NOTE Confidence: 0.579155921428571
- $00:07:41.810 \longrightarrow 00:07:43.760$  have been designed around it.
- NOTE Confidence: 0.579155921428571
- $00:07:43.760 \dashrightarrow 00:07:45.240$  So things like insurance markets.
- NOTE Confidence: 0.579155921428571
- $00:07:45.240 \longrightarrow 00:07:47.360$  So this is the famous,
- NOTE Confidence: 0.579155921428571
- 00:07:47.360 --> 00:07:48.240 this is Lloyds of London,
- NOTE Confidence: 0.579155921428571
- $00{:}07{:}48.240 \dashrightarrow 00{:}07{:}50.158$  a little picture of Lloyds of London.
- NOTE Confidence: 0.579155921428571
- $00:07:50.160 \longrightarrow 00:07:51.528$  And I think that it's likely
- NOTE Confidence: 0.579155921428571

 $00:07:51.528 \rightarrow 00:07:53.115$  plays a very crucial role in

NOTE Confidence: 0.579155921428571

 $00{:}07{:}53.115 \dashrightarrow 00{:}07{:}54.359$  many aspects of psychopathology.

NOTE Confidence: 0.579155921428571

 $00:07:54.360 \longrightarrow 00:07:55.816$  And this is a study that has

NOTE Confidence: 0.579155921428571

00:07:55.816 - 00:07:57.360 been done by very many groups,

NOTE Confidence: 0.579155921428571

 $00:07:57.360 \longrightarrow 00:07:59.040$  including obviously working

NOTE Confidence: 0.579155921428571

00:07:59.040 --> 00:08:01.472 in in in in Yale too.

NOTE Confidence: 0.579155921428571

 $00:08:01.472 \rightarrow 00:08:03.440$  So things like anxiety and mania

NOTE Confidence: 0.579155921428571

 $00:08:03.511 \longrightarrow 00:08:05.656$  are obviously issues about what

NOTE Confidence: 0.579155921428571

 $00{:}08{:}05{.}656 \dashrightarrow 00{:}08{:}07{.}352$  might happen could could be there

NOTE Confidence: 0.579155921428571

 $00:08:07.352 \longrightarrow 00:08:08.942$  in OCD you'd see that as well

NOTE Confidence: 0.579155921428571

 $00:08:08.942 \longrightarrow 00:08:10.106$  something again something that

NOTE Confidence: 0.579155921428571

 $00:08:10.106 \rightarrow 00:08:11.800$  Phil has actually worked on too.

NOTE Confidence: 0.579155921428571

 $00{:}08{:}11{.}800 \dashrightarrow 00{:}08{:}13{.}976$  And you also you have this notion of

NOTE Confidence: 0.579155921428571

 $00:08:13.976 \dashrightarrow 00:08:15.917$  these sort of ruminative what ifs.

NOTE Confidence: 0.9303524305

00:08:15.920 --> 00:08:18.336 So in the context of the complex world

NOTE Confidence: 0.9303524305

 $00:08:18.336 \longrightarrow 00:08:20.776$  that we occupy there are many ways in

 $00:08:20.776 \longrightarrow 00:08:23.492$  which we can be many risks that can

NOTE Confidence: 0.9303524305

 $00:08:23.492 \rightarrow 00:08:25.790$  with very low probability events there

NOTE Confidence: 0.9303524305

 $00{:}08{:}25{.}863 \dashrightarrow 00{:}08{:}28{.}122$  will cast swerves on the ice in a in

NOTE Confidence: 0.9303524305

 $00:08:28.122 \rightarrow 00:08:30.555$  a in Tubian this morning very icy.

NOTE Confidence: 0.9303524305

00:08:30.560 --> 00:08:32.240 So you can imagine when you're you know

NOTE Confidence: 0.9303524305

 $00{:}08{:}32{.}240 \dashrightarrow 00{:}08{:}33{.}862$  walking on the pavement there is a

NOTE Confidence: 0.9303524305

 $00:08:33.862 \dashrightarrow 00:08:35.360$  chance that something nasty can happen.

NOTE Confidence: 0.9303524305

00:08:35.360 - 00:08:37.232 If you pay a lot of attention to these

NOTE Confidence: 0.9303524305

 $00:08:37.232 \rightarrow 00:08:39.277$  very low probability probability outcomes,

NOTE Confidence: 0.9303524305

 $00{:}08{:}39{.}280 \dashrightarrow 00{:}08{:}42{.}000$  then then of course that's going to be

NOTE Confidence: 0.9303524305

 $00:08:42.000 \rightarrow 00:08:43.576$  problematical for your expectations

NOTE Confidence: 0.9303524305

 $00{:}08{:}43.576 \dashrightarrow 00{:}08{:}46.400$  about what might about what might happen.

NOTE Confidence: 0.9303524305

 $00{:}08{:}46{.}400 \dashrightarrow 00{:}08{:}47{.}160$  And when you do that,

NOTE Confidence: 0.9303524305

 $00{:}08{:}47{.}160 \dashrightarrow 00{:}08{:}49{.}384$  when you know you commit to a long

NOTE Confidence: 0.9303524305

 $00:08:49.384 \dashrightarrow 00:08:51.558$  series of choices, then as I as I said,

 $00:08:51.560 \longrightarrow 00:08:53.940$  you have to worry about how risk

NOTE Confidence: 0.9303524305

 $00:08:53.940 \rightarrow 00:08:56.118$  accumulates along these along these paths.

NOTE Confidence: 0.9303524305

00:08:56.120 --> 00:08:58.200 So it's been beautifully studied

NOTE Confidence: 0.9303524305

 $00:08:58.200 \rightarrow 00:09:00.280$  using single shot gambling paradigms.

NOTE Confidence: 0.9303524305

00:09:00.280 --> 00:09:02.116 So here's a classic example where

NOTE Confidence: 0.9303524305

 $00:09:02.116 \dashrightarrow 00:09:04.360$  you have a choice of either a Shaw

NOTE Confidence: 0.9303524305

 $00{:}09{:}04.360 \dashrightarrow 00{:}09{:}07.100$  \$5 or a 5050 chance of \$10 or a 5050

NOTE Confidence: 0.9303524305

 $00{:}09{:}07{.}183 \dashrightarrow 00{:}09{:}08{.}479$  chance of \$16.00.

NOTE Confidence: 0.9303524305

00:09:08.480 --> 00:09:10.165 I'm sorry in this case

NOTE Confidence: 0.9303524305

00:09:10.165 - 00:09:11.513 here so many paradigms.

NOTE Confidence: 0.9303524305

 $00:09:11.520 \rightarrow 00:09:12.660$  Obviously Canavan diversity done a

NOTE Confidence: 0.9303524305

 $00:09:12.660 \longrightarrow 00:09:14.440$  lot of work on that in in Yale.

NOTE Confidence: 0.9303524305

 $00:09:14.440 \longrightarrow 00:09:16.771$  IFAT has done a lot of beautiful

NOTE Confidence: 0.9303524305

 $00:09:16.771 \longrightarrow 00:09:18.520$  work along these lines too.

NOTE Confidence: 0.9303524305

 $00:09:18.520 \longrightarrow 00:09:20.744$  But what we want to look at is

NOTE Confidence: 0.9303524305

 $00:09:20.744 \longrightarrow 00:09:22.378$  the sequential problems and not

- NOTE Confidence: 0.9303524305
- $00:09:22.378 \rightarrow 00:09:24.400$  only not only single shot games.
- NOTE Confidence: 0.9303524305
- $00:09:24.400 \dashrightarrow 00:09:26.920$  And so we'll see how that comes out.
- NOTE Confidence: 0.9303524305
- 00:09:26.920 --> 00:09:29.236 So in order to make progress,
- NOTE Confidence: 0.9303524305
- $00:09:29.240 \dashrightarrow 00:09:31.208$  we have to define what sort of what
- NOTE Confidence: 0.9303524305
- $00:09:31.208 \rightarrow 00:09:33.040$  measure of risk we're going to use.
- NOTE Confidence: 0.9303524305
- $00{:}09{:}33{.}040 \dashrightarrow 00{:}09{:}35{.}537$  So there are a number of measures that
- NOTE Confidence: 0.9303524305
- $00:09:35.537 \dashrightarrow 00:09:36.599$  have been studied in the literature.
- NOTE Confidence: 0.9303524305
- 00:09:36.600 --> 00:09:37.920 So prospect theory, for instance,
- NOTE Confidence: 0.9303524305
- $00:09:37.920 \dashrightarrow 00:09:40.608$  very famously gives us a ways of thinking
- NOTE Confidence: 0.9303524305
- $00:09:40.608 \dashrightarrow 00:09:43.491$  about how to combine your utilities and
- NOTE Confidence: 0.9303524305
- $00:09:43.491 \rightarrow 00:09:45.631$  probabilities and these risk cases.
- NOTE Confidence: 0.9303524305
- $00{:}09{:}45{.}640 \dashrightarrow 00{:}09{:}47{.}523$  But there's also a lot of work
- NOTE Confidence: 0.9303524305
- 00:09:47.523 --> 00:09:48.880 from the insurance industry,
- NOTE Confidence: 0.9303524305
- $00{:}09{:}48.880 \dashrightarrow 00{:}09{:}49.760$  which of course has been,
- NOTE Confidence: 0.9303524305
- 00:09:49.760 --> 00:09:50.364 you know,
- NOTE Confidence: 0.9303524305

 $00:09:50.364 \longrightarrow 00:09:51.874$  which was worried about many

NOTE Confidence: 0.9303524305

00:09:51.874 --> 00:09:53.896 aspects of risk for a long time

NOTE Confidence: 0.9303524305

 $00:09:53.896 \rightarrow 00:09:55.474$  and in a very quantitative way.

NOTE Confidence: 0.9303524305

 $00:09:55.480 \longrightarrow 00:09:56.950$  And one of the and they've

NOTE Confidence: 0.9303524305

 $00:09:56.950 \longrightarrow 00:09:58.640$  sort of come up with ideas,

NOTE Confidence: 0.9303524305

00:09:58.640 --> 00:10:00.992 or the mathematical aspect of that has come NOTE Confidence: 0.9303524305

 $00:10:00.992 \rightarrow 00:10:03.718$  up with ideas about how to systematize risk.

NOTE Confidence: 0.9303524305

 $00:10:03.720 \rightarrow 00:10:06.640$  And one of the systematic ways that they

NOTE Confidence: 0.9303524305

 $00{:}10{:}06.640 \dashrightarrow 00{:}10{:}09.555$  think about is to think about tail events.

NOTE Confidence: 0.9303524305

 $00{:}10{:}09{.}560 \dashrightarrow 00{:}10{:}11{.}730$  So here we think of the distribution

NOTE Confidence: 0.9303524305

 $00:10:11.730 \longrightarrow 00:10:13.293$  of possible returns as just

NOTE Confidence: 0.9303524305

 $00:10:13.293 \longrightarrow 00:10:14.437$  some sort of histogram.

NOTE Confidence: 0.9303524305

 $00:10:14.440 \longrightarrow 00:10:16.648$  And then we the risks

NOTE Confidence: 0.9303524305

 $00:10:16.648 \longrightarrow 00:10:18.120$  that we worry about,

NOTE Confidence: 0.9303524305

 $00{:}10{:}18{.}120 \dashrightarrow 00{:}10{:}19{.}848$  the risks we care about are risks which

NOTE Confidence: 0.9303524305

 $00:10:19.848 \rightarrow 00:10:21.560$  are found typically in the lower tail.

 $00:10:21.560 \rightarrow 00:10:23.436$  They're the nastiest things that can happen.

NOTE Confidence: 0.9303524305

 $00:10:23.440 \longrightarrow 00:10:24.247$  So for instance,

NOTE Confidence: 0.9303524305

00:10:24.247 --> 00:10:26.556 many of you will know that you could

NOTE Confidence: 0.9303524305

 $00{:}10{:}26.556 \dashrightarrow 00{:}10{:}28.361$  think about there these Markovits

NOTE Confidence: 0.9303524305

 $00:10:28.361 \longrightarrow 00:10:30.471$  utilities where you add to the

NOTE Confidence: 0.9303524305

 $00{:}10{:}30{.}471 \dashrightarrow 00{:}10{:}32{.}277$  mean some fraction of the variance,

NOTE Confidence: 0.9303524305

 $00{:}10{:}32.280 \dashrightarrow 00{:}10{:}33.846$  but the variance of the distribution

NOTE Confidence: 0.9303524305

 $00:10:33.846 \rightarrow 00:10:35.637$  includes not only the lower tail but

NOTE Confidence: 0.9303524305

 $00{:}10{:}35{.}637 \dashrightarrow 00{:}10{:}37{.}275$  also the upper tail that thinks about

NOTE Confidence: 0.9303524305

 $00:10:37.320 \longrightarrow 00:10:39.120$  the whole structure of the distribution.

NOTE Confidence: 0.9303524305

 $00:10:39.120 \longrightarrow 00:10:40.245$  Whereas the things that we

NOTE Confidence: 0.9303524305

 $00:10:40.245 \longrightarrow 00:10:41.680$  worry about are the tail risks.

NOTE Confidence: 0.9303524305

 $00:10:41.680 \longrightarrow 00:10:42.480$  They're the nastiest things

NOTE Confidence: 0.9303524305

 $00{:}10{:}42.480 \dashrightarrow 00{:}10{:}43.280$  that could possibly happen.

NOTE Confidence: 0.9303524305

 $00:10:43.280 \rightarrow 00:10:45.597$  So things like and that's naturally medicine,

 $00:10:45.600 \rightarrow 00:10:48.150$  finance, engineering and maybe also

NOTE Confidence: 0.826717684545455

 $00{:}10{:}48.150 \dashrightarrow 00{:}10{:}51.080$  things like predation in animals too.

NOTE Confidence: 0.826717684545455

 $00:10:51.080 \longrightarrow 00:10:52.000$  So how does that work?

NOTE Confidence: 0.826717684545455

 $00:10:52.000 \rightarrow 00:10:53.244$  So just illustrate this

NOTE Confidence: 0.826717684545455

 $00:10:53.244 \longrightarrow 00:10:54.799$  with our very simple case,

NOTE Confidence: 0.826717684545455

 $00:10:54.800 \dashrightarrow 00:10:57.168$  the Saint Petersburg problem.

NOTE Confidence: 0.826717684545455

 $00{:}10{:}57{.}168 \dashrightarrow 00{:}10{:}59{.}195$  So yeah, So what I'm now doing is

NOTE Confidence: 0.826717684545455

 $00:10:59.195 \rightarrow 00:11:00.986$  showing you all the outcomes and their

NOTE Confidence: 0.826717684545455

 $00:11:00.986 \rightarrow 00:11:02.672$  weighted by the and their probabilities.

NOTE Confidence: 0.826717684545455

 $00:11:02.680 \rightarrow 00:11:04.714$  So this is 5050 for two EUR up to,

NOTE Confidence: 0.826717684545455

 $00{:}11{:}04.720 \dashrightarrow 00{:}11{:}07.037$  you know, gets vanishingly small with this,

NOTE Confidence: 0.826717684545455

 $00:11:07.040 \longrightarrow 00:11:08.684$  this average value outcome

NOTE Confidence: 0.826717684545455

 $00:11:08.684 \longrightarrow 00:11:09.917$  being worth Infinity.

NOTE Confidence: 0.826717684545455

00:11:09.920 --> 00:11:11.719 And if you think about the tail,

NOTE Confidence: 0.826717684545455

 $00:11:11.720 \longrightarrow 00:11:13.078$  what we might do is to say

NOTE Confidence: 0.826717684545455

 $00:11:13.078 \longrightarrow 00:11:14.360$  let's choose in this instance,

- NOTE Confidence: 0.826717684545455
- $00:11:14.360 \longrightarrow 00:11:17.440$  let's say the lower 7/8 of the distribution.
- NOTE Confidence: 0.826717684545455
- $00:11:17.440 \rightarrow 00:11:20.240$  So that's just these three dark blue bars.
- NOTE Confidence: 0.826717684545455
- $00:11:20.240 \longrightarrow 00:11:22.208$  And that cuts off the upper
- NOTE Confidence: 0.826717684545455
- 00:11:22.208 --> 00:11:23.520 1/8 of this distribution,
- NOTE Confidence: 0.826717684545455
- $00:11:23.520 \longrightarrow 00:11:24.440$  which is all the other,
- NOTE Confidence: 0.826717684545455
- $00{:}11{:}24{.}440 \dashrightarrow 00{:}11{:}26{.}660$  the much nicer outcomes you could
- NOTE Confidence: 0.826717684545455
- 00:11:26.660 --> 00:11:30.644 possibly have and and this and then
- NOTE Confidence: 0.826717684545455
- $00{:}11{:}30{.}644 \dashrightarrow 00{:}11{:}33{.}011$  this the the value of the outcome
- NOTE Confidence: 0.826717684545455
- $00{:}11{:}33{.}011$  -->  $00{:}11{:}35{.}524$  at the which is which is defined
- NOTE Confidence: 0.826717684545455
- $00:11:35.524 \rightarrow 00:11:38.039$  by this by this lower 7/8 tail.
- NOTE Confidence: 0.826717684545455
- $00:11:38.040 \longrightarrow 00:11:38.931$  That's a quantile.
- NOTE Confidence: 0.826717684545455
- $00:11:38.931 \longrightarrow 00:11:40.416$  That's just a 7/8 quantile
- NOTE Confidence: 0.826717684545455
- $00{:}11{:}40{.}416 \dashrightarrow 00{:}11{:}41{.}800$  of this distribution.
- NOTE Confidence: 0.826717684545455
- 00:11:41.800 --> 00:11:43.920 That's a risk measure itself
- NOTE Confidence: 0.826717684545455
- $00:11:43.920 \rightarrow 00:11:46.680$  called the Value at Risk or VAR,
- NOTE Confidence: 0.826717684545455

- $00:11:46.680 \longrightarrow 00:11:47.262$  shown here.
- NOTE Confidence: 0.826717684545455
- $00:11:47.262 \longrightarrow 00:11:49.299$  It turns out that the value at
- NOTE Confidence: 0.826717684545455
- $00:11:49.299 \rightarrow 00:11:51.489$  risk doesn't satisfy some of these
- NOTE Confidence: 0.826717684545455
- $00:11:51.489 \longrightarrow 00:11:53.736$  nice qualities that we expect that
- NOTE Confidence: 0.826717684545455
- $00:11:53.736 \longrightarrow 00:11:55.501$  the from the insurance industry
- NOTE Confidence: 0.826717684545455
- $00:11:55.501 \rightarrow 00:11:57.284$  nicely worked out by Artzner,
- NOTE Confidence: 0.826717684545455
- $00{:}11{:}57{.}284 \dashrightarrow 00{:}12{:}00{.}196$  Rockefeller and EUR 7 many others as well.
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}00{.}200 \dashrightarrow 00{:}12{:}02{.}288$  But a measure which also thinks
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}02{.}288 \dashrightarrow 00{:}12{:}04{.}567$  about the lower tail and does
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}04.567 \dashrightarrow 00{:}12{:}06.607$  satisfy these axioms is called
- NOTE Confidence: 0.826717684545455
- 00:12:06.607 --> 00:12:08.440 the conditional Value at Risk,
- NOTE Confidence: 0.826717684545455
- $00:12:08.440 \longrightarrow 00:12:10.420$  which is simply the average
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}10.420 \dashrightarrow 00{:}12{:}12.400$  value in that lower tail.
- NOTE Confidence: 0.826717684545455
- $00:12:12.400 \longrightarrow 00:12:13.779$  So the idea is you say I'm
- NOTE Confidence: 0.826717684545455
- $00:12:13.779 \longrightarrow 00:12:14.640$  worried about the tail,
- NOTE Confidence: 0.826717684545455
- $00:12:14.640 \rightarrow 00:12:15.846$  we have an alpha value saying

- NOTE Confidence: 0.826717684545455
- 00:12:15.846 --> 00:12:17.319 which tail am I worried about?
- NOTE Confidence: 0.826717684545455
- $00:12:17.320 \longrightarrow 00:12:18.184$  The 7/8 tail.
- NOTE Confidence: 0.826717684545455
- $00:12:18.184 \longrightarrow 00:12:20.497$  If it's the if it's the 100% tail,
- NOTE Confidence: 0.826717684545455
- $00:12:20.497 \longrightarrow 00:12:21.388$  the one tail,
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}21{.}388 \dashrightarrow 00{:}12{:}22{.}873$  it's just the whole distribution.
- NOTE Confidence: 0.826717684545455
- $00:12:22.880 \longrightarrow 00:12:23.918$  Here it's the seven eighths tail.
- NOTE Confidence: 0.826717684545455
- $00:12:23.920 \longrightarrow 00:12:25.294$  I've cut off all the really
- NOTE Confidence: 0.826717684545455
- 00:12:25.294 --> 00:12:26.843 nice outcomes and I'm left only
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}26.843 \dashrightarrow 00{:}12{:}27.999$  with the nastiest outcomes.
- NOTE Confidence: 0.826717684545455
- 00:12:28.000 --> 00:12:29.596 And as that gets more extreme,
- NOTE Confidence: 0.826717684545455
- $00:12:29.600 \longrightarrow 00:12:31.154$  I think about more and more or
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}31{.}154 \dashrightarrow 00{:}12{:}32{.}879$  less and less of the distribution,
- NOTE Confidence: 0.826717684545455
- $00:12:32.880 \rightarrow 00:12:34.280$  just more and more of the nastiest
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}34.280 \dashrightarrow 00{:}12{:}35.880$  things that can happen are going to be
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}35{.}880 \dashrightarrow 00{:}12{:}37{.}280$  the things that I imagine happening.
- NOTE Confidence: 0.826717684545455

- $00:12:37.280 \longrightarrow 00:12:38.765$  And that then defines the
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}38.765 \dashrightarrow 00{:}12{:}39.953$  average value in those,
- NOTE Confidence: 0.826717684545455
- $00:12:39.960 \longrightarrow 00:12:41.675$  defines this conditional value at
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}41.675 \dashrightarrow 00{:}12{:}44.319$  risk or this C bar value itself.
- NOTE Confidence: 0.826717684545455
- $00:12:44.320 \longrightarrow 00:12:46.560$  So how does that look?
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}46.560 \dashrightarrow 00{:}12{:}49.000$  As we reduce alpha so alpha equals one,
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}49.000 \dashrightarrow 00{:}12{:}50.200$  we have the whole distribution.
- NOTE Confidence: 0.826717684545455
- 00:12:50.200 --> 00:12:51.000 That's Infinity.
- NOTE Confidence: 0.826717684545455
- $00{:}12{:}51{.}000 \dashrightarrow 00{:}12{:}53{.}000$  If alpha is 15 sixteenths,
- NOTE Confidence: 0.826717684545455
- $00:12:53.000 \rightarrow 00:12:54.836$  we just get these four bars,
- NOTE Confidence: 0.826717684545455
- $00:12:54.840 \longrightarrow 00:12:56.320$  7/8 the three bars,
- NOTE Confidence: 0.826717684545455
- $00:12:56.320 \longrightarrow 00:12:58.872 3/4$  these two bars, and alpha is 1/2.
- NOTE Confidence: 0.826717684545455
- $00:12:58.872 \longrightarrow 00:13:00.800$  We just have this one bar left
- NOTE Confidence: 0.826717684545455
- $00{:}13{:}00{.}800 \dashrightarrow 00{:}13{:}03{.}180$  and so as alpha gets smaller we're
- NOTE Confidence: 0.826717684545455
- $00:13:03.180 \rightarrow 00:13:05.398$  getting more and more risk averse.
- NOTE Confidence: 0.826717684545455
- $00:13:05.400 \longrightarrow 00:13:06.640$  We're thinking about this lower

- NOTE Confidence: 0.826717684545455
- $00:13:06.640 \rightarrow 00:13:08.320$  tail of the outcomes that we could,
- NOTE Confidence: 0.826717684545455
- $00:13:08.320 \longrightarrow 00:13:10.320$  that we could possibly have.
- NOTE Confidence: 0.826717684545455
- $00{:}13{:}10{.}320 \dashrightarrow 00{:}13{:}12{.}912$  So formally you can write that down as
- NOTE Confidence: 0.826717684545455
- $00:13:12.912 \rightarrow 00:13:15.997$  being the expected value in this lower tails.
- NOTE Confidence: 0.826717684545455
- $00:13:16.000 \longrightarrow 00:13:16.195$  That's.
- NOTE Confidence: 0.826717684545455
- $00{:}13{:}16.195 \dashrightarrow 00{:}13{:}17.560$  Then you could just write down these,
- NOTE Confidence: 0.826717684545455
- $00:13:17.560 \longrightarrow 00:13:17.915$  these,
- NOTE Confidence: 0.826717684545455
- $00:13:17.915 \rightarrow 00:13:19.690$  this expected value underneath this
- NOTE Confidence: 0.826717684545455
- $00{:}13{:}19.690 \dashrightarrow 00{:}13{:}22.160$  quantile of the distribution.
- NOTE Confidence: 0.826717684545455
- $00:13:22.160 \longrightarrow 00:13:23.140$  But there's another way
- NOTE Confidence: 0.826717684545455
- $00:13:23.140 \longrightarrow 00:13:24.120$  of thinking about this,
- NOTE Confidence: 0.8859505666666667
- $00:13:24.120 \longrightarrow 00:13:25.612$  exactly the same calculation,
- NOTE Confidence: 0.8859505666666667
- $00{:}13{:}25.612 \dashrightarrow 00{:}13{:}27.477$  almost like a dual view,
- NOTE Confidence: 0.8859505666666667
- $00{:}13{:}27{.}480 \dashrightarrow 00{:}13{:}29{.}442$  which also relates to the way
- NOTE Confidence: 0.8859505666666667
- $00{:}13{:}29{.}442 \dashrightarrow 00{:}13{:}30{.}750$  that prospect theory controls
- NOTE Confidence: 0.8859505666666667

 $00:13:30.813 \longrightarrow 00:13:32.477$  or thinks about probabilities,

NOTE Confidence: 0.8859505666666667

 $00:13:32.480 \longrightarrow 00:13:35.128$  which is to have a what they call

NOTE Confidence: 0.8859505666666667

00:13:35.128 --> 00:13:37.280 a probability distortion function.

NOTE Confidence: 0.8859505666666667

 $00:13:37.280 \rightarrow 00:13:40.296$  So here I've also now written down explicitly

NOTE Confidence: 0.8859505666666667

 $00:13:40.296 \rightarrow 00:13:42.158$  these probabilities of these outcomes,

NOTE Confidence: 0.8859505666666667

 $00:13:42.160 \rightarrow 00:13:44.038$  so half, 1/4 and so forth.

NOTE Confidence: 0.8859505666666667

00:13:44.040 --> 00:13:46.362 And what you do with probably

NOTE Confidence: 0.8859505666666667

 $00:13:46.362 \rightarrow 00:13:48.847$  distortion is to say I'm allowed

NOTE Confidence: 0.8859505666666667

00:13:48.847 --> 00:13:51.403 to multiply the values or change

NOTE Confidence: 0.8859505666666667

 $00:13:51.403 \rightarrow 00:13:54.199$  the values of the nastier outcomes.

NOTE Confidence: 0.8859505666666667

 $00:13:54.200 \rightarrow 00:13:56.792$  I boost those probabilities and I

NOTE Confidence: 0.8859505666666667

 $00:13:56.792 \rightarrow 00:13:58.520$  suppress the higher probabilities,

NOTE Confidence: 0.8859505666666667

 $00{:}13{:}58{.}520 \dashrightarrow 00{:}14{:}03{.}002$  and the idea inside this conditional

NOTE Confidence: 0.8859505666666667

 $00{:}14{:}03{.}002 \dashrightarrow 00{:}14{:}05{.}389$  value at risk is that there's a

NOTE Confidence: 0.8859505666666667

 $00:14:05.389 \rightarrow 00:14:07.557$  maximum value of possible distortion.

NOTE Confidence: 0.8859505666666667

 $00:14:07.560 \longrightarrow 00:14:10.038$  So if my alpha value is 7/8,

- NOTE Confidence: 0.8859505666666667
- $00{:}14{:}10.040 \dashrightarrow 00{:}14{:}11.396$  which means I'm interested in this
- NOTE Confidence: 0.8859505666666667
- $00:14:11.396 \longrightarrow 00:14:12.920$  bottom 7/8 of the distribution,
- NOTE Confidence: 0.8859505666666667
- 00:14:12.920 --> 00:14:15.590 it means I'm allowed to multiply
- NOTE Confidence: 0.8859505666666667
- $00:14:15.590 \longrightarrow 00:14:17.370$  all my nastiest probabilities
- NOTE Confidence: 0.8859505666666667
- $00:14:17.449 \longrightarrow 00:14:19.640$  by 8 / 7 by 1 over alpha.
- NOTE Confidence: 0.8859505666666667
- $00:14:19.640 \longrightarrow 00:14:20.956$  And then I just keep on doing
- NOTE Confidence: 0.8859505666666667
- $00{:}14{:}20{.}956 \dashrightarrow 00{:}14{:}22{.}240$  that until I run out of Rd.,
- NOTE Confidence: 0.8859505666666667
- 00:14:22.240 --> 00:14:24.151 until I run out of probability mass
- NOTE Confidence: 0.8859505666666667
- $00:14:24.151 \longrightarrow 00:14:26.239$  because in the end it still has
- NOTE Confidence: 0.8859505666666667
- $00:14:26.239 \longrightarrow 00:14:27.754$  to be a probability distribution.
- NOTE Confidence: 0.8859505666666667
- $00:14:27.760 \longrightarrow 00:14:28.972$  So in this instance,
- NOTE Confidence: 0.8859505666666667
- $00{:}14{:}28{.}972 \dashrightarrow 00{:}14{:}31{.}163$  I multiply all these outcomes by a
- NOTE Confidence: 0.8859505666666667
- $00:14:31.163 \rightarrow 00:14:33.319$  weighting factor which is 8 sevenths here
- NOTE Confidence: 0.8859505666666667
- $00{:}14{:}33{.}320 \dashrightarrow 00{:}14{:}35{.}880$  until I then run out of run out of road.
- NOTE Confidence: 0.8859505666666667
- $00{:}14{:}35{.}880 \dashrightarrow 00{:}14{:}37{.}888$  And so then that just leaves the
- NOTE Confidence: 0.8859505666666667

 $00:14:37.888 \rightarrow 00:14:39.934$  only these three bars as being something

NOTE Confidence: 0.8859505666666667

 $00{:}14{:}39{.}934 \dashrightarrow 00{:}14{:}42{.}158$  which is contributing to my to my values.

NOTE Confidence: 0.8859505666666667

 $00{:}14{:}42{.}160 \dashrightarrow 00{:}14{:}44{.}248$  And you can see that that's an exactly

NOTE Confidence: 0.8859505666666667

 $00:14:44.248 \rightarrow 00:14:45.933$  equivalent to the three bars that we

NOTE Confidence: 0.8859505666666667

 $00{:}14{:}45{.}933 \dashrightarrow 00{:}14{:}47{.}998$  have here in terms of the value at risk.

NOTE Confidence: 0.8859505666666667

 $00{:}14{:}48.000 \dashrightarrow 00{:}14{:}50.800$  So these are equivalent ways of thinking NOTE Confidence: 0.8859505666666667

00:14:50.800 --> 00:14:52.944 about, about thinking about this,

NOTE Confidence: 0.8859505666666667

 $00:14:52.944 \rightarrow 00:14:56.120$  about the effect of these tales.

NOTE Confidence: 0.8859505666666667

00:14:56.120 --> 00:14:58.280 And they're both very, I think,

NOTE Confidence: 0.8859505666666667

 $00{:}14{:}58{.}280 \dashrightarrow 00{:}15{:}00{.}300$  very useful constructs to think

NOTE Confidence: 0.8859505666666667

 $00:15:00.300 \longrightarrow 00:15:02.553$  about the about these, these,

NOTE Confidence: 0.8859505666666667

 $00{:}15{:}02{.}553 \dashrightarrow 00{:}15{:}05{.}718$  these these nasty possible outcomes.

NOTE Confidence: 0.8859505666666667

00:15:05.720 --> 00:15:07.040 OK, so just to summarise on,

NOTE Confidence: 0.8859505666666667

00:15:07.040 --> 00:15:07.848 on Sevar,

NOTE Confidence: 0.8859505666666667

 $00:15:07.848 \rightarrow 00:15:10.676$  it's what's called a coherent risk measure.

NOTE Confidence: 0.8859505666666667

 $00{:}15{:}10.680 \dashrightarrow 00{:}15{:}12.192$  And that's these axioms I was

- NOTE Confidence: 0.8859505666666667
- $00{:}15{:}12{.}192 \dashrightarrow 00{:}15{:}13{.}992$  referring to that that we want from
- NOTE Confidence: 0.8859505666666667
- $00{:}15{:}13{.}992 \dashrightarrow 00{:}15{:}15{.}474$  insurance which have to do with
- NOTE Confidence: 0.8859505666666667
- $00{:}15{:}15{.}474 \dashrightarrow 00{:}15{:}17{.}226$  things like you want the risk to
- NOTE Confidence: 0.8859505666666667
- $00:15:17.226 \rightarrow 00:15:18.940$  decrease if we diversify your assets,
- NOTE Confidence: 0.8859505666666667
- $00:15:18.940 \dashrightarrow 00:15:20.790$  something that's what the value
- NOTE Confidence: 0.8859505666666667
- $00{:}15{:}20.790 \dashrightarrow 00{:}15{:}22.560$  at risk does not have.
- NOTE Confidence: 0.8859505666666667
- $00:15:22.560 \rightarrow 00:15:24.880$  It emphasises the lower tail.
- NOTE Confidence: 0.8859505666666667
- $00:15:24.880 \longrightarrow 00:15:26.326$  So we're always interested in the
- NOTE Confidence: 0.8859505666666667
- $00:15:26.326 \longrightarrow 00:15:27.640$  nasty things that can happen.
- NOTE Confidence: 0.8859505666666667
- 00:15:27.640 --> 00:15:28.684 If alpha's one,
- NOTE Confidence: 0.8859505666666667
- $00:15:28.684 \longrightarrow 00:15:30.076$  it's the regular mean.
- NOTE Confidence: 0.8859505666666667
- $00{:}15{:}30.080 \dashrightarrow 00{:}15{:}31.800$  We just think about the overall mean of
- NOTE Confidence: 0.8859505666666667
- $00:15:31.800 \longrightarrow 00:15:33.117$  the distribution that was the Infinity.
- NOTE Confidence: 0.8859505666666667
- $00:15:33.120 \longrightarrow 00:15:35.436$  Here, as alpha tends to zero,
- NOTE Confidence: 0.8859505666666667
- $00:15:35.440 \rightarrow 00:15:38.080$  we only care about the worst possible case,
- NOTE Confidence: 0.8859505666666667

 $00:15:38.080 \rightarrow 00:15:40.800$  which is the the minimum that can happen.

NOTE Confidence: 0.8859505666666667

 $00{:}15{:}40{.}800 \dashrightarrow 00{:}15{:}43{.}236$  And we have this nice equivalence

NOTE Confidence: 0.8859505666666667

 $00:15:43.240 \rightarrow 00:15:45.340$  to these distorted these probability

NOTE Confidence: 0.8859505666666667

 $00:15:45.340 \longrightarrow 00:15:47.020$  distortion measures in which

NOTE Confidence: 0.8859505666666667

 $00{:}15{:}47.020 \dashrightarrow 00{:}15{:}48.799$  we favour that outcomes.

NOTE Confidence: 0.8859505666666667

00:15:48.800 --> 00:15:49.040 OK,

NOTE Confidence: 0.8859505666666667

 $00{:}15{:}49{.}040 \dashrightarrow 00{:}15{:}50{.}960$  so that's when we can see the whole

NOTE Confidence: 0.8859505666666667

 $00{:}15{:}50{.}960 \dashrightarrow 00{:}15{:}52{.}196$  distribution in front of us like

NOTE Confidence: 0.8859505666666667

 $00:15:52.196 \rightarrow 00:15:53.839$  you have in a regular gambling case.

NOTE Confidence: 0.8859505666666667

00:15:53.840 --> 00:15:55.856 You know if you're just specify

NOTE Confidence: 0.8859505666666667

 $00:15:55.856 \rightarrow 00:15:58.044$  that what happens if we the way

NOTE Confidence: 0.8859505666666667

 $00:15:58.044 \rightarrow 00:15:59.976$  we started thinking about this was

NOTE Confidence: 0.8859505666666667

 $00{:}15{:}59{.}976 \dashrightarrow 00{:}16{:}01{.}807$  to think about the sequential case

NOTE Confidence: 0.8859505666666667

 $00{:}16{:}01{.}807 \dashrightarrow 00{:}16{:}03{.}968$  where we spin the coin and then we

NOTE Confidence: 0.8859505666666667

 $00:16:03.968 \longrightarrow 00:16:05.736$  either get it either get a head or

NOTE Confidence: 0.8859505666666667

 $00:16:05.736 \longrightarrow 00:16:07.914$  tail and then we can spin the coin again.

- NOTE Confidence: 0.8859505666666667
- $00:16:07.920 \rightarrow 00:16:10.040$  So how does that work in this in this domain?
- NOTE Confidence: 0.713596822857143
- $00{:}16{:}10.040 \dashrightarrow 00{:}16{:}12.208$  And you'll see a sort of surprise comes
- NOTE Confidence: 0.713596822857143
- $00:16:12.208 \rightarrow 00:16:14.272$  up that we then have to cope with.
- NOTE Confidence: 0.713596822857143
- $00{:}16{:}14.272 \dashrightarrow 00{:}16{:}16.640$  So here we started off with the first
- NOTE Confidence: 0.713596822857143
- $00{:}16{:}16{.}708 \dashrightarrow 00{:}16{:}18{.}985$  flip of the coin and so these you know
- NOTE Confidence: 0.713596822857143
- 00:16:18.985 --> 00:16:21.279 if we get the tail we get to €2.00,
- NOTE Confidence: 0.713596822857143
- $00:16:21.280 \longrightarrow 00:16:23.216$  we get the head, we get a chance
- NOTE Confidence: 0.713596822857143
- $00:16:23.216 \rightarrow 00:16:25.411$  to carry on to know and then we get
- NOTE Confidence: 0.713596822857143
- $00{:}16{:}25{.}411 \dashrightarrow 00{:}16{:}27{.}359$  to chances to spin the coin again.
- NOTE Confidence: 0.713596822857143
- $00:16:27.360 \longrightarrow 00:16:29.296$  So and then if you spin the coin
- NOTE Confidence: 0.713596822857143
- 00:16:29.296 --> 00:16:30.950 again you get to know again if
- NOTE Confidence: 0.713596822857143
- 00:16:30.950 --> 00:16:32.595 you get a tail you get €4.00.
- NOTE Confidence: 0.713596822857143
- $00:16:32.600 \longrightarrow 00:16:33.160$  If you get the head,
- NOTE Confidence: 0.713596822857143
- 00:16:33.160 --> 00:16:34.216 you get, excuse me,
- NOTE Confidence: 0.713596822857143
- $00:16:34.216 \longrightarrow 00:16:36.200$  the chance to spin the coin again,
- NOTE Confidence: 0.713596822857143

 $00:16:36.200 \longrightarrow 00:16:36.880$  You spin the coin again,

NOTE Confidence: 0.713596822857143

00:16:36.880 --> 00:16:39.535 you get  ${\in}8$  and then and so forth and

NOTE Confidence: 0.713596822857143

 $00:16:39.535 \rightarrow 00:16:42.358$  just carries on down and down and down.

NOTE Confidence: 0.713596822857143

 $00:16:42.360 \longrightarrow 00:16:44.502$  So as I mentioned now what we want to

NOTE Confidence: 0.713596822857143

 $00{:}16{:}44{.}502 \dashrightarrow 00{:}16{:}46{.}665$  do when we're thinking about the the

NOTE Confidence: 0.713596822857143

 $00:16:46.665 \rightarrow 00:16:49.040$  risk is we distort our probabilities.

NOTE Confidence: 0.713596822857143

 $00:16:49.040 \longrightarrow 00:16:50.798$  So we start at the beginning.

NOTE Confidence: 0.713596822857143

00:16:50.800 --> 00:16:53.344 We say OK well now I said that

NOTE Confidence: 0.713596822857143

 $00:16:53.344 \rightarrow 00:16:55.388$  if alpha is 7 / 7 / 8,

NOTE Confidence: 0.713596822857143

 $00{:}16{:}55{.}388 \dashrightarrow 00{:}16{:}57{.}044$  we get to distort the properties

NOTE Confidence: 0.713596822857143

 $00:16:57.044 \longrightarrow 00:16:58.488$  by 8 by by 8 / 7.

NOTE Confidence: 0.713596822857143

 $00:16:58.488 \longrightarrow 00:17:00.328$  Then we can distort those

NOTE Confidence: 0.713596822857143

 $00{:}17{:}00{.}328 \dashrightarrow 00{:}17{:}01{.}800$  properties some maximum value,

NOTE Confidence: 0.713596822857143

 $00:17:01.800 \longrightarrow 00:17:03.264$  which means that we make it

NOTE Confidence: 0.713596822857143

 $00:17:03.264 \rightarrow 00:17:05.026$  more likely to get the tail and

NOTE Confidence: 0.713596822857143

 $00:17:05.026 \rightarrow 00:17:06.478$  less likely to get the head.
- NOTE Confidence: 0.713596822857143
- $00:17:06.480 \longrightarrow 00:17:08.096$  So we make this bar the the
- NOTE Confidence: 0.713596822857143
- $00:17:08.096 \rightarrow 00:17:09.487$  left bar slightly higher and
- NOTE Confidence: 0.713596822857143
- $00:17:09.487 \longrightarrow 00:17:11.037$  the right bar slightly lower.
- NOTE Confidence: 0.713596822857143
- 00:17:11.040 --> 00:17:12.345 That's our distortion.
- NOTE Confidence: 0.713596822857143
- 00:17:12.345 --> 00:17:14.520 Our risk sensitivity has said,
- NOTE Confidence: 0.713596822857143
- $00:17:14.520 \longrightarrow 00:17:16.230$  OK, we think that even though
- NOTE Confidence: 0.713596822857143
- $00:17:16.230 \longrightarrow 00:17:17.720$  it should really be 5050,
- NOTE Confidence: 0.713596822857143
- $00:17:17.720 \longrightarrow 00:17:20.000$  the the real answer is 5050.
- NOTE Confidence: 0.713596822857143
- $00{:}17{:}20.000 \dashrightarrow 00{:}17{:}22.316$  In our subjective evaluation of this,
- NOTE Confidence: 0.713596822857143
- $00:17:22.320 \rightarrow 00:17:24.301$  we boost the nasty one and and
- NOTE Confidence: 0.713596822857143
- $00:17:24.301 \rightarrow 00:17:25.993$  slightly suppress the the nice
- NOTE Confidence: 0.713596822857143
- $00{:}17{:}25{.}993 \dashrightarrow 00{:}17{:}27{.}820$  one and the amount that we suppress
- NOTE Confidence: 0.713596822857143
- $00:17:27.881 \longrightarrow 00:17:30.032$  it by then though is is is also
- NOTE Confidence: 0.713596822857143
- 00:17:30.032 --> 00:17:31.960 reflected by the to to make sure
- NOTE Confidence: 0.713596822857143
- $00:17:31.960 \longrightarrow 00:17:34.000$  that the property is also up to 1.
- NOTE Confidence: 0.713596822857143

- $00:17:34.000 \longrightarrow 00:17:35.928$  So you might think it'd be
- NOTE Confidence: 0.713596822857143
- $00{:}17{:}35{.}928 \dashrightarrow 00{:}17{:}36{.}552$  very natural thing.
- NOTE Confidence: 0.713596822857143
- 00:17:36.552 --> 00:17:36.760 Well,
- NOTE Confidence: 0.713596822857143
- $00:17:36.760 \longrightarrow 00:17:38.044$  now we have another choice and
- NOTE Confidence: 0.713596822857143
- $00{:}17{:}38.044 \dashrightarrow 00{:}17{:}39.760$  we do the same distortion again,
- NOTE Confidence: 0.713596822857143
- 00:17:39.760 --> 00:17:41.200 and then we do the same
- NOTE Confidence: 0.713596822857143
- $00:17:41.200 \longrightarrow 00:17:42.520$  distortion again and so forth.
- NOTE Confidence: 0.713596822857143
- $00:17:42.520 \longrightarrow 00:17:46.072$  But that does actually
- NOTE Confidence: 0.713596822857143
- 00:17:46.072 --> 00:17:48.440 generate a a version of sebar,
- NOTE Confidence: 0.713596822857143
- $00:17:48.440 \longrightarrow 00:17:49.675$  but it doesn't generate the
- NOTE Confidence: 0.713596822857143
- $00{:}17{:}49.675 \dashrightarrow 00{:}17{:}51.263$  version of sebar that we started
- NOTE Confidence: 0.713596822857143
- $00:17:51.263 \rightarrow 00:17:52.479$  off with thinking about.
- NOTE Confidence: 0.713596822857143
- $00{:}17{:}52{.}480 \dashrightarrow 00{:}17{:}54{.}405$  So here I say what you want to do is just
- NOTE Confidence: 0.713596822857143
- $00{:}17{:}54{.}405 \dashrightarrow 00{:}17{:}56{.}078$  look only at the lower possible tail.
- NOTE Confidence: 0.713596822857143
- $00:17:56.080 \longrightarrow 00:17:57.767$  You can see that if we just
- NOTE Confidence: 0.713596822857143
- $00:17:57.767 \rightarrow 00:17:59.119$  keep on distorting by the same

- NOTE Confidence: 0.713596822857143
- $00:17:59.120 \longrightarrow 00:18:00.496$  fraction every single time,
- NOTE Confidence: 0.713596822857143
- $00:18:00.496 \longrightarrow 00:18:03.309$  then we're going to actually get instead of
- NOTE Confidence: 0.713596822857143
- $00:18:03.309 \rightarrow 00:18:05.717$  getting distorting the the tails like this,
- NOTE Confidence: 0.713596822857143
- $00:18:05.720 \rightarrow 00:18:07.394$  we're actually going to get a
- NOTE Confidence: 0.713596822857143
- $00:18:07.394 \rightarrow 00:18:09.479$  contribution from all the possible outcomes.
- NOTE Confidence: 0.713596822857143
- $00{:}18{:}09{.}480 \dashrightarrow 00{:}18{:}12{.}049$  But now each of the outcomes instead
- NOTE Confidence: 0.713596822857143
- $00:18:12.049 \rightarrow 00:18:14.478$  of instead of being boosted by,
- NOTE Confidence: 0.713596822857143
- 00:18:14.480 --> 00:18:16.550 instead of being going down like
- NOTE Confidence: 0.713596822857143
- $00:18:16.550 \rightarrow 00:18:18.758$  one like a half 1/4 and so forth,
- NOTE Confidence: 0.713596822857143
- 00:18:18.760 --> 00:18:19.880 it tends to go,
- NOTE Confidence: 0.713596822857143
- $00:18:19.880 \longrightarrow 00:18:21.280$  it actually goes down like
- NOTE Confidence: 0.713596822857143
- $00{:}18{:}21{.}280 \dashrightarrow 00{:}18{:}22{.}320$  3737 squared and so forth.
- NOTE Confidence: 0.713596822857143
- $00{:}18{:}22{.}320 \dashrightarrow 00{:}18{:}24{.}320$  There's a sort of technical reason for that.
- NOTE Confidence: 0.713596822857143
- $00{:}18{:}24{.}320 \dashrightarrow 00{:}18{:}25{.}748$  You can see that that doesn't
- NOTE Confidence: 0.713596822857143
- $00:18:25.748 \longrightarrow 00:18:27.165$  have the property that I talked
- NOTE Confidence: 0.713596822857143

 $00:18:27.165 \longrightarrow 00:18:28.401$  about in which we just sort

NOTE Confidence: 0.713596822857143

 $00{:}18{:}28{.}401 \dashrightarrow 00{:}18{:}29{.}600$  of slice off this bottom,

NOTE Confidence: 0.713596822857143

 $00:18:29.600 \rightarrow 00:18:31.598$  this bottom aspect of the distribution.

NOTE Confidence: 0.738826960625

 $00:18:31.600 \longrightarrow 00:18:33.193$  It is a, it is a risk measure that

NOTE Confidence: 0.738826960625

 $00{:}18{:}33{.}193 \dashrightarrow 00{:}18{:}34{.}757$  we some that we could also use.

NOTE Confidence: 0.738826960625

00:18:34.760 --> 00:18:38.396 And in fact in many cases it's a very,

NOTE Confidence: 0.738826960625

00:18:38.400 - 00:18:40.758 it's a very severe risk measure.

NOTE Confidence: 0.738826960625

 $00:18:40.760 \rightarrow 00:18:42.278$  It's a more severe risk measure.

NOTE Confidence: 0.738826960625

00:18:42.280 --> 00:18:44.359 But the measure we wanted to talk

NOTE Confidence: 0.738826960625

00:18:44.359 --> 00:18:45.936 about instead actually requires us to

NOTE Confidence: 0.738826960625

 $00{:}18{:}45{.}936 \dashrightarrow 00{:}18{:}47{.}400$  do a different sort of calculation,

NOTE Confidence: 0.738826960625

 $00{:}18{:}47{.}400 \dashrightarrow 00{:}18{:}49{.}563$  which I think is really important for

NOTE Confidence: 0.738826960625

 $00{:}18{:}49{.}563 \dashrightarrow 00{:}18{:}51{.}244$  thinking about how risk processing

NOTE Confidence: 0.738826960625

 $00{:}18{:}51{.}244 \dashrightarrow 00{:}18{:}53{.}314$  works in this this sequential way.

NOTE Confidence: 0.738826960625

 $00:18:53.320 \rightarrow 00:18:56.834$  So instead what happens is after we've,

NOTE Confidence: 0.738826960625

 $00:18:56.840 \rightarrow 00:18:58.196$  after we've boosted the, after we,

- NOTE Confidence: 0.738826960625
- $00:18:58.200 \rightarrow 00:19:00.356$  we're lucky and we we got ahead.
- NOTE Confidence: 0.738826960625
- $00{:}19{:}00{.}360 \dashrightarrow 00{:}19{:}02{.}240$  At this point, if you think about it,
- NOTE Confidence: 0.738826960625
- $00:19:02.240 \longrightarrow 00:19:03.675$  we're trying to accumulate the
- NOTE Confidence: 0.738826960625
- $00:19:03.675 \longrightarrow 00:19:05.733$  amount of luck that we can have
- NOTE Confidence: 0.738826960625
- $00{:}19{:}05{.}733 \dashrightarrow 00{:}19{:}07{.}437$  over a whole sequence of choices.
- NOTE Confidence: 0.738826960625
- $00:19:07.440 \longrightarrow 00:19:09.120$  This is the sequential aspect.
- NOTE Confidence: 0.738826960625
- $00:19:09.120 \rightarrow 00:19:11.595$  And if we start off and we're already lucky,
- NOTE Confidence: 0.738826960625
- $00:19:11.600 \rightarrow 00:19:12.940$  it means we've already consumed
- NOTE Confidence: 0.738826960625
- $00:19:12.940 \longrightarrow 00:19:14.280$  some of our good luck.
- NOTE Confidence: 0.738826960625
- $00{:}19{:}14.280 \dashrightarrow 00{:}19{:}16.305$  Which means that now we have to be a
- NOTE Confidence: 0.738826960625
- $00:19:16.305 \longrightarrow 00:19:18.092$  little bit more risk averse in the
- NOTE Confidence: 0.738826960625
- 00:19:18.092 --> 00:19:19.970 future in order that the total amount
- NOTE Confidence: 0.738826960625
- 00:19:19.970 --> 00:19:22.171 of luck that we're expecting to get or
- NOTE Confidence: 0.738826960625
- $00{:}19{:}22{.}171 \dashrightarrow 00{:}19{:}24{.}208$  that good or bad luck we're expecting
- NOTE Confidence: 0.738826960625
- $00:19:24.208 \rightarrow 00:19:27.077$  to get is pegged to right at the beginning.
- NOTE Confidence: 0.738826960625

- $00:19:27.080 \longrightarrow 00:19:28.520$  So that means that now
- NOTE Confidence: 0.738826960625
- 00:19:28.520 --> 00:19:29.960 having been this much risk,
- NOTE Confidence: 0.738826960625
- $00:19:29.960 \rightarrow 00:19:31.514$  having been this lucky in this case,
- NOTE Confidence: 0.738826960625
- $00:19:31.520 \rightarrow 00:19:33.680$  we got our first tail,
- NOTE Confidence: 0.738826960625
- $00:19:33.680 \longrightarrow 00:19:35.236$  we got Einstein first,
- NOTE Confidence: 0.738826960625
- $00{:}19{:}35{.}236 \dashrightarrow 00{:}19{:}39{.}240$  we now have to be a more risk averse.
- NOTE Confidence: 0.738826960625
- $00:19:39.240 \longrightarrow 00:19:41.922$  So alpha started out at 7/8 and now it
- NOTE Confidence: 0.738826960625
- $00:19:41.922 \rightarrow 00:19:44.318$  turns out that it has to be boosted.
- NOTE Confidence: 0.738826960625
- $00{:}19{:}44{.}320 \dashrightarrow 00{:}19{:}45{.}172$  It has to be.
- NOTE Confidence: 0.738826960625
- $00:19:45.172 \longrightarrow 00:19:46.237$  The amount of risk aversion
- NOTE Confidence: 0.738826960625
- $00:19:46.237 \rightarrow 00:19:47.160$  has to be boosted,
- NOTE Confidence: 0.738826960625
- $00:19:47.160 \longrightarrow 00:19:49.374$  which means that the alpha value
- NOTE Confidence: 0.738826960625
- $00:19:49.374 \longrightarrow 00:19:51.758$  decreases from being 7/8 to being 3/4.
- NOTE Confidence: 0.738826960625
- $00:19:51.760 \rightarrow 00:19:54.800$  So now when we do our probability distortion,
- NOTE Confidence: 0.738826960625
- 00:19:54.800 --> 00:19:58.104 we're now we distort the we now make
- NOTE Confidence: 0.738826960625
- $00:19:58.104 \rightarrow 00:20:00.248$  it even more likely now with Four

- NOTE Confidence: 0.738826960625
- $00:20:00.248 \longrightarrow 00:20:02.036$  Thirds more likely rather than rather
- NOTE Confidence: 0.738826960625
- $00:20:02.036 \longrightarrow 00:20:04.052$  than 8 sevenths more likely that we're
- NOTE Confidence: 0.738826960625
- $00:20:04.052 \rightarrow 00:20:05.996$  going to get the unfortunate outcome,
- NOTE Confidence: 0.738826960625
- 00:20:06.000 00:20:09.920 which is the the the tail in this case,
- NOTE Confidence: 0.738826960625
- $00:20:09.920 \longrightarrow 00:20:11.460$  and we make it less likely that
- NOTE Confidence: 0.738826960625
- $00:20:11.460 \longrightarrow 00:20:12.800$  we're going to get the head.
- NOTE Confidence: 0.738826960625
- 00:20:12.800 --> 00:20:14.320 And now if we do get the head,
- NOTE Confidence: 0.738826960625
- $00:20:14.320 \longrightarrow 00:20:15.600$  we've been lucky again.
- NOTE Confidence: 0.738826960625
- 00:20:15.600 --> 00:20:18.160 We've consumed even more of our good luck.
- NOTE Confidence: 0.738826960625
- $00:20:18.160 \longrightarrow 00:20:20.288$  And so now the we become even
- NOTE Confidence: 0.738826960625
- 00:20:20.288 --> 00:20:21.200 more risk averse.
- NOTE Confidence: 0.738826960625
- $00:20:21.200 \rightarrow 00:20:24.520$  The alpha value goes down further to 1/2.
- NOTE Confidence: 0.738826960625
- $00{:}20{:}24{.}520 \dashrightarrow 00{:}20{:}26{.}400$  And so now when we do the distortion
- NOTE Confidence: 0.738826960625
- $00{:}20{:}26{.}400 \dashrightarrow 00{:}20{:}28{.}439$  it turns out we do maximal distortion.
- NOTE Confidence: 0.738826960625
- $00:20:28.440 \longrightarrow 00:20:31.380$  So now the tail instead of being
- NOTE Confidence: 0.738826960625

 $00:20:31.380 \longrightarrow 00:20:34.161$  probably 5050 in our minds it's gone

NOTE Confidence: 0.738826960625

 $00:20:34.161 \longrightarrow 00:20:36.357$  up to the probably has gone up to 1.

NOTE Confidence: 0.738826960625

 $00:20:36.360 \rightarrow 00:20:37.200$  The probably getting the head,

NOTE Confidence: 0.738826960625

 $00:20:37.200 \rightarrow 00:20:38.395$  the sorry the probably getting

NOTE Confidence: 0.738826960625

 $00{:}20{:}38{.}395 \dashrightarrow 00{:}20{:}39{.}880$  the head has gone to zero.

NOTE Confidence: 0.738826960625

 $00{:}20{:}39{.}880 \dashrightarrow 00{:}20{:}41{.}280$  And that is then means that we

NOTE Confidence: 0.738826960625

 $00:20:41.280 \longrightarrow 00:20:42.240$  therefore can never get the,

NOTE Confidence: 0.738826960625

 $00:20:42.240 \rightarrow 00:20:45.273$  we never get any more further down the tree.

NOTE Confidence: 0.738826960625

 $00{:}20{:}45{.}280 \dashrightarrow 00{:}20{:}48{.}094$  And so in order to compute the

NOTE Confidence: 0.738826960625

 $00:20:48.094 \rightarrow 00:20:49.760$  Sivar in this way,

NOTE Confidence: 0.738826960625

 $00{:}20{:}49.760 \dashrightarrow 00{:}20{:}51.874$  when we think about a sequential problem,

NOTE Confidence: 0.738826960625

 $00:20:51.880 \rightarrow 00:20:55.000$  we have to keep on revaluing our alphas.

NOTE Confidence: 0.738826960625

00:20:55.000 --> 00:20:55.948 If we're lucky,

NOTE Confidence: 0.738826960625

00:20:55.948 --> 00:20:58.160 it means we become more risk averse,

NOTE Confidence: 0.738826960625

 $00:20:58.160 \longrightarrow 00:20:59.640$  which means alpha gets lower.

NOTE Confidence: 0.738826960625

00:20:59.640 --> 00:21:00.357 If we're unlucky,

- NOTE Confidence: 0.738826960625
- $00:21:00.357 \longrightarrow 00:21:02.030$  it means in fact we can become
- NOTE Confidence: 0.738826960625
- $00:21:02.087 \longrightarrow 00:21:03.671$  more risk seeking in the future
- NOTE Confidence: 0.738826960625
- 00:21:03.671 --> 00:21:04.727 because we're sort of
- NOTE Confidence: 0.866114429
- 00:21:04.783 --> 00:21:06.615 trying to peg the total amount of risk
- NOTE Confidence: 0.866114429
- $00{:}21{:}06.615 \dashrightarrow 00{:}21{:}09.080$  that we suffer along the whole path
- NOTE Confidence: 0.866114429
- $00:21:09.080 \rightarrow 00:21:11.718$  along the way towards towards the end.
- NOTE Confidence: 0.866114429
- 00:21:11.718 --> 00:21:13.102 So there's this notion
- NOTE Confidence: 0.866114429
- $00:21:13.102 \longrightarrow 00:21:14.960$  here of pre commitment.
- NOTE Confidence: 0.866114429
- $00{:}21{:}14.960 \dashrightarrow 00{:}21{:}17.480$  When we start the problem we think how
- NOTE Confidence: 0.866114429
- 00:21:17.480 --> 00:21:19.565 much risk are we willing to endure
- NOTE Confidence: 0.866114429
- $00{:}21{:}19.565 \dashrightarrow 00{:}21{:}22.303$  or and then as we then are lucky or
- NOTE Confidence: 0.866114429
- 00:21:22.303 --> 00:21:24.825 unlucky we don't have to adjust the
- NOTE Confidence: 0.866114429
- $00{:}21{:}24{.}825 \dashrightarrow 00{:}21{:}29{.}466$  way that we we endure this the way
- NOTE Confidence: 0.866114429
- $00{:}21{:}29{.}466 \dashrightarrow 00{:}21{:}32{.}196$  that we evaluate future outcomes.
- NOTE Confidence: 0.866114429
- $00{:}21{:}32{.}200 \dashrightarrow 00{:}21{:}33{.}992$  So in pre committed C bar we're
- NOTE Confidence: 0.866114429

00:21:33.992 --> 00:21:35.398 privileging a start saying we're

NOTE Confidence: 0.866114429

 $00{:}21{:}35{.}398 \dashrightarrow 00{:}21{:}37{.}144$  saying this is where we're defining

NOTE Confidence: 0.866114429

 $00:21:37.144 \rightarrow 00:21:38.765$  risk from because then because

NOTE Confidence: 0.866114429

00:21:38.765 -> 00:21:40.400 we're then revaluing our alpha,

NOTE Confidence: 0.866114429

00:21:40.400 --> 00:21:41.580 our risk aversion in order

NOTE Confidence: 0.866114429

 $00:21:41.580 \longrightarrow 00:21:42.760$  to peg where we're going.

NOTE Confidence: 0.866114429

 $00:21:42.760 \longrightarrow 00:21:44.153$  So you might think of that as

NOTE Confidence: 0.866114429

 $00:21:44.153 \longrightarrow 00:21:45.855$  being like a home or a or a nest

NOTE Confidence: 0.866114429

 $00{:}21{:}45.855 \dashrightarrow 00{:}21{:}47.040$  for an animal for instance.

NOTE Confidence: 0.866114429

 $00:21:47.040 \rightarrow 00:21:48.839$  And then we have to change alpha

NOTE Confidence: 0.866114429

 $00:21:48.839 \longrightarrow 00:21:51.211$  and the way we change it is like a

NOTE Confidence: 0.866114429

 $00:21:51.211 \rightarrow 00:21:52.960$  justified form of the gambler's fallacy.

NOTE Confidence: 0.866114429

00:21:52.960 --> 00:21:54.040 If you're unlucky,

NOTE Confidence: 0.866114429

 $00:21:54.040 \rightarrow 00:21:55.558$  you've been unlucky for a while,

NOTE Confidence: 0.866114429

 $00:21:55.560 \longrightarrow 00:21:57.198$  then you then in some sense

NOTE Confidence: 0.866114429

00:21:57.198 --> 00:21:58.680 you can be more risk.

- NOTE Confidence: 0.866114429
- 00:21:58.680 --> 00:22:00.024 You can be more a little

00:22:00.024 --> 00:22:00.920 bit more risk seeking,

NOTE Confidence: 0.866114429

00:22:00.920 --> 00:22:02.480 you mean less risk averse.

NOTE Confidence: 0.866114429

 $00{:}22{:}02{.}480 \dashrightarrow 00{:}22{:}04{.}195$  If you've been lucky then you're expecting

NOTE Confidence: 0.866114429

 $00:22:04.195 \longrightarrow 00:22:05.997$  to be more unlucky in the future,

NOTE Confidence: 0.866114429

 $00{:}22{:}06.000 \dashrightarrow 00{:}22{:}08.191$  so therefore your alpha decreases in that

NOTE Confidence: 0.866114429

00:22:08.191 - 00:22:10.530 way in order to peg the total amount

NOTE Confidence: 0.866114429

 $00:22:10.530 \rightarrow 00:22:12.678$  of risk you have along a whole path.

NOTE Confidence: 0.866114429

 $00:22:12.680 \rightarrow 00:22:15.277$  Alpha equals zero and one are special,

NOTE Confidence: 0.866114429

 $00:22:15.280 \longrightarrow 00:22:17.920$  so alpha equals one is means.

NOTE Confidence: 0.866114429

 $00:22:17.920 \longrightarrow 00:22:19.312$  It's just the mean and then

NOTE Confidence: 0.866114429

 $00{:}22{:}19{.}312 \dashrightarrow 00{:}22{:}20{.}240$  you never revalue that.

NOTE Confidence: 0.866114429

 $00:22:20.240 \longrightarrow 00:22:21.500$  You just keep on without

NOTE Confidence: 0.866114429

 $00:22:21.500 \longrightarrow 00:22:22.760$  value of alpha equals one,

NOTE Confidence: 0.866114429

 $00{:}22{:}22{.}760 \dashrightarrow 00{:}22{:}24{.}424$  alpha equals 0 is the minimum and you

 $00:22:24.424 \longrightarrow 00:22:25.923$  stick with that too because you can

NOTE Confidence: 0.866114429

 $00{:}22{:}25{.}923 \dashrightarrow 00{:}22{:}27{.}439$  never you can never get more risk.

NOTE Confidence: 0.866114429

00:22:27.440 --> 00:22:28.590 You know you you basically

NOTE Confidence: 0.866114429

00:22:28.590 --> 00:22:30.080 if you you've run out of Rd.

NOTE Confidence: 0.866114429

00:22:30.080 --> 00:22:31.805 you're always thinking about the

NOTE Confidence: 0.866114429

 $00{:}22{:}31{.}805 \dashrightarrow 00{:}22{:}33{.}530$  worst possible outcome that can NOTE Confidence: 0.866114429

 $00:22:33.594 \rightarrow 00:22:35.253$  ever happen and so you have to

NOTE Confidence: 0.866114429

00:22:35.253 --> 00:22:37.166 then in order to do this you don't

NOTE Confidence: 0.866114429

 $00{:}22{:}37.166 \dashrightarrow 00{:}22{:}38.488$  have to have this either.

NOTE Confidence: 0.866114429

00:22:38.488 --> 00:22:40.936 So monitor how much luck you've

NOTE Confidence: 0.866114429

 $00:22:40.936 \longrightarrow 00:22:43.681$  had along a path or we just think NOTE Confidence: 0.866114429

 $00{:}22{:}43.681$  -->  $00{:}22{:}45.127$  about changing the value of alpha NOTE Confidence: 0.866114429

 $00{:}22{:}45{.}127 \dashrightarrow 00{:}22{:}47{.}053$  as we go along and then we make it NOTE Confidence: 0.866114429

00:22:47.053 --> 00:22:49.058 in the way I showed you for Saint

NOTE Confidence: 0.866114429

00:22:49.058 --> 00:22:50.543 Petersburg problem where we make

NOTE Confidence: 0.866114429

 $00{:}22{:}50{.}543 \dashrightarrow 00{:}22{:}51{.}935$  alpha where there we made alpha

 $00{:}22{:}51{.}935 \dashrightarrow 00{:}22{:}53{.}268$  smaller and smaller because we kept

NOTE Confidence: 0.866114429

 $00{:}22{:}53{.}268 \dashrightarrow 00{:}22{:}54{.}633$  on being lucky and lucky and lucky.

NOTE Confidence: 0.866114429

00:22:54.640 - 00:22:56.117 Every time we got the head until

NOTE Confidence: 0.866114429

 $00{:}22{:}56{.}117 \dashrightarrow 00{:}22{:}57{.}928$  the end we ran out of road and then

NOTE Confidence: 0.866114429

 $00:22:57.928 \longrightarrow 00:22:59.756$  we ran out of the at the after the,

NOTE Confidence: 0.866114429

 $00:22:59.760 \longrightarrow 00:23:01.160$  you know, evaluation of this,

NOTE Confidence: 0.866114429

 $00{:}23{:}01{.}160 \dashrightarrow 00{:}23{:}05{.}318$  we ran out of at the third outcome.

NOTE Confidence: 0.866114429

 $00{:}23{:}05{.}320 \dashrightarrow 00{:}23{:}07{.}368$  So how does that look in a more

NOTE Confidence: 0.866114429

 $00:23:07.368 \longrightarrow 00:23:08.718$  conventional sort of random walk?

NOTE Confidence: 0.866114429

 $00{:}23{:}08{.}720 \dashrightarrow 00{:}23{:}11{.}051$  So here's a simple random walk where

NOTE Confidence: 0.866114429

 $00:23:11.051 \rightarrow 00:23:14.514$  we have a agent which can go left or right,

NOTE Confidence: 0.866114429

 $00:23:14.520 \longrightarrow 00:23:16.277$  or try to stay where it is.

NOTE Confidence: 0.866114429

 $00:23:16.280 \longrightarrow 00:23:17.464$  There are two rewards,

NOTE Confidence: 0.866114429

 $00{:}23{:}17.464 \dashrightarrow 00{:}23{:}19.240$  one on the right hand side,

NOTE Confidence: 0.866114429

00:23:19.240 --> 00:23:21.480 a small reward worth +11,

 $00:23:21.480 \longrightarrow 00:23:23.517$  on the left hand side worth +2.

NOTE Confidence: 0.866114429

00:23:23.520 --> 00:23:25.320 And then here's one of Chris's Lava pits,

NOTE Confidence: 0.866114429

 $00:23:25.320 \longrightarrow 00:23:26.216$  which is,

NOTE Confidence: 0.866114429

 $00:23:26.216 \longrightarrow 00:23:27.560$  which is threatening.

NOTE Confidence: 0.866114429

 $00:23:27.560 \longrightarrow 00:23:29.504$  And you have again a small

NOTE Confidence: 0.866114429

 $00:23:29.504 \longrightarrow 00:23:30.800$  probability of an error

NOTE Confidence: 0.952537403636364

 $00:23:30.800 \longrightarrow 00:23:33.306$  in the choices. So here if you

NOTE Confidence: 0.952537403636364

00:23:33.306 --> 00:23:34.920 have completely uniform choice,

NOTE Confidence: 0.952537403636364

 $00:23:34.920 \longrightarrow 00:23:36.453$  you go left, right or try to

NOTE Confidence: 0.952537403636364

 $00{:}23{:}36{.}453 \dashrightarrow 00{:}23{:}38{.}078$  stay where you are equally often.

NOTE Confidence: 0.952537403636364

 $00:23:38.080 \longrightarrow 00:23:39.914$  Then if this is our start state,

NOTE Confidence: 0.952537403636364

 $00{:}23{:}39{.}920 \dashrightarrow 00{:}23{:}41{.}678$  this is the distribution of outcomes

NOTE Confidence: 0.952537403636364

 $00:23:41.678 \rightarrow 00:23:43.386$  you would actually get with some

NOTE Confidence: 0.952537403636364

 $00:23:43.386 \longrightarrow 00:23:44.838$  with a discount factor of .9.

NOTE Confidence: 0.952537403636364

 $00:23:44.840 \longrightarrow 00:23:46.128$  So then because in the end you

NOTE Confidence: 0.952537403636364

 $00:23:46.128 \longrightarrow 00:23:47.437$  get trapped by the lava pit and

- NOTE Confidence: 0.952537403636364
- $00:23:47.437 \rightarrow 00:23:48.511$  then that's the end of the,
- NOTE Confidence: 0.952537403636364
- $00:23:48.520 \longrightarrow 00:23:49.678$  that's the end of the game.
- NOTE Confidence: 0.952537403636364
- $00:23:49.680 \rightarrow 00:23:51.556$  And so here from the stored state,
- NOTE Confidence: 0.952537403636364
- $00:23:51.560 \longrightarrow 00:23:52.584$  this is the distribution.
- NOTE Confidence: 0.952537403636364
- $00:23:52.584 \rightarrow 00:23:54.120$  So we're thinking about C bar,
- NOTE Confidence: 0.952537403636364
- $00:23:54.120 \longrightarrow 00:23:55.192$  We're obviously thinking about
- NOTE Confidence: 0.952537403636364
- $00:23:55.192 \rightarrow 00:23:56.800$  the tails of this PC bar.
- NOTE Confidence: 0.952537403636364
- $00:23:56.800 \rightarrow 00:23:59.680$  We're thinking about the tails of
- NOTE Confidence: 0.952537403636364
- $00{:}23{:}59{.}680 \dashrightarrow 00{:}24{:}01{.}588$  this distribution to think about.
- NOTE Confidence: 0.952537403636364
- $00:24:01.588 \longrightarrow 00:24:03.484$  So how can we evaluate the
- NOTE Confidence: 0.952537403636364
- $00:24:03.484 \longrightarrow 00:24:05.197$  locations in this in this world?
- NOTE Confidence: 0.952537403636364
- $00{:}24{:}05{.}200 \dashrightarrow 00{:}24{:}07{.}881$  Well, if you have the this uniform
- NOTE Confidence: 0.952537403636364
- $00:24:07.881 \rightarrow 00:24:10.720$  policy and here our alpha value is 1.
- NOTE Confidence: 0.952537403636364
- 00:24:10.720 --> 00:24:12.544 So we're just a regular reinforcement
- NOTE Confidence: 0.952537403636364
- $00:24:12.544 \rightarrow 00:24:14.053$  learner thinking about the average
- NOTE Confidence: 0.952537403636364

 $00:24:14.053 \rightarrow 00:24:15.517$  value of each of the states.

NOTE Confidence: 0.952537403636364

 $00{:}24{:}15{.}520 \dashrightarrow 00{:}24{:}17{.}096$  So you can see that here I've shown

NOTE Confidence: 0.952537403636364

 $00:24:17.096 \rightarrow 00:24:18.914$  them in colour from -10 up to plus 10.

NOTE Confidence: 0.952537403636364

 $00:24:18.920 \rightarrow 00:24:21.008$  So the ones on the right are relatively

NOTE Confidence: 0.952537403636364

 $00{:}24{:}21.008 \dashrightarrow 00{:}24{:}22.645$  good because you have this reward of

NOTE Confidence: 0.952537403636364

 $00:24:22.645 \rightarrow 00:24:24.344$  one it you tend to a while before

NOTE Confidence: 0.952537403636364

 $00:24:24.344 \longrightarrow 00:24:26.396$  you you end up in the in the lavapia,

NOTE Confidence: 0.952537403636364

 $00{:}24{:}26{.}396 \dashrightarrow 00{:}24{:}28{.}086$  which means that that value

NOTE Confidence: 0.952537403636364

 $00:24:28.086 \longrightarrow 00:24:29.520$  is discounted by a lot.

NOTE Confidence: 0.952537403636364

 $00{:}24{:}29{.}520 \dashrightarrow 00{:}24{:}32{.}400$  If alpha is 0 you always think the worst

NOTE Confidence: 0.952537403636364

 $00:24:32.400 \rightarrow 00:24:34.676$  possible thing can happen will happen.

NOTE Confidence: 0.952537403636364

 $00:24:34.680 \longrightarrow 00:24:36.353$  So the way I'm showing you that

NOTE Confidence: 0.952537403636364

 $00:24:36.353 \longrightarrow 00:24:38.019$  is there are these grey arrows

NOTE Confidence: 0.952537403636364

 $00:24:38.019 \rightarrow 00:24:39.795$  here and so though inside this,

NOTE Confidence: 0.952537403636364

 $00{:}24{:}39{.}800 \dashrightarrow 00{:}24{:}43{.}060$  inside these, inside these the choices,

NOTE Confidence: 0.952537403636364

00:24:43.060 --> 00:24:45.960 it says how frequently you try to go left,

 $00:24:45.960 \rightarrow 00:24:48.634$  right or or stay where you are.

NOTE Confidence: 0.952537403636364

 $00:24:48.640 \longrightarrow 00:24:50.520$  The re weighting system says,

NOTE Confidence: 0.952537403636364

 $00:24:50.520 \rightarrow 00:24:52.360$  well I'm going to think about the outcome,

NOTE Confidence: 0.952537403636364

 $00:24:52.360 \rightarrow 00:24:53.896$  which is the worst possible outcome

NOTE Confidence: 0.952537403636364

 $00{:}24{:}53.896 \dashrightarrow 00{:}24{:}55.989$  because my alpha is 0 and that puts all

NOTE Confidence: 0.952537403636364

 $00{:}24{:}55{.}989 \dashrightarrow 00{:}24{:}57{.}595$  the weight on going left because the

NOTE Confidence: 0.952537403636364

 $00:24:57.595 \rightarrow 00:24:59.715$  nastiest thing that can happen is going left.

NOTE Confidence: 0.952537403636364

 $00:24:59.720 \longrightarrow 00:25:01.712$  And so here you can see that all

NOTE Confidence: 0.952537403636364

00:25:01.712 -> 00:25:03.716 the values are then much much worse,

NOTE Confidence: 0.952537403636364

 $00:25:03.720 \longrightarrow 00:25:05.435$  and indeed you then just go left.

NOTE Confidence: 0.952537403636364

 $00:25:05.440 \rightarrow 00:25:07.800$  Every time you just end up in the lava pit.

NOTE Confidence: 0.952537403636364

 $00{:}25{:}07{.}800 \dashrightarrow 00{:}25{:}10{.}398$  And then in for intermediate values.

NOTE Confidence: 0.952537403636364

 $00{:}25{:}10{.}400 \dashrightarrow 00{:}25{:}12{.}675$  You can see intermediate values of alpha,

NOTE Confidence: 0.952537403636364

 $00{:}25{:}12.680 \dashrightarrow 00{:}25{:}14.878$  you can see how states get evaluated.

NOTE Confidence: 0.952537403636364

 $00{:}25{:}14.880 \dashrightarrow 00{:}25{:}16.917$  And again you can see this effect.

 $00:25:16.920 \rightarrow 00:25:19.680$  When I said that if you are lucky,

NOTE Confidence: 0.952537403636364

 $00{:}25{:}19.680 \dashrightarrow 00{:}25{:}21.168$  that means in this instance that

NOTE Confidence: 0.952537403636364

00:25:21.168 - 00:25:22.160 means you're going white.

NOTE Confidence: 0.952537403636364

00:25:22.160 --> 00:25:23.880 Because right states are better,

NOTE Confidence: 0.952537403636364

 $00{:}25{:}23.880 \dashrightarrow 00{:}25{:}25.530$  then you tend to decrease your

NOTE Confidence: 0.952537403636364

 $00{:}25{:}25{.}530 \dashrightarrow 00{:}25{:}26{.}355$  value of alpha.

NOTE Confidence: 0.952537403636364

 $00:25:26.360 \longrightarrow 00:25:27.580$  So these these arrows,

NOTE Confidence: 0.952537403636364

 $00:25:27.580 \longrightarrow 00:25:28.800$  these little grey arrows,

NOTE Confidence: 0.952537403636364

 $00{:}25{:}28.800 \dashrightarrow 00{:}25{:}30.720$  outside the choices that you make,

NOTE Confidence: 0.952537403636364

 $00:25:30.720 \longrightarrow 00:25:32.680$  they tend to point downwards.

NOTE Confidence: 0.952537403636364

00:25:32.680 --> 00:25:33.769 If you're unlucky,

NOTE Confidence: 0.952537403636364

 $00:25:33.769 \longrightarrow 00:25:35.221$  which in this instance

NOTE Confidence: 0.952537403636364

00:25:35.221 --> 00:25:36.680 means going going left,

NOTE Confidence: 0.952537403636364

 $00:25:36.680 \rightarrow 00:25:38.320$  then you tend to become a bit more,

NOTE Confidence: 0.952537403636364

 $00:25:38.320 \longrightarrow 00:25:40.434$  you become a bit less risk averse,

NOTE Confidence: 0.952537403636364

 $00:25:40.440 \longrightarrow 00:25:41.815$  which means that the arrows

- NOTE Confidence: 0.952537403636364
- $00:25:41.815 \longrightarrow 00:25:42.640$  then point upwards.
- NOTE Confidence: 0.952537403636364
- $00{:}25{:}42.640 \dashrightarrow 00{:}25{:}44.602$  And so you can see that as we become
- NOTE Confidence: 0.952537403636364
- $00{:}25{:}44.602 \dashrightarrow 00{:}25{:}46.406$  more and more risk averse so this
- NOTE Confidence: 0.952537403636364
- $00:25:46.406 \longrightarrow 00:25:48.250$  alpha value we have this very nice
- NOTE Confidence: 0.952537403636364
- $00{:}25{:}48.250 \dashrightarrow 00{:}25{:}50.271$  way of looking at the the changes of
- NOTE Confidence: 0.952537403636364
- $00:25:50.271 \rightarrow 00:25:52.119$  how states go from being on the right.
- NOTE Confidence: 0.952537403636364
- 00:25:52.120 --> 00:25:54.190 For instance go from being good
- NOTE Confidence: 0.952537403636364
- $00{:}25{:}54{.}190 \dashrightarrow 00{:}25{:}54{.}880$  to being
- NOTE Confidence: 0.66603186875
- $00{:}25{:}54.880 \dashrightarrow 00{:}25{:}57.680$  go to from being good to being bad.
- NOTE Confidence: 0.66603186875
- $00:25:57.680 \longrightarrow 00:25:59.840$  So you don't only have to
- NOTE Confidence: 0.66603186875
- $00:25:59.840 \longrightarrow 00:26:01.508$  think about evaluation here,
- NOTE Confidence: 0.66603186875
- 00:26:01.508 --> 00:26:04.010 you can also optimise your policy
- NOTE Confidence: 0.66603186875
- $00:26:04.083 \rightarrow 00:26:06.435$  based on the on your risk aversion.
- NOTE Confidence: 0.66603186875
- $00:26:06.440 \longrightarrow 00:26:08.960$  You try to optimise say what's
- NOTE Confidence: 0.66603186875
- $00:26:08.960 \rightarrow 00:26:11.356$  the policy which maximises my my
- NOTE Confidence: 0.66603186875

 $00{:}26{:}11.356 \dashrightarrow 00{:}26{:}13.258$  this pre committed C var value

NOTE Confidence: 0.66603186875

 $00:26:13.258 \longrightarrow 00:26:15.518$  with a given value of alpha.

NOTE Confidence: 0.66603186875

 $00:26:15.520 \rightarrow 00:26:22.160$  So if your alpha is 1, then then,

NOTE Confidence: 0.66603186875

 $00:26:22.160 \longrightarrow 00:26:23.880$  then, then the risk averse.

NOTE Confidence: 0.66603186875

00:26:23.880 --> 00:26:24.840 You're not risk averse at all,

NOTE Confidence: 0.66603186875

 $00:26:24.840 \rightarrow 00:26:26.160$  you're just thinking about the mean.

NOTE Confidence: 0.66603186875

 $00:26:26.160 \longrightarrow 00:26:27.762$  We designed it such that the

NOTE Confidence: 0.66603186875

 $00:26:27.762 \longrightarrow 00:26:29.160$  from the start state here,

NOTE Confidence: 0.66603186875

 $00{:}26{:}29{.}160 \dashrightarrow 00{:}26{:}30{.}268$  if alpha equals one,

NOTE Confidence: 0.66603186875

 $00{:}26{:}30{.}268 \dashrightarrow 00{:}26{:}32{.}456$  the best thing you can do is just

NOTE Confidence: 0.66603186875

 $00{:}26{:}32{.}456 \dashrightarrow 00{:}26{:}34{.}570$  to go left and you can try and stay

NOTE Confidence: 0.66603186875

 $00{:}26{:}34{.}570 \dashrightarrow 00{:}26{:}36{.}680$  at the at the reward is worth 2 and

NOTE Confidence: 0.66603186875

 $00{:}26{:}36{.}680 \dashrightarrow 00{:}26{:}38{.}973$  as long as you can and that's then

NOTE Confidence: 0.66603186875

00:26:38.973 --> 00:26:40.953 a way of maximizing your reward.

NOTE Confidence: 0.66603186875

00:26:40.960 --> 00:26:43.798 If alpha equals zero, you try.

NOTE Confidence: 0.66603186875

 $00:26:43.800 \longrightarrow 00:26:45.185$  Well, the IT actually doesn't

- NOTE Confidence: 0.66603186875
- $00:26:45.185 \rightarrow 00:26:47.158$  matter at all what you try to do,
- NOTE Confidence: 0.66603186875
- $00{:}26{:}47.160 \dashrightarrow 00{:}26{:}49.000$  because there's a chance that if you try,
- NOTE Confidence: 0.66603186875
- 00:26:49.000 00:26:51.120 if you try to stay where you are,
- NOTE Confidence: 0.66603186875
- $00:26:51.120 \rightarrow 00:26:52.398$  you'll know less will go left.
- NOTE Confidence: 0.66603186875
- $00:26:52.400 \rightarrow 00:26:53.954$  If you think about the worst outcome,
- NOTE Confidence: 0.66603186875
- $00:26:53.960 \longrightarrow 00:26:55.360$  it's always to go left.
- NOTE Confidence: 0.66603186875
- $00:26:55.360 \longrightarrow 00:26:56.648$  And so you can see that the
- NOTE Confidence: 0.66603186875
- $00:26:56.648 \longrightarrow 00:26:57.320$  alpha value equals 0.
- NOTE Confidence: 0.66603186875
- 00:26:57.320 --> 00:26:57.566 Here,
- NOTE Confidence: 0.66603186875
- $00:26:57.566 \longrightarrow 00:26:59.042$  the optimum policy is just the
- NOTE Confidence: 0.66603186875
- $00{:}26{:}59{.}042 \dashrightarrow 00{:}27{:}00{.}659$  same as the uniform policy or
- NOTE Confidence: 0.66603186875
- $00{:}27{:}00{.}659 \dashrightarrow 00{:}27{:}02{.}034$  any other policy as well.
- NOTE Confidence: 0.66603186875
- $00:27:02.040 \longrightarrow 00:27:02.988$  You'll always go left.
- NOTE Confidence: 0.66603186875
- $00{:}27{:}02{.}988 \dashrightarrow 00{:}27{:}05{.}379$  So in fact this is sort of a form
- NOTE Confidence: 0.66603186875
- $00{:}27{:}05{.}379 \dashrightarrow 00{:}27{:}06{.}595$  of learned helplessness where
- NOTE Confidence: 0.66603186875

 $00:27:06.595 \rightarrow 00:27:08.092$  although you really have control

NOTE Confidence: 0.66603186875

 $00{:}27{:}08.092 \dashrightarrow 00{:}27{:}09.933$  in this world and some control in

NOTE Confidence: 0.66603186875

00:27:09.933 --> 00:27:11.845 this world because you think about

NOTE Confidence: 0.66603186875

 $00:27:11.845 \rightarrow 00:27:13.960$  the worst thing that could happen,

NOTE Confidence: 0.66603186875

 $00{:}27{:}13.960 \dashrightarrow 00{:}27{:}16.760$  you sort of don't trust your own control.

NOTE Confidence: 0.66603186875

 $00:27:16.760 \longrightarrow 00:27:18.272$  And therefore you think the the worst NOTE Confidence: 0.66603186875

 $00:27:18.272 \rightarrow 00:27:19.719$  thing that could happen will happen.

NOTE Confidence: 0.66603186875

 $00:27:19.720 \longrightarrow 00:27:21.205$  And thereby therefore it doesn't

NOTE Confidence: 0.66603186875

00:27:21.205 --> 00:27:22.930 matter what you do, you can't.

NOTE Confidence: 0.66603186875

 $00:27:22.930 \longrightarrow 00:27:24.520$  There's nothing you can do to

NOTE Confidence: 0.66603186875

 $00:27:24.520 \longrightarrow 00:27:25.889$  mitigate that that chance and

NOTE Confidence: 0.66603186875

 $00{:}27{:}25{.}889 \dashrightarrow 00{:}27{:}27{.}881$  then in the middle so here we had

NOTE Confidence: 0.66603186875

 $00{:}27{:}27{.}881 \dashrightarrow 00{:}27{:}29{.}799$  this the pre commitment remember

NOTE Confidence: 0.66603186875

 $00:27:29.800 \longrightarrow 00:27:31.558$  is relative to a start state.

NOTE Confidence: 0.66603186875

00:27:31.560 --> 00:27:33.808 So here our start state is this is

NOTE Confidence: 0.66603186875

00:27:33.808 - > 00:27:36.036 this at alpha equals .3 and you

- NOTE Confidence: 0.66603186875
- $00:27:36.036 \rightarrow 00:27:38.420$  can see again that now we have a
- NOTE Confidence: 0.66603186875
- 00:27:38.503 --> 00:27:40.965 policy where you know in this in
- NOTE Confidence: 0.66603186875
- $00:27:40.965 \longrightarrow 00:27:42.530$  this particular domain the optimal
- NOTE Confidence: 0.66603186875
- $00:27:42.597 \longrightarrow 00:27:44.550$  policy at that start state is to
- NOTE Confidence: 0.66603186875
- $00:27:44.550 \longrightarrow 00:27:46.514$  go right rather than to go left
- NOTE Confidence: 0.66603186875
- $00{:}27{:}46.514 \dashrightarrow 00{:}27{:}48.420$  because of the problems of the risk.
- NOTE Confidence: 0.66603186875
- $00:27:48.420 \longrightarrow 00:27:50.820$  And then as you as then this is
- NOTE Confidence: 0.66603186875
- $00:27:50.820 \longrightarrow 00:27:52.478$  what you you try to do.
- NOTE Confidence: 0.66603186875
- $00{:}27{:}52{.}480 \dashrightarrow 00{:}27{:}53{.}964$  And then and then you try to
- NOTE Confidence: 0.66603186875
- $00:27:53.964 \rightarrow 00:27:55.480$  stay here as long as you can.
- NOTE Confidence: 0.66603186875
- $00:27:55.480 \longrightarrow 00:27:56.080$  And so you can see that,
- NOTE Confidence: 0.66603186875
- $00:27:56.080 \rightarrow 00:27:58.720$  as you might expect for everywhere
- NOTE Confidence: 0.66603186875
- $00:27:58.720 \longrightarrow 00:28:01.552$  else in the in this random walk,
- NOTE Confidence: 0.66603186875
- $00{:}28{:}01.552 \dashrightarrow 00{:}28{:}04.240$  apart from the value alpha equals zero,
- NOTE Confidence: 0.66603186875
- $00:28:04.240 \longrightarrow 00:28:07.360$  you have a better outcome.
- NOTE Confidence: 0.66603186875

 $00:28:07.360 \longrightarrow 00:28:08.960$  You have all these values.

NOTE Confidence: 0.66603186875

00:28:08.960 --> 00:28:10.442 All the values of the optimum

NOTE Confidence: 0.66603186875

 $00:28:10.442 \longrightarrow 00:28:11.987$  policy are much better than the

NOTE Confidence: 0.66603186875

 $00{:}28{:}11{.}987 \dashrightarrow 00{:}28{:}13{.}517$  values of the uniform policy here,

NOTE Confidence: 0.66603186875

 $00:28:13.520 \longrightarrow 00:28:15.175$  except for this long nastiest

NOTE Confidence: 0.66603186875

00:28:15.175 --> 00:28:15.837 possible outcome,

NOTE Confidence: 0.66603186875

 $00{:}28{:}15.840 \dashrightarrow 00{:}28{:}17.395$  nastiest possible degree of risk

NOTE Confidence: 0.66603186875

 $00:28:17.395 \rightarrow 00:28:18.950$  aversion where you're where you

NOTE Confidence: 0.66603186875

 $00{:}28{:}19{.}000 \dashrightarrow 00{:}28{:}20{.}264$  just think whatever terrible

NOTE Confidence: 0.66603186875

 $00:28:20.264 \rightarrow 00:28:22.160$  happened will happen no matter what.

NOTE Confidence: 0.854460794

 $00:28:25.160 \longrightarrow 00:28:26.160$  I should just say so.

NOTE Confidence: 0.854460794

00:28:26.160 --> 00:28:27.840 There's also this this NC,

NOTE Confidence: 0.854460794

 $00{:}28{:}27.840 \dashrightarrow 00{:}28{:}29.575$  this other mechanism which doesn't

NOTE Confidence: 0.854460794

 $00:28:29.575 \rightarrow 00:28:32.047$  pre commit to a value but instead

NOTE Confidence: 0.854460794

00:28:32.047 --> 00:28:33.722 just sticks at a particular

NOTE Confidence: 0.854460794

 $00:28:33.722 \longrightarrow 00:28:35.719$  value of alpha the whole time.

 $00:28:35.720 \longrightarrow 00:28:37.592$  That's what I showed you in the in

NOTE Confidence: 0.854460794

00:28:37.592 --> 00:28:39.040 the Saint Petersburg paradox where

NOTE Confidence: 0.854460794

 $00{:}28{:}39{.}040 \dashrightarrow 00{:}28{:}41{.}529$  you just waited the the heads and

NOTE Confidence: 0.854460794

 $00:28:41.529 \rightarrow 00:28:43.433$  tails the same way every single time.

NOTE Confidence: 0.854460794

 $00:28:43.440 \longrightarrow 00:28:45.192$  So in this domain that actually

NOTE Confidence: 0.854460794

00:28:45.192 - 00:28:47.232 turns out to be for alpha equals one,

NOTE Confidence: 0.854460794

 $00{:}28{:}47{.}232 \dashrightarrow 00{:}28{:}49{.}308$  it's the same as PC bar for alpha which

NOTE Confidence: 0.854460794

00:28:49.308 - 00:28:51.120 is just the mean for alpha equals 0.

NOTE Confidence: 0.854460794

 $00{:}28{:}51{.}120 \dashrightarrow 00{:}28{:}52{.}996$  Again it just focuses on the minimum,

NOTE Confidence: 0.854460794

 $00{:}28{:}53.000 \dashrightarrow 00{:}28{:}55.023$  the worst thing that can happen and

NOTE Confidence: 0.854460794

 $00{:}28{:}55{.}023 \dashrightarrow 00{:}28{:}57{.}667$  so it also looks the same but in

NOTE Confidence: 0.854460794

 $00{:}28{:}57.667 \dashrightarrow 00{:}28{:}59.346$  between in for intermediate values.

NOTE Confidence: 0.854460794

00:28:59.346 --> 00:29:01.794 Then you can see you can see you

NOTE Confidence: 0.854460794

 $00{:}29{:}01{.}794 \dashrightarrow 00{:}29{:}03{.}820$  can again get evaluations of states.

NOTE Confidence: 0.854460794

 $00{:}29{:}03.820 \dashrightarrow 00{:}29{:}06.200$  And in this instance it turns out

 $00:29:06.261 \longrightarrow 00:29:08.451$  that this NC bar mechanism here

NOTE Confidence: 0.854460794

 $00{:}29{:}08{.}451 \dashrightarrow 00{:}29{:}12{.}117$  is a generally more risk averse,

NOTE Confidence: 0.854460794

 $00:29:12.120 \longrightarrow 00:29:13.920$  so the values are worse than

NOTE Confidence: 0.854460794

 $00:29:13.920 \longrightarrow 00:29:15.640$  the values for the PC bar.

NOTE Confidence: 0.854460794

 $00{:}29{:}15{.}640 \dashrightarrow 00{:}29{:}17{.}684$  So that's not true in the Saint

NOTE Confidence: 0.854460794

00:29:17.684 --> 00:29:18.845 Petersburg paradox because in

NOTE Confidence: 0.854460794

00:29:18.845 - 00:29:20.434 that problem the only way you get

NOTE Confidence: 0.854460794

00:29:20.434 --> 00:29:22.000 to carry on is by being lucky,

NOTE Confidence: 0.854460794

 $00{:}29{:}22.000 \dashrightarrow 00{:}29{:}23.918$  whereas in this problem you can be

NOTE Confidence: 0.854460794

00:29:23.918 - 00:29:26.037 lucky or unlucky as you as you carry on.

NOTE Confidence: 0.854460794

 $00:29:26.040 \longrightarrow 00:29:28.343$  And then in PC bar if you're

NOTE Confidence: 0.854460794

 $00:29:28.343 \rightarrow 00:29:30.279$  unlucky then you become less,

NOTE Confidence: 0.854460794

00:29:30.280 --> 00:29:32.280 you become less risk averse.

NOTE Confidence: 0.854460794

 $00:29:32.280 \rightarrow 00:29:34.325$  Whereas in the Saint Petersburg

NOTE Confidence: 0.854460794

 $00{:}29{:}34{.}325 \dashrightarrow 00{:}29{:}36{.}840$  paradox or in the bot task,

NOTE Confidence: 0.854460794

 $00:29:36.840 \rightarrow 00:29:38.808$  every time you continue you must

- NOTE Confidence: 0.854460794
- $00:29:38.808 \rightarrow 00:29:40.963$  have been lucky and therefore you

 $00:29:40.963 \longrightarrow 00:29:43.452$  become more risk averse and so

NOTE Confidence: 0.854460794

 $00:29:43.452 \rightarrow 00:29:45.600$  therefore relatively you the there's

NOTE Confidence: 0.854460794

00:29:45.600 - 00:29:47.280 a greater degree of risk aversion.

NOTE Confidence: 0.854460794

 $00:29:47.280 \longrightarrow 00:29:48.072$  It's Peterborough paradox.

NOTE Confidence: 0.854460794

 $00{:}29{:}48.072 \dashrightarrow 00{:}29{:}49.920$  Whereas in these sorts of other problems,

NOTE Confidence: 0.854460794

 $00:29:49.920 \longrightarrow 00:29:53.360$  NC bar is is generally more risk averse.

NOTE Confidence: 0.854460794

 $00{:}29{:}53{.}360 \dashrightarrow 00{:}29{:}55{.}439$  In these sorts of cases you see

NOTE Confidence: 0.854460794

 $00:29:55.439 \rightarrow 00:29:57.698$  that by these values all being more

NOTE Confidence: 0.854460794

 $00{:}29{:}57{.}698 \dashrightarrow 00{:}30{:}00{.}040$  red than the than the other ones.

NOTE Confidence: 0.854460794

 $00{:}30{:}00{.}040 \dashrightarrow 00{:}30{:}02{.}112$  So and then you can work out

NOTE Confidence: 0.854460794

 $00:30:02.112 \longrightarrow 00:30:04.465$  the optimal policy has the same

NOTE Confidence: 0.854460794

 $00{:}30{:}04.465 \dashrightarrow 00{:}30{:}05.397$  similar characteristics.

NOTE Confidence: 0.854460794

00:30:05.400 -> 00:30:05.790 OK,

NOTE Confidence: 0.854460794

 $00{:}30{:}05{.}790 \dashrightarrow 00{:}30{:}09{.}300$  so let's come back to our lava pits where

 $00:30:09.396 \rightarrow 00:30:12.160$  we had these these cases where we had,

NOTE Confidence: 0.854460794

00:30:12.160 --> 00:30:12.760 excuse me,

NOTE Confidence: 0.854460794

 $00:30:12.760 \longrightarrow 00:30:14.315$  where we where we gave

NOTE Confidence: 0.854460794

 $00:30:14.315 \longrightarrow 00:30:15.559$  our subjects this chance,

NOTE Confidence: 0.854460794

 $00:30:15.560 \longrightarrow 00:30:17.060$  we we showed them this and

NOTE Confidence: 0.854460794

 $00:30:17.060 \longrightarrow 00:30:18.719$  asked them how they would move.

NOTE Confidence: 0.854460794

 $00{:}30{:}18.720 \dashrightarrow 00{:}30{:}20.365$  And so we designed this domain so

NOTE Confidence: 0.854460794

 $00:30:20.365 \longrightarrow 00:30:22.133$  that it would start to distinguish

NOTE Confidence: 0.854460794

 $00{:}30{:}22.133 \dashrightarrow 00{:}30{:}23.477$  different values of alpha.

NOTE Confidence: 0.854460794

 $00{:}30{:}23{.}480 \dashrightarrow 00{:}30{:}25{.}279$  So different values of risk aversion as

NOTE Confidence: 0.854460794

00:30:25.279 --> 00:30:27.053 a way of interrogating what subjects NOTE Confidence: 0.854460794

 $00:30:27.053 \rightarrow 00:30:29.640$  would be like in these in these cases.

NOTE Confidence: 0.854460794

00:30:29.640 --> 00:30:33.376 So it turns out that the this most direct NOTE Confidence: 0.854460794

 $00{:}30{:}33{.}376$  -->  $00{:}30{:}36{.}400$  path is associated with alpha equals one.

NOTE Confidence: 0.854460794

 $00{:}30{:}36{.}400 \dashrightarrow 00{:}30{:}38{.}911$  So if you are risk neutral then you would NOTE Confidence: 0.854460794

 $00:30:38.911 \rightarrow 00:30:42.120$  take this what this this rather risky path.

- NOTE Confidence: 0.854460794
- $00:30:42.120 \rightarrow 00:30:44.853$  If your value of alpha is about 0.5,
- NOTE Confidence: 0.854460794
- $00{:}30{:}44.853 \dashrightarrow 00{:}30{:}46.904$  which means you just think about the
- NOTE Confidence: 0.854460794
- 00:30:46.904 --> 00:30:48.368 bottom 50% of that distribution,
- NOTE Confidence: 0.854460794
- $00:30:48.368 \rightarrow 00:30:50.120$  then you take this intermediate path.
- NOTE Confidence: 0.854460794
- $00{:}30{:}50{.}120 \dashrightarrow 00{:}30{:}51{.}956$  You tend to take this intermediate
- NOTE Confidence: 0.854460794
- $00{:}30{:}51{.}956 \dashrightarrow 00{:}30{:}53{.}780$  path like this and then if you're
- NOTE Confidence: 0.854460794
- $00:30:53.780 \longrightarrow 00:30:54.680$  much more risk averse,
- NOTE Confidence: 0.854460794
- $00:30:54.680 \longrightarrow 00:30:56.396$  you care about the bottom 15%
- NOTE Confidence: 0.854460794
- $00:30:56.400 \longrightarrow 00:30:57.920$  of the of the outcomes,
- NOTE Confidence: 0.854460794
- $00:30:57.920 \longrightarrow 00:30:59.032$  then you take this,
- NOTE Confidence: 0.854460794
- $00:30:59.032 \rightarrow 00:31:01.000$  this much more extreme risk aversion here.
- NOTE Confidence: 0.854460794
- 00:31:01.000 --> 00:31:02.335 And I think it's interesting
- NOTE Confidence: 0.854460794
- 00:31:02.335 --> 00:31:03.670 as one of these cases
- NOTE Confidence: 0.677287811818182
- $00:31:03.732 \dashrightarrow 00:31:06.135$  where it's very hard when you see how
- NOTE Confidence: 0.677287811818182
- $00:31:06.135 \rightarrow 00:31:08.490$  somebody in your lab you know performs this.
- NOTE Confidence: 0.677287811818182

00:31:08.490 --> 00:31:10.784 If you're a sort of 0.4 a person,

NOTE Confidence: 0.677287811818182

00:31:10.784 --> 00:31:12.272 it's very hard to imagine somebody

NOTE Confidence: 0.677287811818182

 $00:31:12.272 \longrightarrow 00:31:13.935$  who would be so risk of so risk

NOTE Confidence: 0.677287811818182

 $00:31:13.935 \rightarrow 00:31:15.719$  seeking as to take the very short one.

NOTE Confidence: 0.677287811818182

 $00:31:15.720 \longrightarrow 00:31:17.277$  Or if you're the person who takes this very,

NOTE Confidence: 0.677287811818182

 $00:31:17.280 \rightarrow 00:31:18.848$  very long path, you think it's you think

NOTE Confidence: 0.677287811818182

 $00:31:18.848 \dashrightarrow 00:31:20.440$  you know how could any body take these,

NOTE Confidence: 0.677287811818182

 $00:31:20.440 \rightarrow 00:31:22.360$  these these short paths themselves.

NOTE Confidence: 0.677287811818182

 $00:31:22.360 \longrightarrow 00:31:24.400$  So I think there's some interesting

NOTE Confidence: 0.677287811818182

 $00{:}31{:}24{.}400 \dashrightarrow 00{:}31{:}26{.}320$  phenomena that come up with this.

NOTE Confidence: 0.677287811818182

 $00{:}31{:}26{.}320 \dashrightarrow 00{:}31{:}30{.}184$  So we administered 30 of these mazes to

NOTE Confidence: 0.677287811818182

 $00{:}31{:}30{.}184 \dashrightarrow 00{:}31{:}33{.}140$  mazes like this to a a group of subjects

NOTE Confidence: 0.677287811818182

 $00:31:33.140 \rightarrow 00:31:34.880$  and we designed them in order to,

NOTE Confidence: 0.677287811818182

 $00:31:34.880 \longrightarrow 00:31:36.378$  you know, in order to look at

NOTE Confidence: 0.677287811818182

 $00{:}31{:}36{.}378 \dashrightarrow 00{:}31{:}37{.}893$  things like how consistent was an

NOTE Confidence: 0.677287811818182

 $00:31:37.893 \dashrightarrow 00:31:39.525$  individual subject in the way that

 $00:31:39.525 \rightarrow 00:31:41.275$  they would be risk averse in these,

NOTE Confidence: 0.677287811818182

 $00:31:41.280 \longrightarrow 00:31:42.840$  in these, in these domains.

NOTE Confidence: 0.677287811818182

 $00:31:42.840 \longrightarrow 00:31:44.640$  And we saw a very nice

NOTE Confidence: 0.677287811818182

 $00:31:44.640 \rightarrow 00:31:47.679$  degree of of consistency.

NOTE Confidence: 0.677287811818182

00:31:47.680 --> 00:31:48.552 So if it's here,

NOTE Confidence: 0.677287811818182

 $00{:}31{:}48.552 \dashrightarrow 00{:}31{:}50.177$  you can see one another of these

NOTE Confidence: 0.677287811818182

 $00:31:50.177 \dashrightarrow 00:31:52.039$  mazes where the start stage is here,

NOTE Confidence: 0.677287811818182

 $00:31:52.040 \longrightarrow 00:31:53.100$  the goal is here.

NOTE Confidence: 0.677287811818182

 $00{:}31{:}53{.}100 \dashrightarrow 00{:}31{:}56{.}013$  And so again we have a very sort of a

NOTE Confidence: 0.677287811818182

 $00:31:56.013 \rightarrow 00:31:59.114$  path which is for the people who are

NOTE Confidence: 0.677287811818182

 $00:31:59.114 \rightarrow 00:32:00.782$  pretty risk neutral would take which

NOTE Confidence: 0.677287811818182

 $00{:}32{:}00{.}782 \dashrightarrow 00{:}32{:}02{.}557$  gets close to these two lava pits.

NOTE Confidence: 0.677287811818182

 $00{:}32{:}02{.}560 \dashrightarrow 00{:}32{:}04{.}210$  You have this intermediate path

NOTE Confidence: 0.677287811818182

 $00{:}32{:}04{.}210 \dashrightarrow 00{:}32{:}05{.}200$  which is longer,

NOTE Confidence: 0.677287811818182

 $00{:}32{:}05{.}200 \dashrightarrow 00{:}32{:}06{.}960$  which is why it would be less favoured,

 $00:32:06.960 \longrightarrow 00:32:08.160$  but only goes close to one

NOTE Confidence: 0.677287811818182

 $00:32:08.160 \longrightarrow 00:32:08.960$  of these lava pits.

NOTE Confidence: 0.677287811818182

 $00:32:08.960 \longrightarrow 00:32:10.800$  And then we have an an even

NOTE Confidence: 0.677287811818182

 $00:32:10.800 \rightarrow 00:32:11.840$  longer path which looks,

NOTE Confidence: 0.677287811818182

 $00:32:11.840 \longrightarrow 00:32:13.569$  which goes all the way around here

NOTE Confidence: 0.677287811818182

 $00:32:13.569 \longrightarrow 00:32:15.604$  to get to the goal which really

NOTE Confidence: 0.677287811818182

 $00:32:15.604 \rightarrow 00:32:17.223$  avoids these lava pits dramatically.

NOTE Confidence: 0.677287811818182

 $00{:}32{:}17{.}223 \dashrightarrow 00{:}32{:}19{.}521$  And so these are three individual

NOTE Confidence: 0.677287811818182

 $00:32:19.521 \dashrightarrow 00:32:21.598$  subjects and so these choices

NOTE Confidence: 0.677287811818182

 $00{:}32{:}21{.}598 \dashrightarrow 00{:}32{:}23{.}326$  were themselves associated with

NOTE Confidence: 0.677287811818182

 $00{:}32{:}23{.}326 \dashrightarrow 00{:}32{:}25{.}480$  three different values of alpha,

NOTE Confidence: 0.677287811818182

00:32:25.480 --> 00:32:25.795 point,

NOTE Confidence: 0.677287811818182

 $00:32:25.795 \rightarrow 00:32:28.819$  you know like point 2.5 and point 2.9 or so.

NOTE Confidence: 0.677287811818182

 $00{:}32{:}28{.}819 \dashrightarrow 00{:}32{:}30{.}457$  And then in another maze the

NOTE Confidence: 0.677287811818182

 $00{:}32{:}30{.}457 \dashrightarrow 00{:}32{:}32{.}517$  the the behaviour of the same

NOTE Confidence: 0.677287811818182

 $00:32:32.517 \rightarrow 00:32:34.232$  subject in a different maze.

 $00:32:34.240 \longrightarrow 00:32:35.554$  So here this is a bit like a Cliff.

NOTE Confidence: 0.677287811818182

00:32:35.560 --> 00:32:37.996 There's just two other pits here.

NOTE Confidence: 0.677287811818182

 $00:32:38.000 \rightarrow 00:32:39.500$  The question is how far around

NOTE Confidence: 0.677287811818182

 $00:32:39.500 \rightarrow 00:32:41.039$  you know around them do you go.

NOTE Confidence: 0.677287811818182

00:32:41.040 --> 00:32:43.008 So one option is just to go directly

NOTE Confidence: 0.677287811818182

 $00{:}32{:}43.008 \dashrightarrow 00{:}32{:}45.446$  to the goal from the start say here to

NOTE Confidence: 0.677287811818182

 $00:32:45.446 \longrightarrow 00:32:47.520$  the goal that's most no risk neutral.

NOTE Confidence: 0.677287811818182

 $00{:}32{:}47{.}520 \dashrightarrow 00{:}32{:}48{.}780$  Here's one which is a bit

NOTE Confidence: 0.677287811818182

 $00{:}32{:}48.780 \dashrightarrow 00{:}32{:}50.040$  a bit more risk averse.

NOTE Confidence: 0.677287811818182

 $00{:}32{:}50{.}040 \dashrightarrow 00{:}32{:}51{.}872$  You can think well how far away from

NOTE Confidence: 0.677287811818182

 $00:32:51.872 \longrightarrow 00:32:53.627$  the the Cliff you would you would

NOTE Confidence: 0.677287811818182

 $00:32:53.627 \dashrightarrow 00:32:55.400$  you choose to be there yourself.

NOTE Confidence: 0.677287811818182

 $00{:}32{:}55{.}400 \dashrightarrow 00{:}32{:}55{.}816$  And again,

NOTE Confidence: 0.677287811818182

 $00{:}32{:}55{.}816 \dashrightarrow 00{:}32{:}57{.}272$  it's very hard if you're a sort

NOTE Confidence: 0.677287811818182

 $00:32:57.272 \longrightarrow 00:32:58.879$  of risk neutral person to think,

 $00:32:58.880 \rightarrow 00:32:59.137$  well,

NOTE Confidence: 0.677287811818182

 $00{:}32{:}59{.}137 \dashrightarrow 00{:}33{:}01{.}193$  how is it crazy to go so far

NOTE Confidence: 0.677287811818182

 $00:33:01.193 \longrightarrow 00:33:03.036$  away from the from the goal.

NOTE Confidence: 0.677287811818182

 $00:33:03.040 \dashrightarrow 00:33:05.760$  We took these 30 mazes that we administered.

NOTE Confidence: 0.677287811818182

 $00{:}33{:}05{.}760 \dashrightarrow 00{:}33{:}08{.}105$  We looked at the first half and

NOTE Confidence: 0.677287811818182

 $00{:}33{:}08{.}105 \dashrightarrow 00{:}33{:}09{.}478$  the second-half inferred the

NOTE Confidence: 0.677287811818182

 $00{:}33{:}09{.}478 \dashrightarrow 00{:}33{:}11{.}308$  values of alpha that our subjects

NOTE Confidence: 0.677287811818182

 $00:33:11.308 \longrightarrow 00:33:13.579$  had for those for those mazes by

NOTE Confidence: 0.677287811818182

 $00:33:13.579 \dashrightarrow 00:33:15.517$  fitting the choices that they made.

NOTE Confidence: 0.677287811818182

 $00{:}33{:}15{.}520 \dashrightarrow 00{:}33{:}17{.}581$  And you can see that we had a reasonable

NOTE Confidence: 0.677287811818182

 $00{:}33{:}17{.}581 \dashrightarrow 00{:}33{:}18{.}855$  degree of consistency between the

NOTE Confidence: 0.677287811818182

 $00{:}33{:}18.855 \dashrightarrow 00{:}33{:}20.839$  1st 15 mazes and the 2nd 15 mazes.

NOTE Confidence: 0.677287811818182

 $00:33:20.840 \longrightarrow 00:33:23.120$  So this shows the the alpha,

NOTE Confidence: 0.677287811818182

 $00:33:23.120 \longrightarrow 00:33:23.656$  the peak,

NOTE Confidence: 0.677287811818182

 $00{:}33{:}23.656 \dashrightarrow 00{:}33{:}24.996$  the map out of the,

NOTE Confidence: 0.677287811818182

00:33:25.000 - > 00:33:26.700 the the maximum likelihood

- NOTE Confidence: 0.677287811818182
- $00{:}33{:}26{.}700 \dashrightarrow 00{:}33{:}28{.}400$  alpha value for the first
- NOTE Confidence: 0.773659392272727
- $00:33:28.400 \longrightarrow 00:33:29.532$  and second-half of mazes.
- NOTE Confidence: 0.773659392272727
- $00:33:29.532 \longrightarrow 00:33:31.626$  So we see that they are reasonably
- NOTE Confidence: 0.773659392272727
- $00:33:31.626 \dashrightarrow 00:33:33.971$  well pinned and indeed the the means
- NOTE Confidence: 0.773659392272727
- $00{:}33{:}33{.}971 \dashrightarrow 00{:}33{:}36{.}320$  are fairly similar to and then if we
- NOTE Confidence: 0.773659392272727
- $00{:}33{:}36{.}320 \dashrightarrow 00{:}33{:}38{.}520$  look at the across all our subjects.
- NOTE Confidence: 0.773659392272727
- $00{:}33{:}38{.}520 \dashrightarrow 00{:}33{:}39{.}920$  So now this axis shows
- NOTE Confidence: 0.773659392272727
- $00:33:39.920 \longrightarrow 00:33:41.320$  you the value of alpha.
- NOTE Confidence: 0.773659392272727
- $00:33:41.320 \longrightarrow 00:33:43.080$  This is now the this is the the
- NOTE Confidence: 0.713342685
- $00:33:45.320 \longrightarrow 00:33:46.360$  posterior value of alpha
- NOTE Confidence: 0.713342685
- $00:33:46.360 \longrightarrow 00:33:47.920$  across all the toss we have.
- NOTE Confidence: 0.713342685
- $00{:}33{:}47{.}920 \dashrightarrow 00{:}33{:}49{.}880$  So you know, you know hierarchical fit.
- NOTE Confidence: 0.713342685
- $00:33:49.880 \dashrightarrow 00:33:51.469$  And then we just ordered the subjects
- NOTE Confidence: 0.713342685
- $00{:}33{:}51{.}469 \dashrightarrow 00{:}33{:}53{.}145$  by from alpha the people with the
- NOTE Confidence: 0.713342685
- $00{:}33{:}53{.}145 \dashrightarrow 00{:}33{:}54{.}561$  smallest value of alpha to people
- NOTE Confidence: 0.713342685

 $00:33:54.612 \longrightarrow 00:33:56.040$  with the largest value of alpha.

NOTE Confidence: 0.713342685

 $00{:}33{:}56{.}040 \dashrightarrow 00{:}33{:}57{.}741$  And you can see that we nicely

NOTE Confidence: 0.713342685

00:33:57.741 --> 00:33:59.318 cover the range of possible alphas

NOTE Confidence: 0.713342685

 $00:33:59.318 \dashrightarrow 00:34:01.166$  in this in this domain and some

NOTE Confidence: 0.713342685

 $00:34:01.223 \longrightarrow 00:34:03.106$  people we can't infer alpha so well

NOTE Confidence: 0.713342685

 $00{:}34{:}03.106 \dashrightarrow 00{:}34{:}04.739$  just from these these plots.

NOTE Confidence: 0.713342685

 $00{:}34{:}04{.}739 \dashrightarrow 00{:}34{:}07{.}436$  And so you can see that then we also in

NOTE Confidence: 0.713342685

 $00:34:07.436 \rightarrow 00:34:09.249$  order to fit them, fit their behaviour.

NOTE Confidence: 0.713342685

 $00:34:09.249 \dashrightarrow 00:34:11.680$  We have a couple of other statistics as well.

NOTE Confidence: 0.713342685

 $00:34:11.680 \rightarrow 00:34:13.000$  We have they have a temperature,

NOTE Confidence: 0.713342685

00:34:13.000 - 00:34:14.172 so an inverse temperature,

NOTE Confidence: 0.713342685

 $00:34:14.172 \rightarrow 00:34:16.180$  or temperature, which is how noisy

NOTE Confidence: 0.713342685

 $00:34:16.180 \longrightarrow 00:34:17.600$  is their behaviour generally,

NOTE Confidence: 0.713342685

 $00{:}34{:}17.600 \dashrightarrow 00{:}34{:}19.312$  and then a lapse rate which says that

NOTE Confidence: 0.713342685

 $00:34:19.312 \rightarrow 00:34:20.520$  sometimes they try to, they know.

NOTE Confidence: 0.713342685

 $00{:}34{:}20{.}520 \dashrightarrow 00{:}34{:}22{.}280$  We imagine they might try to go north,
- NOTE Confidence: 0.713342685
- $00:34:22.280 \longrightarrow 00:34:23.184$  but perhaps they just,

00:34:23.184 --> 00:34:24.070 you know, by mistake,

NOTE Confidence: 0.713342685

 $00:34:24.070 \longrightarrow 00:34:25.360$  go in a different direction too.

NOTE Confidence: 0.713342685

 $00:34:25.360 \longrightarrow 00:34:27.100$  So these are very standard things

NOTE Confidence: 0.713342685

 $00:34:27.100 \rightarrow 00:34:29.298$  you'd have in a model of their behaviour.

NOTE Confidence: 0.713342685

 $00{:}34{:}29{.}298 \dashrightarrow 00{:}34{:}30{.}792$  But the thing we're focusing on

NOTE Confidence: 0.713342685

00:34:30.792 --> 00:34:32.280 indeed is this risk sensitivity,

NOTE Confidence: 0.713342685

 $00:34:32.280 \rightarrow 00:34:34.224$  which is then just a histogram of the values

NOTE Confidence: 0.713342685

 $00{:}34{:}34{.}224 \dashrightarrow 00{:}34{:}36{.}158$  that we can infer from there and ourselves.

NOTE Confidence: 0.713342685

00:34:36.160 --> 00:34:37.864 It's a nicely aligned,

NOTE Confidence: 0.713342685

 $00:34:37.864 \rightarrow 00:34:39.994$  nicely arrayed across the different

NOTE Confidence: 0.713342685

 $00{:}34{:}39{.}994 \dashrightarrow 00{:}34{:}43{.}600$  possible values of alpha as you can see.

NOTE Confidence: 0.713342685

 $00:34:43.600 \rightarrow 00:34:46.690$  So we then try to interrogate our

NOTE Confidence: 0.713342685

 $00{:}34{:}46{.}690 \dashrightarrow 00{:}34{:}49{.}240$  mechanism for changing values of alpha.

NOTE Confidence: 0.713342685

 $00{:}34{:}49{.}240 \dashrightarrow 00{:}34{:}52{.}480$  And here we had what to us was a bit of

 $00:34:52.480 \rightarrow 00:34:54.480$  a surprise in terms of what happened.

NOTE Confidence: 0.713342685

 $00{:}34{:}54{.}480 \dashrightarrow 00{:}34{:}57{.}176$  So here what we're looking at is how

NOTE Confidence: 0.713342685

00:34:57.176 - 00:34:59.839 did alpha change on if on one trial,

NOTE Confidence: 0.713342685

 $00:34:59.840 \longrightarrow 00:35:00.578$  one maze,

NOTE Confidence: 0.713342685

 $00{:}35{:}00{.}578 \dashrightarrow 00{:}35{:}03{.}530$  you've got a you've got a win or

NOTE Confidence: 0.713342685

 $00{:}35{:}03.618 \dashrightarrow 00{:}35{:}06.000$  the OR the OR or you've got a loss.

NOTE Confidence: 0.713342685

00:35:06.000 -> 00:35:08.196 So mostly So what this shows,

NOTE Confidence: 0.713342685

 $00:35:08.200 \longrightarrow 00:35:10.168$  as we said, if we then infer the

NOTE Confidence: 0.713342685

 $00{:}35{:}10.168 \dashrightarrow 00{:}35{:}11.800$  value of alpha on one maze,

NOTE Confidence: 0.713342685

 $00:35:11.800 \longrightarrow 00:35:13.116$  if you then one on that maze,

NOTE Confidence: 0.713342685

 $00:35:13.120 \dashrightarrow 00:35:14.840$  what happens to the next value of alpha?

NOTE Confidence: 0.713342685

00:35:14.840 --> 00:35:16.670 Are you more risk averse or

NOTE Confidence: 0.713342685

00:35:16.670 - 00:35:18.599 more risk seeking on that case?

NOTE Confidence: 0.713342685

 $00{:}35{:}18.600 \dashrightarrow 00{:}35{:}20.328$  And so from the PC bar

NOTE Confidence: 0.713342685

00:35:20.328 --> 00:35:21.480 mechanism I talked about,

NOTE Confidence: 0.713342685

 $00:35:21.480 \rightarrow 00:35:23.505$  what we would have expected is if you are

 $00:35:23.505 \rightarrow 00:35:25.560$  lucky on that case you didn't get the maze,

NOTE Confidence: 0.713342685

00:35:25.560 --> 00:35:26.880 you'd become more risk averse.

NOTE Confidence: 0.713342685

 $00{:}35{:}26.880 \dashrightarrow 00{:}35{:}28.956$  Next what we actually saw was

NOTE Confidence: 0.713342685

 $00:35:28.956 \rightarrow 00:35:30.340$  the opposite interestingly which

NOTE Confidence: 0.713342685

 $00{:}35{:}30{.}402 \dashrightarrow 00{:}35{:}31{.}800$  is that after a lava pit,

NOTE Confidence: 0.713342685

 $00{:}35{:}31{.}800 \dashrightarrow 00{:}35{:}34{.}894$  so after you saw a after you got trapped

NOTE Confidence: 0.713342685

 $00{:}35{:}34{.}894 \dashrightarrow 00{:}35{:}37{.}688$  in one maze then in fact you became a

NOTE Confidence: 0.713342685

 $00:35:37.688 \rightarrow 00:35:40.232$  bit more risk averse in the next maze.

NOTE Confidence: 0.713342685

 $00{:}35{:}40{.}240 \dashrightarrow 00{:}35{:}41{.}782$  And so we're we're sort of

NOTE Confidence: 0.713342685

 $00:35:41.782 \longrightarrow 00:35:43.000$  contemplating why that might be.

NOTE Confidence: 0.713342685

 $00{:}35{:}43.000 \dashrightarrow 00{:}35{:}45.480$  We did see A and and we are also

NOTE Confidence: 0.713342685

 $00{:}35{:}45{.}551 \dashrightarrow 00{:}35{:}47{.}867$  looking inside the choices you make

NOTE Confidence: 0.713342685

 $00:35:47.867 \rightarrow 00:35:50.678$  inside a single maze because if you

NOTE Confidence: 0.713342685

 $00:35:50.678 \dashrightarrow 00:35:53.072$  remember we have noisy actions so

NOTE Confidence: 0.713342685

00:35:53.072 --> 00:35:54.528 sometimes you're lucky or unlucky

 $00{:}35{:}54{.}528$  -->  $00{:}35{:}56{.}575$  inside a single maze and they do see

NOTE Confidence: 0.713342685

 $00{:}35{:}56{.}575 \dashrightarrow 00{:}35{:}58{.}271$  APC bar like effect which is that if

NOTE Confidence: 0.713342685

 $00:35:58.327 \dashrightarrow 00:36:00.056$  you've been lucky then in the future NOTE Confidence: 0.713342685

 $00:36:00.056 \dashrightarrow 00:36:01.768$ you're more a little bit more risk

NOTE Confidence: 0.713342685

 $00{:}36{:}01.768 \dashrightarrow 00{:}36{:}03.220$  averse and if you've been unlucky

NOTE Confidence: 0.713342685

 $00:36:03.272 \dashrightarrow 00:36:05.160$  you've been a little bit less risk averse.

NOTE Confidence: 0.713342685

 $00{:}36{:}05{.}160 \dashrightarrow 00{:}36{:}06{.}885$  So there's a conflict between

NOTE Confidence: 0.713342685

 $00{:}36{:}06{.}885 \dashrightarrow 00{:}36{:}08{.}610$  different time scales of how

NOTE Confidence: 0.857840121333333

 $00{:}36{:}08{.}672 \dashrightarrow 00{:}36{:}10{.}157$  of how this is operating.

NOTE Confidence: 0.857840121333333

 $00{:}36{:}10.160 \dashrightarrow 00{:}36{:}12.512$  And that conflict also comes up a little

NOTE Confidence: 0.857840121333333

 $00{:}36{:}12.512 \dashrightarrow 00{:}36{:}14.999$  bit when we look across the the the

NOTE Confidence: 0.857840121333333

 $00:36:14.999 \dashrightarrow 00:36:16.997$  first and second-half of these mazes,

NOTE Confidence: 0.857840121333333

 $00{:}36{:}17.000 \dashrightarrow 00{:}36{:}19.637$  the 1st 15 mazes versus the 2nd 15 mazes.

NOTE Confidence: 0.857840121333333

00:36:19.640 --> 00:36:22.678 Whereby if you had the more losses,

NOTE Confidence: 0.857840121333333

 $00:36:22.680 \rightarrow 00:36:25.119$  if you had more losses in the first half,

NOTE Confidence: 0.857840121333333

 $00:36:25.120 \longrightarrow 00:36:26.884$  we can ask are you more risk averse and

 $00:36:26.884 \rightarrow 00:36:28.560$  more risk seeking in the second-half.

NOTE Confidence: 0.857840121333333

 $00{:}36{:}28.560 \dashrightarrow 00{:}36{:}30.036$  And there's some small evidence that

NOTE Confidence: 0.857840121333333

 $00{:}36{:}30{.}036 \dashrightarrow 00{:}36{:}32{.}054$  in on average or a bit more risk

NOTE Confidence: 0.857840121333333

 $00:36:32.054 \rightarrow 00:36:33.530$  seeking in the second-half and you've

NOTE Confidence: 0.857840121333333

 $00{:}36{:}33{.}580 \dashrightarrow 00{:}36{:}35{.}155$  had more losses in the first half.

NOTE Confidence: 0.857840121333333

 $00{:}36{:}35{.}160 \dashrightarrow 00{:}36{:}37{.}014$  So that suggests that this phenomenon

NOTE Confidence: 0.857840121333333

 $00{:}36{:}37{.}014 \dashrightarrow 00{:}36{:}39{.}796$  which is a trial like a maze to maze

NOTE Confidence: 0.857840121333333

 $00:36:39.796 \rightarrow 00:36:41.683$  effect may itself not completely generalise

NOTE Confidence: 0.857840121333333

 $00{:}36{:}41.683 \dashrightarrow 00{:}36{:}44.035$  over the whole context of the mazes.

NOTE Confidence: 0.857840121333333

 $00{:}36{:}44.040 \dashrightarrow 00{:}36{:}46.788$  So really some interesting things to

NOTE Confidence: 0.857840121333333

 $00:36:46.788 \rightarrow 00:36:49.639$  investigate in this in this domain.

NOTE Confidence: 0.857840121333333

00:36:49.640 --> 00:36:51.120 OK it's an interim summary.

NOTE Confidence: 0.857840121333333

 $00:36:51.120 \longrightarrow 00:36:52.092$  So what we have,

NOTE Confidence: 0.857840121333333

 $00:36:52.092 \longrightarrow 00:36:54.302$  what I'll try to show you is this

NOTE Confidence: 0.857840121333333

 $00{:}36{:}54{.}302 \dashrightarrow 00{:}36{:}56{.}037$  sort of parametric risk avoidant

 $00:36:56.037 \rightarrow 00:36:58.410$  behaviour which can come from this pre

NOTE Confidence: 0.857840121333333

 $00:36:58.410 \dashrightarrow 00:37:00.318$  committed PC bar and pre commitment.

NOTE Confidence: 0.857840121333333

 $00:37:00.320 \longrightarrow 00:37:01.320$  Is that you think,

NOTE Confidence: 0.857840121333333

 $00:37:01.320 \dashrightarrow 00:37:03.360$  well how much risk am I willing?

NOTE Confidence: 0.857840121333333

 $00:37:03.360 \longrightarrow 00:37:04.240$  How much you know?

NOTE Confidence: 0.857840121333333

 $00{:}37{:}04{.}240 \dashrightarrow 00{:}37{:}05{.}340$  Which part of this distribution

NOTE Confidence: 0.857840121333333

00:37:05.340 --> 00:37:06.983 am I willing to think about right

NOTE Confidence: 0.857840121333333

 $00:37:06.983 \longrightarrow 00:37:07.673$  from the beginning.

NOTE Confidence: 0.857840121333333

 $00{:}37{:}07{.}680 \dashrightarrow 00{:}37{:}09{.}020$  And that requires you to

NOTE Confidence: 0.857840121333333

 $00:37:09.020 \rightarrow 00:37:10.186$  have this gambler's fallacy.

NOTE Confidence: 0.857840121333333

 $00{:}37{:}10.186 \dashrightarrow 00{:}37{:}12.690$  So change the value of alpha as you

NOTE Confidence: 0.857840121333333

00:37:12.757 --> 00:37:14.504 as as you are unlucky or unlucky.

NOTE Confidence: 0.857840121333333

 $00{:}37{:}14.504 \dashrightarrow 00{:}37{:}16.340$  So obviously the inference is a

NOTE Confidence: 0.857840121333333

 $00:37:16.401 \dashrightarrow 00:37:18.236$  little bit more complicated here,

NOTE Confidence: 0.857840121333333

 $00:37:18.240 \rightarrow 00:37:19.976$  but in fact many ways almost every

NOTE Confidence: 0.857840121333333

 $00:37:19.976 \dashrightarrow 00:37:21.920$  way that we have of thinking about

- NOTE Confidence: 0.857840121333333
- $00:37:21.920 \longrightarrow 00:37:23.636$  risk in the sequential case is
- NOTE Confidence: 0.857840121333333
- $00:37:23.690 \rightarrow 00:37:25.503$  going to rely on a more complicated
- NOTE Confidence: 0.857840121333333
- 00:37:25.503 -> 00:37:26.635 way of doing evaluation.
- NOTE Confidence: 0.857840121333333
- 00:37:26.635 --> 00:37:29.120 Because you know for instance if you
- NOTE Confidence: 0.857840121333333
- $00:37:29.120 \longrightarrow 00:37:31.840$  have a non linear a utility function,
- NOTE Confidence: 0.857840121333333
- $00:37:31.840 \longrightarrow 00:37:33.004$  then if you think about my
- NOTE Confidence: 0.857840121333333
- 00:37:33.004 --> 00:37:34.040 total utility on a path,
- NOTE Confidence: 0.857840121333333
- $00:37:34.040 \dashrightarrow 00:37:35.860$  you're going to have to monitor what
- NOTE Confidence: 0.857840121333333
- $00{:}37{:}35{.}860 \dashrightarrow 00{:}37{:}37{.}483$  that total utility you know which is
- NOTE Confidence: 0.857840121333333
- $00:37:37.483 \rightarrow 00:37:39.200$  how you which is the non linearity.
- NOTE Confidence: 0.857840121333333
- 00:37:39.200 --> 00:37:40.320 Then you're going to have to monitor,
- NOTE Confidence: 0.857840121333333
- 00:37:40.320 --> 00:37:41.517 you're going to have to modify your,
- NOTE Confidence: 0.857840121333333
- $00{:}37{:}41.520 \dashrightarrow 00{:}37{:}43.739$  you're going to have to monitor the
- NOTE Confidence: 0.857840121333333
- $00{:}37{:}43.739 \dashrightarrow 00{:}37{:}45.979$  total utility so that you can then
- NOTE Confidence: 0.857840121333333
- 00:37:45.979 00:37:48.120 manipulate it in this non linear way.
- NOTE Confidence: 0.857840121333333

00:37:48.120 --> 00:37:50.064 You also see in prospect theory

NOTE Confidence: 0.857840121333333

 $00{:}37{:}50.064 \dashrightarrow 00{:}37{:}51.360$  for instance as well,

NOTE Confidence: 0.857840121333333

 $00:37:51.360 \longrightarrow 00:37:53.413$  if we have this nested what

NOTE Confidence: 0.857840121333333

 $00:37:53.413 \rightarrow 00:37:54.878$  we sometimes call NC bar,

NOTE Confidence: 0.857840121333333

 $00:37:54.880 \longrightarrow 00:37:56.511$  that's the one where we just fix

NOTE Confidence: 0.857840121333333

 $00{:}37{:}56{.}511 \dashrightarrow 00{:}37{:}58{.}111$  the value alpha and just apply the

NOTE Confidence: 0.857840121333333

00:37:58.111 --> 00:37:59.879 same value as you go down and down,

NOTE Confidence: 0.857840121333333

 $00:37:59.880 \longrightarrow 00:38:01.560$  then in some cases you can

NOTE Confidence: 0.857840121333333

 $00{:}38{:}01{.}560 \dashrightarrow 00{:}38{:}02{.}680$  get excessive risk aversion.

NOTE Confidence: 0.857840121333333

 $00{:}38{:}02.680 \dashrightarrow 00{:}38{:}05.183$  So in the random walk that we saw

NOTE Confidence: 0.857840121333333

 $00{:}38{:}05{.}183 \dashrightarrow 00{:}38{:}07{.}290$  there and then again we we can

NOTE Confidence: 0.857840121333333

 $00:38:07.366 \longrightarrow 00:38:09.904$  still think about that at different

NOTE Confidence: 0.857840121333333

 $00{:}38{:}09{.}904 \dashrightarrow 00{:}38{:}11{.}596$  values of alpha itself.

NOTE Confidence: 0.857840121333333

 $00:38:11.600 \longrightarrow 00:38:14.912$  We think that there's we're now

NOTE Confidence: 0.857840121333333

 $00:38:14.912 \rightarrow 00:38:16.568$  worrying about indeterminacy

NOTE Confidence: 0.857840121333333

00:38:16.568 --> 00:38:19.079 between your prior expectation,

- NOTE Confidence: 0.857840121333333
- $00:38:19.080 \longrightarrow 00:38:20.400$  for instance getting caught in
- NOTE Confidence: 0.857840121333333
- $00:38:20.400 \longrightarrow 00:38:22.377$  the maze by a lava pit versus
- NOTE Confidence: 0.857840121333333
- 00:38:22.377 > 00:38:23.877 the degree of risk aversion.
- NOTE Confidence: 0.857840121333333
- $00{:}38{:}23{.}880 \dashrightarrow 00{:}38{:}26{.}368$  And those two work opposite to each other
- NOTE Confidence: 0.857840121333333
- $00{:}38{:}26{.}368 \dashrightarrow 00{:}38{:}28{.}676$  in terms of the in terms of PC bar.
- NOTE Confidence: 0.857840121333333
- $00:38:28.680 \longrightarrow 00:38:29.852$  So you get caught.
- NOTE Confidence: 0.857840121333333
- $00:38:29.852 \dashrightarrow 00:38:31.610$  That increases your prior to the
- NOTE Confidence: 0.857840121333333
- 00:38:31.673 --> 00:38:33.397 possibility of getting caught,
- NOTE Confidence: 0.857840121333333
- $00:38:33.400 \rightarrow 00:38:35.880$  but it also increases the value of alpha,
- NOTE Confidence: 0.857840121333333
- $00:38:35.880 \longrightarrow 00:38:37.920$  makes you a little bit less risk averse.
- NOTE Confidence: 0.912421653333333
- $00{:}38{:}37{.}920 \dashrightarrow 00{:}38{:}39{.}492$  And so those two things are
- NOTE Confidence: 0.912421653333333
- $00:38:39.492 \rightarrow 00:38:41.083$  fighting with each other we think
- NOTE Confidence: 0.912421653333333
- $00:38:41.083 \longrightarrow 00:38:42.553$  in the context of these mazes.
- NOTE Confidence: 0.912421653333333
- $00{:}38{:}42.560 \dashrightarrow 00{:}38{:}43.792$  And of course it would be interesting
- NOTE Confidence: 0.912421653333333
- $00:38:43.792 \dashrightarrow 00:38:45.318$  to look at ambiguity as well as risk.
- NOTE Confidence: 0.912421653333333

 $00:38:45.320 \longrightarrow 00:38:47.032$  So here all I did talked about is

NOTE Confidence: 0.912421653333333

 $00:38:47.032 \rightarrow 00:38:48.746$  cases where you know the probabilities

NOTE Confidence: 0.912421653333333

 $00:38:48.746 \longrightarrow 00:38:50.291$  are frankly expressed as subjects

NOTE Confidence: 0.912421653333333

 $00:38:50.291 \rightarrow 00:38:51.717$  know exactly what the probability

NOTE Confidence: 0.912421653333333

 $00:38:51.717 \rightarrow 00:38:53.622$  is of getting caught by the the,

NOTE Confidence: 0.912421653333333

 $00:38:53.622 \dashrightarrow 00:38:55.434$  the sorry, they know exactly probably

NOTE Confidence: 0.912421653333333

 $00{:}38{:}55{.}434 \dashrightarrow 00{:}38{:}57{.}634$  of having a lapse in terms of the

NOTE Confidence: 0.912421653333333

 $00:38:57.634 \rightarrow 00:38:59.599$  the way that they move in the maze.

NOTE Confidence: 0.912421653333333

 $00:38:59.600 \dashrightarrow 00:39:01.160$  They know the values of everything.

NOTE Confidence: 0.912421653333333

00:39:01.160 - 00:39:02.520 We didn't make it ambiguous.

NOTE Confidence: 0.912421653333333

 $00{:}39{:}02{.}520 \dashrightarrow 00{:}39{:}04{.}389$  But of course ambiguity as a sort

NOTE Confidence: 0.912421653333333

00:39:04.389 --> 00:39:06.206 of 2nd order probability also makes

NOTE Confidence: 0.912421653333333

00:39:06.206 --> 00:39:08.439 you gives you an extra aspect of

NOTE Confidence: 0.912421653333333

 $00:39:08.502 \rightarrow 00:39:10.357$  probability that you don't know.

NOTE Confidence: 0.912421653333333

 $00:39:10.360 \longrightarrow 00:39:12.556$  And so then if you think about the law,

NOTE Confidence: 0.912421653333333

 $00:39:12.560 \longrightarrow 00:39:14.751$  so a tale of those properties you

00:39:14.751 --> 00:39:17.223 don't know that's a way of inducing

NOTE Confidence: 0.912421653333333

 $00:39:17.223 \rightarrow 00:39:18.968$  ambiguity aversion because of the of

NOTE Confidence: 0.912421653333333

 $00:39:18.968 \longrightarrow 00:39:20.480$  the extra uncertainty that you have,

NOTE Confidence: 0.912421653333333

 $00:39:20.480 \longrightarrow 00:39:22.320$  the 2nd order uncertainty you

NOTE Confidence: 0.912421653333333

 $00{:}39{:}22{.}320 \dashrightarrow 00{:}39{:}24{.}160$  have in those cases too.

NOTE Confidence: 0.912421653333333

00:39:24.160 --> 00:39:26.800 From a psychiatric point of view,

NOTE Confidence: 0.912421653333333

 $00:39:26.800 \rightarrow 00:39:29.165$  you what you can see is a sort of an aspect

NOTE Confidence: 0.912421653333333

 $00:39:29.165 \rightarrow 00:39:31.636$  of sort of pathological avoidance right here.

NOTE Confidence: 0.912421653333333

 $00{:}39{:}31{.}640 \dashrightarrow 00{:}39{:}33{.}030$  The way you're evaluating what

NOTE Confidence: 0.912421653333333

 $00:39:33.030 \rightarrow 00:39:34.735$  could be a relatively benign world

NOTE Confidence: 0.912421653333333

00:39:34.735 --> 00:39:36.319 is you're thinking about all the

NOTE Confidence: 0.912421653333333

 $00:39:36.319 \longrightarrow 00:39:37.679$  nasty things that can happen.

NOTE Confidence: 0.912421653333333

 $00{:}39{:}37{.}680 \dashrightarrow 00{:}39{:}39{.}920$  That's what that's what what is

NOTE Confidence: 0.912421653333333

 $00{:}39{:}39{.}920 \dashrightarrow 00{:}39{:}41.072$  becomes really critically important.

NOTE Confidence: 0.912421653333333

 $00{:}39{:}41.072 \dashrightarrow 00{:}39{:}42.800$  And then if you're living in

00:39:42.850 --> 00:39:43.960 a stochastic environment,

NOTE Confidence: 0.912421653333333

 $00{:}39{:}43{.}960 \dashrightarrow 00{:}39{:}45{.}836$  which of course we we all do,

NOTE Confidence: 0.912421653333333

 $00:39:45.840 \rightarrow 00:39:48.234$  then if you're really extremely risk averse,

NOTE Confidence: 0.912421653333333

 $00:39:48.240 \rightarrow 00:39:49.997$  so alpha is really near to zero,

NOTE Confidence: 0.912421653333333

 $00{:}39{:}50{.}000 \dashrightarrow 00{:}39{:}52{.}220$  then that's a route to indifference

NOTE Confidence: 0.912421653333333

 $00{:}39{:}52{.}220 \dashrightarrow 00{:}39{:}52{.}960$  or helplessness.

NOTE Confidence: 0.912421653333333

 $00:39:52.960 \rightarrow 00:39:55.237$  Because it doesn't matter what you try to do,

NOTE Confidence: 0.912421653333333

 $00{:}39{:}55{.}240 \dashrightarrow 00{:}39{:}56{.}420$  you're always worried about the

NOTE Confidence: 0.912421653333333

 $00{:}39{:}56{.}420 \dashrightarrow 00{:}39{:}57{.}600$  nastiest thing that can happen.

NOTE Confidence: 0.912421653333333

 $00:39:57.600 \rightarrow 00:40:02.076$  So that makes life super complicated.

NOTE Confidence: 0.912421653333333

 $00:40:02.080 \longrightarrow 00:40:04.080$  OK, so that's online behaviour.

NOTE Confidence: 0.912421653333333

 $00:40:04.080 \dashrightarrow 00:40:06.278$  So, so here we think about planning.

NOTE Confidence: 0.912421653333333

 $00:40:06.280 \longrightarrow 00:40:08.205$  We won't imagine what are our subjects

NOTE Confidence: 0.912421653333333

 $00:40:08.205 \rightarrow 00:40:10.289$  doing as they're thinking about how to move

NOTE Confidence: 0.912421653333333

 $00{:}40{:}10.289 \dashrightarrow 00{:}40{:}12.399$  in that maze with the with the choices.

NOTE Confidence: 0.912421653333333

 $00:40:12.400 \longrightarrow 00:40:14.104$  So there we can do what as Phil

 $00{:}40{:}14.104 \dashrightarrow 00{:}40{:}15.538$  mentioned at the beginning as sort

NOTE Confidence: 0.912421653333333

 $00{:}40{:}15.538 \dashrightarrow 00{:}40{:}17.586$  of forms of something a bit like say

NOTE Confidence: 0.912421653333333

 $00:40:17.586 \rightarrow 00:40:18.730$  model based reinforcement learning

NOTE Confidence: 0.912421653333333

 $00{:}40{:}18.730 \dashrightarrow 00{:}40{:}20.664$  where we have a model of the world

NOTE Confidence: 0.912421653333333

 $00:40:20.664 \rightarrow 00:40:21.840$  and we're planning in that model.

NOTE Confidence: 0.912421653333333

 $00{:}40{:}21.840 \dashrightarrow 00{:}40{:}23.934$  We're thinking about the risk that

NOTE Confidence: 0.912421653333333

 $00:40:23.934 \rightarrow 00:40:25.661$  accumulates along these paths and

NOTE Confidence: 0.912421653333333

 $00:40:25.661 \rightarrow 00:40:27.797$  changing these values of alpha as we go.

NOTE Confidence: 0.912421653333333

 $00{:}40{:}27.800 \dashrightarrow 00{:}40{:}29.744$  But there's a lot of interest at the

NOTE Confidence: 0.912421653333333

 $00:40:29.744 \longrightarrow 00:40:31.751$  moment in also thinking about offline

NOTE Confidence: 0.912421653333333

 $00:40:31.751 \rightarrow 00:40:34.160$  processing that can happen during periods of,

NOTE Confidence: 0.912421653333333

 $00:40:34.160 \longrightarrow 00:40:34.890$  for instance,

NOTE Confidence: 0.912421653333333

 $00{:}40{:}34.890 \dashrightarrow 00{:}40{:}37.080$  quiet wakefulness or sleep in animals.

NOTE Confidence: 0.912421653333333

00:40:37.080 --> 00:40:39.856 Also into in into trial intervals in in

NOTE Confidence: 0.912421653333333

 $00{:}40{:}39.856 \dashrightarrow 00{:}40{:}42.397$  humans that we've been looking at too.

 $00{:}40{:}42{.}400 \dashrightarrow 00{:}40{:}44{.}584$  And so the idea has been that

NOTE Confidence: 0.912421653333333

 $00:40:44.584 \longrightarrow 00:40:45.520$  there's a coordinate,

NOTE Confidence: 0.912421653333333

 $00:40:45.520 \rightarrow 00:40:47.600$  that there's hippocampal and cortical

NOTE Confidence: 0.912421653333333

 $00:40:47.600 \rightarrow 00:40:49.680$  replay which themselves are coordinated,

NOTE Confidence: 0.912421653333333

 $00{:}40{:}49{.}680 \dashrightarrow 00{:}40{:}52{.}224$  which can be used to do

NOTE Confidence: 0.912421653333333

 $00:40:52.224 \rightarrow 00:40:53.920$  aspects of offline planning.

NOTE Confidence: 0.912421653333333

 $00:40:53.920 \longrightarrow 00:40:56.377$  Which is to say that we normally

NOTE Confidence: 0.912421653333333

 $00{:}40{:}56{.}377 \dashrightarrow 00{:}40{:}58{.}385$  think about a model of the world

NOTE Confidence: 0.912421653333333

 $00{:}40{:}58.385 \dashrightarrow 00{:}40{:}59.690$  that's like a generative model

NOTE Confidence: 0.912421653333333

 $00:40:59.747 \longrightarrow 00:41:01.077$  of the of the environment.

NOTE Confidence: 0.912421653333333

 $00:41:01.080 \rightarrow 00:41:03.600$  The inverse of that model is a policy.

NOTE Confidence: 0.912421653333333

 $00{:}41{:}03.600 \dashrightarrow 00{:}41{:}06.096$  It's like what should I do in the

NOTE Confidence: 0.912421653333333

00:41:06.096 --> 00:41:07.712 environment in order to optimise

NOTE Confidence: 0.912421653333333

00:41:07.712 --> 00:41:09.854 my my return or optimise my C

NOTE Confidence: 0.800395791363636

 $00:41:09.923 \rightarrow 00:41:11.480$  bar return? And so in that case,

NOTE Confidence: 0.800395791363636

 $00:41:11.480 \rightarrow 00:41:13.293$  the inverse of the model is something

 $00:41:13.293 \longrightarrow 00:41:14.827$  you can calculate offline when you're

NOTE Confidence: 0.800395791363636

 $00:41:14.827 \rightarrow 00:41:16.885$  not having to use the model to make your

NOTE Confidence: 0.800395791363636

 $00:41:16.885 \longrightarrow 00:41:19.054$  choices as it as it as it as it goes.

NOTE Confidence: 0.800395791363636

 $00{:}41{:}19.054 \dashrightarrow 00{:}41{:}21.256$  And there's evidence in both rodents

NOTE Confidence: 0.800395791363636

 $00{:}41{:}21{.}256 \dashrightarrow 00{:}41{:}24{.}652$  and also in humans in the last few

NOTE Confidence: 0.800395791363636

 $00{:}41{:}24.652 \dashrightarrow 00{:}41{:}27.545$  years using typically using Meg that

NOTE Confidence: 0.800395791363636

 $00{:}41{:}27.545 \dashrightarrow 00{:}41{:}29.670$  subjects are actually engaging in

NOTE Confidence: 0.800395791363636

 $00:41:29.670 \rightarrow 00:41:31.370$  offline processing which actually

NOTE Confidence: 0.800395791363636

 $00:41:31.436 \longrightarrow 00:41:33.242$  has an impact on their behaviour

NOTE Confidence: 0.800395791363636

 $00:41:33.242 \rightarrow 00:41:35.160$  when it happens in the future.

NOTE Confidence: 0.800395791363636

 $00:41:35.160 \rightarrow 00:41:37.236$  So in the reinforcement learning world,

NOTE Confidence: 0.800395791363636

 $00{:}41{:}37{.}240 \dashrightarrow 00{:}41{:}39{.}034$  this has been closely associated with

NOTE Confidence: 0.800395791363636

00:41:39.034 --> 00:41:41.412 an idea from Rich Sutton in the 90s

NOTE Confidence: 0.800395791363636

00:41:41.412 --> 00:41:43.104 called Dyna where he thought about

NOTE Confidence: 0.800395791363636

 $00:41:43.166 \rightarrow 00:41:45.121$  offline processing this replay like

 $00:41:45.121 \rightarrow 00:41:47.076$  processing to enable exploration and

NOTE Confidence: 0.800395791363636

 $00:41:47.080 \longrightarrow 00:41:49.645$  then got embedded in in the sort of

NOTE Confidence: 0.800395791363636

 $00{:}41{:}49{.}645$  -->  $00{:}41{:}51{.}471$  forms advanced forms of reinforcement NOTE Confidence: 0.800395791363636

 $00:41:51.471 \longrightarrow 00:41:54.114$  learning for for in AI in replay

NOTE Confidence: 0.800395791363636

 $00:41:54.114 \rightarrow 00:41:56.280$  buffers for things like the DQN.

NOTE Confidence: 0.800395791363636

 $00{:}41{:}56{.}280$  -->  $00{:}41{:}59{.}560$  So deep Q learning the networks that for NOTE Confidence: 0.800395791363636

00:41:59.560 --> 00:42:01.753 instance DeepMind used very successfully

NOTE Confidence: 0.800395791363636

 $00:42:01.753 \rightarrow 00:42:04.850$  for things like Alphago to win it go.

NOTE Confidence: 0.800395791363636

 $00:42:04.850 \rightarrow 00:42:06.400$  And then slightly more recently,

NOTE Confidence: 0.800395791363636

 $00{:}42{:}06{.}400 \dashrightarrow 00{:}42{:}08{.}914$  there's a lovely paper from Marcelo

NOTE Confidence: 0.800395791363636

00:42:08.914 --> 00:42:11.519 Mata and Nathaniel Door which was

NOTE Confidence: 0.800395791363636

 $00:42:11.519 \rightarrow 00:42:13.673$  was speculating that the replay

NOTE Confidence: 0.800395791363636

 $00:42:13.673 \longrightarrow 00:42:15.710$  that we see in rodents might be

NOTE Confidence: 0.800395791363636

 $00:42:15.773 \rightarrow 00:42:17.849$  optimised to improve the the way

NOTE Confidence: 0.800395791363636

 $00:42:17.849 \rightarrow 00:42:19.994$  that that these rodents are planning

NOTE Confidence: 0.800395791363636

 $00:42:19.994 \longrightarrow 00:42:21.719$  in the in the environment.

 $00:42:21.720 \rightarrow 00:42:23.388$  So given that they discover something

NOTE Confidence: 0.800395791363636

 $00{:}42{:}23{.}388 \dashrightarrow 00{:}42{:}25{.}073$  about the world they discover like

NOTE Confidence: 0.800395791363636

 $00{:}42{:}25.073 \dashrightarrow 00{:}42{:}26.886$  a reward they didn't know about or

NOTE Confidence: 0.800395791363636

 $00:42:26.886 \rightarrow 00:42:28.349$  maybe they've forgotten then then

NOTE Confidence: 0.800395791363636

 $00:42:28.349 \rightarrow 00:42:30.077$  they have to do some relearning.

NOTE Confidence: 0.800395791363636

 $00{:}42{:}30{.}080 \dashrightarrow 00{:}42{:}32{.}887$  Then what Matter and Dole suggested is

NOTE Confidence: 0.800395791363636

 $00:42:32.887 \longrightarrow 00:42:35.824$  that the sequence of which the animal

NOTE Confidence: 0.800395791363636

 $00:42:35.824 \rightarrow 00:42:38.314$  engages in replay well is informative,

NOTE Confidence: 0.800395791363636

 $00{:}42{:}38{.}320 \dashrightarrow 00{:}42{:}40{.}352$  is chosen in order to optimize the way

NOTE Confidence: 0.800395791363636

 $00:42:40.352 \rightarrow 00:42:42.239$  that the animals will then subsequently

NOTE Confidence: 0.800395791363636

 $00:42:42.239 \rightarrow 00:42:44.219$  move through the world using a

NOTE Confidence: 0.800395791363636

 $00:42:44.276 \rightarrow 00:42:46.280$  simpler way of making doing planning.

NOTE Confidence: 0.800395791363636

 $00{:}42{:}46{.}280 \dashrightarrow 00{:}42{:}48{.}432$  And they pointed out that that you should

NOTE Confidence: 0.800395791363636

 $00{:}42{:}48.432 \dashrightarrow 00{:}42{:}50.338$  choose to make updates to your model

NOTE Confidence: 0.800395791363636

 $00{:}42{:}50{.}338 \dashrightarrow 00{:}42{:}52{.}400$  based on the product of 2 quantities,

 $00:42:52.400 \longrightarrow 00:42:53.210$  gain and need.

NOTE Confidence: 0.800395791363636

 $00:42:53.210 \longrightarrow 00:42:56.163$  So gain is if you were to do a replay

NOTE Confidence: 0.800395791363636

 $00:42:56.163 \longrightarrow 00:42:58.480$  at a particular location in the main,

NOTE Confidence: 0.800395791363636

 $00:42:58.480 \rightarrow 00:42:59.705$  maybe somewhere where you're not

NOTE Confidence: 0.800395791363636

 $00:42:59.705 \longrightarrow 00:43:01.253$  you have this motion of distal

NOTE Confidence: 0.800395791363636

 $00{:}43{:}01{.}253 \dashrightarrow 00{:}43{:}02{.}638$  replay near the Campbell world.

NOTE Confidence: 0.800395791363636

00:43:02.640 - 00:43:05.504 Then the game is how much you would

NOTE Confidence: 0.800395791363636

 $00:43:05.504 \rightarrow 00:43:08.240$  change your policy if you made an update.

NOTE Confidence: 0.800395791363636

 $00:43:08.240 \rightarrow 00:43:10.000$  So there's no point in making an update.

NOTE Confidence: 0.800395791363636

 $00:43:10.000 \rightarrow 00:43:11.855$  It is not going to change your

NOTE Confidence: 0.800395791363636

 $00{:}43{:}11.855 \dashrightarrow 00{:}43{:}13.524$  actions because it will have no

NOTE Confidence: 0.800395791363636

00:43:13.524 --> 00:43:15.186 impact on your final return and

NOTE Confidence: 0.800395791363636

 $00:43:15.186 \longrightarrow 00:43:17.022$  the need is how frequently you're

NOTE Confidence: 0.800395791363636

 $00:43:17.022 \longrightarrow 00:43:19.331$  going to visit that state in the

NOTE Confidence: 0.800395791363636

00:43:19.331 --> 00:43:20.996 future given your current policy.

NOTE Confidence: 0.800395791363636

 $00:43:21.000 \rightarrow 00:43:23.115$  So it turns out the product of those two

- NOTE Confidence: 0.800395791363636
- $00{:}43{:}23.115 \dashrightarrow 00{:}43{:}24.796$  governs the sequencing that you should
- NOTE Confidence: 0.800395791363636
- $00:43:24.796 \rightarrow 00:43:26.879$  apply to looking at states in the world.
- NOTE Confidence: 0.800395791363636
- 00:43:26.880 --> 00:43:27.756 And so if you think about,
- NOTE Confidence: 0.800395791363636
- 00:43:27.760 --> 00:43:29.240 you know you discover something,
- NOTE Confidence: 0.800395791363636
- $00:43:29.240 \rightarrow 00:43:30.984$  how should you go about planning
- NOTE Confidence: 0.800395791363636
- $00:43:30.984 \rightarrow 00:43:32.360$  using during this offline,
- NOTE Confidence: 0.800395791363636
- $00:43:32.360 \longrightarrow 00:43:34.420$  during these offline cases.
- NOTE Confidence: 0.800395791363636
- $00:43:34.420 \rightarrow 00:43:36.845$  So we thought about, well,
- NOTE Confidence: 0.800395791363636
- $00{:}43{:}36{.}845 \dashrightarrow 00{:}43{:}38{.}305$  what does optimal planning
- NOTE Confidence: 0.800395791363636
- $00:43:38.305 \longrightarrow 00:43:39.662$  look like for Seva?
- NOTE Confidence: 0.800395791363636
- $00{:}43{:}39.662 \dashrightarrow 00{:}43{:}41.839$  You have if you're risk risk averse.
- NOTE Confidence: 0.800395791363636
- $00:43:41.840 \longrightarrow 00:43:43.680$  So here,
- NOTE Confidence: 0.800395791363636
- $00:43:43.680 \longrightarrow 00:43:44.236$  excuse me,
- NOTE Confidence: 0.800395791363636
- $00{:}43{:}44{.}236 \dashrightarrow 00{:}43{:}45{.}626$  we're showing again another simple
- NOTE Confidence: 0.800395791363636
- $00{:}43{:}45.626 \dashrightarrow 00{:}43{:}47.359$  domain where you have a start state.
- NOTE Confidence: 0.800395791363636

 $00:43:47.360 \longrightarrow 00:43:48.810$  There's just a single word

NOTE Confidence: 0.800395791363636

 $00{:}43{:}48{.}810 \dashrightarrow 00{:}43{:}50{.}260$  at this location here and

NOTE Confidence: 0.743035424736842

 $00{:}43{:}50{.}323 \dashrightarrow 00{:}43{:}51{.}315$  there's one of these

NOTE Confidence: 0.743035424736842

 $00:43:51.315 \longrightarrow 00:43:52.844$  lava pits at the at here.

NOTE Confidence: 0.743035424736842

 $00{:}43{:}52{.}844 \dashrightarrow 00{:}43{:}55{.}116$  But what these numbers show is if all

NOTE Confidence: 0.743035424736842

 $00:43:55.116 \rightarrow 00:43:57.277$  you know about is where you start,

NOTE Confidence: 0.743035424736842

 $00:43:57.280 \longrightarrow 00:43:58.918$  you have a model of the world,

NOTE Confidence: 0.743035424736842

 $00{:}43{:}58{.}920 \dashrightarrow 00{:}44{:}00{.}272$  but you don't and you know about the

NOTE Confidence: 0.743035424736842

 $00:44:00.272 \longrightarrow 00:44:01.797$  law of a pit and the and the reward,

NOTE Confidence: 0.743035424736842

 $00:44:01.800 \longrightarrow 00:44:02.717$  but you don't know how to plan.

NOTE Confidence: 0.743035424736842

 $00:44:02.720 \longrightarrow 00:44:04.475$  You haven't got a plan of what to do.

NOTE Confidence: 0.743035424736842

 $00:44:04.480 \longrightarrow 00:44:05.720$  We're thinking of the replay

NOTE Confidence: 0.743035424736842

 $00{:}44{:}05{.}720 \dashrightarrow 00{:}44{:}06{.}960$  in matter and door world.

NOTE Confidence: 0.743035424736842

 $00{:}44{:}06{.}960 \dashrightarrow 00{:}44{:}09{.}702$  The replay is constructing that plan

NOTE Confidence: 0.743035424736842

 $00:44:09.702 \rightarrow 00:44:12.332$  for you by by essentially focusing

NOTE Confidence: 0.743035424736842

 $00:44:12.332 \longrightarrow 00:44:14.997$  on a state in the world and then

 $00{:}44{:}14{.}997 \dashrightarrow 00{:}44{:}17{.}157$  doing a little little Bellman update.

NOTE Confidence: 0.743035424736842

 $00:44:17.160 \longrightarrow 00:44:19.098$  Just one step of reinforcement learning

NOTE Confidence: 0.743035424736842

 $00:44:19.098 \longrightarrow 00:44:21.568$  and the steps the the order of the

NOTE Confidence: 0.743035424736842

 $00:44:21.568 \longrightarrow 00:44:23.236$  steps is shown by these numbers.

NOTE Confidence: 0.743035424736842

 $00:44:23.240 \rightarrow 00:44:26.312$  So it turns out that if you prioritise

NOTE Confidence: 0.743035424736842

00:44:26.312 --> 00:44:28.860 based on on being risk neutral and

NOTE Confidence: 0.743035424736842

 $00:44:28.860 \longrightarrow 00:44:31.448$  what I mean by prioritisation here is

NOTE Confidence: 0.743035424736842

 $00{:}44{:}31{.}448 \dashrightarrow 00{:}44{:}33{.}159$  you're thinking about what planning

NOTE Confidence: 0.743035424736842

 $00{:}44{:}33{.}159 \dashrightarrow 00{:}44{:}35{.}310$  should I do that has the most effect on

NOTE Confidence: 0.743035424736842

 $00{:}44{:}35{.}361 \dashrightarrow 00{:}44{:}37{.}209$  the value of the start state because

NOTE Confidence: 0.743035424736842

00:44:37.209 - 00:44:39.095 that's the value where you're you're

NOTE Confidence: 0.743035424736842

 $00:44:39.095 \rightarrow 00:44:40.835$  where you're where you're beginning.

NOTE Confidence: 0.743035424736842

 $00{:}44{:}40{.}840 \dashrightarrow 00{:}44{:}43{.}585$  So it turns out that in the if you

NOTE Confidence: 0.743035424736842

00:44:43.585 --> 00:44:45.695 prioritise based on this neutrality you

NOTE Confidence: 0.743035424736842

 $00:44:45.695 \rightarrow 00:44:48.946$  for some reason you do one step at the NOTE Confidence: 0.743035424736842

 $00:44:48.946 \rightarrow 00:44:52.117$  this location away from the lava pit

NOTE Confidence: 0.743035424736842

 $00:44:52.120 \rightarrow 00:44:54.240$  and then all the subsequent steps you do,

NOTE Confidence: 0.743035424736842

 $00{:}44{:}54{.}240 \dashrightarrow 00{:}44{:}56{.}544$  in this case the subsequent 7 steps or

NOTE Confidence: 0.743035424736842

 $00:44:56.544 \rightarrow 00:44:58.698$  seven six steps essentially plan in

NOTE Confidence: 0.743035424736842

 $00{:}44{:}58.698 \dashrightarrow 00{:}45{:}00.966$  this instance backwards from the goal

NOTE Confidence: 0.743035424736842

 $00:45:01.035 \rightarrow 00:45:03.317$  from the reward back to the beginning.

NOTE Confidence: 0.743035424736842

 $00:45:03.320 \rightarrow 00:45:05.978$  And this notion about backward sequencing

NOTE Confidence: 0.743035424736842

 $00:45:05.978 \rightarrow 00:45:08.720$  like reverse replay in the in the

NOTE Confidence: 0.743035424736842

 $00:45:08.720 \longrightarrow 00:45:11.121$  in the hippocampal world is also seen

NOTE Confidence: 0.743035424736842

 $00:45:11.121 \rightarrow 00:45:13.479$  in something called Prioritised sweeping,

NOTE Confidence: 0.743035424736842

 $00{:}45{:}13.480 \dashrightarrow 00{:}45{:}16.105$  which is an old idea in Reinforcement

NOTE Confidence: 0.743035424736842

 $00:45:16.105 \rightarrow 00:45:18.042$  Learning from Andrew Moore where

NOTE Confidence: 0.743035424736842

 $00{:}45{:}18.042 \dashrightarrow 00{:}45{:}20.625$  you'd optimise the the sequence of of

NOTE Confidence: 0.743035424736842

00:45:20.625 --> 00:45:22.812 updates you would do if you prioritise

NOTE Confidence: 0.743035424736842

 $00:45:22.812 \rightarrow 00:45:25.080$  instead based on a value of alpha,

NOTE Confidence: 0.743035424736842

 $00:45:25.080 \longrightarrow 00:45:26.340$  which is much lower,

- NOTE Confidence: 0.743035424736842
- $00:45:26.340 \longrightarrow 00:45:27.915$  so much more risk averse.
- NOTE Confidence: 0.743035424736842
- $00:45:27.920 \longrightarrow 00:45:29.901$  Now you can see that you spend
- NOTE Confidence: 0.743035424736842
- 00:45:29.901 --> 00:45:31.693 all your planning time instead of
- NOTE Confidence: 0.743035424736842
- $00{:}45{:}31.693 \dashrightarrow 00{:}45{:}33.751$  planning how to get to the reward.
- NOTE Confidence: 0.743035424736842
- $00{:}45{:}33.760 \dashrightarrow 00{:}45{:}36.160$  You spend all your planning time
- NOTE Confidence: 0.743035424736842
- $00{:}45{:}36{.}160 \dashrightarrow 00{:}45{:}38{.}264$  thinking about the about the lava pit,
- NOTE Confidence: 0.743035424736842
- $00:45:38.264 \rightarrow 00:45:39.394$  thinking about where you can.
- NOTE Confidence: 0.743035424736842
- $00:45:39.400 \longrightarrow 00:45:40.352$  You know how to avoid the lava
- NOTE Confidence: 0.743035424736842
- $00:45:40.352 \longrightarrow 00:45:41.159$  pit if you were there,
- NOTE Confidence: 0.743035424736842
- $00:45:41.160 \longrightarrow 00:45:42.560$  so the first is the same one,
- NOTE Confidence: 0.743035424736842
- $00:45:42.560 \longrightarrow 00:45:44.168$  but then all the subsequent ones
- NOTE Confidence: 0.743035424736842
- $00{:}45{:}44{.}168 \dashrightarrow 00{:}45{:}46{.}013$  are all avoiding the lava pit and
- NOTE Confidence: 0.743035424736842
- $00{:}45{:}46.013 \dashrightarrow 00{:}45{:}47.679$  have nothing to do with getting to
- NOTE Confidence: 0.743035424736842
- 00:45:47.734 $-\!\!>$ 00:45:49.558 the reward So you can see how you're
- NOTE Confidence: 0.743035424736842
- $00{:}45{:}49{.}560 \dashrightarrow 00{:}45{:}51{.}534$  even the structure of of thinking
- NOTE Confidence: 0.743035424736842

 $00:45:51.534 \rightarrow 00:45:53.929$  offline is going to be really could

NOTE Confidence: 0.743035424736842

 $00:45:53.929 \rightarrow 00:45:55.957$  could get really dominated by the

NOTE Confidence: 0.743035424736842

 $00{:}45{:}55{.}960 \dashrightarrow 00{:}45{:}57{.}717$  by these nasty things that could by

NOTE Confidence: 0.743035424736842

 $00:45:57.717 \dashrightarrow 00:45:59.398$  the nasty things that could happen.

NOTE Confidence: 0.743035424736842

00:45:59.400 --> 00:46:00.840 And if alpha equals 0,

NOTE Confidence: 0.743035424736842

00:46:00.840 --> 00:46:02.208 there's no point in doing planning

NOTE Confidence: 0.743035424736842

 $00{:}46{:}02.208 \dashrightarrow 00{:}46{:}03.611$  at all because you can't mitigate

NOTE Confidence: 0.743035424736842

 $00:46:03.611 \longrightarrow 00:46:05.151$  the child the the risk of getting

NOTE Confidence: 0.743035424736842

 $00:46:05.151 \longrightarrow 00:46:06.277$  to the log pit as well.

NOTE Confidence: 0.743035424736842

 $00:46:06.280 \longrightarrow 00:46:08.359$  So you just sit there and do

NOTE Confidence: 0.743035424736842

00:46:08.360 --> 00:46:11.240 you just can't help yourself.

NOTE Confidence: 0.743035424736842

00:46:11.240 --> 00:46:12.216 So as I mentioned,

NOTE Confidence: 0.743035424736842

 $00:46:12.216 \longrightarrow 00:46:13.680$  this is not only for humans.

NOTE Confidence: 0.743035424736842

 $00{:}46{:}13.680 \dashrightarrow 00{:}46{:}15.306$  So there's a lovely study that

NOTE Confidence: 0.743035424736842

 $00{:}46{:}15{.}306 \dashrightarrow 00{:}46{:}17{.}698$  comes from the from Mitsuko Wataba,

NOTE Confidence: 0.743035424736842

00:46:17.698 --> 00:46:19.276 Yushida's Yushida's lab,

- NOTE Confidence: 0.743035424736842
- $00:46:19.280 \longrightarrow 00:46:21.944$  where she's a very simple task
- NOTE Confidence: 0.743035424736842
- $00:46:21.944 \longrightarrow 00:46:23.960$  for for for mice.
- NOTE Confidence: 0.918624877142857
- $00:46:23.960 \longrightarrow 00:46:27.040$  So here she had a simple arena,
- NOTE Confidence: 0.918624877142857
- 00:46:27.040 --> 00:46:29.032 just an open like an open
- NOTE Confidence: 0.918624877142857
- $00:46:29.032 \longrightarrow 00:46:30.360$  field arena shown here.
- NOTE Confidence: 0.918624877142857
- $00:46:30.360 \longrightarrow 00:46:31.782$  And then the mice were put
- NOTE Confidence: 0.918624877142857
- $00:46:31.782 \longrightarrow 00:46:33.240$  in for a couple of days.
- NOTE Confidence: 0.918624877142857
- $00:46:33.240 \longrightarrow 00:46:34.086$  There's nothing there.
- NOTE Confidence: 0.918624877142857
- $00:46:34.086 \longrightarrow 00:46:35.778$  They had 25 minutes for a
- NOTE Confidence: 0.918624877142857
- $00:46:35.778 \longrightarrow 00:46:37.080$  session just to run around.
- NOTE Confidence: 0.918624877142857
- $00:46:37.080 \longrightarrow 00:46:38.560$  And here's some here's a path of a,
- NOTE Confidence: 0.918624877142857
- $00{:}46{:}38{.}560 \dashrightarrow 00{:}46{:}40{.}594$  of a, of a one of the mice just
- NOTE Confidence: 0.918624877142857
- $00{:}46{:}40.594 \dashrightarrow 00{:}46{:}42.159$  running around this this maze.
- NOTE Confidence: 0.918624877142857
- $00{:}46{:}42.160 \dashrightarrow 00{:}46{:}45.440$  Then on the third day after this habituation,
- NOTE Confidence: 0.918624877142857
- 00:46:45.440 --> 00:46:47.558 Mitsuko put in a novel object,
- NOTE Confidence: 0.918624877142857

00:46:47.560 --> 00:46:49.492 just basically a bunch of Lego

NOTE Confidence: 0.918624877142857

00:46:49.492 --> 00:46:51.567 blogs near to one corner of

NOTE Confidence: 0.918624877142857

 $00{:}46{:}51{.}567 \dashrightarrow 00{:}46{:}53{.}640$  the of the environment and then

NOTE Confidence: 0.918624877142857

 $00:46:53.640 \rightarrow 00:46:54.920$  monitored how the animals,

NOTE Confidence: 0.918624877142857

 $00{:}46{:}54{.}920 \dashrightarrow 00{:}46{:}56{.}408$  then what what the animals then

NOTE Confidence: 0.918624877142857

 $00:46:56.408 \rightarrow 00:46:57.680$  did over the subsequent days,

NOTE Confidence: 0.918624877142857

 $00:46:57.680 \longrightarrow 00:46:59.260$  so subsequent 4 days with

NOTE Confidence: 0.918624877142857

 $00:46:59.260 \longrightarrow 00:47:01.210$  this same novel object in the

NOTE Confidence: 0.918624877142857

 $00:47:01.210 \longrightarrow 00:47:02.755$  same location of the maze.

NOTE Confidence: 0.918624877142857

 $00:47:02.760 \longrightarrow 00:47:05.210$  And you can see even just eyeballing

NOTE Confidence: 0.918624877142857

 $00:47:05.210 \longrightarrow 00:47:07.480$  the the trajectories that the

NOTE Confidence: 0.918624877142857

 $00:47:07.480 \rightarrow 00:47:09.576$  animal have this really interesting

NOTE Confidence: 0.918624877142857

 $00:47:09.576 \rightarrow 00:47:11.596$  mix of essentially neophobia and

NOTE Confidence: 0.918624877142857

00:47:11.596 --> 00:47:13.346 neophilia and neophobia is much

NOTE Confidence: 0.918624877142857

 $00:47:13.346 \longrightarrow 00:47:14.956$  more much more apparent here.

NOTE Confidence: 0.918624877142857

 $00:47:14.960 \longrightarrow 00:47:16.448$  So it changes really the structure

 $00:47:16.448 \longrightarrow 00:47:18.525$  of the of the movement

NOTE Confidence: 0.918624877142857

 $00:47:18.525 \longrightarrow 00:47:19.557$  through the environment.

NOTE Confidence: 0.918624877142857

 $00:47:19.560 \longrightarrow 00:47:21.232$  So for various reasons,

NOTE Confidence: 0.918624877142857

 $00:47:21.232 \rightarrow 00:47:22.904$  Mitsuko characterized being within

NOTE Confidence: 0.918624877142857

 $00:47:22.904 \rightarrow 00:47:25.256$  7 centimetres of the object as being

NOTE Confidence: 0.918624877142857

 $00{:}47{:}25{.}256 \dashrightarrow 00{:}47{:}27{.}352$  sort of a critical distance as where

NOTE Confidence: 0.918624877142857

 $00:47:27.352 \rightarrow 00:47:29.672$  the animal is is sort of inspecting this,

NOTE Confidence: 0.918624877142857

 $00:47:29.680 \longrightarrow 00:47:31.016$  is inspecting this object.

NOTE Confidence: 0.918624877142857

00:47:31.016 --> 00:47:33.020 And then what what she's showing

NOTE Confidence: 0.918624877142857

 $00:47:33.081 \longrightarrow 00:47:34.943$  here is how much per minute of

NOTE Confidence: 0.918624877142857

 $00:47:34.943 \longrightarrow 00:47:37.046$  these 25 minutes in each of these

NOTE Confidence: 0.918624877142857

 $00{:}47{:}37{.}046 \dashrightarrow 00{:}47{:}38{.}601$  sessions does the animals spend

NOTE Confidence: 0.918624877142857

 $00{:}47{:}38.601 \dashrightarrow 00{:}47{:}40.680$  within 7 centimetres of the object.

NOTE Confidence: 0.918624877142857

 $00{:}47{:}40.680 \dashrightarrow 00{:}47{:}42.437$  So in the habituation days is just

NOTE Confidence: 0.918624877142857

 $00{:}47{:}42{.}437 \dashrightarrow 00{:}47{:}43{.}919$  within 7 centimetres of that circle.

 $00:47:43.920 \longrightarrow 00:47:45.240$  That's this circle shown here.

NOTE Confidence: 0.918624877142857

 $00:47:45.240 \rightarrow 00:47:46.640$  And you see that that, you know,

NOTE Confidence: 0.918624877142857

 $00:47:46.640 \rightarrow 00:47:48.080$  the animals spent some time there.

NOTE Confidence: 0.918624877142857

00:47:48.080 --> 00:47:49.160 But there's nothing,

NOTE Confidence: 0.918624877142857

 $00:47:49.160 \longrightarrow 00:47:51.320$  there's nothing failing those locations here.

NOTE Confidence: 0.918624877142857

 $00:47:51.320 \rightarrow 00:47:53.560$  When she puts in the novel object,

NOTE Confidence: 0.918624877142857

 $00:47:53.560 \longrightarrow 00:47:55.084$  you can see that then that

NOTE Confidence: 0.918624877142857

 $00:47:55.084 \rightarrow 00:47:56.100$  really dramatically changes the

NOTE Confidence: 0.918624877142857

 $00{:}47{:}56{.}150 \dashrightarrow 00{:}47{:}57{.}158$  structure of behaviour.

NOTE Confidence: 0.918624877142857

 $00{:}47{:}57{.}160 \dashrightarrow 00{:}47{:}59{.}505$  And here she's ordered the animals that

NOTE Confidence: 0.918624877142857

 $00{:}47{:}59{.}505 \dashrightarrow 00{:}48{:}02{.}006$  like 26 animals by the amount of total

NOTE Confidence: 0.918624877142857

 $00:48:02.006 \rightarrow 00:48:04.479$  time they spend near the near the object.

NOTE Confidence: 0.918624877142857

 $00:48:04.480 \longrightarrow 00:48:05.419$  So these animals,

NOTE Confidence: 0.918624877142857

 $00{:}48{:}05{.}419 \dashrightarrow 00{:}48{:}07{.}610$  these early animals spend a sit barely

NOTE Confidence: 0.918624877142857

 $00:48:07.667 \rightarrow 00:48:09.395$  anytime near the object at all.

NOTE Confidence: 0.918624877142857

 $00:48:09.400 \rightarrow 00:48:11.638$  These animals which are late here,

- NOTE Confidence: 0.918624877142857
- $00{:}48{:}11.640 \dashrightarrow 00{:}48{:}13.672$  they spend much more time near to the
- NOTE Confidence: 0.918624877142857
- $00{:}48{:}13.672 \dashrightarrow 00{:}48{:}15.635$  object than the than the first ones do.
- NOTE Confidence: 0.918624877142857
- $00{:}48{:}15{.}640 \dashrightarrow 00{:}48{:}17{.}348$  And so there's a sense in which
- NOTE Confidence: 0.918624877142857
- $00:48:17.348 \longrightarrow 00:48:19.199$  these are very risk averse animals.
- NOTE Confidence: 0.918624877142857
- $00:48:19.200 \longrightarrow 00:48:20.516$  They had what we would think of
- NOTE Confidence: 0.918624877142857
- $00:48:20.516 \rightarrow 00:48:21.917$  as being this low value of alpha,
- NOTE Confidence: 0.918624877142857
- $00:48:21.920 \longrightarrow 00:48:23.756$  whereas these animals are much more,
- NOTE Confidence: 0.918624877142857
- $00:48:23.760 \longrightarrow 00:48:24.864$  much less risk averse,
- NOTE Confidence: 0.918624877142857
- 00:48:24.864 --> 00:48:26.520 They're much more willing to go
- NOTE Confidence: 0.918624877142857
- $00:48:26.520 \longrightarrow 00:48:28.760$  get close to the to the object.
- NOTE Confidence: 0.918624877142857
- $00{:}48{:}28{.}760 \dashrightarrow 00{:}48{:}30{.}668$  And so you can see that the way that
- NOTE Confidence: 0.918624877142857
- $00:48:30.668 \rightarrow 00:48:32.795$  they approach the object is also changes.
- NOTE Confidence: 0.918624877142857
- $00:48:32.800 \longrightarrow 00:48:34.280$  So here you can see that in the
- NOTE Confidence: 0.918624877142857
- $00{:}48{:}34{.}280 \dashrightarrow 00{:}48{:}35{.}557$  first day of the object they
- NOTE Confidence: 0.918624877142857
- $00{:}48{:}35{.}557 \dashrightarrow 00{:}48{:}36{.}632$  what she's done is used.
- NOTE Confidence: 0.918624877142857

 $00:48:36.640 \rightarrow 00:48:39.904$  They use deep lab cut from the mathesis

NOTE Confidence: 0.918624877142857

 $00{:}48{:}39{.}904 \dashrightarrow 00{:}48{:}41{.}590$  to classify whether the animal has

NOTE Confidence: 0.918624877142857

 $00:48:41.590 \longrightarrow 00:48:43.130$  his nose pointing to the object

NOTE Confidence: 0.918624877142857

 $00:48:43.130 \longrightarrow 00:48:44.677$  or the tail point of the object.

NOTE Confidence: 0.918624877142857

 $00:48:44.680 \rightarrow 00:48:47.200$  You see in the early days the animal only

NOTE Confidence: 0.918624877142857

 $00:48:47.200 \longrightarrow 00:48:49.160$  has what they call cautious approach,

NOTE Confidence: 0.918624877142857

 $00:48:49.160 \rightarrow 00:48:51.020$  so only approaches the object with

NOTE Confidence: 0.918624877142857

 $00:48:51.020 \rightarrow 00:48:53.517$  its nose in front and its tail behind.

NOTE Confidence: 0.804344923333333

 $00{:}48{:}53{.}520$  -->  $00{:}48{:}54{.}962$  Then over time the animals are then

NOTE Confidence: 0.804344923333333

 $00{:}48{:}54{.}962 \dashrightarrow 00{:}48{:}56{.}450$  more willing or some of the animals

NOTE Confidence: 0.804344923333333

 $00{:}48{:}56{.}450 \dashrightarrow 00{:}48{:}57{.}962$  are more willing to just engage the

NOTE Confidence: 0.804344923333333

 $00{:}48{:}57{.}962 \dashrightarrow 00{:}48{:}59{.}112$  object that they're not protecting

NOTE Confidence: 0.804344923333333

 $00:48:59.112 \longrightarrow 00:49:00.710$  their tail in this particular way.

NOTE Confidence: 0.804344923333333

00:49:00.710 --> 00:49:02.050 Very appropriate for tail

NOTE Confidence: 0.804344923333333

 $00:49:02.050 \longrightarrow 00:49:03.920$  risk as you can imagine.

NOTE Confidence: 0.804344923333333

 $00:49:03.920 \rightarrow 00:49:06.755$  So if we look at the frequency of approach,

- NOTE Confidence: 0.804344923333333
- 00:49:06.760 --> 00:49:08.920 so frequency per minute of
- NOTE Confidence: 0.804344923333333
- $00:49:08.920 \longrightarrow 00:49:11.080$  approach with the tail behind,
- NOTE Confidence: 0.804344923333333
- $00:49:11.080 \longrightarrow 00:49:13.536$  you can see that the that the
- NOTE Confidence: 0.804344923333333
- $00:49:13.536 \longrightarrow 00:49:15.076$  all the animals are here.
- NOTE Confidence: 0.804344923333333
- $00:49:15.080 \longrightarrow 00:49:17.078$  Again this is set up segmented
- NOTE Confidence: 0.804344923333333
- $00{:}49{:}17.078 \dashrightarrow 00{:}49{:}18.077$  into these sessions.
- NOTE Confidence: 0.804344923333333
- $00:49:18.080 \longrightarrow 00:49:19.200$  So all the animals start
- NOTE Confidence: 0.804344923333333
- $00:49:19.200 \longrightarrow 00:49:20.320$  off with their tail behind.
- NOTE Confidence: 0.804344923333333
- $00{:}49{:}20{.}320 \dashrightarrow 00{:}49{:}22{.}872$  So this is this cautious approach and then
- NOTE Confidence: 0.804344923333333
- $00:49:22.872 \rightarrow 00:49:24.760$  again using the same sort of the animals,
- NOTE Confidence: 0.804344923333333
- $00:49:24.760 \longrightarrow 00:49:27.120$  so the same sorting between one and 26.
- NOTE Confidence: 0.804344923333333
- $00:49:27.120 \longrightarrow 00:49:28.560$  You can see that the animals who are timid,
- NOTE Confidence: 0.804344923333333
- $00:49:28.560 \longrightarrow 00:49:29.805$  who don't approach the object
- NOTE Confidence: 0.804344923333333
- $00{:}49{:}29{.}805 \dashrightarrow 00{:}49{:}31{.}302$  they are or barely approach to
- NOTE Confidence: 0.804344923333333
- $00:49:31.302 \rightarrow 00:49:32.716$  spend any time near to the object.
- NOTE Confidence: 0.804344923333333

 $00:49:32.720 \longrightarrow 00:49:35.000$  They also never risk their tail.

NOTE Confidence: 0.804344923333333

00:49:35.000 - 00:49:36.816 So their tail is always but is always

NOTE Confidence: 0.804344923333333

 $00:49:36.816 \longrightarrow 00:49:38.485$  they they they're spending no time NOTE Confidence: 0.804344923333333

 $00:49:38.485 \rightarrow 00:49:40.225$  with their tail exposed whereas the

NOTE Confidence: 0.804344923333333

00:49:40.281 --> 00:49:42.038 brave animals these ones down at the

NOTE Confidence: 0.804344923333333

 $00:49:42.038 \longrightarrow 00:49:43.828$  bottom they not only spend more time NOTE Confidence: 0.804344923333333

 $00:49:43.828 \rightarrow 00:49:45.958$  near the object they also do it with

NOTE Confidence: 0.804344923333333

 $00:49:45.958 \rightarrow 00:49:47.799$  their their tail exposed in this way.

NOTE Confidence: 0.804344923333333

00:49:47.800 --> 00:49:50.160 But we were very struck by this huge

NOTE Confidence: 0.804344923333333

 $00{:}49{:}50{.}160 \dashrightarrow 00{:}49{:}51{.}445$  individual differences in the in

NOTE Confidence: 0.804344923333333

 $00{:}49{:}51{.}445 \dashrightarrow 00{:}49{:}52{.}950$  the in the way that these animals

NOTE Confidence: 0.804344923333333

00:49:53.000 -> 00:49:54.560 approach the object and so we're

NOTE Confidence: 0.804344923333333

 $00{:}49{:}54{.}560 \dashrightarrow 00{:}49{:}56{.}388$  interested in in modelling that

NOTE Confidence: 0.804344923333333

 $00:49:56.388 \longrightarrow 00:49:59.146$  so at Kitty Egal they they they

NOTE Confidence: 0.804344923333333

 $00:49:59.146 \rightarrow 00:50:01.079$  characterize various aspects of the

NOTE Confidence: 0.804344923333333

 $00:50:01.079 \dashrightarrow 00:50:03.697$  of the behaviour so the fraction of

 $00:50:03.697 \longrightarrow 00:50:05.755$  time they're close to the object.

NOTE Confidence: 0.804344923333333

 $00:50:05.760 \rightarrow 00:50:07.482$  I showed you that already here showing

NOTE Confidence: 0.804344923333333

 $00{:}50{:}07{.}482 \dashrightarrow 00{:}50{:}09{.}039$  with confident and cautious approach.

NOTE Confidence: 0.804344923333333

 $00:50:09.040 \rightarrow 00:50:11.518$  So cautious in green, confident in blue.

NOTE Confidence: 0.804344923333333

 $00:50:11.520 \longrightarrow 00:50:12.766$  And again you can see with their

NOTE Confidence: 0.804344923333333

 $00{:}50{:}12.766$  -->  $00{:}50{:}14.018$  sort of the animals that there's

NOTE Confidence: 0.804344923333333

 $00:50:14.018 \rightarrow 00:50:15.579$  only green at the top when there's

NOTE Confidence: 0.804344923333333

 $00{:}50{:}15.625 \dashrightarrow 00{:}50{:}16.600$  some blue at the bottom.

NOTE Confidence: 0.804344923333333

 $00{:}50{:}16.600 \dashrightarrow 00{:}50{:}18.280$  And this is only showing the days.

NOTE Confidence: 0.804344923333333

 $00:50:18.280 \rightarrow 00:50:20.260$  Since the only showing the days

NOTE Confidence: 0.804344923333333

 $00:50:20.260 \rightarrow 00:50:22.639$  off the object has been evaluated.

NOTE Confidence: 0.804344923333333

 $00:50:22.640 \longrightarrow 00:50:24.408$  You can look at the how long they

NOTE Confidence: 0.804344923333333

 $00:50:24.408 \longrightarrow 00:50:26.168$  spend near the object and again you

NOTE Confidence: 0.804344923333333

 $00{:}50{:}26.168 \dashrightarrow 00{:}50{:}27.751$  can see that that's shown again

NOTE Confidence: 0.804344923333333

 $00:50:27.751 \longrightarrow 00:50:28.839$  shown by this colour.

 $00:50:28.840 \longrightarrow 00:50:30.280$  So the brave ones spend a lot of time,

NOTE Confidence: 0.804344923333333

 $00{:}50{:}30{.}280 \dashrightarrow 00{:}50{:}31{.}960$  the the timid ones spend very little

NOTE Confidence: 0.804344923333333

 $00:50:31.960 \rightarrow 00:50:33.710$  time and how frequently they visit

NOTE Confidence: 0.804344923333333

 $00:50:33.710 \longrightarrow 00:50:35.732$  the object, they they go there.

NOTE Confidence: 0.804344923333333

 $00:50:35.732 \rightarrow 00:50:38.253$  And again the brave ones visit frequently

NOTE Confidence: 0.804344923333333

 $00:50:38.253 \rightarrow 00:50:41.718$  the the timid ones are barely visited at all.

NOTE Confidence: 0.804344923333333

 $00:50:41.720 \longrightarrow 00:50:43.239$  So it goes a model of this,

NOTE Confidence: 0.804344923333333

00:50:43.240 --> 00:50:43.880 but I'm not going to,

NOTE Confidence: 0.804344923333333

 $00:50:43.880 \longrightarrow 00:50:44.958$  I haven't got time to go through

NOTE Confidence: 0.804344923333333

 $00:50:44.958 \longrightarrow 00:50:45.878$  all the details of the model,

NOTE Confidence: 0.804344923333333

 $00:50:45.880 \longrightarrow 00:50:47.200$  but just to just to give you the,

NOTE Confidence: 0.804344923333333

 $00:50:47.200 \longrightarrow 00:50:49.195$  the, the hint of what's inside it.

NOTE Confidence: 0.804344923333333

 $00:50:49.200 \longrightarrow 00:50:50.676$  So why do they visit the object at all?

NOTE Confidence: 0.804344923333333

 $00:50:50.680 \rightarrow 00:50:51.640$  Well, that's Neophilia.

NOTE Confidence: 0.804344923333333

 $00:50:51.640 \longrightarrow 00:50:52.280$  They're interested.

NOTE Confidence: 0.804344923333333

 $00:50:52.280 \rightarrow 00:50:54.056$  There's an exploration bonus we imagine

- NOTE Confidence: 0.804344923333333
- $00{:}50{:}54.056 \dashrightarrow 00{:}50{:}56.145$  which is associated with that and we
- NOTE Confidence: 0.804344923333333
- $00:50:56.145 \longrightarrow 00:50:57.575$  imagine that this exploration bonus
- NOTE Confidence: 0.804344923333333
- $00{:}50{:}57{.}575 \dashrightarrow 00{:}50{:}59{.}077$  replenishes as if they don't know,
- NOTE Confidence: 0.804344923333333
- $00:50:59.080 \rightarrow 00:51:00.760$  they don't know that the object is not,
- NOTE Confidence: 0.804344923333333
- $00:51:00.760 \longrightarrow 00:51:01.402$  is not,
- NOTE Confidence: 0.804344923333333
- $00{:}51{:}01{.}402 \dashrightarrow 00{:}51{:}03{.}328$  is not never actually gives them
- NOTE Confidence: 0.804344923333333
- $00:51:03.328 \longrightarrow 00:51:04.676$  a real return, right.
- NOTE Confidence: 0.804344923333333
- $00:51:04.676 \rightarrow 00:51:06.080$  The object is just a bunch of Lego blocks.
- NOTE Confidence: 0.804344923333333
- $00:51:06.080 \longrightarrow 00:51:07.745$  There's no food or anything
- NOTE Confidence: 0.804344923333333
- $00{:}51{:}07{.}745 \dashrightarrow 00{:}51{:}09{.}077$  positive associated with it
- NOTE Confidence: 0.75158916875
- $00:51:09.080 \longrightarrow 00:51:11.530$  and we imagine that when the animals
- NOTE Confidence: 0.75158916875
- $00:51:11.530 \longrightarrow 00:51:13.340$  have due confidence approach they
- NOTE Confidence: 0.75158916875
- $00:51:13.340 \longrightarrow 00:51:15.474$  they can stay enjoy more than
- NOTE Confidence: 0.75158916875
- $00{:}51{:}15{.}474 \dashrightarrow 00{:}51{:}17{.}359$  they consume the reward faster.
- NOTE Confidence: 0.75158916875
- $00:51:17.360 \longrightarrow 00:51:18.878$  Then we have a hazard function.
- NOTE Confidence: 0.75158916875

 $00:51:18.880 \rightarrow 00:51:20.160$  Why are they neo phobic?

NOTE Confidence: 0.75158916875

 $00:51:20.160 \rightarrow 00:51:22.043$  Well they're why that maybe at some

NOTE Confidence: 0.75158916875

 $00:51:22.043 \longrightarrow 00:51:23.685$  point a predator or something is

NOTE Confidence: 0.75158916875

 $00:51:23.685 \rightarrow 00:51:25.498$  going to jump out from this object

NOTE Confidence: 0.75158916875

 $00:51:25.553 \rightarrow 00:51:27.053$  or something naughty might happen

NOTE Confidence: 0.75158916875

 $00{:}51{:}27.053 \dashrightarrow 00{:}51{:}28.897$  and we imagine that that increases

NOTE Confidence: 0.75158916875

00:51:28.897 - 00:51:30.919 over time spent near the object.

NOTE Confidence: 0.75158916875

 $00:51:30.920 \longrightarrow 00:51:32.680$  So the longer they spend near the object,

NOTE Confidence: 0.75158916875

 $00:51:32.680 \longrightarrow 00:51:34.650$  the more that they're worried

NOTE Confidence: 0.75158916875

 $00:51:34.650 \rightarrow 00:51:35.438$  about predation.

NOTE Confidence: 0.75158916875

 $00{:}51{:}35{.}440 \dashrightarrow 00{:}51{:}37{.}384$  And then that we imagine that then

NOTE Confidence: 0.75158916875

 $00:51:37.384 \rightarrow 00:51:39.397$  resets when they move away from the object.

NOTE Confidence: 0.75158916875

 $00:51:39.400 \longrightarrow 00:51:40.906$  And we imagine that it's less

NOTE Confidence: 0.75158916875

 $00:51:40.906 \rightarrow 00:51:42.264$  dangerous when they do cautious

NOTE Confidence: 0.75158916875

 $00:51:42.264 \rightarrow 00:51:43.480$  approach than confident approaches

NOTE Confidence: 0.75158916875

 $00:51:43.480 \longrightarrow 00:51:45.554$  of why they want to approach in
- NOTE Confidence: 0.75158916875
- $00:51:45.554 \rightarrow 00:51:47.318$  this cautious way in the 1st place.
- NOTE Confidence: 0.75158916875
- $00{:}51{:}47{.}320 \dashrightarrow 00{:}51{:}49{.}784$  And we critical to this is that
- NOTE Confidence: 0.75158916875
- $00:51:49.784 \rightarrow 00:51:51.240$  the uncertainty about that,
- NOTE Confidence: 0.75158916875
- $00{:}51{:}51{.}240 \dashrightarrow 00{:}51{:}52{.}455$  about their about whether there's
- NOTE Confidence: 0.75158916875
- $00{:}51{:}52{.}455 \dashrightarrow 00{:}51{:}54{.}219$  a predator or not only will reduce
- NOTE Confidence: 0.75158916875
- $00:51:54.219 \longrightarrow 00:51:55.719$  if they actually visit the object.
- NOTE Confidence: 0.75158916875
- $00:51:55.720 \longrightarrow 00:51:56.920$  If they don't visit the object
- NOTE Confidence: 0.75158916875
- $00:51:56.920 \longrightarrow 00:51:58.000$  or don't spend time there,
- NOTE Confidence: 0.75158916875
- $00{:}51{:}58{.}000 \dashrightarrow 00{:}51{:}59{.}498$  they're not going to find out that
- NOTE Confidence: 0.75158916875
- $00:51:59.498 \longrightarrow 00:52:01.048$  in fact the object is completely
- NOTE Confidence: 0.75158916875
- $00:52:01.048 \rightarrow 00:52:02.473$  benign and never hurts them.
- NOTE Confidence: 0.75158916875
- $00{:}52{:}02{.}480 \dashrightarrow 00{:}52{:}03{.}880$  And so we have this nice parcel,
- NOTE Confidence: 0.75158916875
- $00:52:03.880 \rightarrow 00:52:05.885$  this important path dependence whereby
- NOTE Confidence: 0.75158916875
- $00:52:05.885 \rightarrow 00:52:08.479$  the timid animals don't visit for long,
- NOTE Confidence: 0.75158916875
- $00:52:08.480 \longrightarrow 00:52:10.013$  they don't find out the object is
- NOTE Confidence: 0.75158916875

 $00:52:10.013 \rightarrow 00:52:11.383$  safe and therefore they they carry

NOTE Confidence: 0.75158916875

 $00:52:11.383 \dashrightarrow 00:52:12.721$  on not visiting for long because

NOTE Confidence: 0.75158916875

 $00:52:12.721 \longrightarrow 00:52:13.958$  they haven't found out this,

NOTE Confidence: 0.75158916875

 $00:52:13.960 \longrightarrow 00:52:14.929$  this safety itself.

NOTE Confidence: 0.75158916875

 $00{:}52{:}14{.}929 \dashrightarrow 00{:}52{:}17{.}190$  And then we have this risk of

NOTE Confidence: 0.75158916875

 $00{:}52{:}17{.}264 \dashrightarrow 00{:}52{:}19{.}759$  aversion 2 and then when we then

NOTE Confidence: 0.75158916875

 $00{:}52{:}19.759 \dashrightarrow 00{:}52{:}21.726$  build a model of their behaviour.

NOTE Confidence: 0.75158916875

 $00:52:21.726 \rightarrow 00:52:23.178$  So here I just characterised that

NOTE Confidence: 0.75158916875

 $00{:}52{:}23.178 \dashrightarrow 00{:}52{:}24.531$  sort of abstracted away from

NOTE Confidence: 0.75158916875

 $00{:}52{:}24{.}531 \dashrightarrow 00{:}52{:}25{.}595$  the animal data themselves.

NOTE Confidence: 0.75158916875

 $00:52:25.600 \longrightarrow 00:52:26.776$  You can see we sort of capture

NOTE Confidence: 0.75158916875

 $00{:}52{:}26.776 \dashrightarrow 00{:}52{:}27.746$  the sort of the, the,

NOTE Confidence: 0.75158916875

 $00{:}52{:}27.746 \dashrightarrow 00{:}52{:}29.874$  the general trends in the animal in the,

NOTE Confidence: 0.75158916875

 $00:52:29.880 \longrightarrow 00:52:30.812$  in the, in the.

NOTE Confidence: 0.75158916875

 $00{:}52{:}30{.}812 \dashrightarrow 00{:}52{:}31{.}977$  With this abstraction you can

NOTE Confidence: 0.75158916875

 $00:52:31.977 \rightarrow 00:52:33.398$  see we do a really good job.

NOTE Confidence: 0.75158916875

 $00:52:33.400 \rightarrow 00:52:35.160$  We have quite a lot of parameters I must say.

NOTE Confidence: 0.75158916875

 $00:52:35.160 \longrightarrow 00:52:36.976$  We can do a really good job of

NOTE Confidence: 0.75158916875

 $00:52:36.976 \rightarrow 00:52:38.444$  fitting their data by essentially

NOTE Confidence: 0.75158916875

 $00:52:38.444 \rightarrow 00:52:40.044$  synergising the amount by which

NOTE Confidence: 0.75158916875

 $00:52:40.044 \rightarrow 00:52:42.077$  they're to which they're risk averse,

NOTE Confidence: 0.75158916875

 $00{:}52{:}42.080 \dashrightarrow 00{:}52{:}44.390$  this PC bar mechanism and also

NOTE Confidence: 0.75158916875

 $00:52:44.390 \longrightarrow 00:52:46.991$  the amount by which to which they

NOTE Confidence: 0.75158916875

 $00:52:46.991 \longrightarrow 00:52:48.765$  are with their prior over what

NOTE Confidence: 0.75158916875

 $00{:}52{:}48.765 \dashrightarrow 00{:}52{:}50.950$  the object is like and that prior

NOTE Confidence: 0.75158916875

 $00:52:50.950 \longrightarrow 00:52:52.635$  is not not influenced enough.

NOTE Confidence: 0.75158916875

 $00:52:52.640 \longrightarrow 00:52:53.756$  If they don't visit the object,

NOTE Confidence: 0.75158916875

 $00:52:53.760 \longrightarrow 00:52:54.880$  they don't disturb the object.

NOTE Confidence: 0.75158916875

 $00:52:54.880 \dashrightarrow 00:52:58.435$  It's it's safe in the way that I described.

NOTE Confidence: 0.75158916875

 $00{:}52{:}58{.}440 \dashrightarrow 00{:}52{:}58{.}640$  OK.

NOTE Confidence: 0.75158916875

 $00{:}52{:}58.640 \dashrightarrow 00{:}53{:}00.040$  So because I'm running out of time,

NOTE Confidence: 0.75158916875

 $00:53:00.040 \longrightarrow 00:53:02.640$  let me just go to the general discussion

NOTE Confidence: 0.75158916875

 $00{:}53{:}02.640 \dashrightarrow 00{:}53{:}05.000$  that's really discussion about that.

NOTE Confidence: 0.75158916875

00:53:05.000 --> 00:53:08.193 So just to sum up then on this risk aversion,

NOTE Confidence: 0.75158916875

00:53:08.200 --> 00:53:08.884 I think we can,

NOTE Confidence: 0.75158916875

 $00{:}53{:}08{.}884 \dashrightarrow 00{:}53{:}10{.}546$  it's nice to think from a sort of

NOTE Confidence: 0.75158916875

 $00{:}53{:}10.546 \dashrightarrow 00{:}53{:}11.845$  computational psychiatric point of

NOTE Confidence: 0.75158916875

 $00:53:11.845 \rightarrow 00:53:14.078$  view about the things that the thing,

NOTE Confidence: 0.75158916875

 $00:53:14.078 \rightarrow 00:53:15.752$  the way that evaluation happens in

NOTE Confidence: 0.75158916875

 $00{:}53{:}15{.}752 \dashrightarrow 00{:}53{:}17{.}438$  the context of this risk aversion.

NOTE Confidence: 0.75158916875

 $00{:}53{:}17{.}440 \dashrightarrow 00{:}53{:}19{.}844$  So you think of sort of people who

NOTE Confidence: 0.75158916875

 $00:53:19.844 \rightarrow 00:53:21.398$  are highly risk averse in some sense.

NOTE Confidence: 0.75158916875

 $00:53:21.400 \rightarrow 00:53:23.150$  Maybe they're solving a different

NOTE Confidence: 0.75158916875

 $00:53:23.150 \longrightarrow 00:53:24.200$  problem from others.

NOTE Confidence: 0.75158916875

 $00:53:24.200 \longrightarrow 00:53:25.742$  And so here we've shown that

NOTE Confidence: 0.75158916875

 $00{:}53{:}25{.}742 \dashrightarrow 00{:}53{:}26{.}513$  you that optimally,

NOTE Confidence: 0.75158916875

 $00:53:26.520 \longrightarrow 00:53:28.179$  if you have a really low value

NOTE Confidence: 0.75158916875

 $00:53:28.179 \longrightarrow 00:53:29.778$  of alpha or in some context

NOTE Confidence: 0.75158916875

 $00:53:29.778 \longrightarrow 00:53:31.153$  this this nested C bar,

NOTE Confidence: 0.75973713

 $00:53:31.160 \longrightarrow 00:53:33.590$  NC bar, then you'll see this

NOTE Confidence: 0.75973713

 $00:53:33.590 \longrightarrow 00:53:34.400$  dysfunctional avoidance.

NOTE Confidence: 0.75973713

 $00{:}53{:}34{.}400 \dashrightarrow 00{:}53{:}35{.}570$  And also this rumination process

NOTE Confidence: 0.75973713

 $00{:}53{:}35{.}570 \dashrightarrow 00{:}53{:}37{.}216$  in the sense that you'll keep on

NOTE Confidence: 0.75973713

 $00{:}53{:}37{.}216 \dashrightarrow 00{:}53{:}38{.}500$  worrying about all the nasty things

NOTE Confidence: 0.75973713

 $00{:}53{:}38{.}500 \dashrightarrow 00{:}53{:}40{.}038$  that can happen if alpha is near 0.

NOTE Confidence: 0.75973713

 $00{:}53{:}40{.}040 \dashrightarrow 00{:}53{:}41{.}099$  You have action,

NOTE Confidence: 0.75973713

 $00:53:41.099 \rightarrow 00:53:42.158$  indifference and helplessness,

NOTE Confidence: 0.75973713

 $00{:}53{:}42.160 \dashrightarrow 00{:}53{:}43.560$  and that's the correct answer.

NOTE Confidence: 0.75973713

 $00{:}53{:}43{.}560 \dashrightarrow 00{:}53{:}45{.}318$  That's the right thing to do.

NOTE Confidence: 0.75973713

 $00{:}53{:}45{.}320 \dashrightarrow 00{:}53{:}47{.}272$  If your value of alpha is so low

NOTE Confidence: 0.75973713

 $00{:}53{:}47{.}272 \dashrightarrow 00{:}53{:}49{.}478$  and you live in a stochastic world,

NOTE Confidence: 0.75973713

 $00{:}53{:}49{.}480 \dashrightarrow 00{:}53{:}51{.}358$  how much rumination you should do?

NOTE Confidence: 0.75973713

 $00{:}53{:}51{.}360 \dashrightarrow 00{:}53{:}52{.}360$  There's some sort of threshold.

NOTE Confidence: 0.75973713

00:53:52.360 --> 00:53:54.439 How much planning you want to to do,

NOTE Confidence: 0.75973713

 $00{:}53{:}54{.}440 \dashrightarrow 00{:}53{:}56{.}352$  how much improvement you need to have is

NOTE Confidence: 0.75973713

 $00:53:56.352 \rightarrow 00:53:58.076$  something which again is under your control.

NOTE Confidence: 0.75973713

00:53:58.080 --> 00:53:59.706 Maybe you want to really squeeze

NOTE Confidence: 0.75973713

 $00{:}53{:}59{.}706 \dashrightarrow 00{:}54{:}00{.}519$  out all possibilities.

NOTE Confidence: 0.75973713

 $00:54:00.520 \longrightarrow 00:54:02.144$  Then you're going to have to do an

NOTE Confidence: 0.75973713

00:54:02.144 --> 00:54:03.685 awful lot of rumination to worry

NOTE Confidence: 0.75973713

 $00{:}54{:}03.685 \dashrightarrow 00{:}54{:}05.317$  about all the really low probability

NOTE Confidence: 0.75973713

 $00:54:05.366 \longrightarrow 00:54:06.518$  outcomes that can happen.

NOTE Confidence: 0.75973713

 $00{:}54{:}06{.}520 \dashrightarrow 00{:}54{:}08{.}072$  And then for humans we have this problem

NOTE Confidence: 0.75973713

 $00:54:08.072 \rightarrow 00:54:09.836$  that we live in a very complicated world.

NOTE Confidence: 0.75973713

 $00{:}54{:}09{.}840 \dashrightarrow 00{:}54{:}11{.}680$  We can always imagine another

NOTE Confidence: 0.75973713

 $00:54:11.680 \longrightarrow 00:54:13.152$  catastrophe around the corner.

NOTE Confidence: 0.75973713

 $00{:}54{:}13.160 \dashrightarrow 00{:}54{:}14.847$  If you pay a lot of attention

NOTE Confidence: 0.75973713

 $00:54:14.847 \rightarrow 00:54:16.080$  to low probability outcomes,

NOTE Confidence: 0.75973713

 $00:54:16.080 \rightarrow 00:54:18.509$  then we can always invent nasty low

NOTE Confidence: 0.75973713

 $00{:}54{:}18{.}509 \dashrightarrow 00{:}54{:}20{.}113$  probability outcomes that will cause

NOTE Confidence: 0.75973713

 $00:54:20.113 \rightarrow 00:54:22.113$  you to to to to to have problems.

NOTE Confidence: 0.75973713

 $00:54:22.120 \longrightarrow 00:54:23.248$  And then as then in the

NOTE Confidence: 0.75973713

 $00:54:23.248 \longrightarrow 00:54:24.440$  case of the the rodents,

NOTE Confidence: 0.75973713

 $00{:}54{:}24{.}440 \dashrightarrow 00{:}54{:}26{.}568$  we can see there's an effect on this

NOTE Confidence: 0.75973713

00:54:26.568 --> 00:54:27.588 exploration exploitation trade off

NOTE Confidence: 0.75973713

 $00{:}54{:}27{.}588 \dashrightarrow 00{:}54{:}29{.}114$  in the sense that the animals that

NOTE Confidence: 0.75973713

00:54:29.114 --> 00:54:30.648 don't explore can't find out about

NOTE Confidence: 0.75973713

00:54:30.648 --> 00:54:32.275 safety and therefore they can never,

NOTE Confidence: 0.75973713

 $00{:}54{:}32{.}275 \dashrightarrow 00{:}54{:}35{.}115$  they will never be able to to to

NOTE Confidence: 0.75973713

00:54:35.120 --> 00:54:37.040 essentially treat the object in its

NOTE Confidence: 0.75973713

 $00{:}54{:}37{.}040 \dashrightarrow 00{:}54{:}39{.}010$  natural way in terms of to another

NOTE Confidence: 0.75973713

 $00{:}54{:}39{.}010$  -->  $00{:}54{:}40{.}991$  source of problems and risk in terms NOTE Confidence: 0.75973713

00:54:40.991 - 00:54:42.779 of evaluation is that maybe when

NOTE Confidence: 0.75973713

 $00:54:42.779 \rightarrow 00:54:44.599$  we're thinking about this rumination,

NOTE Confidence: 0.75973713

 $00{:}54{:}44{.}600 \dashrightarrow 00{:}54{:}46{.}538$  we think maybe there's some subjects

NOTE Confidence: 0.75973713

 $00{:}54{:}46{.}538 \dashrightarrow 00{:}54{:}49{.}519$  who try to do this ruminative planning,

NOTE Confidence: 0.75973713

 $00:54:49.520 \rightarrow 00:54:50.554$  they try to think, well, OK,

NOTE Confidence: 0.75973713

 $00{:}54{:}50{.}554 \dashrightarrow 00{:}54{:}51{.}958$  if I'm at the native object,

NOTE Confidence: 0.75973713

 $00:54:51.960 \dashrightarrow 00:54:53.800$  here's what I would do to go away from it.

NOTE Confidence: 0.75973713

 $00:54:53.800 \rightarrow 00:54:55.880$  But it's so aggressive to think about it.

NOTE Confidence: 0.75973713

00:54:55.880 --> 00:54:57.758 They will never consummate that planning.

NOTE Confidence: 0.75973713

 $00{:}54{:}57{.}760 \dashrightarrow 00{:}54{:}59{.}225$  They never stop doing that

NOTE Confidence: 0.75973713

 $00:54:59.225 \rightarrow 00:55:00.397$  planning in this way.

NOTE Confidence: 0.75973713

 $00{:}55{:}00{.}400 \dashrightarrow 00{:}55{:}01{.}996$  And so that's an idea that Quentin

NOTE Confidence: 0.75973713

 $00:55:01.996 \rightarrow 00:55:03.558$  Hughes and I worked on a long,

NOTE Confidence: 0.75973713

 $00:55:03.560 \longrightarrow 00:55:05.000$  long time ago was that this,

NOTE Confidence: 0.75973713

 $00{:}55{:}05{.}000 \dashrightarrow 00{:}55{:}08{.}024$  this is a sort of internal behavioural

NOTE Confidence: 0.75973713

 $00:55:08.024 \dashrightarrow 00:55:09.560$  inhibition associated with a,

NOTE Confidence: 0.75973713

 $00:55:09.560 \longrightarrow 00:55:10.058$  with a thought,

- NOTE Confidence: 0.75973713
- 00:55:10.058 --> 00:55:10.556 if you like,
- NOTE Confidence: 0.75973713
- $00:55:10.560 \rightarrow 00:55:12.120$  about a piece of planning.
- NOTE Confidence: 0.75973713
- $00:55:12.120 \longrightarrow 00:55:13.440$  So maybe that leads you never
- NOTE Confidence: 0.75973713
- $00:55:13.440 \longrightarrow 00:55:14.320$  to consummate the planning,
- NOTE Confidence: 0.75973713
- $00:55:14.320 \longrightarrow 00:55:15.454$  which means you have to do
- NOTE Confidence: 0.75973713
- $00:55:15.454 \rightarrow 00:55:16.679$  it again and again and again.
- NOTE Confidence: 0.75973713
- $00:55:16.680 \longrightarrow 00:55:18.438$  So again leading to a sort
- NOTE Confidence: 0.75973713
- $00:55:18.438 \longrightarrow 00:55:19.317$  of rumination itself,
- NOTE Confidence: 0.75973713
- $00:55:19.320 \dashrightarrow 00:55:21.072$  you can imagine that you don't
- NOTE Confidence: 0.75973713
- 00:55:21.072 --> 00:55:22.240 adjust for luck appropriately.
- NOTE Confidence: 0.75973713
- 00:55:22.240 --> 00:55:23.752 So if you're unlucky you don't
- NOTE Confidence: 0.75973713
- 00:55:23.752 --> 00:55:24.760 think that I'm now,
- NOTE Confidence: 0.75973713
- $00{:}55{:}24.760 \dashrightarrow 00{:}55{:}26.596$  I can now afford to be a bit more
- NOTE Confidence: 0.75973713
- $00{:}55{:}26{.}596 \dashrightarrow 00{:}55{:}28{.}032$ risk avert risk neutral again.
- NOTE Confidence: 0.75973713
- $00{:}55{:}28.032 \dashrightarrow 00{:}55{:}29.928$  So again you'll then have more
- NOTE Confidence: 0.75973713

 $00:55:29.928 \longrightarrow 00:55:30.560$  negative evaluation,

NOTE Confidence: 0.75973713

 $00:55:30.560 \longrightarrow 00:55:33.440$  you should have itself and then in terms

NOTE Confidence: 0.75973713

 $00:55:33.440 \rightarrow 00:55:35.840$  of the the maybe the environment you have,

NOTE Confidence: 0.75973713

 $00:55:35.840 \longrightarrow 00:55:37.562$  the way that you're evaluating risk is

NOTE Confidence: 0.75973713

 $00{:}55{:}37{.}562 \dashrightarrow 00{:}55{:}39{.}239$  not appropriate the environment you have.

NOTE Confidence: 0.75973713

 $00{:}55{:}39{.}240 \dashrightarrow 00{:}55{:}40{.}563$  I think one nice way to think

NOTE Confidence: 0.75973713

 $00{:}55{:}40{.}563 \dashrightarrow 00{:}55{:}42{.}524$  about that is in terms of over

NOTE Confidence: 0.75973713

 $00:55:42.524 \rightarrow 00:55:43.198$  generalizing representations.

NOTE Confidence: 0.75973713

 $00{:}55{:}43.200 \dashrightarrow 00{:}55{:}44.894$  So with something again you see in

NOTE Confidence: 0.75973713

00:55:44.894 --> 00:55:46.345 depression which is I've shown you

NOTE Confidence: 0.75973713

 $00{:}55{:}46{.}345 \dashrightarrow 00{:}55{:}47{.}913$  that this sort of infects states so

NOTE Confidence: 0.707357337333333

 $00:55:47.967 \rightarrow 00:55:49.449$  if you think that something nasty

NOTE Confidence: 0.707357337333333

 $00{:}55{:}49{.}449 \dashrightarrow 00{:}55{:}51{.}214$  might happen then the value of that

NOTE Confidence: 0.707357337333333

 $00:55:51.214 \rightarrow 00:55:52.762$  state gets associated with the nastiest

NOTE Confidence: 0.707357337333333

 $00:55:52.762 \rightarrow 00:55:54.158$  thing that can possibly happen.

NOTE Confidence: 0.707357337333333

00:55:54.160 - 00:55:55.815 So if you over generalize

- NOTE Confidence: 0.707357337333333
- 00:55:55.815 -> 00:55:56.477 your representations,
- NOTE Confidence: 0.707357337333333
- 00:55:56.480 > 00:55:58.090 you're putting nice States and
- NOTE Confidence: 0.707357337333333
- $00:55:58.090 \rightarrow 00:55:59.700$  nasty states together and therefore
- NOTE Confidence: 0.707357337333333
- $00:55:59.748 \dashrightarrow 00:56:01.554$  the value of the nasty states over
- NOTE Confidence: 0.707357337333333
- $00{:}56{:}01{.}554 \dashrightarrow 00{:}56{:}03{.}168$  infects the values of the nice
- NOTE Confidence: 0.707357337333333
- $00:56:03.168 \rightarrow 00:56:04.478$  states you could possibly have.
- NOTE Confidence: 0.707357337333333
- $00{:}56{:}04{.}480 \dashrightarrow 00{:}56{:}06{.}027$  So lots of things to investigate in
- NOTE Confidence: 0.707357337333333
- $00:56:06.027 \dashrightarrow 00:56:08.459$  in in in risk in the in the future
- NOTE Confidence: 0.707357337333333
- $00:56:08.459 \rightarrow 00:56:09.603$  using hopefully these different
- NOTE Confidence: 0.707357337333333
- $00:56:09.660 \rightarrow 00:56:11.320$  aspects of sequential evaluation.
- NOTE Confidence: 0.707357337333333
- $00:56:11.320 \longrightarrow 00:56:14.000$  So thank you very much.