# KPIs and Experimentation

## Day 1 Lab

## Transcript:

for it excited you check out
55:39
the lab what I want you to do is make sure you're on the latest version of the codebase uh pull pull from Main if
55:45
you're not you're going to need to uh set this uh stat Sig API key environment
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variable if you have not done that um I can show youall how to do that if you um
55:57
uh like later on like hopefully hopefully you all have some experience of setting an environment variable but
56:03
so flask is a way of building out a web server so what I want to uh do is first
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I want to show youall how to set this up so let me um open Terminal real
56:19
quick okay
56:27
okay so I want to be in uh here and the whole idea here is I if if you do um
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Python and then you do Source server.py this is going to set up you see how it
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says running on this uh domain if we go to that uh domain you'll see like hello
56:47
this is a flask API so that's essentially uh this is like the hello world sort of web server and what you
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can do is what I want to show show you though is if I go to tasks right you'll
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see that I'm like okay it's saying experiment group Green and then it's saying odd tasks for blue and green even
57:06
for red and orange so that's probably wild right and you'll see like I have a
57:11
a user identifier here so this is all based on configurations from stat Sig
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and this is an experiment I'm doing uh called like button colors or something like that and uh we're going to go over
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in more details how this works from stats Sig but let's kind of like walk through that code real quick first so
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you'll see here uh we have this um app. route uh it's on line 33 here uh this
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tasks route which is going to be what supplies this uh this link for this web
57:46
server and then uh you'll see we essentially are trying to figure out the way to get the the hash string so you'll
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see uh one of the hash strings uh the initial H hash string is based on the remote Adder so this is going to be like
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your IP address essentially and then uh this is essentially saying uh we can
58:08
also specify random and what random does is it will change our user ID so if I
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say question mark random equals true then I will be assigned like a different
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group right you see how like that's probably kind of nuts right you see how like because now that my user ID is
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essentially set at random and I'm not uh my logged out user ID is just a random
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number now and so I I'll get assigned a random group right but you see if I if I
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don't put random my IP address I always consistently get green and that's like
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kind of what you would expect so let's kind of go over how to build out this experiment and I'm going to essentially
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make another version of this experiment so that y'all can um go ahead and start with
58:53
me okay so this is uh you see if you
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made your account on stat Sig this is kind of like the stat Sig uh API or like
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the stat UI that uh it's pretty cool um if we go in and you'll see over here on
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the left there's like a bunch of different options here there's like feature Gates experiments metrics all
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sorts of really cool stuff here I'm very happy that I integrated with stat Sig but so if I go to experiments I'm going
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to show you first the experiment that I made and then I'm going to create new one to show you how to make your own so
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you'll see in experiments here we have button color V2 and saying we're refreshing your
59:36
pulse results okay whatever uh it's like taken a million years so uh you'll see
59:43
we have um so this this is the experiment so as you see like see this button color V2 the name here if you go
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look in the code base here you see this like line 40 here you see this like stats
59:56
.g experiment and then I pass it a stat Sig user and then I pass it button color
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V2 and then I want to get the attribute button color and then uh this is like
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the default value if for some reason the user can't be put into an experiment so let's go to setup real
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quick because I think that is probably a little bit confusing okay so what we are looking at
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here is initially this is how it works right so uh you you want to and yeah but
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you can't edit edit any of the parameters okay because once you start an experiment you can't edit any of
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these things it's like it's like set essentially so here's how it works right
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remember how I was talking about like okay what percent of users are going to be allocated to this experiment and then
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uh I say okay 100% so we're saying and then it's like 100% of what users so you can say like 100% of chrome users 100%
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of Android users 100% of all users right and then you have to split you can uh
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and this is your split between all your groups and uh in this case I have four
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groups I have control is blue you have uh test is red or test one is red test
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two is green and test three is orange so that's those are the three tests and
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groups and this is essentially how this experiment works and um and this will essentially go ahead
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and collect data and we'll have data here and this like pulse uh results some

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of this stuff we won't actually end up doing because this is like a local web server and we can't collect as much data
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but that's the whole point here as data Engineers my whole point here is I'm trying to teach y'all how experimentation Works underneath the
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hood so that you can like have a better appreciation for how things get split up
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so if we go back to the experiments tab here and uh what we want to do is we want to hit create we want to hit this
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blue create button and I'm going to call this button color uh let's going to call this button color V3 and then I'm going
1:01:59
to say I think the red button the red button
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is is the best one all right and then uh this is where remember I was talking
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about like you can either use user ID or stable ID uh you can use either one here um I would say user ID because if you
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pick stable ID the problem is is like since it's local you're only going to
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get assigned one group and then you're done like that's all that there's nothing else you can do about it but um
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if you pick stable ID then that's what and normally that's fine because like if you're a different user you'll be on a
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different device and a different location but like for us we want to have control over the user
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IDs so we're going to hit create awesome so now we have our uh kind of experiment
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kind of set up um one of the other things you need to do is you want to think about the metrics that you could
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uh potentially be looking at right and so these are uh like there's a bunch of
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metrics that statti gives you for free like uh daily active users l14 l28 all
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these are like very um kind of baked into the platform you'll see some of these like I have like user confirmed
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successful and sign up successful and visited sign up these are uh uh custom
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events that I added into stats Sig and uh I'm going to show you how you can we're going to log our own events as
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well so in this case what I want to look at is I want to look mostly at daily active
1:03:31
users so you have to pick a metric here so what I'm saying is like I don't know I think that the red button is the best
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one and then you know the the null hypothesis in this case is that color doesn't impact things
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so then uh if we go down here you'll see we have our and originally it it breaks
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it out into see how it breaks it out into groups and then we have test and control
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and what I want to do is I want to add a parameter here and we're going to call this button color we're going to add so
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then uh control we're going to say is blue and test we're going to say is red and say we want more groups you can
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click this plus over here and then I can say green and I can hit plus again and I can say orange and so now we have
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essentially uh an experiment that's going to run that is an even split 25 25
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25 25 between blue blue red green and orange and we can see how that impacts our metrics the metric that we are
1:04:31
caring about is daily active users obviously let's let's throw in another metric here uh let's say let's do um
1:04:38
visited sign up let's add that metric as well and so uh this is pretty much ready
1:04:46
so what you want to do next here is you want to hit save always remember save like save
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always messes me up so now since we have defined our Hy hypothesis right we have our primary
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metrics we're looking to track we are we have defined our groups and we can uh
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keep in mind each group can have its own parameters right I might add like U maybe I can add like paragraph text
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right and then I can be like uh you know data engineering boot camp and then here
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I can be like data engineering self-paced course and here are going to be like data
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engineering uh I don't know Academy and here I can be like that I could also
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put like de um boot camp and because maybe people don't like to read all of
1:05:33
it and they like the abbreviations but like you can see you can add whatever other uh parameters you want to each uh
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version of this so that like you can imagine that I could swap out different titles with this or different paragraphs
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of things this way so I'm going to hit save here before we hit start so okay so now we have uh our our
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experiment is essentially ready to go uh the only other thing we need to do here is we want to hit start and then and
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then it's going to yell at us cuz uh you haven't tested your experiment in a non-production environment yet and um
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obviously you can you can do that if you want to test stuff uh I'm just going to hit launch though it's uh it's
1:06:17
fine okay so we have launched great and so now what we want to do is let's go
1:06:24
back into pie charm and yeah on line 40 here we can change button color V2 change this the button
1:06:31
color V3 right and then I also want to get the
1:06:36
uh I want to get the paragraph text or the title text we call this title
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text uh par no it's called paragraph text right that's what I called it in the paragraph text and then this is
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um paragraph text then in here I'm just going to say data engineering boot camp
1:06:58
and so uh now I have my paragraph text and I want to add this paragraph text just as
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um as another um HTML element here I'm going to put it here paragraph text I
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don't know if y'all have uh ever written some HTML just saying in the lab or in
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the homework for this week y'all are going to be doing some of this stuff so you'll see I switched to uh button color
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V3 and I have my data engineering boot cap as my um this is essentially the
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default if for some reason stat Sig can't put a user into a group it will
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just use that paragraph text so now if we go back here and we refresh so you
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see now it's saying data engineering self-paced course right but I'm going to be forever in red because of this is my
1:07:48
user identifier and now I'm in red forever but obviously if you throw on random equals true you can see how this
1:07:55
will uh essentially swap like whatever group I'm
1:08:00
in and so this is kind of the idea behind how this stuff works is you have
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um uh different groups and this assigns and then you have a different experience
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depending on the user that you are and the user that is kind of working with
1:08:20
this stuff so how does this like so okay cool y'all are probably like wow Zach
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you made uh different colorful images show up in the lab today but it's like how does this make any difference in uh
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experiments like so well on one side we now are tracking daily active users so
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we will know whether or not someone's daily active just based on whether or not they hit this uh URL and then that's
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automatically logged in stat Sig um but we we need more right we need to see
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like okay if they go here do they actually visit another page so you saw
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how we had that uh we're tracking that other um metric you see this visited
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signup we probably want to track that metric as well so that's going to be the
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next thing that we want to do is we're going to add another metric into this another event that so that we can track
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that and we can see what happens as things kind of uh progress as we're
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adding more metrics and more engagement to this if we go back to pie charm one of the things is is what we want to do
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is you'll see there's a bunch of different routes and stuff for this API and you see this like Hello World
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route so you want to essentially copy lines 28 to 30 and then paste it again
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and then what you want to change here is this backs slash make it back slash
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signup so now this is going to be and then you want to change the string in here to be like this is the signup
1:10:01
page so uh oh yeah sign up page we'll put it all one word there so so now what
1:10:06
this is going to do is this GNA this is going to give us another web page on our server that we can look at so if we go
1:10:14
here and then we essentially go to instead of back slash tasks we go to back SL signup you can't have you got to
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change this from Hello to sign up that's why because we have two functions with the same name so now now now flask won't
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be mad at us um okay so now it's working in Safari and I'm going to put that signup route back because it was right
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so now um for some reason it wasn't working but now if we put sign up
1:10:41
here see now this is the signup page great but we probably want to put a route in the other page as well so um I
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don't know if yall have ever done like so in this get tasks function you'll see this ends up rendering a lot of like
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HTML what I want you to do is at the bottom here we're just going to say um we're going to make an a tag and you
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want to use an href here uh if y'all have worked with HTML this is going to we're just going to say inside here
1:11:09
we're going to say go to sign up and then in the hre here we're going to just put back slash signup and I'll show why

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we want to do this so um so that we can kind of have a a better time here so
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let's go back to tasks okay okay so you see uh wow blue
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is really hard to read okay but like you see down here this says like you see
1:11:33
this like there's this go to sign up page that you can click and this this links back over to the sign up page kind
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of the basic sign up page so this is kind of the idea right is okay green is way easier to read so then we can say go
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to sign up great now we are at this new sign up page and so this we want this
1:11:52
action to be logged so that we can see like okay if people go to this tasks
1:11:58
page how many of them click on this link and actually follow up so that's going to be our first thing that we want to do
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and the way that you do that is with um so stat has another um so we say like
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stat Sig then we got like there like log event and then in this case we have uh
1:12:21
visited sign up and uh but we need to get our stat Sig user so in this case
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our stat Sig user is going to be based on um like it's going to be based on the
1:12:37
same sort of Randomness or it's going to be based on the same user ID from uh all of this stuff so uh if you copy the
1:12:46
lines what 41 to 45 here this will give us our user ID that's going to be the
1:12:51
hash and then then we have our stat Sig user stat Sig user is going to be stat
1:12:58
Sig user user ID so now this will be our logged stat Sig user and then you just
1:13:04
have to pass him in here as kind of a that's that's right I'm pretty sure
1:13:11
like so and then that will log the event for that specific stat Sig user so what
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we want to do is go back up to the server here and we need to import that um so we can say from stat sig. staig
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event import stat Sig event that's so lame
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that's the way that you have to do it so in this case uh then we're going to have a stat Sig
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event in this case that's going to be a new stat Sig event and then inside here there's going to be a user and that's
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going to be a stat Sig user and then we have a event name that's going to be
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visited sign up and then this is and then you pass it
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in all together like that that's how it that's what it's expecting so this is going to be our
1:14:01
kind of way that we're going to be adding more code into uh the signup page
1:14:06
and this will give us our event logging that we're looking for so now uh I'm
1:14:11
pretty sure if I like hit sign up again there we go so now we're actually getting uh like actual event logging
1:14:18
here that you would expect um so this is now we have our signup page and then we
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have our tasks page right because we go to tasks okay we're in the orange group
1:14:29
you go to sign up boom and then so now that is going to be a logged event so we
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should be able to see that actually if we go to button color V3 should be able
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to go to like Diagnostics okay there we go so you'll
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see in um stat Sig we have uh these are going to be all of the exposures of
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different users right and you'll see a lot of them were like the those random users that I was implementing before
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with that um question random equals true so these are going to be all these users that were exposed to our um different
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kind of logging or or to our different uh in tests right so you see like okay this user got test two this one got
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control this one got test so you can get all sorts of different uh rules and uh
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splits that for users and you can see EX exactly how they're going to come in this way um and then if you go to the
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metrics tab one of the things that you should see here is oh there's going to
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also this is going to also have all of like my websites metrics in it too right
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yeah okay that's not it's not going to be there is is there one in here that's going to work does this have like metric
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lift at all okay okay I forget staing does take a little bit of time before
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you can actually see any of the um the actual metrics involved with stuff it
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takes like a little bit of time to like like log and show metrics so um that's
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kind of the idea behind how these metrics and these uh things are set up
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one of the things that's important to think about is when you're building out like apis and stuff like that is okay
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when is stuff logged and like so for example in this case one of the things
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that you might be uh that might be interesting here to y'all is that this
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is going to be logged on the server side as opposed to being logged like in the HTML because you could also put like an
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onclick here you can put onclick and then you could put like a function in here like bust out JavaScript in in
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python or whatever but like I don't recommend that but um that's like you could also potentially put the logging
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on the client side so that it happens before you even hit the signup page because that can be another way to uh
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kind of log stuff and so you can do client side logging and server side logging and they have their different uh
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benefits and risks right so serers side logging is generally easier to set up like you saw how I set this up in like I
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don't know like five seconds um and so that is the great thing about serers side logging client side logging is a
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little bit trickier because of the fact that uh we don't want like and here's the problem with client side logging is
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we don't want to give random clients the ability to just log
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whatever they want to our servers so you have to do this thing called like OA like uh ooth like um authorization with
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your client which like is a little bit more complicated uh but the thing is is
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like you also get better Fidelity data that way because you get the you get the
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event when they clicked and like when they did the action in the client not when the server picked it up so like you
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actually get like better events and higher quality events and like you also can get things like scroll time and like
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uh view time and like I know at Facebook they have this this notion of this thing
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called time spent which is like how long someone is spending in the feed and that could be another uh powerful thing for
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people to work with uh and that time spent is mostly a client side uh logging
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kind of mechanism and all those metrics can be very important for experimentation as well
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so this is kind of the idea right is you want to set up uh your servers to do
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both and generally speaking you want to start with doing uh server side logging
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because it's like it's just easier just so much easier and then uh after a while
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what you can do is you can set up other sort of things right so one of the things I don't know if y'all saw but if
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you go to like Zack wilson. Tech and um I'm currently running an experiment here
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on this sign up button so this sign up button uh for some people is red and for some people it's blue depending on uh
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like who you are it's the way I have it set up right now is it's 80% red 20% blue and so that's just uh something to

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to see and uh definitely know that that's like a thing that's happening but uh let let me show you how that works

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because for that experiment like I actually didn't use I didn't run an experiment with it what I did was I used

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what's called a feature gate so there's a couple differences there um feature gate one of the big things about

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it is like you don't get groups you only get a yes or a no and in this case I

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have like red or blue which is also just if you have two outcomes then like you can use a feature gate as well and

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feature Gates can sometimes be uh simpler to work with than experiments because feature Gates don't have like

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you'll see like when you're in this feature gate page you'll see there's no like make a decision and you can also

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edit things like as whenever you want whereas experiments like are a little bit more like controlled where you have

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to just like they have to be fixed at a certain time but feature gates are awesome especially like you know how I

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was talking about those long-term holdouts of like people who don't receive notifications on Facebook or

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different sort of things like that so what you get in this case is this is going to be my uh kind of homepage show

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new homepage which which it's just filtering that that button right so you see the split here so we have like 80 %

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uh means the 80% gets red and 20% gets blue and obviously I can change this I

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can make this 50% if I wanted to and then that's not going to that's going to just that's going to be fine and that

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will like and it will just it will just change the environment of the thing but

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the idea behind this is you can also kind of do longer term experiments here
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so let me let let me show you what I mean by like okay so here's my uh here's the results so I set this up like two
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days ago I think yeah August 11th I set this up on like on it was like more on Saturday but so in that time in the last
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two days there's been uh like 2700 people who have like been part of this
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experiment uh in the last like two two two three days and we don't have
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Monday's data yet but uh you'll see like it's keeping that nice like 8020 split
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like so what that means is 2200 people have seen the red button and 500 people
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have seen the blue button and it's keeping that nice 8020 split that we're expecting um so this is where you get
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more data behind like statistical significance so one of the things you'll notice here is um for our 90% confidence
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interval you'll see that like every single bar overlaps zero so if any of
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these bars overlap zero what that means is like the effect could be negative or
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positive like we don't know and so uh that's like kind of uh like frustrating
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but like what what essentially that means from this experiment so far is
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that it doesn't matter that much right red versus red button versus Blue Button does not matter that much but you'll see
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like I can go in here and I can edit this confidence interval so let me show you like what the difference here is
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let's go to 80 % confidence interval and you'll see okay with the 80% confidence
1:22:29
interval now we have a statistically significant result we have this guy here uh this uh visited signup but um because
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its P value is17 and that's less than 0.2 uh but
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like most data scientists might look at this and be like I don't know if I can trust that because there still is like almost a 20% chance that this could be

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random and so that's a thing to remember when you're like interpreting these results is that the the confidence

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interval matters quite a bit and so generally speaking you want it to be set to uh 95 so you see how this is like

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Alpha equals .2 Alpha equals 05 that's essentially the probab Alpha is the

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probability that you're wrong the probability that you are saying that this is not a coincidence when it

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actually is a coincidence and that's where uh the the the the 95% confidence

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interval generally speaking is the better play but one of the things that

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uh I want to show as well though is these things aren't necessarily uh just you can look at

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things more specific right so for example this one this like so you see

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this is a not this is that visited signup not a stat a statistically significant result and you'll see like

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okay even if you group it by different countries like you see okay Canada Great Britain India they're all not

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statistically significant but if we drop this to 80% the only reason I'm doing this is to show y'all like kind of uh

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how things can be different here though but you see okay so now this experiment that like is statistically significant

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overall it's actually not statistically significant in India and it's not

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significant statistically significant in Great Britain but apparently the US and

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Canada they just freaking love they just the US in particular really loves like

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red buttons right this is almost like you almost can get you can almost use 0.9 as your uh confidence interval like

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a 90% confidence interval for the us but you'll notice that like for India and Great Britain like the color really does

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not matter and so uh that's one of the things to think about when you are also
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running your statistical tests is is there actually an underlying population
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where things might be different where things might be like for example maybe I
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run a test where instead of putting my prices in dollars I put my prices in INR
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and if I put my prices in INR like I would imagine uh it would hurt the us and it would help India so like that's a
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just a you know an obvious like duh sort of example that would have a like of an
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experiment that would have a very strong impact on like a a a certain slice of
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your users and in probably a detrimental Slice on another set of users and so
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that's a thing to think about when you're like building out this kind of stuff is when you're running experiments like you might not get like a clean
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thing where it's like okay yeah overall we get a a a bump but like for some
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users it might be a drop and for other users it might be a gain it's not always
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like a a clean and cut like everybody wins and it's always a better exper
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exper experience for everybody so that's a another thing to think about when you're kind of like building out
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different things so that's what so feature gates are really powerful in that way and uh and they can do some
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really some really good stuff one of the things that I I I just wanted to kind of end with here with experimentation is
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that experiments are going to be one of the most important ways to have impact
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as a data engineer and It's tricky because of the fact that
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when you are doing experimentation and setting stuff up and like getting this far where you end up having these like
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actual Pages where you can look at stuff is like it's very far removed from the
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actual data engineering job and like that's one of the things that like I think will change in some regards and
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I'm hoping that some of y'all you picked the analytics track and I'm I'm my uh
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understanding is that some of y'all that picked the analytics track actually your goal might be to be more of like an
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analytics engineer or a data scientist or like another kind of role like that and that's where like having this
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knowledge can be very useful but it can also be very useful for data Engineers as well because it's like okay what
1:27:11
metrics like what other numbers do we need in these charts like this so that
1:27:16
uh data scientists can have a clearer picture of their experiments so like
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that's one of the big things that they do in big Tech right so this is one of the things that Airbnb is kind of like
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uh like leading the way on is they have this thing called manura which is like a metric repository of all the metrics
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that like Airbnb could care about and then an and so then in an experiment you
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can have all these metrics and one of the things that uh you can do with some of these metrics so if I go to metrics
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and let me go to like visited signup so if I go into this metric here and I go
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to um setup here uh there should be a way isn't there a way to do
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it you can't do it in here oh that's lame okay well anyways uh most metrics
1:28:04
have a way of being what's called uh is it metric catalog go here I think this
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is where it is okay so you can catalog metrics and then I think in here you can add manage tags there we go there we go
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so like in here you can create a new tag and then we can say like guard rail right so
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um these are all the metrics that should never go
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down right okay so now I have my tags and uh I have this tag for guardrail and
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now that will be what we can use for our different metrics catalogs and you'll see now if I add that to here I can be
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like guard rail metric and then I can add another guard rail metric so what guardrail metrics do is they are metrics
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that are so important to the business that like if uh if an experiment causes
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these numbers to go down that experiment is essentially blocked from deploying um
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for example uh at uh at Airbnb uh uh the guard rail metric that I worked on was
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reservation profitability so it's like if we have an experiment that significantly drops uh profitability
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then that experiment probably is not going to launch that that's not a like that's a that's a nogo right and so
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that's and that is where um data Engineers can actually have a very
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important impact and play a very important role in experimentation is if
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your company has the notion of a guardrail metric that metric can be owned essentially by you as a data
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engineer or an analytics engineer and that is it's essentially a way to
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prevent data scientists and product Managers from like going too wild and
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doing all sorts of crazy because like you don't want them to do that right because if they are doing crazy stuff like like that's going to hurt the
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business and it's going to hurt these metrics and so and you don't want them to do that like that's not like a that's
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not a that's not a solid way to to to go about doing stuff you know and so I I
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would recommend in those cases to uh like really invest in quality because
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that was one of the things that was the problem with uh like with guard with guardrail metrics when you create them
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they have to be very high quality right you can't have crazy quality bugs in your gardom metrics cuz like they're

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going to stop experiments right they have to be very trusted so like they're G to they have to have very high quality

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they also have to be very fresh because you can't have like your guard rail data being behind where where you have your

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data scientists who needed to determine do I do I launch this experiment do I not launch this experiment right you

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have to do that as well and like if you do that like okay like how do you have like a a regular ly

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refreshing uh metric that is a guardrail metric that people can use that will

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then prevent them from launching bad experiments and making bad decisions and that's where I I'm hoping that between

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like weeks three when we were talking a lot about um uh data quality and talking

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about like how to have high high high data quality using things like write audit publish and then in week four

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we're talking about like analytical patterns where you have those State change patterns those state change patterns are very often guard rail

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metrics where you don't have you don't want to have too many users churning you also don't want to have too many users

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who are uh like stale or like too many or too many fake accounts that are

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coming in right there could be all sorts of different uh things that can happen that can make guardrail metrics uh very

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important for launching experiments so that's the kind of the last thing I wanted to talk about at least in this

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kind of UI and how you can kind of catalog these different metrics into different buckets of things congrats on

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getting to the end of the day one lab if you're taking this class for credit make sure to switch over to the other tab so you can get credit