**Interviewer 2:** [00:00:00] Good.

**Interviewer 1:** [00:00:03] Okay. So the first questions I have are about just your background. So could you tell us what is your current position at your job? I'm guessing that you're a freelance developer.

**Interviewee:** [00:00:15] Okay, I work freelance, so I'm not in a permanent position. I am working as a freelancer or as machine learning developer for the last five years and do you want I tell you? Okay, I am more focused on supervised learning, not unsupervised learning. The last year I am working in reinforcement learning, too.

**Interviewer 1:** [00:00:43] Okay, thank you. That was very informative. So you said that you have five years of experience in machine learning? Is it your overall work experience or did you work on anything else before that?

**Interviewee:** [00:00:56] Yes, and before I have worked about ten years or fifteen, ten passes, as a back-end developer.

**Interviewer 1:** [00:01:08] Okay.

**Interviewee:** [00:01:09] Mainly on python, perl, something of java. Right now I am a hundred percent on Python.

**Interviewer 1:** [00:01:16] Okay, thank you. And you said you worked mostly on supervised learning. So which problems you were trying to tackle using deep learning networks when doing that, like an example could be image classification, speech recognition and etc.

**Interviewee:** [00:01:33] Okay, I haven't worked with image recognition. I have just an academical knowledge about that - I did some classical exercises but not on images and I am very focused on finance and on betting games too. So finance is.. Like half of my work is related to finance the other I am working on betting game systems and another work.. I have work trying to estimate or predict something for example the weather.. No, not the weather, based on the weather some other fields: the electricity that is going to be consumped in some cities or country to [inaudible] the companies how many power some industrial compression will demand according the temperature of the some underlying products and try to optimize the equation between the cost of the electricity and the cost of the refrigerator that the compressor needs. So it's an optimization problem based on the estimation with the..

**Interviewer 1:** [00:02:55] Okay. Thank you. And you said that you're using Python as a programming language. Do you use any specific Frameworks for deep learning?

**Interviewee:** [00:03:04] And yes, I work with scikit-learn - one, the second - tensorflow and I'm not sure if it is a framework, I am using very much stable base lines or baselines for reinforcement learning it deals also with tensorflow, but it's a library for that which use Gym [?]. I am not sure if you know it. Okay.

**Interviewer 1:** [00:03:32] Okay. Thank you. So as I mentioned before for this interview, we have one general question which is what kind of problems errors challenges bugs you have faced while developing these systems. So if you have anything on your mind about that you could start from there and we could go forward. Sorry, just to make it more clear. By bugs we mean all kinds of bugs like all error messages, bugs, conceptual bugs, even small technical issues, so anything that comes to your mind. Sorry, I've interrupted you.

**Interviewee:** [00:04:12] No, no problem. No problem. I have.. Maybe it helps you, related to my background because it's something statistical. I have a master degree. So if you want to take note for the statistics, I have a Masters on this field and also in finance. Okay?

**Interviewer 1:** [00:04:32] Okay. Thank you.

**Interviewee:** [00:04:33] I thought about the bugs and I haven't found... I cannot tell you that I haven't found bugs but I need to respond.. Not reply.. every time that I have some issues I need to advance, so I need to patch it, figure it out or try with different alternatives and sometimes they are bad, but I don't realize because I see what are the summary. I see that in I don't have good results in that way and I had to try different things. I don't.. I cannot tell you, okay, I have a bug on something, I can tell you that tensorflow helps a lot because it's an infrastructure that I can work on my machine and I deploying the cloud without any problem. I have, yes,. I have something very very interesting for you related these things. And it is related to the random number generators, okay?

**Interviewer 1:** [00:05:38] Okay.

**Interviewee:** [00:05:39] Okay. So one thing is let's suppose I want to replicate a training of the model. So I train, I see more or less.. because the training is not always straightforward. Maybe I trained 10 000 batches with some learning rate, then I need to change and see how is the results and I do a lot of things mainly for neural network, a lot of manual things and then I once I have the summary I want to replicate the results and despite I use a seed is not always easy or possible to replicate exactly the same results. It's related for several.. Or maybe I can reproduce in some cases, I [can, got?] reproduce that training on my machine, but then when I move to a AWS, there is another library, so despite I use the same seed, the result are different.

Another of the problem related to that is that when you train with concurrency or GPU despite you use the seed of the random seed in the same machine, because of some synchronisation a random seed I cannot get the same result. So that's not an issue. It's a problem. It's a problem that would be good to have it, but I don't know a way and I really don't know it. How to do it. But that's a thing. Another thing is I use a specific library for reinforcement learning that is very good it's based on base lines. It's called Stable Baselines [but I?] Try to have a [inaudible, general?] API for that and..When I train a machine learning model I can train, maybe if I need the resources, I can stop and continue the training with the same previous states and as I can directly access to tensorflow, I can save all the content that I want. With this specific library - Stable Baselines, I can save or perasist the similar thing like the tensors, the each of the contact of the neurons but I cannot save all the optimization parameters, for example, what if the current learning rate and the momentum and some other things so I don't have to start from scratch because I have all the content but I don't have the optimization values. It's a reported bug and this is a problem, but it's something specific for one specific library I work with.

**Interviewer 1:** [00:08:44] Okay, anything else you have to add?

**Interviewee:** [00:08:51] [inaudible] of the things. I really try to have.. I of course deal with all the things. Sometimes I tried the models in my machine and then I want to go to another machine on the cloud with my model, but the libraries were not exactly the same versions. So if I try to download a library and sometimes I have the same library, but not the same STD.. The standard libraries of the... I work with Linux, so maybe I have Python 3.63 and on the cloud is 3.64 or something like that. Despite that I use erxactly the same library, it cannot pickle or load the model because of different encoding [inaudible] thing different on the libraries. But I deal with that, I see if there is [inaudible] and try to standardize the things so trying to replicate the things depending on the problem. I have to deal with, I am not sure [inaudible] are thing to have in mind.

**Interviewer 1:** [00:10:04] Okay.

**Interviewer 2:** [00:10:04] Thank you.

**Interviewer 1:** [00:10:05] Thanks a lot. So I wanted to ask about the training data for your systems. So do you usually use existing datasets or did you ever have to collect your own training data?

**Interviewee:** [00:10:18] I..okay. I work a lot with finance so if I try to get public data from finance sources, it's not so easy, I.. Is not so easy or so cheap because possibly everything is with money. What I do is I have some some quote that I use but maybe I have quotes on daily basis. I mean one quote per day. In some cases with the [inaudible] that I tried the most one minutely or one minute quote - one quote per minute in some cases. With that information I more or less manage to validate my models and then I used another platforms that [host?] the infrastructure and integration with the code. [And I control?] my models there. I got [inaudible] it if you need it, if you want.

**Interviewer 1:** [00:11:30] No, no.

**Interviewee:** [00:11:31] Okay, I have to deal with that, with the quote that I have, of course, I download and I [inaudible] myself and in some other cases for example the..I am working on a [removed as per the interviewee's request, from now on 'removed'] betting system that I am improving constantly. My client has some developers that work on the crawlers to get information and they give to me somehow processesed, they give me a dataset. Then I have to process a lot, but they give me the dataset.

**Interviewer 1:** [00:12:11] Okay, so you said that you have to pre-process your training data a lot. Could you tell us about the cases when you had problems while training because some pre-processing step was missing? Do you remember any particular case?

**Interviewee:** [00:12:27] Not regarding that, I have.. When I have a dataset process a lot and process is I compute a lot of statistical information, for example [removed] betting system. As an example, I have the [removed] and the finish position - if finished first, second, third, and what I do is, okay, what is the average position of the last one month, three months, six, year, the standard deviation and with that.. With an underlying data set of 150 megabytes I finish in 40 or 50 gigabyte dataset. So, of the underline of the 150 MBs. So when I process that I have said that I have a lot of missing values but not only from them, the line in the dataset. I also have missing values from my processes. Because if I want the best the [inaudible] position of the last three races and the [removed] has one or two races, I have missing values from my own process. So missing values [inaudible] is something that I have to be deal with and depending on the case I work with.. If I [inaudible] the the average of the [removed: race object] on the path or the average of the [removed: race object] at [inaudible] moment, so I guess I won't be here. The average up to the moment and so I try to turn to don't discard the instanse but to have data that is not too much influence, but don't discard the information. No, I guess I don't have to.. [inaudible] maybe sometimes when you deal with this amount of data, I have done with the memory and sometimes I have to run some process to have the [inaudible] without loading everything on memory and.. I'm not showing you more.. focus more on some other thing about this question.

**Interviewer 1:** [00:15:07] Could you tell us how you deal with the memory issues in these cases?

**Interviewee:** [00:15:13] Okay, it really depends, so let's suppose that I can run one.. I run several processes, okay? And several it could be.. for that [removed] bet dataset around about 15 main processes, like compute the start of the X periods on X month. For example, of the last races or combine several metrics to build another one and I have several processes. So if I can, what I do is try to split on different processes and run them independently. Okay. so when I run that maybe I don't have to know all the data - I can load some partial information and for other things what I do is try to load from not batches, from [inaudible]. For example, I load only the information from one [removed: race object], compute the [inaudible] of that [removed: the race object] and then iterate with different [removed: the race objects] and. I don't deal, don't deal with one [removed: the race object] maybe I deal with 1,000 [removed: the race objects], but I know only 1000 [removed: the race objects] in memory, I process and then sort the results and and continue. This is not about data transformation, but sometimes it's really hard to train a random Forest or GBM with all the dataset in memory and one of the advantages of the neural network is that I can.. I don't need to know everything in memory. I can read from these and train and then with another piece of data.

**Interviewer 1:** [00:17:15] Okay, so regarding training data again, did you have cases when you had problems because your training data was wrong in some way like some labels were wrong or not?

**Interviewee:** [00:17:29] Yes, and the labels is a target and you mean in the supervised learning where the class, right?

**Interviewer 1:** [00:17:39] Yes exactly.

**Interviewee:** [00:17:40] Okay. Not too much, the class have the class wrong. I have.. Only with the [removed: race object] and.. no, the classes ..No with the class I haven't had directly.

**Interviewer 1:** [00:18:01] Okay.

**Interviewee:** [00:18:02] With incorrect data - yes.

**Interviewer 1:** [00:18:05] So which in which way was the data incorrect?

**Interviewee:** [00:18:11] At first the main problem is to detect it that not always easy and I recall two problems in the [removed] betting. I mainly detect when something is out of range. Okay, it's not an outlier, it is out of range. Maybe [inaudible] to 20-50 I have something higher than 500 I discard it. I [inaudible] with another thing. It's it's more than an outlier, it's out of range and... I had some other problems when the data [inaudible] incorrect or not consistent and I see only when I process and I graph it. Only with graph I can see it, well there are other ways like saying if the data [inaudible, bond?] Is one 1.5 from the start of the [inaudible] or something like that but in general I.. When I filter, if it's possible to have the time and to filter, and on that process and I try to graph everything against everything if possible. Otherwise, I try to praph the 10 most important metric with the other 10 and try to see what are the points according the class that are...That you feel that are wrong [or?] Too far from the average. That's [inaudible] process takes time.

**Interviewer 1:** [00:20:05] Okay, thank you. So I wanted to ask about model structure. So did you ever have any problems related to the wrong model structure and by that I mean like the number or types of the layers you've been using, their dimensions or maybe you were using the wrong type of model overall?

**Interviewee:** [00:20:29] The question is if the models or the type of data? Sorry I I didn't catch one hundred percent.

**Interviewer 1:** [00:20:37] The models the type of layers that you use in models, their number, the number of layers that you use and etcetera.

**Interviewee:** [00:20:47] You are talking specifically about a neural network,right?

**Interviewer 1:** [00:20:51] Yes, exactly.

**Interviewee:** [00:20:52] Okay, okay. Practically, all the times I accept that I have to would be shown I never have the best layer architecture from scratch. What I try.. I have a different approach and do you want I tell you or?

**Interviewer 1:** [00:21:16] Yes, yes.

**Interviewee:** [00:21:18] What I try to do is try to first select what are the most important input metrics because for [removed] betting, for example, I have more than 2,500 derivative metrics. So it's a lot for a neural network and I am not going to have good results so I first trained some GBM models I get what are the top most important metrics. Maybe 100-200 and that I can reduce.. or maybe with principal component, it's another way, but I can reduce the size of the dataset and the amount of inputs. And with this I train the network. In fact I try to go with the top 20 or top 30, okay, something with [inaudible]. In general, those 30 metrics you have the core. Okay, so with that it's more easy to train the neural network and start adding more [neurals?] and more layers and what I do is start with something basic like three layers depend with 30 inputs I can try three layers of 20 neurons with that according the results I can increase decrease. I try with a really lot of different things not only the neurons and regularisations and that is very important. Well, I try with.., of course, I have to try with standardized data and that's it, the main thing that I do - adding more neurons, play with the regularization. Maybe sometimes what I do is initially I have several layers and several neurons and add a good regulation because the regulation is is good and there is no problem to have a big architecture.

**Interviewer 1:** [00:23:42] Okay, so. Another question I have is about hyperparameter tuning. So I wanted to ask whether you ever had problems with training your model because of wrong hyperparameter values if yes, which hyperparameters you think cause problems most often and how do you handle the tuning of them?

**Interviewee:** [00:24:09] In general, I train and I see the results..There are some research to see that. I try to avoid that... What I tried to do is manually I am changing the parameters. Of course, sometimes I configure that, not [inaudible] but I been [inaudible] that try my neural network. I [inaudible] Tensorflow but on the low level API not with Keras on the high level so I have to build everything to train my model with different parameters and.. But I said on a config file, okay, what are the parameters and I see the results and I try to tell: okay, train x amount of epochs and cut off when it is not progressing or something like that? And I also do that on non neural network problems with GBM, with decision trees and with most of the problems and I ran several tests with different parameters that I set and I get what are the best. If you want I have one webpage that I show that how I [inaudible] with examples if you are interested.

**Interviewer 1:** [00:25:50] Okay, yes.

**Interviewee:** [00:25:51] Do you want? Okay, give me one second that I'm going to paste here the address, okay? Because I showed that, I showed that, exactly that. I guess I was right. Okay, it is big but at least you can... Okay, you have samples of reinforcement learning and not deep learning yet, because I am working, but with other models you have a lot of samples of how I train and how... I don't run a [inaudible], but I search with different parameters and I run [inaudible] with more than 3,000 [inaudible] this on soft markets.

**Interviewer 1:** [00:26:43] Okay,thank you. I also wanted to ask about loss functions. Do you usually use a predefined or a custom written loss function. Did you ever have any problems because you have selected the wrong loss function or it was implemented incorrectly?

**Interviewee:** [00:27:02] Okay, here are two.. its neural network and non neural network, okay? Regarding non neural network I may define what are the loss functions and if there is a bug there either, I don't know and I see I do try and on my page you can see I try with different criterion and loss function and take what is the best and that is my best answer. On a neural network... I had some issues when Tensorflow has changed how to call the most standard loss function that [inaudible] with the version, but I have to update my models and when I see there is something that I want to tweak, I have to build my.. replicate the basic loss function but tweak by myself. For example, when I worked [inaudible] apply the same loss and when some input in between some value and some other value and I don't want to transform the input in... And okay, this is for any model, with the [removed] betting system I have to change some parameters of the losses. I have to [inaudible] myself. But if I change the loss function is because something important that I want to focus. I don't start with that.

**Interviewer 1:** [00:29:06] Okay, I see.

**Interviewee:** [00:29:08] One more thing about that, sorry. Sometimes on the finance Market I need to update the loss function because... it's not the same, you bet or you [inaudible], I give you one dollar or one percent or one hundred percent despite of what you win. So in that case you have to adapt the winning function...the loss function. And reinforcement learning helps a lot on that things. Reinforcement learning was because you have the reward. I am not sure if you know about that, but okay as you have the reward, it can see a lot. It's too much complex to train a reinforcement learning model, but I can play much more with the reward. That's something that I cannot do easily on unsupervised learning.

**Interviewer 1:** [00:30:08] And one question I have is about the hardware. So, where do you train your models? And did you ever encounter problems that are related to hardware specifically?

**Interviewee:** [00:30:20] Okay. Can I add something more from the previous question?

**Interviewer 1:** [00:30:27] Yes, of course.

**Interviewee:** [00:30:28] This is not something that happens to be bad. I see that a lot of people try to do not apply properly the optimization of loss functions. When you work with neural networks you cannot apply.. you cannot optimize any loss function. For example, I see people are trying to.. on the stock market using the profit as a loss function and that function has some property that are not consistent with what the neural network asked, for example it is not continious, has no derivative. And so what I want to tell you is that I see people using not correct loss function and that's a mistake.

**Interviewer 1:** [00:31:22] Okay, I see, thank you. And about the hardware?

**Interviewee:** [00:31:26] About the hardware, okay. I had to buy a new notebook to apply some models mainly for myself and let's look up.. I develop models for myself and for clients, okay? For clients I can't... I used to work on Cloud system - digital Ocean or AWS according to how big is the client. In general, I try to reduce the problem to develop on my machine and train on my machine some samples see that everything works okay. I have the expected output and then I trained on the cloud. For myself, I can buy some.. or sometimes... well, I never buy, I use some clients' servers for these but I try to avoid because I have bought a new machine for this. It's a notebook. It's a notebook with GPU but I don't want to burn it and so the best answer for this is for my things I try to use my machine except I cannot validate with my machine that the model is okay, and then trying three-four days in a cloud system to have it one group training and for my clients I just test it on my machine, but then they work with Cloud servers. Everything with Linux.

**Interviewer 1:** [00:33:14] Okay, thank you. And do you remember any problems that you had because of the hardware: error messages, crashes or just..

**Interviewee:** [00:33:27] About four years ago I worked with one company that they had to work with Azure.

**Interviewer 1:** [00:33:36] Uh-huh.

**Interviewee:** [00:33:37] Do you know it, it is from Microsoft?

**Interviewer 1:** [00:33:39] Yes, Yes.

**Interviewee:** [00:33:40] Okay, [inaudible] my pronunciation got correct. [inaudible] in that moment working with Linux on a show. What's a pain. We lost a lot of time I haven't lost reputation, but it was a lot of time dealing with Azure problems instead of working my things, I was [inaudible]. More tension because my client don't see that they are getting the result. He understand my issues, but... I try to solve problems and not give more problems and they say it's Microsoft, its Azure.. Finally we moved that project to to AWS, to Amazon. A lot of problem solved with that. I don't say that right now this happens but on that moment everything was problematic, the support was really bad and we were paying about $4,000 per month or I don't recall the number but the the support was really bad you even... I guess that, I have more knowledge about that than the support, probably the issue was that they don't give us the good support, but it's another problem. So I try to avoid Azure, I am not sure how it is right now. I thought that that one was improving but Azure was a problem. In Amazon.. Amazon, if you have money, it's such a solution, but you have to have money. And other of the thing is, maybe it's not a problem for the companies but I don't want to have dependency with them - with Amazon and like everything is [inaudible] and I see a lot of people, okay, you can do this with Lambda and other sort of thing but if they decide to charge me much more or shut down, I don't want to have that dependency with them. I try to do more standard things maybe for my things. Or maybe they deprecated something and I cannot work, alright. What I want is, with common sense, I want that something adapt to my problem and not me adapting to a cloud platform and I see that the companies, maybe they start and everything is very good and then they start to using a lot of specific things on them and then you have to work with another thing [inaudible] that things and it's a ball of snow that is hard to get out. Maybe, probably, the cloud companies want that.

**Interviewer 1:** [00:36:44] Okay. Okay, thank you. So I have one very general question. So let's say that you have your data you have your model you train it, you to get some results. So what what are the usual steps you take after you have initials results to improve the accuracy of your model. Are there like some specific steps you usually take to do that?

**Interviewee:** [00:37:11] Okay, the most important is to analyze what are the data or the things that really impact on my results on my model. So I need to detect that and for that reason I don't run a research certain I run something step by step because I try to detect... This is not so easy on a neural network, but it's possible, but I want to detect, okay, on every step step what is my gain so I can see, okay, if I standarize the data I have a gain or not; if I add new, maybe not one more important, maybe if 5 more inputs of the top 30, what is my gain? If I add 10 then what is my gain? If I change instead of using the mean square error, I use another loss like [inaudible] mean square error or the cross entropy. Okay, what is my game with that change? So that's, instead of adding all in I try to understand my data, understand the impact of every change and with this I see what I need is add more layers, add more neurons and I want to see, okay, when I do something the result is different thing. So the answer is analyzing the data, how the data flows.

**Interviewer 1:** [00:38:43] Okay, thank you. So do you have anything else to add? Otherwise, I think, we can wrap up?

**Interviewee:** [00:38:54] No, the question is if you have something more to ask me.

**Interviewer 2:** [00:38:56] One more question, maybe. Can you remember any trivial bug that you sometimes get, maybe it's related to dimensions of the layers, maybe it's related to tensors. I don't know, just something trivial that you know how to solve but sometimes it pops out.

**Interviewee:** [00:39:16] Okay, starting with tensorflow was hard so I don't see how to get the information [inaudible]. I know that the information is there on the tensor, but I don't know how to get it or how to feed the data and building loss functions and transformation data. On tensorflow, it is not so easy because with the time you are getting more experience. When you have to debug something on Tensorflow, on the low level API and you want to print and see the data. It's not so easy. It is not, it's not about but. I have some advantages of that but because I can run on several GPUs or in GPU over my memory so they are reason there is an advantage about that but the value in that is not so.. The data or how it is.. When you want.. When sometimes you come a lot of matrix, transform one to other and there is an error, it's not so easy to understand it and I have to, as I work freelance, I charge to my client by time. So it's frequent that despite I spent two days doing something I don't want to charge two days for the client. So I have to take time for my own. Hold on, let me.. Give me one more minute because I recall something.

**Interviewer 2:** [00:41:18] Okay, sure.

**Interviewee:** [00:41:19] Okay, I will tell you something similar to this but not from.. From scikit learn, okay? Okay, they don't have several.. When you have some.. They don't implement some kind of data. I mean you can have data that is nominal, like it's a number. But sometime you have data that is categorical. Like categorical but with an order, okay. There is a distance concept but it's not known in advance what is the distance between each of the members and, for example, the colors. Let's say white is before then you have yellow, red and black. But what is the distance between one and the other? So maybe if you define like.. Okay you replace, let's say that you replace.. The colors you set us categorical, but you defined a number to give an distance.. an order concept, okay. Despite is defined as categorical, scikit learn, most of the scikit learn implementation consider as a nominal so they compute that from black to.. no, from white to black there is a distance of 4 and then it was red is a half distance and that's not correct and I tell that to several co-workers and they don't understand or they don't know. So I know that issue, not issue, I know that they don't Implement that and I have to manage by myself. Maybe I create dummies or I do something but what I think that sometimes people think that the implementation is doing one thing and the implementation is not doing that thing.

**Interviewer 2:** [00:43:29] Thank you. Another little question would be: so you mentioned that you sometimes train on multiple GPUs. Did you ever face any problems regarding to parallel run of your programs? Maybe some race conditions, concurrency problems, Etc. Anything related to GPUs?

**Interviewee:** [00:43:51] Okay, I haven't trained with several GPUs, only with one, I just tried to say what is the advantage of tensorflow but with one GPU on my machine and on Amazon. Okay, regarding this, I haven't faced races and those issues. But I had.. I need to be careful that sometimes running the things on the CPU is slower than on the CPU. I have to realise that. I understand the reason, the latency to send information to the memory and the batches that I use, so it's another thing that when I work with Tensorflow is to test if worse to work on my CPU or in the GPU. Because sometimes it takes the double, okay?

**Interviewer 2:** [00:44:55] Thank you. Okay. Just, it is not the question, just when you mentioned that some of your colleagues sometimes use the wrong loss functions. So they do not really correlate to the data they have. Do you mean that they should have customized the loss function they used for the needs of the data or the problem they have? So they must do something on top of the existing loss functions, right? Did I understand it right?

**Interviewee:** [00:45:24] Yes. Yes, you are. I can tell you an example if you want.

**Interviewer 2:** [00:45:28] That would be cool.

**Interviewee:** [00:45:29] Okay. I trained some model to invest in the stock market and I use the more traditional loss function like mean square error for the regression, no, [inaudible] for the regression, for the classic [inaudible] accuracy considered and then I test okay with that model. How good is the performance. My client is okay, let's do something different. Let's use us the loss function. What is the gain? And maximize the gain or invert to minimize the losses, okay. I tell okay, this is possible to implement, but the neural network work with the gradient descent and you cannot apply that, the gain.. The gain is okay, you bet to or you invest in one stop, you are going to win according the quote of the next day and that function is not continuous is not derivative in no points. It is not correct to use that loss function. The client says yes, it's correct. And I tell him the reasons but he hasn't understood and tell me that I am wrong. He close the contract. That was one of the cases. And I talked with other interviews are people that tell me, okay, let's maximize. It can be not only the gain, the sharp ratio of the risk or the profit divided by the rate of.. You maybe don't want to have the maximum profit, but not have a profit but not too much drop down or not too much losses on the moment. There are a lot of thing that would be nice to optimize but it's not possible to do and we have the constraint that gradient descent has.

**Interviewer 1:** [00:47:32] Okay.

**Interviewer 2:** [00:47:33] Okay. Thank you. Some question..[removed per request of the interviewee]

**Interviewee:** [00:47:52] [removed per request of interviewee]

**Interviewer 2:** [00:50:48] Yes, we will cut we will remove everything.

**Interviewer 1:** [00:50:55] Yeah, okay ,without any problem. So, I think we're done. Thanks a lot for your help.

**[removed, not related]**

**Interviewee:** [00:52:17] Thank you guys. No, no girls. Sorry. See ya.

**Interviewer 1:** [00:52:20] Thank you, bye.

**Interviewer 2:** [00:52:25] Bye. Thank you.