Interviewer: Can you please introduce yourself and your role in your company, your organization?

Interviewee: I did my bachelor in Bangladesh in IUT in computer science and then I came for my Master degree in Europe with an Erasmus Mundus scholarship, and it was based on computer vision and Machine Learning programs. Then after I went to Bangladesh, I was teaching for one year in a university as a lecturer in the Computer Science department. Then in 2016, I came to Canada in Montreal, I did PhD in University of Quebec. It's called the Ecole The Technology Superiori, it's in Montreal with Professor XXX. My main topic was basically Machine Learning core, doing clustering algorithms and also deep learning methods and mostly worked with making learning better with just a few labels given. And even if we don't have any labels, that is called unsupervised learning and then I worked on different topics, I also work in fairness, where we want to reduce the bias in Machine Learning models, because sometimes we want to keep protected different races and genders so that when we want to take any decision from Machine Learning, let's say, for clustering and let's say that algorithm is used for rewording loan from banks or something. We don't want any bias against any minority group in awarding the loans. And also, I did work in the metric learning process. We are just trying to make Machine Learning better based on learning a better future embedded. Now, I am working as a research and technology lead in the XXX Group, and we mostly work on making Machine Learning explainable. Now, Machine Learning can take decisions and can lead decisions, but we actually don't know the background, how the machine actually came up with this decision. So, we want to debug inside the model so that we understand which kind of features are responsible for taking such a decision. That is called explainable AI. I am working on explainable AI projects in Thales now.

Interviewer: Do you consider yourself a more academic person or industry-related person?

Interviewee: I am in between both actually, although I am doing the research and technology part in Thales, but we are basically trying to integrate a different functional project in Thales. For example, if Thales has products on sensor data or data on satellite, also on smart cranes, we also build models for avionics where we want to search and make the path of modeling of avionics also using different computer vision technologies. But the thing is now my project is mostly trying to, even though we have some implemented Machine Learning models, we also try to understand the main features and the accuracy behind this model. So that is what I am focusing on. Once we have the research done, we try to integrate it into the main functionality of the deployed projects.

Interviewer: Can you please describe your responsibilities in your organization.

Interviewee: As a research and technology lead, what I am doing is, I have my own project defined. So, my project is a vast project actually, it's trying to make the Machine Learning decisions accountable. Sometimes the executives, even in a crucial application of Machine Learning, for example, in medical imaging or something, if a tumor is detected or not and the Machine Learning is saying that, OK, the tumor is detected with 90 percent accuracy, but then we also want to know why it was detected tumor. It may be something different, why the Machine Learning actually took the decision and for which kind of features Learning actually took this decision this is a tumor or not? That is why it’s not very straightforward because it's nonlinear model we mostly use Machine Learning and then debug it to identify which features are actually responsible for that. That is crucial. That is what I am trying to investigate now, and now the main project is, we want to learn also not from all the labels because deep learning actually is data hungry. We need a lot of labels to have very accurate models. We have limited labeled data. But from that limited label data, let's say a human can understand any labels just showing one or two examples of a cat or dog, but it's not the same case in machines. So, what we are trying to do, we can also try to make the improvements of the few shot learning better, learning from fewer labels, also trying to see for which reason and for which kind of features, it took that decision. So, yeah, so that is my main role. I am working with the team also. I have collaborations with different universities and also, we have some software engineering teams. We all work interconnectedly.

Interviewer: Can you please describe your experience working with non-functional requirements?

Interviewee: I will categorize my work as a non-functional requirement for the models that we are trying to improve. So even though we can see that it is detected from a satellite, if we want to find the vessels in a sea, how many army vessels are there, even though it will give some sensory information, we also try to make it better in the background. So that is what I am trying to do.

Interviewer: Do you think Non-functional requirements can play an important role in the success of software? If it is yes, how?

Interviewee: In terms of explainability, fairness, and other metrics, quality attributes, of course, it's a very important part of making any software as a service better. Definitely I will say, this is very important because the non-functional requirements will trigger the accuracy and better service of any software.

Interviewer: Do you think there are differences in non-functional requirements between generic software and Machine Learning software?

Interviewee: For generic software or rule-based system, of course, there should have some metrics in the background with, which we always try to get feedback from the functionality and also, we want to get feedback from the user cases of the user inputs. If we try to do the continuous integration and continuous deployment, we always take these issues, we create the sprints and then we try to make it evaluate based on the user feedback and also the feedback of different metrics that we are collecting the background and then based on that, we define our goals. Nowadays, I think Machine Learning is having a big scope of where people are trying to deploy Machine Learning to make the services better.

Interviewer: Do you think there are some non-functional requirements that are more prominent or important in a Machine Learning context?

Interviewee: There are several cases. I can say, for my project, while there are controversies about explainable AI. Last time in 2017 there was the debate in Eurex which is one of the biggest conferences in Artificial Intelligence. There was a debate between the two groups of prominent researchers. Some people were saying that it's bullshit. We don't want any explainability. Some people are saying that, OK, no, for executives, let's say that I am the research team and technology team. But whenever I want to provide some decisions to the executives, the executives will not always try to rely upon the accuracy that we have in Machine Learning. What is the accuracy? They want something more than what we took, because as a big organization like Thales, I can say it is a military contractor of almost 90 countries almost around. It has branches in 56 countries. And if some of the technologies that Thales provides goes wrong or anything, and if there is an issue based on the transparency or the fairness or being in a biased decision taken from the technology, then it will be also violating some international rules. There are some rules also, in fairness, the already accommodated and already have been taken into account by European Union and also by US law so that's very important. Even though we can deliver some good product based on good accuracy, on the deep learning or something, that's not enough in many cases.

Interviewer: Which Non-functional requirements can be more prominent?

Interviewee: I just talked about one that is fairness and explainability, because trying to give some decisions also delivered some additional answers. There is something called visual question-answering system. In visual Question-answering system. the computer will give a result. I will give an image to the computer, Computer says, OK, it's a dog. And then I can ask again what the dog is doing there. So, if the dog is playing or somebody is patting upon the dog's head, it also has to say that a dog is trying to play with its owner or something. Then why you say it’s a dog, then it is like the same, because we are trying to give some similar capabilities of humans to the machines. So, I have said that, OK, if we want to have loop feedback between the service and also the accuracy, we have to be satisfied in both ways. So, I think in the software also, it's the same, right? We always try to get some different metrics of the performance of the software and try to. Now, if you said that, which one is crucial? I cannot say anything. But for my field nowadays, people are mostly talking and raising the voice for explainability and for the fairness, where Machine Learning is getting more criticized.

Interviewer: Do you think there are some non-functional requirements that are less important in a Machine Learning context, which were more important for rule-based software?

Interviewee: I think it's not only about explainability and fairness. I think that if you say the data analytics is a background non-requirement functionality and I think it is because, for banks, the bank will keep services. But like for taking insurance for a car, the insurance provider will ask many factors about if they want to give insurance to some people or not. So whenever somebody wants their insurance for a car, they will ask many questions about what kind of car you need based on the models and also do you have any other garage or not all these things, because the insurance company will always try to minimize their cost of giving back to the claims of something. So, they want to give insurance to those people who will be reliable or something. And nowadays they are feeding this data to a model, software is giving a score and based on the score, they are deciding whether I will give you the insurance or not or whether your insurance premium will be higher or lower. In that case, something is happening in the background. You can call it non-functional thing, because all the metrics are collected in the background. There are many things I will say that if I am denied a really good premium said that for some people the car premium insurance is $64 per month. Now they are saying that we can only offer $200 to you. Even if I talked to the customer service, they would say that only we don't know why, it's based on your credit scores, based on all this information we collect and maybe this is about this or that, but where is the transparency? I think that's also a factor. For data analytics also, Machine Learning can be deployed, but obviously, it's all interconnected. It's not only data analytics or Machine Learning. I would say for some cases, there is no need for Machine Learning because Machine Learning has faults itself. If we don't have good data, if we don't get it and if we cannot provide good data to Machine Learning, it will not give good results. Bad inputs will give bad results. So, we have to justify whether we should or should not adopt Machine Learning for some cases. In some cases, rule-based systems, decision trees will work much better, but nowadays there is hype that everybody wants to utilize the deep learning models, even it will work or not. Even as a researcher, it makes us crazy.

I worked with the startups also here. And startups are taking money from mutual investment or something. They try to deliver a product. But at the end of the five years of six years of spending, it was useless, the money is gone. Of course, we cannot restrict innovations like that. But it also crucial to understand that, if you don't have a good scope and feasibility of applying Machine Learning, why will we just adopt a Machine Learning or deep learning over the rule based system.

Interviewer: Do you think any nonfunctional requirements which is less important in Machine Learning Context

Interviewee: In Machine Learning context, I think there are many. Well, the thing is, we can automate some processes for sure, but for some process automation, as I have said before, it's not always necessary to deploy Machine Learning models. You can do it with simple rules-based systems in your computer, with traditional optimization methods. So, I don't know, I think there are many cases where you even don't need some Machine Learning context. Yeah, but always people can find opportunity.

Interviewer: Do you think this non-functional requirement for the whole software or just in Machine Learning model or just data part?

Interviewee: If I try to connect both and if I will have some separate fragments, let's say for Facebook. Facebook's main idea will be how to make people engaged so that their revenue becomes better. So, they will get some information. And to find the engagement of the people on certain topics, Machine Learning can automate things. Because when the data, data size and scope, and the number of freedoms is very big, that is where Machine Learning helps. But if there is some small context, let's say like some team of software can handle, that's like a fault in the server fault the server is also Machine Learning is used also even in the router also. But if you say, we want to just collect some clicks and other behavioral data from each user, then I think this is only based on some simple programming. You just collect the data through APIs or something. I don't know, maybe there is scopes if there are some really big complexities. But if it is very simple, just taking each data based on each feature, you just do a distributed programming there and you just get this accumulate data in the database, then it's OK. But to make it efficient, I saw people also are trying to optimize this process through Machine Learning. I even saw the Machine Learning touching every sector. But of course, if we don't have the scope of big data, if we don't cannot leverage, even though we are working to learn from few labels, but it depends, I think it depends on the cost also. There is a cost involved in Machine Learning. You have to utilize the big power resource or something. But if we can just do simple rule-based systems, without that much cost, just taking the distribution of CPUs that's ok. But learning process can take sometimes much time. So, I will say that it depends on what the concerned people on any software wants.

Interviewer: What challenges do you experience with nonfunctioning requirements for Machine Learning?

Interviewee: One challenge that I told that we have to make the whole system transparent, because most of the cloud services, if it is crucial like the banking and also the critical systems that we work in Thales, there is smart crane or if there is a boulder or something. Now, if we want to implement a computer vision system in autonomous car, then there are a lot of things coming that, OK, if it just kills the passer by, that happened last time. What we have to also make it better that should we take the turn or not? If there is a child, it came, it violated, maybe sometimes there was a interesting talk this year. I attended a conference call EEEI and that was the professor called Pat Lang, He is very famous. So he gave one team, one term coined one term, it's called justified agent. So what is justified agent he said, that looks like I'm a guy, I'm waiting in front of the counter of McDonald's, waiting for now. I am in a hurry. My car is leaving or something bad happen, so I can go to some people and I can explain and I just can take the things I can come by and go, you know, it can happen sometimes people may ignore, people say no or something. But how you can make these computers that emotionally connected with people or not. So, I would say that there are a lot of questions if we want to implement Machine Learning. There are many other factors we have to take into account that you say that fairness, transparency, explain ability. And it's not only having an accuracy measure. Although some people for some cases on the accuracy may help. But I don't know, for deployment as a responsible company in critical systems, always there needs to have some transparency, some feedback and the Machine Learning should also be implemented based on the law. It cannot violate the laws that is defined by the US laws and the EU laws. That's the other costs of having Machine Learning.

Interviewer: Do you measure these nonfunctional requirements over Machine Learning enable software.

Interviewee: I think, yes, there are a lot of metrics collected each time continuously, let's say, for smart trains, there is a thing that said there are some trains deployed in France by Thales they want to check the timing, the where the train is now. So, the train is continuously giving some feedback, although there was any latency or not, it was supposed to come to one station at this time, how late it was. So, we try to get these things. This is kind of a scheduling problem and try to make it better. So, in that case, we are also trying to take into account the Machine Learning systems. So continuously we are trying to measure. And if you say that, what kind of metrics? It is a continuous process in these applications. We are regularly updating the metrics. We are trying to, you know, make it better and maybe some other things happening. We are also trying to make this better. So, for now, to have a very good system, we try to collect every metrics that can affect the performance of the service. So, it's a continuous process and we analyze every metrics, and we try to then propose a new roadmap that how we can make it improved or not. So, I think the metric collections if you say that, what kind of metrics? It's I will say that some kind of background evaluation metrics of the system based on different performance measures, t's not only about accuracy.

Interviewer: How do you measure that?

Interviewee: We measure based on some performance metrics.

Interviewer: Do you measure these non-functional requirements over the whole system or just Machine Learning part?

Interviewee: I will say over the whole system because although it will have Machine Learning as the backend, the main concerns of the products are how it is delivering as a service to the users, to the customers. So, customers will not always be satisfied. Ok, I will show any image them and I am identified by 90 percent accuracy. Now, what will I do with this? So, what is the main target? Why I am utilizing these things. Some people have different interests in Facebook. People are using Facebook for business; People are using Facebook for connecting. Some people even don’t want to use it.

Interviewer: How do you capture this non-functional requirements and their measurements from Machine Learning systems?

Interviewee: There are many ways I think. For me, I'm not an expert, but I know some of the procedures, some of the things are called AB testing. General AB testing that in the software we are doing that, that we keep even before deployment of something, we keep something in the trial version, and we try to collect feedback from some giving one software available, then try to give an alternative software and try to get the feedback from the same customers or from different customers or from different users. AB testing is standard in many quality attributes for measuring the performance of a software. There are questionnaires is also, there are customers service where customers complaints, if it is based on the performance, about the satisfaction of the customers. Now, internally for engineering teams, there are several other factors. Let's say, I will say generally, like we want to improve the accuracy measure so now the model trained with Machine Learning is keeping 70 percent. But now we introduced a new dataset. In that case, it was keeping 60 percent. Although for now, the data we train with it can give some services, but for some other non-related data on which it was not trained, it is giving another performance. So, we try to keep these metrics and we are trying to adapt it, so that it also improves to generalize more to variety of data. Because the requirements are always changing. As the requirements of the services are changing, based upon that, we also can define some collection of data based on some measures, we will just give some feedback, we will take some feedback based on AB system. We will try one system and then we'll see that if the system is right or wrong, and then we'll try an alternative system and will take the feedback, then we'll try to compare that which to get better performance. And based on that, we also try to adopt the technology. So, there are many internal metrics I think already standard, but I don't know much about that. But that's what I know.

Interviewer: What are the challenges you face while measuring these non-functional requirements for Machine Learning?

Interviewee: Challenge is inherent in many cases. First challenge if the service is actually affecting a very vast majority of people. And trying to understand the requirements, it’s a random process, try to understand the requirements in a meaningful clustered way, like market segmentation. So, it's very challenging also that how we will define all these criteria. It's it becomes a statistical problem. So, it is statistical problem and majority of data, the randomness inside the data, the randomness of the stochastic procedure of this whole scenario of certain software makes it complex that how we will adopt the metric. Some metrics will work for some system component of the system or the segment of customers or some of the metrics will not give much valuable insights of the system for that certain part. So, we have to adopt several different metrics to understand the whole picture. But it's not always easy. Because I think there are many randomness and it's not always structured like the data and the processes are not structured and the process itself is random.