In Conversation With Louis Bouchard

CHAPTERS:

CHAPTER I.
Who Is Jeremy Cohen and What Is His Background?

00:00:00 - 00:00:11

LOUIS:

Then let's jump right into it and I will start with the basic question of basically who are you and what's your background?

00:00:11 - 00:01:09

JEREMY:

So I'm an engineer and I've been working for the last 5 to 6 years on autonomous driving and self-driving cars. And today what I do is to help engineers work in that space, too. So I started in 2017 and I got interested in AI a bit by accident. I was working in Internet of Things and I was in a consulting company. And basically they changed my project to a project related to Artificial Intelligence. And so I thought, Oh, this is an interesting thing, maybe even better than my entire diploma on the Internet of Things and all of that. And so I started learning about it. And at some point, I saw something going on with self-driving cars. And I don't know if you were interested in that back then. But in 2017, that was self-driving cars. We would talk about that everywhere.

And so I set a goal to work as a self-driving car engineer, maybe some like 1 to 2 years after that. And this was something that I had been wanting to do. I was more and more excited the more I learned about it. I saw the potential of, you know, impacting cities, changing lives. And also, I wanted to do something cool with my career and with my life. I didn't want to just,

you know, be in projects that weren't meaningful to me. I just wanted to do this stuff that was super advanced, super exciting, and I could not find that in consulting. Consulting is something that is different. You are given a project and you can't really choose it. You can say yes or no, but you don't really choose what you're going to work on. And sometimes you're going to get invited to join a project and it's totally different from your goals and what you wanted to do. And so what I had been doing was to try and get out of consulting, to join the space. And eventually I managed to do that.

After a year, I was able to become a self-driving car engineer, and suddenly I was building autonomous shuttles in France. So maybe it was luck. I also worked super hard on skills to get it, but maybe a bit of both. And eventually I was working in Computer Vision, building autonomous shuttles, and I've been doing that for a couple of years and some time in computer vision purely. And we can come back to like why I started with computer vision and not self-driving cars, but eventually that's what was going to happen for me. And then some years later I launched Think Autonomous, which is now helping engineers do something similar everywhere around the world: building advanced and relevant skills, learning how to market them; because engineers have difficulties sometimes to market their own skills to sell themselves to pitch. So I also help them with that and then to just get this dream job in the cutting edge space.

CHAPTER II.
How Did JEREMY Become A Self-Driving Car Engineer?

00:03:25 - 00:03:50

LOUIS:

So before getting this dream job that you just mentioned, I just wonder, how did you make this transition from, not a completely different field, but still a very different field, into a new one that was pretty much non-existing or like very, very new. So how did you do that? You did that completely online on your own?

00:03:52 - 00:04:31

JEREMY:

Yeah. So I have an engineering diploma, so it's not like I started from nothing. I knew how to code. I did not know any python, so I had to learn it. And then I took online courses a lot. I took courses. I mostly learned online. And yes, so you start with some basic structure of your skills and then you build additional skills related to the space you want to join. So I was in IOT and then I accidently went into AI, and from AI you can get to computer vision. And so that's what I did.

I joined another consulting company and I was a computer vision engineer. And what I did was building prototypes related to computer vision. So one was that you put some HoloLens from Microsoft and you know, these are like augmented reality glasses. And basically my job was to work with YOLO object detection, and you would just find objects around the place. And when you find an object, you just scan it with the glasses and it tells you the distance, the exact object, and then you can do stuff with the control and you can just buy objects, do some stuff like that. But mainly it did not, it wasn't really useful to anybody. We did not sell that. It was just to have something to show to the clients. But eventually for me, that was something that helped me build skills in computer vision for like a year. And then I was able to continue learning the other skills important to self-driving cars, and then I was able to transition to self-driving cars in the computer vision space.

00:05:39 - 00:06:14

LOUIS:

So you progressively learned required skills to get a job that was closer to the desired job. And so you did that twice, like once to jump into computer vision. and the second time to jump into self-driving cars. So you didn't go right into like, I want to be a self-driving car engineer and just focus on that. You started with not the basics, but something broader, which is computer vision to build a better, maybe a better portfolio to be Hireable.

00:06:14 - 00:07:07

JEREMY:

So it kind of depends on what you want to do and what kind of companies you want to join. In my case, I wanted to be this guy working the artificial intelligence in the autonomous car shuttle, anything. And so I was not going to do that with just my basic experience as an intern in consulting. Well, basically working on chatbots and stuff like that, that could not happen. So I would either stay in the chatbot industry for like two years until eventually I have the skills, and try to apply. Or I would get closer and closer and closer to the objective until maybe someday I either reach it or I'm in a similar position doing something related like

medical imaging, for example. And that would be fine as well. I would have been happy with that as well.

So yeah, you don't just wait until you're ready to, because that's something very a lot of people do. I don't know if you had that feedback, but people are going to wait and wait and wait and then they're going to take another online course and another. And after 20 they say, okay, now I feel legitimate to apply to a position. But why don't you just apply to a position that is easier for you to get and you don't have to take 20 courses, but maybe 1 or 2. And then after that, you use the experience plus the learning to arrive faster to the goal.

00:07:44 - 00:08:00

LOUIS:

Exactly. And the worst case that can happen is that you completely fail the interview. But it's just good practice, to ace the next interview. So it's like there's no downside except taking you a little of your time. So yeah, definitely worth it.

00:08:00 - 00:09:00

JEREMY:

Yeah, I will tell you a story about it. I actually got a self-driving car engineer offer very, very early, something like two months after deciding I wanted to be a self-driving car engineer and that was in France. But the problem is that they offered me 30 K per year. So, that's very low. It depends on the country. But in France, the average salary when you get out of engineering school is more like 40 and was offered 30. And with that, it was like over an hour drive from my house. And they told me basically, well, that's how it is. There are five companies in France, maybe less. If it's not us, you're not going to get this job as a self-driving car engineer. So you either join us at this salary or you just kiss your self-driving car engineer dream goodbye.

And so I said, No, I don't want to work for this salary. I actually got saved.

I was about to say yes. And somebody online said because I was asking questions on forums (a bit like your Discord, it was Slack). And I asked some people and there's some guy that says, hey, I have to give you a call. You cannot do that. You're going to start very low. You're going to stay very low all your career. They won't value you. All of that. Plus, there were lots of other stories with the interview and he said to raise my job. So anyway, I said no. And I said, Well, I'll just go to computer vision. And if that does not happen, that does not happen. And so that's what I did. So yeah, it's okay to make it a long term goal and to advance on your skills anyway.

00:09:47 - 00:10:13

LOUIS:

And that's also one of the reasons that it's good to join a community, especially when you don't have a like.. For you, for example, just like myself, you didn't study in self-driving cars, so you didn't have any contacts in the field, really. So joining an online community is like a great way to create those contacts that you lacked since you didn't study in this field.

00:10:13 - 00:10:54

JEREMY:

Yes and so in my case, I was enrolled in the self-driving car Nanodegree from Udacity. I joined like one of the first cohort when it launched. And what they had back then, it was really good. They had a Slack with all the students, so I myself wanted to do something like that for Think Autonomous for a long time. It's in the works, but the community is very, very hard to design. If you want to make it good, you probably know what I'm talking about. When you want engagement, and you want people to actually like meeting others that can change their life for real. Like it can really happen. Someone can just give you a phone call and hire you.

I was once in an interview and the guy revealed at the end of the interview that he was in the same community and that he actually followed the post I did. And that's how he contacted me via email to get the job. So that's like, he did not admit early. He told me at the very end that a job offer can happen because of that. So yeah, I say communities are very useful. Unfortunately lots of communities, especially on Facebook, are like mostly people sharing blog posts and nobody's commenting. So yeah. We got to do something about this.

00:11:34 - 00:11:53

LOUIS:

Yeah. Yeah. That's why I created the Discord. And, in fact, I can definitely relate just because I found my first real job in the industry through being online. And so, like, a person reached out and he was the CEO and just wanted to hire me just because of the videos and what I did.

00:11:55 - 00:12:00

JEREMY:

Because you were in a community or because you were publishing content on YouTube?

00:12:00 - 00:12:41

LOUIS:

Yeah, this was because of YouTube. But then, thanks to the The Discord community. Well, sorry, just to go back a little, the CEO wanted me to build an AI team at his company. And so thanks to the Discord community, I met with a lot of amazing people and hired three of them through the Discord into this company. And so it was amazing. It's just people that were genuinely helping others in the community and just chatting. And I just like them as a person. And we met and we hired them and I'm no longer there, but it was a good time. It was really fun. And yeah, definitely worthwhile.

00:12:41 - 00:12:42

JEREMY:

The impact is very strong.

00:12:42 - 00:12:44

LOUIS:

Yeah, yeah, definitely.

00:12:44 - 00:12:58

JEREMY:

All it takes is one person to just change your career. And it's true in real life, but in communities you have access to a lot of these people and if the community is engaged enough, this can happen. Quicker than you expect.

00:12:58 - 00:13:04

LOUIS:

Yeah. And by the way, how did you find this first job? Like two months in?

00:13:05 - 00:13:17

JEREMY:

Um. I don't really remember. Probably Indeed. Or something like that.

00:13:18 - 00:13:18

LOUIS:

Okay.

00:13:18 - 00:13:21

JEREMY:

Maybe LinkedIn. Not. Not sure that was LinkedIn.

00:13:21 - 00:13:23

LOUIS:

Okay so a regular recruiter reached out.

00:13:23 - 00:13:24

JEREMY:

Yeah, something like that.

CHAPTER III.
What Is A Self-Driving Car Engineer?

00:13:25 - 00:13:35

LOUIS:

Okay, that makes sense. So before we dive in, um, I probably should ask, what is a self-driving car engineer?

00:13:36 - 00:13:52

JEREMY:

Okay. Sure. So when you are saying the word self-driving car engineer, it's mostly marketing, right? And I use that word a lot. I'm guilty of it. But that's just how it works. That's the world.

00:13:53 - 00:13:54

LOUIS:

Just Like AI.

00:13:54 - 00:14:08

JEREMY:

Just like AI, you cannot be an AI engineer. It doesn't make sense, what are you doing exactly? So I have built something. I don't know if you can see my screen. Can you see this thing? (shows mind map on screen)

00:14:08 - 00:14:10

LOUIS:

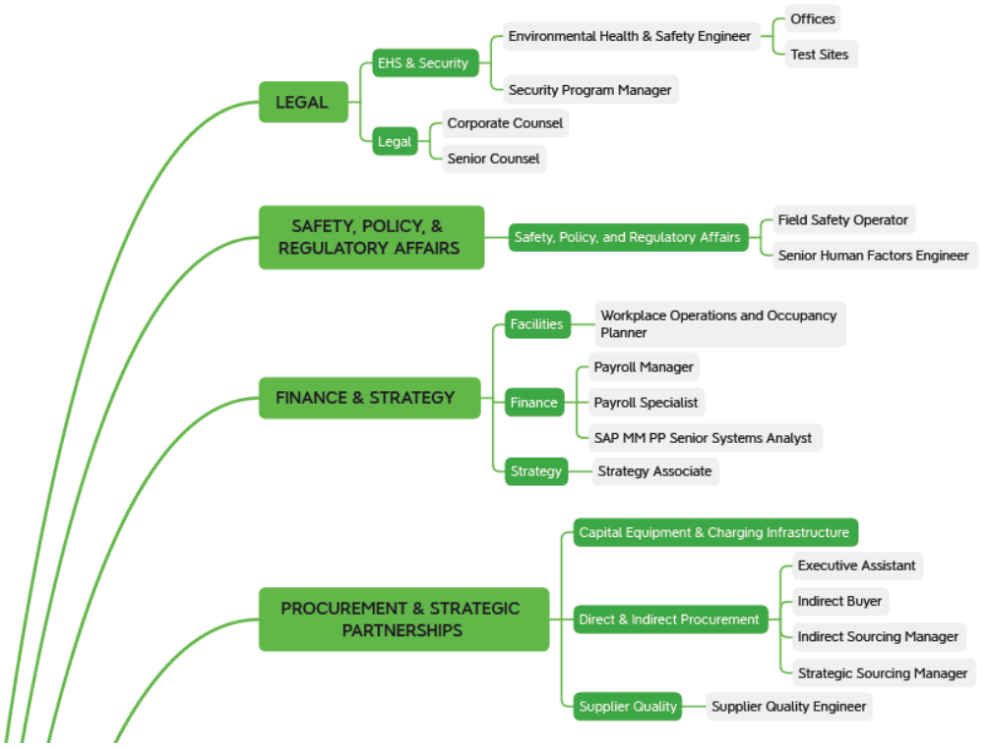
Yeah. I can see it.

00:14:11 - 00:14:52

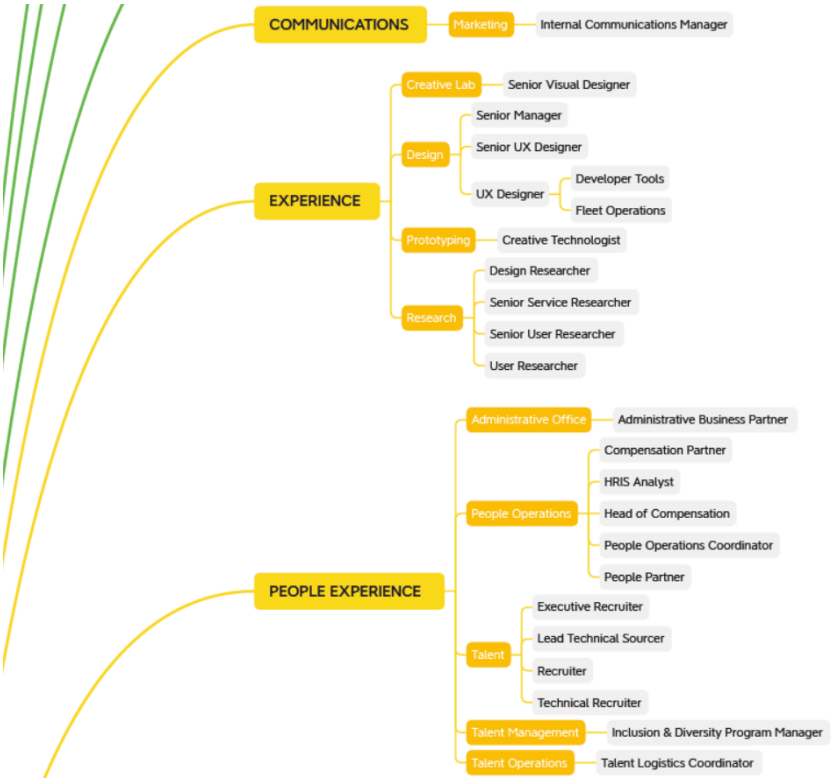
JEREMY:

Last year, I did something with Zoox. Zoox is a company doing autonomous shuttles. And basically what they have been doing last year was that they were hiring over a thousand people to their team. So that's a lot. And so I thought, I'm going to go through the 1426 job offers and I'm going to understand the field better. And so I'm going to spend now a minute showing you all the types of jobs you can have in the self-driving car space. And then you tell me what you think a self-driving car engineer means.

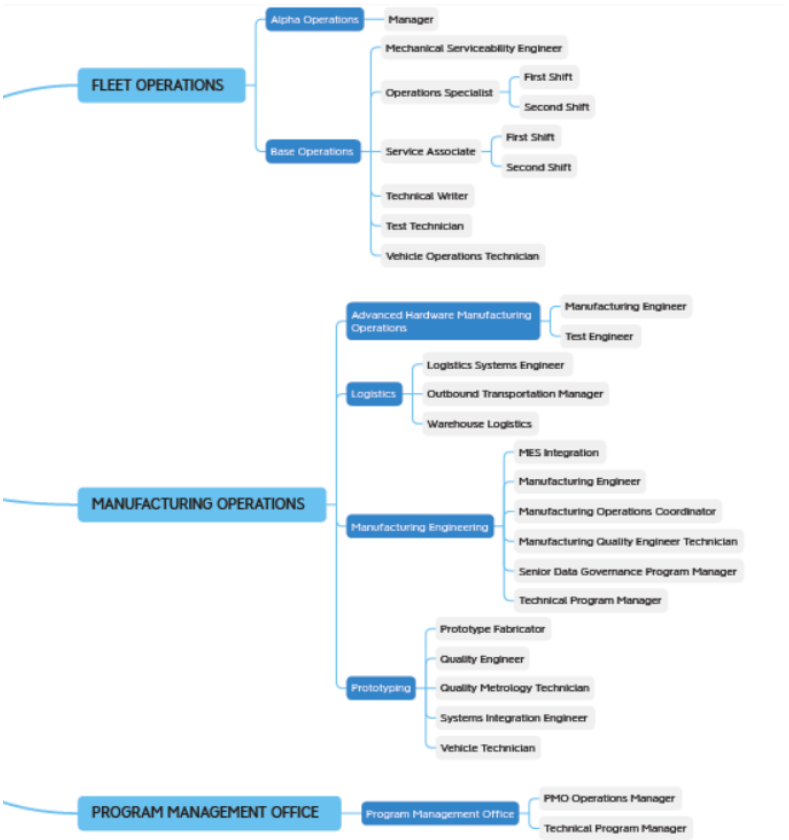
So Zoox, I think you interviewed the director of Perception already. That was a great interview, by the way. Really liked it. And so, that would be in the software team. Now, let me show you. First, we have everything related to the suits, okay? The people with the money, people who are paying, who are investing and stuff. So that's an entire team there. And you can see there are environmental health and safety engineers. We have a workplace Operations payroll manager. We have lots of jobs like that.



Then you have teams related to people. Communications, UX experience, the design of how you get in the shuttle, how you order a shuttle, all of these things like how to build the app, but also everything related to the consumer experience. We also have the people's experience. You know, we have a lead technical sourcer, executive recruiter, and recruiter. People operations coordinator. So that's like suits, people.

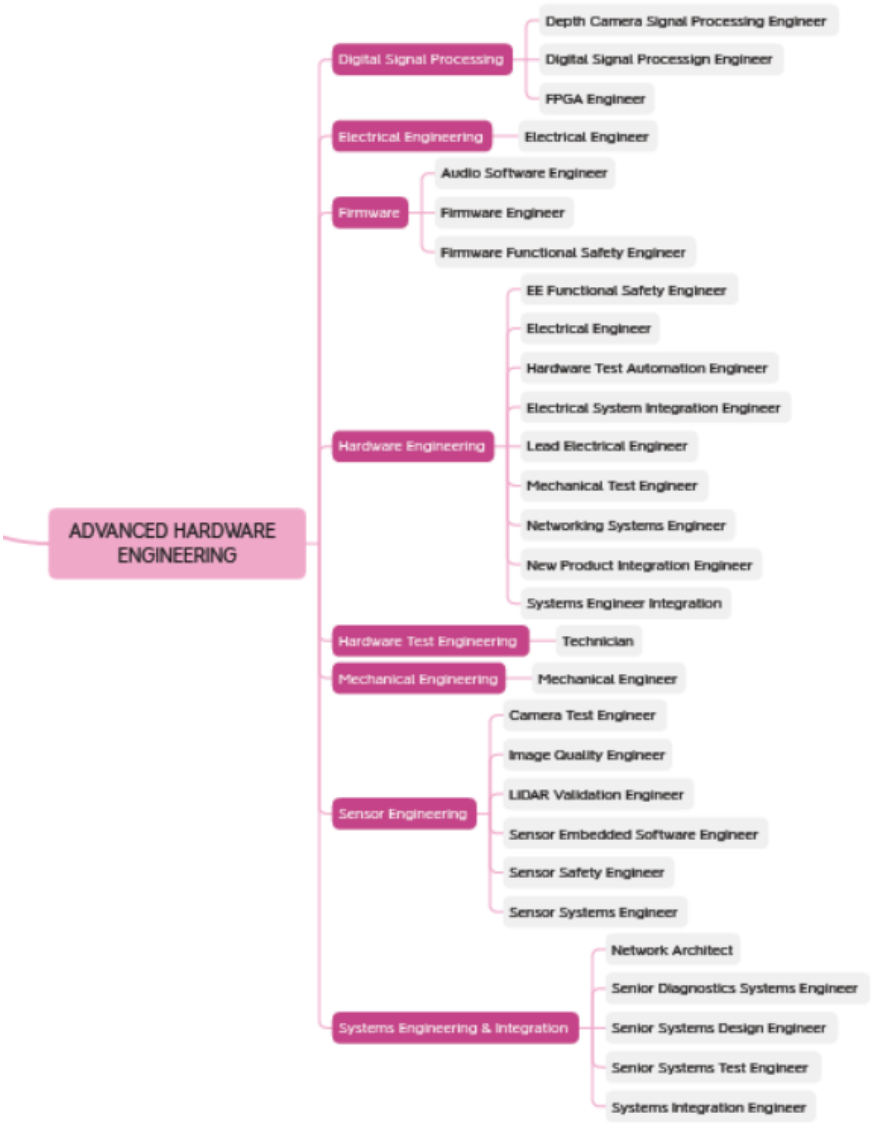


Then if you can continue, we have everything related to the operations. So in a self-driving car, we have lots of day to day operations. You're going to take a Shuttle, you're going to go to the field, you're going to test the algorithms. And so if you have five shuttles and you have ten engineers, how does it happen so that the engineers can spend time on the field but also spend time at the office coding stuff.

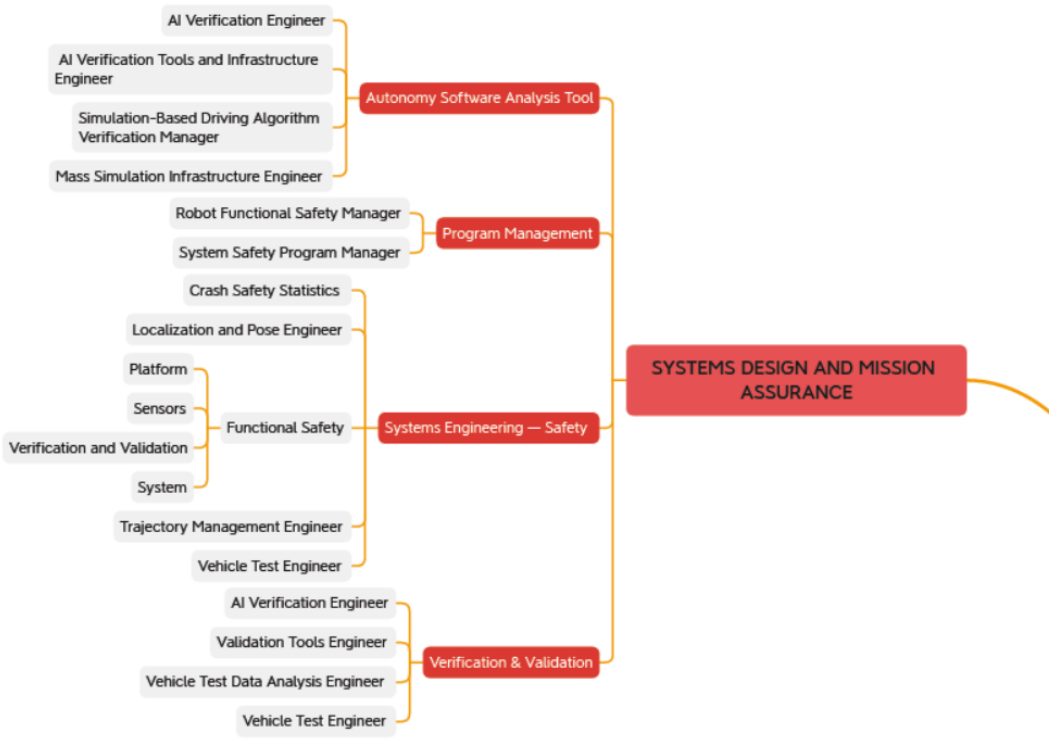


So you want people that like there are logistics, manufacturing, prototyping and even there, there are also questions related to how do we get rights to go and experiment a shuttle in the open? Where can we test it? So all of these jobs are related to Operations. So they are mostly business related roles so far, like everything related to people who've been through business school management and also some engineers.

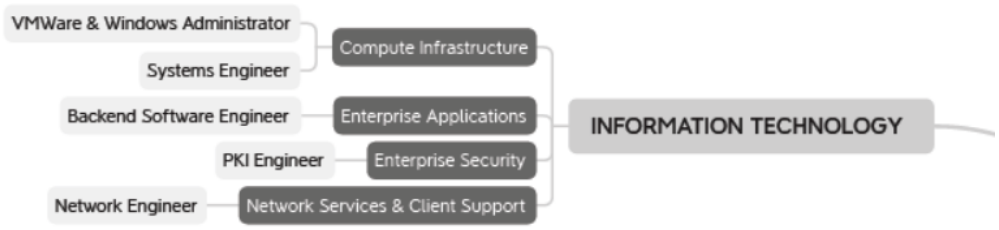
Then there is hardware engineering, so everything related to validation of the hardware, the cameras. Also you know, you have camera testing, image quality, LIDAR validation. So all of that related to building the hardware, but also testing it, making sure it's safe, it's going to work. We have the audio, we have the platform itself, like the car, the wheels, all of that. If the company is manufacturing its own vehicle, that's going to be like 100 people working on that.



Then we have industrial design and then, only then if you go there, we have in red everything related to quality insurance. So the people who are going to build the test, the test operations, like they're going to create a paper and they're going to write all the cases where it's going to fail and where we want the scenario to pass. What's happening if there is a roundabout, and if there is nobody in the roundabout, we must test our algorithms there. And if there are people in the roundabout. And we must test it in several roundabouts and maybe sometimes in just one city, and we're going to go through that city over and over and over again. And so that's a totally different job as well. But that's the job of an engineer, that an engineer can work on. And I have in fact, worked with engineers who were doing that all day.

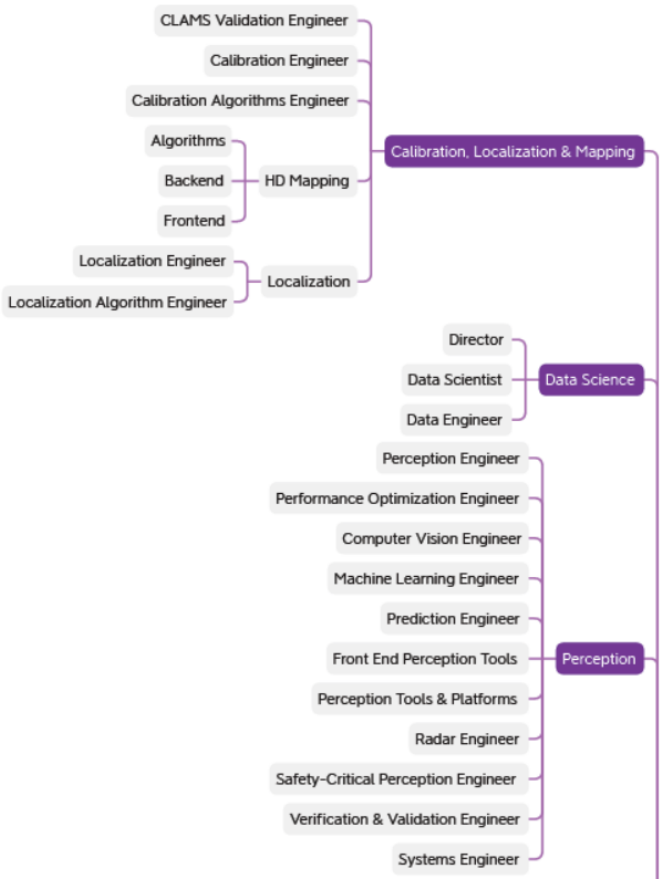


Then you have two other things. You have the IT. So these are the people in some dark rooms that are going to give you your computer when you arrive on the first day and then they're going to take it back.



And then there is everything related to software. And so let me guide you a bit through software. We have localization and mapping. So that's basically building a map of the world, localising your car in it. There is an entire team there, even building maps, collecting data to build a map, all of that. There is data science perception. There is embedded software, hardware. Motion planning and control. Simulation. Collecting the data. Network. V to V. All of that software and machine learning.

Imagine all these jobs. So that is a Self-driving car company who has over a thousand open job positions. And so if you apply for a company doing this, basically you're going to end up in one of these positions. And now that's for big companies like Zoox. And what I teach mainly is related to this thing only: perception and data science.



That's it. That's what I teach around that: perception, LiDAR, radar, computer vision mostly. So all of that. And notice how small it appears compared to all of the possible positions. But then you can also join startups. And in startups there are going to be 5 or 6, maybe 15, maybe 20. In my case, I arrived and we were eight and sometimes I spent 50% of the time under a car trying to fix stuff.

So that's not related to this at all. That's just how it happens in a small company. Everybody is doing everything. You might have a bit of a specialty. In my case, it was perception and computer vision, but you're going to also spend a lot of time driving, testing, doing stuff that are unrelated to the main job but that can help the startup, otherwise it dies. So all of that makes, I guess, the self-driving car engineer position.

CHAPTER IV.
Do You Recommend An Engineering Role In A Big Company, Or Work At A Startup?

00:20:34 - 00:21:26

LOUIS:

Yeah, that definitely makes sense since it's such a challenging problem and yeah, but I wonder since you've just mentioned that you can basically do both: either work at a big company like Zoox or at a startup and do many diverse tasks.

What would you personally recommend if you are, for example, super interested in LIDAR and perception, just understanding the world or like seeing the world? What would you recommend going into, trying to aim? To work in this very specific role at a big company or working at a startup and working on this, but also all the juxtaposed, um, systems? Or does it just depend on the person? Like does he want to. Does the person want to?

00:21:26 - 00:21:31

JEREMY:

I would tend to say this because that's the safe answer. It depends on the person.

00:21:32 - 00:21:32

LOUIS:

Definitely.

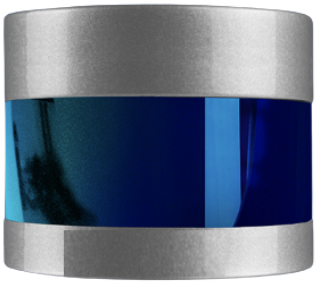
00:21:32 - 00:22:00

JEREMY:

In reality, what happens is some people can't stand to be in big companies. Some people like me, actually. Like I have a hard time if I'm just given a tiny perimeter that even if the perimeter is super fascinating and interesting, I have the type of personality where I'm going to say, Hey, what about the marketing of the company? Can we do something about it? And that's just how I am.

And so I'm going to feel better in startups because they're going to tend to allow me to help them on the other side as well. But some people could not stand the startup life, and that's totally fine as well. And in fact, if you start as a test engineer, you can then change internally. Like you spend some time learning computer vision and then you join the computer vision team. And then you join the LiDAR team because you worked on point clouds. So you can also see all these jobs separately and one after the other. And that's also totally fine.

CHAPTER V.
What Is A LiDAR And How Does It Work?



00:22:41 - 00:22:46

LOUIS:

Could you explain a bit more what LIDAR is and how it works?

00:22:46 - 00:23:36

JEREMY:

LiDAR? Sure. It's a laser that basically is going to... You know what? Just hold on a second because I actually have a LiDAR here. Okay I can show you something better. This is a prototype of a self-driving car. Okay, so this is a small prototype. There are, like, ultrasonic sensors here. And. And there was a camera. I don't know where I put it, but there was a camera. And what you can do is plug a LiDAR to this. And this is a LiDAR. This is a LiDAR that is rotating. And notice here how we have this. That is sending beams. Okay? That is our laser waves.

And they are sent to some object and then they reflect and we measure the time it takes to go to hit the object and to come back to the receiver. Okay, we have two things: emitter and receiver. So it's measuring the time it takes to come back. And once it comes back, it just says, okay, so that's the speed of light. So we have the velocity, we have the time it took, so we can measure the distance. And using that you have tons of points because let's say point, point, point, point, point, you have tons of points and you have what we call a point cloud. And in this point cloud, we have data where each point has three dimensions: X, Y and Z.

And that's basically the main idea of the LiDAR. It's that. You don't really miss detections. You can build some kind of security bubble and you say if there are a bunch of point clouds in front of us, we're going to brake. We're not going to keep operating the shuttle. It's just going to brake. Even if we have an object detector and it missed the object. If there is an object, no matter if we classified it or not, we brake.

00:24:48 - 00:24:59

LOUIS:

Yeah. So let's say that we are in Canada right now and there's a ton of snow there. It may be a problem for a LiDAR.

00:24:59 - 00:25:27

JEREMY:

Yes, exactly. It depends on the type of LiDAR. I'm actually building some content right now on the type of LiDAR that exists. This one is a rotational LiDAR. Okay. Don't know if that's visible, but basically it rotates. And so that's something you mount on top of a car and that generates a 360 view. But today, that's something that costs basically 100 bucks. Okay. It's not a big LiDAR.

A big LiDAR that companies purchase is more expensive. It's like ten, 15, 20 thousand, maybe 50 thousand bucks. And that's Solid state, meaning that it doesn't rotate. It's just going to go in one direction and to generate the points. So based on the type of LiDAR, you can choose to be affected by fog, snow, stuff like that. And today LiDARs are getting better and better. So we can basically try to see through fogs. For example, I've been at the CES this year in Las Vegas and I saw companies promoting LIDAR that could see through fog and that could very well measure the distance of objects, all of that. And I was amazed that this was even possible.

And then I asked a few others and they told me, Well, everybody is doing that now. We can all see through fog. Like Mobileye, they were doing this as well with their FMCW LiDAR because they are using a higher wavelength. And so because of that higher wavelength they can penetrate the stuff better. And so they are not affected by these particles. But if you have some sort of snowstorm, of course that's not going to work.

00:26:43 - 00:26:50

LOUIS:

Will it be complemented with a camera or something to understand that it's snow and it's not real objects.

00:26:51 - 00:27:36

JEREMY:

Yeah. So you're going to have a hard time finding snow with the camera, like saying this point cloud is snow? That's going to be hard. The truth is today, when you see self-driving cars driving, you mostly see them in Phoenix, Arizona, San Francisco, in California. I saw one in Los Angeles during my trip. I saw a Waymo car driving and I saw lots of cars in San Francisco because the weather there is perfect. It's good to experiment. I mean, maybe not San Francisco, but at least Phoenix. This is where like, this is the area number one, I would say. And yeah, probably people are spending most time there and not that much on snow conditions.

But you can go to Europe. In Northern Europe, you're going to see in Sweden or Norway, some companies working basically a lot of time, most of the year on snowy conditions and so there are companies building just based on that problem as well.

CHAPTER VI.
How Far Are We From Self-Driving Cars In Heavy Rain or Snow?

00:28:01 - 00:28:11

LOUIS:

Do you think we are far from having self-driving cars on the roads when there's heavy rain or snow?

00:28:11 - 00:28:12

JEREMY:

Yeah, definitely.

00:28:13 - 00:28:14

LOUIS:

We are definitely far?

00:28:15 - 00:29:03

JEREMY:

I would say. The main problem is already hard to solve and people are realising this now. I was talking about how 2017 was super hype and perfect. 2023 is definitely not the same year. It's a year where there are tech layoffs in general where people do not raise money that easily. And so we should now have self-driving cars. But the fact is, we don't. And so people are saying that this is taking much longer than planned and they are seeing how hard the problem is. So before the end, they go through the snow problem and the storms and all of that. Yeah, that's definitely not the priority I would say.

00:29:03 - 00:29:13

LOUIS:

Yeah, it's definitely the Pareto rule. Like the last bit, it is much more complicated than just having a car following streets.

00:29:13 - 00:29:25

JEREMY:

You can build a team that's going to have a self-driving car that's going to drive around 90% of the problems in something like a few weeks or a few months if the people are really good.

And I even heard like Sebastian Thrun, who's like the godfather of self-driving cars. He once said in an interview something like, In a weekend you can have a self-driving car working. But only working in 90% of the cases. And then the 10%, that's a few years. So that's like just how difficult it suddenly becomes.

00:29:53 - 00:30:17

LOUIS:

Yeah, that definitely makes sense.

CHAPTER VII.
What Do You Think About Using LiDAR vs Cameras In Self-Driving Cars?

LOUIS:

What do you think of the not controversy but debate between Tesla's approach of using only cameras like human eyes versus LIDAR. That seems quite promising since it can see basically better than us through fog. So what do you think of using cameras versus LiDAR or trying to use both?

00:30:17 - 00:30:43

JEREMY:

So that's been a question forever. In the self-driving car field. I even talked to a Tesla engineer in one of my interviews. And his answer, it kind of helped me also understand the problem. What I say is that Tesla is selling cars, so they don't want to sell 100 K cars because nobody's going to buy it.

00:30:43 - 00:30:43

LOUIS:

Yeah.

00:30:43 - 00:32:44

JEREMY:

If they have one, two, three, five LiDARs each costing $15,000, they cannot sell their car to the consumer directly. I have friends who are tempted to purchase Teslas today because they only cost something like 40,000 euro. So yeah, that's something that only cost 40,000 because there is no LiDAR and that's some sort of a high end product. But when you're considering Waymo and Cruise and all the other companies, even Zoox, they are not selling their car, they are selling the service. So what they do is that they charge you $1 per ride or 20. And they can afford to have lots of LiDARs because ultimately after a few years that's going to, you know, get ROI.

But even the LiDAR is something you need to replace every 2 to 3 years. So that's costly as well. Yeah, that's something I was thinking, “really? 2 to 3 years?” And in fact, yes. A lot of LiDARs don't have a really big lifespan. They're going to need repair and all of that, especially if they are driving all day for several years. Yeah, that's not going to work that well. And if you need to replace it every time, I say it's a big investment. So it's smart for Tesla to see the problem differently and say, we don't have the capacity to buy LiDARs for €200 and €500, let's just get rid of them. Otherwise, there is no point in building the company. So that's their approach. Others like Mercedes or Audi, they do differently. They can integrate the LiDAR and sell it. So well, that's another approach they're trying. The car is therefore more expensive. So we'll see.

00:32:45 - 00:32:58

LOUIS:

Yeah, we'll see. I assume the LiDAR is always going to be less expensive, like they are just getting cheaper and cheaper, I assume. Or the technology is getting better and it makes them more expensive? But I assume it will..

00:32:58 - 00:33:33

JEREMY:

It's like if you want a LiDAR from 2017. Yes, it's going to be cheaper today. But because LiDARs evolve so much, now we are talking about FMCW LiDARs. So these are LiDARS that can use the Doppler effect from the radar? So the radar is like the object that gives you a speed ticket, it measures your velocity directly and the LiDAR is integrating this technology to its sensor. So now, it not only measures the X, Y, Z, but also Vx, Vy, and Vz.

So it means that we directly have the velocity. And so, well, the price just doubled. And so now we are getting back to this price, super high end price again and trying to decrease until we then have another type of LiDAR, maybe flash LiDARs. And then suddenly again we have this cost that goes up.

CHAPTER VIII.
Are New State-Of-The-Art Models Actually Being Used In The Self-Driving Car Industry?

00:33:56 - 00:34:34

LOUIS:

So speaking of progress in LiDAR and just technology in general, we've seen, for example, just yesterday or two days ago, we've seen GPT four come out. Well two days ago at the time we are recording this, but a few days, weeks ago GPT four came out, there was also Chat GPT, stable diffusion, dall-e, all those super cool models that everyone is playing with and hearing about. How much of those not hyped but like high end NLP computer vision models are actually used in the self-driving car industry?

00:34:36 - 00:36:21

JEREMY:

Um. Well. It kind of depends on the type of self-driving car company. If you are having a company like Aurora building, you know trucks, or Tesla, they're going to have super advanced algorithms. First they were building CNNs and they were pioneers there. Then they built, for example, for Tesla, they went to build HydraNets. So they are neural networks with several heads. Imagine like we have heads everywhere and each head is solving one task. So you have a head doing object detection, another head doing segmentation, all of that. And the point is you only have one neural network, so you don't have 50 back propagations to train and you can share the encoders because ultimately the encoders are always the same stuff. You know, you have a ResNet or you have something similar. And rather than having 50 ResNet, you have just one and then you change the heads.

So they've been doing that, and then they went to occupancy networks like in 2022, which is something where you have a 3D voxel world where you have, you know, 3D cubes. And the goal of the algorithms is to use attention transformers and everything that is in the GPT networks. They're using that and they're telling whether the cube is occupied or free. And then you don't even have object detection anymore. You just have this thing where you have: is it occupied or is it Free? And then you try to drive only in the free space. So that's the super advanced car companies who have tons of funds and research and all of that.

And on the other hand, you have the companies doing robotics. They're using autonomous technologies, but they are not driving. And if they have some sort of crash, it's going to be okay. Like if a Roomba goes through your sofa, that's fine, you're okay with it, you accept the risk. It's not a big risk. And I would say most of the companies in the robotics space are like that. And even some you know, I was talking to an autonomous golf cart company going at very low speed, something like ten kilometres per hour. That's okay. You know, it's not like 50 or 100. You don't want to hurt anybody. But the risk is much lower.

And in these companies, you don't need to have super advanced algorithms, all of that. In fact, some companies are operating with very traditional algorithms. They don't even use deep learning. They just have a LIDAR. They have traditional algorithms from the 1980s. They have lots of robustification added to it, lots of sensor fusion, and that's it. And if that happens to crash, well, that crashed, that's too bad. But you just take the robot. If this robot crashes, that's fine. Okay. And many companies are working on that. They don't want the problem, but they don't have to invest millions in R&D, R&D and all of that to just get the more advanced algorithms. They can just use algorithms and then just work more on industrialization, marketing, all of these other aspects as well.

00:38:05 - 00:38:09

LOUIS:

Yeah. And they can use these algorithms in marketing and other aspects.

00:38:11 - 00:38:13

JEREMY:

Yeah. Definitely.

CHAPTER IX.
Take A Break!

00:38:14 - 00:38:25

LOUIS:

Awesome. So we can maybe jump into the break, an idea that you've had based on, I believe a French YouTuber or Twitch streamer.

00:38:25 - 00:38:37

JEREMY:

Yeah, so the break in general, I think that's cool for us to have a break and to try to ask each other some questions about the (Self-Driving Car) space and see whether we agree or disagree.

00:38:38 - 00:38:53

LOUIS:

Yeah, perfect. So some kind of debate that we thought about and we think it may be interesting to see our point of view, even if for myself, I am not an expert. I am a PhD student, so my answers may not be completely applicable.

00:38:53 - 00:38:58

JEREMY:

I could very well ask you a question about what you think of PhDs. That's going to be interesting.

00:38:59 - 00:39:23

LOUIS:

Yeah. Yeah, we can. Yeah, we have basically five questions that we pre-selected, but we can add some if we think of more. So maybe, yeah, I can start with one since we are talking about self-driving.

CHAPTER X. (L1)
Is Aiming To Be A Self-Driving Car Engineer Too Specialised?

LOUIS:

Do you think self-driving cars well, do you think aiming to be a self-driving car engineer is aiming to be too specialised?

00:39:24 - 00:40:41

JEREMY:

Okay. Um. I think not. And the reason is: Let's say you spend two years learning the skills related to self-driving cars. You're gonna learn some computer vision, some motion planning, all of that. And let's say you don't find a job. That's your question, right? What if you don't find a job and then you're too specialised and so, “oh no, I cannot do anything”. I only know how to do this and I don't know how to do anything else.

But what's happening is, if you learn Computer Vision for autonomous driving, you can do computer vision for many other things. In fact, I once interviewed for a company who was doing computer vision for shoplifting detection. Unfortunately I did not get the job because that involved a lot of 3D stuff, you know, 3D, deep learning, 3D convolutional neural nets, all of that. But what I did was to learn how to process videos. So you have a video which is just a series of images and you learn how to feed that to a CNN that's going to classify whether the guy is trying to steal something or if he's legit, all of that. So you classify the action. That's something we learn to do in self-driving cars as well.

So if you learn how to do this, you can then work in computer vision startups. I also had partnerships in a hackathon like 3 to 4 years ago related to health care. And we were working with a company doing fracture detection in X rays. That's just image segmentation. Of course you're going to learn that in self-driving cars. And so all of these skills that look super specialised, are actually widely used. If you learn motion planning, that's like 90% of a robotics engineer job doing motion planning. So if it's not a car, then it's going to be a robot. That's fine.

The goal is to get closer to the objective. And the most fundamental goal is not... I think to myself, it's not the car. It's more like you are able to get to work and do something you love and do something that excites you; that you chose, not that someone forced you into and that you actually feel great about and feel proud about. And you chose the problem and you say, I'm going to solve this problem. And that's more than enough.

It's okay if you don't work at Tesla, it's okay if you don't do all of these things. I did not work at Tesla. That's fine. What's interesting is for you to take your current job and say, Is it good enough for me? Is it advanced enough? As an engineer, I always want to learn the most advanced stuff. A bit like you, I love to read research papers. I used to hate it, but now I don't. Now I just love to read them and to just understand the technology, write Technical content about it. That's something that I feel grateful to be able to do in my job. I think that just doing that is far from like... It's way enough, so you don't need to do anything else.

00:42:37 - 00:44:09

LOUIS:

Yeah, I completely agree. And in fact, being too specialised is also something that I feared for the PhD because it's like pretty much exactly the goal of a PhD - to specialise yourself in a very specific topic. And my personal topic is basically brain and spinal cord segmentation for multiple sclerosis. So I was afraid, like, will I be forced to stay in this exact specific field for the rest of my life if I do a PhD and like to stay in healthcare and not...

I love healthcare, that's what I wanted to study on and work on for now. But I don't want to be stuck staying in this and closing any opportunities; until I spoke to many people and realised that, as you said, I'm doing segmentations. I'm using state of the art models, implementing state of the art models, reading state of the art research, and just basically keeping up to date with the most recent computer vision stuff, especially in 3D. And so it's all super relevant to a lot of industries. And I'm just learning like improving my python skills, my, uh, basically machine learning skills. So it's definitely relevant and as you said, as long as you like it and you learn, there's no downside. Like it's just fun and you improve.

00:44:09 - 00:45:32

JEREMY:

If you just happen to be sick of finding multiple sclerosis on images, you can always go a bit larger to the general medical field and then you can change field. The only thing is that every time you want to change fields, you need to learn some more stuff about the field. So I could join the medical field. But I'm not a doctor and I don't know anything about healthcare, so I would just need to spend some time learning it. That's like perfectly fine. But if you learn how to adapt to them, then they're going to learn to take you in their team.

And I would say that the downside is far inferior to the benefit because, what happens if you are a super specialised engineer? Some companies are ready to pay you super high because you are specialised. Take you versus just an engineer who happens to learn about segmentation. What's the difference for a healthcare company if they have you who knows a lot about Healthcare and a lot about image segmentation and even apply that in very specific problems. So you understand the challenges, all of that versus someone who tried lots of things and segmentation happens to be a part of these things. You know, that's totally different. Specialised specialists are paid much more and they are desired much more.

00:45:32 - 00:45:33

LOUIS:

Yeah.

CHAPTER XI. (J1)
Do You Think Transformers Are Replacing CNNs?

00:45:34 - 00:46:04

JEREMY:

Okay, my turn. Um. You talk a lot about Transformers, right? And you do study a lot of research papers. And you've been through, like, following the evolution of the field. And my question to you is, do you think: (1) do you think Transformers are replacing CNNs. And if yes, (2) do you think it's an urge for engineers to just go and learn transformers as quickly as they should?

00:46:08 - 00:47:27

LOUIS:

I have two answers to that question. First, I think that they are not replacing CNN's for everything. It may be biassed, because I've done my whole master's degree on CNNs, and now I'm still also working with CNN's. So the recent state of the art in medical imaging is still UNet... so like that's pretty old and well it's modified UNet but still like UNet. It is very powerful and super efficient, and I think when you don't have as much data as you want and as much compute as you want, there's a place for CNN. I think there is a place for both. But I agree that on YouTube, I mainly talk about Transformers. And that's because it's recent in every field and they are being applied to different tasks in which they were not applied before, and they also are becoming much more compute-friendly. So maybe? Maybe it's the future, but I couldn't say... Maybe CNN's will just improve as well. And yeah, I think there's a place for both. Definitely right now there's a place for both.

00:47:27 - 00:47:39

JEREMY:

And when you're looking at Yolo v8, I don't think there are Transformers in it. I haven't really been through the paper, but I think it's mostly convolutions, and that's the state of the art.

00:47:39 - 00:47:50

LOUIS:

Yeah, I haven't seen the recent papers. It's crazy that they are at YOLO V8. But I haven't seen it. Is it the most recent one for YOLO?

00:47:50 - 00:47:51

JEREMY:

Yes. Yes.

00:47:51 - 00:48:07

LOUIS:

OK, for anyone listening that is not familiar, YOLO is, I believe, You Only Look Once, and it has been a state of the art detection algorithm for well, since the first YOLO version. I don't know when?

00:48:09 - 00:48:22

JEREMY:

Yeah. 2015 or something like that. We had two stage detectors back then and then we moved to one stage. And so YOLO is the perfect trade off between speed and accuracy usually.

CHAPTER XII. (L2)
Do You Think A $200,000 Salary For A Computer Vision Engineer Is A Myth?

00:48:24 - 00:48:39

LOUIS:

Yeah, perfect. So the third question, since we already spoke about salary and speciality paying more, do you think $200,000 computer vision engineer salary is a myth or is it real?

00:48:40 - 00:48:56

JEREMY:

Um. For most people, it's a myth. And. For me it has been as well. I have been hired. I had a job offer at 30 K. Okay.

00:48:56 - 00:48:57

LOUIS:

Yeah.

00:48:57 - 00:49:20

JEREMY:

In self-driving car space. That's something most people don't even imagine is possible. But in reality, that's what a lot of people who try to get into the self-driving car space, they're going to get normal job offers with normal salaries, especially when they're starting their careers. They're going to go like, okay, so the average salary for someone who gets out of school is 40k.

We give you 40k. And maybe if you're a bit better, we give you 41k. But that's it. And when you're looking at salaries. And I also sometimes promote and show job offers to people because they are salaries that are incredibly high and in many cases, well, it happens that these salaries.. They do exist but it depends on the country. It depends on the specific moment. If you've been a solidity engineer working on blockchain and all of that in 2017, that wasn't paying much. And then suddenly in 2021, 2022, it became a hype. And so we've seen articles talking about solidity engineers making way over 100 K per year.

And that's probably true, like I assume that's true. But there are countries like the United States where it very much depends on where the industry is currently at, and where there is the most need right now. But generally try to have something steady and a bit slow at first. Be okay with making the same salary at first, as long as it's not an insult or something, that's going to be fine. And then of course, you learn to build more specialised skills, more advanced skills. These are the things I teach, like how to build super advanced skills. People who come to me, they usually come to me with Basic AI and computer vision skills. So I don't teach them the beginner stuff.

I don't teach them how to build an image classification algorithm. I assume that most people that come to me, they already know that and so I'm here to take them to the most advanced part. Like how do you build a HydraNet? How do you build a transformer network for image segmentation? How do you build a 3D reconstruction system with several cameras? These

are the types of stuff I teach, and I believe that these skills are specialised and advanced and are in need by companies not just today, but they are in need in general. And so, yes, they're going to pay better. Maybe not 200, maybe a hundred, but that's going to be any way better than the salary you'd get if you don't - if you just stay with the basic skills.

00:51:45 - 00:51:53

LOUIS:

Yeah, but so you would say that it's mainly because of hype if you get a very high salary.

00:51:54 - 00:52:49

JEREMY:

Hype helps. Then there is obviously your skills. The more specialised you are, the more you risk having a very high salary. And it also depends on the network. There are so many factors to a salary. Just the fact that you can brand yourself better can change a thousand dollars on your salary. It really can. I've seen people changing salaries with one negotiation.

You know, people will spend a lot of time cutting back on some $3 or $5 fees. They're going to cancel their Netflix subscription. They're going to do stuff like that. And ultimately, at the end of the month, maybe they will save 40 or 50 bucks, but they won't spend time learning how to make a $5,000 raise on their salary. You know, even with the Free tips, all of that, they won't do that. They prefer to cut back rather than to make more.

And I believe it's a better option to learn and try to make more because in a negotiation I was once offered 55 and I said, hey, no, I want 60. And they told me, okay, we can do that. And that was it. I was shocked. I was like, Really? You're not going to fight? You're not going to tell me it's not possible. And they said, No, No, we want you there. That's it. So, you know that can happen. That exists. People don't think it's possible, but in reality, I think it is if you practise it a lot.

I'm telling you the nice stories, but I also had a lot of time where I'm telling them a salary and the people are like, get out of here. You know, like this guy from the Slack I talked about, I asked him for 60 and it was the first job I ever did. I asked for $60,000 per year when the Average Output was like 40. And so he told me, “Get out of here.” Like, “we don't want that here. We're working with serious people”, so sometimes it's not going to work, but sometimes it will.

00:53:54 - 00:53:54

JEREMY:

Yeah.

00:53:54 - 00:54:34

LOUIS:

But anyways, if you are asking just a little bit more, you do not risking getting the “get the * out” sentence. Like they basically will (give it to you) if they want you. Well, if they are at the point of asking you how much do you want, it's because they want you most certainly. And so to me, well the worst I've seen is that they will say, oh, we cannot do that, but we can

instead add one week of vacation or just do a bit lower; like they will try to negotiate. It's not like you ask for 60,000 and or else it's no job.

00:54:34 - 00:54:37

JEREMY:

Have you read the book “Never split the difference”?

00:54:37 - 00:54:38

LOUIS:

Yeah.

00:54:38 - 00:54:51

JEREMY:

So basically you can see how much we can use leverage and change the way the negotiation works with that. When you learn to negotiate, you can do that. Yes.

00:54:51 - 00:54:58

LOUIS:

Yeah, it's definitely worth it. For anyone listening, it’s “never split the difference”. I don't remember the name of the author,

00:54:58 - 00:54:58

JEREMY:

Chris Voss.

00:55:00 - 00:55:03

LOUIS:

Perfect. So you should read that if you haven't.

00:55:04 - 00:55:08

JEREMY:

Yeah. From, like an FBI negotiator. Yeah. I really love that. I think everybody loves it.

00:55:08 - 00:55:08

LOUIS:

Yeah, super interesting.

00:55:08 - 00:55:10

JEREMY:

Impossible not to like it.

00:55:10 - 00:55:25

LOUIS:

Yeah, yeah I agree it's like crazy stories and just really useful tips. In the end, I've always lived like I don't really want to argue and negotiate. I just like to let it be and I'm a bit more calm.

00:55:25 - 00:55:28

JEREMY:

But people are going to take advantage of you.

00:55:28 - 00:55:30

LOUIS:

Yeah. yeah exactly.

00:55:30 - 00:55:42

JEREMY:

And it decreases your value as well. Because if you accept everything, then people are going to think that you're not worth that much after all. And so that's just not going to be good for either part.

00:55:42 - 00:56:12

LOUIS:

Yeah, I agree. And the book is also just great in general to express yourself better and like even if in a relationship or in your job, like how to better phrase what you want and what you need without hurting others or like not manipulating. Well, a bit, but just like improving your relationships. Basically, it's just a really good book and super useful. Um, was it my turn?

CHAPTER XIII. (J2)
What Do You Think Of The Value Of A Certificate For An Online Course?

00:56:13 - 00:56:53

JEREMY:

Okay, my turn. Um, my take on online courses. I sell online courses for living. That's what I do, I sell online courses. But I never sell online course certificates because for one, most companies around the world don't know me and they don't care if you've been through a Think Autonomous course. And two, most companies around the world don't really care anymore if you've been through course certificates, especially after COVID. Because now everybody has a course certificate and I think it's worthless. Like I think you should not even show it. You can even damage your brain. What do you think of that?

00:56:54 - 00:58:04

LOUIS:

(laughter) Um, we are also building courses at TowardsAI, so I'm kind of doing that for a living as well. So it's a.. We are a bit biassed. But I.. we also don't have certifications. I don't know. I'm a bit two sided on that as well. I think it's useless as well for most people. I don't really care if someone has a (I don't know) Coursera certification or Udemy or something like this. But is it worthwhile if you have a Google certification, especially for example, if you want to work at Google and you've done some courses? I don't even know if Google has courses, that may not be a good example. Okay, NVIDIAhas some courses, so if you want to work at NVIDIA, do you think it is worth having NVIDIA certifications and showing that you've done their courses? And before you answer, it's basically because in an interview I did a few weeks ago, someone said that certifications may be useful just because it's a very easy way to showcase and prove that you learned something.

00:58:05 - 00:58:30

JEREMY:

So about NVIDIA. If you want to go to NVIDIA and they have stuff where they sell certificates or this is free or whatever. Yes. In this case you want to show you are invested in the company and that you already handle the skills that they are looking for. Maybe it can be a good thing. In general, I recommend showing what you did with portfolio projects.

00:58:30 - 00:58:31

LOUIS:

Yup.

00:58:31 - 00:59:45

JEREMY:

So. That's something I've been teaching a lot. And every one of my courses has at the end a portfolio project. So for example, rather than saying I have a course certificate from an online course and I have been building a self-driving car, why don't you just come to the interview with that and, you know, connect the smartphone and then you say, Hey, let's see how it drives. And that just tells the whole story. Of course, it's much harder to do, but that tells a much better story. What recruiters want is a story. They want to see you doing this, and then they are going to be amazed that, like, did you see what this guy just did? And then they're

going to remember that and they're going to tell the story to others. And that's much better. And in fact, in one of my interviews with an engineer from my courses who got a job as an autonomous tractor engineer, he actually showed me the robot and said, “Yeah, this is how I got the job. I brought the robot. It barely worked. But they were so amazed by the investment I made in myself, in the energy to build it and all of that, that it just spoke for itself. I did not need to show anything else.”

00:59:45 - 00:59:55

LOUIS:

Yeah, it directly showcases your passion and how you are willing to work a bit more than others just because you love it.

00:59:55 - 01:00:24

JEREMY:

Yeah. And that's also visual proof.. That's demonstration plus visual proof. So doing a demonstration is always something you want to do. Like if I had an interview tomorrow, I would just build a set of projects I did, bring an iPad and just show the different videos one after the other and say, Hey, I've built this, I've built this, I've built this. And then I let the other ask me questions because this way I lead the interview, I show.

01:00:24 - 01:00:24

LOUIS:

Exactly.

01:00:25 - 01:00:41

JEREMY:

And they ask me stuff about what I did. So I'm in charge of how the interview is going to go versus just talking randomly about a course and then they can just ask me whatever question they want. And now I have to be in their space. You know, that's very different.

01:00:42 - 01:01:46

LOUIS:

Yeah, I've done many interviews because we had to do three internships in my engineering degree and during the first summer I spent the summer creating a very bad, uh, mobile app game. It was like a social game. I did that on iPhone, iOS, and Android. And then for all subsequent interviews, I always just.. Like the interviewer would start seeing my project section, and just like they've either installed the app or talked about this, and then the whole 30 minutes just talking about the app and how I built it and why. Like just talking about the app, even though the internship wasn't related at all to like swift coding or whatever I did to, to build the app. We just spoke about this and then they wanted me, just because they saw I did something other than just going to my courses and through university.

01:01:46 - 01:02:42

JEREMY:

They don't want to hear you recite your resume in real person, you know that that's not what they want. They already saw your resume. They already know your skills. That's why you're

here. What they want is to hear your story and this is not some bullshit sentence I'm giving. Like, share your story, all of that. You can actually really take storytelling courses and learn how to tell a better story. You can actually... I read a book called Story that teaches how to write a screenplay for Hollywood. I'm never, I'm probably never going to use that, but I learned how to build characters, how to, you know, make transitions of characters, all of that. And ultimately that's better than when you're talking about your story.

When they tell me, tell me about yourself, what do they want to hear? Do they want to hear something like... “Okay, so first I started there. And then I went there.” No, they want a story with drama. With all of that. They want to ask you questions about, oh my God, and what did you do? You know, that's what they are looking for. And so when you're doing this, they get to feel that they can be part of your story and they can participate in it and all of that. But when you're just reciting the facts, that's cold. That's not really nice to them. That's like they have to do this interview and that's it. And when you are sharing a story. Ultimately, the entire thing is better. They love it. They remember it, they own it. They can then retell it to others. So that's what you should do. Definitely.

CHAPTER XIV. (L3)
Is Silicon Valley The Only Place Where You Can Work As A Self-Driving Car Engineer?

01:03:23 - 01:03:51

LOUIS:

Yeah, I completely, completely agree. Okay, So let's dive into the last question slash debate that we can have. That is maybe the last blocker that someone may have if he wants to go into self driving. And it's about the location. So, is Silicon Valley the only place where you can work as a self-driving car engineer you think?

01:03:53 - 01:04:19

JEREMY:

Well, I have been able to work in France, so yeah, no. But I have lots of people coming to me with questions about India, for example. And because in the US you can always find a company nearby and somehow people in the US are okay to travel and change their life completely because of a job. In France, we don't have that culture pretty much.

But in the US that's a thing. And in India that's another problem because we have more engineers than companies or even capabilities to recruit and all of that. And so the engineers are like, Should we go to the US, try and get a green card and do all of that, or can we just stay home and try to find self-driving car companies? And the answer I think after talking to lots of engineers from India and I'm saying India, but that can be lots of other countries where there are not a lot of self-driving car companies.

I have seen people in my audience, in my Courses being hired in India as self-driving car engineers. That happens. That's possible. They did it. I saw it with my eyes. These people are alive. They exist. So there are. And they are more than you can imagine.

And then there are other people who just go the other route and then they just travel to Germany, to Europe, to the US. And that works as well for them. Because if they go to Germany, they're going to easily find a job, especially if they are Indians, because everybody wants to hire them. And so that's much easier for them. And worst case scenario, they really want to stay home. Either they find one of these companies or they go to Plan B. Which is a related job in the robotics space, in the computer vision space. And that's also fantastic. Come on. That's also a great job. You can have a lot of impact and then you can change when the field evolves a bit. You know, that's how I see it.

01:05:58 - 01:06:05

LOUIS:

And as you said, you may as well work on the exact same problem, even if it's a completely different Industry.

01:06:05 - 01:06:22

JEREMY:

Definitely, that may be the exact same problem. And then it's your job to market it to yourself as if it was as exciting. But it's a certain case. It can be more exciting. Like if you work on finding cancers in images, that can be more exciting than building cars actually, you know?

01:06:23 - 01:06:49

LOUIS:

Yeah, it really depends on how you see it. So perfect. So we hope you enjoyed this. Like try to maybe debunk some thoughts or just let us know what you think of all those. I think we had five different questions. First, if one of you is actually paid more than $200,000, let us know. We may be interested. So anyways.

01:06:49 - 01:07:00

JEREMY:

150k, all of these salaries. Maybe not 100k because 100k is becoming more and more common, but 150k, 200k. That's a high end salary I say. Yeah.

01:07:00 - 01:07:25

LOUIS:

Yeah, I think so too. Well, I'm far from that at the PhD, but from what I've heard, I think yeah. It will happen. Yeah, I hope so. But yeah, from what I've seen, $100,000 is not the norm. But it's not especially high in data science, I assume.

01:07:25 - 01:07:41

JEREMY:

In the US, it is no longer something crazy. In France, of course, it's like we're still like... But you can have people earning more and more like 80, 90 after like five, six years. That's going to happen eventually.

01:07:41 - 01:08:07

LOUIS:

Yeah, I think it's the same here in Montreal. Like it's getting higher, but it's much lower than the US. So I assume a good option may be to work remotely for the US if you can, if you are aiming for a better salary. That's good. That's ideal. So yeah, we can maybe come back a bit to the self-driving car engineering world. And more precisely, we haven't really...

CHAPTER XV. (J3)
Do You Need A Masters Or PhD To Be A Self-Driving Car Engineer?

01:08:07 - 01:08:39

LOUIS:

We talked about your story, but we haven't delved into what should be a typical or an ideal resume that is required to get into the field. For example, would you recommend going to the university or taking an online course? Would you recommend going for a master's or PhD? Like what's the education level and, else, other work needed?

01:08:42 - 01:09:54

JEREMY:

I would say... Don't do anything under master's degree for the self-driving car space. And of course, companies are going to say that I'm full of sh*t because they hire just everybody and anybody and all of that. But I think, in my experience actually! Most people have a Master's Degree, like 80% of them. Then the rest are PhDs. I once had an interview... The interview went well. I'm going to the building. I'm talking to them about technical stuff that I want to do, and what I want to do in my life in general. You know, I'm sharing my story, all of that. And the recruiter, after two hours of interview, he says, okay, we love your profile. I want to hire you, we agree on the salary. Basically, it wasn't a crazy salary. We agree on it, we're fine! Now there is just one problem. And we told you we don't need PhDs. We said it on the paper, we told you that. But the reality is that if you don't do a PhD, you're going to eventually have a ceiling inside the company.

01:09:54 - 01:09:54

LOUIS:

Hmm...

01:09:54 - 01:10:28

JEREMY:

So I was like: "Okay, you just said I did not need to do it and you are ready to hire me. So now I have to go do a PhD?". And they said: "No, we can finance it! And we have you working in the company, and you are doing your PhD in parallel, and we help you with that. We cover everything, the expenses, the conferences, everything. We pay for it. But you need to do the PhD. Otherwise, well, you're not going to evolve. And we're not sure we want to hire someone who doesn't want to evolve..."

01:10:30 - 01:10:30

LOUIS:

Oh Wow

01:10:31 - 01:11:56

JEREMY:

Okay, so it's kind of mandatory, right? Because I'm not going to promote myself as someone who doesn't want to evolve, and of course I'm not going to change the entire company's

policy, so ultimately I said no because I did not want to go through the PhD route. But in lots of cases, you can have companies preaching that they don't need a master's degree, they don't need a PhD. The truth is, lots of companies still do. And the other truth is most companies don't find enough PhDs, and so what they hire is a master's Degree at 80%. Okay? I've been at a company and we had 80% Master's degree, then a few PhDs, and usually you have the PhDs leading on some technical aspects and you have the master's degree being able to go faster to the management roles. So you sometimes have a master's degree giving orders to PhDs. Or you can have PhDs being team Lead and that can happen as well. But the problem is that a PhD is going to sometimes get inside a bubble and not be able to, you know, talk to people, vulgarise some stuff, do some marketing, and that can also do some damage.

So about the resume, I say try to have advanced skills. Don't worry too much about the diploma. If you have a diploma, you have a Master's Degree, focus more on sharing a story, giving some projects. Your resume doesn't have to be just a one page technical thing with all your work, it can be one page, it should be one page. But you can put links there. Okay. People are going to click. They know how to click links. They're going to click. They're going to end up on your GitHub website. They're going to see videos and all the work done at this moment, not when they are reading stuff and you're trying to emphasise some stuff in bold. You know, you can actually do all of that. I have done that, and that works very well.

01:12:45 - 01:13:01

LOUIS:

So you would advertise to share something online, like when you are creating a project. Try to work on a project that can be pushed online or like at least in the form of a video or blog post or something that they can see by, as you said, clicking links?

01:13:01 - 01:13:35

JEREMY:

Things can change. But in my case, I always had job offers because... sometimes they saw a blog post and they said: "Hey, we want to talk to you about joining us." And now they are selling you the idea of coming and you don't have to pitch them. They are coming to you, and that happens. And yeah, and sometimes, just because of that one blog post that they really needed at that moment, that's going to work. You know, they're going to negotiate more easily with you. That's going to get better.

01:13:36 - 01:13:44

LOUIS:

So having such projects would be more important than getting more education, you think?

01:13:44 - 01:14:09

JEREMY:

Yes, definitely. The ability to solve projects... that shows everything. Sometimes they're going to say: "Hey, you don't have the PhD or the Master's Degree, but you know, we still love your profile." So, that happens more often than you think. Sometimes you don't have most of the qualifications, but they still love you anyway.

So I once had an interview. I know I said that a lot, but I had like 50 interviews, so now I have stories to tell. I went to an interview. I failed a technical test, and they said they wanted to hire me anyway because of the profile and the work that I've done with my… I had a nonprofit community on artificial intelligence back then. All of that, they said: "Yeah, you know, that's okay for the test. We're going to change the number or whatever. We're going to still make you pass through the second phase.".

So that can happen if you have a great story and if you can pitch people. These are not robots. These are people. So they have emotions. They react like they can like you, even if you're not good, you know?

LOUIS:

Yeah, yeah, definitely. It's also a lot of, uh, personality fit, so definitely.

CHAPTER XVI.
How Can Someone Improve Their Skills?

01:14:52 - 01:15:27

LOUIS:

And what would you recommend to improve your career? Or like I assume it's by building projects, but what would you recommend to someone who has done studies (or has learned like either online courses or studies) and then wants to improve their skills or work on products progress and or just progress? Like what would you recommend them to do? How to get started in learning more and doing something.

01:15:27 - 01:16:11

JEREMY:

Definitely, if you already have some basic skills and you're interested in a self-driving car space, I have Think Autonomous. So what I do, basically you have a free (I hate to call it that, but that's how it is) newsletter. I have a free email list with private emails. I prefer to market it this way, but that's really what it is. These are emails that I would never share on LinkedIn or anywhere else. You know, people would just react negatively to it. It's anti-corporate, there's a lot of stuff going on, but these emails, for some people, actually change lives for real. Like some people answered me, You know, I've used this tip in your email from last week and I got the job. You can start there.

I have a newsletter, free daily emails on self-driving cars, and I'm spending sometimes three hours per day on it. Most of the time it's like one hour. So I'm investing a lot of time in them for you and they are free. I don't expect you to do anything in return. You can just stay for three years and read them. Then of course I'm going to sell you some of my advanced courses as well. I have a lot of courses. I have a course that is worth $20 and it's a roadmap to the self-driving car engineer world. And this course, some people told me like, I invested the $20 and really I don't know what I have been doing for a year, an entire year, just going around through Coursera and through all of these and just going back and forth and not finding anything clear. And that is clear. That is concrete. You know, there is the mind map. It explains exactly what you should do based on where you are right now. Like that is something you should do.

And then you go to build advanced skills, have courses on everything, have 3D computer vision, 3D deep learning on LiDAR point clouds. I have tons of courses and yeah, definitely. That's for me, that's the solution I would have wanted to have. And that's the solution I'm building and I'm spending all my time and money on it because I highly believe that it's going to make a lot of engineers' lives much better.

CHAPTER XVII.
Is There A Transformer Course For Computer Vision Engineers?

01:17:39 - 01:17:57

LOUIS:

Yeah, it's really cool. And I've seen your website and also related to what we talked about ChatGPT and the prevalence of Transformers. Do you have something for Transformers, for example, a course on Transformers for computer vision engineers or something like that?

01:17:57 - 01:18:37

JEREMY:

Yes. So what I have, it's not. Currently, because that can change, but currently it's not a course. It's a DLC. So a DLC is an idea I took from the video game industry. Basically you have the main video game. Okay, so I'm an Assassin's Creed guy. So you purchase Assassin's Creed and you play in ancient Greece or something. And when you're done, they are telling you that for $15 you can have another chapter, a bonus chapter. And so I did this with Think Autonomous because in the case of transformer networks, it requires lots of prerequisites. Right? It's not something anybody can learn just like that.

So if you go through my segmentation course, it's going to teach you everything about the modern deep learning architectures for segmentation. So segmentation is the use case, but mainly it's a modern, deep learning course where you learn about CNNs encoder decoders, and lots of blocks in the CNN space. You know, the deep learning blocks like residual blocks, all of these other blocks, you have tons of blocks. And when you're done with this and when you can build the most advanced CNN project, then you go to Transformers with my course (DLC) on SegFormers. And this is a course that is only open to those who have these skills. So, whoever has been through the course or who can solve a challenge. And if it's your case, then you can learn about SegFormers. And yes, that's advanced, we learn about attention. And you know what? It's the only course.

I built this course because when I was trying to learn about Transformers, I could not learn about them. Any blog post, any video, anything, it was oriented to natural language processing. So all the examples, all of that, that just NLP everywhere, they show you strings of characters and how the transformers do translations, all of that. And it was just not working with my brain because I'm a computer vision guy. So I want to see images. I want to see how the networks learn with the filters. I want to see things. And I was not finding it anywhere.

So I built a course of transformer networks for computer vision engineers. And so what we learn is attention and we visualise attention maps, we visualise query keys and values in real life. When it's training, when it's running, we see these maps and we see, okay, if we multiply this patch by this patch, it's going to be “a tree times a road”. And so all the trees and the road are suddenly going to have their attention lighted. And we really see that and we understand it very well. Because of this, it's probably one of the courses I'm the most proud of. So yeah.

01:20:46 - 01:21:30

LOUIS:

Yeah, that must be an awesome way to also get your foot in the self-driving door just because as you mentioned, you need to have a computer vision background or like yeah basic skills at least. And then you can dive into your Think Autonomous for more advanced resources. And so that's definitely a great way to get into the field.

CHAPTER XVIII.
Tips For Joining The Self-Driving Field?

LOUIS:

Would you have any other tips or mistakes to avoid when trying to join this field or maybe generalise to any new field in AI? But. Either specifically to self-driving or new fields. Any tips or mistakes to avoid?

01:21:31 - 01:22:22

JEREMY:

So. Something to do is to definitely keep up with the field. How the field is moving, If suddenly everybody's talking about Transformers. Well, I know it's hard to learn about them. I spent like it started in 2017. I was like, "yeah no, I don't want to learn this." And then the next year, same thing. And then postpone and postpone and postpone. And at some point I could not postpone anymore because, look at Chat Gpt and all of these things. They're just transformers. And we could not do that with CNN's. So if you see something like that happening. Um yeah don't don't try to miss that train because maybe all the best jobs are going to be about it.

It doesn't mean you won't have jobs because 99% of companies are still working on CNN's. But transitions happen and people are sometimes looking for some skills. And it impresses a lot of companies when you can do some stuff like that, they really love it. So that's something that they will want to see as well.

CHAPTER XIX.
Any Mistakes to Avoid?

01:22:43 - 01:22:51

LOUIS:

Any mistakes to avoid when trying to join a new field like self driving, that you can think of?

01:22:53 - 01:22:56

JEREMY:

That's difficult. There are lots of mistakes you can make.

01:22:58 - 01:23:01

LOUIS:

What's the biggest mistake you've made if you remember?

01:23:06 - 01:24:06

JEREMY:

Um, I would say. Technically speaking, it's important to also not neglect too much of the other stuff. So for example. I'm horrible at everything mechanical. So, I built this robot, but it was written something like 1 or 2 hours on the box and it took me like 50 hours. Okay, So that's how bad I am at this. And when you're working in a self-driving car startup, they sometimes expect you to change a tire or something and I cannot do that as well. So what I'm trying to say is that. There are lots of other skills that maybe don't get enough promotion, but that should be considered that as well.

Being a great developer, learning how to solve problems, you know, anything related to Bazel, to build environments, to Docker, all of these, you know, they are like stuff people don't learn. They either learn it because they have to at some point or they never learn it. And I say it's important to understand that a lot of these things are going to just be adopted sometimes 100% by companies.

Um. In my case, we once tested the Apollo software. That's a software that a company in China built for autonomous driving. And what they say is that if you have these sensors and this computer and the cars, you know. Exactly you put the camera at this exact location and all of that, and you do the wiring the way we say it, you just download our software and then you have an autonomous car.

And we tested this thing. And it was really good. And the risk was that we adopted this completely. And if that was the case, I would not have continued working there because it involved too much stuff that I didn't know how to do. So everything related to Advanced Linux, Bazel, Docker. Kubernetes, all of that. That's sometimes you're going to feel like you don't like it. Why are these people talking about it? We don't really care. But for a lot of companies, architecture is important. They're going to spend months on the architecture and thinking about it, all of that. So yeah. I would say don't neglect that too much. And don't stop at too basic stuff in your skills because today everybody can do object detection. Think about your manager who has never coded. He knows how to clone a GitHub repo and run an object detector. I've seen it like, yeah, my job was doing object detection. And then the

manager came and he said, Hey, I just installed it and it works. And I was like, So what's my point here? I'm no longer useful. And so. Yeah, if you want to be useful, you need to have more advanced skills and skills that are complementary. And all of this, everything we discussed.

01:26:34 - 01:27:08

LOUIS:

So when building a project, it will also be a good idea to work on a very like complete project that involves all the steps into, for example, building a machine learning based model, then testing it and then deploying it online and host it somewhere, Create a little, uh, front end for web app or something. It's good to learn a bit about all the different components like Docker and everything. As you mentioned. I assume this might be ideal.

01:27:08 - 01:28:33

JEREMY:

I'm not a big fan of the Giant project, because for myself, it's very hard for me to do them. But for example, at Think Autonomous, I have a course on neural optimization and that's something where you take a pre-trained network for image segmentation, for example, and it works, but it runs at five frames per second. And then you learn to do the quantization. The optimization of the Neural network. You know, knowledge distillation, all of that. And ultimately your network is twice or ten times faster. And you know. You don't do anything else than learning just the optimization part. And that's what the course teaches. And it has amazing results.

And what you can do is something similar. You want to learn about web apps. Take everything Pre-trained, don't spend more than an hour just setting up everything and then focus only on the web app side. And the rest. It doesn't matter. Even if it's just grayscale imaging stuff that just changes you into grayscale, that's fine. It doesn't matter. As long as you learn how to do the other stuff very well and just focus on one thing and then just move from one thing to the other and abstract all the rest as libraries. You call black boxes, you use all of that.

01:28:34 - 01:29:05

LOUIS:

That a really good tip, I think.

CHAPTER XX. Questions From The Community. Are The Driving Algorithms Now Based On Reinforcement Learning, Or Still A Classical Planning Algorithm?

01:29:05 - 01:29:35

LOUIS:

And so this will be the last segment of this interview. And it's basically I told my community on Discord and YouTube that I was doing this interview with someone in the self-driving car industry. And so they had some questions that they wanted me to ask. And one of which is a bit more technical. And the others are like, just to have your thoughts on the future, basically.

And so the first one, which is more technical that I will read because my memory is pretty bad: what methods are used for the actual driving part? For example, is it based on reinforcement learning or is it, as you mentioned earlier, still classical planning, algorithms and control? And what type of algorithms is used? I will just repeat that it's for the actual driving part.

01:29:35 - 01:29:48

JEREMY:

If you take, for example a course online from 2017 or 2018, they are all going to teach the same thing, which is that self-driving cars have mainly 4 or 5 steps, which will be:

1. Perception. So you see the world.
2. Localization, you localise yourself in this world.
3. Planning so you know where you are and what the world is. So you're just going to plan a destination and
4. Control.

So it's very modular. You have these 4 steps and you move from one to the other. And so data passes from perception to control. Yeah, that's one way of building a self-driving car.

The others that were raised recently are end to end. So end to end means you send all your data to one neural net and it outputs the driving steering angle and the acceleration directly. That's it. So you have one network for the whole thing. Of course, it's not just one network. Sometimes you have some other algorithms running, but that's the main idea. You have one network that is optimised for driving based on all the inputs. So the inputs can be LiDAR point clouds coupled with images coupled with radio radar signals, all of that.

And then you have something related to reinforcement learning. Where you're trying to optimise a policy for driving. And that's a bit often related to end to end driving as well. So you're teaching a car how to drive then based on experiences and examples and all of that.

And so for that, check what Wayve is doing. That's a company in London. And they are building reinforcement learning cars and you have a video called "Learn to Drive in one day". It's very old but you can see what they did back then is that they have a small car and they just, every time it drives and then every time it goes off road, they correct it. And so it goes back. It drives again, goes off road, corrects it.

And in the end, it can do the lap entirely. And so today, they are much more advanced than that. They have transformers. They have epistemic uncertainty. So it's something where the

neural network can tell how uncertain it is in some predictions. And so it can also counter this. And there is so much going on. But yeah you usually have these two things, like modular versus end to end / reinforcement learning based.

01:32:07 - 01:32:14

LOUIS:

But still using very new algorithms, not like they are not sticking to the 80s and 90s classical.

01:32:14 - 01:32:27

JEREMY:

It depends on the specific condition the car is set to. But usually, if it's a car driving, and if it's if it raised millions and all of that. Yeah, that's going to be like that.

01:32:27 - 01:32:32

LOUIS:

So the progress isn't only hype, it's actually used.

01:32:32 - 01:32:48

JEREMY:

Yeah, real progress that they are making. And the occupancy network from Tesla has been uploaded in Autopilot. You know, that's like it's not just an algorithm they show for a demo. It's really like they updated the algorithm for hundreds of thousands of users.

01:32:48 - 01:32:54

LOUIS:

Yeah, that's really cool. It's crazy that they can do that live to actual people.

01:32:54 - 01:32:59

JEREMY:

Yeah, that's sick. OTA. That's amazing.

CHAPTER XXI.
How Do You See Self-Driving Cars In 5 Years?

01:33:00 - 01:33:20

LOUIS:

Yeah. So the second question is about the future a little bit. Specifically, the question was what will be the future of self-driving cars? But maybe I can turn that into the question that we all hate, which is: could you make like your five year prediction not of yourself, but of self-driving cars?

01:33:22 - 01:33:24

JEREMY:

Okay. Um.

01:33:25 - 01:33:26

LOUIS:

You can also do more.

01:33:27 - 01:33:30

JEREMY:

It's going to be wrong. But basically what I see...

01:33:30 - 01:33:31

LOUIS:

We never know.

01:33:32 - 01:34:25

JEREMY:

Right now. It's tough. It's like the present 2023 is possibly the worst moment of self-driving cars because of the hype cycle. We had a big hype in 2017. We have reached the Peak and now we are basically at the lowest point possible in autonomous driving. I'm referring to the Gartner Hype cycle for those listening. And so basically we are in a space where it's very hard. I said that Zoox had 1426 jobs opened last year. I just checked their website and it's like 350 now. Okay, so divided by four. So the number of people hiring you know, just tons of hundreds of people? That's not going to happen.

But in any of the tech industries, you know, that's like people are raising less funds. They want profitability. And it turns out that self-driving cars are not profitable. They invested billions in them. And right now they are not making money because they are doing free rides and they are not taking passengers for paid. And most of the companies don't have authorization. That's just research and development. So right now is going to be tough.

For engineers it's not going to be tough. If they get hired, it can be the best years for them because that's also the moment where all the evolutions happen and where all the best

improvements to the car happen, and everything happens very well. So if you're not in the space and you want to get in, it might be a bit harder right now. Um, hopefully I'm hoping to make it easier for you. And if you are in the space, it's going to be Okay. But you have the risk of the company dying. And five years we expect to have. Like, no, I would not expect to have an autonomous car world in five years, you know, five years from now. I don't see all these cars suddenly autonomous because that's going to be a very gradual transition.

We saw Mercedes-Benz. I saw yesterday an ad on TV that said we are the first to introduce Level three autonomous vehicles. And I was like, what?

And so they showed their car and they said, now our cars are autonomous at level three. And so, okay, they say they can do it and they sell it. So that's okay. But that's going to be like that on the ADAS side. So, you know, advanced driver assistance, that's going to be very slow. Features after features, the field is going to improve like that. One day they can just steer, then they can continue like they can brake, then they can change lanes, then they can take roundabouts incrementally, just like Tesla has been doing. And then on the shuttle side, the Cruise Passenger robotaxi. That's a much harder question to answer.

It's going to happen. Like I predict, a lot of companies will die right now in the self-driving car space because they have just hired too much. And that's just too much cost. And if they lose their main fund like Argo did late 2022, they risk dying. And that can happen even to companies like Waymo or, you know, the big major companies. Nobody's really safe from dying in this space because there's so much money that has been lost. And on the other hand, it's going to give room to new attempts, new solutions, something different. And so we can also have new companies launching almost overnight with different challenges. And that can not change the entire world, but maybe one city after the other.

I think the Robotaxi path is going to happen, one city after the other, in general. There are lots of places where 30 years from now, there still won't be self-driving cars. I'm sure of that. Like many places where people today barely can drive, it's not going to be autonomous suddenly, you know. It's still going to take a lot of time. Most countries still have manual cars and not automatic cars. You know, that's a big thing.

CHAPTER XXII.
Do You Think The Government Will Block Self-Driving Cars?

01:38:06 - 01:38:30

LOUIS:

Yeah. And well, on my end, I'm a bit pessimistic about what I'm about to say, but what do you think will happen for the government? Like the permissions and just the.. Not ethical, but like all that can happen, like the laws, everything related to the government. Do you think this will be a big blocker?

01:38:30 - 01:39:17

JEREMY:

That can be a political issue for a lot. You know, we can have it in the US. We have the presidency on the left and we have Silicon Valley on the left. We can expect that they're not going to shut down stuff like that and just ban everybody. Like permission in the US to drive. I wouldn't say it's easy, I know nothing about that. But from what I read it's like the testing and all of that... That's easier than in most countries. So that's like something where they tend to give trust. And in other countries, the governments. It depends on how the guys think about it; what the guys think about the self-driving cars and the Senate and all of that.

01:39:18 - 01:39:18

LOUIS:

Yeah.

01:39:18 - 01:40:59

JEREMY:

What do they think? Like, usually they want to be pro technology, but they don't want to make mistakes with people's lives as well. And I would say they would need to build better systems for us as passengers to trust self-driving cars. Currently in the US and even in Europe, it's probably not enough. What do we do to say that a car is allowed to drive autonomously? Maybe there has to be some work done around that, before we can then say that we can drive autonomously, and we can scale from one city to the other, all of that.

There are tons of companies in lots of places as well where they're just driving. Everybody's accepting and they drive and drive and drive and drive. And sometimes, there are accidents that happen, and then they continue driving. And eventually, hopefully that strategy will help them say that they lost a few, a bit of money. Maybe they had some car crashes that unfortunately caused people's death. But overall, that's how they think. I think overall we're going to have millions of cars crash every day happening because that's what's happening today. Like millions of car crashes are happening as we speak. Maybe not millions, but you get my point. There are car crashes, and those who are anti self-driving cars, they don't want self-driving cars, but they don't want to accept that there is a problem with people's lives being gone suddenly because someone was on the phone in the car.

01:40:59 - 01:41:01

LOUIS:

Yeah, definitely.

01:41:01 - 01:41:19

JEREMY:

You know, even the driver assistance that can brake autonomously when there is a passenger or something. That's like every car should have this today. Like why don't we all have this today and make it mandatory because we cannot accept so many crashes and this system for now is very reliable.

01:41:21 - 01:41:52

LOUIS:

Yeah, I completely agree.

CHAPTER XXIII.
Whose Duty Is It to Make Self-Driving Cars Safe?

LOUIS:

And do you think engineers that are building this self-driving car and those who are working in this industry should think of these issues since they are the first that are working with it and even the first to use it? Should they think of all these issues or is it the government people and yeah lawyers and just the public? Like do they need to get their hands dirty on those ethical questions?

01:41:53 - 01:43:32

JEREMY:

As an Engineer, you have a responsibility in general when you're building something to make it safe. Yeah, you never want.. I don't know how it was for you, but when I got my diploma, they made me read some texts about a sermon. Yeah. I don't even remember it, but it meant something to me. At the moment I read it, I was super convinced that I would not do harm to the world. And in general, that's what you want. That's what you expect from an engineer to try and do the best. But we also need others who know better to tell us what we should not do.

And especially with the rise of AI we've seen recently, we need people just maybe to think about this and the societal impact and all of that. Because the engineers, we have a problem that if we can build something, we're going to build it, even if we should not do it. You know, they're really going to be on the Terminator. They will because that's maybe a possibility. You know, that's like.. We want to see how far we are technically able to go. So we never want the bad aspects, but we just you know, we are all feature creeps; and if there is something we can do, we're going to try and do it. And so, yeah. It needs to be a collective problem, not just like the engineers thinking about some stuff and then telling the world, okay, that's what we do. There is not enough communication, definitely.

01:43:32 - 01:44:33

LOUIS:

Yeah. That's also something to highlight from this interview as you showed us that self-driving in general is a very, very difficult problem involving basically everyone. It is just so complex and you need everything. You need communication. You need lawyers, engineers, you just need everything. So it definitely makes sense that it's like one of maybe the most complicated problems, I'm not sure, but definitely a hard one. That is quite impossible to make predictions. So we forgive you for that. And maybe you will be right as well. So who knows? But yeah. So thank you very much for your time. And if anyone listening to this wants to start and get your feet in the self-driving, I recommend looking into Think Autonomous, his website. The link is in the description so it's definitely a good resource.

01:44:33 - 01:44:42

JEREMY:

ThinkAutonomous.ai and it's also related to Computer vision, all of that. So yeah. Definitely give it a look. Thank you very much.

01:44:43 - 01:45:02

LOUIS:

Yeah, give it, give it a look. If you, if you have some kind of background in the AI field if you don't you can look into my my guide to to get started and then jump into Think Autonomous. So that's a good learning path if you like the online way. And so yeah, thank you very much for your time Jeremy.

01:45:02 - 01:45:02

JEREMY:

Thank you!

01:45:02 - 01:45:04

LOUIS:

It was super interesting and super useful.

01:45:04 - 01:45:07

JEREMY:

Definitely. Thank you. I was happy to talk to you.

01:45:08 - 01:45:13

LOUIS:

Thank you!