SheDrivesMobility 51 - Carolina Sanchez

Katja Diehl (0:15)

Welcome back or maybe also for the first time. And this is She Drives Mobility, a podcast all around mobility regarding the special topics from diversity to new work and also the behavioral change we need to do to have a better climate-friendly mobility in the future. Today, my guest is from China. It's the first time I think that I'm in China this time. And Carolina has worked in so many different countries. So she has also an overview about the different countries regarding the change of mobility, which is really interesting. And we are talking about autonomous driving, which is also the first time that I talk about this topic because sometimes I'm really annoyed by the hype we are building around this topic because I think we need to change mobility right now. And we can't wait any longer until autonomous driving level 5 will be there on the streets. So I really like that Carolina gives us a bit of an insight. What is level 0 to level 5 of autonomous driving? Where are we at the moment right now? And are the rumors correct that Tesla will soon be having level 5 autonomous driving on the street? So she is really honest. She's a really good researcher. She compares different approaches in different countries. And as me, she would like to have a European build-up mobility solution because she thinks that we have so many cultural things here happening that are not into a Chinese mobility or an American mobility. So she really likes if cities and also rural areas keep the shaping of mobility of the people

who are living there. I invite you to join and to have a really deep dive into autonomous driving. And I think Carolina is really good at explaining things and not making it too technical, but understandable for every one of us. And that is something I really like a lot. So enjoy and leave some comments, also maybe stars. And hopefully, you will hear she drives mobility also the next time. Bye bye.

Katja Diehl (2:27)
All right. People ask me on Twitter: "Why are you going to China?" And I was like: "Did you hear about this fancy Zoom meeting stuff maybe before? I don't go to China, but I am a guest at China." I am really lucky to have you by my side today. And at first, I would like that you introduce yourself, please.

Carolina Sanchez (2:53)
 Hello, Katja. Thank you for the invitation. So, my name is Carolina Sanchez. I am a Mexican working for a German company in China. I work in autonomous driving as a system architect manager. So, I have a group of system architects who work in this area.

Katja Diehl (3:11)
 Thank you so much. And we have talked in preparing this talk that we maybe just tell people what is autonomous driving about, that you have like a basic knowledge. So, please, my audience is maybe not so technical affin sometimes. What is autonomous driving? What different levels do we have at the moment?

Carolina Sanchez (3:37)

So autonomous driving is a huge topic and it's very trendy now. So I will try to explain to you very basic. So the SAA, so they say that we have six levels from zero to five. But then those don't go technically. So level zero is practically every car who has no automation. Every car that the driver is responsible for taking control of the car. Level one is the one that is more and more coming. So this half at least, for example, adaptive cruise control, that is that you have a radar and in front of you is another car. So you follow that car and keep the distance that is specified. So you still have the power to change something, but you can feel more in control. The car is more in control, but you have the power. Or for example, line keep assistance, the car, the video see where are the lines and then make you alarm if you are leaving the line. So this kind of assistance is what we call level one. Level two is what we are now. So the current cars that are there outside, that they are very fancy and then say: "Oh, autonomous driving", we are now in level two. So this is the driver always is responsible, but it's a partial automation. That means you have, for example, the ACC in front of you so you can see where is your car and following. And then they tell you as well, where are the lines so you can relax. Even there are some cars already on the highway. In the highway, you can take out your hands, but you always need to be alert. So there comes level three. That is somehow conditional automation. Let's say, you suppose that you will have like 10 seconds to get again the wheel. And this is really somehow in the limbo because why you should have a car that you can drive autonomously, but you need to be attentive. So somehow

everybody is trying to go from level two, where is comfort and safety to level four, because level four is like you need, you don't need to care. So it's more like in level three is no hands in level four is no eyes in level five is no brain. So that's somehow like how you can see it in the future. And level four is already there, but only for closed system, like for example, parking. So there are already some parking houses when a lot of sensors on the parking house, the car itself has sensors. So you just drop your car, you can left the car or you can stay on the car if you want, but the car will parking by itself. So this is level four, you don't need to care. You just sit there. Level five is totally a new revolution. So it's supposed that the car will not have a wheel. You don't need to know how to drive. You don't need a driver license. You just step in the car and go from A to B or to C, or you can share the car. So this is a totally different business case and as well have different scenarios. We are every time more near to that. So we are now somehow in the cars that are on the market is level two. Sometimes we call it level 2.5 because you can really let the hands off, but still the safety and everything is not ready for level three.

Katja Diehl (7:08)
 I like this brain, eyes, hands. I didn't hear it before, but I think that is something that people need sometimes to have like pictures in their mind. It's just not about having this technical speeches. It's sometimes about embracing that the people out there are not like us as nerds of mobility who already know a bit about it. Here in Germany, there is always a fear of change. I think it's not about

Germany, it's maybe everywhere around the world. And when you talk about autonomous driving, you're really, you're smiling and you're looking forward to manage this. So to start with some maybe like positive examples, what is in your mind? Where can we help with autonomous driving?

Carolina Sanchez (8:03)
 Yeah, so I think that's an important question. Like what is our motivation, right? So what is the motivation to go to build a car that you don't need a driver? If we have driver, we have taxi drivers, I can drive. But I think not everybody can drive. And we have many kind of business cases that will be covered on that scenario. So one, for example, is demographic problems. So we see that the people is, some people choose to don't drive. They don't want to drive, but they need in some cases to go from A to C, where they are not public transportation or is difficult to arrive. Or as well, they are not able to drive for some, maybe the age, so they are old, or they have some kind of impediment, physical impediment. So that's one of our big motivations. The second one that is very important is urbanization. So I think more and more people is living in cities. We have more and more traffic, more and more pollution. So autonomous driving is trying to attack that problem in the sense that these cars, if you imagine the level five that drive by itself or level four even, you can drive more efficiency. For example, now already the car tells you like: "Change the gear" or "stop", but you don't follow that. You want to be the faster in the red light or you give gas even if you don't need it. So this kind of cars will drive more intelligent

and they will already be connected with the infrastructure. So for example, let's say a truck who is autonomous driving can communicate with the cloud and then he can say: "Okay, there is a accident in two kilometers, so I don't need to be so fast because anyway, I will be stuck in, I don't know, in two kilometers". So in that sense, we'll be more efficient and as well more environmental friendly. We see that will be less traffic because all the cars will be connected and then will be more easy for the car to decide which road to take and which velocity to use.

Katja Diehl (10:18)
 And I think it's also important to point out that there is no private car ownership anymore, because some people in Germany tell the story of autonomous driving as having a private car autonomous driven, which is really not the solution to put 48 billion cars. We have to cut this down. And I think it's something that people are trying not to speak out loud because it's also making fears, because it's a key industry in Germany, 'the car builders'. But you told me before that you had some research about megatrends, which we can't deny they are there. So which trends do you see that we need to change in mobility?

Carolina Sanchez (11:11)
 So we see that in the megatrends, the mobility habits are changing a lot. So the private cars are replaced by sharing services. For example, in other countries, Uber or DiDi here in China is very common. But as well, they share rights. So the people doesn't mind to

share this car with somebody else that go in the same direction. And this, we can see it, and as well, the business model for autonomous driving level 4, level 5, especially level 5, is not that you spend, I don't know, 8 million euro in a car that you will use maybe, I don't know, four hours. This car is built up with a lot of sensors and as well a lot of redundancy system. That means if something breaks, you have option B. If the sensor doesn't work, you have two sensors. So that means this car is equipped with double sensors connected with two clouds. So everything is redundant. So you can afford if you are super rich, but that's not the business model. The business model is to have this car outside, taking data, making with this data, the communication to other cars. That's the idea. And I think the people will take some time until they have the acceptance of this shared mobility and as well autonomous driving without a driver. But I think I see more and more, I live now in China and I work in China, I see the benefit to take, for example, DiDi that is very similar to Uber. You just take the car, bring you somewhere, you leave the car, the car never parks. So in that sense, you save a lot of space, you save a lot of time, you don't need to look for a parking space. And as well, you feel more connected because you say: "OK, I just go out to the street, I take the vehicle and I left where I want to be." I think the step that is missing is still this mindfulness on the car. So like if you are in your own car, so not in your own car, but in your own space, then you can say: "OK, in this time, I will move from A to B and I will read my book or I will talk, I have a coffee with my friend." So you can as well play with these use cases in autonomous driving that you don't have with a driver. But that's

somehow like the future that we are embracing. We are learning a lot now with level 2.5 and as well learning a lot about the new technologies, how to make these connections, how to use redundant systems. And this is where we are today.

Katja Diehl (13:56)
And it's really interesting because you are touching a point of cultural embracing. Because when we as Germans, before Corona, travelled into another country, for us, it's like fun, sharing rides in Turkey or somewhere else. It's like: "Oh, the chicken bus, so funny." But coming back to Germany, it's like: "No way. I won't share my car. I hate sharing. I want my own space." So there is also, I think, tackling something like you need to change your behavioral space because it's really the private space at the moment, which is really like, for some people, I think, really on a high level of feeling privacy and having maybe the only time on the day to be with yourself. So for me, it's also like, how can we enable the people to see: OK, this is a privilege and this is nothing that is normal and you can buy it. This is right. But we need to change this to change the world for the better. So is there also a megatrend or something you see where we can build this kind of road to change also the behavior of mobility?

Carolina Sanchez (15:16)
I think that depends a lot on the values of the person. If they value this, I don't know, to be in my own car or to be in my own space, let's call it a space because this in the future could be your own

space. You book the car for your own or for your family. But maybe in the future that could be as well like; "Okay, today I feel like meeting somebody or to share my car. So I have more time, I have five minutes more so I can just make one stop in my way to work." And then you have this opportunity to say: "Okay, today I can share my car." For example, me, I take sometimes the DiDi, so the Uber to my work. And sometimes I want to speak Chinese. So I say: "Okay, I have more time. I want to meet locals." So I share my commute to the work. And then somebody else randomly entered to my car. And then of course, they see I am foreigner and they start to talk with me. So that depends as well how much time I have or how much I feel to talk in Chinese or not. And I think this will come more and more like as well in Germany. In Germany, I think this ownership of the car is very important with the status that you have. But I see the new generations, they are not in the same line. So I see many young people, they don't have a driver license. And it's not like a goal in their life to have a driver license. They really try to use another, yeah, like a bicycle or public transportation. Unfortunately, what I see or when I was living in Germany, I lived there 10 years, four years ago, not everything is connected. And as well, the e-bikes that is, for example, a very easy way to move here, we have a lot of electronic e-bikes, and they have a special place for them. So it's very safe, or at least it's safe to drive. Or I feel safe, let's say, I don't want, I don't know how many accidents we have per year. But I feel safe when I drive my e-bike to work, because I feel like I have my own channel, and not any car will come and crush me, at least when I am in that in that channel. If I cross the street, I'm very care-

ful. But that kind of infrastructure is, I think, is missing that the people say: "OK, I can switch, I can take a e-bike, today. I can take the bicycle or I can walk." I think in Germany for walking is very good, but countries like US is horrible to walk. You don't have places really to cross the street, it's really hard. And all these kind of things should be, yeah, constructed or there that the people use it. Because if not, you just want, in the end, you want to be convenient and comfortable for you and your family. But I think that the mindset is not like: "Oh, I don't want to be eco-friendly", or "I don't want to let my car". It's more like: "I want this space for me, this safety, this comfort." So I think if autonomous driving reach a product like that or a system like that, that is easy to book, that is easy to say: "OK, today I want a car for me", or "I want a car for a disabled, for wheel chairs, or for Kinderwagen, or to carry my baby with the car, baby car", I don't know how it's called in English. I think if we give that kind of use cases for the people who will really use it, then we are in the right track.

Katja Diehl (19:03)
 For me it's also sometimes so easy to say it's more like a chance than causing problems, you tackled the international view and as having you here as a really good researcher, you're looking upon the world and upon the different countries, are there special approaches when you see and compare the different countries, are they all on the same way or is it depending on how you work on.

Carolina Sanchez (19:38)

Yeah, no, I think every country have different approaches to autonomous driving. So if you see, let's for example, for the nations, there are four points that are very important. So one is the government support and division. And there are countries, for example, like the Netherlands or Singapore, who are really ahead on these regulations and division of have, for example, Singapore have some bus shuttles that are autonomous drive. But the point is, they don't build up these cars, right? So they are not the car makers, but they are already ahead on that, that support ambition. Another point that is super important is the highway. So should be an excellent infrastructure, because these cars will drive on the highway, let's say, but if there is any kind of accident or the condition is not good, then we can have some problems on safety. So that's a very key point that we already look as well. And in that sense, for example, I see see China, Japan, US and Germany ahead. So ahead in the sense that they are the ones who are doing cars, at least the most of them, South Korea as well, but the larger manufacturing is China, US, Japan and Germany. But as well, they are investing a lot of money and a lot of resources to bring in autonomous driving to the people. Now I can speak only a little bit about China, because I live in China. And I think, yeah, that gives a little bit of insider tip. Here, the government is supporting a lot to have two technologies, many technologies, but two technologies in the field of autonomous driving. So one is the car itself, the sensor, the technology, everything that is around the car. But the other one that is as well very important is the intelligent infrastructure. Intelligent infrastructure means you have a highway, maybe only for autonomous driving car,

or as well is a lot of sensors on the highway that connect with your cars. And the advantage, so they're here, there are different opinions, but one advantage is that here is only one government. So they say, if I want to build up a highway from Shanghai to Beijing, it cross three different provinces with different governments, but there is one big government or one big boss. So they say: "Okay, we build it" and they build it. There is no kind of discussions. So in that sense, there are pros and cons, of course, but in that sense, it's very likely that in China, we will have autonomous driving level five very soon, because we will have this kind of ecosystem similar to electro-mobility in China. I will not go in deep on that, but here I think China is one of the most countries that have electric cars. I have even an electric car because the full infrastructure is there. I can charge my car in my home, in every mall, in every gas station, in every hotel. It's very easy. It's already there. And you get money if you buy an electric car. So in the same sense, China is taking the same approach with autonomous driving. Put everything there that you need, that you bring it to the reality. And the people is already very used to this DiDi, that is the Uber here in China. So they are already used to take the app, just share a commute or take a commute for themselves.

Katja Diehl (23:34)
So it's for me, I always like to believe in the European idea because I think it is there's so much strength, not just to think about your own country, but to think United as a strong Europe. But I have this lack of systems here. And also, even just in Germany, there is no vi-

sion about it. It's just about different projects. And I don't see the red line or something that crunches together into an ecosystem. And we are also dependent on China because most of our cars are going there. So it's also our market, to be honest. And for me, it's really like, how can we manage that politicians and deciders of the car industry see that they need to have a vision that is beyond the private own car? And I think it's not easy to compare China with Germany, but I think it's about being open that there is a change going on and you have to be a player of the game and not someone who tries to seek after: "Oh, they are changing , now we have to change. So if you're just in your ecosystem of people you're talking to, do you see that people are coming into this mindset?

Carolina Sanchez (25:05)
 So I think I agree with you. So I see a lot of benefits in Europe. So we have a lot of technology there. So that's why I'm here. So Germany sent me to China. Nevertheless, I think these are two points. So technology and know-how is there. And as well, we have, or at least in Germany, we have years of experience. We know how to make that kind of systems, right? We did that before for other kind of systems. Personally, what I think is very difficult to put all the nations together. If Europe will say, like: "OK, here is the regulation for autonomous driving, we could be faster." Or it doesn't matter who is first, but we could be better in the sense that I think Europe is very, they look that everybody have the same right or a common well-being. But the regulations, from my opinion, are missing. So in China, US, they have already this kind of regulations. They are not

perfect, but they are there. So you can start with that. You can start to test the car on the street. You can start to make some use cases with some vehicles. As far as I know, for example, highway assistance is still not released in Germany. It's a system that is already released in US and in China, and you can buy a car and use it. So it's not the final state that we want, but at least you can experience and the people who have this car say: "OK, it works. I trust the system. I trust the car. I trust that the car communicates with the map, and I know where I am." So I really hope that, at least for Germany, they find a common system. And system, I mean, we have at least three key players. So Volkswagen, the ones with Daimler. BMW. And everybody's in their own race. Everybody wants to be the first level 5 robot taxi or for their customer, as a product. This is a great car that drives safely on the street. But I think that shouldn't be the common goal. The common goal is that you have a system for Europe, for Germany, or for worldwide that communicates these three cars. Because what is the sense to have a car that is: OK, you have a BMW, it's amazing, but doesn't communicate with the Volkswagen. And there are five Volkswagen, three BMWs, and four Daimler. But if they don't communicate each other, then you don't have this big advantage of the system or of the infrastructure. And I think that's something that in this race is missing. So I see the same in US. So we have Tesla. We have Waymo. We have many startups. They don't have one communication system. And I am system architect, so I know that every single challenge, change, or variance is a huge impact. So if you really don't use the same communication system, Ethernet.com, or the same cloud protocol, it's not one

to one. It's not like you plug in and press start and it works. So I see that as a disadvantage now in Germany, that they have some gremios where they talk to each other, but the regulation are not there, and the common goal is not there.

Katja Diehl (28:44)
So is it for you a conclusion that there needs to be, if you're shaping the future, there also is like a lack of holistic approach that you are able to talk with each other and that you are embracing, you're not always in fight, but you have to shape the future together. And does it mean, it's like a deep dive now, but does it mean there's also a lack of new leadership?

Carolina Sanchez (29:13)
Yeah, I think that the leadership should be more people-oriented, so not product-oriented in this case, because that's where we come from, right? So we come from a product-oriented. I have a BMW. I had a BMW. I love BMW, but that was this feeling, right? I have this product. Now for autonomous driving, it's not that anymore. I think for future generations as well, even if, and I am included there, all people think that this is a product, the new generations are not given that importance or value. They are not defined by this car. And this is really hard to understand to many people because they really feel attachment to that. So I think this is the mindset that is changing, and I'm sure everybody knows in your audience, the world is changing so fast that the people, all the generations, and I am included there, it's very struggling for us to switch.

Okay, now the new app, now the new cell phone, now the new technology. So they used to call. Now it's a video cam. Now it's Zoom. Now it's Skype. So everything is changing so fast that we need to learn faster. But the new generations for them is normal. I think they expect that this change too fast. So for them to change from the car is a product that I own and defines me or defines my identity to switch to today my e-bike that I'm driving, I choose the color, I think I'm red today and tomorrow pink. It doesn't matter. They are used to this change and to redefine themselves in diffe-rent stages of life. And I think our generation, at least my generati-on, is more like: "Okay, this is who I am. These are my labels." And you try to stick on that. And the current world is not like that. And these megatrends, and that's why, so in the end, we are a company and we want to sell something, right? So we want to do profit and the company want to make profit. So if we want to do profit, we need to understand the market and the market is changing. The market is going to sharing or to own your own space, but not your own car. And this is what we need to adapt.

Katja Diehl (31:36)
 You touched Tesla, Waymo and others. And that's of course some-thing I'm curious about because here in Germany, sometimes they tell the story they are this nearby level five autonomous driving at Tesla because Tesla Elon Musk is really building an ecosystem. He pushed also satellites into space to have a better internet. He built infrastructure for charging the cars. He is someone doing this ap-proach you are painting, but just for himself and his ecosystem. So

if you look upon this kind of Silicon Valley mobility guys, how near are they to level five? And how much is it just about storytelling?

Carolina Sanchez (32:30)

So I think in general, as well, my personal opinion, so Tesla is level two, so there is no car now in the market that is level five. So the only level four is, so maybe a parking lot, so then you have a closed system where you really can live yourself, but you have a system where everything is controlled. But Waymo is aiming the level four as well. But what I see in US, and I'm not very expert in US, so I studied there, but I never lived there. What I see is this like a race to the moon. Everybody wants to be the first. Everybody wants to say: "I can do it. And doesn't matter how much money, and doesn't matter if it makes sense, I will get the most nerd and smartest guys, and I will make it happen. I want to put my name on that." So I think, so without going really in details, the cars that are on the street, they are safe. Because if you compare it with the humans, failure, at least they are in the same status. But the point is that if you have, for example, nine of 10 accidents is caused by human. But if you have the same amount of accident by a car that is autonomous driving, the acceptance is not the same. That's why the cars should be much, much, the autonomous driving cars should be much, much better, or much more safer. That means much more money, or redundant system, and all this kind of stuff. In my opinion, the strategy of Elon Musk is more like: "Let's try, let's see on the market what happens. So some people will die, but anyway, they will die anyway." So very, very practical. And I think because of his fame,

because as you say, everybody says: "Wow, he's a genius, he's an amazing person." They allowed him that. I think if another car maker say like: "We have these accidents", everybody say like: "Oh my God, what will happen?" But because he's this kind of hero for us, it's like: "Okay, he's trying, let's give him another chance. So it's fine." Everybody's keep buying Tesla, and we know everybody knows that we have a lot of accidents with the autopilot from Tesla, and as well, many misuses. Where the people don't follow the rules, they as well not say, so they don't have this redundant system that if the people is not looking to the street, shut off the system, because yeah, they say: "Okay, let's try, let's see the data, and then we make it better." It's another approach. It's like: "Okay, let's get the data, and then we improve our system, and then they reflash the system, and every time will be better." It's a very good approach, but I think only people like Elon Musk can afford that. So I think no OEMs in the traditional way will be able to afford that kind of reputation and trust.

Katja Diehl (35:52)
 So as the last point of our talk, I would like to ask you to paint your vision of an urban city lifestyle when autonomous driving is there, because we tackled the point like gaining time, having quality time, having the right to choose if you want to travel by your own or with your family. So if you look into the future when autonomous driving level five is there, what is your picture?

Carolina Sanchez (36:29)

I think, or I wish that in the future with Level 5 we get more mind-fulness and as well productivity and we will really use this kind of a space to meditate, to talk with our family, to work in the sense if you want or to make something creative. I hope we just don't take that time to keep watching our cell phones. I hope we go more in direction learning and this kind of things that make us grow. As well I hope or I envision that as less traffic jam or no traffic jam, better emissions, so no emissions. All this as an ecosystem so that for everybody is easy to book a car that bring me to a place that I normally cannot reach with public transportation or with my bicy-cle or with my e-bike or with all this kind of mobility options that we have there. And give you this kind of freedom that we always look now in these cars that you own your car, you own your freedom. But no, I hope in the future we shift this mindset of freedom to I cannot reach any place with this shared car that is autonomous driving, even if I don't drive I can just go and visit my grandchild or my daughter or whatever in the time whenever I want without any problem.

Katja Diehl (38:03)
That's nice. And also it comes closer to my vision of the child-fri-endly city, because I think it's so much about regaining space from parked cars and we can build the city again as a place where peop-le interact, where we can look into each other's eyes and not just always going by and avoiding contact. So for me, my vision is also to live in Hamburg and feel more like on vacation, because always we travel to places that are nice, calm, without any traffic. And I

like to have this on my daily space also. And I think that is so much about storytelling that people like to shape the future with us and starting from today on, because I think it's so much about gaining stuff and having more time with your loved ones, I don't know, than being stuck in traffic. And yeah, hopefully I think that not the wrong narratives will win, that people are afraid of change, because that is also something where I have a look upon. Thank you so much for your time. And it was so nice meeting you in person. And now we say bye bye to the audience, I guess.

Carolina Sanchez (39:30)
 Yeah, thank you very much for the invitation. I enjoyed a lot of the talk. Bye, thank you everyone for hearing.

Katja Diehl (39:37)
 That was nice. Thank you.