Autonomous Vehicles – Legal Concerns

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[00:00:00] **Tracy:** I am convinced that the US legal system is not prepared currently to handle autonomous vehicle crash cases. So crashes that are caused by some sort of hardware, software malfunction, rather than by, by driver error.

[00:00:15] **Christoph:** It is alarming that the leading country in testing autonomous vehicles is legally unprepared for this disruptive technology. Last week, we already started talking about how autonomous vehicles might change our society. This week, we will try to better understand the legal and political implications that these new forms of transportation might introduce.

[00:00:41] **Music:** This is the Human-Robot Interaction podcast.

[00:00:48] I am your host, Christoph Bartneck.

[00:00:58] **Christoph:** So what exactly is the problem in the legal system of the US?

[00:01:01] **Tracy:** We have no case law. We have very minimal statutory law in the United States right now. And so I'm concerned that the judges are going to mishandle these cases, hand down rulings that are very unfavorable either to industry or to consumers and both of those would be very problematic.

[00:01:16] My name is Tracy Pearl, and I am a Professor of Law at Texas Tech University School of Law in Lubbock, Texas.

[00:01:24] **Ryan:** I don't think we're quite at a position where we should be making general laws about machine learning, because I don't think we completely understand its full ramifications. My name is Ryan Calo. I am a Law Professor at the University of Washington in Seattle. I think that government should officially accrue greater expertise.

[00:01:43] For example, by refunding the office of technology assessment I've even argued for a standalone agency devoted to better understanding cyber-physical system.

[00:01:52] **Christoph:** The Office of Technology Assessment was an office of the United States Congress from 1972 to 1995. It's purpose was as the name suggests, to assess what impact technology might have on society. For this purpose, it provided objective analysis of the complex scientific and technical issues of the late 20th century.

[00:02:14] Despite protests. It was defunded.

[00:02:17] **Tracy:** I watched the Mark Zuckerberg hearings with great interest earlier last year in the United States. And I think the dynamic that you saw at play in the Senate hearings is exactly what in courts, which is you have younger smugger people explaining to older more in authority people, technology that the older people really struggle to understand.

[00:02:38] I clerked for two federal judges when I graduated from law school. One at the trial level and one at the appellate level. My trial court judge was still having his emails printed out and given to him by his assistant and for as incredibly wise, as an incredibly good jurist as he was he was not somebody I think, who was maybe the right person to be judging really sophisticated matters of technology.

[00:03:02] And I would say that about a large number of judges in the United States tend to be older. That's the nature of that career path. And so I think that we've seen that struggle, not with autonomous vehicles yet, but in other areas of technology, judges are really struggling to understand even just the nature of the dispute much less, reach a decision that makes a lot of sense.

[00:03:21] There's less information available about jury pools. Certainly there are young people serving on juries, but I have really complex patent cases involving, really dense technological issues, the composition of microprocessors. And I've just seen juries just with completely glazed over expressions for the entirety of those trials and really questioned whether or not they were the right people to make the decision and whether the jury system at all is the sort of correct milieu which those issues should be deal with.

[00:03:52] **Christoph:** Pointing the finger at the incompetence of others is easy. I, myself am not a computer scientist. Have you any experience in programming?

[00:04:02] **Tracy:** I have programmed a computer in the most minimal way possible. I took pre computer programming classes when I was in school and I did basic like HTML and things like that. But no, I am not a computer scientist by any stretch of the imagination.

[00:04:15] **Christoph:** If you have little experience in programming, where do you get your information from that enable you to form your legal opinions?

[00:04:23] **Tracy:** Yeah. So the great thing about law and technology is that there are a lot of interdisciplinary conferences. So I, over the last couple of years have become less interested in attending law conferences because I think it's.a lot of people who have the same knowledge base talking amongst themselves. And I really become much more in favor about attending conferences like these, where there are computer scientists or other engineers and having those conversations, because I think this is an existing problem in all areas of law, which is that you have judges, lawyers and lawmakers tend to be lawyers just like law professors.

[00:04:55] And we're all talking to each other and not talking as much to industry as we need to. And then you have industry that's lobbying lawmakers in a really self-interested way. And so I think what is missing there is those kinds of honest in depth conversations about the nature of the issues that we have to confront.

[00:05:11] And that's my hope, the legal world is really siloed and the legal academic world is even more siloed. And so I hope to see more of those conversations happening and more collaborations happening, across disciplines in this area.

[00:05:25] **Ryan:** There has been a growing number of applications of machine learning to context like translation and so on. That feel to me that at least at the application layer, not the development of the core techniques behind AI, but at the level of what can we deploy today because we have the algorithms and the data and the computational power. That, it is something that's getting being part of the mainstream. So what I'm thinking about is, for example, liability regimes for driverless cars drone navigation, things like that.

[00:05:58] **Christoph:** Liability refers to who will have to pay in case of an accident. The manufacturers of autonomous vehicles also struggle with liability implications. They could be hold responsible when their vehicles, misbehave or underperform. The problem is that the manufacturers cannot completely predict how their cars will perform in the real world.

[00:06:23] Naturally, they would not like to be liable for the damage. Their costs may cost. Last week, we already discussed several accidents in which the autonomous vehicles failed and even killed a pedestrian.

[00:06:38] **Alan:** These are really challenging problems. That is probably, I think, one of the most challenging problems in artificial intelligence this fact that these systems can become so complex and so experiential, right? The robot's behavior could change with his experiences out there in the world.

[00:06:56] The Loyal Wingman project, which was a project looked at by the United States Air Force had these systems that wouldn't learn on the fly, but would learn through, it would run a mission. It would be debriefed on the mission and it would include that in its future missions and rationale for behavior. It can certainly get far away, further out than that programmer ever intended.

[00:07:21] **Christoph:** The real problem seems to be the complex environment. The reality on the road is far more complicated than current autonomous vehicles can handle. Just this week, Waymo announced that its car can know just from police officers, managing traffic manually. Again, this development was announced only this week, which means that so far, it would have not known what to do.

[00:07:45] While this form of traffic regulation is rare in most developed countries. It is far more common in the developing countries. Moreover, in some countries, no traffic signs hold any true regulatory power. They are merely suggestions. How could an autonomous vehicle operate in such a lively and organic flow of traffic?

[00:08:08] **Tracy:** Yeah, I think just exactly what you said, which is that as, as good as programmers are and can be, they can't possibly predict the complexity of the driving environment. Additionally, there are driving situations in which there are two bad options rather than two good ones. This is the sort of famous trolley problem. Do you program the car to run into the

mom with the stroller or to run into the group of six people? That there's not a good choice there.

[00:08:33] **Christoph:** If the legal system is unprepared, what could a solution be?

[00:08:37] **Tracy:** So my proposal is a victim compensation fund, and this is, I don't want to say a uniquely American phenomenon, but one that America, I think has utilized more than other countries. So a victim compensation fund is an alternative to the legal system. It creates a pool of money and makes it available to victims of a particular type of injury.

[00:08:58] And it tells those victims that it will compensate them for their injuries. In exchange for them waiving their right to sue. We've used these in the United States to compensate among other groups 9/11 victims, victims of the Deepwater Horizon oil spill, coal miners who suffer from black lung and the victims of the Virginia Tech shooting.

[00:09:18] And I think that these kinds of funds offer a really interesting alternative for AV crash cases. And so I've proposed creating a fund that would compensate people who are injured by fully autonomous vehicles. And that would offer an exchange manufacturers some protection from liability exposure.

[00:09:36] And I think additionally, we have to come to grips with the fact that autonomous vehicles are not going to have a 0% risk, they, there is going to be some predictable amount of injuries or fatalities caused by autonomous vehicles. And importantly, that doesn't mean that they're a bad product or that somebody should be held liable, but it does create real issues in terms of liability exposure.

[00:09:58] So the analogy that I give here and I give it to my paper is childhood vaccines. So childhood vaccines are great. I'm a believer in childhood vaccines. They save tens of thousands of lives in United States every year. But childhood vaccines also injure a predictable, unfortunately small number of children every year.

[00:10:17] And there's nothing that we can really do. We can make them sort of incrementally safer, but there will always be some number of children who have a bad reaction to a vaccine in the United States. Vaccine manufacturers

were almost sued out of existence in the 1980s and nineties, because every time a child was injured, even if it was one of those sort of predictable injuries that we can't eliminate from the vaccine protocol their parents would turn around and Sue the vaccine manufacturers and for small companies in particular, the liability exposure of producing.

[00:10:48] Childhood vaccines simply became too high and they stopped producing them. And we almost run out of vaccines in the United States. And so we created a victim compensation fund that eliminated that problem. So now in the U S you pay a tax on every childhood vaccine, and if your child is injured you're compensated via a fund.

[00:11:04] This may seem completely obvious to all of my European Australian, and apparently Kiwi counterparts, right? You've been doing this much better than we have in United. But I think for autonomous vehicles, we're going to have the same exact issue. There will be a risk profile. People will be injured, but I think the net positive is going to be very significant.

[00:11:23] **Christoph:** This sounds like an interesting idea. Although it does seem more like a workaround trace argument, is that in the absence of any legal guidelines or laws, we need to settle outside of the legal system. There's still another option available. Saudi Arabia gave the Sophia robot citizenship and the European Union is also debating whether the grant personhood to robots. Could the autonomous vehicles not become a legal entity that would become responsible for its own actions?

[00:11:55] **Alan:** How? I don't see how you could have a robot have a legal state. The European Union has hinted at this with the electronic personhood. But I don't understand it because you cannot punish a robot. You can only punish the individual that is behind the robot, the human.

[00:12:10] But holding the system itself responsible makes no sense because the system has no sense of punishment. No sense of loss.

[00:12:21] **Tracy:** I know that there has been a lot of discussion about giving machines legal rights. There's a book that I read called "Robots Are People Too". That was about justice issue. Talked about this in terms of like insurance instead of making humans own insurance, why not make the car itself the insurable entity?

[00:12:41] Gosh, I don't know that I have better answers than anybody else here in terms of how we define autonomy and whether and how it's possible to make machines accountable for their own actions. One way to do it would be, I think it's always presented as a sort of either, or either machines have the full panoply of human rights and they can go get a beer from the local store as long as they have a license or, and do everything else that a human would do.

[00:13:06] And it certainly reaches a level of absurdity. I think there are ways in which that we could consider machines from a legal perspective, illegal entity, such that the machine itself can be sued or force the machine itself to carry insurance. And I think that actually, creates a lot of interesting possibilities when we're talking about compensating people for injuries.

[00:13:26] I don't also know that rights rather 'cause maybe the right paradigm to use, to address some of these questions. I think that when we talk about rights, it's so squishy and it's subject to so many assumptions and so much existing law that talking about the rights context, may actually create more problems than it solves.

[00:13:45] **Christoph:** Person itself is a difficult term from a legal perspective. What are the requirements for an entity to be considered a person?

[00:13:53] **Tracy:** Oh, goodness. That's like the hardest question. Here's the thing we don't have a great answer legally as well. If you look at sort of the abortion jurisprudence that we have, one of the most basic questions to ask about personhood which is: when does it start? It's something that's subject to great political debate.

[00:14:09] And one that's still, I would argue at least a sort of legally open question. So I don't know that we have a legal answer. And I think that it's funny that we just don't even address that issue when we enter into a case until we're compelled to, because we have some sort of super difficult question.

[00:14:27] **Christoph:** Ask so often the situation is more complex since also humans can lose their citizenship, civil rights, and can even be declared incompetent. At some point in our lives, we also require to stop driving, even Prince Phillip, surrendered his driving license, after an accident at the age of 97.

[00:14:48] **Tracy:** One thing that states have done, I know in the state of Hawaii, for instance, you renew your license every eight years, but after the age of 72, you have to renew it, every say, every two, meaning that you have to undergo eye testing, that, you have to be eyeballed by somebody in a position of authority who can then make that determination.

[00:15:07] I think that should be standard in all states. I think. Maybe past the age of 65, you should have to go for more routine testing. And the presumption should increasingly be that you actually are not a safe driver rather than that you are. Now I know I'm going to get a huge amount of pushback from elderly people.

[00:15:21] And I certainly don't want to insinuate that elderly people carte blanche should be taken off the roads because there are people well into their eighties and nineties who are very safe drivers. But I think that with the sort of growing elderly population in the U S this is going to be a really difficult question that we're going to have to ask for ourselves not only legally, but personally as well when we're dealing with our elderly parents.

[00:15:43] **Christoph:** Besides age, there are other factors that might compromise our ability to drive. Certain medical conditions, disqualify us from driving. What does it take to become incompetent?

[00:15:55] **Tracy:** Yeah, so it actually varies from jurisdiction to jurisdiction. So that's competency law, and in most states it's actually surprisingly difficult to have an adult declared incompetent. We've encountered this actually in my own family. I have a relative who has frontal lobe dementia and who has very clear symptoms of it and has changes in his personality.

[00:16:17] And we cannot yet get him declared incompetent because he still able to function fairly normally, and that he can dress himself. He can bathe himself. His decision-making abilities are very comparable. But that's actually not enough under the state law of the state in which he's living to have him declared incompetent.

[00:16:33] **Christoph:** Is he allowed to drive car?

[00:16:35] **Tracy:** He is allowed to drive a car and that's been a real issue. We had to step in and actually take his car away. Not so much because he had lost his driving abilities actually, but because his relationship to drinking changed as

a result of the dementia. And so he went from somebody who didn't drink much at all to somebody who drank quite copious amounts and then was making the decision to get behind the wheel. Competency laws are really tricky because if you make it too easy to have somebody declared incompetent it can become a form of coercion, right? And you can have people who are fully functional, institutionalized against their will.

[00:17:07] And we went through that in sort of the 1960s and 70s, in the United States. If you've read Ken Kesey's 'To kill a Mockingbird' that comes out of not 'To kill a Mockingbird' what's the name of the book I'm looking for 'One flew over the Cuckoo's nest' and involved a bird. On the other hand, if you make it too difficult to have people declared incompetent, you have situations exactly like the one in which my family finds itself in which you have people who really should have supervision and who really should lose their driver's license and any number of other things they're able to do.

[00:17:33] But you know, just don't reach that level. The driver's test doesn't become just then, can you parallel park? Do you know how to handle a four-way stop, but can you drive better than an autonomous vehicle? And I think the answer there is a hundred percent of the time going to be no, because an autonomous vehicle, I know that Waymo's prototypes I scan, I think it's 1.7 million spots per second. And so they've already far exceeded the capabilities of human perception. And so I just see humans losing or failing that test every single time, no matter how good of a driver they are. For as high of a number of accidents as we have per year and motor vehicle deaths continue to be a leading cause of death for most age groups, we're actually pretty good given the number of miles that we drive every year. Like we're pretty sophisticated at handling machinery. And most of us, in our day-to-day lives encounter, what could otherwise be tricky driving problems with really no problem at all. But that doesn't mean that we deserve a chance to be on the road when there's a vehicle that's 94% safer than we are, at that point, I think that, the right result legally and morally is to hand our keys back over to the robots.

[00:18:53] **Ryan:** I believe that we should be in a process now that culminates in the near term in legislation, because I don't think that AI is truly transformative unless it leads to changes to our law and legal institutions. But I think it may be premature to pass general rules about machine learning at this time.

[00:19:12] **Christoph:** The opinions on when we should hand our keys over to the autonomous vehicles and when we should engage in the process of creating the legal framework for the operation, do seem to differ. Researchers are more or less optimistic when autonomous vehicles will be safer than human drivers. In the meantime, we need to be careful not to trust autonomous vehicles too much.

[00:19:37] Here's Alan Walkner from the Pennsylvania State University.

[00:19:41] **Alan:** There's a raw wide variety of different types of social interactions. And some of the things we've tried to do is have robots communicate that they shouldn't be trusted at some point. And we found this exact extremely difficult to give you an example, we had a sort of maze following experiment where we would put a person in a maze and we'd say just, you can follow the robot or you can try to find your own way out.

[00:20:02] This was an early experiment. And the robot, we just wanted to see how the robot could communicate that it was broken. And so initially we had the robot move randomly around and the experiment was supposed to take about 90 seconds, but we found that some people would follow the robot for 15 minutes.

[00:20:18] And so we looked at another way, but what if the robot just goes around an obstacle, like in a loop? And, but we still found that people would follow it for 15 minutes. Then finally we would have the robot run into a wall fall over and just stay there. And then we found some people would stand by the robot waiting and believing that it would, that the robot was going to tell them something important. So we've looked at a variety of different ways that robots can try to communicate that at this moment you shouldn't trust me. It's very difficult to do, but it comes back to this issue that people are nuanced.

[00:20:53] And so even as an engineer, you're looking for that one solution and there isn't that one solution you need to have a variety of different solutions that depend on the actions of the person is making at the moment. A lot of the first electric appliances, people would literally unplug them every night just to plug them back in, in the morning because they did, they were afraid that fires would start from these devices.

[00:21:18] And in fact, there were a lot, a number of fires with the first electric devices. So It wasn't totally unfounded. So the point being that as we develop

better models of the robots we interact with a lot without question. Our trust will probably become more calibrated to the actual system and its behavior, but the challenge becomes what there will always be people that haven't interacted with a robot.

[00:21:40] And so while they're trying to develop that relationship, that understanding of the system. What are the risks that they're taking on that are maybe not well founded? The best examples of the ones we've already recently seen watching Harry Potter while your autonomous vehicle is flying along. Now, these are these are rare events, right?

[00:21:59] But it's this belief. And we see it in our data a lot that people believe that these systems are flawless, that they cannot fail, or they believe that the programmers or the people or the companies that created them are largely flawless because they've interacted for example, with Google or so having cell phones that have worked in these ways,

[00:22:18] **Christoph:** It is not only the humans that need to be careful when trusting machines, but also the machines need to be careful when to trust humans.

[00:22:28] **Alan:** There are many situations where an autonomous system should not potentially trust the human. So my advisor was Ron Arkin and he's looked at a lot of military situations and in these situations, people can get very emotional in, in war situations. And so you wouldn't want a human soldier to tell a robot to commit a massacre in that situation that the autonomous system should say no, and it should have the right to say no.

[00:22:56] Not accept the command to commit that, that atrocity. Now I'm assuming a lot, a lot of perception, a lot of action, a lot of behavior there, but we afford this with our soldiers in the west, they have the right to refuse commands that are moral. And so if we're going to feel Autonomous robotic systems that are there are soldiers, they have to have that same.

[00:23:15] But it brings up these moral issues that are so critical and that we have no answer to. And if people like us that really know the technology well, can't even begin to answer these questions. Who can?

[00:23:29] **Christoph:** Autonomous weapons systems, another upcoming topic at the Human-Robot Interaction podcast. Join me again next week when we discuss humans, robots and everything in between.