

AI and You

Transcript

Guest: Todd Litman

Episode 61

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Hello, and welcome to episode 61! I've said more than once that autonomous vehicles are the gift that keeps on giving to this show. We have gotten into so many AI-related issues that they have spawned, most notably among them the Trolley Problem, and if you've been following every episode of this show you may be relieved when I say that nowhere in this episode's interview do the words Trolley Problem appear. Fascinating as it is, it tends to dominate discussions about autonomous vehicles when there are more immediate and pressing things to talk about. Which is what we're going to do now.

Today's guest is Todd Litman, who is founder and executive director of the Victoria Transport Policy Institute, an independent research organization dedicated to developing innovative solutions to transport problems. His work helps expand the range of impacts and options considered in transportation decision-making, and his research is used worldwide in transport planning and policy analysis. Among many publications he authored the *Online TDM Encyclopedia*, a comprehensive Internet resource for identifying and evaluating mobility management strategies, and has worked on every continent except Antarctica. I don't know what the traffic is like there but I'm betting they don't give speeding tickets.

So one of Todd's publications, available through his web site, vtpi.org, is "Autonomous Vehicle Implementation Predictions: Implications for Transport Planning," and here we are. We are going to be talking about policy planning for AVs with an expert. Also we will be talking about zombie kangaroos. You'll just have to listen to the episode. By the way, Todd lives near me, and although we didn't get to meet in person out of Covid distancing rules, you'll hear him mention place names that are likely only familiar if you're in British Columbia. But it's not hard to figure out what he means; just in case you want to know, Victoria and Duncan are two large-ish cities joined by a road that goes over a low mountain pass that may have snow during the winter. Here we go with Todd Litman.

Todd, welcome to the show.

Thank you, Peter.

So, you're at ground zero of possibly the biggest poster child for artificial intelligence that we have today, autonomous vehicles. Now I know that's not the only thing that your institute does. So can you give us a brief introduction to what VTPI is all about?

Sure. I'm a policy analyst, which means that I address a wide range of issues, including the engineering and the physical design of transportation vehicles and facilities. But also issues like the regulations, pricing - I do a lot of work on pricing - the integration of different forms of transportation. So, for example, we know that it's the ease of connecting between different modes, the ease with which you could, for example, bicycle to a train station or a bus stop,

affects the degree that you'll use those modes. I also do a lot of work on related to land use development policy. So where things occur, and the affordability of housing and where that's located, the development densities, things like that, they all fit together. This is the key message of my work is that transportation land use development patterns are two sides of the same coin. So, if you want a particular transportation system, you want complimentary land use policies, and if you want particular development policies, you want complementary transportation policies. So, I work in the integration of all of those issues.

And what was that first got you looking at the autonomous vehicle sphere? I mean the overlaps appear obvious with what you were saying; but tell us a story about how that showed up for you initially, and then what led you to developing your research in that.

Sure. So, I'm curious about all the aspects of transportation, and I'm a bit of a technical geek myself. I have done my share of kind of engineering related issues and things like that. So, say six or seven years ago about 2015, there were very optimistic predictions of how quickly we were going to have a transportation system organized around autonomous vehicles and usually it's presented as shared autonomous vehicles, robotaxis. So, rather than owning your own car, you would... every time you wanted to go on a trip, you just call up, and this self-driving car would pull up in front of your home, and take you wherever you want to go and you'd step out and it would go on to the next customer. And, as you might recall, Peter, there were people who were predicting by 2020 nobody would own a car; that was the claim. I was a little skeptical and so I did the research. I have a somewhat different perspective from many of the people involved in these issues. A lot of people come to autonomous vehicle analysis from a technical perspective. They're engineers or venture capitalists and they're very enthusiastic about this technology. I'm more of a planner and economist. So, I ask a somewhat different set of questions I, you know, I'm interested in the basic question, what is the technology look like and how soon will it be available? And if you're familiar with the classic-S Curve, you know, which basically is the pattern of development for new technologies, virtually all new technologies go through a predictable cycle, beginning with a concept which gets developed, which goes into pilot stage and gets tested and at some point, it will achieve some degree of approval and with motor vehicles that's particularly true and then it goes into commercial, it becomes commercially available. So, at some point, you could go to a car dealership, and buy your self-driving car and then usually new technologies, especially vehicle technologies are initially somewhat unreliable and expensive, but then in the technology or you could say the commercial aspects of it, it develop and it becomes more diverse, so you get more types of the technology and they fit into new niches and eventually you get this very rapid growth phase and then at some point you reach some level of saturation and some point its technology usually peaks and then declines somewhat and gets replaced by the next technology. And this certainly applies to transportation. So, one of the fun things that I do is, I go back for my book, I should plug my book, 'New Mobilities'. I went back and I looked at the effects and particularly from an economic perspective. What are the impacts, the benefits and costs of new transportation technologies over the last century? And, I look at automobiles, I look at components of the automobile, so the automatic transmission, airbags, electric cars, all these new technologies go through a fairly predictable cycle and so we can look at autonomous vehicles and we can to some degree use that to predict how soon you're

going to be able to go to a dealer and buy a fully autonomous, that is a level four or level five autonomous vehicle. And, it will let's say drive you while you're sleeping, or will go pick up your mother-in-law, or take you to work and then return home, all those things, let's say that's the goal. And, we can start predicting how long it would take before those become technically feasible, and then affordable, and then available through the vehicle's fleets. And so that's part of my research was to use experience with previous vehicle technologies and apply those to project how soon you will be able to fire your chauffeur, knowing that your car will drive itself.

And what conclusion did you arrive at? The suspense is killing me.

This is the fun part of my work is, I asked not only how soon the technology will be available and affordable, but also what are the benefits and costs. But, looking first at this question, how soon will it be available? As I mentioned the optimistic predictions were that by 2020, everybody will be driving electric or autonomous vehicles, electric autonomous vehicles, and that most people wouldn't bother to even have a driver's license. Peter, what year is it?

Right.

How soon before it's 2020?

Well, for the last five years, the prediction of that has been always next year.

Yes. Okay, so now I'm not belittling the progress that's being made, their technical progress, so there are we're at the pilot project stage and you do have... for example the autopilot system that is functional. Now, to be honest, the Tesla autopilot is a level three. It is not even level four and certainly not level five and has caused a number of deaths already because that technology was deployed, I would argue, way too early and with not very accurate communication with the consumer. So, people were obviously using it in unsafe ways. So, we're currently at the... I would say the pilot projects stage and I optimistically, if the technical progress proceeds at, let's call it a normal rate, by the end of this decade, 2030, you might be able to go to a car dealer, and buy a level 4, autonomous-capable vehicle. It'll be fairly expensive. Basically if it follows the pattern of previous technologies, it'll initially be available on Mercedes Benzes and Cadillacs. The very high-end vehicles and it'll cost five to ten thousand dollars extra for all that additional hardware and require a subscription to these very sophisticated mapping systems and sometimes when you punch in a destination to the car, so you say, you know, I want to go from Victoria to... let's say Duncan or something like that. That maybe one out of every 20 times, it'll say, sorry, I can't go there because the weather's poor and we can't operate in snow or heavy rain.

And that's the level four as opposed to five...

That's the level four. Or it'll say; that's not on our high-quality mapping system, the special mapping system that you're subscribing to will, if it's, for example on a dirt road, and you punch in that destination, the car will say no, you can't go there. So, I suspect that by say 2030, you will be able to have level 4 cars that are commercially available, but they will not be mass market yet. They won't be the affordable, reliable option that will quickly dominate the market. Let me ask you this. What would you pay? Let's say an extra two or three thousand dollars a year for a car that can drive you, will provide autonomous capability, but let's say 5 or 10 percent of the time

will not be able to take you to your destination. So, you will still require a human driver available, it will not be able to drive to destinations fully autonomously. Would you be willing to pay the premium?

Of course we've paid a one-time premium for the Tesla full self-drive, which is currently instantiated as you said with the auto drive. But they have this FSD beta which appears to be a level higher. Well, some people characterize the auto drive as level 2 and the FSD beta as level 3. I've seen some of the videos but as you said there are a number of conclusions here, we really have to pick this apart a lot. As you intimated a lot of people looked at the possibility of full self-drive of autonomous vehicles, and went straight to level five, it's a car that can drive as well as if a person was driving it, and what are the implications of that, and then you have robotaxis and cars that can take blind people to the hospital and things like that. What they did was leap over a huge leap of faith to what we get there and I think the SAE didn't do us any favors by having five levels and saying well we're already at level two in some of these and therefore people go one, two... well, it can't be that far, right? When really it seems to me that there should be more like there's about a thousand levels between 3.0 and 4.0, most of which we have no idea what they are yet. So it seemed to me that a lot of the infrastructure that you would expect to go along with autonomous vehicles of any level didn't exist. I was stunned when I first got my Tesla that I could tell it to drive itself on just about any ordinary road. I thought that would be restricted to certain places where that had been certified. The regulatory bodies, have it seemed to me not caught up with this. Prior to 2015, the predictions were that people were saying well when we have autonomous vehicles, they'll be marked lanes, there'll be signs saying, you can do it here but not there. None of that exists, we're all just participating in this experiment where you can turn it on wherever you want. Have the regulatory bodies, the governments, the departments of transportation and so forth, are they just unable to stay up with the pace of development or are they just taking a wait-and-see attitude, what do you think?

Well, that's not my expertise. So, I only follow it, I don't lead on that type of analysis but what the evidence I've seen is that there have been crashes and fatalities, including some that are fatal and probably a lot more that are not getting any media coverage and I've... which indicates and when you look at the... let's say that the causes, what were the factors that led to those crashes, the technology is not ready for the use that it's being given. You know, the Tesla corporation, they have all these warnings: you do have to sit and pay attention to the road, and keep your hands on the steering wheel. But the truth of the matter is driving is a really boring activity, if you're going to pay extra for the autopilot features, you want to be able to use it, and that means at a minimum, take your eyes off the road and watch a television show on your screen, right next to your drive, your steering wheel and very likely you're going to do what some people have been doing, which is put your seat down and take a nap and that is one of the primary selling points for autonomous vehicles, is that, let's say you'll accept a 90-minute commute on the assumption that you're going to be able to sleep or get some work done. Okay?

Oh, yes.

Well...

I want to be able to get in the car at 10 P.M. and tell it, drive me to my next meeting, and go to sleep, and then wake up and maybe there'll be some place I can take a shower first.

Right.

The future is arriving unevenly. I don't know to what extent you've gotten into these areas, but there are for instance Waymo operating, apparently level four service in Phoenix. Auto-X operating apparently level four services in Shenzhen, China. You can see videos of people in the back seat of a vehicle, where no one in the driver's seat.

Sure.

Of course, the conditions are as good as it gets, they are freeways or surface streets that are as almost as good as freeways.

Exactly, so, for my, if you want to use a fancy term, my modeling, or my way of the method that I use to predict how these technologies are going to develop and enter the market. I would say we're at the pilot project stage, and so sure, there are some experiments going on, and as you point out they are limited experiments, they are certainly not profitable, so these companies are spending a lot of money testing out an idea. And, more importantly, they are gathering practical information. What is it really like? That's what a pilot project is all about, is to take the theory and apply that in real world conditions and so they're doing it, in Chandler, Arizona and a couple other places, and that's fine. But, as many of us have pointed out, there is a very large series of steps; there are many steps between doing a pilot project in a very controlled, limited scale, and being able to operate level four in many areas and then going to level five, there are many complications that are out there. Let me just ask you this; if you were programming, developing the software for autonomous cars in Australia, would you have to prepare for kangaroos?

Yes, the same way we have to prepare for deer.

Exactly. So, your autonomous car when it arrives in Australia would need to download a special component of the software. A special set of software to prepare for kangaroos and from what I've read, kangaroos are actually particularly difficult for autonomous vehicles to deal with because they can change direction very rapidly, and they're jumping around, unpredictable. Okay. So, when you drive, take your car, your self-driving car to Australia, it's going to download the kangaroo module. Is there any chance that there's going to be kangaroos in North America?

I think that's small enough that anyone could say that if one escaped from a zoo and you accidentally ran into it that that was an act of God.

Well, yeah, but if you were driving that car and you saw a kangaroo, you would probably have a sense of how to respond, where the self-driving car would not.

Right.

If there's even a small chance that there's going to be a kangaroo rash in British Columbia or in Texas or wherever you're driving, your car would probably need that little kangaroo response module, just in case. Now let me ask you this, since Peter as we discussed you have some children in your house, do children ever dress up in kangaroo costumes? Does that ever occur?

You're giving them ideas. Yes.

Yeah.

Halloween is going to be a really challenging time.

Exactly. So, is your kangaroo module going to have to have some code that's able to differentiate between a real kangaroo and a child dressed up as a kangaroo? Is that going to be part of it?

Well, I think you're getting into an important area here of the way that the training of these things is done which is that the people who train these things could say for any situation that you describe, either, oh we've already trained it on that, or, no problem to train it on that, we could do that. It's just that you could list many more situations than they have thought of or could ever think of.

Well, yes, and let me add the next stage. Do teenagers ever dress up as vampires and zombies?

It hasn't happened in this house yet, I'm hoping it won't but...

Well, there are zombie walks and other teenage events, and some of those, it's perfectly conceivable, that sometime a zombie walk, some young adult will dress up as a kangaroo vampire, they will be a vampire that eats other vampires, and they'll have a fake blood on their mouth. And if I was to warn you, say you're driving into the low, you know, downtown Victoria or something like that and I warn you, oh yeah, watch out for the zombie walk, where there are a bunch of young people dressed up in wild costumes like zombie kangaroos, you would understand that because you have one time been a foolish young person yourself, I assume, or very likely if you're a normal adult. Where a computer has no reference and so a computer would probably immediately code a foolish teenager dressed up as a zombie kangaroo as either a terrible threat or a traffic accident victim and so my point is simply that there are layers of complexity. So, according to some of the software engineers that I've heard from, modern jet planes require orders of magnitude more navigation code than, you know, what they had say a decade ago that pretty much every decade, you add that the aviation coding increases by say an order of magnitude. But, with surface vehicles automobiles, they start needing, at least one order of magnitude more code than any airplane. A jet airplane has far fewer decisions to make than an automobile because basically they're in the middle of nowhere, they're flying. I'm sure, you know, there's some decisions to be made and takeoff and landing and they have to be watching out for certain risks. But, the number of interactions that they have with other objects is orders and orders of magnitude fewer than what a typical car needs to be prepared for just driving around the block. Now this is getting a little off track because as I said I look at these issues from a planning and an economic perspective more than a design or a software coding perspective. But, I just want to warn you that there's a big difference at that last going from... let's say 90

percent capable; so, 90 percent of the destinations you code in, the car could safely reach; to go to 95 that are going to be a whole major effort. And going from 95 to 99 is going to be even more difficult. And going from 99 to 99.9 is going to be even more difficult because each of these introduces new categories of uncertainty and as a result, if somebody is predicting that we will have level five, afford, reliable and affordable by 2030, I would categorize them as being very optimistic; and it could be level 4 by 2030 and so you would buy this car and you would use it, you would use the self-driving capability when you're on the highway, when you're going say from Victoria to Duncan or Victoria to Nanaimo. But it would not be fully operational for driving around downtown.

Right and I think that, it's going to take some breakthroughs that we don't know how to make, because if I deconstruct what you were saying with the -- and this is definitely a first for this podcast -- zombie kangaroos. You're saying that the types of pattern that we can train neural networks on, not include the kinds of situations that we can as humans deconstruct, even though it takes a double take to go, wait a minute, I've not seen one of those before, I've got to take my brain off automatic, what is that, oh okay, even though I've never seen a zombie kangaroo before, I can tell that's something I shouldn't hit because of a person in there. And are we going to be able to make these training networks be able to generalize to that extent? That's the big question. So, it's like shared hallucination, it's not just a couple of car companies, they seem to *all* be saying "We're on the verge of doing this." Do you think and -- feel free to just advance your personal opinion -- that we're on the verge of a giant disillusionment of a huge shakeout in the industry. If it's going to take another nine years then a whole lot of people are going to run out of money.

Well, I don't predict those kinds of things. What I can say is that level four is perfectly feasible, and I could accept a prediction that by 2030, that you would be able to drive your car to the highway on map and let it take you from there and that will be very useful for things like public transportation buses, and for freight transport trucks.

That's the end of part 1 of the interview; this is a two-parter because we had just so much to talk about. And I think one thing that's already getting fleshed out is the realization that the self-driving revolution that many people have been pushing—and we all know some prominent names in that respect—is not about to arrive in the way that has been predicted, with vehicles in all situations empty of human drivers. We have to carefully discriminate just where and under what circumstances autonomous vehicles will be capable of working. Clearly, policymakers have not yet caught up with the technology, and Todd's job is to help them do that.

In today's news ripped from the headlines about AI, and picking from the target-rich environment of news about autonomous vehicles, Germany has adopted legislation that will allow driverless vehicles on public roads by 2022, laying out a path for companies to deploy robotaxis and delivery services in the country at scale. While autonomous testing is currently permitted in Germany, this would allow operations of driverless vehicles without a human safety operator behind the wheel.

The bill, which passed the Bundestag, Germany's lower house of parliament, on May 21, and the upper chamber of parliament, or the Bundesrat, on May 28, specifically looks at vehicles with Level 4

autonomy. Germany expects some AV use cases to start operating in 2022. Overall, this represents a legal framework for deployments and operation of only the simplest AV use cases considered Mobility-as-a-Service (MaaS). Personal AVs are not currently included in the regulation. “In the future, autonomous vehicles should be able to drive nationwide without a physically present driver in specified operating areas of public road traffic in regular operation,” reads the legislation. “According to the Federal Government, further steps must be taken to introduce corresponding systems into regular operation so that the potential of these technologies can be exploited and society can participate in them.” This does put Germany ahead of other countries in this type of legislation, and I hope from listening to Todd that you’re getting an idea of what context to put it in and how limited you can expect the vehicles to be, because the average press release would be happy to have you thinking in terms of cars without drivers hitting the street outside your house any day now.

Next week, we’ll conclude the interview with Todd, when we’ll get into the commercial environment, i.e., trucking, and infrastructure for smart vehicles, how those aspects are developed, and how policy is likely to evaluate the role of self-driving vehicles versus other choices for transportation planning. That’s next week on *AI and You*.

Until then, remember: no matter how much computers learn how to do, it’s how we come together as *humans* that matters.

<http://aiandyou.net>