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Preventing a collision with the future

AUTONOMOUS VEHICLES INVOLVED IN ACCIDENTS PRESENT MYRIAD LIABILITY CONSIDERATIONS

"What do people expect? It's a computer; they crash all the time."

That rueful observation (and perhaps unintentional pun) was just one of a tsunami of heated comments flooding social media in response to an Instagram post describing a 2019 crash that killed two people in a Honda Civic in Gardena. The other vehicle involved in the crash was a Tesla Model S, operating on "Autopilot" at the time it careened through a red light at 74 mph, leaving the Honda's occupants, a couple on their first date, dead and the Tesla's driver and passenger hospitalized.

Most posters were suspicious of or outraged over this technology, but social-media users aren't the only ones on uncertain ground. Cognizant of the confusion and conflict that continue to swirl about its development, use, and contemplated advantages versus risks, legal scholars are struggling to come to terms with the impending disruption of the current legal system that will accompany the arrival of autonomous vehicles ("AVs") and pondering how it should best adapt.

In the meantime, without clear federal or state legislation or industry regulation to guide them, a lack of caselaw for precedent, and limited understanding of the complex technology behind these vehicles, courts will be forced to improvise rulings on accident liability on a case-by-case basis. Although AV technology is widely acknowledged as offering vast potential increases in safety and lives saved, the transition to its use remains rocky. One of the most glaring issues to be addressed is legal-liability modification. When humans become merely passengers in their own vehicles, who – or what – should be responsible for the losses these new "drivers" incur?

Ready or not, here they come

The car: We can't live without it, but sometimes we can't live with it, either. In fact, the CDC reports that 1.35 million people are killed on roadways globally each year, making crash injuries the eighth leading cause of death for all age groups (2020). Perhaps not surprisingly, the NHTSA reports that 94% of crashes are attributable to human error (2015).

Unlike their human counterparts, AVs never become distracted, drunk, tired, break traffic laws, or engage in road rage. Also, they boast technology that reacts faster than a human driver's reflexes as well as 360-degree perception.

Despite their superior credentials, computers are not infallible and accidents are inevitable. Moreover, regardless of AV performance, accidents unrelated to driver responsibility or mechanical or software-related defects will still occur due to unsafe road conditions, faulty or unpredictable pedestrian behavior, uncontrollable natural conditions, wireless-connection failures that impact communication with other vehicles or third-party control hubs, or cybersecurity breaches. How will traditional tort principles of driver fault adapt to roadways populated by "driverless" vehicles? Although there are no definitive answers, legal scholarship has noted key issues, which will influence how the current legal system will adjust to this inevitable paradigm shift.

State of the art and projected timeline

Despite its complexity, AVs' sophisticated hardware is generally recognized as sufficiently developed at the present time to allow deployment. Contemplated changes to transportation infrastructure to accommodate AV adoption, along with development of wireless technology necessary for the cooperative operation of AVs and oversight by external third-party agencies (vehicle-to-vehicle, or "V2V," and vehicle-to-infrastructure, or "V2I," communication) remain in progress.

The greatest remaining obstacle, however – and one of the most important challenges for liability assessment – is working out the finer details of software technology that analyzes and interprets the data provided by hardware to make independent driving decisions in a manner analogous to a human driver.

Driving's sheer complexity and ever-changing circumstances preclude AVs from operating pursuant to specific "if-then" coding rules. Instead, programming must rely on responses developed through "machine learning," a decision-making system that results from multi-millions of iterations of data obtained over millions of miles of testing until the computer can independently "learn" the appropriate response, much in the way that novice human drivers learn from accumulated experience.

Adding to the overall delay is the lack of comprehensive AV-specific regulation at either the federal or state level and the uncertainty of potential federal preemption effects. As of now, no fully autonomous vehicles are commercially available; the partially autonomous vehicles on roadways today incorporate various driver-assistance features but cannot operate solely on their own, only briefly allowing a human driver to cede operational responsibilities while still requiring them to constantly remain alert and ready to take over full control.

What is an "autonomous vehicle"?

AV capabilities vary greatly, ranging from minimal driver assistance to full driving capabilities. To establish a normative standard for rating levels of automation, the Society of Automotive Engineers created an industry-wide accepted set of criteria known as the "SAE Standard J3016" in 2014. This comprehensive table categorizes vehicle autonomy into six distinct levels: "0" (no automation); "1" (driver assistance); "2" (partial automation); "3" (conditional automation); "4" (high automation); and "5" (fully autonomous driving system). At Levels 0-2, the human driver primarily monitors the driving environment. The

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automated driving system is capable of controlling decision-making and vehicle control at Levels 3-5, with higher automation levels able to operate all driving functions without any human interaction.

For purposes of this discussion, the term "autonomous vehicle" or "AV" shall refer to any vehicle (including partially autonomous vehicles) that incorporates some level of driver-assistance technology, unless otherwise specifically noted ("fully autonomous vehicle(s)" or "fully AV").

Who (or what) is a "driver" or "operator" – and is there a difference?

If there is no human driver, who (or what) is operating the vehicle? California Vehicle Code section 38750(4) defines the "operator" of an autonomous vehicle as "the person who is seated in the driver's seat, or, if there is no person in the driver's seat, causes the autonomous technology to engage." If human AV users eventually exert no control over the vehicle, they will merely be passengers, not "drivers"; arguably, manufacturers or software designers would be the operators who "(cause) the autonomous technology to engage." Legislation should clearly define this term to clarify AV tort obligations.

Liability as a function of autonomy, privacy, level of automation and adoption

Four critical factors will impact liability: autonomy, privacy, level of automation in use, and interaction between human and computer-based drivers.

Autonomy

For many, control over a powerful machine constitutes the essence and pleasure of driving. Even when their personal safety is involved, research has shown that approximately one-fourth of drivers currently choose to disable standard driver assistance features because they find them "annoying" or "distracting." (*Forbes*, July 2020.) Also, a human might choose to ignore or override a vehicle's alert to take control. Conversely, fully autonomous vehicles might not allow the user to engage automatic features at will or enable the vehicle to make its own decisions about where and how it chooses to travel. Pursuant to ethical norms coded into its software, an AV may opt for certain losses over others (the "trolley problem" analogy) or prioritize its user's safety over others'. The respective level of control held by the human versus that of the vehicle will impact liability considerations.

Privacy

AVs will be capable of amassing vast amounts of data with respect to their operation. This record can reveal numerous issues pertinent to an accident, such as the speed and position of vehicles or individuals involved, what vehicle systems were active at the time, whether and when the driver took over the vehicle's control and whether the vehicle requested them to do so, and how the vehicle interpreted and acted upon collected data.

Additional data may accrue from vehicles' inter-communication to coordinate their movements or with external infrastructure or third-party agencies. Privacy concerns include determination of the types of data permissible for collection, who owns the data, who should be allowed to access it, and how it should be maintained and protected. Privacy regulation will also weigh heavily in insurance-related liability settlements.

Level of automation

Level 0 vehicles are fully manually controlled; Level 5 vehicles are fully automated. At all interim levels (1-4), there is, at least under certain conditions, a hybrid mix of human driver and AV system functions, creating the potential for overlap and confusion. Issues of liability become most blurry at Level 3 handover/takeover transitions, where human and AV responsibility for control of the vehicle is most vaguely defined and sometimes shared. Clearly, the level of automation in use at and prior to any accident will be relevant in determining the tort duties of the vehicle's "operator": Who (or what) was in charge, at what point and at whose discretion?

Universal vs. partial adoption of fully autonomous vehicles

Unless and until regulation or industry practice makes fully automated usage exclusive and universal (no partially autonomous nor any purely manually controlled vehicles on public roadways, only fully autonomous vehicles), there will remain interaction between human and computer-based drivers, either directly between multiple vehicles or via dual responsibilities within a single partially autonomous vehicle, that complicates liability assessment. Human drivers may be lulled into "automation bias" that overestimates their own vehicle's capabilities or develop moral hazard, taking other AVs' commitment to safety for granted.

Current liability in AV-involved accidents

Since no fully autonomous vehicles are in general use today, accidents involving driverless vehicles may assign tort liability to the human driver of a partially autonomous vehicle, a traditional vehicle's human operator, and/or the manufacturer or designer of a partially autonomous vehicle, depending upon the accident's circumstances. Under California's comparative-negligence laws, accident fault may be divided between some combination of these parties for a total of 100%. A victim may be found to share some fault in causing the accident, but this does not necessarily preclude them from recovering partial damages. Liability is generally considered under principles of negligence, where the defendant(s) owed the plaintiff(s) a duty of care, breached that duty through negligence and, as a result thereof, caused the plaintiff(s) to suffer harm.

Cars with driver assistance AV technology on the road today are required under California Vehicle Code section 38750(1c) to have a safety alert system that notifies the operator of any detection of fault in the vehicle's technology. The human

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operator must also be ready to take full control of the vehicle at all times when the autonomous mode is engaged, including use of the brake, accelerator pedal or steering wheel. If, in the event of an emergency, they fail to do so, or if they do something after assuming control that causes an accident, they may be found at fault.

If a driver of a traditional vehicle is involved in an accident with an AV and is found to have been negligent in breaching their duty of reasonable care to other vehicles, pedestrians, or obstacles, or in violating traffic laws, they may be found at fault even if the other vehicle involved was in self-driving mode.

The company behind an AV involved in an accident may be strictly liable for damages pursuant to California products-liability laws, which state that anyone who designs, manufactures, or sells a defective product or fails to provide proper warnings for its foreseeable use will be held liable if the product was dangerous and caused the accident (whether negligence was involved).

Consideration of liability in an AV-populated world is essentially a theoretical exercise at present. This discussion shall offer limited summary and synthesis of various legal scholarship on suggested liability frameworks.

Products liability

As vehicles advance toward full autonomy, current tort principles of human driver fault will become increasingly (and at some point, completely) irrelevant, shifting emphasis toward manufacturers, software designers, and suppliers for hardware defects or insufficient testing, unreasonable or deficient design choices, or inadequate warnings or faulty representations. A strict products liability system appears most likely, at least for a "grace period" until AV deployment becomes more mainstream, vehicles attain Level 5 automation, and accidents become less frequent and severe.

Many argue against adopting a products-liability scheme because it would impede innovation and deprive society of life-saving AV technology due to manufacturers' fear of high liability risk. Others reason, however, that heightened litigation risk will motivate manufacturers and developers to improve vehicle safety pursuant to consumer demand in order to remain competitive within the market.

Also, given the popularity of these vehicles and their sales potential, it is unlikely that manufacturers will resist development, instead passing their costs on to consumers in the form of higher sales prices. (See generally Gurney, J. K. (2013). *Sue my car not me: Products liability and accidents involving autonomous vehicles*. U. Ill. JL Tech. & Pol'y, 247.)

Product liability for manufacturers/developers could be either strict or based on negligence. Successful negligence claims would require proof that a manufacturer violated its duty to provide products that, when used in reasonably foreseeable ways, would be safe for consumers, and may include a claim for breach of warranty (expressed or implied) or misrepresentation of facts. Strict liability would hold that manufacturers would be liable even if they took reasonable precautions to prevent harm caused by a product defect and whether or not they had a contractual relationship with the plaintiff.

Defect in manufacture or design

All products-liability claims would require that there was a defect in either manufacturing, design, or failures to warn of hidden risks or adequately instruct consumers in the product's safe use. As with current products-liability claims, manufacturers would presumably not be held liable for an owner's lack of maintenance or alterations made to the vehicle post-sale.

Manufacturing-defect claims might prove the least problematic; plaintiffs would simply have to prove that parts of the vehicle, such as sensors or cameras, did not work as promised. The malfunction doctrine variation would allow a plaintiff to claim a manufacturing defect without having to specifically show how it was defective.

Software-design defects may prove more problematic. The traditional "consumer expectations" test for design defects is generally shunned for AVs because, due to their novelty and complex technology, it will be difficult for courts to determine what consumers may reasonably expect – with concern that many may expect total accident avoidance. The "risk-utility" test has thus been embraced under section 2(b) of the Third Restatement of Torts as the proper test for design defects to determine if the safety benefits to a user would have outweighed the costs for the seller to use a reasonable and available alternative design. However, a plaintiff would need an expert witness to describe how an algorithm could have been coded in a superior way and prevented even a minor accident.

The "black box problem"

Moreover, because courts will have difficulty understanding the vehicle's reasoning at the time of an accident (referred to as the "black box problem"), it may be difficult to ascribe liability when it is unclear whether the car was acting as a result of its original programming, a defect in its design, in response to its environment, or some other variable based upon its own evolved and humanly inscrutable artificial thought. Here, neither human error nor development defect can be easily pinpointed. Thus, it may be both difficult and prohibitively expensive (except in cases involving substantial loss thresholds) to bring design defect claims.

Failure to warn

Failure-to-warn claims may also pose difficulty. The first part – informing buyers of "hidden dangers" – may include, for example, advising them of situations where the technology will not perform properly, such as areas where it cannot properly receive necessary wireless signals. The second part involves instructing consumers on safe use of the AV. Due to the new technology's unfamiliarity and complexity, drivers may experience extensive confusion and, at least until fully autonomous vehicles are

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in universal use, will still participate to some extent in the driving process. Hence, a simple instruction manual may be insufficient, and manufacturers may need more creative options such as instructional videos or usage instruction classes.

Warranty claim or advertising bluster?

Manufacturers will also have to protect against breach-of-warranty claims. Advertising necessary to bolster consumer confidence could overstate an AV's trustworthiness and be construed as misleading (consider, for example, partially automated driving systems marketed under names such as Tesla's "Autopilot" or "Full Self-Driving") and pose risk for claims for breach of express warranty. Sellers might also be subject to claims for breach of implied warranty of merchantability if they failed to make certain that an AV was fit for its ordinary intended purposes, satisfying consumer and market expectations.

Potential cybersecurity breaches of data accumulated by the AV or from V2V or V2I wireless communications pose unique liability vulnerabilities. Failure to comply with applicable privacy standards may subject a manufacturer to liability for harm or loss under a cause of action for negligence stating that it violated its duty of reasonable care to a user.

Post-sales duties of the manufacturer

Post-sales duties will also reflect novel risks. Because AV software will continue to improve after subsequent vehicle testing, manufacturers will be obligated to consistently track and quickly upgrade their vehicles' algorithms post-sale while grappling with how to test it first. Even more perplexing may be issues of post-sale liability for algorithmic changes that occur due to the vehicle's independent and ongoing "machine learning" process.

Traditional products-liability defenses will also be impacted by autonomous technology. Comparative-negligence standards will shift with no human driver. Misuse may apply if users purposefully interfere with vehicle parts or modify their vehicles post-sale; however, if misuse is deemed to be "foreseeable" due to vehicle design or operation that facilitates driver over-reliance on the technology (even if unintended), it might not preclude determination of defect. (NHTSA, June, 2022.)

Manufacturers might claim state-of-the-art under a risk-utility test for design defect if safer designs were not technologically available at the time. Finally, AV passengers might be considered to have assumed the risk of this technology because it might be impossible to identify a "defect" when no one can say for sure what the vehicle was thinking at the time of the accident; although assumption of risk might be feasible in early cases of AV litigation, however, it would be more difficult once tested technology becomes mainstream.

Although products liability intuitively appears the most appropriate regime with respect to AVs, it may be an inefficient system. Expert-witness involvement and machine learning pose especially significant challenges. In response, legal scholars have posited alternative models to minimize disruption of victim compensation while maximizing the social benefits of AV deployment.

Suggested alternative liability regimes

Agency law

Some have suggested imbuing AVs with "legal personhood" status when full vehicle autonomy is realized. Under this scenario, tort claims could be considered through the lens of agency law. As the "technological agent" of either their owner or their manufacturer (depending upon capacity), AVs would be considered separate legal entities with rights and responsibilities and able to be sued, much as corporations are responsible for the actions of the humans behind them. Below are two possible scenarios in which an AV might serve in an agency capacity. (See generally Boeglin, J. (2015). *The costs of self-driving cars: Reconciling freedom and privacy with tort liability in autonomous vehicle regulation*. Yale JL & Tech., 17, 171.)

Chauffeur

If a human user maintains maximum autonomy over AV operation and informational privacy, the AV may resemble their agent in a position similar to a chauffeur. In this role, the user dictates their destination and preferred route and can resume control at will. Specifically, the AV would not report to anyone other than the owner (its superior), either because it chooses not to or is unable to do so. Under common law tort principles, the doctrine of respondeat superior assigns liability for chauffeur fault occurring in the course of their employment to their superior.

Taxi driver

If an AV user has no control over the vehicle's operation and the AV communicates solely with its dispatcher (here, its manufacturer), it may be conceived as operating in a capacity analogous to a "taxi driver." Just as a taxi is considered the agent of the dispatching agency responsible for providing the driver, not the paying passenger, liability for an AV's actions in this capacity might be more logically assigned to the manufacturer. Just as a taxi company's fleet of vehicles are interchangeable due to absence of individual driver profiles, mandated implementation of AV technology could standardize AV behavior and create the potential for vehicle uniformity from the same manufacturer, inviting a proportional share liability framework.

Canine law

Some scholars have suggested that AVs are functionally similar to dogs; although they are able to act independently and without human control, and can cause personal injury or property damage, they are considered the property of an owner. In this scenario, an AV's owner would face liability under a strict liability tort scheme similar to "canine law," drawing upon the doctrine of chattels (which assigns liability due to ownership rather than human involvement) to hold animal owners strictly liable for damages caused by their

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pets. Since AVs are predicted to severely decrease accident frequency and severity, actual owner risk is low and manageable through insurance protections. (See generally Duffy, S. H., & Hopkins, J. P. (2013). *Sit, stay, drive: The future of autonomous car liability*. SMU Sci. & Tech. L. Rev., 16, 453.)

Collective liability

Collective liability eliminates tort-based concepts of individual fault and the need to identify particular defendants alleged to have caused a plaintiff's injuries, instead diffusing liability across a shared market or even an entire industry. Collective schemes emphasize incentivizing broad-based safety improvements and more efficiently allocating costs of victim compensation.

Market-share liability

This doctrine within products liability law bypasses assigning individual fault in favor of collective liability of a group of manufacturers for sufficiently fungible products that cause injury according to the respective market share of each. (See *Sindell v Abbott Laboratories* (1980) 607 Cal.3d. 924.) Ultimately, AVs will arguably become fungible industry- wide as V2V and V2I technology necessitate inter-communication, coordination, and sharing of authority between vehicles, infrastructure, and third-party agencies.

Under this regime, each manufacturer would pay into the system a sum calculated upon the proportion of accident costs which involved its vehicles without assessment of fault in any individual claim. A market-share regime would reduce individual manufacturers' liability exposure but, because manufacturers would not receive any liability relief due to individual efforts to maximize product safety, such a system could reduce incentives for increasing AV safety rates overall, especially for manufacturers with a small market share.

Enterprise liability

Enterprise theory eschews individual fault in favor of holding an entire industry jointly liable as a single enterprise shared by those who benefit from it; wrongdoing is perceived not as individual negligence, but as involvement in an activity or industry practices that endanger the public welfare, suggesting a strict products liability-based regime. Enterprise liability broadly includes separate entities throughout the chain of commerce (including manufacturers, component part suppliers, and sellers). As AV accidents can occur even without a traceable defect, and since computers cannot be "negligent" under common law, strict liability borne by an entire industry that assumes the "characteristic risks" of AV development may be more appropriate than either a traditional strict products liability or negligence- based system, especially when fully autonomous vehicles alone populate roadways.

Conclusion

On May 19, 2022, a judge ruled that the driver of the Tesla involved in the 2019 Gardena accident must stand trial for the deadly crash, believed to be the first U.S. felony criminal prosecution against an operator relying upon a partially automated driving system and a stunning decision that sets landmark legal precedent.

Had the defendant been operating a traditional vehicle, it is likely he would have been charged with the civil tort of negligence; it remains to be seen whether Tesla will be implicated for its role in providing a dangerous technology. The ruling suggests that courts may profoundly shift legal liability interpretation for AVs in ways both unexpected and far-reaching moving forward.

At the present time, law and regulation lag behind the technology, and early AV-related decisions may affect later judicial interpretation. The main challenge now – before AVs are widely adopted – is, therefore, creating clear and coherent federal and state regulation and legislation so that both consumers and manufacturers have definite standards to which to adhere. Once a basic roadmap is in place, established industry standards and experience gained through mainstream adoption will yield the most suitable legal liability regime for AVs as they progress towards full autonomy and universal use.

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