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How might an AI Model affect vehicle accident liability?

David McCombs, Eugene Goryunov, and Calmann Clements of Haynes & Boone explore some of the challenges that are associated with determining whether an autonomous vehicle feature – that relies on AI models – is defective for the purpose of determining liability.

The automobile has been around for well over a century. As such, society has in place a legal framework for determining liability in case of an accident. When an automobile is involved in an accident, the law determines whether that accident was the result of a negligent driver or a defective automobile and then assigns liability as appropriate.

Manufacturers have a duty to exercise reasonable care when designing their automobiles to make them safe when used as intended. But even if a manufacturer exercises reasonable care, they may still be strictly liable for manufacturing defects or design defects. Manufacturing or design defects may occur anywhere along the production chain. For example, a defective brake caliper may cause failure of the braking system and lead to a vehicle crash.

But what if an accident involves an autonomous vehicle and the cause of an accident might be a defective autonomous feature, such as auto-steering? While determining whether a brake caliper is defective may be a relatively straightforward task, determining whether the software of an autonomous vehicle is defective can be quite difficult. This is particularly so if the autonomous vehicle feature is one that relies on Artificial Intelligence (AI) models.

The authors explore some of the challenges that are associated with determining whether an autonomous vehicle feature – that relies on AI models – is defective for the purpose of determining liability.

Autonomous vehicle features

Autonomous vehicle features have become more widely available. These features range from the low-level, such as collision avoidance systems, to more complex ones such as highway steering and even active navigation. Autonomy in vehicles is not a one-size-fits-all situation. Indeed, the Society of Automotive Engineers (SAE) and the US Department of Transportation defines various levels of vehicle autonomy as follows:

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Level	Description
0	System provides momentary driving assistance, like warnings and alerts, or emergency safety interventions while driver remains fully engaged and attentive.
1	System provides continuous assistance with either acceleration/braking OR steering, while driver remains fully engaged and attentive.
2	System provides continuous assistance with both acceleration/braking AND steering, while driver remains fully engaged and attentive.
3	System actively performs driving tasks while driver remains available to take over.
4	System is fully responsible for driving tasks within limited service areas while occupants act only as passengers and do not need to be engaged.
5	System is fully responsible for driving tasks while occupants act only as passengers and do not need to be engaged.

Examples of level 0 autonomy include automatic emergency braking, forward collision warning, and lane departure warning. Examples of level 1 autonomy include lane-keeping assist

and cruise control. Examples of Level 2 autonomy include highway steering systems such as Tesla's autopilot, GM's Super Cruise, Ford's Blue Cruise, and so on.

Lower-level autonomous features may not rely on AI models—they may instead rely on simple computations. For example, a forward collision warning system may perform a simple calculation involving the vehicle's speed and the distance between the vehicle and an object in front. If that calculation warrants warning the driver, the system does so.

An autonomous vehicle feature that relies on AI models is more complex because it is designed to make decisions in situations it has never seen. For example, a highway steering feature must be aware of the roadway, lane markings, and surrounding traffic to steer the vehicle and change lanes appropriately. There is no simple formula for doing so. Every time a vehicle navigates traffic it is doing so under a unique set of circumstances the vehicle has never seen. To handle these new and unique circumstances, the highway steering feature relies on an AI model.

AI model production

AI models are created using a process that involves data collection, data pre-processing, model design, model training, and deployment. We explore these steps below with respect to highway steering as an example.

1. **Data collection:**
Machine learning algorithms require a set of data to learn from, i.e., training data. In the case of highway steering, data related to what the vehicle observes, as well as the actions performed by the vehicle, is collected from vehicle sensors and systems as the vehicle is driven in real-world conditions. Data as to what the vehicle observes may be obtained from various sensors such as cameras, RADAR systems, LIDAR systems, GPS systems, and ultrasonic sensor systems. Data as to what actions the driver, and therefore the vehicle, takes may be collected from the vehicle's internal systems that monitor acceleration, braking, and steering.

2. **Data preprocessing:**
The vehicle data, after being collected, must be formatted appropriately. When the data is first collected, it is often unstructured. The data is thus converted into a format that is suitable for being input into a machine learning model.

3. **Model selection and design:**
There are various types of machine learning models available. These models

> **If the original set of data used to train the AI model is defective, it may lead to defects in the operations of the AI model itself.**

Résumés

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may include decision trees, neural networks, support vector machines, and more. The model is designed for a specific purpose such as for highway steering.

4. **Training the model:**
The formatted data is then fed into the model. The model then develops algorithms that give a certain type of input (what the vehicle observes) that will produce a certain type of output (how to drive the vehicle). The developed algorithms can then be evaluated and fine-tuned.

5. **Deployment:**
Once the AI model is trained and fine-tuned, it can be used to make predictions on new, real-world real-time collected data. Specifically, it is put into use to perform its intended function – in this case, highway steering. The trained AI model can be further monitored and evaluated while it is being utilized.

Where can defects occur?

Like a braking system that fails due to a faulty brake caliper, an autonomous vehicle system may fail due to a fault during any phase of the AI model creation process. For example, an AI model is only as good as the data it is provided. If the original set of data used to train the AI model is defective, it may lead to defects in the operations of the AI model itself. There may be several ways in which the data is defective: it may be faulty because the sensors used to collect the data may have been faulty, there may be a defect in the way the data is structured, or faulty sorting or labeling processes could also lead to data defects.

Defects may also occur based on the type of drivers from whom the data is collected. If the training data is collected from careless drivers, then the autonomous vehicle feature based on that AI model may similarly operate carelessly. This defect may be exacerbated if the model is being updated based on real-world scenarios generated by careless or unsafe drivers.

Defects may also occur if the AI model is trained using data from a narrow set of circumstances but applied in different circumstances. For example, if the data is largely collected under clear and dry conditions, the resulting AI model may not work effectively in wet or nighttime conditions. If the data is collected from drivers from a narrowly selected geographical region, then the resulting AI model may not be effective in other geographical regions that have different driving rules, etiquette, customs, or tendencies.

In short, the effectiveness and safety of an autonomous vehicle feature, such as highway driving, is largely dependent upon the data on which the underlying AI model is based. But whether the autonomous vehicle feature can be considered "defective" is a difficult question.

> **These frameworks are robust enough to handle new and complicated technologies such as AI model-based autonomous vehicle features.**

Possible solutions

How must the current legal framework change to account for defects in AI models?

Some might argue that no change is needed because the existing tort and contract laws are sufficient to address these concerns. There is already a well-established and heavily vetted negligence and product liability framework as well. These frameworks are robust enough to handle new and complicated technologies such as AI model-based autonomous vehicle features.

Others might argue that a risk-sharing mechanism, such as insurance or a compensation fund, may be needed. In this scenario, all parties involved (vehicle manufacturers, part manufacturers, and AI model developers) would all contribute to the risk pool. When an accident involving an autonomous vehicle feature occurs, the victims would be compensated, at least in part, from the risk pool. One only needs to determine whether the accident was caused by the autonomous vehicle feature. There would be no need to determine whether the autonomous vehicle feature is actually defective or not.

As AI-based autonomous vehicle features continue to develop, so should our solution to the liability challenge. The ultimate solution should be designed to fairly assign liability without allocating excessive burden on AI model developers.

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