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## How Cutting-Edge AI Technologies Are Being Used to Prevent Truck Accidents

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In the modern world, AI and advanced automation are reliable co-pilots for preventing accidents, filling capability gaps when drivers are impaired or have their hands full in crisis scenarios. And as the technology evolves, even more intelligent functionality emerges.

In the future, self-driving trucks could nearly eliminate many types of **collisions caused by human errors**. And while fully autonomous commercial vehicles are still years away from totally eliminating truck accidents, today's AI-driven active safety systems are vastly reducing truck crashes.

Here is what you should know.

### Collision Avoidance Systems

These systems all leverage AI and machine learning technology. The onboard systems are powered by neural networks that have been trained on millions of diverse traffic scenarios. And the systems learn from experience and become better at accurately detecting potential accidents over time.

Studies have found that advanced **emergency braking can lower rear-end truck crashes** by over 40%. And so more widespread adoption of the latest collision avoidance trucking technology could prevent thousands of accidents each year.

Also, the capabilities of these systems are continuing to advance. Developers are working on "cooperative collision avoidance systems" that allow trucks to directly share sensor data wirelessly with one another. This would enable even earlier detection and prevention of possible crashes.

### A Breakdown of Onboard Crash Avoidance Capabilities

Even with exceptional preventative measures, dangerous road situations can still emerge suddenly. Newer autonomous collision avoidance features are built to handle these split-second emergencies.

#### Automated Emergency Braking

Radar, lidar sensors, and cameras detect when a forward crash is imminent. Within milliseconds, the automated braking system can override driver actions to stop the truck before an impending impact.

This instant response is far faster than human reflexes could respond to applying the brakes. And so automated systems prevent or mitigate multiple types of accidents, like rear endings or run-off-road incidents.

### **Lane Departure Alerts**

Trucks drifting out of their driving lane are at risk for sideswipe accidents, road shoulder accidents, and head-on collisions.

Onboard computers continuously track lane markings and the truck's position within them. When an unintentional lane deviation is detected without the proper turn signal, an audible or vibrating alert makes the driver aware. This allows them to self-correct into the proper lane to avoid potential mishaps.

### **Rollover Warnings**

Top heavy trucks hauling shifting loads have a greater rollover tendency when cornering or maneuvering evasively.

Sophisticated on-board systems that tap into acceleration sensors and load monitoring equipment help to reduce this tendency. They do this by issuing instant feedback to help identify risky maneuvers before centrifugal forces escalate beyond the point of no return.

In short, visual and audible warnings give drivers precious seconds to reduce speed and adjust steering to regain proper stability and prevent truck accidents. And given that **truck wrecks can cause severe injuries**, this is something that goes a long way towards making everyone on the road significantly safer.

## **Driver Fatigue & Distraction Monitoring**

Another major avenue of AI innovation for truck safety is in-cab driver monitoring systems aimed at alerting fatigued or distracted truck drivers.

Drowsy truckers cause over 30% of all truck crashes, while distracted driving also plays a major accident causation role. And so spotting dangerous behavior early is key to preventing these crashes.

In-cab camera and sensor AI systems now provide:

- Drowsiness detection – Tracks eyelid movements, facial expressions, driving performance metrics, and other indicators to detect fatigue
- Distraction alerts – Monitors head/eye movements to determine if the driver looks away from the road for a potentially unsafe period of time
- Driver pose analysis – Analyzes body position continuously to ensure drivers avoid dangerous slouching and remain properly seated

The alerts provided give truckers an opportunity to rest or refocus their attention on driving safely and avoiding accidents. Over time, the AI learns driver-specific patterns to improve alert accuracy and timeliness.

The real-world use of driver monitoring systems is continually showing great safety promise.

## Enhanced Truck Platooning

Look toward the future of trucking, and you may see multiple big rigs driving closely together on highways in tightly coordinated “platoons.” This emerging truck platooning concept aims to improve safety and fuel efficiency.

Here is how it works: the lead truck is driven manually by a human driver, but not the subsequent ones. These ones are controlled by AI.

This allows the following trucks to mirror the lead truck very closely – at displacements under 50 feet in some trials. And radar and other onboard sensors still provide backups to prevent collisions.

The tight coordination of movements enabled by AI alleviates risks from slower reaction times among human drivers of the following trucks. On the other hand, changes in speed or direction are initiated by the lead driver and instantaneously replicated by the autonomous follower trucks.

Early testing suggests truck platooning can reduce rear-end crashes by 40% or more compared to trucks driving independently. The enhanced visibility from shorter following distances also minimizes dangerous cut-ins by other motorists.

There are still challenges to address before wide-scale adoption, including updating regulations and confirming the reliability of the technology. But AI-powered truck platooning promises to amplify trucking safety once implemented.

## Additional Truck Safety AI Uses

The applications highlighted so far focus mostly on preventing crashes directly or addressing key accident causes like driver errors. However, AI can support several other facets of safety in the trucking industry as well:

### Enhanced Vehicle Maintenance

Mechanical defects are involved in many large truck crashes. Issues like faulty brake lines, malfunctioning steering, worn-out tires, cracked wheels, and problems with lights or turn signals can all precipitate wrecks.

IoT-connected sensors now enable continuous monitoring of critical truck parts. Real-time tracking of performance, temperatures, pressures, fluid levels, and other usage metrics allows abnormalities to be identified for preventative maintenance.

For example, pressure readers can detect air leaks or deficiencies in brake lines. Accelerometers identify vibrations signaling potential wheel bearing wear or unbalanced tires. And thermal imaging spots overheating in engines, pumps, fans, and other systems prone to breakdowns.

When thresholds are exceeded, automated alerts notify transportation managers so repairs can be quickly made before catastrophic failures happen on the road.

## Route Safety Rating

Various startups offer AI-powered apps that provide truck drivers with safety and hazard alerts specific to their routes. Factors like past crash data, steep inclines, and traffic levels are used to score route risk.

Access to such granular safety insights allows drivers to tailor their speed and take extra precautions in historically problematic road segments. As more trucks use the apps, shared hazard data improves preventative warnings.

## Cargo Loading Optimization

AI cargo load analysis systems leverage physics simulations and past sensor data to provide loading recommendations for optimal weight distribution and stability.

Poor truck load balance heightens rollover risk during tight turns or abrupt collision avoidance maneuvers. And so ensuring loads are within legal weight limits and evenly distributed supports overall safe handling.

## The Future of AI for Truck Safety

Trucking is estimated to see the fastest growth in AI adoption over the next decade compared to any industry. Based on the array of innovations already emerging, it is clear why – various forms of artificial intelligence address nearly all major accident risks facing truck drivers.

In the future, AI trucking safety applications will keep expanding. Currently, researchers are exploring new areas like noise-canceling cabins to reduce driver fatigue, and AI damage assessment tools for faster incident response. And continuous advancement of core technologies like computer vision, predictive analytics, and connectivity will make existing applications smarter and more effective.

Widespread deployment of AI to enhance safety is inevitable. The greatest open question is just how much the technology can transform the trucking risk profile and reduce the thousands of annual fatal truck accidents.

But make no mistake – artificial intelligence will play a foundational role in enabling safer trucks and saving lives.

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