

Advancing Road Safety

A Closer Look at Sightic's
Impairment Detection

Sightic | Technology | Impairment detection





Introduction

Road safety remains a critical issue worldwide, with alcohol-related accidents posing a significant threat to drivers and pedestrians alike. Sightic has developed an advanced AI-driven impairment detection system aimed at addressing this issue by identifying impaired drivers in real time using existing Driver Monitoring Systems (DMS).

Our technology leverages the world's largest naturalistic impaired driving data collection, positioning us at the forefront of alcohol impairment detection.



This document explores the capabilities of our system, its unique data-driven approach, real-world applications, and future developments, including the potential for pre-start scanning.





The Problem: Alcohol-Related Traffic Accidents

Alcohol-related traffic accidents are a leading cause of fatalities on the road. Traditional breathalyzer methods require physical stops and tests, which are not feasible for continuous monitoring. Sightic's solution continuously monitors a driver's behavior using AI-powered algorithms, identifying signs of impairment without requiring new hardware installations in vehicles.

Unlike other systems, our continuous monitoring begins detecting impairment at very low speeds, right as the vehicle starts moving. To further enhance safety, we also offer pre-start scanning, which assesses drivers before they start the vehicle, providing an additional layer of protection and potentially preventing impaired driving altogether.





The Solution: AI-Driven Impairment Detection

Data Collection & Process

Sightic's system processes data from in-vehicle cameras that are part of standard DMS setups. During controlled testing and simulation environments, we analyze key signals such as:

- **Eye tracking:** Monitoring the driver's eye movements and focus on the road.
- **Head movement:** Detecting unusual or erratic head movements.
- **Telemetry data:** Vehicle speed, GPS, and CAN-bus information, can be integrated to further improve the model's accuracy and performance.



This data is processed through our AI models, which have been trained on the world's largest impaired driving dataset, gathered from a combination of controlled environments and real-world driving scenarios in collaboration with key industry partners.



World's Largest Naturalistic Impaired Driving Data Collection

Sightic's defining feature is its extensive dataset of real-world impaired driving behavior, representing the world's largest collection of its kind. This dataset includes hundreds of drivers in high blood alcohol content scenarios, overcoming ethical and logistical challenges to ensure comprehensive and representative data across a wide variety of age, gender, and ethnic groups.

This unique dataset enables our AI models to learn from real-world impaired driving behaviors, resulting in highly accurate impairment detection across diverse scenarios.



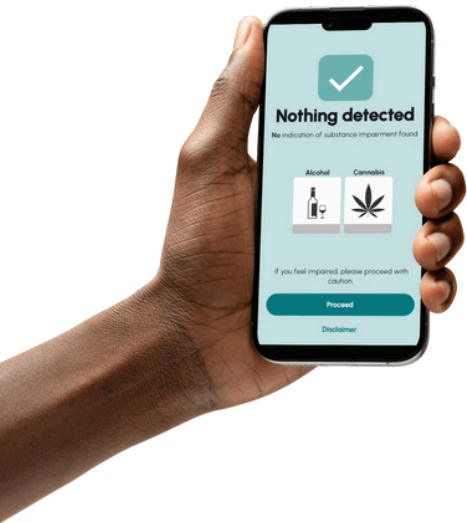


Pre-Test & Continuous Monitoring: Two Complementary Approaches

While our primary focus has been on continuous monitoring, we are now also developing a pre-start scan to complement this approach. Pre-start scanning enhances safety by evaluating drivers for substance impairment before they begin driving. This is a short (10-20 second) eye-tracking scan, similar to our existing smartphone app technology where the driver follows a moving dot on the car's console screen, and the system uses DMS cameras to detect impairment.

The benefit of this pre-start scan is that it can detect severe impairment before the vehicle is operational, further increasing safety by filling a gap left by continuous monitoring, which typically requires time to accumulate enough data for accurate detection.

Lessons from Smartphone App Scanning



Sightic has already developed a smartphone app application that uses a similar eye-tracking approach to detect substance impairment. In the app, users follow a moving dot, and the system analyzes eye and motion sensor data to determine impairment. Lessons learned from this smartphone app solution are helping shape the development of the pre-start scan in vehicles.

- **Sensor limitations:** The vehicle setting lacks some sensors, such as motion detectors, available in smartphone devices.
- **Screen positioning:** In a car, the screen is positioned on the console, which is not directly in front of the driver, complicating eye-tracking experiments.

Despite these challenges, our extensive knowledge and experience give us confidence that we will overcome these obstacles. We are refining this approach to ensure reliability and accuracy in the pre-start scan for vehicles.



AI & Machine Learning

Training the AI Models

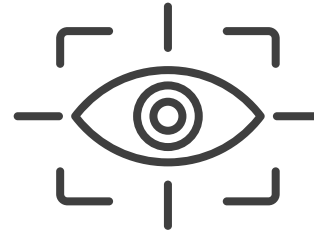
Our models are trained using vast amounts of data collected from both simulation environments and real-world driving conditions. The naturalistic intoxicated driving data plays a critical role in enabling our AI to distinguish between sober and impaired driving behaviors. By exposing the model to a wide variety of driving scenarios, we ensure that the system is capable of detecting impairment with high accuracy.



Pre-Test vs. Continuous Monitoring

The pre-start scan offers immediate intoxication detection before the vehicle begins moving, while continuous monitoring tracks the driver's condition during the journey. By integrating both methods, we can provide a robust solution to impairment detection.





Real-World Application & Integration



Sightic's system integrates seamlessly with existing DMS hardware, requiring no additional installations.

This makes it highly cost-effective for OEMs and fleet operators looking to enhance safety protocols while utilizing their current infrastructure. The pre-start scan can be easily implemented using current DMS cameras and console screens, allowing drivers to complete the test before starting the vehicle, with results provided within seconds. Once the vehicle is in motion, continuous impairment detection provides ongoing safety monitoring.

Ensuring Accuracy in Various Conditions

Our system has been designed to function reliably under various real-world driving conditions, providing consistent accuracy thanks to its integration with existing DMS setups:

- **Night Driving:** Infrared cameras detect eye movements in low-light settings.
- **Sunglasses and Obstructions:** The system tracks through non-IR blocking sunglasses and compensates for partial face obstructions.
- **Variable Lighting:** The system adapts to changing light conditions, such as tunnels or direct sunlight.



Challenges & Future Development

Scaling Real-World Data Collection

One of the biggest challenges in developing driver impairment detection technology is collecting data that accurately reflects real-world conditions. Simulator data plays a crucial role in our development process—not just as a substitute for real-world data, but as an essential tool for building foundational models and verifying which signals are most critical in detecting impairment. Simulator data allows us to safely gather data in scenarios that would be unethical in real life, such as simulating impaired driving in urban environments.

While simulator data is invaluable in building the groundwork for our AI models, it's also vital to verify and tune these models with real-world driving data. We collect impaired driving data from controlled track environments and further validate our models using naturalistic driving data from everyday traffic conditions. Although it is not possible to collect impaired data in real-world traffic, the simulated driving environments help bridge this gap, ensuring we capture realistic driving behaviors in safe, controlled settings.

Extremely Low False Positives

Minimizing false positives is a crucial focus of our ongoing development. The system already performs exceptionally well in distinguishing between sober and impaired drivers, and we are committed to reducing false positives even further. We understand how important this is to the industry, and through our continued efforts in collecting real-world data, we are confident that our system will achieve extremely low false positive rates. Our ongoing data collection and refinement efforts ensure our models can handle the complexities of diverse driving environments while maintaining accuracy.

Expanding Beyond Alcohol Detection

Our technology is not limited to detecting alcohol impairment. We have already developed solutions for detecting cannabis impairment through our existing smartphone app, and we know exactly which features correlate with impairment. This ready-to-use cannabis detection model will now be integrated into our vehicle-based system as we continue developing and enhancing our solutions for the automotive industry. Our ultimate goal is to create a broader system capable of identifying various forms of impairment, such as fatigue and drug use, ensuring that drivers are fit to operate their vehicles safely.



Sightic is committed to advancing driver impairment detection systems by leveraging non-intrusive technology integrated with existing driver monitoring systems. Utilizing the world's largest naturalistic intoxicated driving dataset, we deliver unparalleled accuracy in real-time impairment detection. Our focus is on enhancing road safety through continuous monitoring solutions and innovative pre-start scanning, addressing both current and future needs in the automotive industry. We aim to set a new standard for reliability and safety, offering seamless integration for OEMs and fleet operators alike.

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