



Interior Sensing AI

Extend the intelligence to the entire car

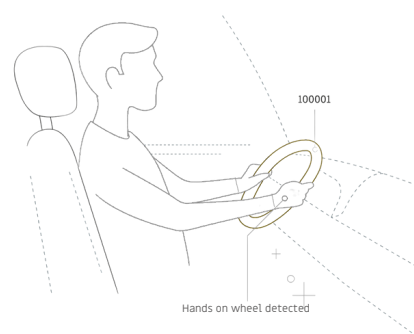
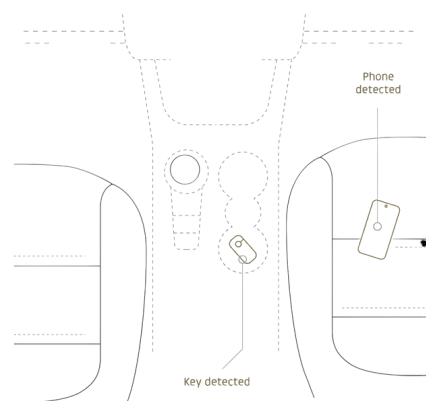
What is Interior Sensing?

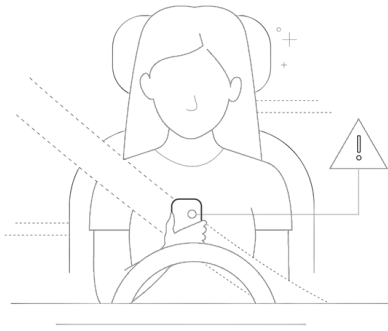
For years, cameras and sensors have been used to give cars a better idea of the road ahead. Interior Sensing turns those cameras and sensors inwards, combining driver monitoring with cabin monitoring to gain a deep, human-centric understanding of what is going on with the people inside the car.

Driver Monitoring and Interior Sensing: What's the Difference?

Just like a Driver Monitoring System (DMS), an Interior Sensing System is based on sensors and AI-based software, built with deep learning and massive amounts of real-world automotive data. But while driver monitoring systems are focused on the driver, Interior Sensing systems extend the intelligence to the entire cabin, capturing the entire car interior.

A combination of different AI algorithms analyzes the cabin to answer questions about who is in the car, what they're doing, what they're feeling and what objects are present.





Driver monitoring systems analyze the driver's head, face, and body posture as well as the objects they use in detail to measure:

Driver Distraction

Is the driver keeping their eyes and mind on the road or are they distracted by something?

Driver Drowsiness

Is the driver getting drowsy or falling asleep?

Face Recognition

Is the person sitting in the driver's seat a registered driver?

Object Detection

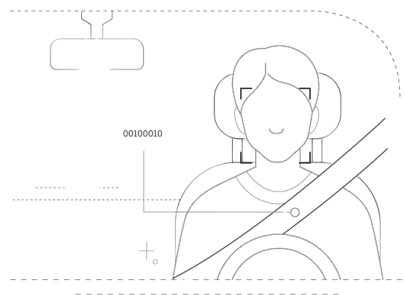
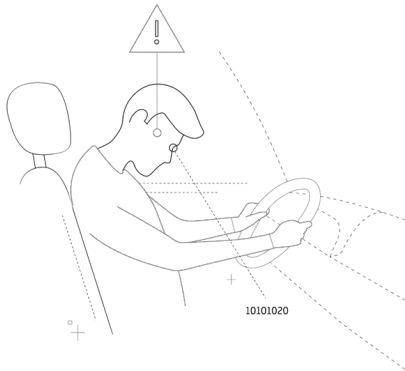
How is the driver interacting with objects present in the vehicle?

Activity Detection

What activities, including driving, is the driver engaged in?

Body Posture

How is the driver sitting and moving? Is the driver interacting with interfaces of the vehicle? Have they taken their hands off the steering wheel, are holding a device, or interacting with the infotainment?



Interior Sensing systems analyze the entire cabin, including the people and objects in it, in detail to measure:

Occupancy

How many people are in the cabin? Where are they sitting? Also includes seat position, seat belt detection and airbag deployment analysis.

Face Recognition

Recognizes registered drivers and passengers.

Driver and Passenger State

Detects drowsiness and distraction (advanced DMS).

Activity Detection

Detects cell phone usage, eating, drinking, smoking, or other activities.

Child Seat Detection or Child Left Behind

Are there any children present in the car? Have any children been left behind in a parked car?

Pet Detection

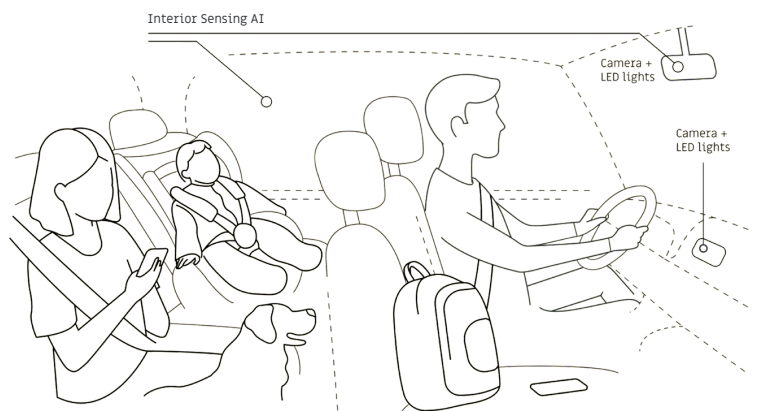
Are there any pets present in the car? Have any pets been left behind in a parked car?

Object Classification and Object Left Behind

Detects bags, cell phones and other objects. Determines whether an object has been left behind.

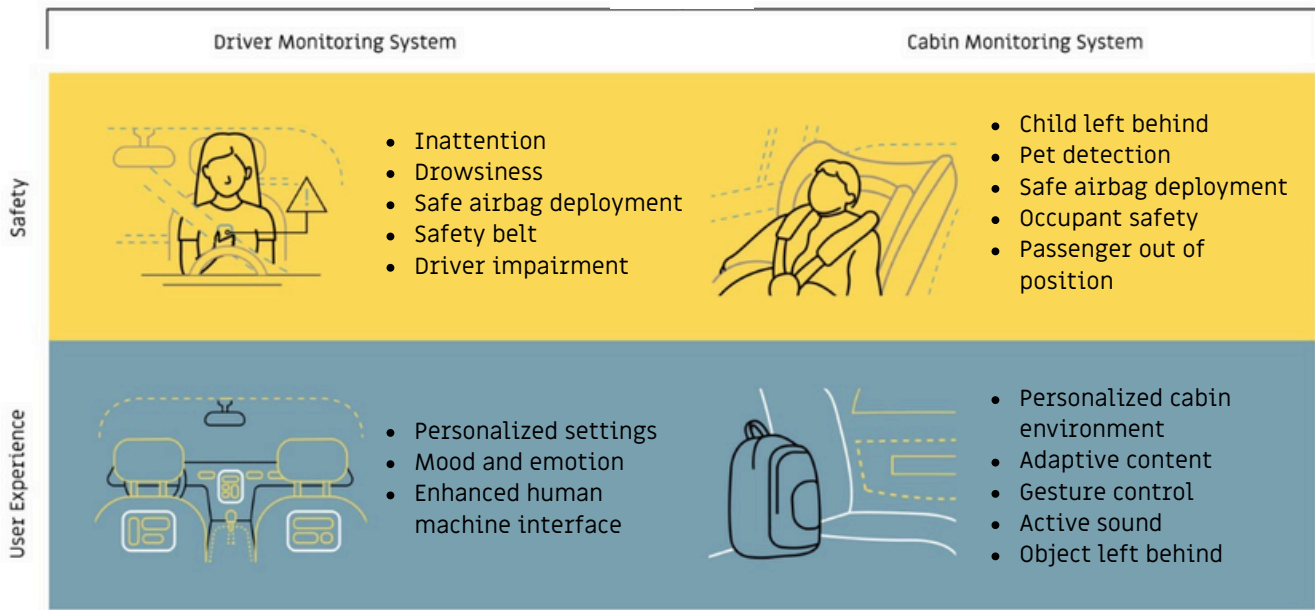
Facial Expression Analysis

How are people reacting to their environment and to content, such as music or video? Facial expression analysis helps the car understand the mood and behaviors of the people in the car.



Why Is Interior Sensing Important?

If a car has a better understanding of what goes on within the cabin, it can activate valuable functions based on the passengers' needs, whether that means providing the vehicle with the most advanced safety measures available or simply playing their favorite song at the right moment.



Safety

Interior Sensing technology is already becoming a safety essential in future cars by using relatively simple measures – but at the exact right time.

By making DMS mandatory in new cars, legislators all over the world have already realized the importance of analyzing not just the state of the car, but the people within in it.

Influential organizations like Euro NCAP are recognizing some Interior Sensing features in the latest update of their assessment protocols. Since 2023, Euro NCAP is rewarding points for Child Presence Detection.

Future iterations of the protocols will also consider airbag deployment adapted to occupants' size, weight, body type, posture and position.

User Experience

When the technology we put into vehicles is developed with a more human-centric approach, riding in a car becomes almost as much about the journey as the destination.

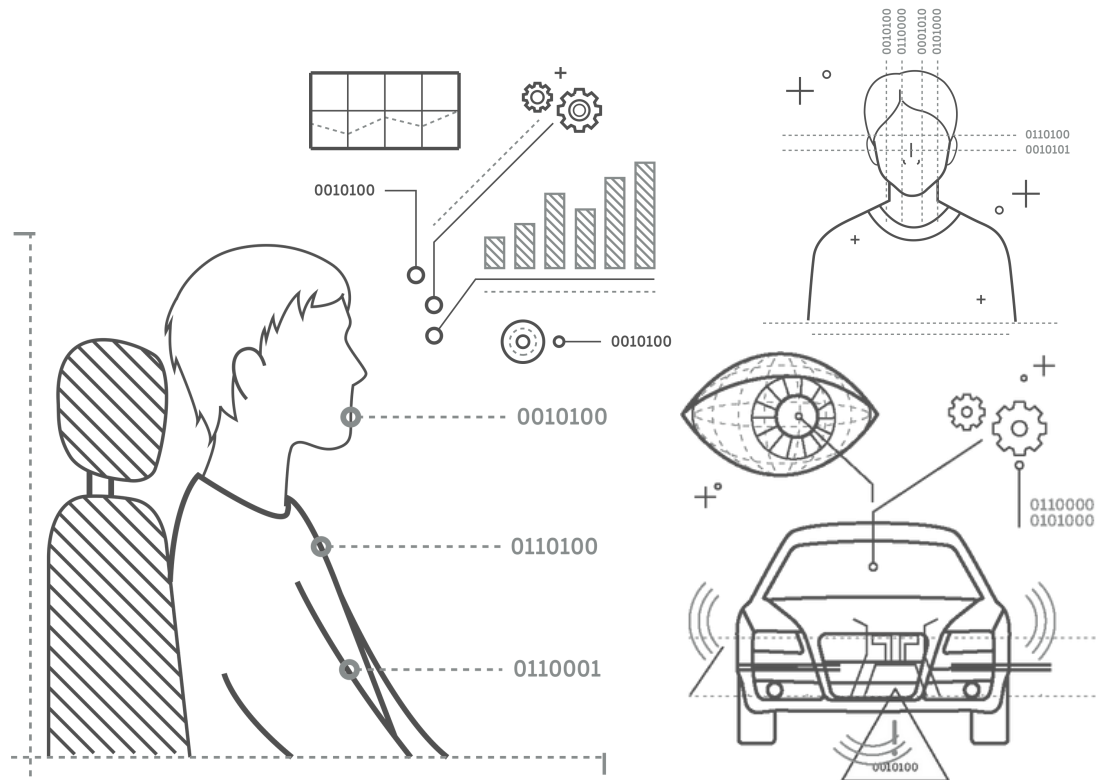
A system that understands the needs and wants of the people in a car can personalize the entire mobility experience.

By fine-tuning things like temperature, lighting, seats, and entertainment in real-time based on the physical, emotional, or cognitive changes of the people in the cabin, the car does more than get its passengers to their destination.

Interior Sensing creates an environment customized to enhance the comfort, wellness, and entertainment of all passengers.

Technical Specifications

Smart Eye's Interior Sensing AI unlocks features and services that enhance wellness, comfort and entertainment, while always putting safety first. Powered by Affectiva's Emotion AI to capture nuanced emotions, reactions, and facial expressions in real time.



Supported Cameras:

- Recommended IR imagers
- Recommended 30 fps
- Recommended 2 MP resolution
- Lens compatibility: wide angle, etc.

Hardware Agnostic

- SOCs: ARM-based CPUs, DSPs, GPUs, CNN accelerators
- Examples: Qualcomm, TI, Nvidia, Renesas, Xilinx, Ambarella, NXP

Flexible Camera Setup:

- Single or multi camera systems
- Camera positions: rear view mirror, center stack, overhead, roof second and third row

Diverse Operating System Support

- Examples: QNX, Android, Linux, Integrity