

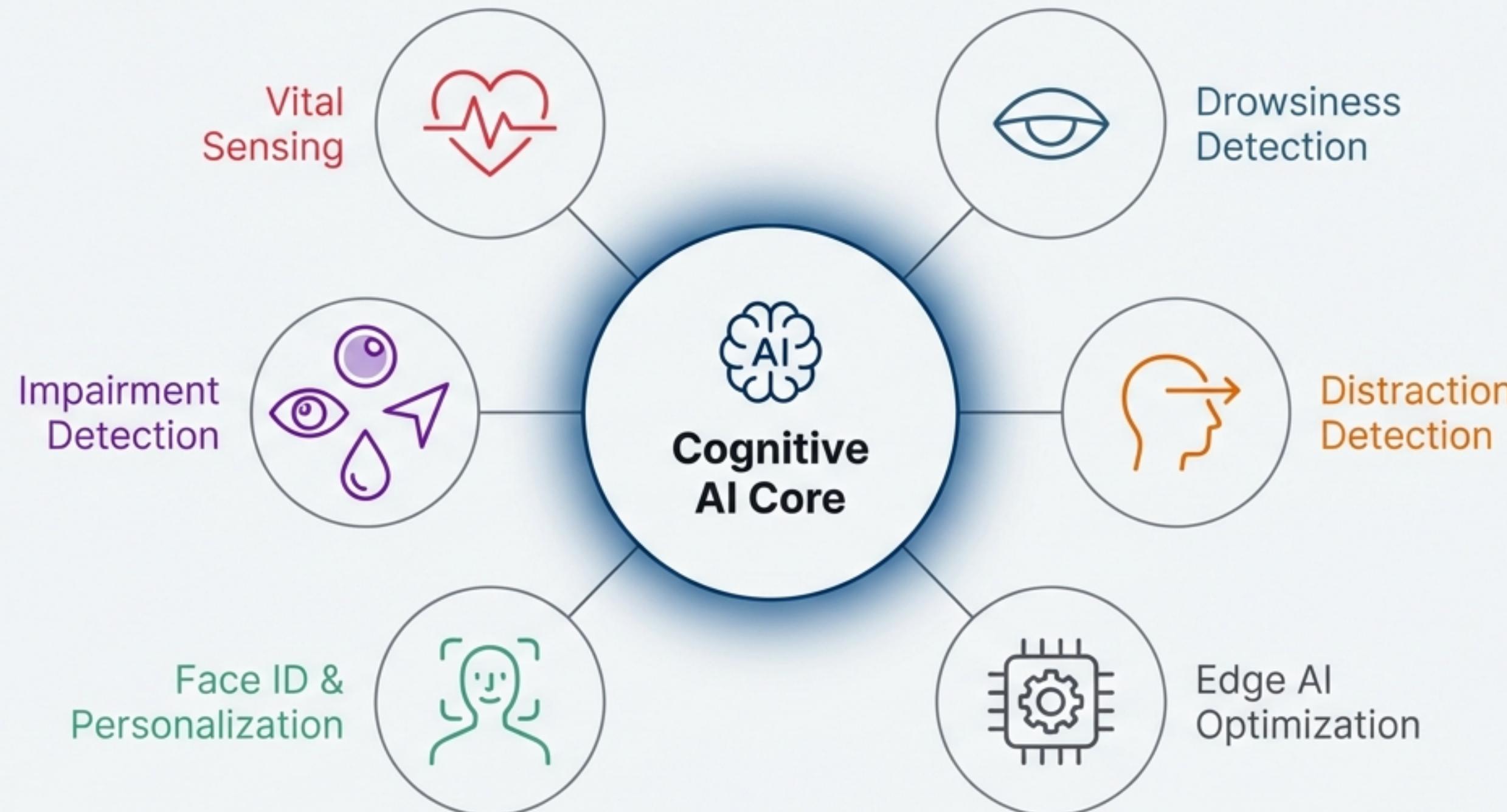
# The Intelligent Guardian

Redefining In-Cabin Sensing with Multi-Layered Physiological AI.

FunnyTech21

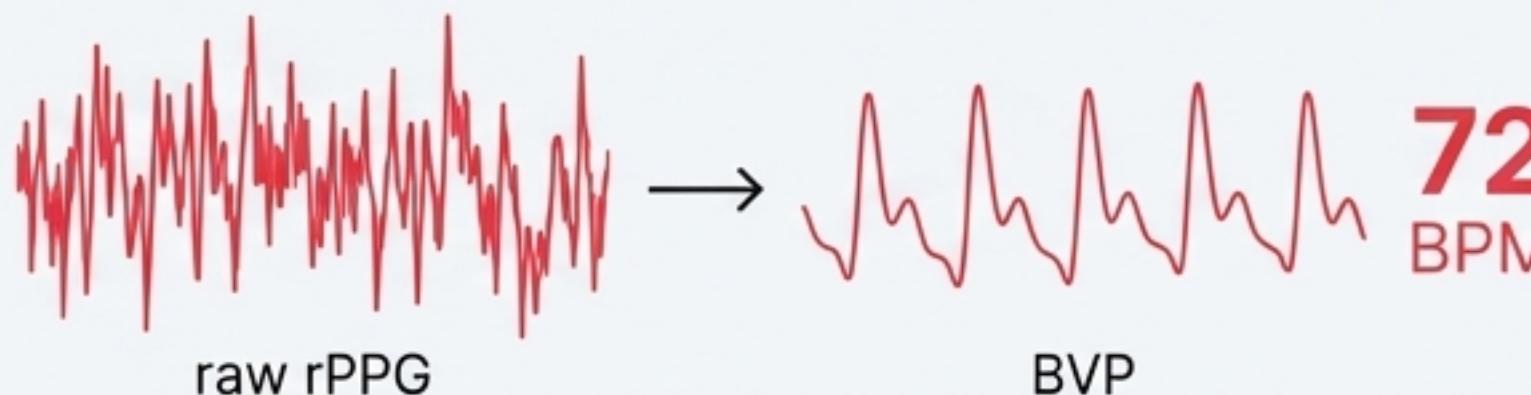
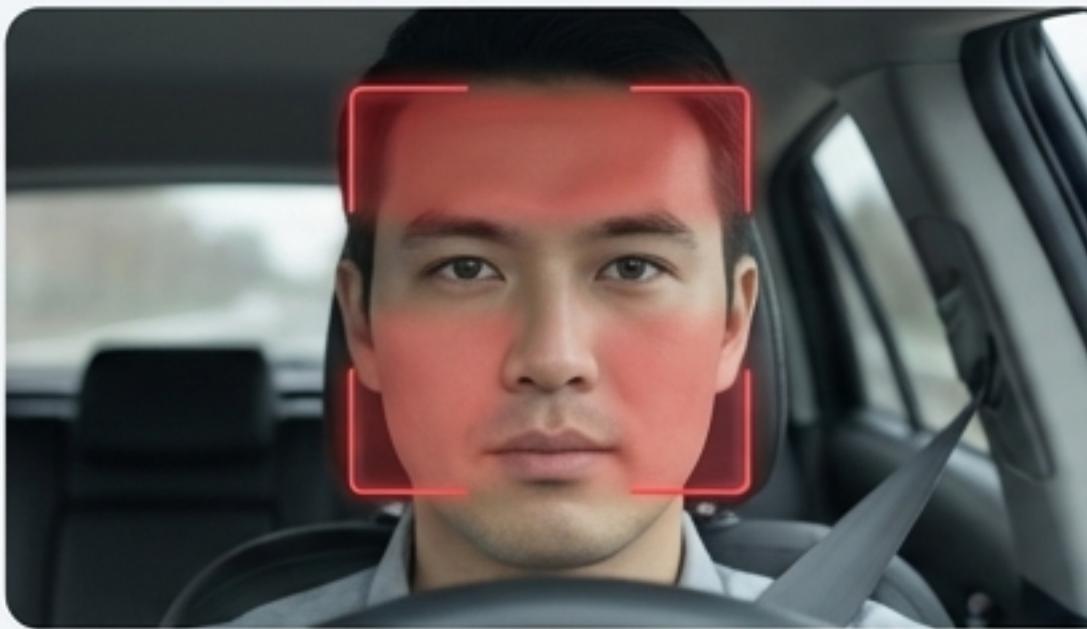
# A Unified Architecture for Total Driver Understanding

Our system is built on distinct, synergistic layers—from foundational sensing to cognitive analysis—all optimized for real-time, on-device performance.

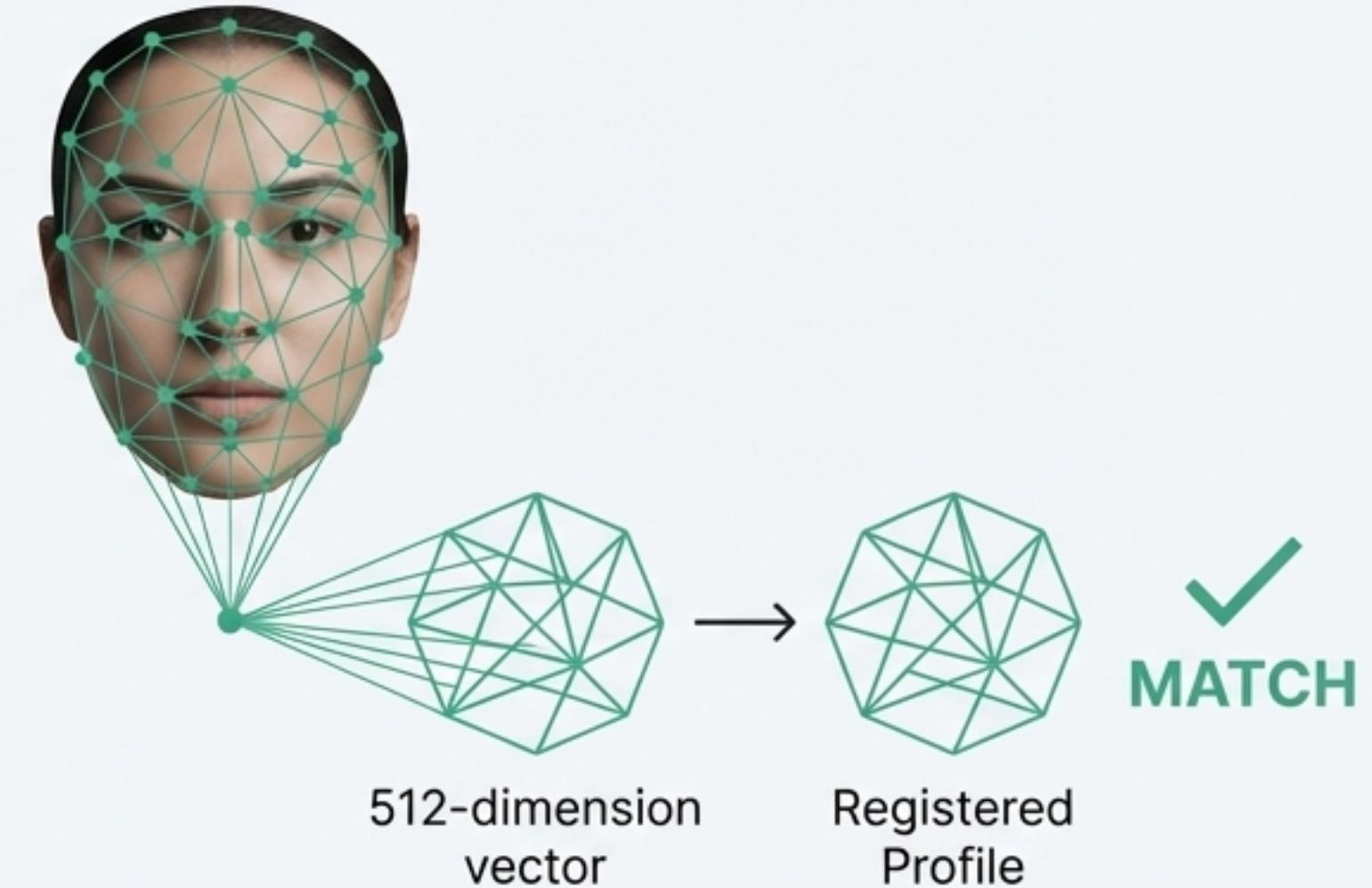


# Layer 1: The Physiological Baseline

Sensing Vital Signs & Identity from RGB Video



**Motion-Compensated CHROM:** Extracts pulse from video, correcting for vehicle vibration and driver movement.



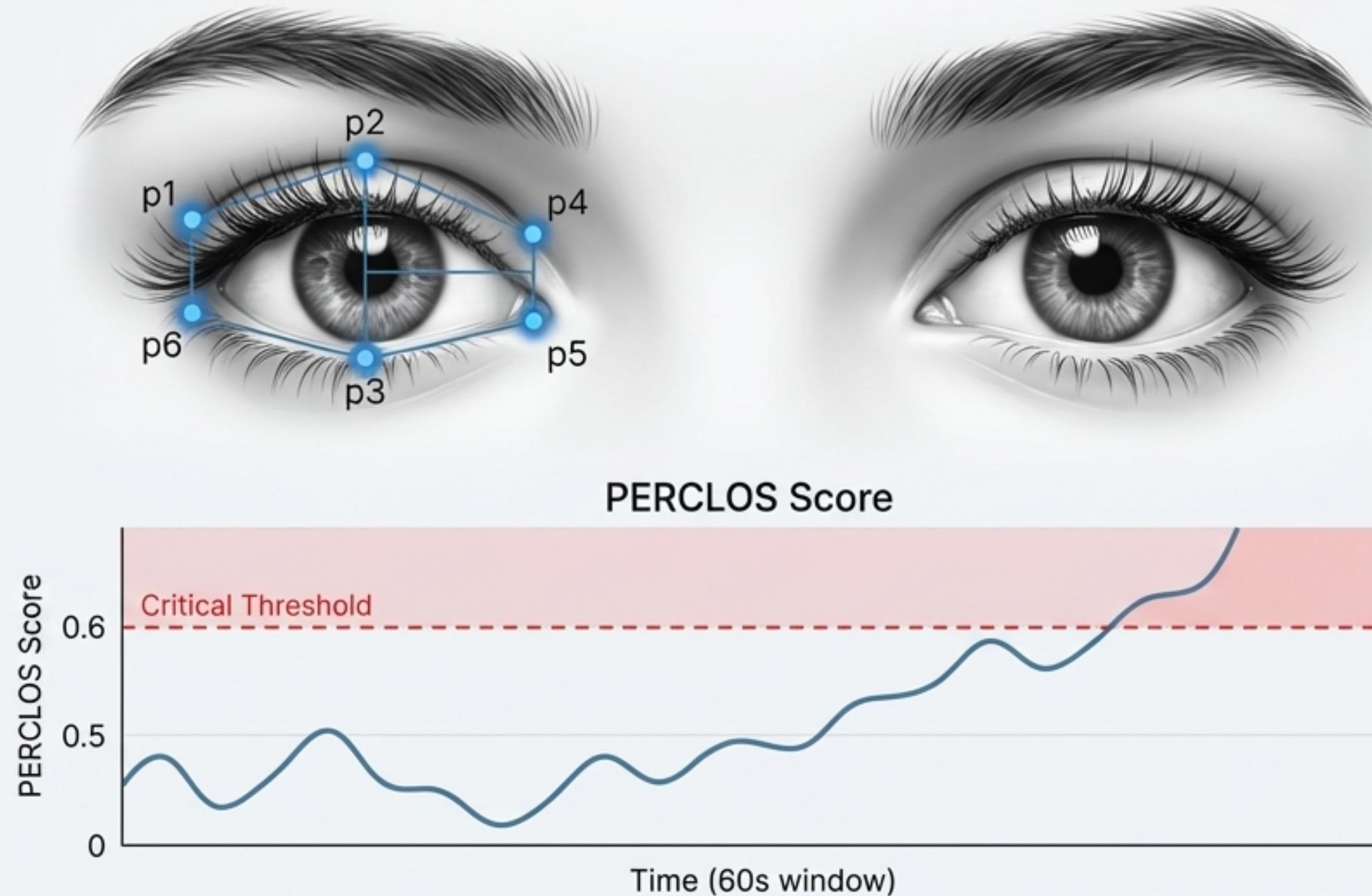
**ArcFace Recognition:** Identifies the driver with high accuracy for profile loading.



**MiniFASNet Anti-Spoofing:** Protects against photo and video-based attacks.

# Layer 2: Detecting Drowsiness & Microsleep

Precision Analysis of Eye State and Blink Patterns



## PERCLOS Metric

Quantifies drowsiness by calculating the percentage of eye closure time.



## Dynamic EAR Threshold

Adapts the Eye Aspect Ratio threshold (0.20-0.30) to individual drivers, increasing accuracy.

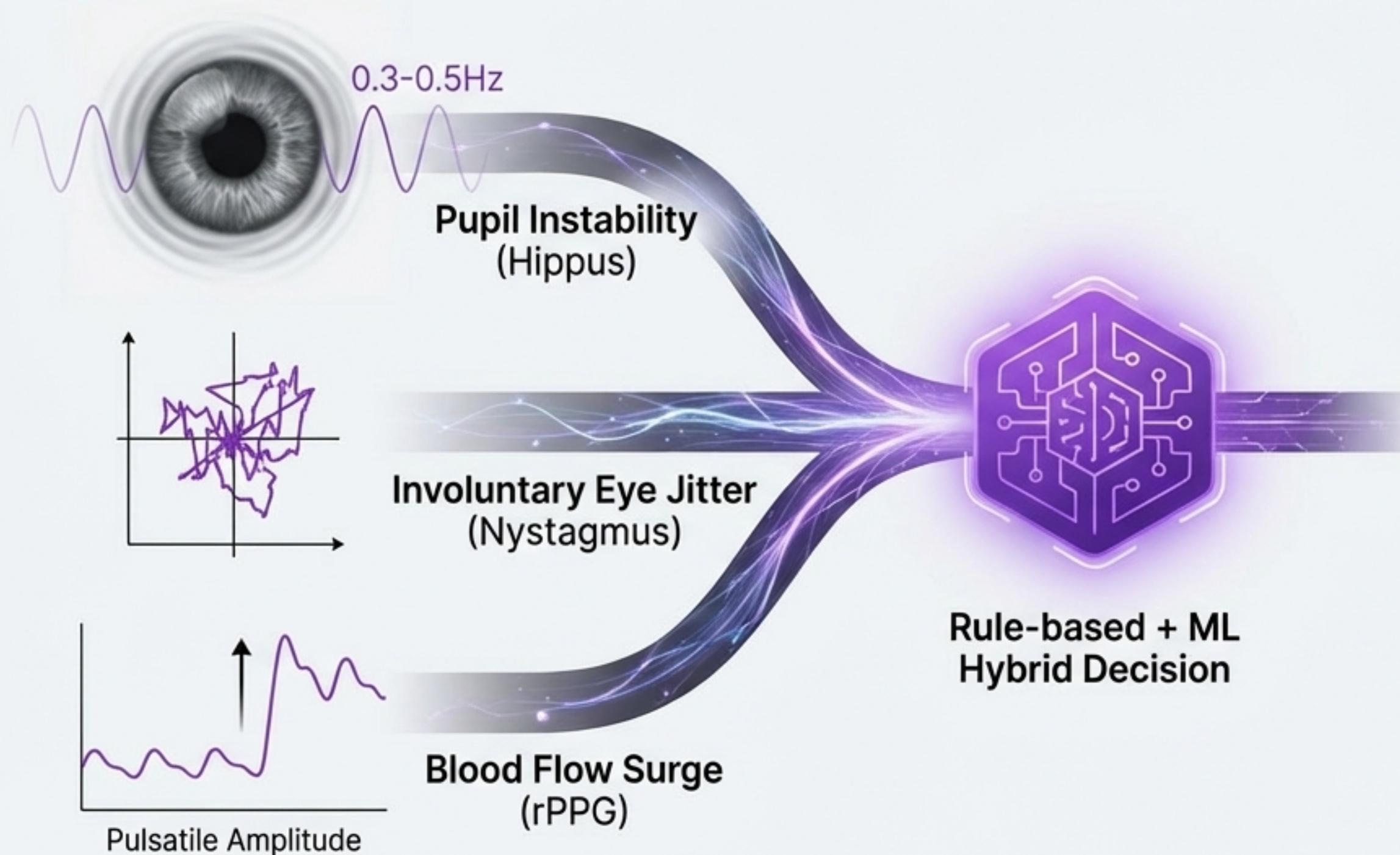


## Instant Microsleep Alert

Triggers an immediate warning if eyes remain closed ( $\text{EAR} < 0.22$ ) for over 1.0 second.

# Layer 3: Unmasking Impairment with Triple-Fusion Analysis

A Hybrid AI Approach to Detect Alcohol & Drug-Induced Impairment



## Pupillometry:

Measures involuntary pupil oscillations linked to impairment.



## Oculomotor Analysis:

Quantifies spontaneous nystagmus (eye jitter).

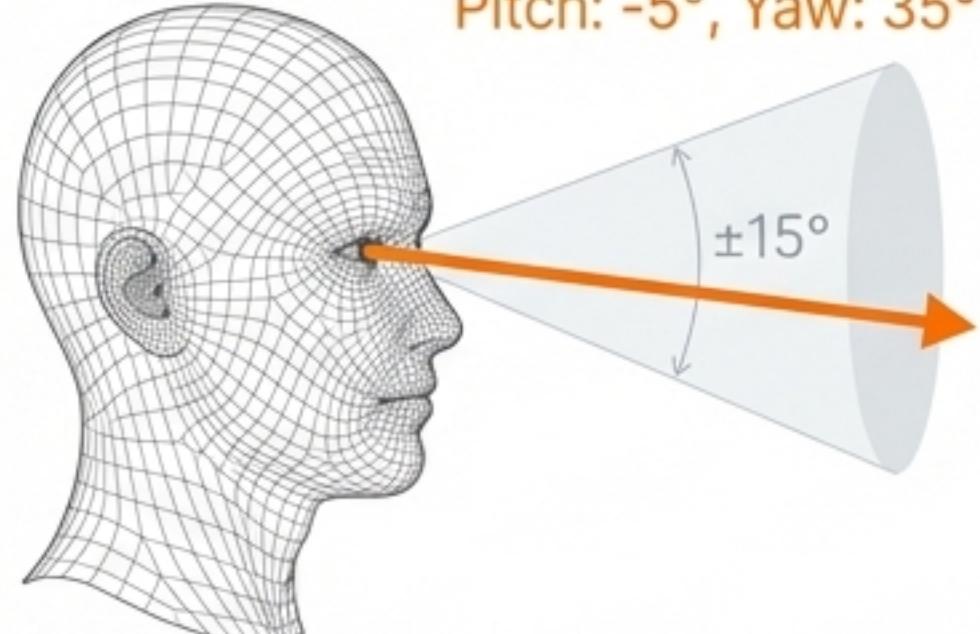


## Hemodynamic Sensing:

Detects sudden blood flow surges via rPPG.

# Layer 4: Monitoring Distraction & Driver Engagement

Fusing Gaze, Object, and Action Recognition

Gaze	Objects	Actions
 <p>Pitch: -5°, Yaw: 35° ±15°</p>		



**3D Gaze Vector Estimation:**  
Accurately tracks where the driver is looking.



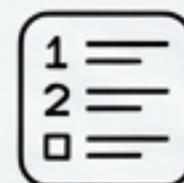
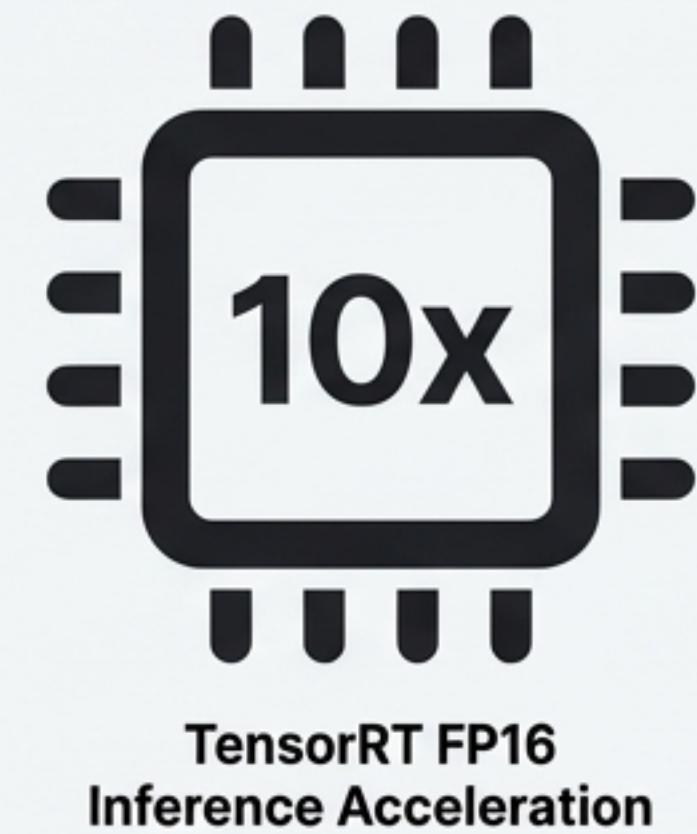
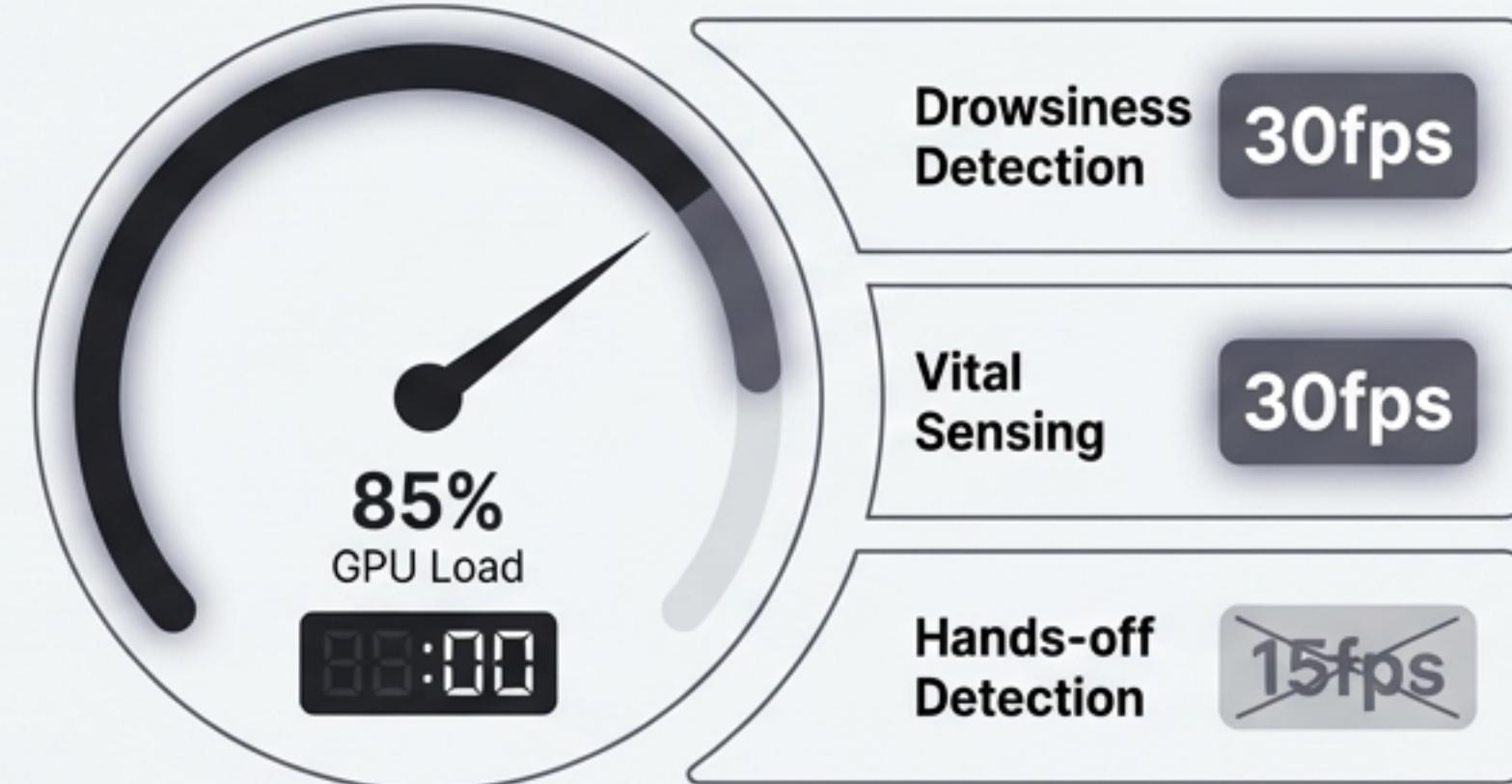
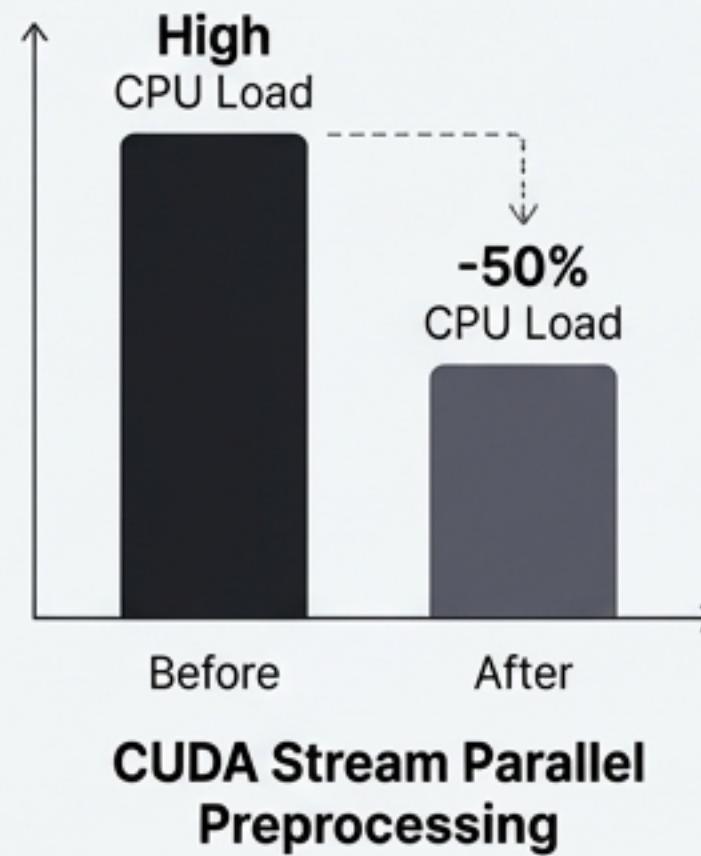
**YOLOv8n + TensorRT:**  
High-speed, on-device detection of distractor objects.



**MediaPipe Hands Tracking:**  
Monitors for prolonged hands-off-wheel events.

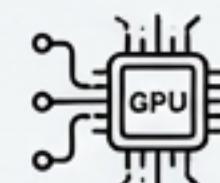
# The Engine: Real-Time Performance on the Edge

Advanced Optimization for Low-Power Embedded Systems



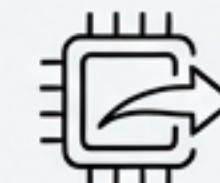
## Adaptive Frame Skip:

Dynamically prioritizes critical safety modules to guarantee 30fps performance.



## CUDA Parallel Processing:

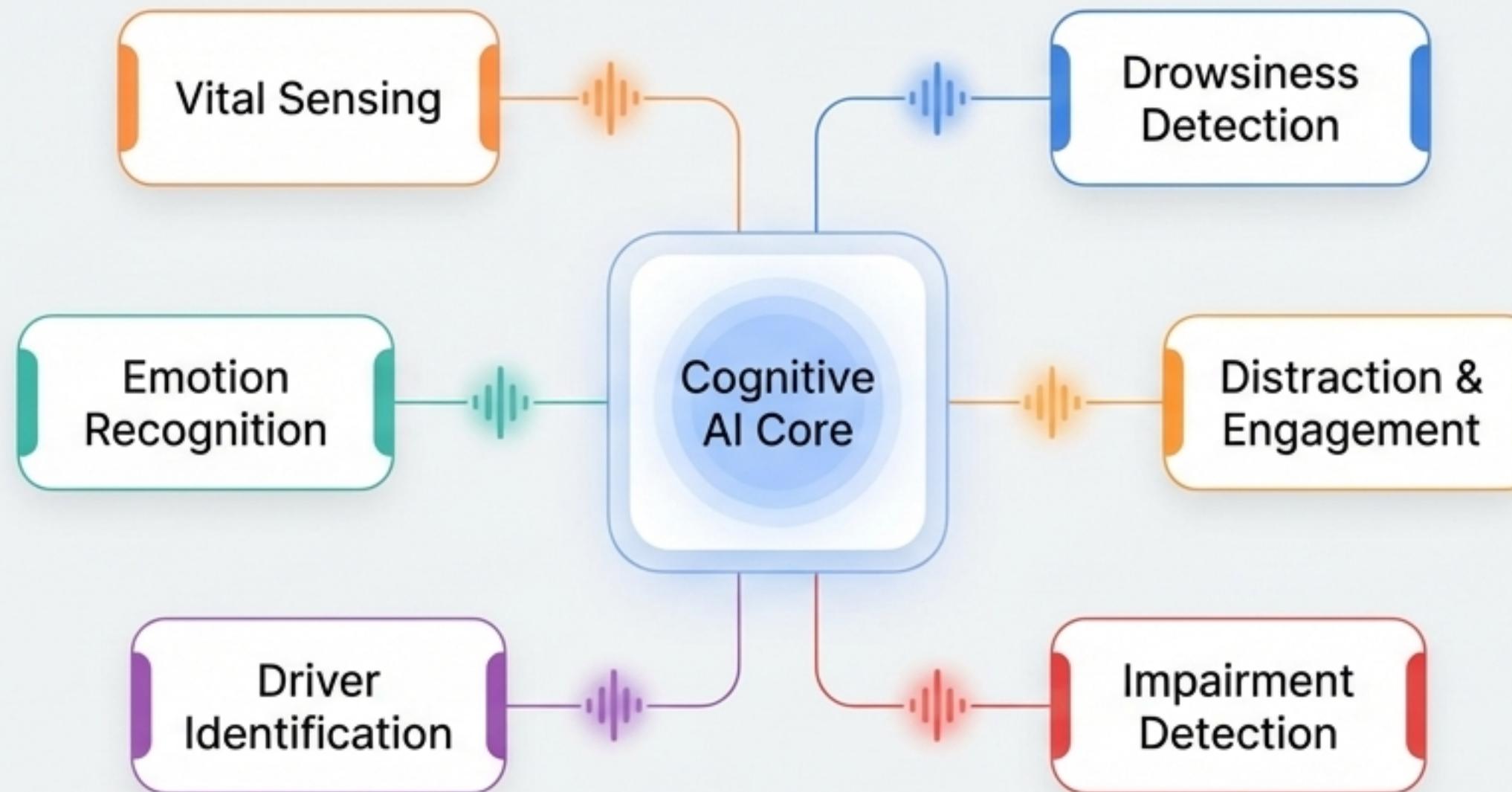
Offloads image preprocessing to the GPU, drastically cutting CPU usage.



## TensorRT Acceleration:

Achieves 6-10x faster inference on all deep learning models.

# The Complete Guardian: A Holistic View of Driver State



**Perceives:** Physiological state through camera-based vital signs.

**Analyzes:** Cognitive states like drowsiness, impairment, and distraction.

**Identifies:** The driver and applies personalized settings.

**Performs:** With unparalleled efficiency on embedded edge devices.

FunnyTech21 delivers a complete, real-time understanding of the driver, creating the foundation for the next generation of vehicle safety and experience.

# FunnyTech21

**Let's Build the Future of  
In-Cabin Safety.**

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***Contact us for a technical deep-dive and live demonstration.***