Context

Driver health monitoring has the potential to **transform road safety and wellbeing at scale**. By continuously tracking vital signs, stress levels, and fatigue in real time, such systems can detect early warning signals of medical emergencies like arrhythmia or cardiac arrest, as well as subtle indicators of drowsiness before they become dangerous. AI-based rPPG extraction uses computer vision to measure heart rate and other vital signs from a simple camera feed, enabling **contactless, seamless health monitoring** that can be naturally embedded into the existing camera and sensor ecosystem of modern vehicles without requiring any additional hardware. This proactive approach not only helps prevent accidents caused by sudden health events or driver fatigue, but also supports healthier, more attentive driving habits. Ultimately, integrating health monitoring into vehicles can save lives, reduce healthcare and insurance costs, and redefine the car as not just a mode of transport, but a **guardian of human health on the road**.

Overview

Participants will work hands-on with **Caire.ai's Cloud API**, which can extract **vital signs** and the **remote photoplethysmography (rPPG) signal** directly from a simple video feed. With this foundation, students will be tasked to design **real-time dashboards** and apply **machine learning** to propose one innovative feature that could make driving safer and smarter.

Objectives

- Familiarize students with **health monitoring via computer vision**.
- Encourage **creative data visualization** by building a dashboard that simulates the system in driving action.
- Introduce **ML-enhanced health analytics** in the context of automotive applications.
- Inspire **practical, impactful use cases** of in-vehicle health systems.

Hackathon Challenge

Core Task

- Use the **Cloud API** to extract **vital signs** (e.g., heart rate, breathing rate) and **rPPG waveforms** from video.

- Develop a **real-time dashboard visualization** that demonstrates the monitoring system in action inside a car scenario.

Add-On ML Innovation (choose one of the following ML-powered features):

1. **Cardiac Event Detection**:
    - Build an ML layer on top of the extracted PPG signal to detect potential **arrhythmia** or **cardiac arrest events**.
    - Showcase the system's ability to raise alerts during high-risk events.
2. **Driver Tiredness Score**:
    - Combine **facial movement features** (e.g., yawning, blinking, head nods) with **heart rate variability (HRV)** indicators.
    - Design an algorithm that generates a **"fatigue score"**, alerting drivers when they may be too tired to continue safely.

Deliverables

- **Interactive Dashboard** simulating driver monitoring in real-time.
- **Machine Learning Feature Implementation** (Arrhythmia detection OR Driver Fatigue Scoring).
- **Pitch/Demo** at the end of Day 2 showcasing their solution.

Resources Provided

- Access to **Caire.ai Cloud API**.
- Example datasets and starter guides.
- Mentorship from experts in AI, digital health, and automotive systems.

Expected Impact

Through this hackathon, students will not only learn how to **leverage AI for health monitoring** but also envision the **future of safer driving**. Their creative solutions may pave the way for innovations in **in-car health detection systems**, ultimately reducing accidents and saving lives