Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	23 May 2023
Team ID	NM2023TMID14164
Project Name	Drowsiness Detection and alerting system

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	EYE ASPECT RATIO	The Eye Aspect Ratio, or EAR, is a scalar value that responds, particularly for opening and closing the eyes . During the flashing process, we can see that the EAR value grows rapidly or decreases significantly. Interesting findings in terms of robustness were obtained when EAR was used to detect blinks
FR-2	MOUTH ASPECT RATIO	Mouth aspect ratio (MAR) is used to detect whether a person is yawning or not. By using the above facial points, we know that points from 49 to 68 represent the mouth coordinates. But we will use only eight points, and they are 61–68 points. The formula for mouth aspect ratio (MAR) calculation
FR-3	ANALYSIS SYSTEM	Drowsiness is identified by using vision-based techniques like eyes detection, yawning, and nodding. When it comes to yawning and nodding some people can sleep without yawning and nodding. One more method is by using physiological sensors like biosensors.
FR-4	DETECTION SYSTEM	rowsiness is identified by using vision-based techniques like eyes detection, yawning, and nodding. When it comes to yawning and nodding some people can sleep without yawning and nodding
FR-5	DECISION SYSTEM	Image processing is used to recognize the face of the driver and then its extracts the image of the eyes of the driver for detection of drowsiness. The HAAR face detection algorithm takes as captured frames of image and then the detected face is considered as output
FR-6	ALARM SYSTEM	The system uses a small infra-red night vision camera that points directly towards the driver's face and monitors the driver's eyes in order to detect fatigue. In such a case when fatigue is detected, a warning signal is issued to alert the driver.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description

NFR-1	**Usability**	The purpose of the drowsiness detection system is to aid in the prevention of accidents passenger and commercial vehicles. The system will detect the early symptoms of drowsiness before the driver has fully lost all attentiveness and warn the driver that they are no longer capable of operating the vehicle safely.
NFR-2	**Security**	Driver drowsiness detection is a car safety technology which prevents accidents when driver is getting drowsy. Driver inattention is might be the result of lack of alertness when driving due to drowsiness and distraction. The system alerts driver through alarm in real time.
NFR-3	**Reliability**	Moreover, the results show that by using only ECG signals, a balanced accuracy of about 80% is achieved for drowsiness classification. (3) The third approach is based on electroencephalogram (EEG) data processing for drowsiness detection
NFR-4	**Performance**	To determine whether the driver is drowsy, the study tests three ensemble algorithms and finds that the Boosting algorithm is the most effective in detecting drowsiness with an accuracy of 89.4%.
NFR-5	**Availability**	Driver drowsiness detection systems can use cameras, eye tracking sensors and other hardware to monitor visual cues, where drowsiness can be detected through yawning frequency, eye-blinking frequency, eye-gaze movement, head movement and facial expressions
NFR-6	**Scalability**	Subjective and incoherent labelling of drowsiness, lack of on road data and inconsistent protocols for data collection are among other challenges to be addressed to progress drowsiness detection for reliable on-road use