# METHODOLOGY

## Materials

### Software

For this application-based drowsiness detection system, the following software is essential:

* **YOLOv8**: The core deep learning model used for real-time drowsiness detection. YOLOv8 identifies specific facial features such as eye closure, yawning, and head tilting to detect early signs of fatigue.
* **OpenCV**: Manages video processing and integrates with YOLOv8 to handle live video feeds from a camera, enabling real-time monitoring.
* **Dlib Library**: Assists in facial recognition and tracking, helping improve the accuracy of detecting drowsiness indicators.
* **Python**: Used for programming the application’s logic and for integrating YOLOv8, OpenCV, and Dlib.
* **TensorFlow or PyTorch**: A framework for training and deploying YOLOv8 to ensure the system can handle real-time processing.

Describe all the software that you used including names and other details.

### Hardware

The application requires:

* **Camera**: Captures live video of the driver’s face, identifying drowsiness cues in real-time without intruding on the driver.
* **Processing Unit (GPU)**: Powers YOLOv8 to run efficiently, making real-time detection possible.
* **Computer or Mobile Device**: Functions as the processing hub and alert system, enabling on-the-go alerts when drowsy behavior is detected.

Describe the hardware that you used.

### Data

Indicate the source of the data, type of data, year of acquisition, and other pertinent details.

· **Data Source**: A dataset compiled from open-source and collected videos of driver behaviors.

· **Data Type**: Includes annotated images and video segments focused on eye closure, yawning, and head tilting.

· **Acquisition Year**: 2024.

· **Details**: Data preparation involves labeling these drowsiness behaviors to train YOLOv8 accurately for detection within an application setting.

## Methods

The headings given here for the methods are only suggestive. Adopt what is appropriate for your research. For example, you would have experimental design if you used one such as multivariate method and the like which would describe the number of tests you did and the conditions for testing.

### Research Design

This study applies a **developmental research approach** to create and test an application designed to detect drowsiness in real-time, focusing on early intervention to improve road safety.

Sample: The study uses developmental research method…

### Artificial Neural Network (if involves Algorithm)

The **Convolutional Neural Networks (CNNs)** within YOLOv8 allow the application to recognize and analyze facial patterns, making it highly effective in detecting drowsy behaviors like prolonged eye closure and yawning.

### Process Model (if involves software development)

The **Waterfall Methodology** is used to develop the system, structuring tasks to streamline the application’s functionality and testing phases.

### Waterfall Methodology (Example of a Process Model)

A diagram of a system

Description automatically generated

#### Requirement Analysis

Gathered requirements focus on creating a responsive, application-based solution that:

* Detects signs of drowsiness without interfering with the driver’s experience.
* Operates accurately in real-time with live video input.

#### System Design

The system design enables:

* Real-time monitoring via a live camera feed.
* YOLOv8 integration to process and detect eye closure, yawning, and head tilting.
* Immediate alerts to the driver when fatigue indicators are detected.

#### System Development

Development includes:

* Integrating YOLOv8 with OpenCV and Dlib for application-level drowsiness detection.
* Testing the detection model to ensure smooth, real-time application performance.

#### Testing

The system undergoes rigorous testing in both simulated and real-world scenarios to validate:

* The reliability and speed of drowsiness detection.
* The application’s ability to provide timely alerts in varied conditions.

### Evaluation

The evaluation phase gathers user feedback on application performance, particularly on alert effectiveness and detection accuracy. This will inform further improvements in the system's usability and functionality.