**Conceptual Design**

1. Downloaded eye and mouth dataset consisting of a total of 2900 images of

* Closed eyes
* Open eyes
* Normal and Yawning images.

Used only the closed and open eye images out of those since we’re using Haar Cascades to detect eyes only.

1. Implemented a Convolutional Neural Network with 3 conv2D layers for classifying eye images as open or closed. Selected CNN model for this problem because convolution filters effectively capture image features such as edges and corners. Used sparse categorical cross entropy as loss function.
2. Used webcam to capture images of users. Implemented Haar Cascade using OpenCV to obtain unique Region of Interests (ROI) around the user’s eyes
3. Trained model takes in the ROI of eyes and outputs whether the driver is drowsy or not.

1. GUI that the drowsiness detection system will run on, was implemented using tkinter library. Tasks such as:

* Turning ON the drowsiness detection system to work in real-time
* Using the drowsiness detection system to display the accuracy on a random image of driver
* Sending customer concerns to customer care email-id
* Exiting the drowsiness detection application

can be performed using the functionalities of the GUI

1. GUI and Model were integrated to work seamlessly in tandem.