DRIVERS' DROWSINESS DETECTION

Problem Statement:

Sleep disorders implicated in over 20% of road accidents and drowsy driving were responsible for 72,000 crashes, 44,000 injuries, and 800 fatalities in 2013.

We need a solution that includes preventing drowsy driving, detecting it early, and providing effective interventions.

INTRODUCTION:

In a world where driver drowsiness is a leading cause of accidents on our roads, there is a critical need for a robust and reliable system that can accurately detect and alert drivers when they are in a state of drowsiness or fatigue. This project aims to address this issue by developing a drowsiness detection system to provide real-time alerts to drivers, thus reducing the incidence of drowsy driving-related accidents and ensuring the safety of all road users.

PHASE-1: IDEATION

During the ideation phase our team actively shared their thoughts and suggestions on potential solutions. We employed various techniques, such as structured discussions. This collaborative approach allowed us to tap into the diverse expertise and perspectives within the team, leading to a rich pool of ideas to explore further in our project.

Our problem analysis include:

- We examined historical accident data and found that a significant number of accidents occurred during late-night or early-morning hours when driver fatigue is more prevalent.
- We investigated factors contributing to drowsy driving, such as long working hours, sleep disorders, and monotonous road conditions.
- We observed driver behaviour in controlled environments and noted signs of drowsiness, such as yawning, reduced blink rate, and erratic steering.

We prioritised ideas based on their feasibility, accuracy in detecting drowsiness, and user-friendliness.

PHASE-2: FEATURES

- Eye Blink Rate: The frequency at which a person blinks their eyes, which can decrease when drowsy.

- Yawning Rate: The frequency of yawning, often associated with tiredness and drowsiness.

- Lane Departure Without Signal: Unintentionally drifting out of a lane without using a turn signal, indicating reduced alertness.

- Head Nodding Off: Repeated, involuntary dropping of the head, a classic sign of drowsiness.

- Sudden Steering Movement: Abrupt or erratic changes in steering behaviour, indicating reduced concentration.

- Drugs: The influence of substances, legal or illegal, on alertness and drowsiness.

- Medication: The impact of prescribed or over-the-counter medications on alertness and drowsiness.

- Sleep Duration: The amount of sleep a person has had, with insufficient sleep often leading to drowsiness.

- Tiredness: General fatigue and exhaustion, a common precursor to drowsiness.

PHASE-3: DATASET CREATION

- Defining the number of rows(n).
- Specify the minimum and maximum values for each feature in your dataset. For example, for features like "blink rate" and "yawning rate," define their respective minimum and maximum allowable values.
- Assigning the weights to each feature to indicate its relative importance in the dataset.
- Determine a threshold value that will be used to classify instances as "driver not sleepy" or "driver sleepy." For example, if the outcome exceeds a certain value, the instance is classified as "driver sleepy."
- Creating empty lists to store the data for each feature and the corresponding class labels. These lists will be used to collect the data generated in the subsequent steps.
- Deciding on the number of data points (n) to generate for the dataset. This represents the size of the dataset.
- For each of the data points(n), generate random values for each feature within their specified minimum and maximum ranges.
- Calculate the outcome for each data point based on the weighted sum of features using the formula:

$$\text{outcome} = \Sigma((\text{feature\_i} * \text{weight\_i}))$$

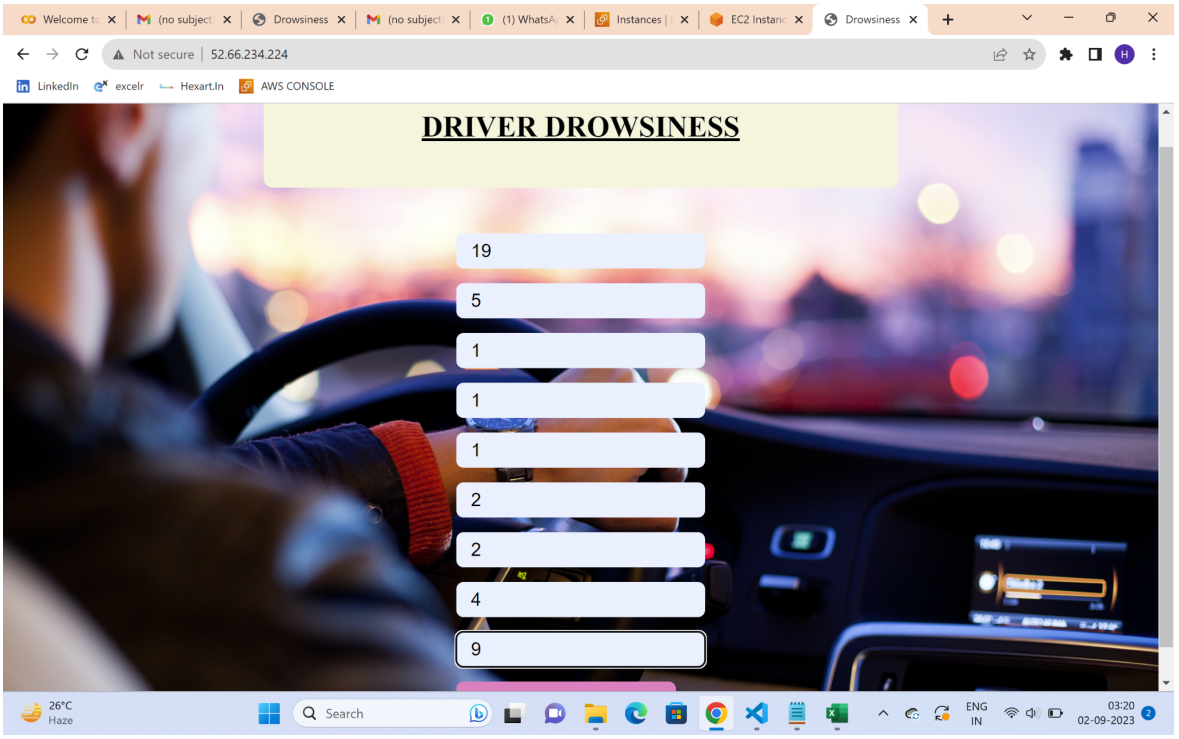
- Assigning class labels (e.g., "drowsy" or "alert") to each data point based on whether the calculated outcome exceeds or falls below the predefined threshold.
- Appending the generated data, including feature values and class labels, to their respective lists.
- Creating a DataFrame from the collected data. Each row represents a data point, and columns correspond to features and class labels.
- Save the DataFrame containing your generated dataset to a CSV (Comma-Separated Values) file for future use and analysis.

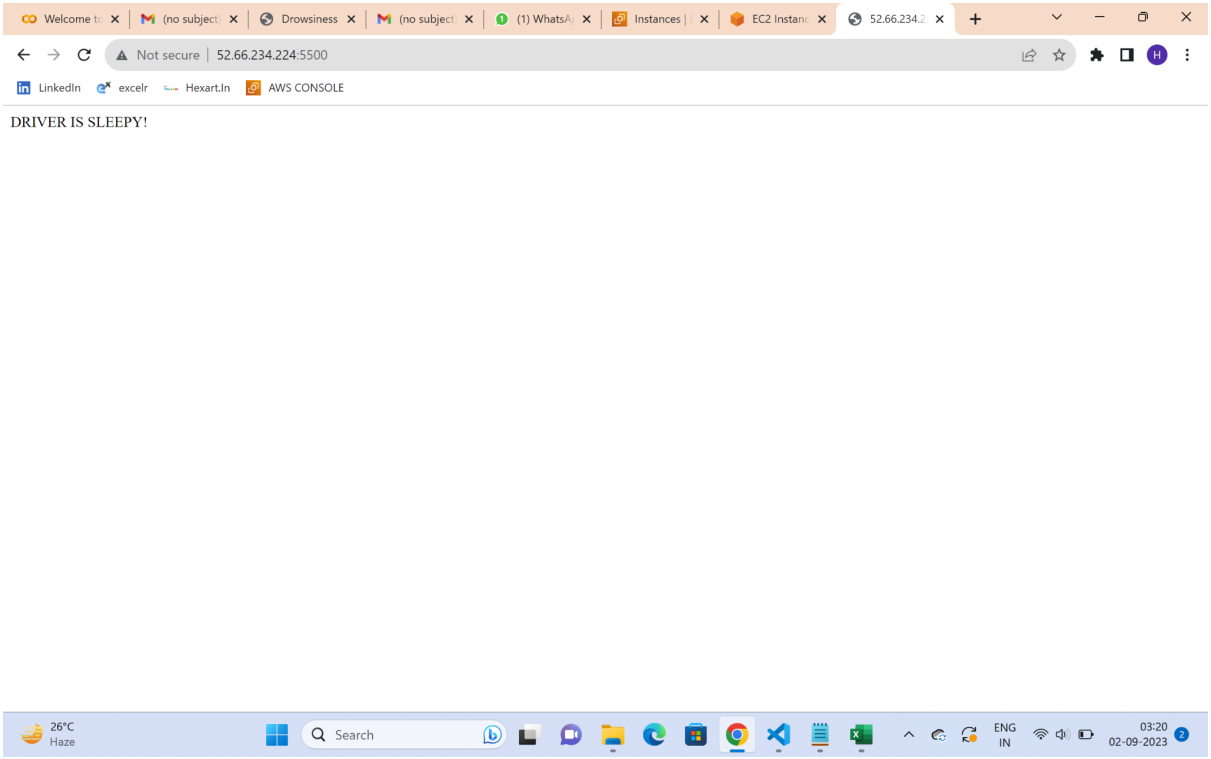
This dataset can now be used for training and evaluating your drowsiness detection model.

PHASE-4: IMPLEMENTATION(CODING+DEPLOYMENT)

Code Purpose: The code aims to implement drowsiness detection.
Programming Languages: Python.
Markup and Styling language: HTML and CSS
Libraries/Frameworks: OpenCV, Pandas.

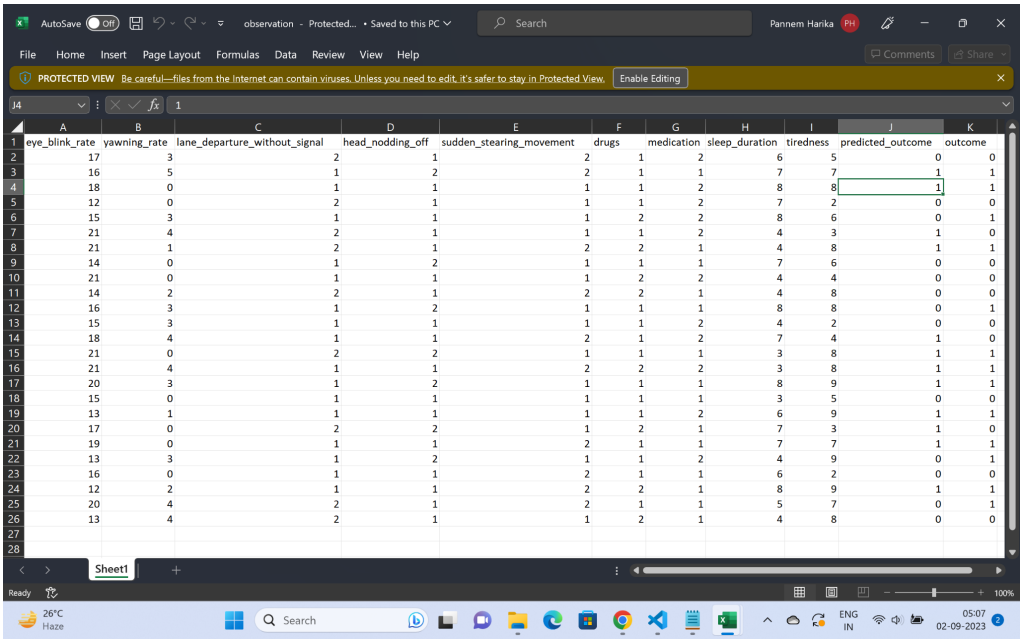
Setting Up AWS S3 Bucket.
Preparing an AWS S3 bucket for code deployment.
Uploading Code to AWS S3 Bucket.
Deploy the drowsiness detection code on an AWS service.





PHASE-5: OBSERVATION

The system provides alerts or warnings when drowsiness is detected.
the type of alerts used (driver not sleepy or driver sleepy) and their clarity.



eye_blink_rate	yawning_rate	lane_departure_without_signal	head_nodding_off	sudden_stearing_movement	drugs	medication	sleep_duration	tiredness	predicted_outcome	outcome
17	3	2	1	2	1	2	6	5	0	0
16	5	1	2	2	1	1	7	7	1	1
18	0	1	1	1	1	2	8	8	1	1
12	0	2	1	1	1	2	7	2	0	0
15	3	1	1	1	2	2	8	6	0	1
21	4	2	1	1	1	2	4	3	1	0
21	1	2	1	2	2	1	4	8	1	1
14	0	1	2	1	1	1	7	6	0	0
21	0	1	1	1	2	2	4	4	0	0
14	2	2	1	2	2	1	4	8	0	0
16	3	1	2	1	1	1	8	8	0	1
15	3	1	1	1	1	2	4	2	0	0
18	4	1	1	2	1	2	7	4	1	0
21	0	2	2	1	1	1	3	8	1	1
21	4	1	1	2	2	2	3	8	1	1
20	3	1	2	1	1	1	8	9	1	1
15	0	1	1	1	1	1	3	5	0	0
13	1	1	1	1	1	2	6	9	1	1
17	0	2	2	1	2	1	7	3	1	0
19	0	1	1	2	1	1	7	7	1	1
13	3	1	2	1	1	2	4	9	0	1
16	0	1	1	2	1	1	6	2	0	0
12	2	1	1	2	2	1	8	9	1	1
20	4	2	1	2	1	1	5	7	0	1
13	4	2	1	1	2	1	4	8	0	0

“The beauty of alerts and warnings lies in their simplicity—a small nudge that can make all the difference on the road of life."

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