

# **Driver Drowsiness Detection system based on IoT-powered technologies and Machine Learning.**

## **Team Members**

- |                           |            |
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| 2. BAPU D PUNEETH KUMAR   | 1DS20CS403 |
| 3. DIVYA M                | 1DS20CS408 |
| 4. THEJESH KUMAR H MUTT S | 1DS20CS423 |

Under the Guidance of

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**Dayananda Sagar Institutions**

Department of Computer Science & Engineering, DSCE

# Introduction

- ❖ Road accidents are one of the leading causes of fatal accidents indiscriminate of roadway and time. This is intensified by the increase in the number of vehicles around the world.
- ❖ According to a research conducted by the Central Road Research Institute (CRRI) on the 300-km Agra-Lucknow Expressway, sleepy or fatigued drivers cause 40% of traffic accidents.
- ❖ Fatigue can easily set in during long journeys, particularly when drivers take inadequate rest periods or pause to help break up the monotony.
- ❖ The proposed system contributes to preventing fatal accidents due to driver drowsiness or fatigue. Although it is not possible to control sleepiness, it is possible to detect it and alert the driver using
- ❖ An alarm/buzzer which will prevent the risk of fatal accidents.



# CONTRIBUTION OF EACH PROJECT MEMBER

<b>THEJESH KUMAR H MUTT</b> <ul style="list-style-type: none"><li>▪ CODING</li><li>▪ CAMERA MODULE</li><li>▪ HARDWARE INTEGRATION</li><li>▪ HUM-ANTENNA</li></ul>	<b>BAPU D PUNEETH KUMAR</b> <ul style="list-style-type: none"><li>▪ IDEA OF PROJECT</li><li>▪ CODING</li><li>▪ CAMERA MODULE</li><li>▪ HEART RATE MODULE</li></ul>
<b>DIVYA M</b> <ul style="list-style-type: none"><li>• HEART RATE MODULE</li><li>• CODING</li><li>• REPORT</li></ul>	<b>ANNAPOORNA</b> <ul style="list-style-type: none"><li>• MESSAGE MODULE</li><li>• REPORT</li><li>• PPT</li></ul>



# System Design

The system is designed on a combined method approach and has three layers as shown in the figure.

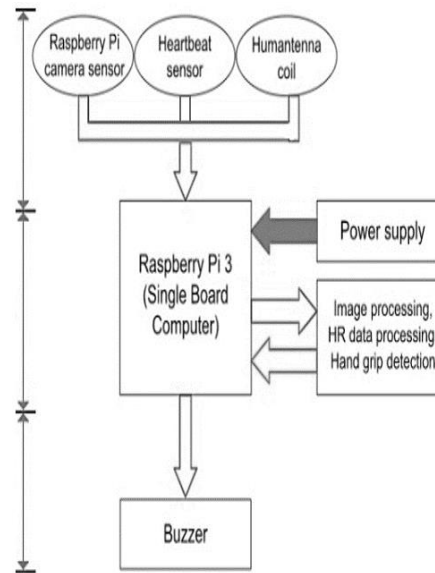


Fig. 2.1: System design

As depicted the raw data from input components is fed to the Raspberry Pi 3 board for data analysis and processing. To analyze and process data means to identify the features of data and process them to identify drowsiness in drivers.



# Methodology

❖ There are three stages in the proposed system as follows:

## A. Data collection

- Image acquisition
- Heartbeat rate
- Touch sensing

## B. Data processing

Once the data is collected it is processed using the Raspberry Pi 3 interface. The raw data obtained by the sensors must be analyzed for Region of Interest(RoI), threshold comparison and must be processed for drowsiness detection.

## C. Alert

A buzzer is used to alert the driver if drowsiness is identified by data processing.



# Components

Processing



Input



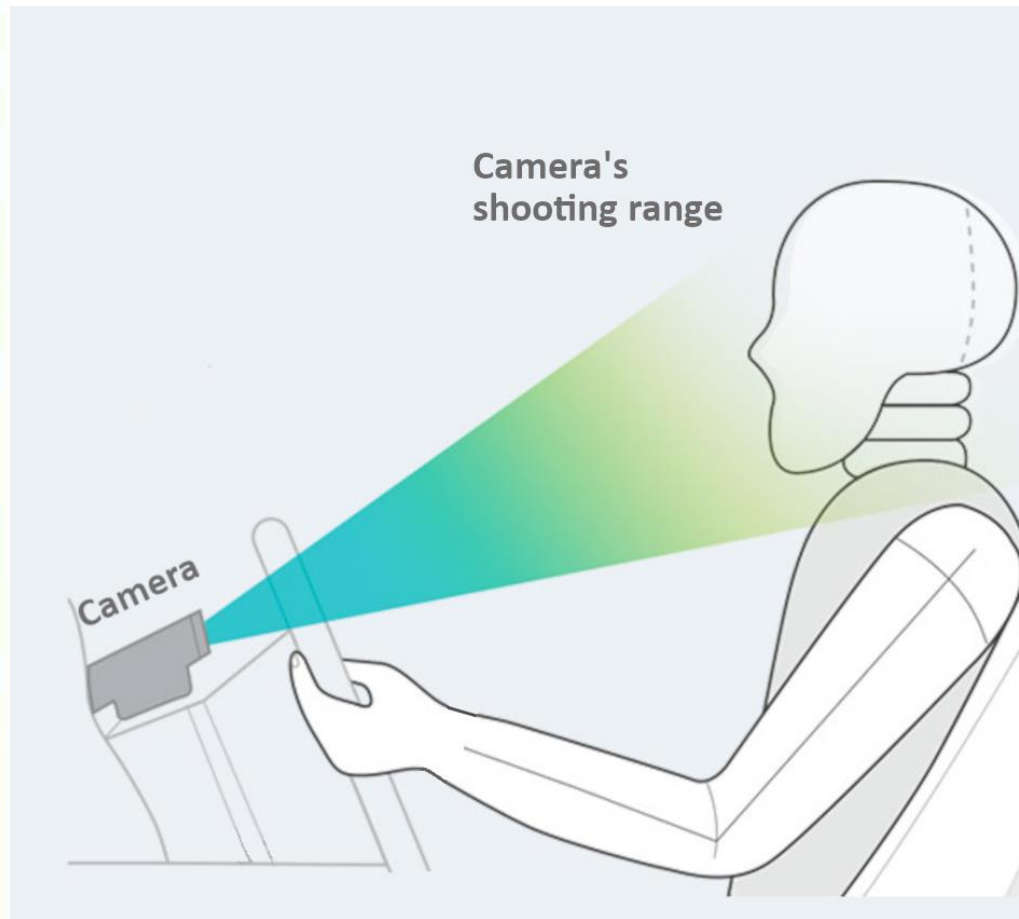
Output



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# Camera sensor

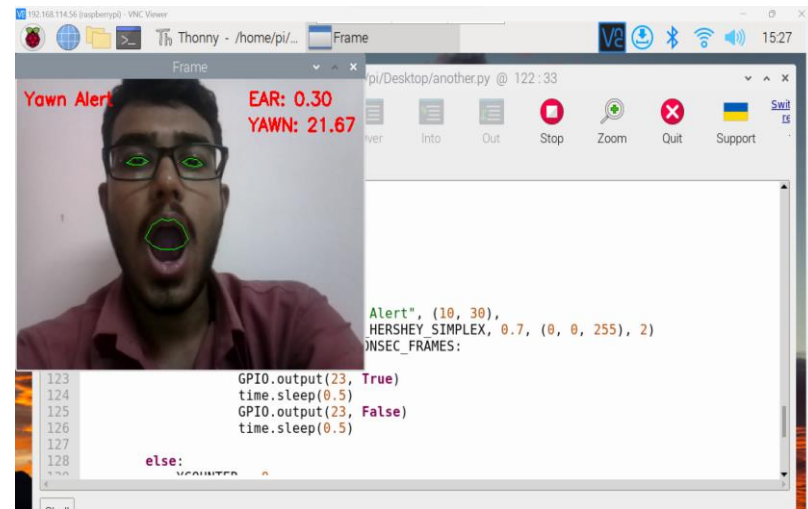
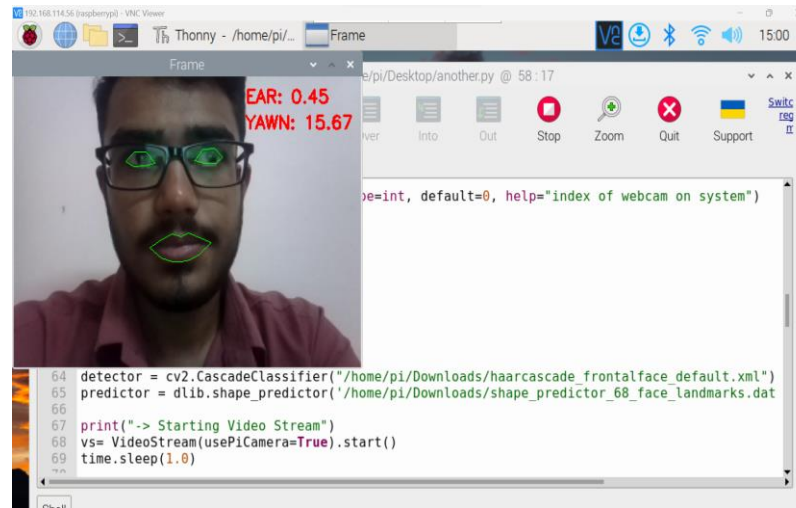


- Haar Cascade algorithm
- Dlib's facial landmarks
- Eye Aspect Ratio



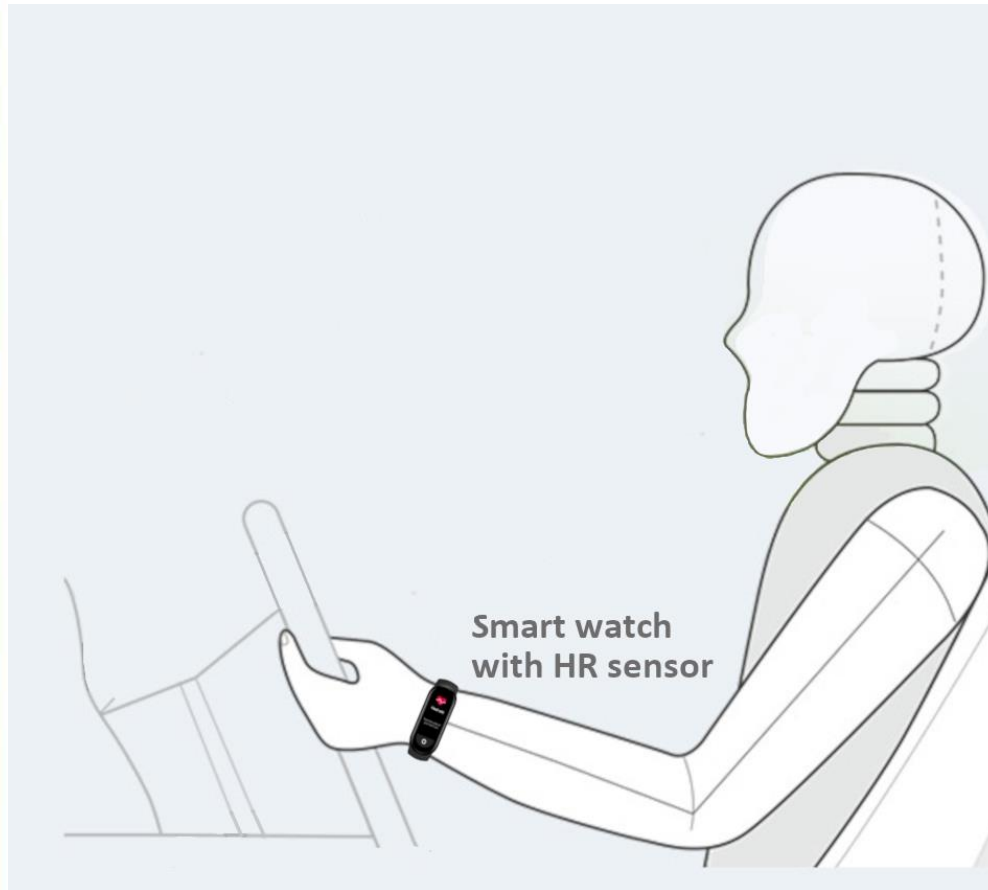


# Camera sensor





# Heart-rate sensor



- Heart rate sensor embedded smart watch or a heart rate sensor



# Heart-rate sensor

```
192.168.84.56 (raspberrypi) - VNC Viewer
27 from miband import miband
28
29 parser = argparse.ArgumentParser()
30 parser.add_argument('-m', '--mac', required=False, help='Set mac address of the device')
31 parser.add_argument('-k', '--authkey', required=False, help='Set Auth Key for the device')
32 args = parser.parse_args()
33
34 hr_data = None
35 MAC_ADDR = "EE:33:7D:B7:D0:16"
36 # Use appropriate MAC
37 AUTH_KEY = "0f4fd053cc1dc3e2e7096b83a22ebb51"
38
39
40 # Convert Auth Key from hex to byte format
41 if AUTH_KEY:
42     AUTH_KEY = bytes.fromhex(AUTH_KEY)
43
44 def send_notif():
45     msg = "Drowsy alert"
46     ty= 1
47     a=[5,4,3]
48     hand.send_custom_alert(a[ty-1], msg)
49
50
51 Shell
52 2023-05-25 19:11:06,396 miband (INFO) > Connecting to EE:33:7D:B7:D0:16
53 2023-05-25 19:11:08,004 miband (INFO) > Connected
54 2023-05-25 19:11:09,894 miband (INFO) > Enabling Auth Service notifications status...
55 2023-05-25 19:11:10,084 miband (INFO) > Requesting random number...
56 2023-05-25 19:11:10,569 miband (INFO) > Sending encrypted random number
57 2023-05-25 19:11:10,759 miband (INFO) > Initialized
58 2023-05-25 19:11:10,760 miband (INFO) > Disabling Auth Service notifications status...
```

```
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46     ty= 1
47     a=[5,4,3]
48     hand.send_custom_alert(a[ty-1], msg)
49
50
51 Shell
52 Latest heart rate is : 81
53 Realtime heart BPM: 81
54 Realtime heart BPM: 82
55 Realtime heart BPM: 79
56 Realtime heart BPM: 80
57 Realtime heart BPM: 81
58 Realtime heart BPM: 82
59 Realtime heart BPM: 81
60
61 Local Python 3 • /usr/bin/python3
```

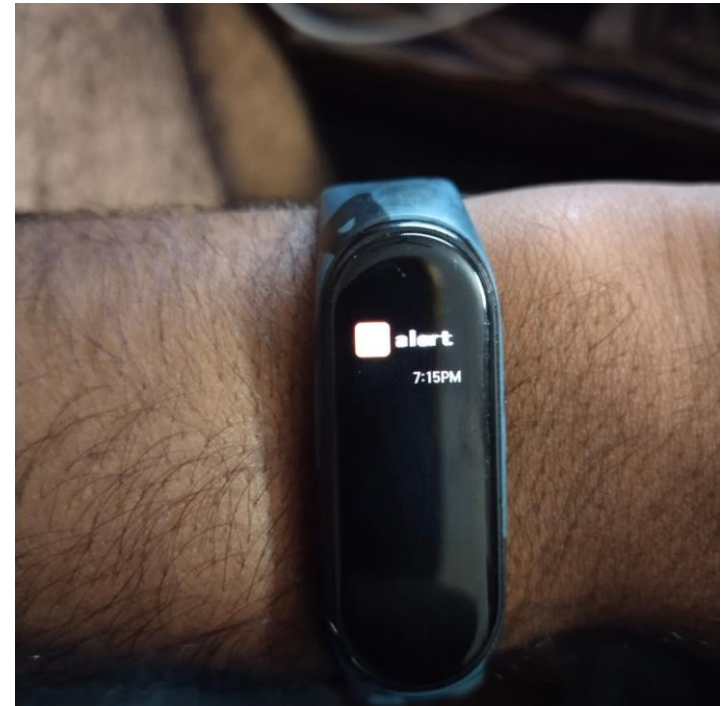


# Heart-rate sensor

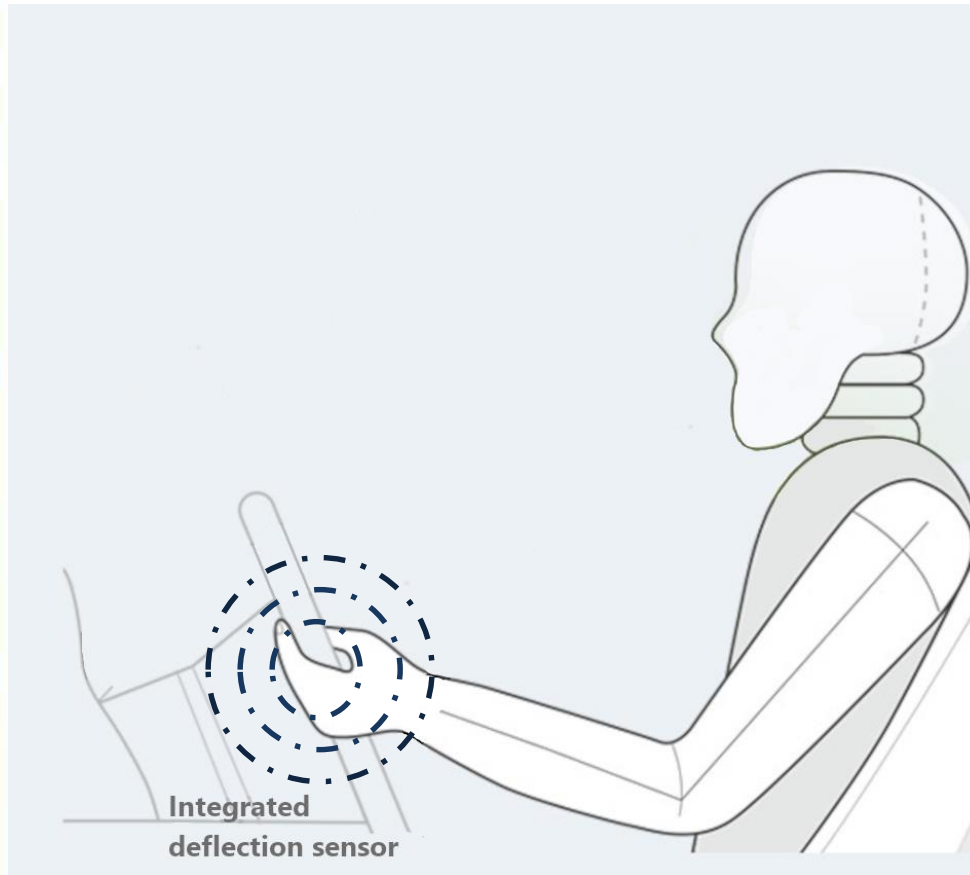


Mi Band 4

Drowsy Alert



# Velostat pressure sensor

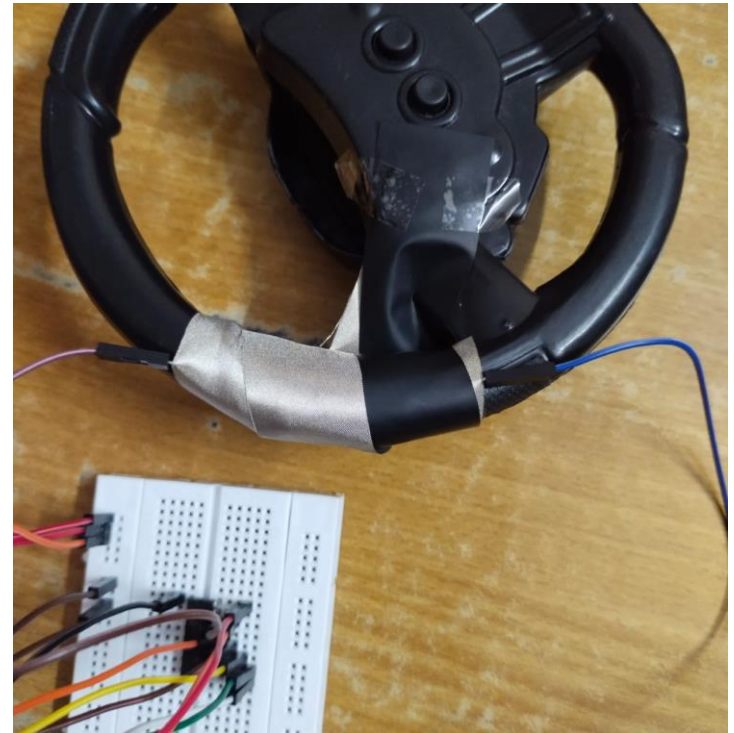
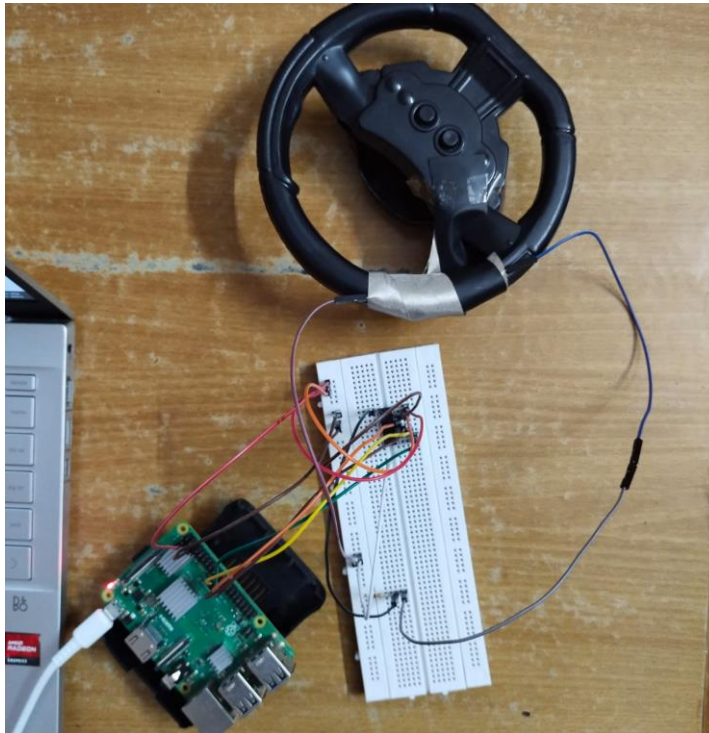


- Velostat sensor
- Woven Conductive sheet
- Hum-antenna technique





# Velostat pressure sensor



Velostat pressure sensor setup



# Velostat pressure sensor

```
192.168.84.56 (raspberrypi) - VNC Viewer
10 #Create SPI
11 spi = spidev.SpiDev()
12 spi.open(0, 0)
13 spi.max_speed_hz=1000000
14
15 def readadc(adcnun):
16     # read SPI data from the MCP3008, 8 channels in total
17     if adcnun > 7 or adcnun < 0:
18         return -1
19     r = spi.xfer2([1, 8 + adcnun <= 4, 0])
20     data = ((r[1] & 3) <= 8) + r[2]
21     return data
22
23 try:
24     while True:
25         pad_value = readadc(pad_channel)
26         print("-----")
27         print("Pressure Pad Value: %d" % pad_value)
28         time.sleep(delay)
29 except KeyboardInterrupt:
30     pass
31
```

Shell

```
-----
Pressure Pad Value: 3
-----
Pressure Pad Value: 5
-----
Pressure Pad Value: 4
-----
Pressure Pad Value: 0
-----
```

Local Python 3 • /usr/bin/python3

```
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28         time.sleep(delay)
29 except KeyboardInterrupt:
30     pass
31
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Shell

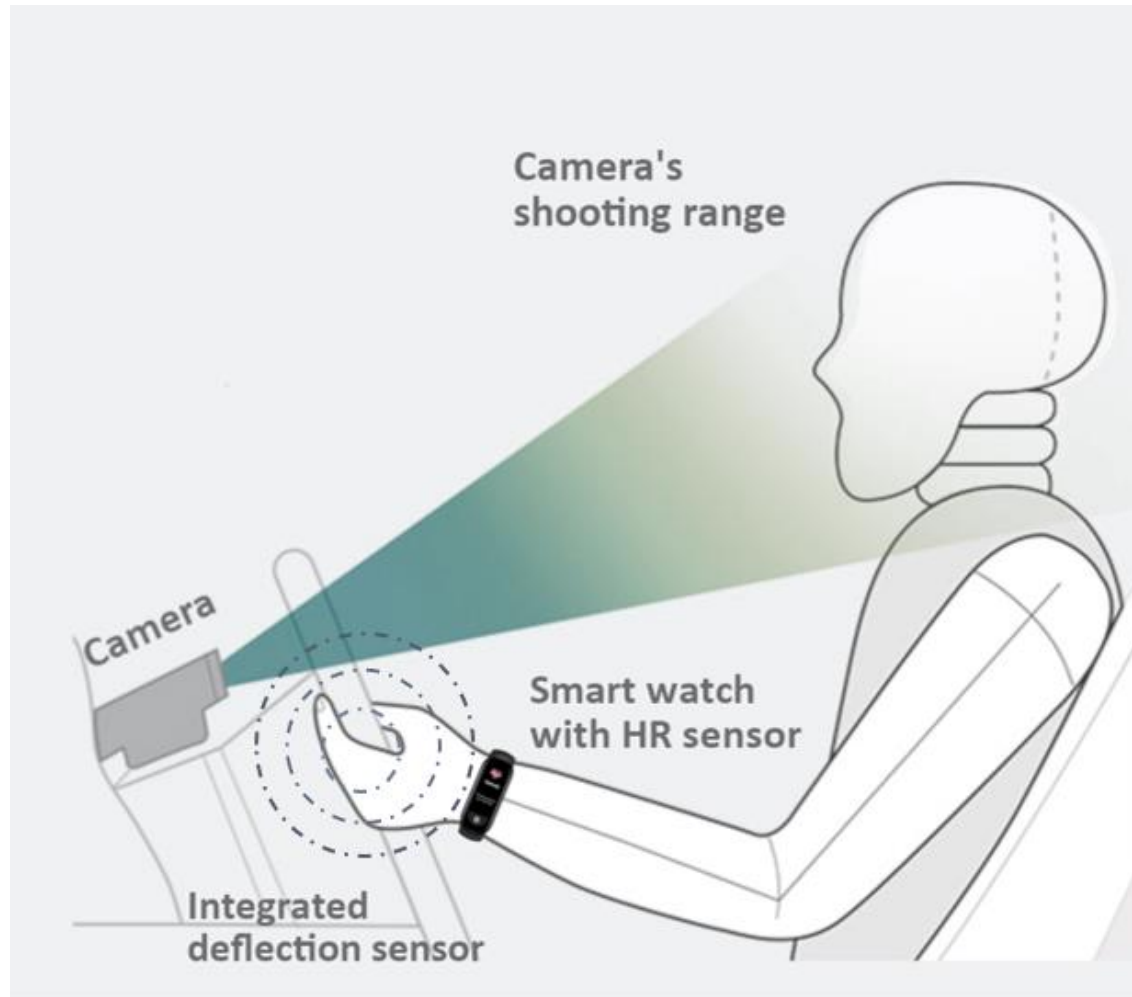
```
-----
Pressure Pad Value: 119
-----
Pressure Pad Value: 0
-----
Pressure Pad Value: 73
-----
Pressure Pad Value: 0
-----
```

Local Python 3 • /usr/bin/python3





# Combined system



# PROJECT TOOL SNAPSHOT

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**IOT-POWERED TECHNOLOGIES AND MACHINE LEARNING BASED DROWSINESS DETECTION SYSTEM** + NEW TASK HIDE CLOSED

COMPLETE 15 TASKS

	ASSIGNEE	DUE DATE	PRIORITY	STATUS	
Base Paper Selection and Phase-1 Review 1	T	11/8/22	High	COMPLETE	
Collecting resources for survey Literature	BK 2 2 T	11/20/22	High	COMPLETE	
Preparing Survey Literature Paper based on project selected	BK 2 T	11/28/22	High	COMPLETE	
Phase-1 Review-2 : review conducted for survey Literature	BK 2 2 T	Jan 2	High	COMPLETE	
Publishing of survey literature paper of our project	T	Jan 9	High	COMPLETE	
Preparing poster presentation on project	T BK 2	Feb 22	High	COMPLETE	
Discussion of hardware components and implementation of project among team members and guide 2/2	BK 2 2 T	Mar 1	High	COMPLETE	
Acquiring the components required for our project	BK T	Mar 20	High	COMPLETE	
Working on implementation on Module-1 Camera module	T BK	Apr 5	High	COMPLETE	
Phase-2 Review-1 review conducted to known the implementation progress of the project	BK T 2 2				
Working on implementation on Module-2 Smart Watch for heart rate	T 2 BK	Apr 28	High	COMPLETE	

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I'm confused

Team Space Projects IOT-POWERED TECHNOLOG... 5 Project 2 2 Project Notes

DASHBOARDS

D BK Invite Upgrade

zoom discord

+ Task





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# Conclusion

The real-time video stream from raspberry pi night vision camera is used to detect driver drowsy while driving in long distance, the system is successful in classifying blinking from sleeping and it works fine in both Day and Night times.

Touch sensor are called as tactile sensors and are sensitive to touch, force or pressure.it can be implemented on steering while the driver losses the hand grip the buzzer get ring to alert driver.

This project is based on multiple-approach integration technique for driver drowsiness detection i.e., camera module, smart watch and pressure-sensitive conductive sheet.

The alert is given by vibrator incorporated in the mi band 4 which will be activated in case of drowsiness detection, Bluetooth speaker is used to provide a voice alert with the specific aspect where drowsiness is detected and a third-party messaging site is used to send an alert message to emergency contact.



# Scope for future work

The increase in the population of vehicles all over the world acts as a fuel for the proposed system.

The system uses major approach such as facial analysis, heart rate analysis, and steering grip analysis for drowsiness detection. This can be considered as crucial aspects through which drowsiness can be detected. Although some other aspects like vehicular based techniques: (1) Driving Lane technique: In which the vehicle driving lane is analyzed for any faulty driving through which driver drowsiness can be predicted, (2) Steering wheel technique: In which the steering wheel handling is analyzed for any sudden pull or faulty handling of the steering through which driver drowsiness is predicted.

The system is successful in classifying blinking from sleeping by providing frame length to ignore blinking. The system detects drowsiness when the yawn threshold is met however it does not classify talking from yawning which can be implemented using audio detection which can be used to classify talking from capturing real-time audio.



THANK YOU



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