CAR DRIVER DROWSINESS DETECTION

Federico Cavedoni

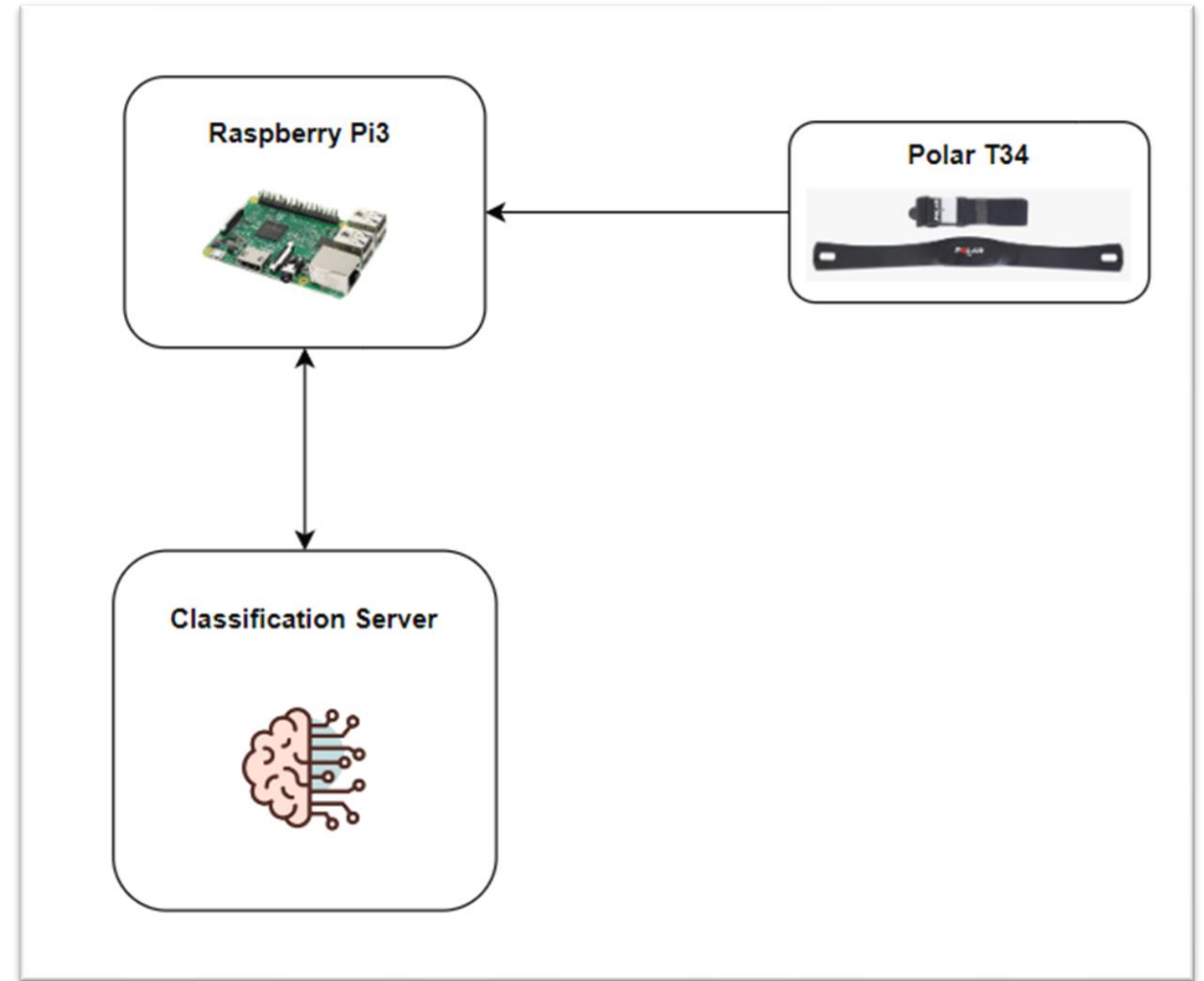Francesco Bruno

DROWSINESS DETECTION SYSTEM

A system capable of understanding if the driver is falling asleep by analysing his hearthbeat

SYSTEM DESCRIPTION
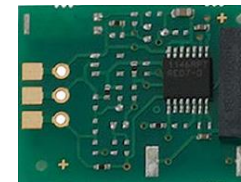
The system is composed of:

- **ECG Sensor (Polar T34)**

- **Sensor Controller (Raspberry PI 3)**

- **Classification Server**

PROTOTYPE DESCRIPTION (1/2)

Hardware description

- Polar T34

- Polar Heart Rate Receiver

- Raspberry PI 3

PROTOTYPE DESCRIPTION (2/2)

Controller Software

- Communication_API.py

- Controller_firmware.py

- Hearth_beat_analysis.py

- Sensor_driver.py

Classifier Server Software

- Communication_API.py

- Project_network.py

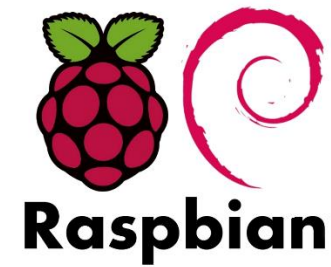- Thread_receiver.py

PERFORMANCE EVALUATION (1/3)

- **KNeighborsClassifier**

KNeighborsClassifier is used because it has great accuracy and good precision, respect to other types of classifiers

model	accuracy	precision
KNN	0.870844	0.295082

- **Scheduling**

Scheduling is managed by the Raspbian O.S.

PERFORMANCE EVALUATION (2/3)

Our SamplingTask is: (**Soft – Firm – Hard) Real Time?**

Firm-Task, because with deadline miss, it will lose the data becoming useless for the system. This event has been handled invalidating the session, restarting the sampling session (60s).

Periodic ?   Aperiodic ?   **Sporadic ?**

Minumum Interrival Time ~ 272mS
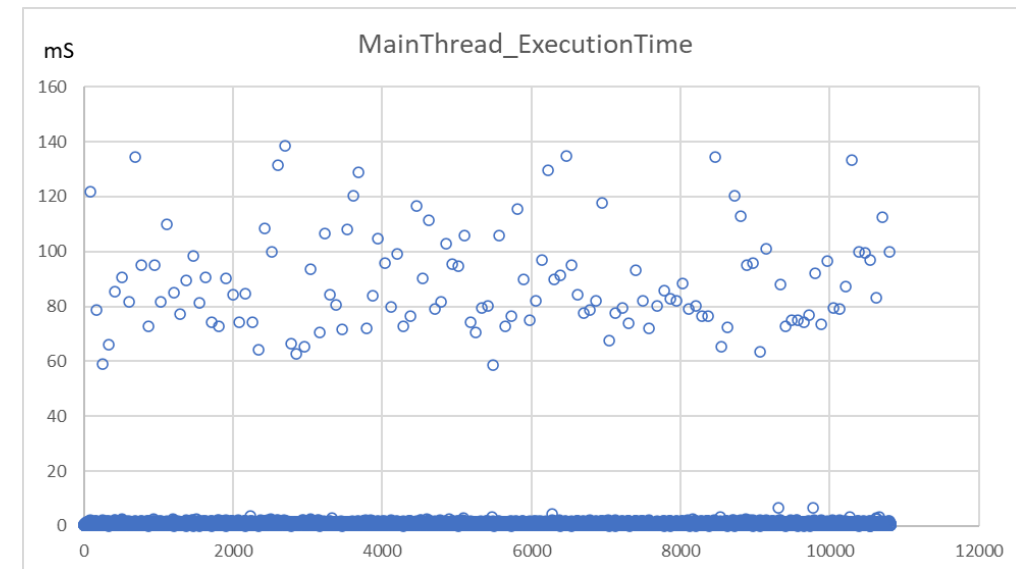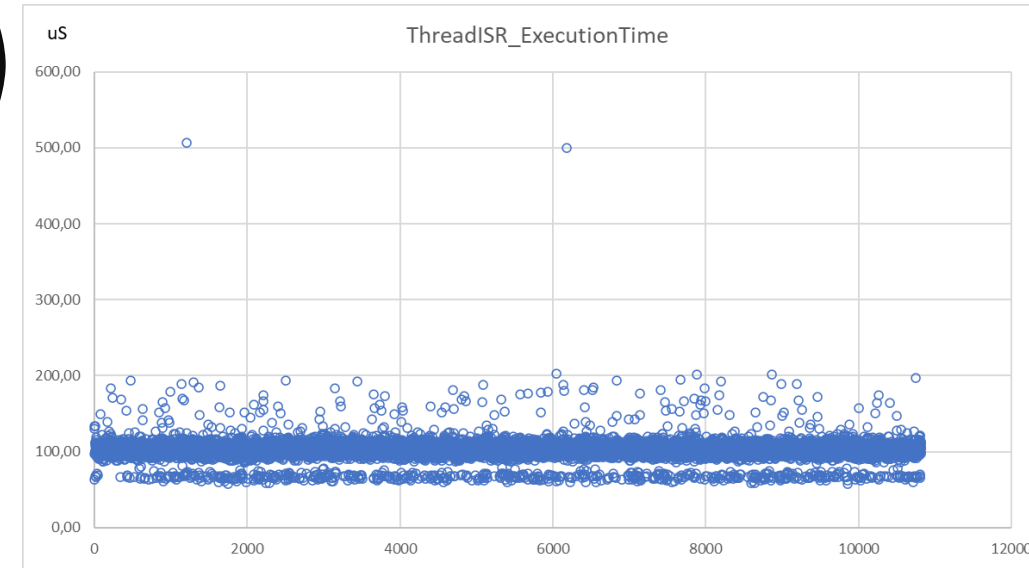
220BPM

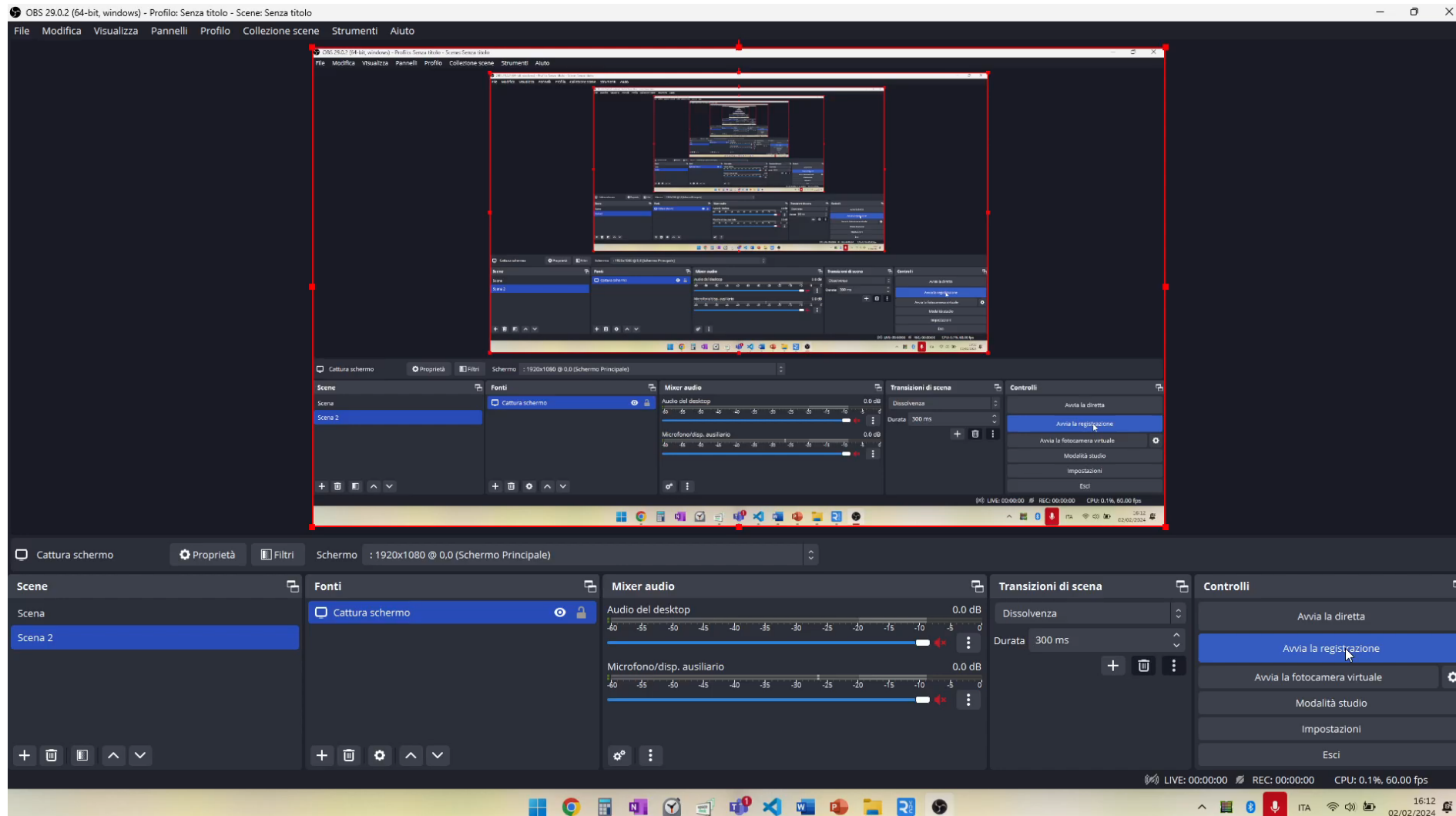# PERFORMANCE EVALUATION (3/3)

Deadline Analysis

Sampling session: ~4 hours

Minimum Interarrival Time: ~272mS

WCET taskISR: ~510uS

WCET MainThread: ~140mS

ThreadISR_ExecutionTime

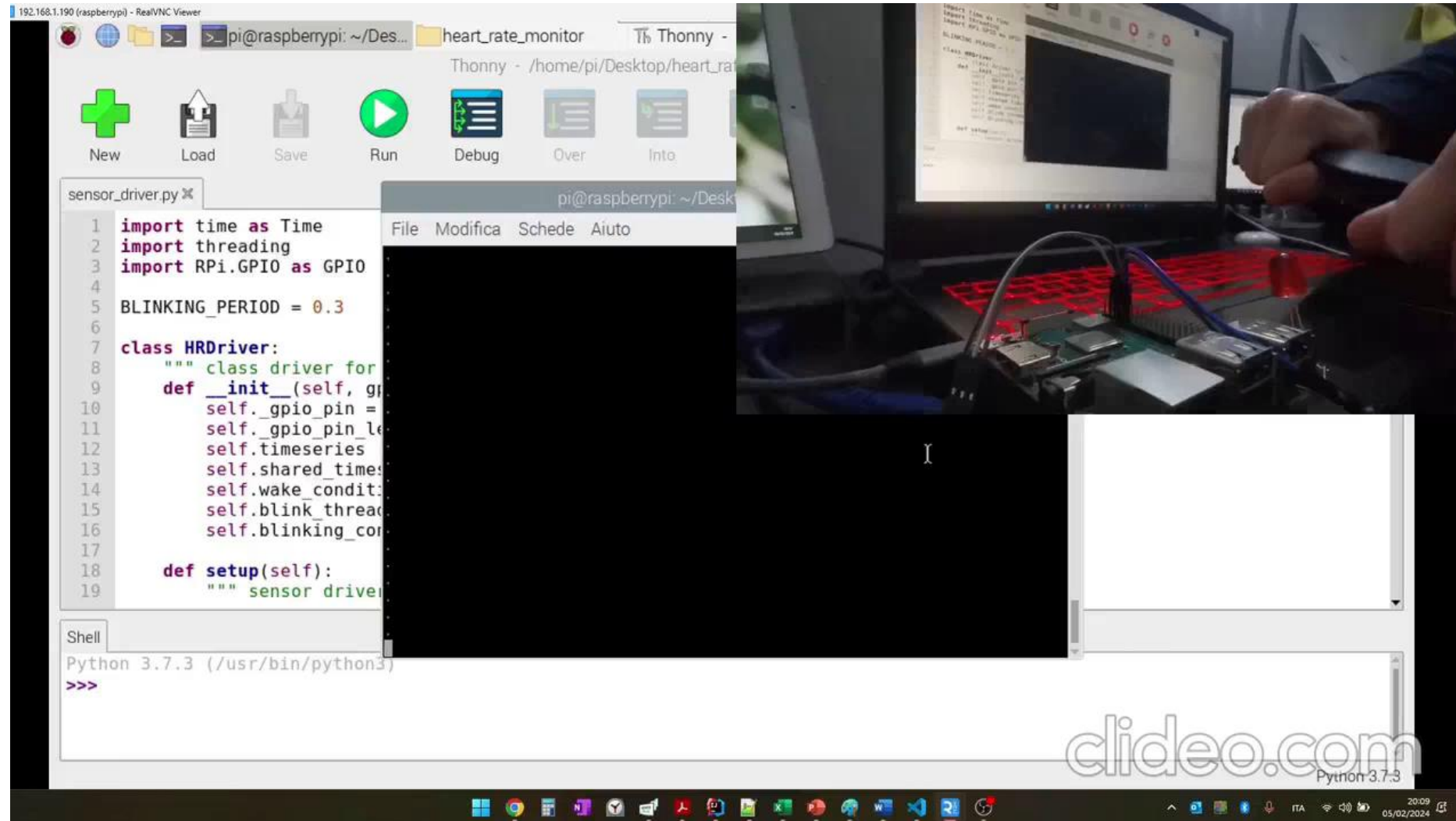MainThread_ExecutionTime

DEMO (1/3): NORMAL SITUATION

DEMO (2/3): ABNORMAL CLASSIFICATION

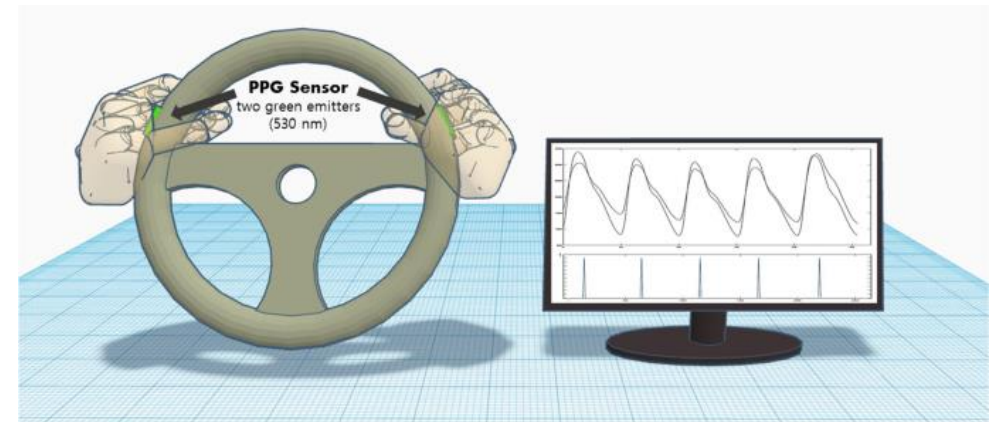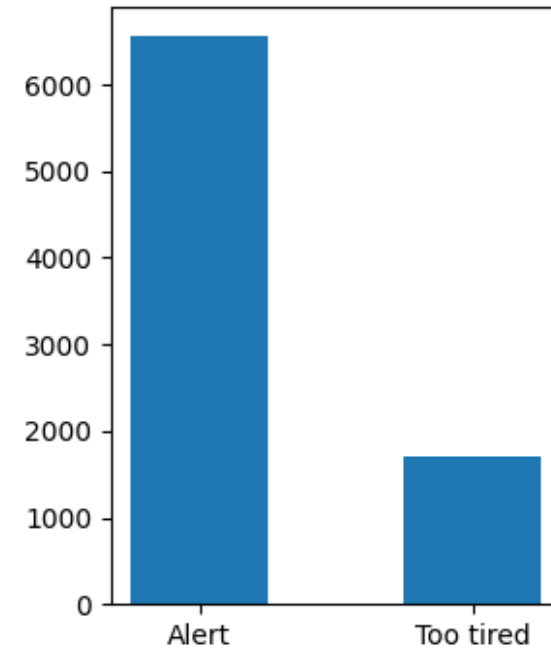# DEMO (3/3): HANDS OFF STEERING WHEEL

CONCLUSIONS

- **Improve the training procedure**
The classification is surely influenced by the unbalanced dataset used

- **Use a PPG sensor**
For better classification due to the incrementing of the sensor precision and usability

REFERENCES

- **PPG Cognitive Fatigue Prediction Source:**
  https://www.kaggle.com/code/katariinaparkja/ppg-cognitive-fatigue-prediction

THANKS FOR THE ATTENTION

Federico Cavedoni

Francesco Bruno