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Unconsciousness detection

Application of artificial intelligence in image recognition and classification

IRON HACK

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Unconsciousness detection

Application of artificial intelligence in image recognition and classification

Project

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Summary

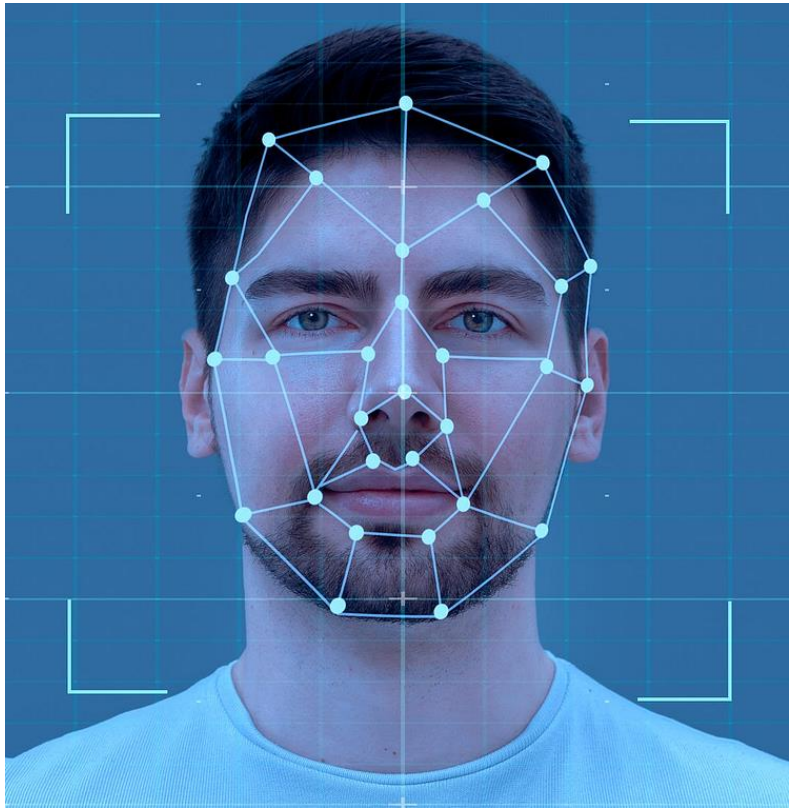
1. **Face and eye detection** in video by applying an image recognition algorithm to each of its frames in real time

2. **Eye classification** to predict whether the eyes are open or closed, and then conclude about the person's unconsciousness

   Conscious status is deteriminated by open eyes and unconscious status is determinated by a consistente period of closed eyes

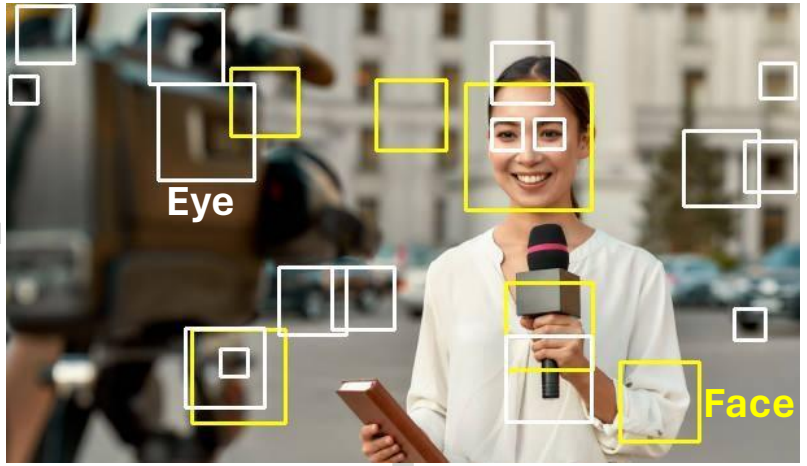
3. **Identification** and visualization **of some applications** in everyday situations, aiming to determine the usefulness of the tools

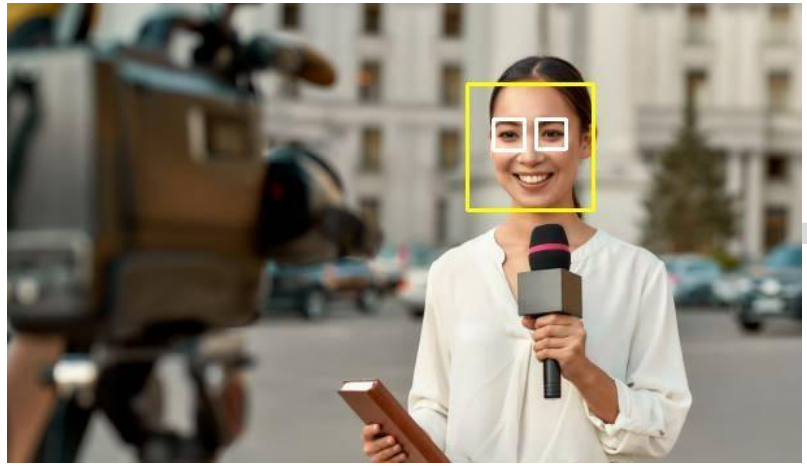
Face and eye detection – Haar Cascades



- **Object detection algorithm**, used in OpenCV, an open computer vision library
- Capable of detecting objects in images, **regardless of their location and scale**
- **Not as accurate** as other modern algorithms, tend to be prone to false-positive detections
- **Really fast**, making it possible to detect objects in real-time video streams

Face and eye detection – Algorithm improvement

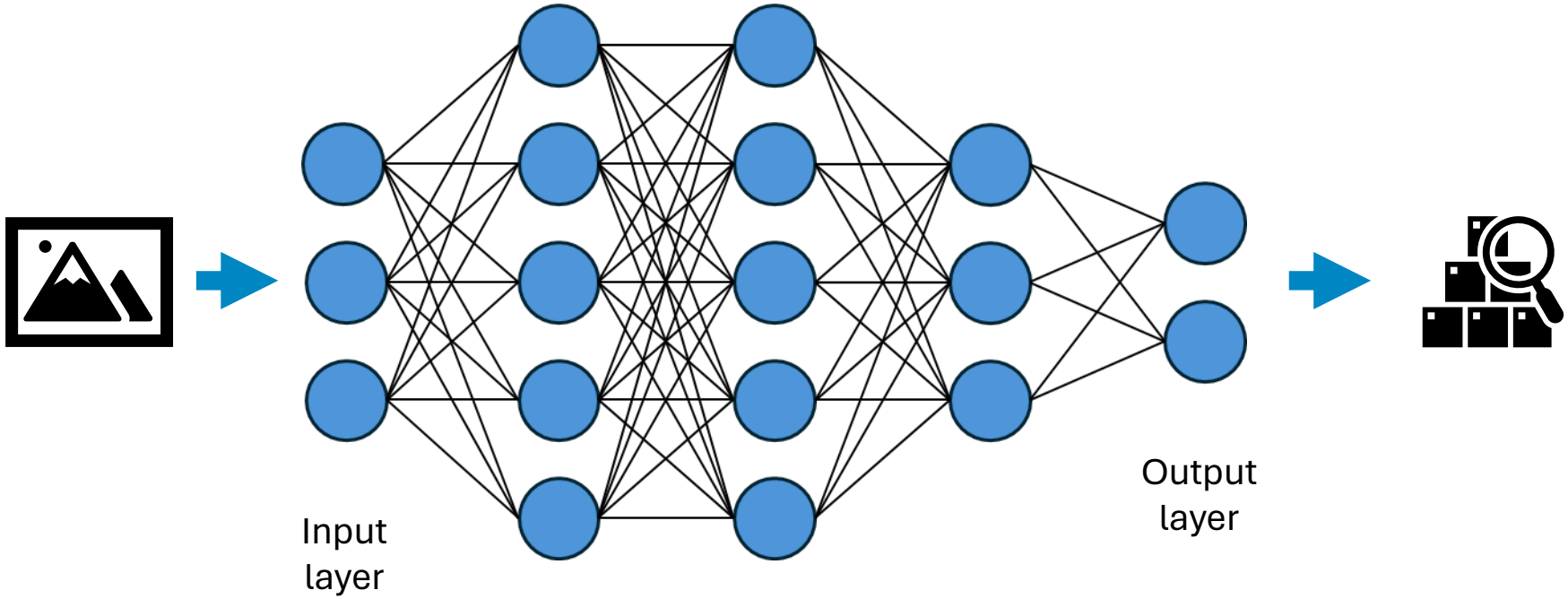




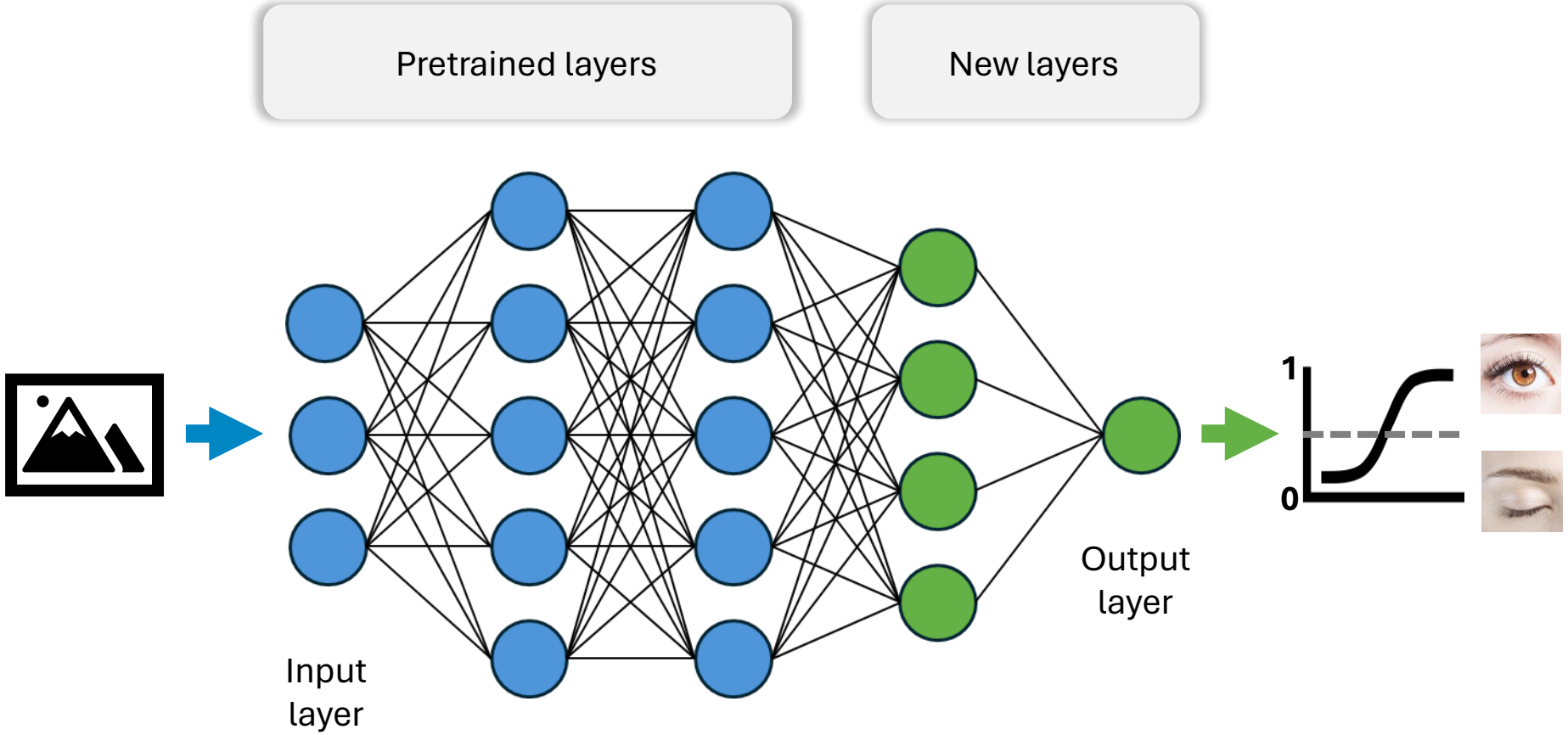
Facial symmetries and proportions

Eye classification – Transfer learning

Deep learning architecture: **MobileNet**

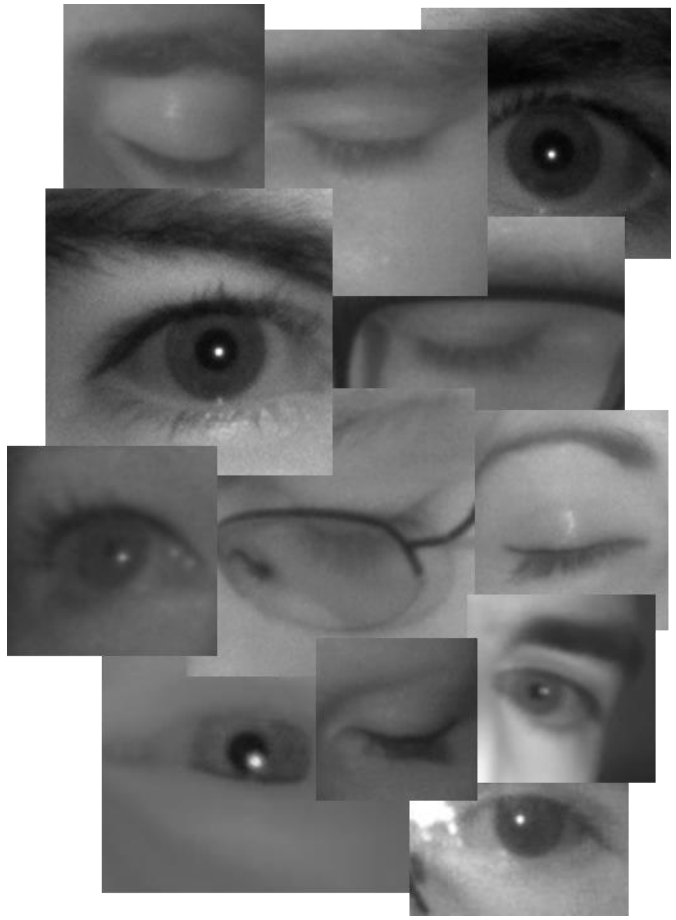


Eye classification – Transfer learning

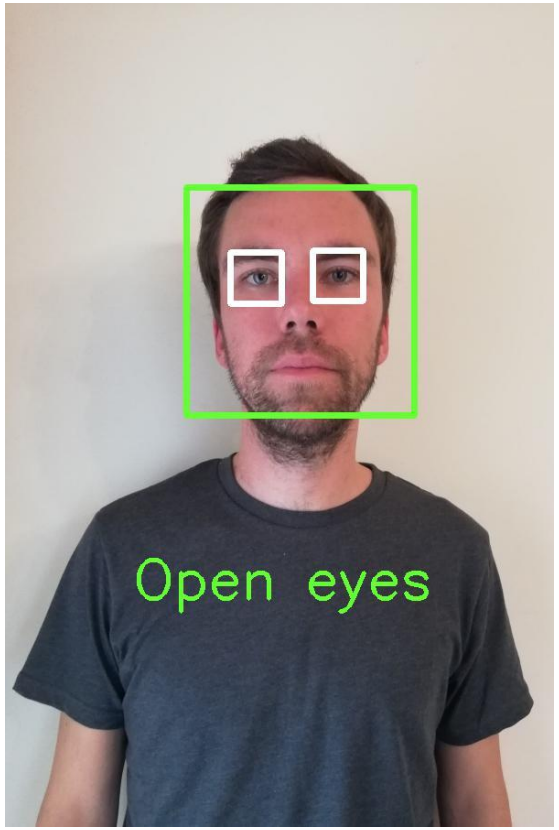


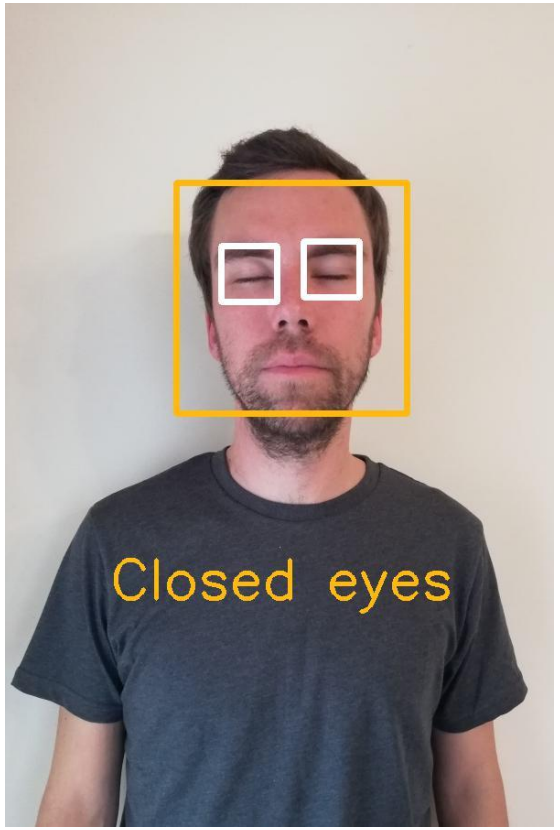
Eye classification – Model training

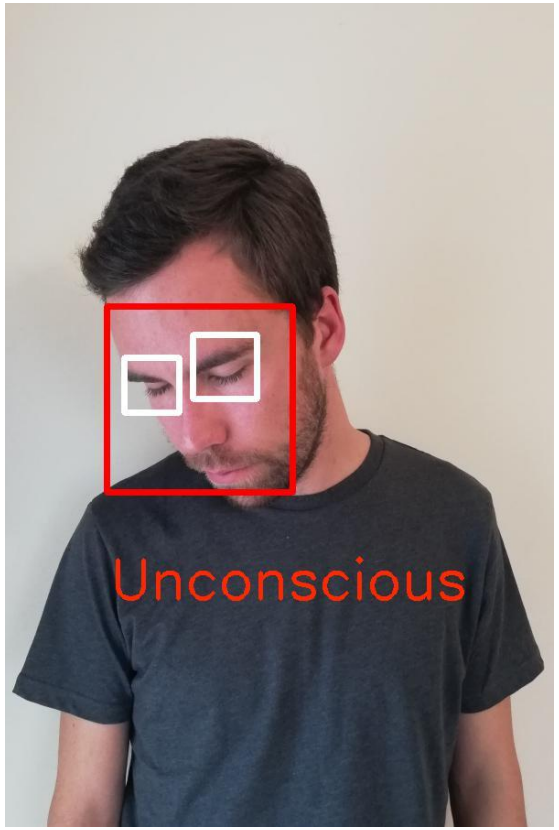
- 79 660 pictures (MRL Eye Dataset)
- Different dimensions
- 50 / 50 % balanced data
- Sample of 37 people
- Diversity in gender and race
- Use of glasses and makeup
- 80 / 20 % train test validation split
- 98 % of accuracy



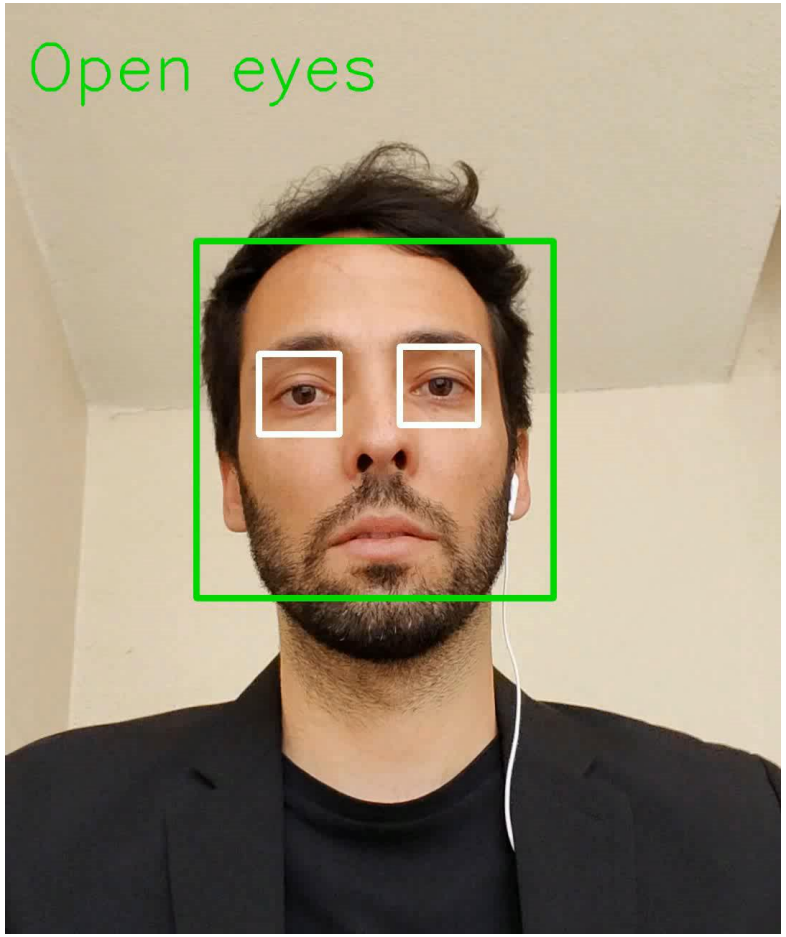
Live demonstration



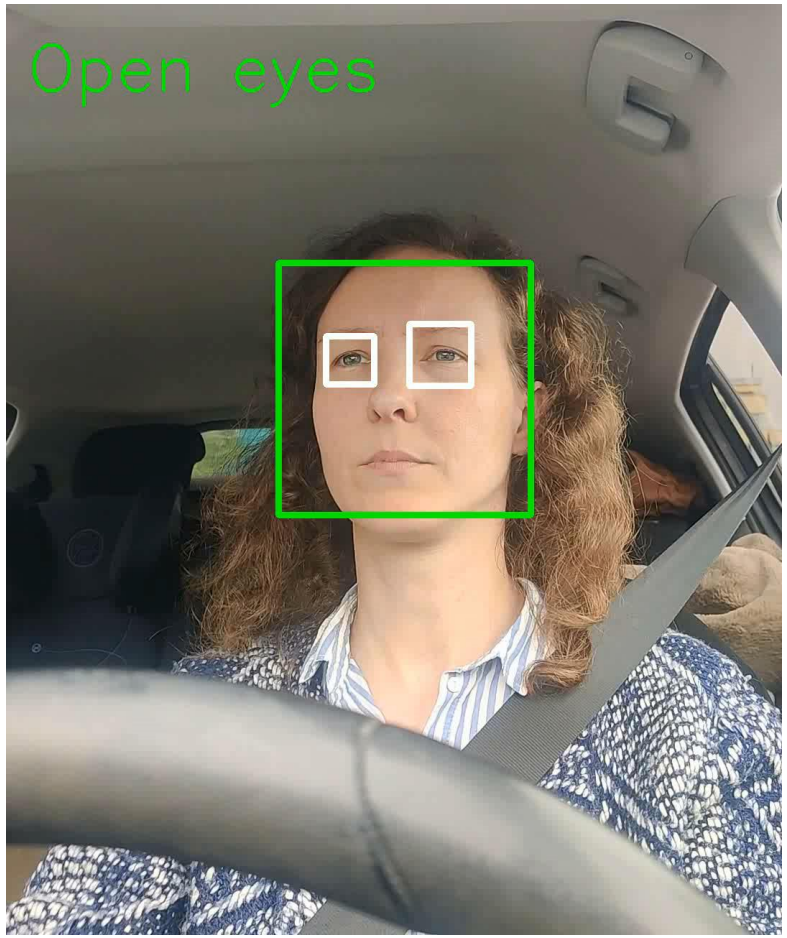


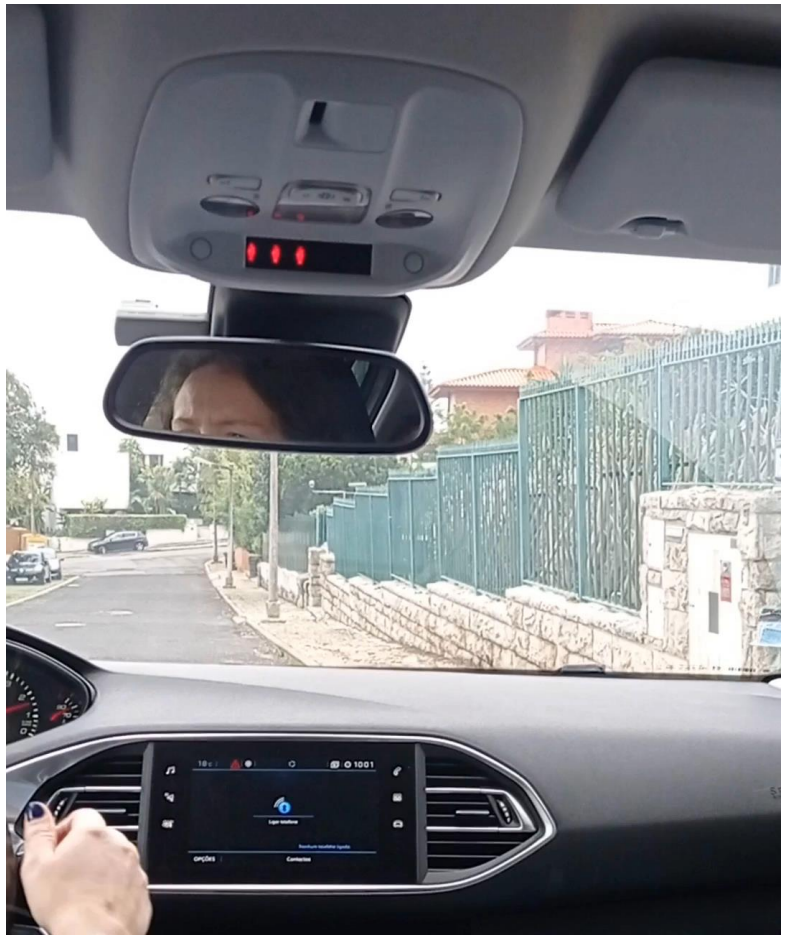


Alarm sounds when security guard falls asleep (video)



Vehicle stops when driver passes out (video)





Synthesis

- Although Haar Cascades is not the most accurate object detection algorithm, it's really fast, making it possible to apply it to real-time video streams
- The implementation of relevant changes related to facial symmetry and proportions allowed the improvement of the face and eye detection algorithm
- With the transfer learning technique it was possible to use existing knowledge to boost the performance of a new model used on a related task
- The eye classification model was trained using a very diverse and complete database, which made it more robust and allowed it to achieve an accuracy of 98%
- The biggest challenges faced are related to the quality of the captured image and to the difficulty of producing fast and accurate results at the same time
- The work developed was successfully applied in some real-life examples and, from one of them, an app was created

Thank you!

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