

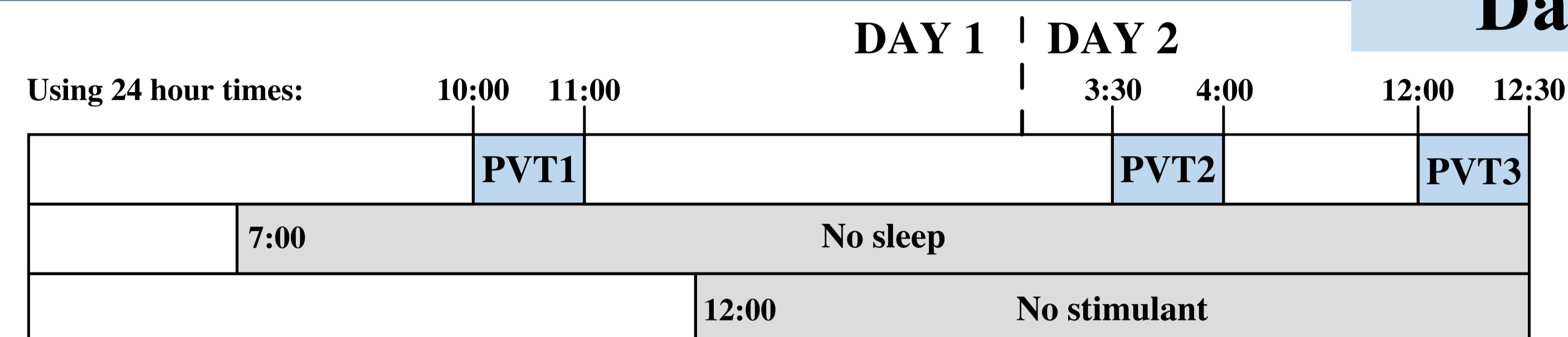
The ULg Multimodality Drowsiness Database (called DROZY) and Examples of Use

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Description

DROZY is a database containing various types of drowsiness-related data (signals, face images, etc.) and intended to help researchers to carry out experiments, and to develop and evaluate systems (*i.e.* algorithms), in the area of drowsiness monitoring.

Data acquisition

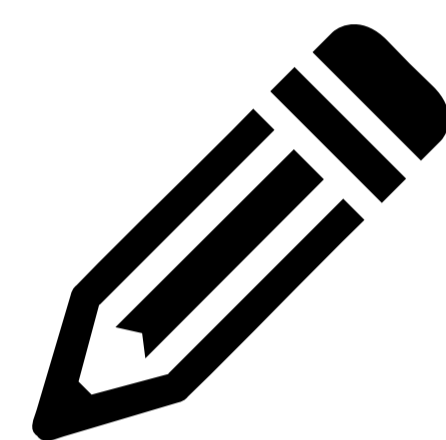
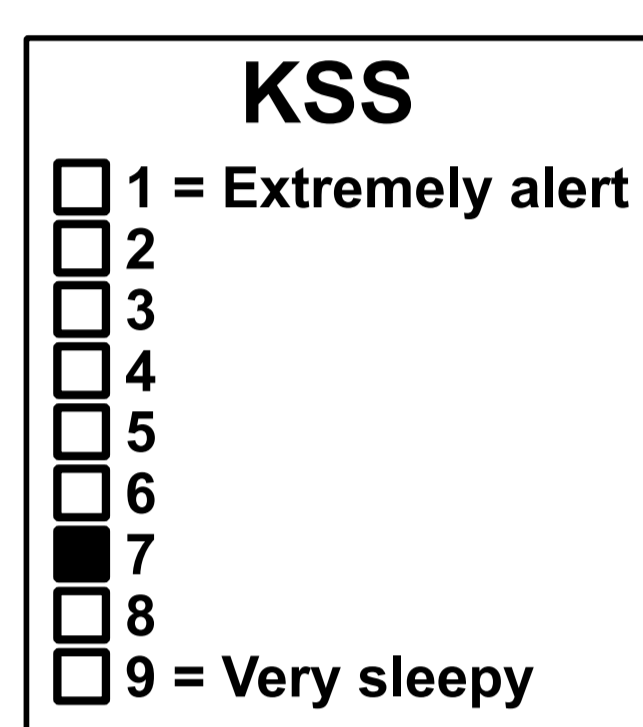


- 14 young, healthy participants (3 M, 11 F)
- PVT = Psychomotor Vigilance Test [1] (duration of 10 minutes)
- Protocol approved by the Ethics Committee of our university.

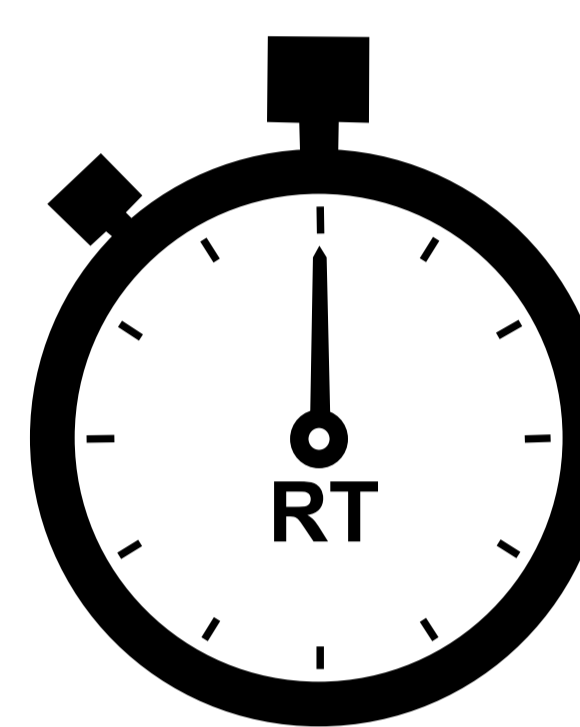
Database content

Standard drowsiness measures

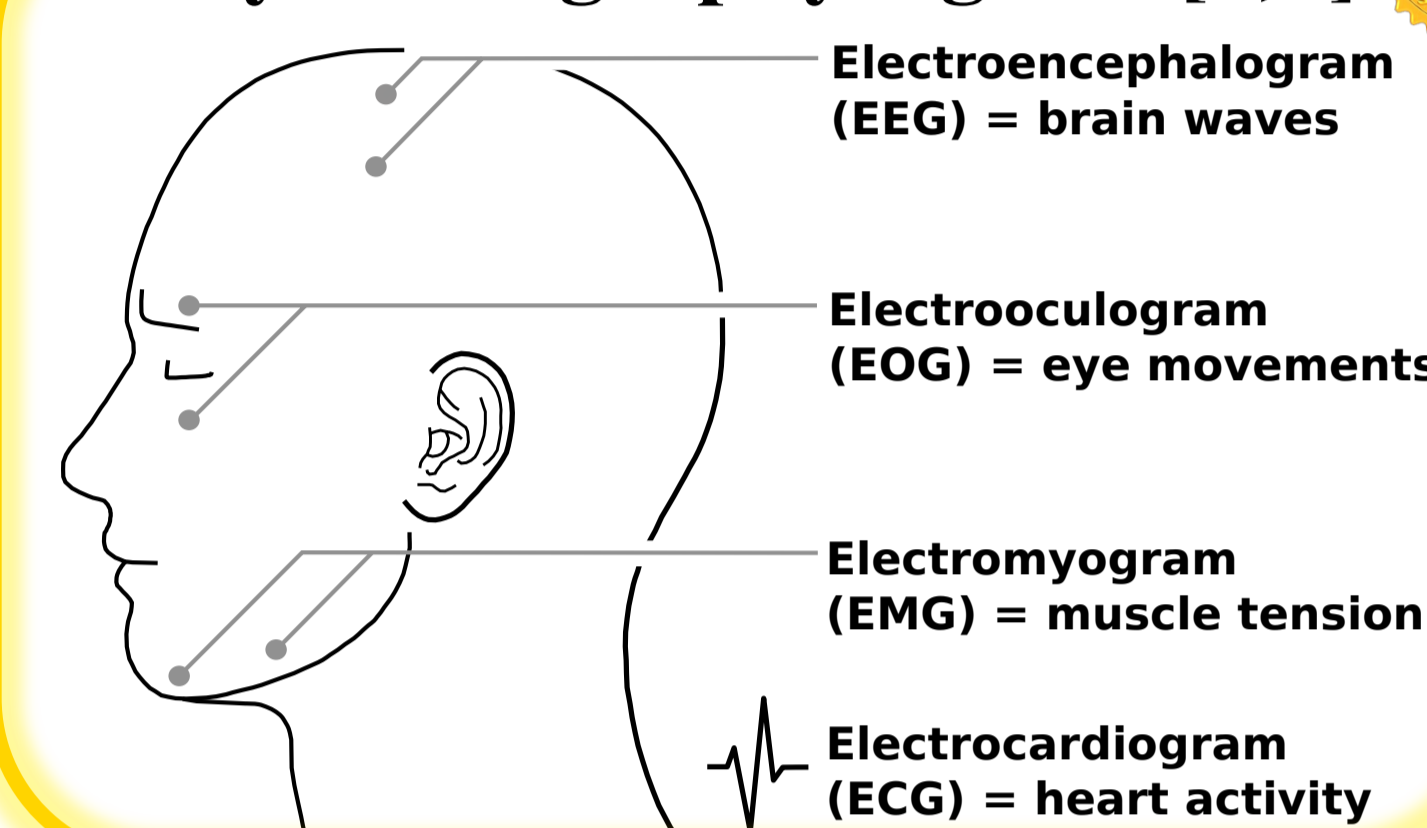
Karolinska Sleepiness Scale [2]



Reaction times [1]



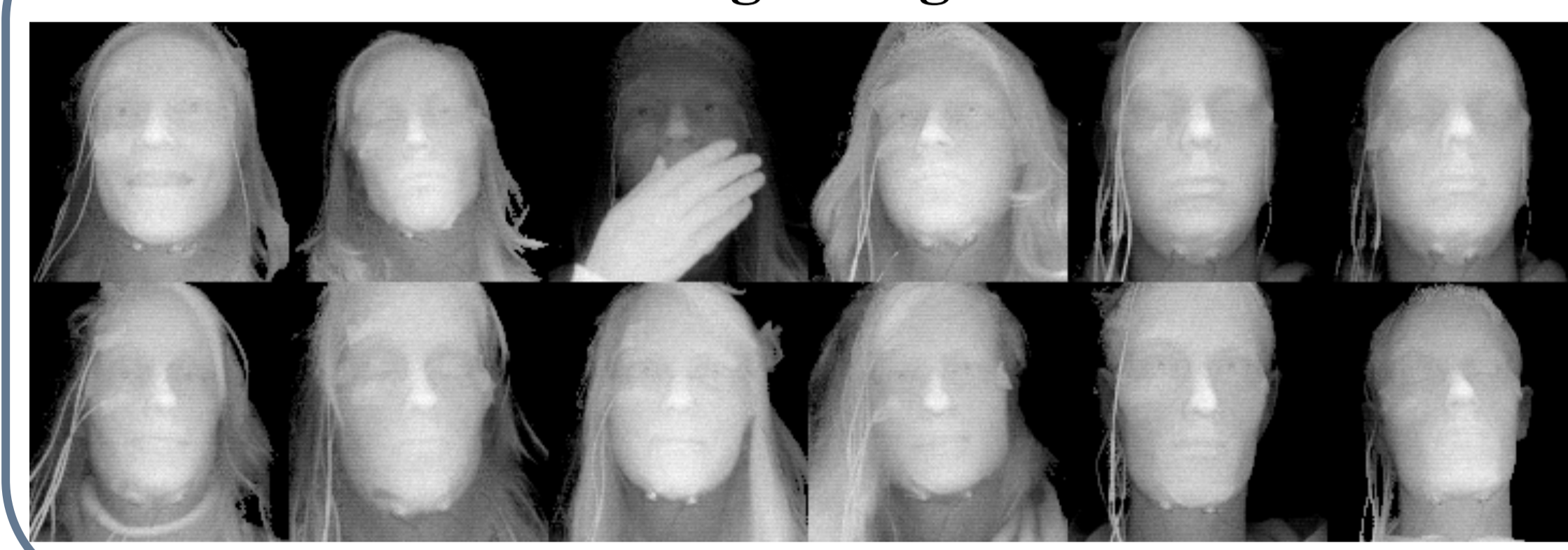
Polysomnography signals [2,3]



Kinect v2 data

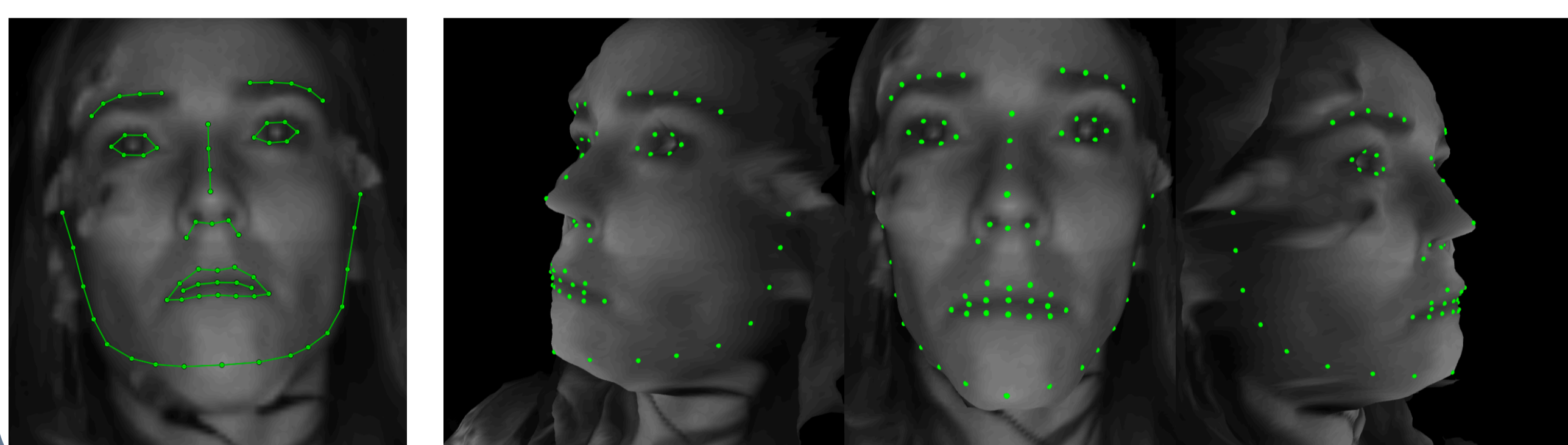


Range images



Annotations

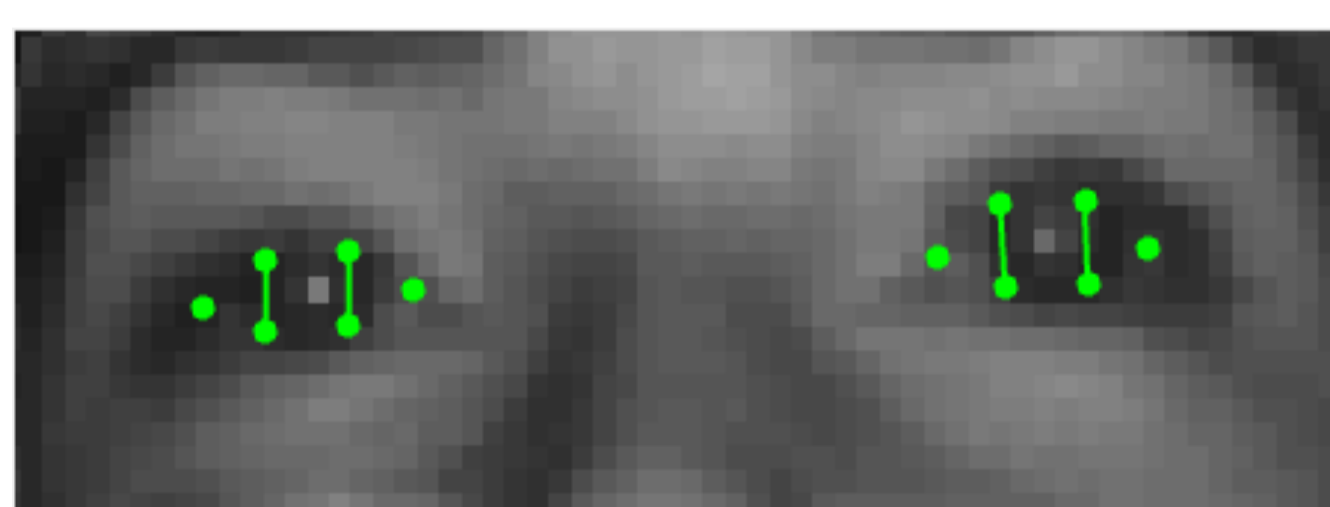
68 face landmarks (2D & 3D)



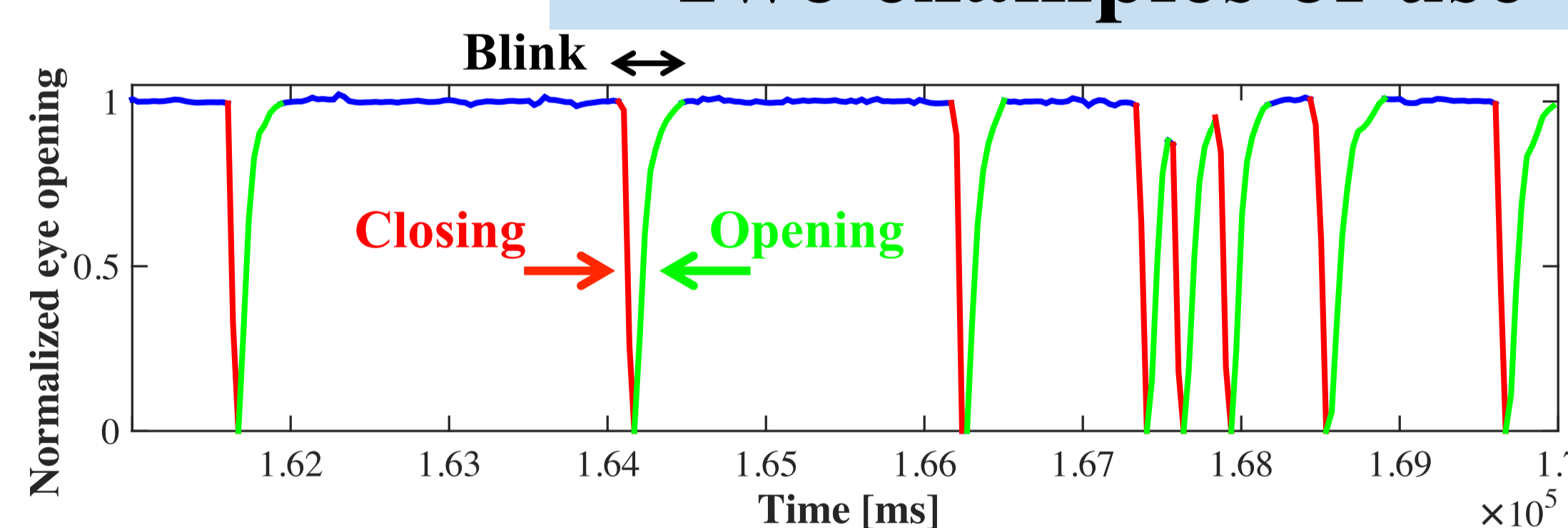
www.drozy.ulg.ac.be



Two examples of use

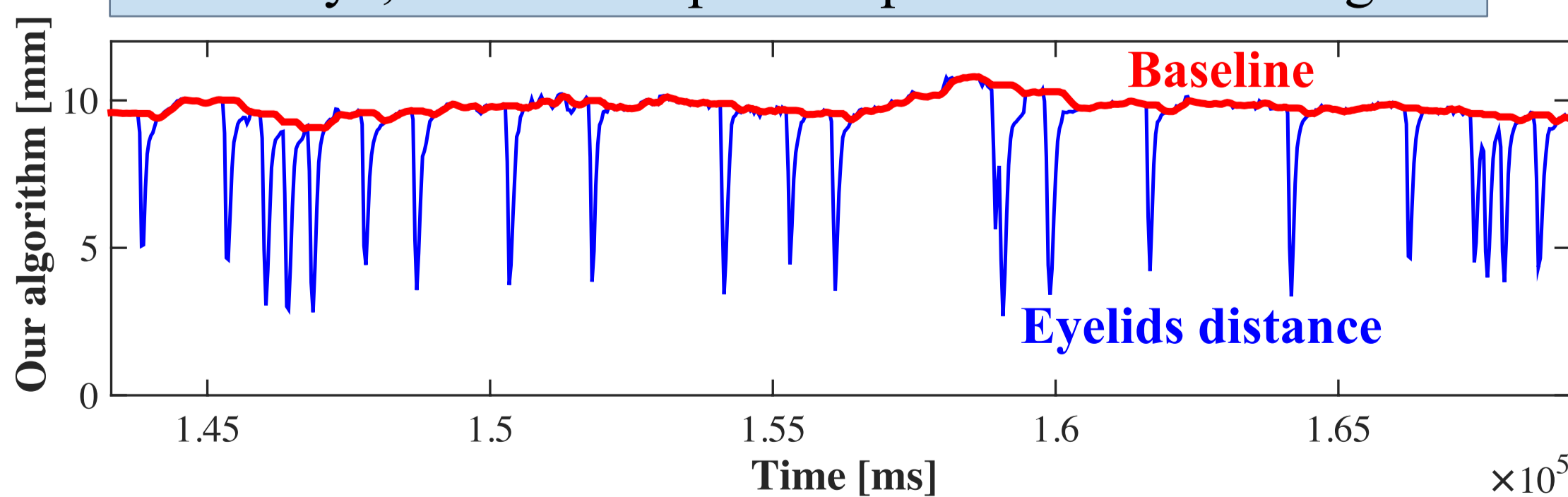


1) Get the (global) eyelids distance from the 8 eyelids landmarks.



3) Normalize and segment the blinks.

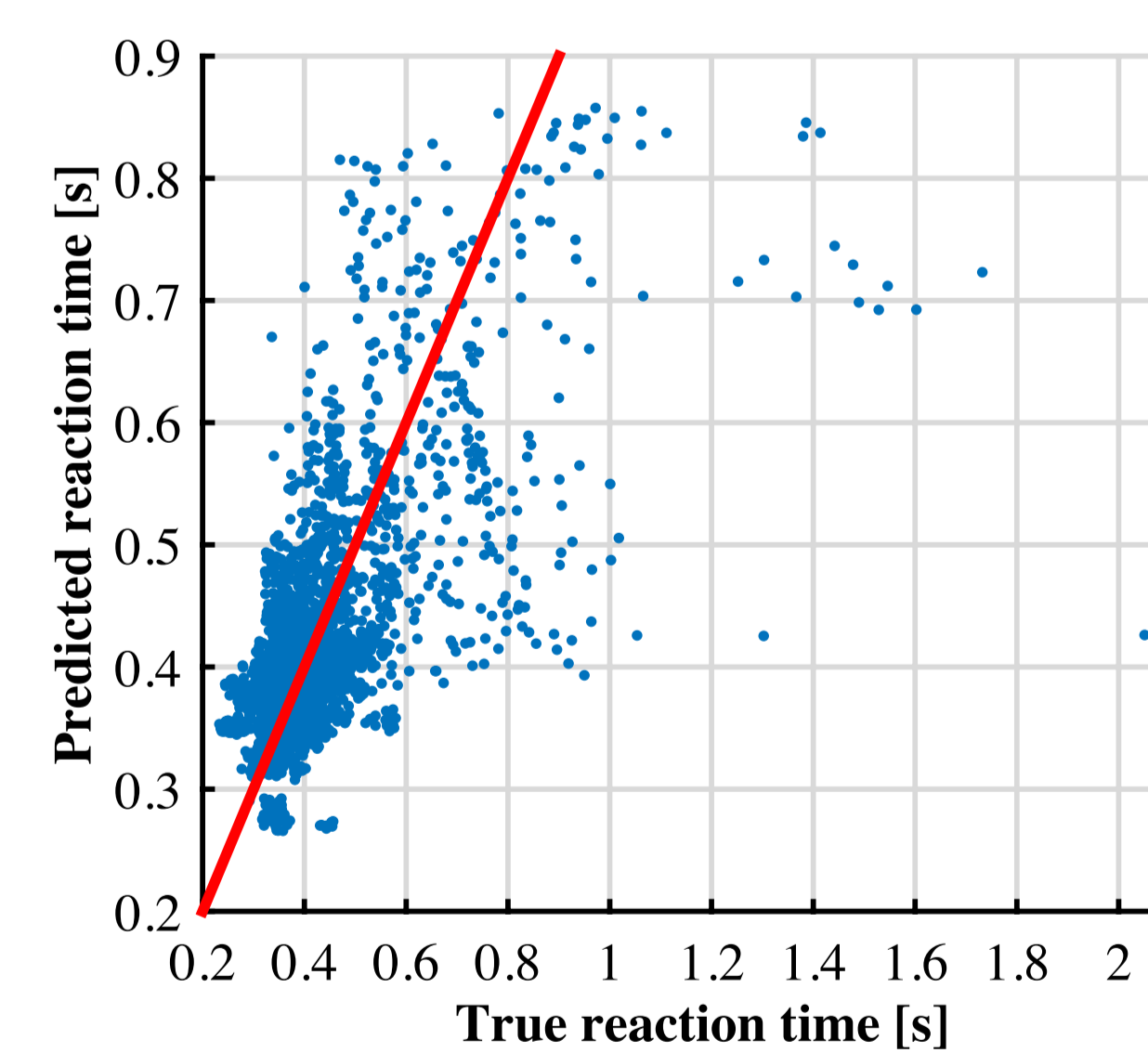
2) Compute the baseline, *i.e.* the maximum opening of the eye, with an adaptive exponential smoothing.



4) Compute ocular parameters:

- values of a 10-bin histogram
- mean duration of blinks
- number of microsleeps
- etc.

5a) **Regression:** we use epsilon-SVR models (with an RBF kernel) to predict the post-stimulus 1-min mean reaction time (RT) from pre-stimulus ocular parameters. We obtain an **RMSE of 105.84 ms** and a **Pearson's correlation of 0.67** using leave-one-subject-out cross-validation.



5b) **Classification:** we use SVM classifiers (with an RBF kernel) to predict the post-stimulus lapses (*i.e.* RT > 500 ms) from pre-stimulus ocular parameters. We obtain a **specificity of 86%**, a **sensitivity of 78%**, and an **accuracy of 85%** using leave-one-subject-out cross-validation.

Confusion matrix:

		Predicted RT	
		≤.5s	>.5s
True RT	≤.5s	2256	360
	>.5s	100	348

Acknowledgments

- We thank:
- the participants for enduring the acute sleep deprivation of 28-30 hours,
 - David Grogna and Philippe Latour (ULg researchers) for their help in supervising the data collection,
 - the Belgian FRIA F.R.S-FNRS for supporting Quentin MASSOZ with a fellowship.

References

- [1] M. Basner and D. F. Dinges. Maximizing sensitivity of the psychomotor vigilance test (PVT) to sleep loss. *Sleep*, 34(5):581-591, 2011.
- [2] T. Åkerstedt and M. Gillberg. Subjective and objective sleepiness in the active individual. *International Journal of Neuroscience*, 52(1-2):29-37, 1990.
- [3] M. Gillberg, G. Kecklund, and T. Åkerstedt. Relations between performance and subjective ratings of sleepiness during a night awake. *Sleep: Journal of Sleep Research & Sleep Medicine*, 1994.

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