

Stress Detection Models on the WESAD Dataset

Team 14

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Signals Processing

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Dataset

The WESAD dataset is a publicly available dataset for wearable stress and affect detection, that features physiological and motion data, recorded from both a wrist- and a chest-worn device, of 15 subjects during a lab study. Measuring blood volume pulse, electrocardiogram, electrodermal activity, electromyogram, respiration, body temperature, and three-axis acceleration. Determining stress and emotions, by containing three different affective states (neutral, stress, amusement).

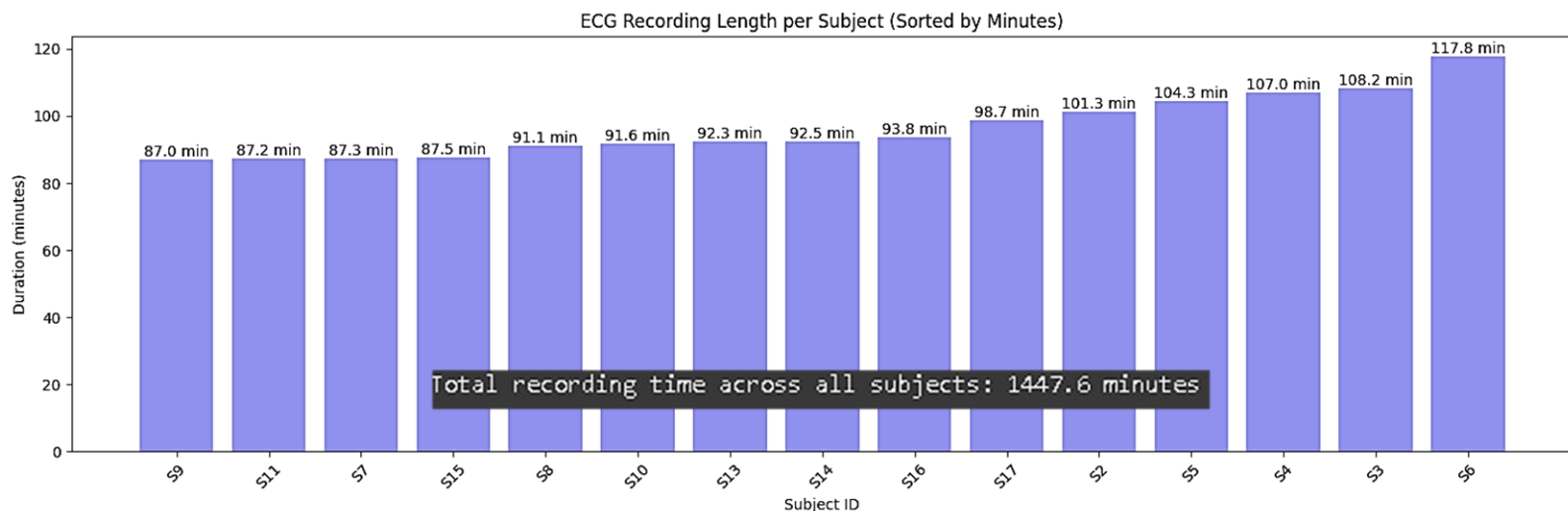
Method

Preparing

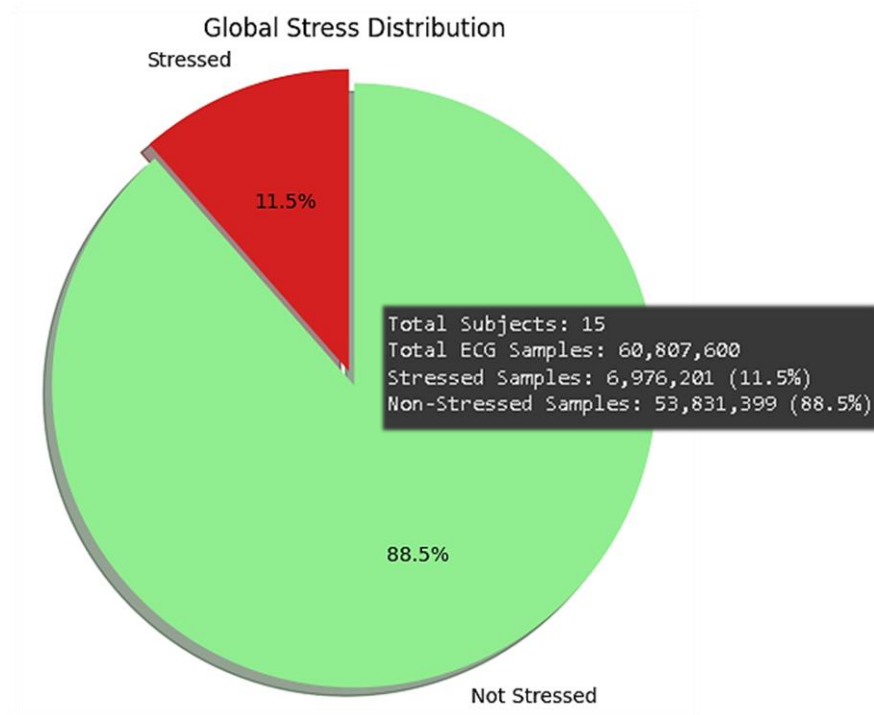
We uploaded the dataset on Kaggle for easier use and made the ML models on Google Colab. And set some fixed variables, as with our reference we made a **fixed Windowing** at **300 Sec.**, and **50% overlapping**, and **sampling frequency** at **700 Hz** as all signals were sampled at 700 Hz. As we read the data, we only took the **ECG signal** from the RespiBAN device from each subject's .pkl file, and Selecting **Stressed** as **1**, and any other state as **Not-Stressed** as **0**, as we are working as **binary classification** case (stress vs. non-stress).

Statistics

We did some calculations on the data, to see the total ESG signals time (in minutes) we have:



And a global stress distribution pie chart, that shows Stressed vs. Not Stressed:



Preprocessing

We did windowing at the signal first, then extracted some **features** like **mean**, **standard deviation**, **minimum**, **maximum**, **skewness**, and **kurtosis**. Then a cleaning process to check for any $\pm\infty$ and replace them with the **median** to ensure that it doesn't affect the data. And **normalizing** the data.

Models

We split the data into **80/20** train/test, and used two pretrained classifiers **XGB** and **BAG** from the recommendation of the reference.

Results

The **BAG** model achieved accuracy of 89%, while the **XGB** model achieved 92%. As for the reference BAG model achieved $99.63\% \pm 0.37\%$ in segmented binary classification on the ECG signal.

Usful Links

Reference

- [From lab to real-life: A three-stage validation of wearable technology for stress monitoring 2025 by Basil A. Darwish, Shafiq Ul Rehman, Ibrahim Sadek, Nancy M. Salem, Ghada Kareem, Lamees N. Mahmoud](#)

Dataset

- [Philip Schmidt, Attila Reiss, Robert Duerichen, Claus Marberger and Kristof Van Laerhoven. 2018. Introducing WESAD, a multimodal dataset for Wearable Stress and Affect Detection](#)

GitHub Repo

- [GitHub](#)

Presentation Video

- [OneDrive](#)