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A Wearable Exam Stress Dataset for Predicting Cognitive Performance in Real-World Settings

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Published: May 26, 2022. Version: 1.0.0

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Amin, M. R., Wickramasuriya, D., & Faghih, R. T. (2022). A Wearable Exam Stress Dataset for Predicting Cognitive Performance in Real-World Settings (version 1.0.0). *PhysioNet*. https://doi.org/10.13026/kvkb-aj90.

Additionally, please cite the original publication:
Amin, Md. Rafiul, Dilranjan S. Wickramasuriya, and Rose T. Faghih. "A Wearable Exam Stress Dataset for Predicting Grades using Physiological Signals." 2022 IEEE Healthcare Innovations and Point of Care Technologies (HI-POCT). IEEE, 2022.

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Abstract

Preliminary datasets containing skin conductance recordings where experiments involve artificial stimuli are available online. However, recordings of a longer duration acquired during real-world cognitive stressors are lacking significantly. This dataset seeks to bridge the gap between a body of knowledge concerning the human stress response primarily built up on laboratory acquired data, and how people's skin conductance fluctuates in reality when they undergo a stressful exam experience. The data contains **electrodermal activity**, **heart rate**, **blood volume pulse**, **skin surface temperature**, **inter beat interval** and **accelerometer data** recorded during **three exam sessions** (midterm 1, midterm 2 and finals) as well as their corresponding grades. The purpose of this dataset is to gauge the influence of stress on exam performance.

Background

Many experiments have subjected participants to artificial stimuli such as a moderate electric shocks, loud noises, aversive pictures and videos in order to examine the human skin conductance response to an external stressor. While the purpose has been to understand how the body responds to these stressors, few experiments have obtained skin conductance recordings in exam settings to see how changes occur in response to more realistic cognitive stressors, such as are frequently experienced by college students.

Preliminary datasets containing skin conductance recordings where experiments involve artificial stimuli are available online. However, recordings of a longer duration acquired during real-world cognitive stressors are lacking significantly.

Our experiment seeks to bridge the gap between a body of knowledge concerning the human stress response primarily built up on laboratory acquired data, and how people's skin conductance fluctuates in reality when they undergo a stressful exam experience.

Methods

Subjects were required to wear the FDA-approved Empatica E4 wristband while they take their midterm (Exam 1 and 2) and final exams. The E4 recorded skin conductance, heart rate, body temperature and movement (accelerometer).

Each E4 device has a tag number. On coming to the exam, each participant picked up an E4 device and wrote their name on the document corresponding to the E4 device they selected. After data collection the participants returned their E4 wristbands to the study team. Finally, the course instructor provided the other members of the study team with the grades corresponding to the device numbers.

Data Description

The data contains **electrodermal activity**, **heart rate**, **blood volume pulse**, **skin surface temperature**, **inter beat interval** and **accelerometer data** recorded during **three exam sessions** (midterm 1, midterm 2 and final) as well as their corresponding grades. All the data are the direct output of the Empatica E4 device and processing has been carried out. The duration of the midterm exam are 1.5 hrs and for final exam the durations is three hours. Some useful notes on the dataset is provided below,

- StudentGrades.txt contains the grades for each student
- The Data.zip file contains folders for each participants named as S1, S2, etc.
- Under each of the folders corresponding to each participants, there are three folders 'Final', 'Midterm 1', and 'Midterm 2', corresponding to three exams.
- Each of the folders contains csv files: 'ACC.csv', 'BVP.csv', 'EDA.csv', 'HR.csv', 'IBI.csv', 'tags.csv', 'TEMP.csv', and 'info.txt'.
- 'info.txt' contains detailed information of each of these files.
- All the unix time stamps are date shifted for de-identification but not time shifted. The date shift have been carried out such a way that it does not change the status of the day light saving settings (CT/CDT) of a day.
- All exam starts at 9:00 AM (CT or CDT depending on the date corresponding to the unix time stamp). Mid terms are 1.5 hr long and final is 3 hr long.
- Sampling frequency of the arrays are provided in 'info.txt'.
- The dataset contains two female and eight male participants, however the gender is not mentioned for the purpose of de-identification.

Usage Notes

The dataset has been used in a publication to predict exam grades from electrodermal activity [1]. In the above publication, dataset has been used just to show the dataset might contain information regarding participants grades only considering electrodermal activity and with very basic features and machine learning techniques. This dataset can widely be used with more advanced techniques with multimodal recordings. As the dataset has been collected from real world settings, it contains motion artifacts. Moreover, the number of participants is also relatively small. Users may utilize codes from computational medicine laboratory github page [2] to process electrodermal activity, especially the repos provided in the reference section [3],[4].

Ethics

The study protocol was reviewed and approved by the University of Houston Institutional Review Board (IRB).

Acknowledgements

This work was supported in part by the U.S. National Science Foundation under Grants 1942585 -- CAREER: MINDWATCH: Multimodal Intelligent Noninvasive brain state Decoder for Wearable AdapTive Closed-loop arcHitectures and 1755780 -- CRII: CPS: Wearable-Machine Interface Architectures.

Conflicts of Interest

No conflicts of interest.

References

1. Amin, Md Rafiul, Dilranjan S. Wickramasuriya, and Rose T. Faghih. "A Wearable Exam Stress Dataset for Predicting Grades using Physiological Signals." 2022 IEEE Healthcare Innovations and Point of Care Technologies (HI-POCT). IEEE, 2022.
2. https://github.com/computational-medicine-lab
3. https://github.com/computational-medicine-lab/Skin-Conductance-Based-Stress-State-Estimation
4. https://github.com/computational-medicine-lab/Skin-Conductance-Deconvolution.git

Access

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Discovery

DOI (version 1.0.0):
https://doi.org/10.13026/kvkb-aj90

DOI (latest version):
https://doi.org/10.13026/wn66-m424

Topics:
stress

Corresponding Author

You must be logged in to view the contact information.

Files

Total uncompressed size: 82.1 MB.

Access the files

- Download the ZIP file (82.0 MB)
- Download the files using your terminal: `wget -r -N -c -np https://physionet.org/files/wearable-exam-stress/1.0.0/`
- Download the files using AWS command line tools: `aws s3 sync s3://physionet-open/wearable-exam-stress/1.0.0/ DESTINATION`

Folder Navigation: <base>

Name	Size	Modified
data		
LICENSE.txt	19.9 KB	2022-05-24
SHA256SUMS.txt	21.6 KB	2022-06-01
StudentGrades.txt	470 B	2021-12-14
readme.md	1.1 KB	2022-04-03