Datasheet : **Tufts fNIRS to Mental Workload**

By L. Wang, Z. Huang, ... , M. Hughes, and R. Jacob

Last updated: 2021-08-27
Dataset Version: 1.1

Summary

The Tufts fNIRS to Mental Workload (Tufts fNIRS2MW) dataset contains records from adult human participants performing controlled cognitive workload tasks.

This document describes Version 1.1 containing all data collected through July 2021.

68 participants represent our recommended eligible cohort. These were selected out of 87 total participants in our study, some of whom we recommend excluding for data quality reasons.

For each individual participant, the dataset contains records of:

- fNIRS recordings with corresponding segment labels, collected during an n-back experimental task to intentionally induce different levels of cognitive workload
    - Each label indicates the n-back intensity level (0-back, 1-back, 2-back, 3-back)
    - Each recording indicates the multivariate time-series recorded by the fNIRS sensor used in this study
        - 8 variables, one for each combination of 2 spatial locations on the forehead, measured concentration (oxygenated hemoglobin and deoxygenated hemoglobin), and optical data type (intensity and phase)
        - For each variable, over 21 minutes of data recorded at 5.2 Hz
- Demographic information
- Task performance

Data was collected from January - July 2021 using a convenience sample of individuals in the Medford, MA area who responded to advertisements. Data has been fully de-identified and approved for release by the Tufts University IRB.

Recommended Uses

This dataset can be used for the following standard ML tasks:

- rolling-window time-series classification
    - *In*: fixed length (e.g. 10 seconds) multivariate time series of fNIRS brain signals
    - *Out*: predicted intensity level, with 2 possibilities: low (0-back) or high (2-back)
    - *Recommended Protocol*: Leave-K-Subjects-Out [more info]

We developed this dataset as a step towards a vision for non-intrusive brain-computer interfaces that can accurately detect the current intensity of a person's cognitive workload (low or high) and respond by adjusting the interface accordingly.

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Motivation

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- **For what purpose was the dataset created?**

- **Who created the dataset and on behalf of which entity?**

- **Who funded the creation of the dataset?**

Composition

- **What do the instances that comprise the dataset represent?**
- **How many instances are there in total (of each type, if appropriate)?**
- **Does the dataset contain all possible instances or is it a sample (not necessarily random) of instances from a larger set?**
- **What data does each instance consist of?**
- **Is there a label or target associated with each instance?**
- **Is any information missing?**
- **Are relationships between individual instances made explicit?**
- **Are there recommended data splits into train/validation/test?**
- **Are there sources of error / noise / redundancy?**
- **Is the dataset self-contained?**
- **Does the dataset contain data that might be considered confidential?**
- **Does the dataset relate to people?**
- **Does the dataset identify subpopulations?**
- **Is it possible to identify individuals?**
- **Does the dataset contain data that might be sensitive in any way?**

Collection Process