1 Introduction

This dataset consists of EEG data from eighteen different subjects. The paradigm consists of 2 different motor imagery tasks (MI), namely, the left hand and the right hand. It has the data for 6 different sessions conducted on different days, with 1 of them being offline (calibration data) and the other 5 are online sessions. The subject undergo closed loop BCI training through two different subject independent training protocols Generic Recentering (GR) and Personally Assisted Recentering (PAR). For a detailed description of the experimental protocol please refer to methods section in [1]

2 Description

In each offline session, there are 4 different runs (gdf files). Each run has 20 trials, 10 of each class i.e. left and right in a randomised fashion.

Each online session consisted two different type of visual feedback runs a) Bar feedback and b) Car racing. Subjects on each day underwent closed loop training through bar based visual feedback runs and then played multiple car racing games using LH and RH motor imagery. The car racing game was modified from cybathlon BCI car racing game to consist of left and right turning tracks and subject need to correctly deliver left or right commands to accelerate the car on corresponding patch.

Each session have multiple bar feedback runs where subjects performed motor imagery in a close loop BCI setting. In this dataset, online session 1 has 4 runs, and online session $2, \cdots 5$ has 3 runs of motor imagery. In each run subjects performed 20 trials 10 of each class.

All the data files provided are stored in general data format (GDF). The ***.gdf*** files can be loaded with the function provided in MATLAB as follows.

```
[s,h]=sload('fileName.gdf');
```

The above command will result in two variables in the MATLAB workspace. The variable **s**(Signal variable) will contain the Signals. In each signal variable first 22 are EEG signals. Variable **h**(header structure) will hold the detailed information of various parameters involved in conducting the experiment. The variable **h** includes the event information that describes the structure of EEG data recorded over time. The following fields describe the event structure overtime for this dataset:

- `h.EVENT.TYP` : This variable provides the trigger value corresponding to an event in the data
- `h.EVENT.POS` : This variable provides the position of the corresponding trigger on the sample scale.

The details of the triggers are as follows for bar feedback online sessions

Offline	**Online**	**Description**
32766	32766	First and Last Trigger
1000	1000	Trial start (start of rest period)
769/770	769/770	Cue Left/Right
7691/7701	7691/7701	Task perios starts
7692/7702	7692/7702	Timeout/Incorrect Hit for Online, Trial End for Offline
-	7693/7703	Cue Left/Right Delivered

In header file of races runs starts and end with a trigger of 32766. 769 correspond to delivery of left hand imagery command while 770 correspond to delivery of right hand imagery while 111 denotes a timeout. To generate the corresponding target trigger i.e. when the starting of race patch is left or right use the flow in `raceTriggerSync.m` to generate the corresponding target triggers. In the generated synced event header 7691 corresponds to a target left patch and 7701 correspond to right hand patch.

References

[1] Satyam Kumar, Hussein Alawieh, Frigyes Samuel Racz, Rawan Fakhreddine, and José del R Millán. Transfer learning promotes acquisition of individual bci skills. *PNAS Nexus*, page pgae076, 2024.