DUPE MIBCI: Database with User's Profile and EEG signals for Motor Imagery Brain Computer Interface research

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Introduction: The strong observed variations in BCI performance between participants remain a critical BCI topic that is yet to be fully understood and addressed [1]. To do so, BCI research transparency and efficiency needs to be supported by open access databases of electroencephalographic (EEG) signals collected during BCI training experiments. Also, the inclusion of detailed BCI users' profile data in a large public database is regrettably scarce in the field. Therefore, we shared a large database as the result of several experiments conducted using the same Motor Imagery (MI) BCI protocol, that we present below.

Material, Methods and Results: Our database contains EEG signals from 87 participants. It also contains the participant's online performances, responses to 6 questionnaires related to demographic information, spatial abilities, pre- and post-experiment user states (e.g. fatigue, mood, motivation), learning style [2] and personality and cognitive profile [3]. We provide information on the study design and instructions, methods, and codes used to conduct the studies (scenarios and scripts used to run the experiments with the free and open-source BCI platform OpenViBE [4]). To ensure data quality and/or transparency, the raw signals were all replayed and double-checked by an experimenter. In addition, we computed topographic event-related spectral perturbation (ERSP) between 8-30 Hz for each subject and phase, to check for possible unusual ERD/ERS patterns. It enabled us to visualize possible problems in some EEG signals and annotate the data accordingly.

Discussion: Such database could prove useful for various studies, including but not limited to: 1) studying the relationships between BCI users' profiles and their BCI performances, 2) studying how EEG signals properties varies for different users' profiles and MI tasks, 3) using the large number of participants to design cross-user BCI machine learning algorithms or 4) incorporating users' profile information into the design of EEG signal classification algorithms. In addition, a branch of BCI and EEG research is dedicated to designing signal processing algorithms to detect, reject or clean noise in EEG signals [5] or to designing machine learning algorithms robust to such noise.
Database available at: https://doi.org/10.5281/zenodo.7554429

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