Integrating EEG and MEG information to enhance motor-imagery classification in brain-computer interface
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Brain-computer interface (BCI) is a powerful tool for rehabilitation and communication that mainly relies on the electroencephalography (EEG). Despite its clinical applications, BCI faces both engineering and user-oriented challenges to improve its spreading. In this work, we assess the possibility of integrating electroencephalographic (EEG) and magnetoencephalographic (MEG) signals to enhance the classification performance in motor imagery-based BCI. By adopting a matching-score fusion approach (in an offline fashion) that optimizes the choice of the features in each individual, we reached an average classification improvement of 12.8% as compared to separate EEG and MEG classifiers. These results could promote multimodal BCIs development.

**Methods**

**BCI protocol**

Fifteen healthy subjects (aged 28±13 ± 410 years, seven women) participated to the protocol.

**Fusion approach**

No artifact removal method applied here to simulate online scenarios.

**Classification fusion enables a significant performance improvement**

![Fig. 3: AUC distributions across the IS subjects, for all the modalities, and for different numbers of features within the alpha-band. White circles correspond to the the median values. In all frequency bands, the type of modality significantly affected the AUC values (ANOVA, p < 0.05), whereas the number of features did not have a significant impact (p > 0.05).](image)

**Inter-subject variability: attributed weights**

![Fig. 4: Contribution of different modalities to the individual performance. Pie diagrams show the i values (in percentage) obtained for each modality via the fusion approach](image)

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