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Large-Scale Electroencephalogram Biometrics through Contrastive Learning

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Abstract : EEG-based biometrics (user identification) has been explored on small datasets of no more than 157 subjects. Here we show that the accuracy of modern supervised methods falls rapidly as the number of users increases to a few thousand. Moreover, supervised methods require a large amount of labeled data for training which limits their applications in real-world scenarios where acquiring data for training should not take more than a few minutes. We show that using contrastive learning for pre-training, it is possible to maintain high accuracy on a dataset of 2130 subjects while only using a fraction of labels. We compare 5 different self-supervised tasks for pre-training of the encoder where our proposed method achieves the accuracy of 96.4%, improving the baseline supervised models by 22.75% and the competing self-supervised model by 3.93%. We also study the effects of the length of the signal and the number of channels on the accuracy of the user-identification models. Our results reveal that signals from temporal and frontal channels contain more identifying features compared to other channels.

Keywords : brainprint, contrastive learning, electroencephalo-gram, self-supervised learning, user identification
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