Tackling EEG test-retest reliability with a pre-processing pipeline based on ICA and wavelet-ICA

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Abstract

The reliability of Electroencephalography (EEG) measurements on normal human neurophysiology can be used to determine whether changes in brain electrical activity in subjects with neurological diseases have potential in the diagnosis or follow-up of the patients, being more crucial in neurodegenerative diseases where reliable measures across time might be needed. The objective of this study is to report the reliability of relative band powers extracted from a two-year four-session resting-EEG longitudinal study conditioned by an automated pipeline that leverages state of the art EEG signal-processing approaches involving ICA, wavelet-ICA, and normalization by a recording-specific constant. The Intraclass Correlation Coefficient (ICC) was used as a measure of reliability. Similarly, to assess the association between age and relative performance. The results of the ICC for EEG data acquisition and preprocessing process showed high significant reliability, where an average ICC of 0.91 $\pm$ 0.04 was obtained for neural related Independent Components (ICs) and 0.92 $\pm$ 0.03 for ROIs (p-value $<$ 5% for all data). This study shows that after performing four EEG recording sessions for 43-subject, the recorded measurements were replicable, and the correlation of relative power with the age of healthy subjects is consistent with the literature. These results suggest that relative power measured from EEGs preprocessed with the automated pipeline is a replicable metric across sessions, and, consequently, is useful for the study of relative power changes caused by the progression of neurodegenerative pathologies such as Alzheimer's disease.

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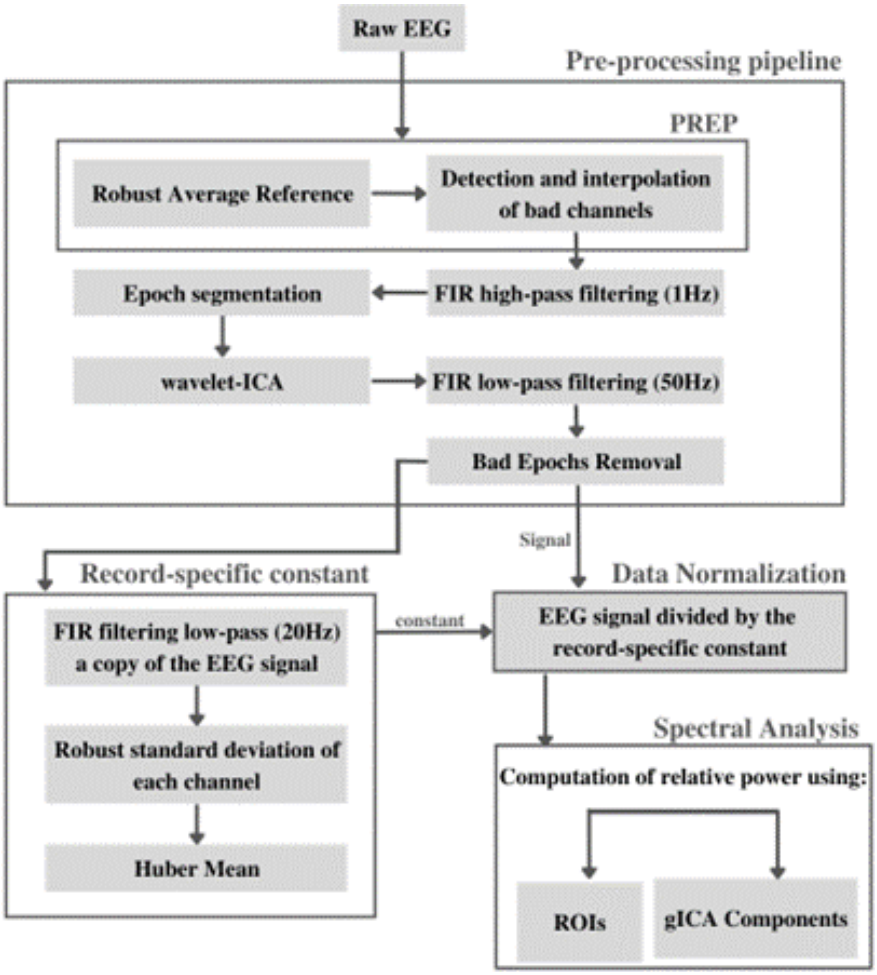

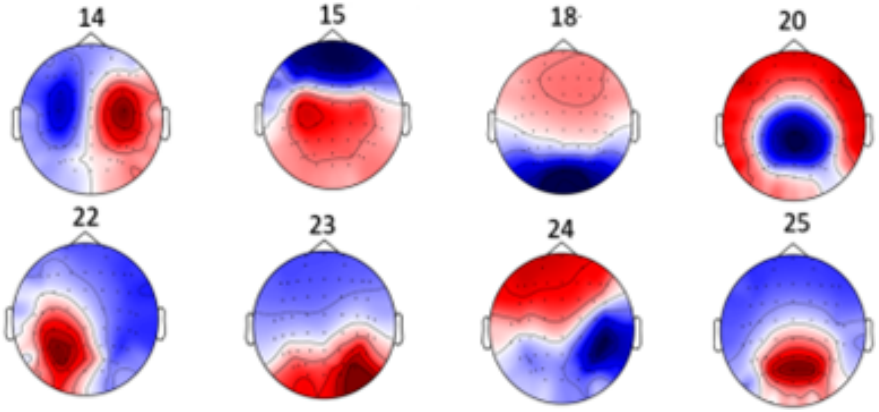

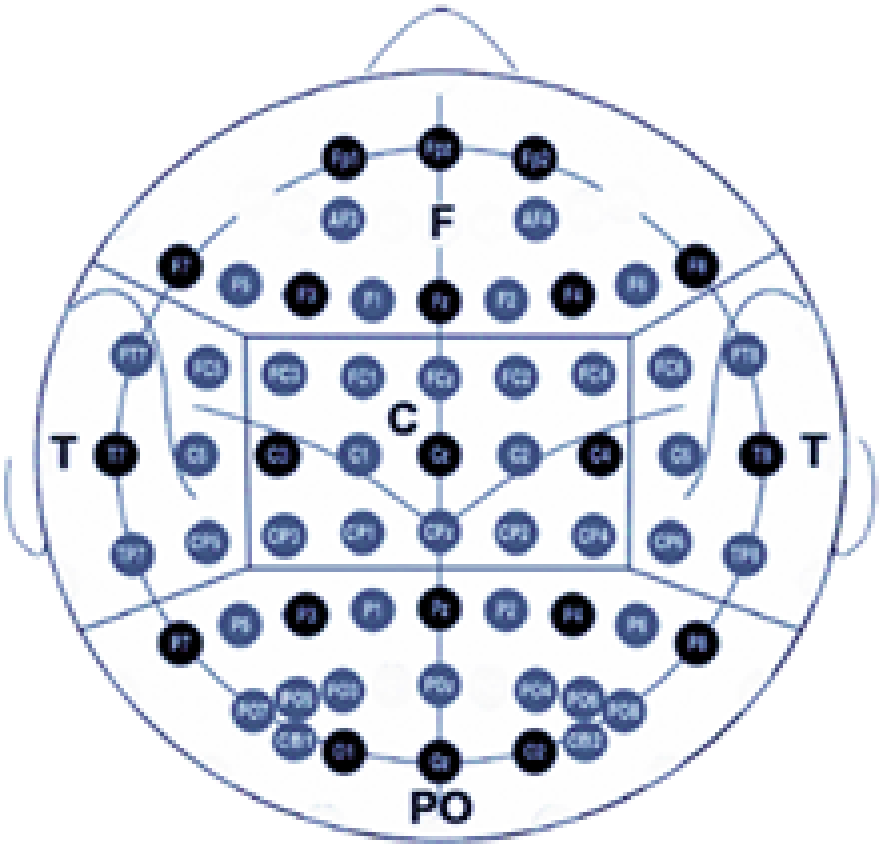

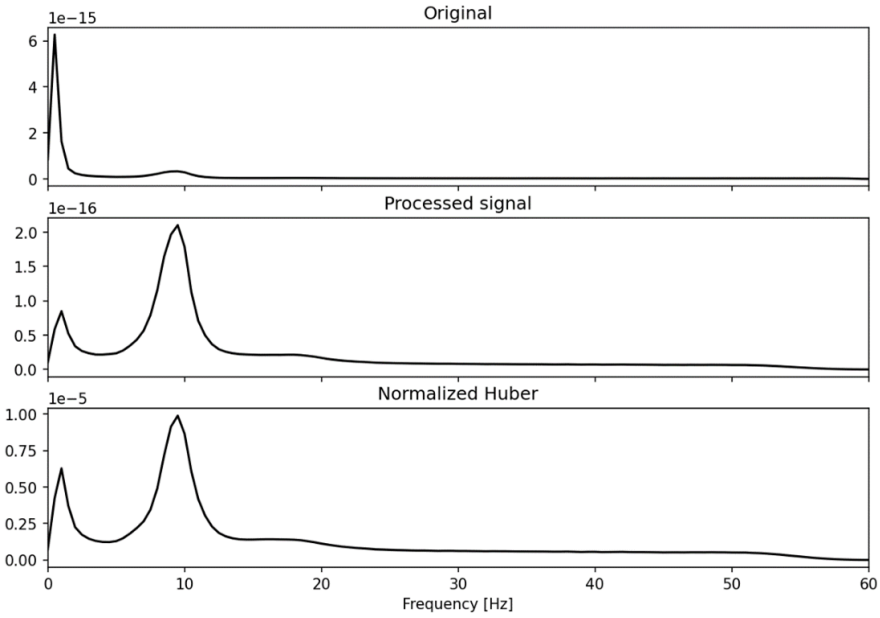

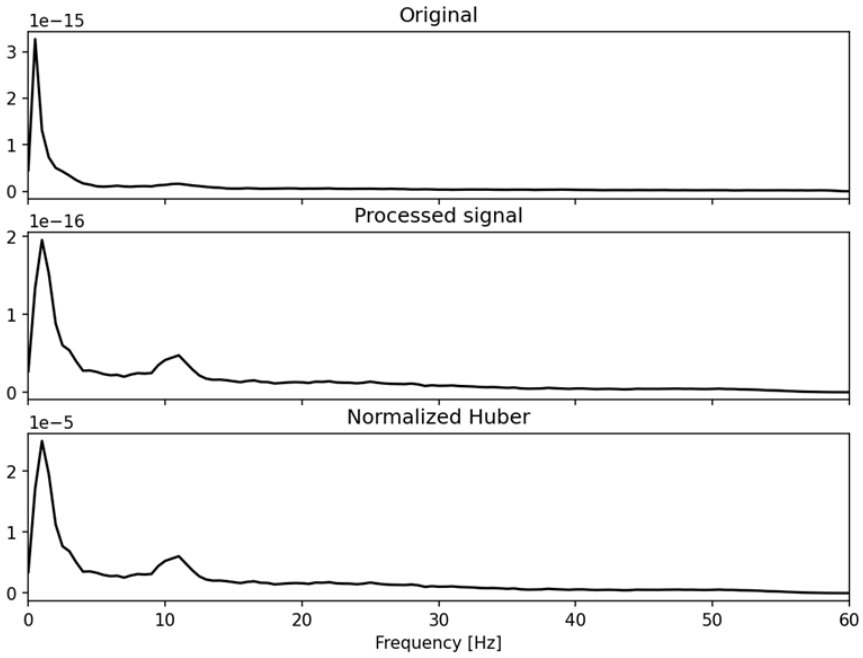

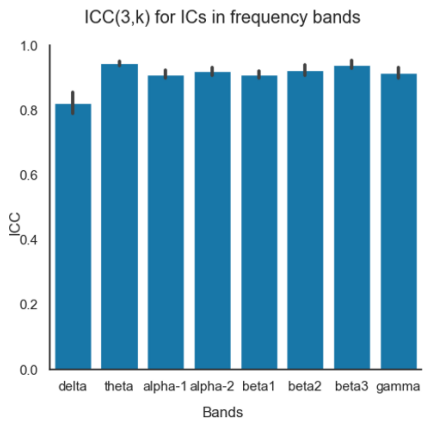

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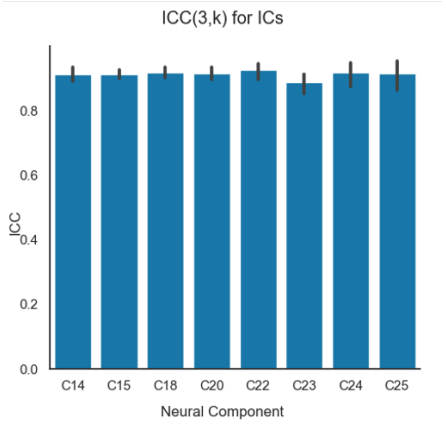

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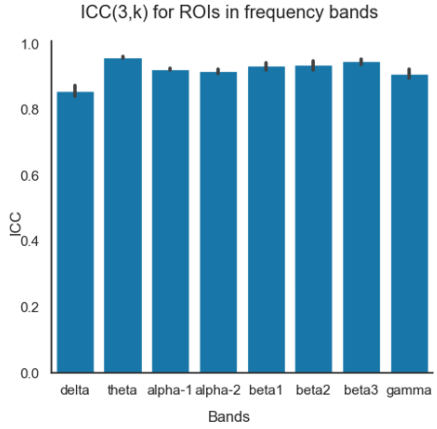

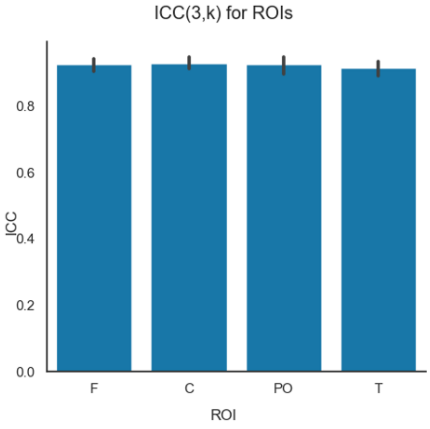

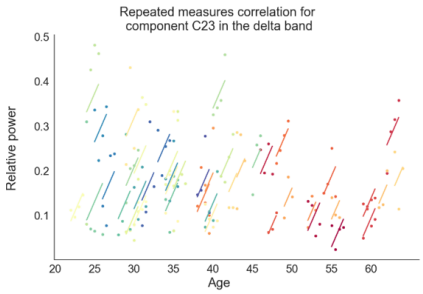

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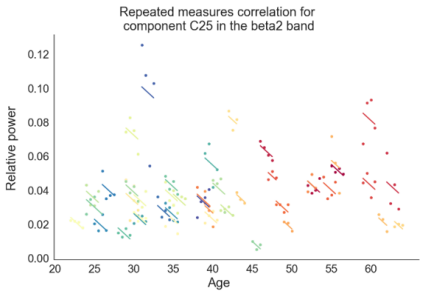

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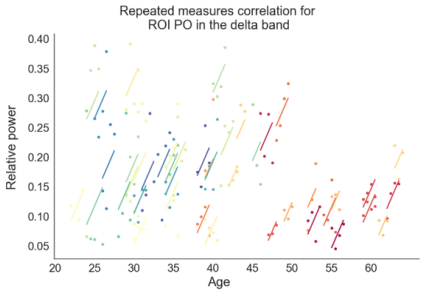

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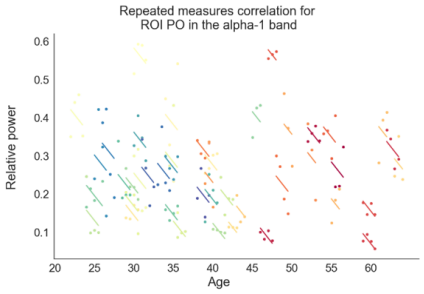

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