A DMC_x^2 Multi-channel cross-correlation analyses of a motor/imaginary human activity experiment electroencephalogram (EEG) recordings

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Abstract

This paper presents an investigation of the motor/imaginary experiment electroencephalogram (EEG) 64-channels recordings, available on the Physionet on-line databank, using the detrended multiple cross-correlation coefficient (DMC_x^2). Using data from 4 channels, $F_3 32$, $F_6 37$ (frontal region of the head) and $P_3 49$, $P_6 54$ (parietal region of the head), the DMC_x^2 was used to evaluate the correlation among one of the channels with the three others alternately. Using all the motor/imaginary experiments and 108 of the 109 subjects, our analysis points to a pattern, detected on most of the subjects, where the correlation of the channel $F_3 32$ against the others presents the higher correlation coefficient compared to the other combinations. The reason why some persons don't match that pattern is still an open question.

Introduction

The electroencephalogram (EEG) is, in short, a technic that reads electrical signals from the brain activity with the use of sensors placed in the scalp of the patient and makes sense of this data. impulses are usually recorded over time, encrypted in an European Data Format (EDF) file. The EEG equipment mesures the electric potential difference from each sensor position in relation with a reference sensor, usually placed in the ear lobe. Although the EEG is almost a centenary technic, in recent decades EEG has addressed new problems as brain-triggered neurorehabilitation treatments, experimental psychology or even computational neuroscience, due to it's versatility and accessibility combined with the advances in signal processing [1].

The F_{DFA} root mean square (rms) fluctuation function was already used to analyze a subset of the same dataset used here to evaluate [2] [3] [4] [5]

Materials and methods

The data set

Methodology

[6,7], [8], [9], [10],

Results

Fig 1

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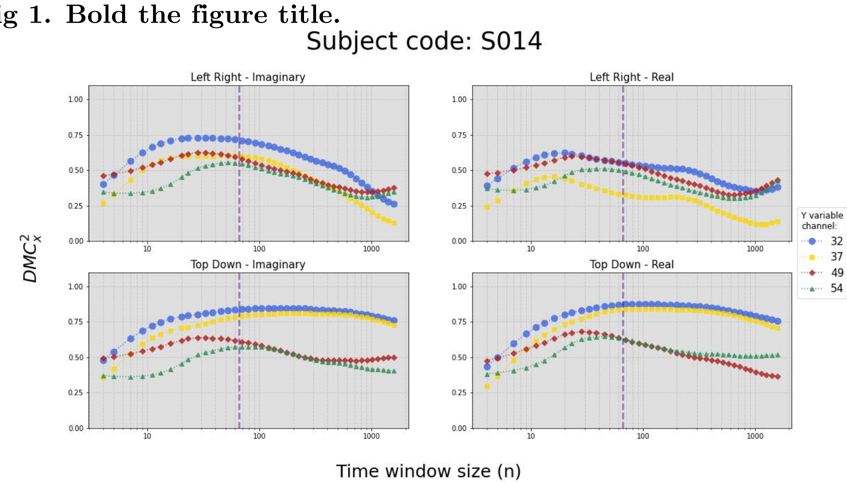

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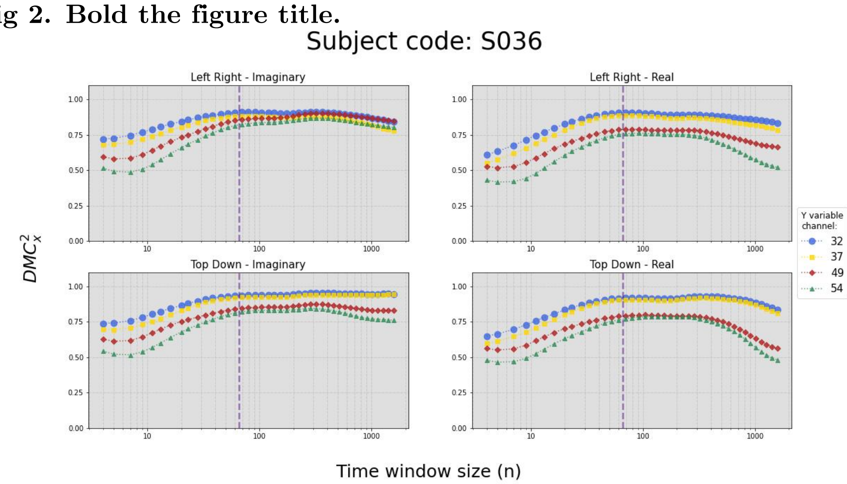

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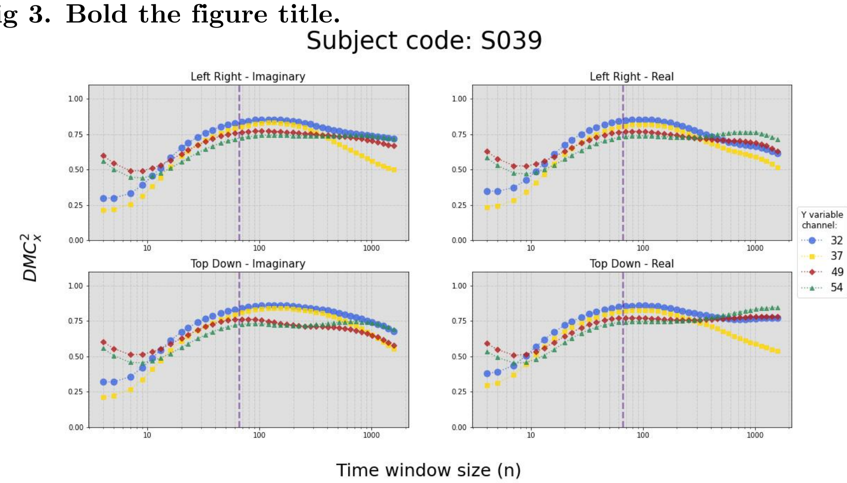

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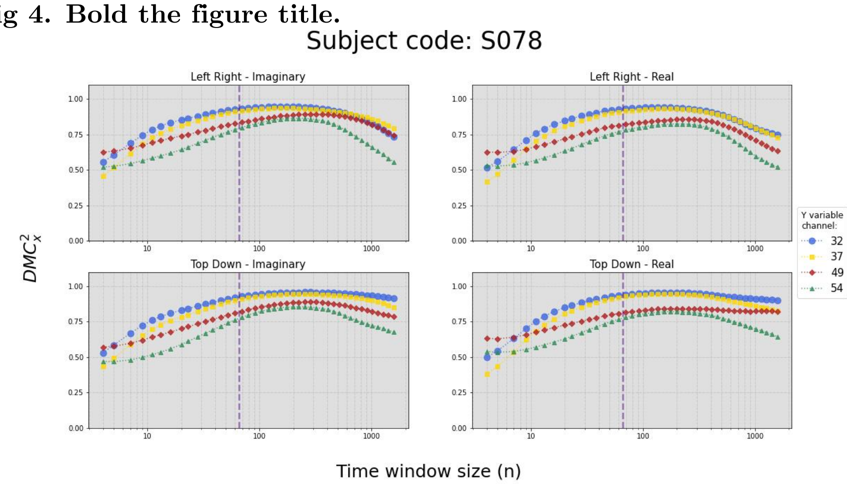

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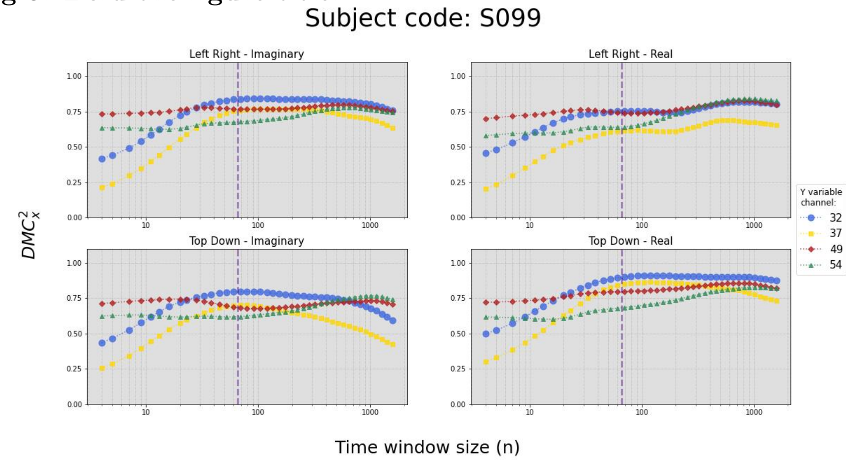

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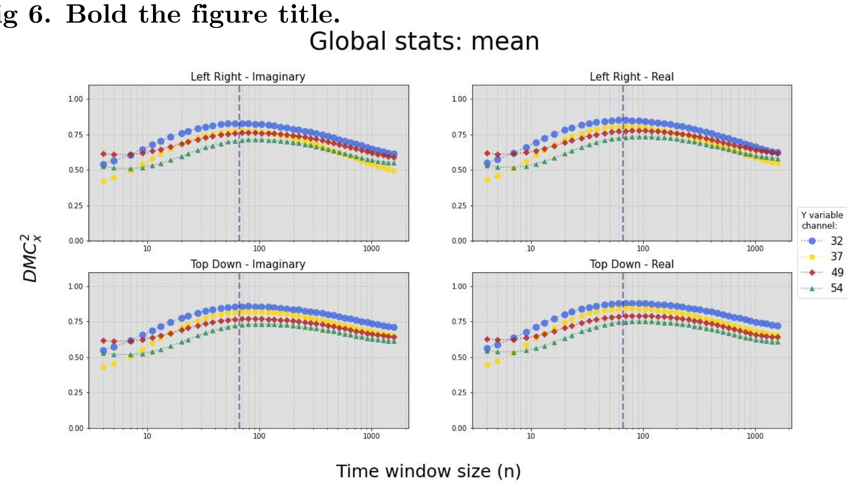

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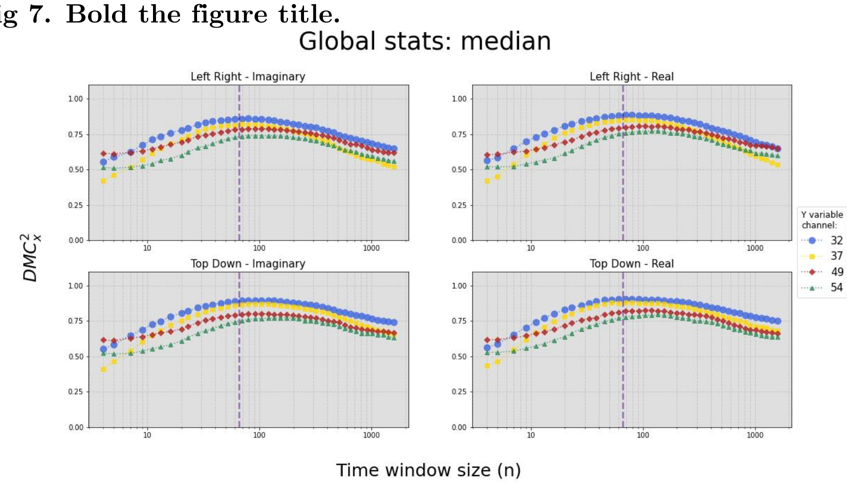

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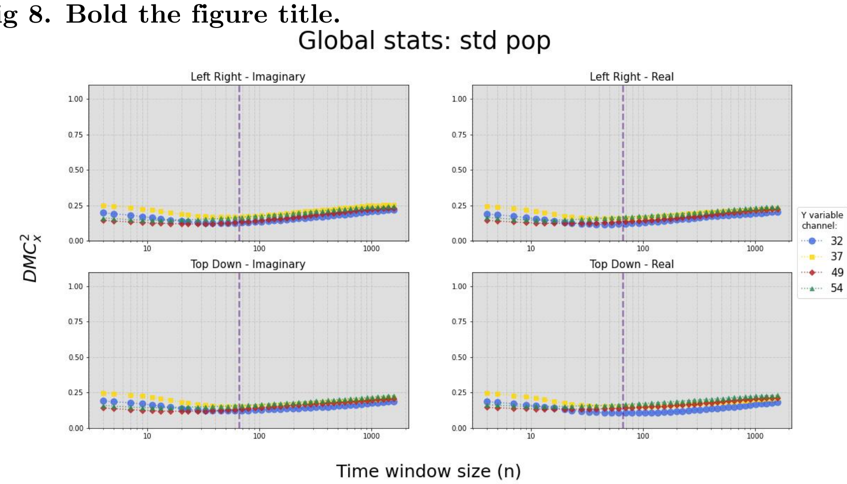

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Discussion

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Conclusion

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Supporting information

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