

# EEG and MEG Data Preprocessing

Oral presentation

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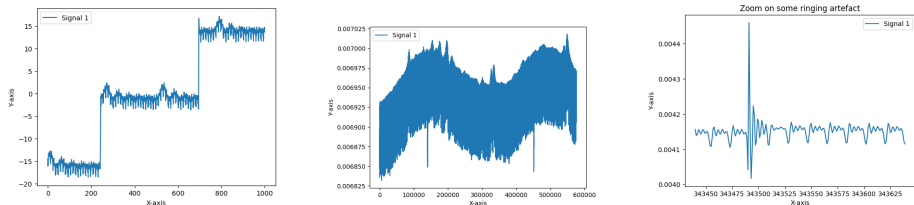
2 Methods

3 Application : Reconstruction

# Introduction

EEG and MEG data are prone to a lot of different artefacts such as steps, ringing, slow drift and glitches.

The article we studied introduces methods to preprocess EEG and MEG data.



**Figure:** MEG steps on the left, trend on the middle and ringing on the right.

# Contributions

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# Robust detrending

Usual detrending methods are sensible to artefacts.

⇒ Robust detrending: estimate the trend ignoring outliers, and flag high errors as outliers for the next iteration

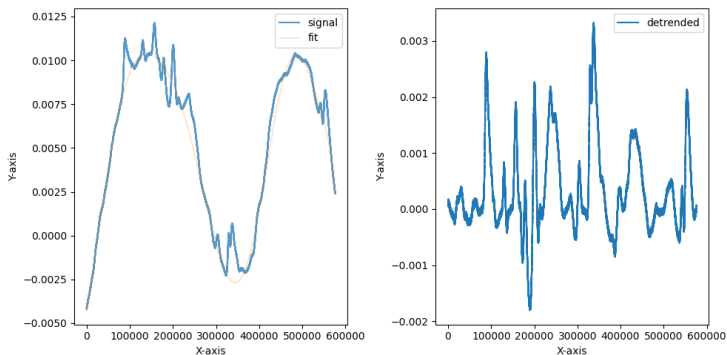


Figure: Application of the detrending algorithm.

# Inpainting

Inpainting is the process of reconstructing the signal at timesteps affected by glitches. Here, we assume that glitches locations are known.

This algorithm first estimates the linear relationship between channels and use it to reconstruct the signal.

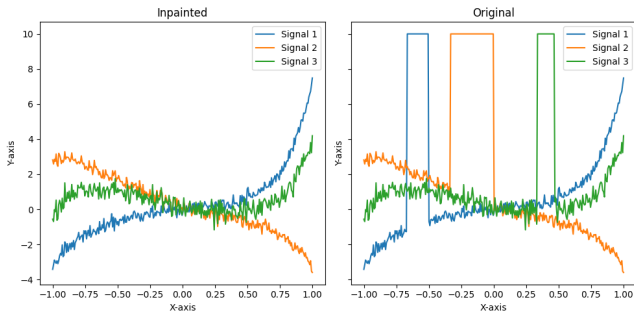


Figure: Application of the inpainting algorithm.

# Outlier detection

To flag outliers, we use the previous algorithm and flag poorly reconstructed values as outliers for the next iteration.

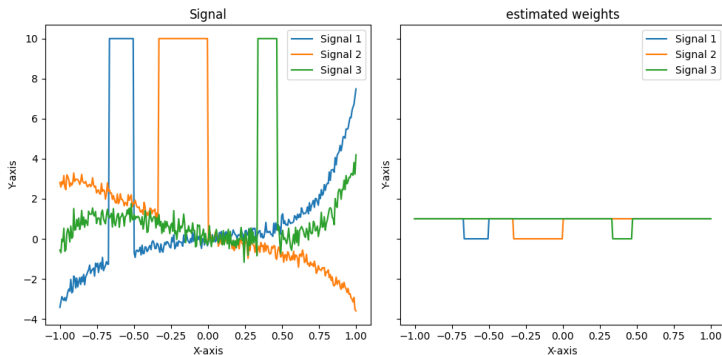


Figure: Application of the outlier detection algorithm.



# Robust rereferencing

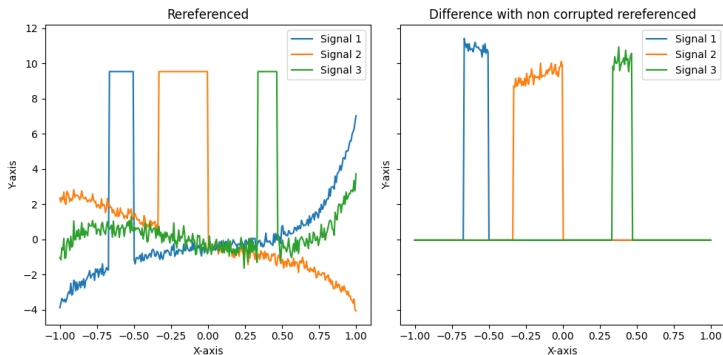


Figure: Application of the robust rereferencing algorithm.

# Step removal

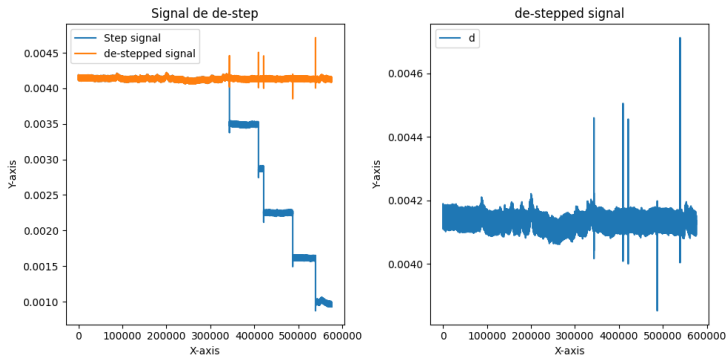


Figure: Application of the step removal algorithm.

# Ringling removal

Ringling artefacts are caused by the antialiasing filter. First, we estimate the parameters of this filter to model its impulse response and cancel it, which removes ringling artefacts.

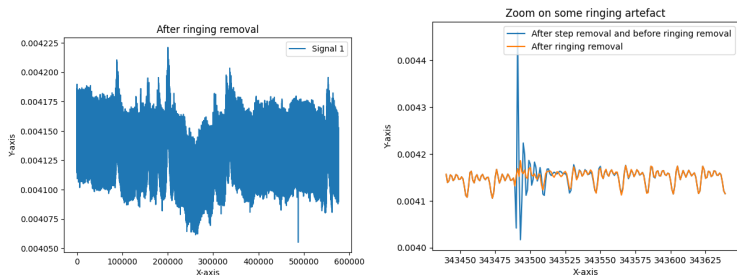


Figure: Left: A full signal. Right: zoom on an artefact

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# Data

4 min long MEG recording at 2400Hz with 303 channels  
 $\Rightarrow$  174'528'000 samples

We used only 16 channels because we have limited compute capabilities.

# A complete pipeline for preprocessing

Remove steps → Remove ringing artefacts → Robust detrend → Detect outliers → Inpainting → Robust rereference.

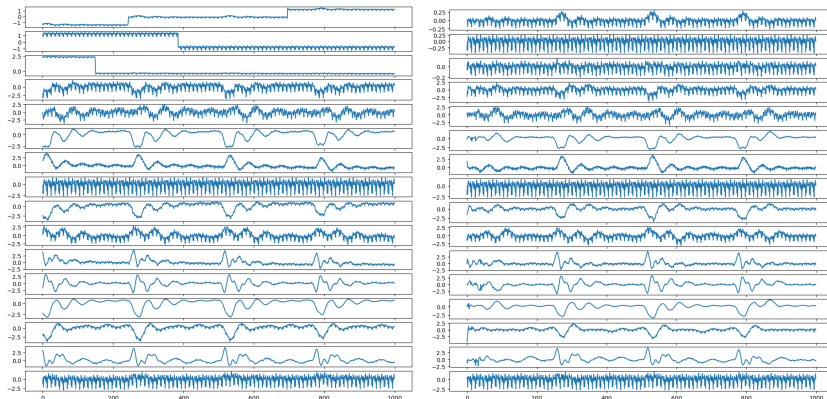
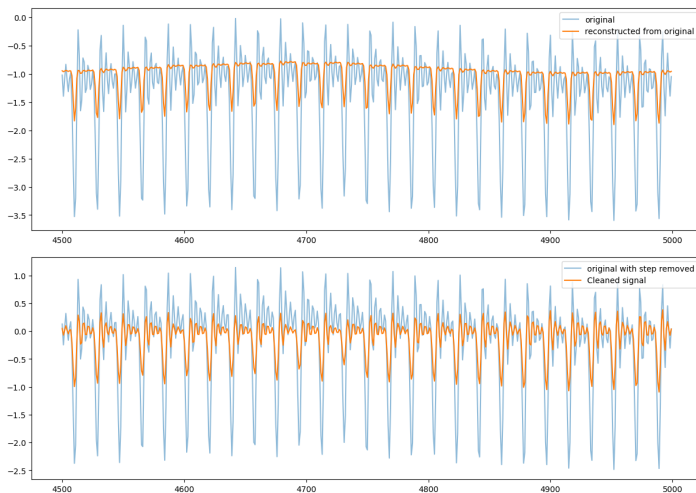


Figure: Left: Raw MEG data. Right: Cleaned MEG data

# Results



**Figure:** Top: Raw MEG and its reconstruction. Bottom: Cleaned MEG with its reconstruction