

EOG Eye Artifact Removal

By: Michael Natenzon

October 5, 2016

1 PseudoCode

1.1 Inputs - All Numerical - "N" defined number of time points

- Time (Milliseconds)
 - | Range: TimeLower - TimeUpper |
 - | $N = \text{TimeUpper} - \text{TimeLower} + 1$ |
- Amplitude (μV)

1.2 Outputs - All Numerical - "N" defined number of time points

- Time (Milliseconds)
 - | Range: TimeLower - TimeUpper |
 - | $N = \text{TimeUpper} - \text{TimeLower} + 1$ |
- Amplitude (μV)

1.3 Function Name

- ICAEyeArtifactRemoval
- Blind source separation using ICA

1.4 Step-by-Step Instructions

1. Install Scikit Learn on server: scikit-learn.org/stable/install.html
2. Install Shogun Machine Learning Toolbox on server: shogun-toolbox.org/doc/en/3.0.0/installation.html
3. Import required libraries (matplotlib.pyplot / numpy / sklearn.decomposition)
4. Import data for desired time range
5. Compute FastICA
6. Plot original data and ICA recovered signals

2 Simulations

2.1 Did PCA work well?

1. Generate one sinusoidal signal, one square signal, and one saw tooth signal
2. Add a small amount of noise to each signal
3. Standardize data by rescaling to have a mean of 0 and stdev of 1
4. Generate a mixing matrix and dot it with the standardized data
5. Perform ICA on standardized data and mixing matrix

6. Revert unmixing and plot: 1) The Mixed Signals | 2) The True Signals | 3) Signals recovered using ICA
7. Compare to determine if ICA recovered desired signals