Introduction to EEG Decoding for Music Information Retrieval Research

RESOURCES

Software

- **MNE: M/EEG analysis and visualization (Python)** http://martinos.org/mne http://mne-tools.github.io/mne-python-intro/
- **EEGLAB: M/EEG analysis and visualization (Matlab)** https://sccn.ucsd.edu/eeglab/
- **FieldTrip: M/EEG analysis (Matlab)** http://www.fieldtriptoolbox.org/
- **Brainstorm: M/EEG analysis (Matlab)** http://neuroimage.usc.edu/brainstorm/
- **libraries for OpenBCI hardware (C++/Arduino, Python/Matlab)** https://github.com/OpenBCI/
- **OpenViBE: BCI platform supporting real-time EEG acquisition, processing and visualization for a wide range of hardware (C++)** http://openvibe.inria.fr/
- **BBCI Toolboxes for running BCI experiments, signal acquisition and feedback control (Python, Matlab)** https://github.com/bbci
- **deepthought: deep learning library for EEG (Python/Theano) (to be updated soon)** https://github.com/sstober/deepthought
- **Reliable Components Analysis toolbox (Matlab)** https://github.com/dmochow/rca
- **Visualizing confusion matrices for RSA (R)** https://github.com/hskim08/RConfMatrixPlots

EEG Datasets

- **BCI Datasets (various tasks and contributors).** http://bnci-horizon-2020.eu/database/data-sets
- **OpenMIIR Dataset.** Stober S et al. (2015). Towards Music Imagery Information Retrieval: Introducing the OpenMIIR Dataset of EEG Recordings from Music Perception and Imagination. In ISMIR, 2015. https://github.com/sstober/openmiir
- **Preprocessed visual responses for classification**. Kaneshiro B et al. (2015). EEG data analyzed in "A Representational Similarity Analysis of the Dynamics of Object Processing Using Single-Trial EEG Classification". Stanford Digital Repository. https://purl.stanford.edu/bq914sc3730
- **Chord progression stimuli and preprocessed data.** Kaneshiro B et al. (2015). EEG-Recorded Responses to Short Chord Progressions. Stanford Digital Repository. http://purl.stanford.edu/js383fs8244
- **Preprocessed responses to intact and scrambled Hindi pop songs.** Kaneshiro B et al. (2016). Naturalistic Music EEG Dataset - Hindi (NMED-H). Stanford Digital Repository. https://purl.stanford.edu/sd922db3535

References – general EEG

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- **Introduction to EEG**. Cohen MX (2014). *Analyzing Neural Time Series Data: Theory and Practice*. Cambridge, MA: The MIT Press.
- **Comparison of EEG/MEG**. Malmivuo (2012). Comparison of the properties of EEG and MEG in detecting the electric activity of the brain. Brain Topography, 25:1, 1–19.
- **ICA for EEG artifact rejection.** Bell AJ and Sejnowski TJ (1995). An information-maximization approach to blind separation and blind deconvolution. Neural Computation 7:6, 1129–1159.
- **ICA for EEG artifact rejection.** Jung TP et al. (1998). Extended ICA removes artifacts from electroencephalographic recordings. Advances in Neural Information Processing Systems 10, 894–900.
- **Spatial filtering of EEG (CSP).** Blankertz B et al. (2008). Optimizing spatial filters for robust EEG single-trial analysis. IEEE Signal Processing Magazine 25:1, 41–56.
- **Linear analysis of EEG.** Parra LC et al. (2005). Recipes for the linear analysis of EEG. NeuroImage 28:2, 326–341.
- **Forward models for EEG.** Haufe S et al. (2014). On the interpretation of weight vectors of linear models in multivariate neuroimaging. NeuroImage 87, 96–110.

References – EEG classification (music studies)

- **Naturalistic music segments**. Schaefer et al. (2011). Name that tune: decoding music from the listening brain. NeuroImage 56, 843 – 849.
- **Subjective accenting of beat sequence (BCI aim)**. Vlek RJ et al. (2011). Sequenced subjective accents for brain-computer interfaces. Journal of Neural Engineering 8:3, 036002.
- **Training imagery classifier on responses to perceived events (BCI aim)**. Vlek RJ et al. (2011). Shared mechanisms in perception and imagery of auditory accents. Clinical Neurophysiology 122:8, 1526–1532.
- **Chord progression endings**. Kaneshiro et al. (2012). An Exploration of Tonal Expectation Using Single-Trial EEG Classification. In ICMPC12-ESCOM8.
- **Rhythms**. Stober et al. (2014). Classifying EEG recordings of rhythm perception. In ISMIR, 649–654.
- **Rhythm classification with convolutional neural networks.** Stober S et al. (2014). Using Convolutional Neural Networks to Recognize Rhythm Stimuli from Electroencephalography Recordings. Advances in Neural Information Processing Systems, 1449-1457.
- **Attended oddball events in polyphonic music (BCI aim).** Treder MS et al. (2014). Decoding auditory attention to instruments in polyphonic music using single-trial EEG classification. Journal of Neural Engineering 11:2, 026009.
- **Pre-training filters for EEG classification.** Stober S et al. (2015). Deep Feature Learning for EEG Recordings. *arXiv preprint arXiv:1511.04306*.

References – classification and BCI/RSA

- **Introduction to BCI.** Blankertz B et al. (2002). Classifying single trial EEG: Towards brain computer interfacing. Advances in Neural Information Processing Systems, 157– 164.
- **Auditory BCI.** Schreuder M et al. (2010). A new auditory multi-class brain-computer interface paradigm: spatial hearing as an informative cue. PLoS ONE 5:4, e9813.
- **Classification tutorial for BCI.** Blankertz B et al. (2011). Single-trial analysis and classification of ERP components — a tutorial. NeuroImage 56:2, 814–825.
- **Introduction to BCMI.** Miranda ER and Castet J, eds. (2014). Guide to Brain-Computer Music Interfacing. London: Springer.

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- **RSA toolbox (Matlab).** Nili H et al. (2014). A toolbox for representational similarity analysis. PLoS Computational Biology 10:4, e1003553.
- **RSA (EEG classification) with vision**: Kaneshiro B et al. (2015). A Representational Similarity Analysis of the Dynamics of Object Processing Using Single-Trial EEG Classification. PLoS ONE 10:8, e0135697.

References – RCA, ISCs

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- **Neurocinematics (fMRI).** Hasson et al. (2008). Neurocinematics: The neuroscience of film. Projections 2:1, 1–26.
- **Introduction of RCA and EEG-ISCs.** Dmochowski et al. (2012). Correlated components of ongoing EEG point to emotionally laden attention—a possible marker of engagement? Frontiers in Human Neuroscience, 6:112.
- **Synchrony of continuous behavioral measures of engagement.** Schubert et al. (2013). Identifying regions of good agreement among responders in engagement with a piece of live dance. Empirical Studies of the Arts 31:1, 1–20.
- **EEG-ISCs predict large-scale audience preferences.** Dmochowski et al. (2014). Audience preferences are predicted by temporal reliability of neural processing. Nature communications, 5:4567
- **EEG-ISCs with intact and scrambled naturalistic music.** Kaneshiro et al. (2014). Toward an objective measure of listener engagement with natural music using inter-subject EEG correlation. In ICMPC13.
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- **EEG-ISCs with physiological and behavioral responses.** Kaneshiro et al. (2016). Neurophysiological and behavioral measures of musical engagement. In ICMPC14.
- **Combined music EEG-ISC studies.** Kaneshiro (2016). Doctoral Dissertation, Stanford University.

Thank You

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