Readme for Corresponding Binocular Rivalry EEG+fMRI/MRI Dataset (last updated 02/25/2017)

This EEG/MRI/fMRI dataset in 20 human subjects was collected under the support of NIH R01 EY023101 (PI: Bin He) at the University of Minnesota. The data are made public as a service to the scientific community, and may be used for any research, non-commercial purpose at the user's own risks. No technical support will be provided on the use of the data.

The work has been published in Roy et al. [1] and Jamison et al [2], which should be cited in any publications if the data would be used in whole or in part.

[1] Roy AV, Jamison KW, He S, Engel SA, He B: "Deactivation in the posterior mid-cingulate cortex reflects perceptual transitions during binocular rivalry: evidence from simultaneous EEG-fMRI," NeuroImage, 2017.
DOI: 10.1016/j.neuroimage.2017.02.041
Available Online February 20, 2017 (http://dx.doi.org/10.1016/j.neuroimage.2017.02.041)

[2] Jamison KW, Roy AV, He S, Engel SA, He B: "SSVEP Signatures of Binocular Rivalry During Simultaneous EEG and fMRI," Journal of Neuroscience Methods, 243:53-62, 2015.

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EEG Data Information:

- 64 channels (bp64.locs), downsampled to 250 Hz, re-referenced to average of all electrodes, bandpass filtered 1-35 Hz
- Gradient artifacts and cardioballistic artifacts removed (*Jamison et al. 2015, DOI: 10.1016/j.jneumeth.2015.01.024*)
- 20 total sessions (subjects)
    - Each scan (.mat file) is 282.068 seconds long (5 trials x 42 seconds each, 12 seconds rest in between trials)
    - .mat files contain scan latencies for button presses corresponding to green (1), red (2) and mixed (3) percepts
    - .mat files also contain visual stimulus trial latencies (latency_trial) and TR latencies (latency_tr) for each scan
    - Tagged SSVEP frequencies of interest are 6.67 Hz and 8.57 Hz (green and red visual stimuli, respectively)

MRI Data Information:

- fMRI were obtained using a 3T Skyra Scanner (HCP)
    - 16 channel receive only head coil
    - Whole brain BOLD using GE-EPI pulse sequence
        - FA = 90 degrees, TR = 2200 ms, TE = 30 ms, 3 mm isotropic voxels, 36 axial slices
        - Fat suppression on, motion corrected, co-registered and spatially smoothed
- Pre-processed fMRI data are available for all subjects (n=20)
    - Slice-timing corrected, motion corrected and unwarped, co-registered, segmented, normalized, spatially smoothed
    - Contained in the folder "[Subject ID]\MRI\fMRI_preproc\"
        - 258 images per EPI scan (129 .hdr files, 129 .img files)
        - 129 TRs/scan*2.2 seconds/TR = 283.8 seconds/scan (skip first 5 TRs for analysis of steady-state BOLD)
        - Each [scan*] folder corresponds to an EEG scan for the same session
- Structural MRIs for each subject are included (MPRAGE acquisition, de-faced, SPM8 format)
    - Contained in the folder "[Subject ID]\MRI\structural\" (i.e. S01_MRI.hdr, S01_MRI.img)

Unthresholded fMRI group results are available at: http://neurovault.org/collections/2180/

- The GLM used for fMRI analysis included 3 event related regressors per visual stimulus type (9 total)
    - Button presses corresponding to subject reported perceptual transitions
    - SSVEP Peaks (identified from the EEG data)
    - SSVEP Crosses (identified from the EEG data)
- The following fMRI contrasts were evaluated and corresponding T-maps of activation are available online:
    - Rivalry Perceptual Transitions – Smooth Replay Perceptual Transitions
    - Rivalry SSVEP Peaks – Smooth Replay SSVEP Peaks
    - Rivalry SSVEP Crosses – Smooth Replay SSVEP Crosses
    - Rivalry Perceptual Transitions – Instantaneous Replay Perceptual Transitions
    - [Rivalry Transitions – Rivalry SSVEP Crosses] – [Smooth Replay Transitions - Smooth Replay SSVEP Crosses]
    - [Rivalry SSVEP Peaks – Rivalry SSVEP Crosses] – [Smooth Replay SSVEP Peaks – Smooth Replay SSVEP Crosses]
    - Rivalry SSVEP Peaks – Rivalry SSVEP Crosses
    - Smooth Replay SSVEP Peaks – Smooth Replay SSVEP Crosses
    - Smooth Replay Perceptual Transitions – Instantaneous Replay Perceptual Transitions

EEG-fMRI Subject Data/File Summary:

- *S01*
  - 13 preprocessed EEG scan files + 13 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','replay_inst','rivalry','replay_smooth','rivalry','replay_inst'}
- *S02*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','rivalry','replay_smooth','replay_inst','rivalry','replay_smooth'}
- *S03*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','replay_smooth','replay_inst'}
- *S04*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','replay_smooth','replay_inst','replay_smooth'}
- *S05*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','replay_inst','rivalry','replay_smooth','replay_inst'}
- *S06*
  - 13 preprocessed EEG scan files + 13 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','replay_smooth','rivalry','replay_smooth','replay_inst','rivalry'}
- *S07*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','replay_smooth','replay_inst'}
- *S08*
  - 9 preprocessed EEG scan files + 9 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','rivalry'}
- *S09*
  - 9 preprocessed EEG scan files + 9 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','rivalry','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','replay_inst'}
- *S10*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','replay_inst','rivalry','replay_inst','replay_smooth'}
- *S11*
  - 13 preprocessed EEG scan files + 13 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','rivalry','replay_smooth','replay_inst','rivalry','replay_inst','replay_smooth'}
- *S12*
  - 17 preprocessed EEG scan files + 17 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','rivalry','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','replay_inst','rivalry','replay_smooth','replay_inst','rivalry'}

- *S13*
  - 10 preprocessed EEG scan files + 10 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','replay_inst','rivalry'}
- *S14*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','replay_smooth','replay_smooth','replay_inst'}
- *S15*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','replay_inst','replay_smooth','replay_inst'}
- *S16*
  - 11 preprocessed EEG scan files + 11 preprocessed fMRI scan folders
  - Scan Types: {'replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst'}
- *S17*
  - 14 preprocessed EEG scan files + 14 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','replay_inst','rivalry','replay_smooth','replay_inst'}
- *S18*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','replay_smooth','rivalry','replay_smooth','replay_inst'}
- *S19*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_inst','rivalry','replay_smooth','replay_inst','replay_smooth'}
- *S20*
  - 12 preprocessed EEG scan files + 12 preprocessed fMRI scan folders
  - Scan Types: {'rivalry','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','rivalry','replay_smooth','replay_inst','replay_smooth','replay_inst'}