

Supplementary material 3: Connectivity analysis algorithm

```
close all
clear
clc

addpath(genpath('fieldtrip-fieldtrip-c6d58e9/external/ibtb')) % all
subdirectories of toolbox are needed
load('biosemi32elec_aligned.mat')
load('elecgroup');

[datasetselection,datapath] = data_selector;
epochtype= 'open end';
%exposures={'baseline' '20%' '30%' '40%' 'final'};
exposuresN2={'baseline' '2.8 ATA' '6 ATA'};
exposuresHe={'baseline' '6 ATA'};
exposuresO2={'baseline' '1 ATA' '1.4 ATA' '2.8 ATA'};

freqs= [8 14];%
binwidth=0.02;%Binwidth for MI calcs

cfg
    = [];
cfg.method
    = 'template';
cfg.template
    = 'biosemi32_neighb.mat';
cfg.layout
    = 'biosemi32.lay';
neighbours = ft_prepare_neighbours(cfg);

%% combining multiple measurements per participant
for i=1:length(datasetselection)
    dataset_toks(i,:)=tokenize(datasetselection{i});
end
participants=unique(dataset_toks(:,2));
gases=flip(unique(dataset_toks(:,3)));

for i=1:length(participants)
    idx=find(strcmp(participants(i),dataset_toks(:,2)));
    if strcmp(dataset_toks(idx(1),3),'N2')
        datasetsorted(i,:)=datasetselection(idx);
    else
        datasetsorted(i,:)=datasetselection(flip(idx));
    end
end

%%
MI_ibtb=[];
for k=1:size(datasetsorted,1) %all selected participants
    expoI=1;
    for l=1:size(datasetsorted,2) %all gas condidions
        filepath=[datapath datasetsorted{k,l} filesep 'cleaned' filesep];

        participantnr=datasetsorted{k,l}(8:10);
        gas=datasetsorted{k,l}(12:13);

        switch gas
            case 'N2'
                exposures=exposuresN2;
            case 'He'
                exposures=exposuresHe;
            case 'O2'
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        exposures=exposuresO2;
    end

    for m=1:length(exposures)
        filename=['CLEAN' datasetsorted{k,l} ' ' exposures{m} ' '
epochtype '.mat'];
        load([filepath filename])

        data=cleandata;

        %concatenate the trials into 1 continuous dataset
        data.trial={cell2mat(data.trial)};
        data.time={ (0:(length(data.trial{1,1})-1))/data.fsample};

        % select EEG channels
        cfg          = [];
        cfg.channel   = 'EEG';
        data = ft_selectdata(cfg, data);

        %Hjorth transformation
        cfg          = [];
        cfg.method    = 'hjorth';
        cfg.elec      = elec_aligned; %from file
        cfg.neighbours= neighbours;
        datahj = ft_scalpcurrentdensity(cfg, data);

        %freqband + Hilbert analysis
        cfg          = [];
        cfg.bpfilter  = 'yes';
        cfg.bpfreq    = freqs;
        cfg.bpfiltord = 3;
        cfg.bpfilttype= 'but';
        cfg.bpfiltldir = 'twopass';
        cfg.hilbert   = 'abs';
        datafreq= ft_preprocessing(cfg,datahj);

        %mutual information
        cfg          = [];
        cfg.method    = 'mi';
        cfg.mi.numbin = 20;
        cfg.mi.lags   = 0;
        MI_ibtb{k,expoI}= ft_connectivityanalysis(cfg, datafreq);

        expoI=expoI+1;
    end
end
end

%% network analysis
cfg2          = [];
cfg2.parameter = cfg1.parameter;
cfg2.method    = 'distance';

cfg3          = [];
cfg3.parameter = 'distance';
cfg3.method    = 'global_efficiency';

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for i=1:size(MI_ibtb,1) % participants
    MIna=MI_ibtb{i,1};
    cfg2.threshold = quantile(MIna.mi(~isnan(MIna.mi)),0.80);
    for j=1:size(MI_ibtb,2) %exposures
        MIna=MI_ibtb{i,j};
        MIna.mi(isnan(MIna.mi))=0;
        statDis = ft_networkanalysis(cfg2, MIna);
        statGE = ft_networkanalysis(cfg3, statDis);
        global_efficiency(i,j)=statGE.global_efficiency;
        %DIMORD participant, exposure
    end
end
end

```