Appendix

1 Matlab and R-Stats Code

Fourier transform code

```
close all
clear all
clc

x={};
xx=[];
tt=[];

load braindata
%put all data into a cell x
x{1}=Blake;
x{2}=David;
x{3}=Ihor;
x{4}=James;
x{5}=Josh;
x{6}=Meysam;
x{7}=Priji;
x{8}=Thommen;

%Scale the time values of each cell in x
for i=1:length(x)
    dt(i)=190/length(x{i});
    t{i}=0:190/length(x{i}):190;%from 0 to 190
end

%n=input('Select person: \n1-Blake \n2-David \n3-Ihor \n4-James \n5-Josh \n6-Meysam \n7-Priji \n8-Thommen\n');
for n=1:8%loop through everyone's data
xx=x{n};%Take one person's data
tt=1/dt(n);%frequency
dtt=dt(n);%Sampling time
xx_split{1}=xx(1:round(length(xx)*6/19));%first 60 seconds of the the audio
xx_split{2}=xx(round(length(xx)*6/19):round(length(xx)*12/19));%next 60 seconds
xx_split{3}=xx(round(length(xx)*12/19):round(length(xx)*18/19));%next 60 seconds
%xx_split{4}=xx(round(length(xx)*18/19):end);%last section spanning 10 secs


for i=1:length(xx_split)

% % %     Fs = tt;                    % Sampling frequency
% % %     T = 1/Fs;                     % Sample time
% % %     L = length(xx_split{i});                     % Length of signal
% % %     t = (0:L-1)*T;                % Time vector
% % %
% % %     NFFT = 2^nextpow2(L); % Next power of 2 from length of y
% % %     Y = fft(xx_split{i},NFFT)/L;
% % %     f = Fs/2*linspace(0,1,NFFT/2+1);
% % %
% % % % Plot single-sided amplitude spectrum.
% % % figure
% % % plot(f,2*abs(Y(1:NFFT/2+1)))
% % % title('Single-Sided Amplitude Spectrum of y(t)')
% % % xlabel('Frequency (Hz)')
% % % ylabel('|Y(f)|')


%     Y=fft(xx_split{i},length(xx_split{i}));
```

```
%     Pyy = Y.*conj(Y)/length(Y);
%     f = (dtt)*(0:length(Pyy)-1);
%     figure
%     plot(f,Pyy(1:length(Pyy)))
%     title('Power spectral density')
%     xlabel('Frequency (Hz)')

    xx_fft{i}=abs(2*fft(xx_split{i})/length(xx_split{i})).^2;%fft
    figure
    freqs{i}=(2:(length(xx_fft{i})))/60;%freqency values
    plot(freqs{i},xx_fft{i}(2:end));
end

for i=1:length(xx_fft)
[bin_strength]=binning(xx_fft{i},freqs{i});%call the binning function
BS{i}=bin_strength;%save bin strengths
end

people_data{n}=BS;%save people-wise data

end


%plot all the raw data together
for i=1:n
subplot(n,1,i)
plot(t{i}(2:end),x{i})
set(gca,'XTick',[0:60:180])
set(gca,'YTick',[-4000:2000:4000])
end
%%%%%%%%%
```

Data Binning Code

```
function [bin_strengths]=binning(FT,f)
bin_strengths=zeros(1,7);%7 bins for 7 frequency ranges-alpha, beta, delta etc.,
for i=1:length(f)
    if f(i)>=0.1&&f(i)<=3
        bin_strengths(1)=bin_strengths(1)+FT(i);
    elseif f(i)>=4&&f(i)<=7
        bin_strengths(2)=bin_strengths(2)+FT(i);
    elseif f(i)>=8&&f(i)<=12
        bin_strengths(3)=bin_strengths(3)+FT(i);
    elseif f(i)>=12&&f(i)<=15
        bin_strengths(4)=bin_strengths(4)+FT(i);
   elseif f(i)>=16&&f(i)<=20
        bin_strengths(5)=bin_strengths(5)+FT(i);
   elseif f(i)>=21&&f(i)<=30
        bin_strengths(6)=bin_strengths(6)+FT(i);
   elseif f(i)>=30&&f(i)<=100
        bin_strengths(7)=bin_strengths(7)+FT(i);
    end
end
```

2 Data

Waveband power Data - Song 1

Subject	Delta	Theta	Alpha	Beta	Gamma
Blake	5.163248411	3.773982151	1.505648882	1.60560021	0.854430231
David	1.275730834	0.252987723	0.086058865	0.064080762	0.02170367
Ihor	1.411940561	1.151812744	0.842639412	0.959255974	1.077204286
James power	1.886175358	0.824150576	0.248711166	0.145262495	0.134758683
Josh	4.847887355	1.552021957	1.000496433	1.136194952	1.017980297
Meysam	6.64796523	1.321424413	0.470461035	0.285716271	0.269985757
Priji	1.676509861	0.951462029	0.359982638	0.35161852	0.358854053
Thommen	2.196019957	0.634282222	0.150238306	0.082025989	0.018129655

Waveband power Data - Song 2 (white noise)

Subject	Delta	Theta	Alpha	Beta	Gamma
Blake	4.86575646	3.926271789	1.496889296	1.727479099	0.619873053
David	1.062802146	0.384178394	0.166170322	0.161242359	0.087960909
Ihor	2.538383421	1.152898049	0.494279138	0.472507955	0.271139426
James	2.171312818	1.196242993	0.303550845	0.225206498	0.084065697
Josh	7.905278015	2.248105846	0.516423694	0.571165578	0.143480058
Meysam	6.291259944	1.043770037	0.403298955	0.174658251	0.15046022
Priji	2.709837829	0.636981738	0.316013377	0.983205946	0.841609366
Thommen	2.096740444	0.501927678	0.161262379	0.083336177	0.013157954

Waveband power Data - Song 3

Subject	Delta	Theta	Alpha	Beta	Gamma
Blake	3.039583525	1.969995054	0.731113967	0.504185115	0.113694039
David	1.352147484	0.342408209	0.117805103	0.123245361	0.072485178
Ihor	1.358578235	0.161449244	0.087135436	0.067454498	0.033426239
James	4.708386361	2.57322283	1.88365643	2.1413262	1.177050987
Josh	2.738767974	0.842688522	0.19776935	0.091965542	0.012998966
Meysam	4.406470663	1.248933401	0.308993951	0.13459399	0.089500518
Priji	4.614747264	1.308923957	0.440587407	1.05469731	1.167639351
Thommen	1.898519041	0.40333496	0.14329867	0.087129713	0.014566698