Matlab code for classification of seven activities using raw data for setting S5 (Gyroscope data with spatial and spectral domain features)

```
clear all
 tic;
%% Passes
SegmentedTrials=["PP01passtrial35","PP01passtrial56","PP01passtrial75",
"PP02passtrial16","PP02passtrial37","PP02passtrial56","PP02passtrial77"
,"PP10passtrial17","PP03passtrial17","PP03passtrial40","PP03passtrial60
","PP03passtrial85","PP04passtrial18","PP04passtrial39","PP04passtrial6
0","PP04passtrial81","PP05passtrial16","PP05passtrial37","PP05passtrial
59","PP05passtrial79","PP06passtrial16","PP06passtrial38","PP06passtria
l60","PP06passtrial83","PP07passtrial18","PP07passtrial39","PP07passtri
al62","PP07passtrial89","PP09passtrial23","PP09passtrial46","PP09passtr
ial67","PP09passtrial89","PP11passtrial16","PP11passtrial35","PP11passt
rial56","PP11passtrial75","PP12passtrial17","PP12passtrial36","PP12pass
trial60","PP12passtrial82"];


%Number of features per statistic
NumStat=15
%TotalNumOfActivities
NumOfActivitiesClass=40;

%TotalNumOfStats

TotalNumOfStats=135;
MatrixOfFeaturesPasses=zeros(NumOfActivitiesClass,TotalNumOfStats);


Mean=zeros(NumOfActivitiesClass,NumStat);
Median=zeros(NumOfActivitiesClass,NumStat);
Std=zeros(NumOfActivitiesClass,NumStat);
Skewness=zeros(NumOfActivitiesClass,NumStat);
Kurtosis=zeros(NumOfActivitiesClass,NumStat);
Min=zeros(NumOfActivitiesClass,NumStat);
Max=zeros(NumOfActivitiesClass,NumStat);
fftCoefficientSum=zeros(NumOfActivitiesClass,NumStat);
fftMaximumCoefficient=zeros(NumOfActivitiesClass,NumStat);


for i=1:length(SegmentedTrials)


    load(SegmentedTrials(i))
    Matrix1 =leftShank.gyroCal;
    Matrix2=leftThigh.gyroCal;
    Matrix3=pelvis.gyroCal;
```

```
    Matrix4=rightShank.gyroCal;
    Matrix5=rightThigh.gyroCal;
%Means
Xmean1=mean(Matrix1(:,1));
Ymean1=mean(Matrix1(:,2));
Zmean1=mean(Matrix1(:,3));

Xmean2=mean(Matrix2(:,1));
Ymean2=mean(Matrix2(:,2));
Zmean2=mean(Matrix2(:,3));

Xmean3=mean(Matrix3(:,1));
Ymean3=mean(Matrix3(:,2));
Zmean3=mean(Matrix3(:,3));

Xmean4=mean(Matrix4(:,1));
Ymean4=mean(Matrix4(:,2));
Zmean4=mean(Matrix4(:,3));

Xmean5=mean(Matrix5(:,1));
Ymean5=mean(Matrix5(:,2));
Zmean5=mean(Matrix5(:,3));

%Median
Xmedian1=median(Matrix1(:,1));
Ymedian1=median(Matrix1(:,2));
Zmedian1=median(Matrix1(:,3));

Xmedian2=median(Matrix2(:,1));
Ymedian2=median(Matrix2(:,2));
Zmedian2=median(Matrix2(:,3));

Xmedian3=median(Matrix3(:,1));
Ymedian3=median(Matrix3(:,2));
Zmedian3=median(Matrix3(:,3));

Xmedian4=median(Matrix4(:,1));
Ymedian4=median(Matrix4(:,2));
Zmedian4=median(Matrix4(:,3));

Xmedian5=median(Matrix5(:,1));
Ymedian5=median(Matrix5(:,2));
Zmedian5=median(Matrix5(:,3));

%Std
Xstd1=std(Matrix1(:,1));
Ystd1=std(Matrix1(:,2));
Zstd1=std(Matrix1(:,3));

Xstd2=std(Matrix2(:,1));
Ystd2=std(Matrix2(:,2));
Zstd2=std(Matrix2(:,3));

Xstd3=std(Matrix3(:,1));
```

```
Ystd3=std(Matrix3(:,2));
Zstd3=std(Matrix3(:,3));

Xstd4=std(Matrix4(:,1));
Ystd4=std(Matrix4(:,2));
Zstd4=std(Matrix4(:,3));

Xstd5=std(Matrix5(:,1));
Ystd5=std(Matrix5(:,2));
Zstd5=std(Matrix5(:,3));

%Skewness
Xskewness1=skewness(Matrix1(:,1));
Yskewness1=skewness(Matrix1(:,2));
Zskewness1=skewness(Matrix1(:,3));

Xskewness2=skewness(Matrix2(:,1));
Yskewness2=skewness(Matrix2(:,2));
Zskewness2=skewness(Matrix2(:,3));

Xskewness3=skewness(Matrix3(:,1));
Yskewness3=skewness(Matrix3(:,2));
Zskewness3=skewness(Matrix3(:,3));

Xskewness4=skewness(Matrix4(:,1));
Yskewness4=skewness(Matrix4(:,2));
Zskewness4=skewness(Matrix4(:,3));

Xskewness5=skewness(Matrix5(:,1));
Yskewness5=skewness(Matrix5(:,2));
Zskewness5=skewness(Matrix5(:,3));

%Kyrtosis
Xkurtosis1=kurtosis(Matrix1(:,1));
Ykurtosis1=kurtosis(Matrix1(:,2));
Zkurtosis1=kurtosis(Matrix1(:,3));

Xkurtosis2=kurtosis(Matrix2(:,1));
Ykurtosis2=kurtosis(Matrix2(:,2));
Zkurtosis2=kurtosis(Matrix2(:,3));

Xkurtosis3=kurtosis(Matrix3(:,1));
Ykurtosis3=kurtosis(Matrix3(:,2));
Zkurtosis3=kurtosis(Matrix3(:,3));

Xkurtosis4=kurtosis(Matrix4(:,1));
Ykurtosis4=kurtosis(Matrix4(:,2));
Zkurtosis4=kurtosis(Matrix4(:,3));

Xkurtosis5=kurtosis(Matrix5(:,1));
Ykurtosis5=kurtosis(Matrix5(:,2));
Zkurtosis5=kurtosis(Matrix5(:,3));
```

```
%Min
Xmin1=min(Matrix1(:,1));
Ymin1=min(Matrix1(:,2));
Zmin1=min(Matrix1(:,3));

Xmin2=min(Matrix2(:,1));
Ymin2=min(Matrix2(:,2));
Zmin2=min(Matrix2(:,3));

Xmin3=min(Matrix3(:,1));
Ymin3=min(Matrix3(:,2));
Zmin3=min(Matrix3(:,3));

Xmin4=min(Matrix4(:,1));
Ymin4=min(Matrix4(:,2));
Zmin4=min(Matrix4(:,3));

Xmin5=min(Matrix5(:,1));
Ymin5=min(Matrix5(:,2));
Zmin5=min(Matrix5(:,3));

%Max
Xmax1=max(Matrix1(:,1));
Ymax1=max(Matrix1(:,2));
Zmax1=max(Matrix1(:,3));

Xmax2=max(Matrix2(:,1));
Ymax2=max(Matrix2(:,2));
Zmax2=max(Matrix2(:,3));

Xmax3=max(Matrix3(:,1));
Ymax3=max(Matrix3(:,2));
Zmax3=max(Matrix3(:,3));

Xmax4=max(Matrix4(:,1));
Ymax4=max(Matrix4(:,2));
Zmax4=max(Matrix4(:,3));

Xmax5=max(Matrix5(:,1));
Ymax5=max(Matrix5(:,2));
Zmax5=max(Matrix5(:,3));

%Fast Fourier Transform
Xfft1=fft(Matrix1(:,1));
Yfft1=fft(Matrix1(:,2));
Zfft1=fft(Matrix1(:,3));

Xfft2=fft(Matrix2(:,1));
Yfft2=fft(Matrix2(:,2));
Zfft2=fft(Matrix2(:,3));

Xfft3=fft(Matrix3(:,1));
Yfft3=fft(Matrix3(:,2));
Zfft3=fft(Matrix3(:,3));
```

```
Xfft4=fft(Matrix4(:,1));
Yfft4=fft(Matrix4(:,2));
Zfft4=fft(Matrix4(:,3));

Xfft5=fft(Matrix5(:,1));
Yfft5=fft(Matrix5(:,2));
Zfft5=fft(Matrix5(:,3));

%Real Part
Xfft1Real=real(Xfft1);
Yfft1Real=real(Yfft1);
Zfft1Real=real(Zfft1);

Xfft2Real=real(Xfft2);
Yfft2Real=real(Yfft2);
Zfft2Real=real(Zfft2);

Xfft3Real=real(Xfft3);
Yfft3Real=real(Yfft3);
Zfft3Real=real(Zfft3);

Xfft4Real=real(Xfft4);
Yfft4Real=real(Yfft4);
Zfft4Real=real(Zfft4);

Xfft5Real=real(Xfft5);
Yfft5Real=real(Yfft5);
Zfft5Real=real(Zfft5);

%fftCoefficientSum
XfftCoeffSum1=sum(Xfft1Real);
YfftCoeffSum1=sum(Yfft1Real);
ZfftCoeffSum1=sum(Zfft1Real);

XfftCoeffSum2=sum(Xfft2Real);
YfftCoeffSum2=sum(Yfft2Real);
ZfftCoeffSum2=sum(Zfft2Real);

XfftCoeffSum3=sum(Xfft3Real);
YfftCoeffSum3=sum(Yfft3Real);
ZfftCoeffSum3=sum(Zfft3Real);

XfftCoeffSum4=sum(Xfft4Real);
YfftCoeffSum4=sum(Yfft4Real);
ZfftCoeffSum4=sum(Zfft4Real);

XfftCoeffSum5=sum(Xfft5Real);
YfftCoeffSum5=sum(Yfft5Real);
ZfftCoeffSum5=sum(Zfft5Real);

%fftMaxCoefficient
XfftMaxCoeff1=max(Xfft1Real);
```

```
YfftMaxCoeff1=max(Yfft1Real);
ZfftMaxCoeff1=max(Zfft1Real);

XfftMaxCoeff2=max(Xfft2Real);
YfftMaxCoeff2=max(Yfft2Real);
ZfftMaxCoeff2=max(Zfft2Real);

XfftMaxCoeff3=max(Xfft3Real);
YfftMaxCoeff3=max(Yfft3Real);
ZfftMaxCoeff3=max(Zfft3Real);

XfftMaxCoeff4=max(Xfft4Real);
YfftMaxCoeff4=max(Yfft4Real);
ZfftMaxCoeff4=max(Zfft4Real);

XfftMaxCoeff5=max(Xfft5Real);
YfftMaxCoeff5=max(Yfft5Real);
ZfftMaxCoeff5=max(Zfft5Real);


 Mean(i,:)=[Xmean1 Ymean1 Zmean1 Xmean2 Ymean2 Zmean2 Xmean3 Ymean3
Zmean3 Xmean4 Ymean4 Zmean4 Xmean5 Ymean5 Zmean5];

 Median(i,:)=[Xmedian1 Ymedian1 Zmedian1 Xmedian2 Ymedian2 Zmedian2
Xmedian3 Ymedian3 Zmedian3 Xmedian4 Ymedian4 Zmedian4 Xmedian5 Ymedian5
Zmedian5];

 Std(i,:)=[Xstd1 Ystd1 Zstd1 Xstd2 Ystd2 Zstd2 Xstd3 Ystd3 Zstd3 Xstd4
Ystd4 Zstd4 Xstd5 Ystd5 Zstd5];

 Skewness(i,:)=[Xskewness1 Yskewness1 Zskewness1 Xskewness2 Yskewness2
Zskewness2 Xskewness3 Yskewness3 Zskewness3 Xskewness4 Yskewness4
Zskewness4 Xskewness5 Yskewness5 Zskewness5];

 Kurtosis(i,:)=[Xkurtosis1 Ykurtosis1 Zkurtosis1 Xkurtosis2 Ykurtosis2
Zkurtosis2 Xkurtosis3 Ykurtosis3 Zkurtosis3 Xkurtosis4 Ykurtosis4
Zkurtosis4 Xkurtosis5 Ykurtosis5 Zkurtosis5];

 Min(i,:)=[Xmin1 Ymin1 Zmin1 Xmin2 Ymin2 Zmin2 Xmin3 Ymin3 Zmin3 Xmin4
Ymin4 Zmin4 Xmin5 Ymin5 Zmin5];

 Max(i,:)=[Xmax1 Ymax1 Zmax1 Xmax2 Ymax2 Zmax2 Xmax3 Ymax3 Zmax3 Xmax4
Ymax4 Zmax4 Xmax5 Ymax5 Zmax5];

 fftCoefficientSum(i,:)=[XfftCoeffSum1 YfftCoeffSum1 ZfftCoeffSum1
XfftCoeffSum2 YfftCoeffSum2 ZfftCoeffSum2 XfftCoeffSum3 YfftCoeffSum3
ZfftCoeffSum3 XfftCoeffSum4 YfftCoeffSum4 ZfftCoeffSum4 XfftCoeffSum5
YfftCoeffSum5 ZfftCoeffSum5];

 fftMaximumCoefficient(i,:)=[XfftMaxCoeff1 YfftMaxCoeff1 ZfftMaxCoeff1
XfftMaxCoeff2 YfftMaxCoeff2 ZfftMaxCoeff2 XfftMaxCoeff3 YfftMaxCoeff3
ZfftMaxCoeff3 XfftMaxCoeff4 YfftMaxCoeff4 ZfftMaxCoeff4 XfftMaxCoeff5
YfftMaxCoeff5 ZfftMaxCoeff5];
```

```
 MatrixOfFeaturesPasses(i,:)=[Mean(i,:) Median(i,:) Std(i,:)
Skewness(i,:) Kurtosis(i,:) Min(i,:) Max(i,:) fftCoefficientSum(i,:)
fftMaximumCoefficient(i,:)];


end



G=[0];
[x,~]=size(MatrixOfFeaturesPasses);
for i=1:x-1
G=[G 0];
end

G=G';
MatrixOfFeaturesPasses=[MatrixOfFeaturesPasses G];



MatrixOfFeaturesPasses=array2table(MatrixOfFeaturesPasses,
'VariableNames',{'Xmean1','Ymean1','Zmean1','Xmean2','Ymean2','Zmean2',
'Xmean3','Ymean3','Zmean3','Xmean4','Ymean4','Zmean4','Xmean5','Ymean5'
,'Zmean5','Xmedian1','Ymedian1','Zmedian1','Xmedian2','Ymedian2','Zmedi
an2','Xmedian3','Ymedian3','Zmedian3','Xmedian4','Ymedian4','Zmedian4',
'Xmedian5','Ymedian5','Zmedian5','Xstd1','Ystd1','Zstd1','Xstd2','Ystd2
','Zstd2','Xstd3','Ystd3','Zstd3','Xstd4','Ystd4','Zstd4','Xstd5','Ystd
5','Zstd5','Xskewness1','Yskewness1','Zskewness1','Xskewness2','Yskewne
ss2','Zskewness2','Xskewness3','Yskewness3','Zskewness3','Xskewness4','
Yskewness4','Zskewness4','Xskewness5','Yskewness5','Zskewness5','Xkurto
sis1','Ykurtosis1','Zkurtosis1','Xkurtosis2','Ykurtosis2','Zkurtosis2',
'Xkurtosis3','Ykurtosis3','Zkurtosis3','Xkurtosis4','Ykurtosis4','Zkurt
osis4','Xkurtosis5','Ykurtosis5','Zkurtosis5','Xmin1','Ymin1','Zmin1','
Xmin2','Ymin2','Zmin2','Xmin3','Ymin3','Zmin3','Xmin4','Ymin4','Zmin4',
'Xmin5','Ymin5','Zmin5','Xmax1','Ymax1','Zmax1','Xmax2','Ymax2','Zmax2'
,'Xmax3','Ymax3','Zmax3','Xmax4','Ymax4','Zmax4','Xmax5','Ymax5','Zmax5
','XfftCoeffSum1','YfftCoeffSum1','ZfftCoeffSum1','XfftCoeffSum2','Yfft
CoeffSum2','ZfftCoeffSum2','XfftCoeffSum3','YfftCoeffSum3','ZfftCoeffSu
m3','XfftCoeffSum4','YfftCoeffSum4','ZfftCoeffSum4','XfftCoeffSum5','Yf
ftCoeffSum5','ZfftCoeffSum5','XfftMaxCoeff1','YfftMaxCoeff1','ZfftMaxCo
eff1','XfftMaxCoeff2','YfftMaxCoeff2','ZfftMaxCoeff2','XfftMaxCoeff3','
YfftMaxCoeff3','ZfftMaxCoeff3','XfftMaxCoeff4','YfftMaxCoeff4','ZfftMax
Coeff4','XfftMaxCoeff5','YfftMaxCoeff5','ZfftMaxCoeff5','Activity'});


%% Shots
SegmentedTrials=["PP01shottrial18","PP01shottrial37","PP01shottrial58",
"PP01shottrial77","PP02shottrial18","PP02shottrial39","PP02shottrial58"
,"PP02shottrial79","PP04shottrial83","PP06shottrial18","PP06shottrial40
","PP06shottrial62","PP07shottrial91","PP10shottrial81","PP11shottrial7
7","PP12shottrial19","PP12shottrial38","PP12shottrial63","PP12shottrial
```

```
84","shot1","shot2","shot3","shot4","shot5","shot6","shot7","shot8","sh
ot9","shot10","shot11","shot12","shot13","shot14","shot15","shot16","sh
ot17","shot18","shot19","shot20","shot21"];


%Number of features per statistic
NumStat=15
%TotalNumOfActivities
NumOfActivitiesClass=40;
%
%TotalNumOfStats

TotalNumOfStats=135;
MatrixOfFeaturesShots=zeros(NumOfActivitiesClass,TotalNumOfStats);


Mean=zeros(NumOfActivitiesClass,NumStat);
Median=zeros(NumOfActivitiesClass,NumStat);
Std=zeros(NumOfActivitiesClass,NumStat);
Skewness=zeros(NumOfActivitiesClass,NumStat);
Kurtosis=zeros(NumOfActivitiesClass,NumStat);
Min=zeros(NumOfActivitiesClass,NumStat);
Max=zeros(NumOfActivitiesClass,NumStat);
fftCoefficientSum=zeros(NumOfActivitiesClass,NumStat);
fftMaximumCoefficient=zeros(NumOfActivitiesClass,NumStat);


for i=1:length(SegmentedTrials)


    load(SegmentedTrials(i))
    Matrix1 =leftShank.gyroCal;
    Matrix2=leftThigh.gyroCal;
    Matrix3=pelvis.gyroCal;
    Matrix4=rightShank.gyroCal;
    Matrix5=rightThigh.gyroCal;
%Means
Xmean1=mean(Matrix1(:,1));
Ymean1=mean(Matrix1(:,2));
Zmean1=mean(Matrix1(:,3));

Xmean2=mean(Matrix2(:,1));
Ymean2=mean(Matrix2(:,2));
Zmean2=mean(Matrix2(:,3));

Xmean3=mean(Matrix3(:,1));
Ymean3=mean(Matrix3(:,2));
Zmean3=mean(Matrix3(:,3));

Xmean4=mean(Matrix4(:,1));
Ymean4=mean(Matrix4(:,2));
Zmean4=mean(Matrix4(:,3));
```

```
Xmean5=mean(Matrix5(:,1));
Ymean5=mean(Matrix5(:,2));
Zmean5=mean(Matrix5(:,3));

%Median
Xmedian1=median(Matrix1(:,1));
Ymedian1=median(Matrix1(:,2));
Zmedian1=median(Matrix1(:,3));

Xmedian2=median(Matrix2(:,1));
Ymedian2=median(Matrix2(:,2));
Zmedian2=median(Matrix2(:,3));

Xmedian3=median(Matrix3(:,1));
Ymedian3=median(Matrix3(:,2));
Zmedian3=median(Matrix3(:,3));

Xmedian4=median(Matrix4(:,1));
Ymedian4=median(Matrix4(:,2));
Zmedian4=median(Matrix4(:,3));

Xmedian5=median(Matrix5(:,1));
Ymedian5=median(Matrix5(:,2));
Zmedian5=median(Matrix5(:,3));

%Std
Xstd1=std(Matrix1(:,1));
Ystd1=std(Matrix1(:,2));
Zstd1=std(Matrix1(:,3));

Xstd2=std(Matrix2(:,1));
Ystd2=std(Matrix2(:,2));
Zstd2=std(Matrix2(:,3));

Xstd3=std(Matrix3(:,1));
Ystd3=std(Matrix3(:,2));
Zstd3=std(Matrix3(:,3));

Xstd4=std(Matrix4(:,1));
Ystd4=std(Matrix4(:,2));
Zstd4=std(Matrix4(:,3));

Xstd5=std(Matrix5(:,1));
Ystd5=std(Matrix5(:,2));
Zstd5=std(Matrix5(:,3));

%Skewness
Xskewness1=skewness(Matrix1(:,1));
Yskewness1=skewness(Matrix1(:,2));
Zskewness1=skewness(Matrix1(:,3));

Xskewness2=skewness(Matrix2(:,1));
Yskewness2=skewness(Matrix2(:,2));
Zskewness2=skewness(Matrix2(:,3));
```

```
Xskewness3=skewness(Matrix3(:,1));
Yskewness3=skewness(Matrix3(:,2));
Zskewness3=skewness(Matrix3(:,3));

Xskewness4=skewness(Matrix4(:,1));
Yskewness4=skewness(Matrix4(:,2));
Zskewness4=skewness(Matrix4(:,3));

Xskewness5=skewness(Matrix5(:,1));
Yskewness5=skewness(Matrix5(:,2));
Zskewness5=skewness(Matrix5(:,3));

%Kyrtosis
Xkurtosis1=kurtosis(Matrix1(:,1));
Ykurtosis1=kurtosis(Matrix1(:,2));
Zkurtosis1=kurtosis(Matrix1(:,3));

Xkurtosis2=kurtosis(Matrix2(:,1));
Ykurtosis2=kurtosis(Matrix2(:,2));
Zkurtosis2=kurtosis(Matrix2(:,3));

Xkurtosis3=kurtosis(Matrix3(:,1));
Ykurtosis3=kurtosis(Matrix3(:,2));
Zkurtosis3=kurtosis(Matrix3(:,3));

Xkurtosis4=kurtosis(Matrix4(:,1));
Ykurtosis4=kurtosis(Matrix4(:,2));
Zkurtosis4=kurtosis(Matrix4(:,3));

Xkurtosis5=kurtosis(Matrix5(:,1));
Ykurtosis5=kurtosis(Matrix5(:,2));
Zkurtosis5=kurtosis(Matrix5(:,3));

%Min
Xmin1=min(Matrix1(:,1));
Ymin1=min(Matrix1(:,2));
Zmin1=min(Matrix1(:,3));

Xmin2=min(Matrix2(:,1));
Ymin2=min(Matrix2(:,2));
Zmin2=min(Matrix2(:,3));

Xmin3=min(Matrix3(:,1));
Ymin3=min(Matrix3(:,2));
Zmin3=min(Matrix3(:,3));

Xmin4=min(Matrix4(:,1));
Ymin4=min(Matrix4(:,2));
Zmin4=min(Matrix4(:,3));

Xmin5=min(Matrix5(:,1));
Ymin5=min(Matrix5(:,2));
```

```
Zmin5=min(Matrix5(:,3));

%Max
Xmax1=max(Matrix1(:,1));
Ymax1=max(Matrix1(:,2));
Zmax1=max(Matrix1(:,3));

Xmax2=max(Matrix2(:,1));
Ymax2=max(Matrix2(:,2));
Zmax2=max(Matrix2(:,3));

Xmax3=max(Matrix3(:,1));
Ymax3=max(Matrix3(:,2));
Zmax3=max(Matrix3(:,3));

Xmax4=max(Matrix4(:,1));
Ymax4=max(Matrix4(:,2));
Zmax4=max(Matrix4(:,3));

Xmax5=max(Matrix5(:,1));
Ymax5=max(Matrix5(:,2));
Zmax5=max(Matrix5(:,3));

%Fast Fourier Transform
Xfft1=fft(Matrix1(:,1));
Yfft1=fft(Matrix1(:,2));
Zfft1=fft(Matrix1(:,3));

Xfft2=fft(Matrix2(:,1));
Yfft2=fft(Matrix2(:,2));
Zfft2=fft(Matrix2(:,3));

Xfft3=fft(Matrix3(:,1));
Yfft3=fft(Matrix3(:,2));
Zfft3=fft(Matrix3(:,3));

Xfft4=fft(Matrix4(:,1));
Yfft4=fft(Matrix4(:,2));
Zfft4=fft(Matrix4(:,3));

Xfft5=fft(Matrix5(:,1));
Yfft5=fft(Matrix5(:,2));
Zfft5=fft(Matrix5(:,3));

%Real Part
Xfft1Real=real(Xfft1);
Yfft1Real=real(Yfft1);
Zfft1Real=real(Zfft1);

Xfft2Real=real(Xfft2);
Yfft2Real=real(Yfft2);
Zfft2Real=real(Zfft2);
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```
Xfft3Real=real(Xfft3);
Yfft3Real=real(Yfft3);
Zfft3Real=real(Zfft3);

Xfft4Real=real(Xfft4);
Yfft4Real=real(Yfft4);
Zfft4Real=real(Zfft4);

Xfft5Real=real(Xfft5);
Yfft5Real=real(Yfft5);
Zfft5Real=real(Zfft5);

%fftCoefficientSum
XfftCoeffSum1=sum(Xfft1Real);
YfftCoeffSum1=sum(Yfft1Real);
ZfftCoeffSum1=sum(Zfft1Real);

XfftCoeffSum2=sum(Xfft2Real);
YfftCoeffSum2=sum(Yfft2Real);
ZfftCoeffSum2=sum(Zfft2Real);

XfftCoeffSum3=sum(Xfft3Real);
YfftCoeffSum3=sum(Yfft3Real);
ZfftCoeffSum3=sum(Zfft3Real);

XfftCoeffSum4=sum(Xfft4Real);
YfftCoeffSum4=sum(Yfft4Real);
ZfftCoeffSum4=sum(Zfft4Real);

XfftCoeffSum5=sum(Xfft5Real);
YfftCoeffSum5=sum(Yfft5Real);
ZfftCoeffSum5=sum(Zfft5Real);

%fftMaxCoefficient
XfftMaxCoeff1=max(Xfft1Real);
YfftMaxCoeff1=max(Yfft1Real);
ZfftMaxCoeff1=max(Zfft1Real);

XfftMaxCoeff2=max(Xfft2Real);
YfftMaxCoeff2=max(Yfft2Real);
ZfftMaxCoeff2=max(Zfft2Real);

XfftMaxCoeff3=max(Xfft3Real);
YfftMaxCoeff3=max(Yfft3Real);
ZfftMaxCoeff3=max(Zfft3Real);

XfftMaxCoeff4=max(Xfft4Real);
YfftMaxCoeff4=max(Yfft4Real);
ZfftMaxCoeff4=max(Zfft4Real);

XfftMaxCoeff5=max(Xfft5Real);
YfftMaxCoeff5=max(Yfft5Real);
ZfftMaxCoeff5=max(Zfft5Real);
```

```
 Mean(i,:)=[Xmean1 Ymean1 Zmean1 Xmean2 Ymean2 Zmean2 Xmean3 Ymean3
Zmean3 Xmean4 Ymean4 Zmean4 Xmean5 Ymean5 Zmean5];

 Median(i,:)=[Xmedian1 Ymedian1 Zmedian1 Xmedian2 Ymedian2 Zmedian2
Xmedian3 Ymedian3 Zmedian3 Xmedian4 Ymedian4 Zmedian4 Xmedian5 Ymedian5
Zmedian5];

 Std(i,:)=[Xstd1 Ystd1 Zstd1 Xstd2 Ystd2 Zstd2 Xstd3 Ystd3 Zstd3 Xstd4
Ystd4 Zstd4 Xstd5 Ystd5 Zstd5];

 Skewness(i,:)=[Xskewness1 Yskewness1 Zskewness1 Xskewness2 Yskewness2
Zskewness2 Xskewness3 Yskewness3 Zskewness3 Xskewness4 Yskewness4
Zskewness4 Xskewness5 Yskewness5 Zskewness5];

 Kurtosis(i,:)=[Xkurtosis1 Ykurtosis1 Zkurtosis1 Xkurtosis2 Ykurtosis2
Zkurtosis2 Xkurtosis3 Ykurtosis3 Zkurtosis3 Xkurtosis4 Ykurtosis4
Zkurtosis4 Xkurtosis5 Ykurtosis5 Zkurtosis5];

 Min(i,:)=[Xmin1 Ymin1 Zmin1 Xmin2 Ymin2 Zmin2 Xmin3 Ymin3 Zmin3 Xmin4
Ymin4 Zmin4 Xmin5 Ymin5 Zmin5];

 Max(i,:)=[Xmax1 Ymax1 Zmax1 Xmax2 Ymax2 Zmax2 Xmax3 Ymax3 Zmax3 Xmax4
Ymax4 Zmax4 Xmax5 Ymax5 Zmax5];

 fftCoefficientSum(i,:)=[XfftCoeffSum1 YfftCoeffSum1 ZfftCoeffSum1
XfftCoeffSum2 YfftCoeffSum2 ZfftCoeffSum2 XfftCoeffSum3 YfftCoeffSum3
ZfftCoeffSum3 XfftCoeffSum4 YfftCoeffSum4 ZfftCoeffSum4 XfftCoeffSum5
YfftCoeffSum5 ZfftCoeffSum5];

 fftMaximumCoefficient(i,:)=[XfftMaxCoeff1 YfftMaxCoeff1 ZfftMaxCoeff1
XfftMaxCoeff2 YfftMaxCoeff2 ZfftMaxCoeff2 XfftMaxCoeff3 YfftMaxCoeff3
ZfftMaxCoeff3 XfftMaxCoeff4 YfftMaxCoeff4 ZfftMaxCoeff4 XfftMaxCoeff5
YfftMaxCoeff5 ZfftMaxCoeff5];


 MatrixOfFeaturesShots(i,:)=[Mean(i,:) Median(i,:) Std(i,:)
Skewness(i,:) Kurtosis(i,:) Min(i,:) Max(i,:) fftCoefficientSum(i,:)
fftMaximumCoefficient(i,:)];


end



G=[1];
[x,~]=size(MatrixOfFeaturesShots);
for i=1:x-1
G=[G 1];
end
```

```
G=G';
MatrixOfFeaturesShots=[MatrixOfFeaturesShots G];


MatrixOfFeaturesShots=array2table(MatrixOfFeaturesShots,
'VariableNames',{'Xmean1','Ymean1','Zmean1','Xmean2','Ymean2','Zmean2',
'Xmean3','Ymean3','Zmean3','Xmean4','Ymean4','Zmean4','Xmean5','Ymean5'
,'Zmean5','Xmedian1','Ymedian1','Zmedian1','Xmedian2','Ymedian2','Zmedi
an2','Xmedian3','Ymedian3','Zmedian3','Xmedian4','Ymedian4','Zmedian4',
'Xmedian5','Ymedian5','Zmedian5','Xstd1','Ystd1','Zstd1','Xstd2','Ystd2
','Zstd2','Xstd3','Ystd3','Zstd3','Xstd4','Ystd4','Zstd4','Xstd5','Ystd
5','Zstd5','Xskewness1','Yskewness1','Zskewness1','Xskewness2','Yskewne
ss2','Zskewness2','Xskewness3','Yskewness3','Zskewness3','Xskewness4','
Yskewness4','Zskewness4','Xskewness5','Yskewness5','Zskewness5','Xkurto
sis1','Ykurtosis1','Zkurtosis1','Xkurtosis2','Ykurtosis2','Zkurtosis2',
'Xkurtosis3','Ykurtosis3','Zkurtosis3','Xkurtosis4','Ykurtosis4','Zkurt
osis4','Xkurtosis5','Ykurtosis5','Zkurtosis5','Xmin1','Ymin1','Zmin1','
Xmin2','Ymin2','Zmin2','Xmin3','Ymin3','Zmin3','Xmin4','Ymin4','Zmin4',
'Xmin5','Ymin5','Zmin5','Xmax1','Ymax1','Zmax1','Xmax2','Ymax2','Zmax2'
,'Xmax3','Ymax3','Zmax3','Xmax4','Ymax4','Zmax4','Xmax5','Ymax5','Zmax5
','XfftCoeffSum1','YfftCoeffSum1','ZfftCoeffSum1','XfftCoeffSum2','Yfft
CoeffSum2','ZfftCoeffSum2','XfftCoeffSum3','YfftCoeffSum3','ZfftCoeffSu
m3','XfftCoeffSum4','YfftCoeffSum4','ZfftCoeffSum4','XfftCoeffSum5','Yf
fftCoeffSum5','ZfftCoeffSum5','XfftMaxCoeff1','YfftMaxCoeff1','ZfftMaxCo
eff1','XfftMaxCoeff2','YfftMaxCoeff2','ZfftMaxCoeff2','XfftMaxCoeff3','
YfftMaxCoeff3','ZfftMaxCoeff3','XfftMaxCoeff4','YfftMaxCoeff4','ZfftMax
Coeff4','XfftMaxCoeff5','YfftMaxCoeff5','ZfftMaxCoeff5','Activity'});

%% 90degreeTurn

SegmentedTrials=["PP01turn90trial10","PP01turn90trial30","PP01turn90tri
al52","PP02turn90trial10","PP02turn90trial32","PP02turn90trial73","PP03
turn90trial34","PP03turn90trial55","PP03turn90trial80","PP04turn90trial
12","PP04turn90trial33","PP04turn90trial55","PP04turn90trial56","PP05tu
rn90trial10","PP05turn90trial31","PP05turn90trial32","PP05turn90trial74
","PP06turn90trial11","PP06turn90trial31","PP06turn90trial55","PP06turn
90trial77","PP07turn90trial12","PP07turn90trial34","PP07turn90trial56",
"PP07turn90trial57","PP09turn90trial15","PP09turn90trial19","PP09turn90
trial39","PP09turn90trial63","PP10turn90trial11","PP10turn90trial33","P
P10turn90trial53","PP10turn90trial54","PP11turn90trial51","PP11turn90tr
ial70","PP12turn90trial11","PP12turn90trial31","PP12turn90trial52","PP1
2turn90trial54","PP12turn90trial77"];


%Number of features per statistic
NumStat=15
%TotalNumOfActivities
NumOfActivitiesClass=40;

% TotalNumOfStats

TotalNumOfStats=135;
MatrixOfFeaturesTurn90=zeros(NumOfActivitiesClass,TotalNumOfStats);
```

```
Mean=zeros(NumOfActivitiesClass,NumStat);
Median=zeros(NumOfActivitiesClass,NumStat);
Std=zeros(NumOfActivitiesClass,NumStat);
Skewness=zeros(NumOfActivitiesClass,NumStat);
Kurtosis=zeros(NumOfActivitiesClass,NumStat);
Min=zeros(NumOfActivitiesClass,NumStat);
Max=zeros(NumOfActivitiesClass,NumStat);
fftCoefficientSum=zeros(NumOfActivitiesClass,NumStat);
fftMaximumCoefficient=zeros(NumOfActivitiesClass,NumStat);


for i=1:length(SegmentedTrials)


    load(SegmentedTrials(i))
    Matrix1 =leftShank.gyroCal;
    Matrix2=leftThigh.gyroCal;
    Matrix3=pelvis.gyroCal;
    Matrix4=rightShank.gyroCal;
    Matrix5=rightThigh.gyroCal;
%Means
Xmean1=mean(Matrix1(:,1));
Ymean1=mean(Matrix1(:,2));
Zmean1=mean(Matrix1(:,3));

Xmean2=mean(Matrix2(:,1));
Ymean2=mean(Matrix2(:,2));
Zmean2=mean(Matrix2(:,3));

Xmean3=mean(Matrix3(:,1));
Ymean3=mean(Matrix3(:,2));
Zmean3=mean(Matrix3(:,3));

Xmean4=mean(Matrix4(:,1));
Ymean4=mean(Matrix4(:,2));
Zmean4=mean(Matrix4(:,3));

Xmean5=mean(Matrix5(:,1));
Ymean5=mean(Matrix5(:,2));
Zmean5=mean(Matrix5(:,3));

%Median
Xmedian1=median(Matrix1(:,1));
Ymedian1=median(Matrix1(:,2));
Zmedian1=median(Matrix1(:,3));

Xmedian2=median(Matrix2(:,1));
Ymedian2=median(Matrix2(:,2));
Zmedian2=median(Matrix2(:,3));

Xmedian3=median(Matrix3(:,1));
Ymedian3=median(Matrix3(:,2));
Zmedian3=median(Matrix3(:,3));
```

```
Xmedian4=median(Matrix4(:,1));
Ymedian4=median(Matrix4(:,2));
Zmedian4=median(Matrix4(:,3));

Xmedian5=median(Matrix5(:,1));
Ymedian5=median(Matrix5(:,2));
Zmedian5=median(Matrix5(:,3));

%Std
Xstd1=std(Matrix1(:,1));
Ystd1=std(Matrix1(:,2));
Zstd1=std(Matrix1(:,3));

Xstd2=std(Matrix2(:,1));
Ystd2=std(Matrix2(:,2));
Zstd2=std(Matrix2(:,3));

Xstd3=std(Matrix3(:,1));
Ystd3=std(Matrix3(:,2));
Zstd3=std(Matrix3(:,3));

Xstd4=std(Matrix4(:,1));
Ystd4=std(Matrix4(:,2));
Zstd4=std(Matrix4(:,3));

Xstd5=std(Matrix5(:,1));
Ystd5=std(Matrix5(:,2));
Zstd5=std(Matrix5(:,3));

%Skewness
Xskewness1=skewness(Matrix1(:,1));
Yskewness1=skewness(Matrix1(:,2));
Zskewness1=skewness(Matrix1(:,3));

Xskewness2=skewness(Matrix2(:,1));
Yskewness2=skewness(Matrix2(:,2));
Zskewness2=skewness(Matrix2(:,3));

Xskewness3=skewness(Matrix3(:,1));
Yskewness3=skewness(Matrix3(:,2));
Zskewness3=skewness(Matrix3(:,3));

Xskewness4=skewness(Matrix4(:,1));
Yskewness4=skewness(Matrix4(:,2));
Zskewness4=skewness(Matrix4(:,3));

Xskewness5=skewness(Matrix5(:,1));
Yskewness5=skewness(Matrix5(:,2));
Zskewness5=skewness(Matrix5(:,3));

%Kyrtosis
Xkurtosis1=kurtosis(Matrix1(:,1));
```

```
Ykurtosis1=kurtosis(Matrix1(:,2));
Zkurtosis1=kurtosis(Matrix1(:,3));

Xkurtosis2=kurtosis(Matrix2(:,1));
Ykurtosis2=kurtosis(Matrix2(:,2));
Zkurtosis2=kurtosis(Matrix2(:,3));

Xkurtosis3=kurtosis(Matrix3(:,1));
Ykurtosis3=kurtosis(Matrix3(:,2));
Zkurtosis3=kurtosis(Matrix3(:,3));

Xkurtosis4=kurtosis(Matrix4(:,1));
Ykurtosis4=kurtosis(Matrix4(:,2));
Zkurtosis4=kurtosis(Matrix4(:,3));

Xkurtosis5=kurtosis(Matrix5(:,1));
Ykurtosis5=kurtosis(Matrix5(:,2));
Zkurtosis5=kurtosis(Matrix5(:,3));

%Min
Xmin1=min(Matrix1(:,1));
Ymin1=min(Matrix1(:,2));
Zmin1=min(Matrix1(:,3));

Xmin2=min(Matrix2(:,1));
Ymin2=min(Matrix2(:,2));
Zmin2=min(Matrix2(:,3));

Xmin3=min(Matrix3(:,1));
Ymin3=min(Matrix3(:,2));
Zmin3=min(Matrix3(:,3));

Xmin4=min(Matrix4(:,1));
Ymin4=min(Matrix4(:,2));
Zmin4=min(Matrix4(:,3));

Xmin5=min(Matrix5(:,1));
Ymin5=min(Matrix5(:,2));
Zmin5=min(Matrix5(:,3));

%Max
Xmax1=max(Matrix1(:,1));
Ymax1=max(Matrix1(:,2));
Zmax1=max(Matrix1(:,3));

Xmax2=max(Matrix2(:,1));
Ymax2=max(Matrix2(:,2));
Zmax2=max(Matrix2(:,3));

Xmax3=max(Matrix3(:,1));
Ymax3=max(Matrix3(:,2));
Zmax3=max(Matrix3(:,3));
```

```
Xmax4=max(Matrix4(:,1));
Ymax4=max(Matrix4(:,2));
Zmax4=max(Matrix4(:,3));

Xmax5=max(Matrix5(:,1));
Ymax5=max(Matrix5(:,2));
Zmax5=max(Matrix5(:,3));

%Fast Fourier Transform
Xfft1=fft(Matrix1(:,1));
Yfft1=fft(Matrix1(:,2));
Zfft1=fft(Matrix1(:,3));

Xfft2=fft(Matrix2(:,1));
Yfft2=fft(Matrix2(:,2));
Zfft2=fft(Matrix2(:,3));

Xfft3=fft(Matrix3(:,1));
Yfft3=fft(Matrix3(:,2));
Zfft3=fft(Matrix3(:,3));

Xfft4=fft(Matrix4(:,1));
Yfft4=fft(Matrix4(:,2));
Zfft4=fft(Matrix4(:,3));

Xfft5=fft(Matrix5(:,1));
Yfft5=fft(Matrix5(:,2));
Zfft5=fft(Matrix5(:,3));

%Real Part
Xfft1Real=real(Xfft1);
Yfft1Real=real(Yfft1);
Zfft1Real=real(Zfft1);

Xfft2Real=real(Xfft2);
Yfft2Real=real(Yfft2);
Zfft2Real=real(Zfft2);

Xfft3Real=real(Xfft3);
Yfft3Real=real(Yfft3);
Zfft3Real=real(Zfft3);

Xfft4Real=real(Xfft4);
Yfft4Real=real(Yfft4);
Zfft4Real=real(Zfft4);

Xfft5Real=real(Xfft5);
Yfft5Real=real(Yfft5);
Zfft5Real=real(Zfft5);

%fftCoefficientSum
XfftCoeffSum1=sum(Xfft1Real);
YfftCoeffSum1=sum(Yfft1Real);
ZfftCoeffSum1=sum(Zfft1Real);
```

```
XfftCoeffSum2=sum(Xfft2Real);
YfftCoeffSum2=sum(Yfft2Real);
ZfftCoeffSum2=sum(Zfft2Real);

XfftCoeffSum3=sum(Xfft3Real);
YfftCoeffSum3=sum(Yfft3Real);
ZfftCoeffSum3=sum(Zfft3Real);

XfftCoeffSum4=sum(Xfft4Real);
YfftCoeffSum4=sum(Yfft4Real);
ZfftCoeffSum4=sum(Zfft4Real);

XfftCoeffSum5=sum(Xfft5Real);
YfftCoeffSum5=sum(Yfft5Real);
ZfftCoeffSum5=sum(Zfft5Real);

%fftMaxCoefficient
XfftMaxCoeff1=max(Xfft1Real);
YfftMaxCoeff1=max(Yfft1Real);
ZfftMaxCoeff1=max(Zfft1Real);

XfftMaxCoeff2=max(Xfft2Real);
YfftMaxCoeff2=max(Yfft2Real);
ZfftMaxCoeff2=max(Zfft2Real);

XfftMaxCoeff3=max(Xfft3Real);
YfftMaxCoeff3=max(Yfft3Real);
ZfftMaxCoeff3=max(Zfft3Real);

XfftMaxCoeff4=max(Xfft4Real);
YfftMaxCoeff4=max(Yfft4Real);
ZfftMaxCoeff4=max(Zfft4Real);

XfftMaxCoeff5=max(Xfft5Real);
YfftMaxCoeff5=max(Yfft5Real);
ZfftMaxCoeff5=max(Zfft5Real);


 Mean(i,:)=[Xmean1 Ymean1 Zmean1 Xmean2 Ymean2 Zmean2 Xmean3 Ymean3
Zmean3 Xmean4 Ymean4 Zmean4 Xmean5 Ymean5 Zmean5];

 Median(i,:)=[Xmedian1 Ymedian1 Zmedian1 Xmedian2 Ymedian2 Zmedian2
Xmedian3 Ymedian3 Zmedian3 Xmedian4 Ymedian4 Zmedian4 Xmedian5 Ymedian5
Zmedian5];

 Std(i,:)=[Xstd1 Ystd1 Zstd1 Xstd2 Ystd2 Zstd2 Xstd3 Ystd3 Zstd3 Xstd4
Ystd4 Zstd4 Xstd5 Ystd5 Zstd5];

 Skewness(i,:)=[Xskewness1 Yskewness1 Zskewness1 Xskewness2 Yskewness2
Zskewness2 Xskewness3 Yskewness3 Zskewness3 Xskewness4 Yskewness4
Zskewness4 Xskewness5 Yskewness5 Zskewness5];
```

```
 Kurtosis(i,:)=[Xkurtosis1 Ykurtosis1 Zkurtosis1 Xkurtosis2 Ykurtosis2
Zkurtosis2 Xkurtosis3 Ykurtosis3 Zkurtosis3 Xkurtosis4 Ykurtosis4
Zkurtosis4 Xkurtosis5 Ykurtosis5 Zkurtosis5];

 Min(i,:)=[Xmin1 Ymin1 Zmin1 Xmin2 Ymin2 Zmin2 Xmin3 Ymin3 Zmin3 Xmin4
Ymin4 Zmin4 Xmin5 Ymin5 Zmin5];

 Max(i,:)=[Xmax1 Ymax1 Zmax1 Xmax2 Ymax2 Zmax2 Xmax3 Ymax3 Zmax3 Xmax4
Ymax4 Zmax4 Xmax5 Ymax5 Zmax5];

 fftCoefficientSum(i,:)=[XfftCoeffSum1 YfftCoeffSum1 ZfftCoeffSum1
XfftCoeffSum2 YfftCoeffSum2 ZfftCoeffSum2 XfftCoeffSum3 YfftCoeffSum3
ZfftCoeffSum3 XfftCoeffSum4 YfftCoeffSum4 ZfftCoeffSum4 XfftCoeffSum5
YfftCoeffSum5 ZfftCoeffSum5];

 fftMaximumCoefficient(i,:)=[XfftMaxCoeff1 YfftMaxCoeff1 ZfftMaxCoeff1
XfftMaxCoeff2 YfftMaxCoeff2 ZfftMaxCoeff2 XfftMaxCoeff3 YfftMaxCoeff3
ZfftMaxCoeff3 XfftMaxCoeff4 YfftMaxCoeff4 ZfftMaxCoeff4 XfftMaxCoeff5
YfftMaxCoeff5 ZfftMaxCoeff5];


 MatrixOfFeaturesTurn90(i,:)=[Mean(i,:) Median(i,:) Std(i,:)
Skewness(i,:) Kurtosis(i,:) Min(i,:) Max(i,:) fftCoefficientSum(i,:)
fftMaximumCoefficient(i,:)];


end



G=[3];
[x,~]=size(MatrixOfFeaturesTurn90);
for i=1:x-1
G=[G 3];
end

G=G';
MatrixOfFeaturesTurn90=[MatrixOfFeaturesTurn90 G];


MatrixOfFeaturesTurn90=array2table(MatrixOfFeaturesTurn90,
'VariableNames',{'Xmean1','Ymean1','Zmean1','Xmean2','Ymean2','Zmean2',
'Xmean3','Ymean3','Zmean3','Xmean4','Ymean4','Zmean4','Xmean5','Ymean5'
,'Zmean5','Xmedian1','Ymedian1','Zmedian1','Xmedian2','Ymedian2','Zmedi
an2','Xmedian3','Ymedian3','Zmedian3','Xmedian4','Ymedian4','Zmedian4',
'Xmedian5','Ymedian5','Zmedian5','Xstd1','Ystd1','Zstd1','Xstd2','Ystd2
','Zstd2','Xstd3','Ystd3','Zstd3','Xstd4','Ystd4','Zstd4','Xstd5','Ystd
5','Zstd5','Xskewness1','Yskewness1','Zskewness1','Xskewness2','Yskewne
ss2','Zskewness2','Xskewness3','Yskewness3','Zskewness3','Xskewness4','
Yskewness4','Zskewness4','Xskewness5','Yskewness5','Zskewness5','Xkurto
sis1','Ykurtosis1','Zkurtosis1','Xkurtosis2','Ykurtosis2','Zkurtosis2',
'Xkurtosis3','Ykurtosis3','Zkurtosis3','Xkurtosis4','Ykurtosis4','Zkurt
osis4','Xkurtosis5','Ykurtosis5','Zkurtosis5','Xmin1','Ymin1','Zmin1','
```

```
Xmin2','Ymin2','Zmin2','Xmin3','Ymin3','Zmin3','Xmin4','Ymin4','Zmin4',
'Xmin5','Ymin5','Zmin5','Xmax1','Ymax1','Zmax1','Xmax2','Ymax2','Zmax2'
,'Xmax3','Ymax3','Zmax3','Xmax4','Ymax4','Zmax4','Xmax5','Ymax5','Zmax5
','XfftCoeffSum1','YfftCoeffSum1','ZfftCoeffSum1','XfftCoeffSum2','Yfft
CoeffSum2','ZfftCoeffSum2','XfftCoeffSum3','YfftCoeffSum3','ZfftCoeffSu
m3','XfftCoeffSum4','YfftCoeffSum4','ZfftCoeffSum4','XfftCoeffSum5','Yf
ftCoeffSum5','ZfftCoeffSum5','XfftMaxCoeff1','YfftMaxCoeff1','ZfftMaxCo
eff1','XfftMaxCoeff2','YfftMaxCoeff2','ZfftMaxCoeff2','XfftMaxCoeff3','
YfftMaxCoeff3','ZfftMaxCoeff3','XfftMaxCoeff4','YfftMaxCoeff4','ZfftMax
Coeff4','XfftMaxCoeff5','YfftMaxCoeff5','ZfftMaxCoeff5','Activity'});

%% 180DegreeTurn

SegmentedTrials=["PP01turn180trial9","PP01turn180trial27","PP01turn180t
rial7","PP01turn180trial48","PP01turn180trial49","PP02turn180trial7","P
P02turn180trial9","PP02turn180trial47","PP02turn180trial48","PP02turn18
0trial49","PP06turn180trial26","PP06turn180trial51","PP06turn180trial73
","PP09turn180trial59","PP09turn180trial60","PP11turn180trial7","PP11tu
rn180trial27","PP11turn180trial49","PP11turn180trial66","PP11turn180tri
al67","turn180_1","turn180_2","turn180_3","turn180_4","turn180_5","turn
180_6","turn180_7","turn180_8","turn180_9","turn180_10","turn180_11","t
urn180_12","turn180_13","turn180_14","turn180_15","turn180_16","turn180
_17","turn180_18","turn180_19","turn180_20"];


%Number of features per statistic
NumStat=15
%TotalNumOfActivities
NumOfActivitiesClass=40;

%TotalNumOfStats

TotalNumOfStats=135;
MatrixOfFeaturesTurn180=zeros(NumOfActivitiesClass,TotalNumOfStats);


Mean=zeros(NumOfActivitiesClass,NumStat);
Median=zeros(NumOfActivitiesClass,NumStat);
Std=zeros(NumOfActivitiesClass,NumStat);
Skewness=zeros(NumOfActivitiesClass,NumStat);
Kurtosis=zeros(NumOfActivitiesClass,NumStat);
Min=zeros(NumOfActivitiesClass,NumStat);
Max=zeros(NumOfActivitiesClass,NumStat);
fftCoefficientSum=zeros(NumOfActivitiesClass,NumStat);
fftMaximumCoefficient=zeros(NumOfActivitiesClass,NumStat);


for i=1:length(SegmentedTrials)


    load(SegmentedTrials(i))
    Matrix1 =leftShank.gyroCal;
    Matrix2=leftThigh.gyroCal;
    Matrix3=pelvis.gyroCal;
```

```
    Matrix4=rightShank.gyroCal;
    Matrix5=rightThigh.gyroCal;
%Means
Xmean1=mean(Matrix1(:,1));
Ymean1=mean(Matrix1(:,2));
Zmean1=mean(Matrix1(:,3));

Xmean2=mean(Matrix2(:,1));
Ymean2=mean(Matrix2(:,2));
Zmean2=mean(Matrix2(:,3));

Xmean3=mean(Matrix3(:,1));
Ymean3=mean(Matrix3(:,2));
Zmean3=mean(Matrix3(:,3));

Xmean4=mean(Matrix4(:,1));
Ymean4=mean(Matrix4(:,2));
Zmean4=mean(Matrix4(:,3));

Xmean5=mean(Matrix5(:,1));
Ymean5=mean(Matrix5(:,2));
Zmean5=mean(Matrix5(:,3));

%Median
Xmedian1=median(Matrix1(:,1));
Ymedian1=median(Matrix1(:,2));
Zmedian1=median(Matrix1(:,3));

Xmedian2=median(Matrix2(:,1));
Ymedian2=median(Matrix2(:,2));
Zmedian2=median(Matrix2(:,3));

Xmedian3=median(Matrix3(:,1));
Ymedian3=median(Matrix3(:,2));
Zmedian3=median(Matrix3(:,3));

Xmedian4=median(Matrix4(:,1));
Ymedian4=median(Matrix4(:,2));
Zmedian4=median(Matrix4(:,3));

Xmedian5=median(Matrix5(:,1));
Ymedian5=median(Matrix5(:,2));
Zmedian5=median(Matrix5(:,3));

%Std
Xstd1=std(Matrix1(:,1));
Ystd1=std(Matrix1(:,2));
Zstd1=std(Matrix1(:,3));

Xstd2=std(Matrix2(:,1));
Ystd2=std(Matrix2(:,2));
Zstd2=std(Matrix2(:,3));

Xstd3=std(Matrix3(:,1));
```

```
Ystd3=std(Matrix3(:,2));
Zstd3=std(Matrix3(:,3));

Xstd4=std(Matrix4(:,1));
Ystd4=std(Matrix4(:,2));
Zstd4=std(Matrix4(:,3));

Xstd5=std(Matrix5(:,1));
Ystd5=std(Matrix5(:,2));
Zstd5=std(Matrix5(:,3));

%Skewness
Xskewness1=skewness(Matrix1(:,1));
Yskewness1=skewness(Matrix1(:,2));
Zskewness1=skewness(Matrix1(:,3));

Xskewness2=skewness(Matrix2(:,1));
Yskewness2=skewness(Matrix2(:,2));
Zskewness2=skewness(Matrix2(:,3));

Xskewness3=skewness(Matrix3(:,1));
Yskewness3=skewness(Matrix3(:,2));
Zskewness3=skewness(Matrix3(:,3));

Xskewness4=skewness(Matrix4(:,1));
Yskewness4=skewness(Matrix4(:,2));
Zskewness4=skewness(Matrix4(:,3));

Xskewness5=skewness(Matrix5(:,1));
Yskewness5=skewness(Matrix5(:,2));
Zskewness5=skewness(Matrix5(:,3));

%Kyrtosis
Xkurtosis1=kurtosis(Matrix1(:,1));
Ykurtosis1=kurtosis(Matrix1(:,2));
Zkurtosis1=kurtosis(Matrix1(:,3));

Xkurtosis2=kurtosis(Matrix2(:,1));
Ykurtosis2=kurtosis(Matrix2(:,2));
Zkurtosis2=kurtosis(Matrix2(:,3));

Xkurtosis3=kurtosis(Matrix3(:,1));
Ykurtosis3=kurtosis(Matrix3(:,2));
Zkurtosis3=kurtosis(Matrix3(:,3));

Xkurtosis4=kurtosis(Matrix4(:,1));
Ykurtosis4=kurtosis(Matrix4(:,2));
Zkurtosis4=kurtosis(Matrix4(:,3));

Xkurtosis5=kurtosis(Matrix5(:,1));
Ykurtosis5=kurtosis(Matrix5(:,2));
Zkurtosis5=kurtosis(Matrix5(:,3));
```

```
%Min
Xmin1=min(Matrix1(:,1));
Ymin1=min(Matrix1(:,2));
Zmin1=min(Matrix1(:,3));

Xmin2=min(Matrix2(:,1));
Ymin2=min(Matrix2(:,2));
Zmin2=min(Matrix2(:,3));

Xmin3=min(Matrix3(:,1));
Ymin3=min(Matrix3(:,2));
Zmin3=min(Matrix3(:,3));

Xmin4=min(Matrix4(:,1));
Ymin4=min(Matrix4(:,2));
Zmin4=min(Matrix4(:,3));

Xmin5=min(Matrix5(:,1));
Ymin5=min(Matrix5(:,2));
Zmin5=min(Matrix5(:,3));

%Max
Xmax1=max(Matrix1(:,1));
Ymax1=max(Matrix1(:,2));
Zmax1=max(Matrix1(:,3));

Xmax2=max(Matrix2(:,1));
Ymax2=max(Matrix2(:,2));
Zmax2=max(Matrix2(:,3));

Xmax3=max(Matrix3(:,1));
Ymax3=max(Matrix3(:,2));
Zmax3=max(Matrix3(:,3));

Xmax4=max(Matrix4(:,1));
Ymax4=max(Matrix4(:,2));
Zmax4=max(Matrix4(:,3));

Xmax5=max(Matrix5(:,1));
Ymax5=max(Matrix5(:,2));
Zmax5=max(Matrix5(:,3));

%Fast Fourier Transform
Xfft1=fft(Matrix1(:,1));
Yfft1=fft(Matrix1(:,2));
Zfft1=fft(Matrix1(:,3));

Xfft2=fft(Matrix2(:,1));
Yfft2=fft(Matrix2(:,2));
Zfft2=fft(Matrix2(:,3));

Xfft3=fft(Matrix3(:,1));
Yfft3=fft(Matrix3(:,2));
Zfft3=fft(Matrix3(:,3));
```

```
Xfft4=fft(Matrix4(:,1));
Yfft4=fft(Matrix4(:,2));
Zfft4=fft(Matrix4(:,3));

Xfft5=fft(Matrix5(:,1));
Yfft5=fft(Matrix5(:,2));
Zfft5=fft(Matrix5(:,3));

%Real Part
Xfft1Real=real(Xfft1);
Yfft1Real=real(Yfft1);
Zfft1Real=real(Zfft1);

Xfft2Real=real(Xfft2);
Yfft2Real=real(Yfft2);
Zfft2Real=real(Zfft2);

Xfft3Real=real(Xfft3);
Yfft3Real=real(Yfft3);
Zfft3Real=real(Zfft3);

Xfft4Real=real(Xfft4);
Yfft4Real=real(Yfft4);
Zfft4Real=real(Zfft4);

Xfft5Real=real(Xfft5);
Yfft5Real=real(Yfft5);
Zfft5Real=real(Zfft5);

%fftCoefficientSum
XfftCoeffSum1=sum(Xfft1Real);
YfftCoeffSum1=sum(Yfft1Real);
ZfftCoeffSum1=sum(Zfft1Real);

XfftCoeffSum2=sum(Xfft2Real);
YfftCoeffSum2=sum(Yfft2Real);
ZfftCoeffSum2=sum(Zfft2Real);

XfftCoeffSum3=sum(Xfft3Real);
YfftCoeffSum3=sum(Yfft3Real);
ZfftCoeffSum3=sum(Zfft3Real);

XfftCoeffSum4=sum(Xfft4Real);
YfftCoeffSum4=sum(Yfft4Real);
ZfftCoeffSum4=sum(Zfft4Real);

XfftCoeffSum5=sum(Xfft5Real);
YfftCoeffSum5=sum(Yfft5Real);
ZfftCoeffSum5=sum(Zfft5Real);

%fftMaxCoefficient
XfftMaxCoeff1=max(Xfft1Real);
```

```
YfftMaxCoeff1=max(Yfft1Real);
ZfftMaxCoeff1=max(Zfft1Real);

XfftMaxCoeff2=max(Xfft2Real);
YfftMaxCoeff2=max(Yfft2Real);
ZfftMaxCoeff2=max(Zfft2Real);

XfftMaxCoeff3=max(Xfft3Real);
YfftMaxCoeff3=max(Yfft3Real);
ZfftMaxCoeff3=max(Zfft3Real);

XfftMaxCoeff4=max(Xfft4Real);
YfftMaxCoeff4=max(Yfft4Real);
ZfftMaxCoeff4=max(Zfft4Real);

XfftMaxCoeff5=max(Xfft5Real);
YfftMaxCoeff5=max(Yfft5Real);
ZfftMaxCoeff5=max(Zfft5Real);


 Mean(i,:)=[Xmean1 Ymean1 Zmean1 Xmean2 Ymean2 Zmean2 Xmean3 Ymean3
Zmean3 Xmean4 Ymean4 Zmean4 Xmean5 Ymean5 Zmean5];

 Median(i,:)=[Xmedian1 Ymedian1 Zmedian1 Xmedian2 Ymedian2 Zmedian2
Xmedian3 Ymedian3 Zmedian3 Xmedian4 Ymedian4 Zmedian4 Xmedian5 Ymedian5
Zmedian5];

 Std(i,:)=[Xstd1 Ystd1 Zstd1 Xstd2 Ystd2 Zstd2 Xstd3 Ystd3 Zstd3 Xstd4
Ystd4 Zstd4 Xstd5 Ystd5 Zstd5];

 Skewness(i,:)=[Xskewness1 Yskewness1 Zskewness1 Xskewness2 Yskewness2
Zskewness2 Xskewness3 Yskewness3 Zskewness3 Xskewness4 Yskewness4
Zskewness4 Xskewness5 Yskewness5 Zskewness5];

 Kurtosis(i,:)=[Xkurtosis1 Ykurtosis1 Zkurtosis1 Xkurtosis2 Ykurtosis2
Zkurtosis2 Xkurtosis3 Ykurtosis3 Zkurtosis3 Xkurtosis4 Ykurtosis4
Zkurtosis4 Xkurtosis5 Ykurtosis5 Zkurtosis5];

 Min(i,:)=[Xmin1 Ymin1 Zmin1 Xmin2 Ymin2 Zmin2 Xmin3 Ymin3 Zmin3 Xmin4
Ymin4 Zmin4 Xmin5 Ymin5 Zmin5];

 Max(i,:)=[Xmax1 Ymax1 Zmax1 Xmax2 Ymax2 Zmax2 Xmax3 Ymax3 Zmax3 Xmax4
Ymax4 Zmax4 Xmax5 Ymax5 Zmax5];

 fftCoefficientSum(i,:)=[XfftCoeffSum1 YfftCoeffSum1 ZfftCoeffSum1
XfftCoeffSum2 YfftCoeffSum2 ZfftCoeffSum2 XfftCoeffSum3 YfftCoeffSum3
ZfftCoeffSum3 XfftCoeffSum4 YfftCoeffSum4 ZfftCoeffSum4 XfftCoeffSum5
YfftCoeffSum5 ZfftCoeffSum5];

 fftMaximumCoefficient(i,:)=[XfftMaxCoeff1 YfftMaxCoeff1 ZfftMaxCoeff1
XfftMaxCoeff2 YfftMaxCoeff2 ZfftMaxCoeff2 XfftMaxCoeff3 YfftMaxCoeff3
ZfftMaxCoeff3 XfftMaxCoeff4 YfftMaxCoeff4 ZfftMaxCoeff4 XfftMaxCoeff5
YfftMaxCoeff5 ZfftMaxCoeff5];
```

```
 MatrixOfFeaturesTurn180(i,:)=[Mean(i,:) Median(i,:) Std(i,:)
Skewness(i,:) Kurtosis(i,:) Min(i,:) Max(i,:) fftCoefficientSum(i,:)
fftMaximumCoefficient(i,:)];


end



G=[2];
[x,~]=size(MatrixOfFeaturesTurn180);
for i=1:x-1
G=[G 2];
end

G=G';
MatrixOfFeaturesTurn180=[MatrixOfFeaturesTurn180 G];



MatrixOfFeaturesTurn180=array2table(MatrixOfFeaturesTurn180,
'VariableNames',{'Xmean1','Ymean1','Zmean1','Xmean2','Ymean2','Zmean2',
'Xmean3','Ymean3','Zmean3','Xmean4','Ymean4','Zmean4','Xmean5','Ymean5'
,'Zmean5','Xmedian1','Ymedian1','Zmedian1','Xmedian2','Ymedian2','Zmedi
an2','Xmedian3','Ymedian3','Zmedian3','Xmedian4','Ymedian4','Zmedian4',
'Xmedian5','Ymedian5','Zmedian5','Xstd1','Ystd1','Zstd1','Xstd2','Ystd2
','Zstd2','Xstd3','Ystd3','Zstd3','Xstd4','Ystd4','Zstd4','Xstd5','Ystd
5','Zstd5','Xskewness1','Yskewness1','Zskewness1','Xskewness2','Yskewne
ss2','Zskewness2','Xskewness3','Yskewness3','Zskewness3','Xskewness4','
Yskewness4','Zskewness4','Xskewness5','Yskewness5','Zskewness5','Xkurto
sis1','Ykurtosis1','Zkurtosis1','Xkurtosis2','Ykurtosis2','Zkurtosis2',
'Xkurtosis3','Ykurtosis3','Zkurtosis3','Xkurtosis4','Ykurtosis4','Zkurt
osis4','Xkurtosis5','Ykurtosis5','Zkurtosis5','Xmin1','Ymin1','Zmin1','
Xmin2','Ymin2','Zmin2','Xmin3','Ymin3','Zmin3','Xmin4','Ymin4','Zmin4',
'Xmin5','Ymin5','Zmin5','Xmax1','Ymax1','Zmax1','Xmax2','Ymax2','Zmax2'
,'Xmax3','Ymax3','Zmax3','Xmax4','Ymax4','Zmax4','Xmax5','Ymax5','Zmax5
','XfftCoeffSum1','YfftCoeffSum1','ZfftCoeffSum1','XfftCoeffSum2','Yfft
CoeffSum2','ZfftCoeffSum2','XfftCoeffSum3','YfftCoeffSum3','ZfftCoeffSu
m3','XfftCoeffSum4','YfftCoeffSum4','ZfftCoeffSum4','XfftCoeffSum5','Yf
ftCoeffSum5','ZfftCoeffSum5','XfftMaxCoeff1','YfftMaxCoeff1','ZfftMaxCo
eff1','XfftMaxCoeff2','YfftMaxCoeff2','ZfftMaxCoeff2','XfftMaxCoeff3','
YfftMaxCoeff3','ZfftMaxCoeff3','XfftMaxCoeff4','YfftMaxCoeff4','ZfftMax
Coeff4','XfftMaxCoeff5','YfftMaxCoeff5','ZfftMaxCoeff5','Activity'});


%% Jumps

SegmentedTrials=["PP01jumptrial13","PP01jumptrial33","PP01jumptrial55",
"PP01jumptrial73","PP02jumptrial13","PP02jumptrial35","PP02jumptrial55"
,"PP02jumptrial76","PP03jumptrial14","PP03jumptrial57","PP03jumptrial58
","PP03jumptrial84","PP04jumptrial36","PP04jumptrial57","PP04jumptrial7
```

```
9","PP04jumptrial80","PP05jumptrial13","PP05jumptrial14","PP05jumptrial
15","PP05jumptrial76","PP06jumptrial37","PP06jumptrial57","PP06jumptria
l58","PP06jumptrial78","PP07jumptrial15","PP07jumptrial86","PP07jumptri
al87","PP07jumptrial88","PP09jumptrial20","PP09jumptrial43","PP09jumptr
ial65","PP09jumptrial66","PP11jumptrial14","PP11jumptrial32","PP11jumpt
rial72","PP11jumptrial74","PP12jumptrial55","PP12jumptrial57","PP12jump
trial59","PP12jumptrial78"];


%Number of features per statistic
NumStat=15
%TotalNumOfActivities
NumOfActivitiesClass=40;

%TotalNumOfStats

TotalNumOfStats=135;
MatrixOfFeaturesJumps=zeros(NumOfActivitiesClass,TotalNumOfStats);


Mean=zeros(NumOfActivitiesClass,NumStat);
Median=zeros(NumOfActivitiesClass,NumStat);
Std=zeros(NumOfActivitiesClass,NumStat);
Skewness=zeros(NumOfActivitiesClass,NumStat);
Kurtosis=zeros(NumOfActivitiesClass,NumStat);
Min=zeros(NumOfActivitiesClass,NumStat);
Max=zeros(NumOfActivitiesClass,NumStat);
fftCoefficientSum=zeros(NumOfActivitiesClass,NumStat);
fftMaximumCoefficient=zeros(NumOfActivitiesClass,NumStat);


for i=1:length(SegmentedTrials)


    load(SegmentedTrials(i))
    Matrix1 =leftShank.gyroCal;
    Matrix2=leftThigh.gyroCal;
    Matrix3=pelvis.gyroCal;
    Matrix4=rightShank.gyroCal;
    Matrix5=rightThigh.gyroCal;
    %Means
Xmean1=mean(Matrix1(:,1));
Ymean1=mean(Matrix1(:,2));
Zmean1=mean(Matrix1(:,3));

Xmean2=mean(Matrix2(:,1));
Ymean2=mean(Matrix2(:,2));
Zmean2=mean(Matrix2(:,3));

Xmean3=mean(Matrix3(:,1));
Ymean3=mean(Matrix3(:,2));
Zmean3=mean(Matrix3(:,3));
```

```
Xmean4=mean(Matrix4(:,1));
Ymean4=mean(Matrix4(:,2));
Zmean4=mean(Matrix4(:,3));

Xmean5=mean(Matrix5(:,1));
Ymean5=mean(Matrix5(:,2));
Zmean5=mean(Matrix5(:,3));

%Median
Xmedian1=median(Matrix1(:,1));
Ymedian1=median(Matrix1(:,2));
Zmedian1=median(Matrix1(:,3));

Xmedian2=median(Matrix2(:,1));
Ymedian2=median(Matrix2(:,2));
Zmedian2=median(Matrix2(:,3));

Xmedian3=median(Matrix3(:,1));
Ymedian3=median(Matrix3(:,2));
Zmedian3=median(Matrix3(:,3));

Xmedian4=median(Matrix4(:,1));
Ymedian4=median(Matrix4(:,2));
Zmedian4=median(Matrix4(:,3));

Xmedian5=median(Matrix5(:,1));
Ymedian5=median(Matrix5(:,2));
Zmedian5=median(Matrix5(:,3));

%Std
Xstd1=std(Matrix1(:,1));
Ystd1=std(Matrix1(:,2));
Zstd1=std(Matrix1(:,3));

Xstd2=std(Matrix2(:,1));
Ystd2=std(Matrix2(:,2));
Zstd2=std(Matrix2(:,3));

Xstd3=std(Matrix3(:,1));
Ystd3=std(Matrix3(:,2));
Zstd3=std(Matrix3(:,3));

Xstd4=std(Matrix4(:,1));
Ystd4=std(Matrix4(:,2));
Zstd4=std(Matrix4(:,3));

Xstd5=std(Matrix5(:,1));
Ystd5=std(Matrix5(:,2));
Zstd5=std(Matrix5(:,3));

%Skewness
Xskewness1=skewness(Matrix1(:,1));
Yskewness1=skewness(Matrix1(:,2));
Zskewness1=skewness(Matrix1(:,3));
```

```
Xskewness2=skewness(Matrix2(:,1));
Yskewness2=skewness(Matrix2(:,2));
Zskewness2=skewness(Matrix2(:,3));

Xskewness3=skewness(Matrix3(:,1));
Yskewness3=skewness(Matrix3(:,2));
Zskewness3=skewness(Matrix3(:,3));

Xskewness4=skewness(Matrix4(:,1));
Yskewness4=skewness(Matrix4(:,2));
Zskewness4=skewness(Matrix4(:,3));

Xskewness5=skewness(Matrix5(:,1));
Yskewness5=skewness(Matrix5(:,2));
Zskewness5=skewness(Matrix5(:,3));

%Kyrtosis
Xkurtosis1=kurtosis(Matrix1(:,1));
Ykurtosis1=kurtosis(Matrix1(:,2));
Zkurtosis1=kurtosis(Matrix1(:,3));

Xkurtosis2=kurtosis(Matrix2(:,1));
Ykurtosis2=kurtosis(Matrix2(:,2));
Zkurtosis2=kurtosis(Matrix2(:,3));

Xkurtosis3=kurtosis(Matrix3(:,1));
Ykurtosis3=kurtosis(Matrix3(:,2));
Zkurtosis3=kurtosis(Matrix3(:,3));

Xkurtosis4=kurtosis(Matrix4(:,1));
Ykurtosis4=kurtosis(Matrix4(:,2));
Zkurtosis4=kurtosis(Matrix4(:,3));

Xkurtosis5=kurtosis(Matrix5(:,1));
Ykurtosis5=kurtosis(Matrix5(:,2));
Zkurtosis5=kurtosis(Matrix5(:,3));

%Min
Xmin1=min(Matrix1(:,1));
Ymin1=min(Matrix1(:,2));
Zmin1=min(Matrix1(:,3));

Xmin2=min(Matrix2(:,1));
Ymin2=min(Matrix2(:,2));
Zmin2=min(Matrix2(:,3));

Xmin3=min(Matrix3(:,1));
Ymin3=min(Matrix3(:,2));
Zmin3=min(Matrix3(:,3));

Xmin4=min(Matrix4(:,1));
Ymin4=min(Matrix4(:,2));
```

```
Zmin4=min(Matrix4(:,3));

Xmin5=min(Matrix5(:,1));
Ymin5=min(Matrix5(:,2));
Zmin5=min(Matrix5(:,3));

%Max
Xmax1=max(Matrix1(:,1));
Ymax1=max(Matrix1(:,2));
Zmax1=max(Matrix1(:,3));

Xmax2=max(Matrix2(:,1));
Ymax2=max(Matrix2(:,2));
Zmax2=max(Matrix2(:,3));

Xmax3=max(Matrix3(:,1));
Ymax3=max(Matrix3(:,2));
Zmax3=max(Matrix3(:,3));

Xmax4=max(Matrix4(:,1));
Ymax4=max(Matrix4(:,2));
Zmax4=max(Matrix4(:,3));

Xmax5=max(Matrix5(:,1));
Ymax5=max(Matrix5(:,2));
Zmax5=max(Matrix5(:,3));

%Fast Fourier Transform
Xfft1=fft(Matrix1(:,1));
Yfft1=fft(Matrix1(:,2));
Zfft1=fft(Matrix1(:,3));

Xfft2=fft(Matrix2(:,1));
Yfft2=fft(Matrix2(:,2));
Zfft2=fft(Matrix2(:,3));

Xfft3=fft(Matrix3(:,1));
Yfft3=fft(Matrix3(:,2));
Zfft3=fft(Matrix3(:,3));

Xfft4=fft(Matrix4(:,1));
Yfft4=fft(Matrix4(:,2));
Zfft4=fft(Matrix4(:,3));

Xfft5=fft(Matrix5(:,1));
Yfft5=fft(Matrix5(:,2));
Zfft5=fft(Matrix5(:,3));

%Real Part
Xfft1Real=real(Xfft1);
Yfft1Real=real(Yfft1);
Zfft1Real=real(Zfft1);
```

```
Xfft2Real=real(Xfft2);
Yfft2Real=real(Yfft2);
Zfft2Real=real(Zfft2);

Xfft3Real=real(Xfft3);
Yfft3Real=real(Yfft3);
Zfft3Real=real(Zfft3);

Xfft4Real=real(Xfft4);
Yfft4Real=real(Yfft4);
Zfft4Real=real(Zfft4);

Xfft5Real=real(Xfft5);
Yfft5Real=real(Yfft5);
Zfft5Real=real(Zfft5);

%fftCoefficientSum
XfftCoeffSum1=sum(Xfft1Real);
YfftCoeffSum1=sum(Yfft1Real);
ZfftCoeffSum1=sum(Zfft1Real);

XfftCoeffSum2=sum(Xfft2Real);
YfftCoeffSum2=sum(Yfft2Real);
ZfftCoeffSum2=sum(Zfft2Real);

XfftCoeffSum3=sum(Xfft3Real);
YfftCoeffSum3=sum(Yfft3Real);
ZfftCoeffSum3=sum(Zfft3Real);

XfftCoeffSum4=sum(Xfft4Real);
YfftCoeffSum4=sum(Yfft4Real);
ZfftCoeffSum4=sum(Zfft4Real);

XfftCoeffSum5=sum(Xfft5Real);
YfftCoeffSum5=sum(Yfft5Real);
ZfftCoeffSum5=sum(Zfft5Real);

%fftMaxCoefficient
XfftMaxCoeff1=max(Xfft1Real);
YfftMaxCoeff1=max(Yfft1Real);
ZfftMaxCoeff1=max(Zfft1Real);

XfftMaxCoeff2=max(Xfft2Real);
YfftMaxCoeff2=max(Yfft2Real);
ZfftMaxCoeff2=max(Zfft2Real);

XfftMaxCoeff3=max(Xfft3Real);
YfftMaxCoeff3=max(Yfft3Real);
ZfftMaxCoeff3=max(Zfft3Real);

XfftMaxCoeff4=max(Xfft4Real);
YfftMaxCoeff4=max(Yfft4Real);
ZfftMaxCoeff4=max(Zfft4Real);
```

```
XfftMaxCoeff5=max(Xfft5Real);
YfftMaxCoeff5=max(Yfft5Real);
ZfftMaxCoeff5=max(Zfft5Real);


 Mean(i,:)=[Xmean1 Ymean1 Zmean1 Xmean2 Ymean2 Zmean2 Xmean3 Ymean3
Zmean3 Xmean4 Ymean4 Zmean4 Xmean5 Ymean5 Zmean5];

 Median(i,:)=[Xmedian1 Ymedian1 Zmedian1 Xmedian2 Ymedian2 Zmedian2
Xmedian3 Ymedian3 Zmedian3 Xmedian4 Ymedian4 Zmedian4 Xmedian5 Ymedian5
Zmedian5];

 Std(i,:)=[Xstd1 Ystd1 Zstd1 Xstd2 Ystd2 Zstd2 Xstd3 Ystd3 Zstd3 Xstd4
Ystd4 Zstd4 Xstd5 Ystd5 Zstd5];

 Skewness(i,:)=[Xskewness1 Yskewness1 Zskewness1 Xskewness2 Yskewness2
Zskewness2 Xskewness3 Yskewness3 Zskewness3 Xskewness4 Yskewness4
Zskewness4 Xskewness5 Yskewness5 Zskewness5];

 Kurtosis(i,:)=[Xkurtosis1 Ykurtosis1 Zkurtosis1 Xkurtosis2 Ykurtosis2
Zkurtosis2 Xkurtosis3 Ykurtosis3 Zkurtosis3 Xkurtosis4 Ykurtosis4
Zkurtosis4 Xkurtosis5 Ykurtosis5 Zkurtosis5];

 Min(i,:)=[Xmin1 Ymin1 Zmin1 Xmin2 Ymin2 Zmin2 Xmin3 Ymin3 Zmin3 Xmin4
Ymin4 Zmin4 Xmin5 Ymin5 Zmin5];

 Max(i,:)=[Xmax1 Ymax1 Zmax1 Xmax2 Ymax2 Zmax2 Xmax3 Ymax3 Zmax3 Xmax4
Ymax4 Zmax4 Xmax5 Ymax5 Zmax5];

 fftCoefficientSum(i,:)=[XfftCoeffSum1 YfftCoeffSum1 ZfftCoeffSum1
XfftCoeffSum2 YfftCoeffSum2 ZfftCoeffSum2 XfftCoeffSum3 YfftCoeffSum3
ZfftCoeffSum3 XfftCoeffSum4 YfftCoeffSum4 ZfftCoeffSum4 XfftCoeffSum5
YfftCoeffSum5 ZfftCoeffSum5];

 fftMaximumCoefficient(i,:)=[XfftMaxCoeff1 YfftMaxCoeff1 ZfftMaxCoeff1
XfftMaxCoeff2 YfftMaxCoeff2 ZfftMaxCoeff2 XfftMaxCoeff3 YfftMaxCoeff3
ZfftMaxCoeff3 XfftMaxCoeff4 YfftMaxCoeff4 ZfftMaxCoeff4 XfftMaxCoeff5
YfftMaxCoeff5 ZfftMaxCoeff5];

 MatrixOfFeaturesJumps(i,:)=[Mean(i,:) Median(i,:) Std(i,:)
Skewness(i,:) Kurtosis(i,:) Min(i,:) Max(i,:) fftCoefficientSum(i,:)
fftMaximumCoefficient(i,:)];


end



G=[4];
[x,~]=size(MatrixOfFeaturesJumps);
for i=1:x-1
G=[G 4];
```

```
end

G=G';
MatrixOfFeaturesJumps=[MatrixOfFeaturesJumps G];


MatrixOfFeaturesJumps=array2table(MatrixOfFeaturesJumps,
'VariableNames',{'Xmean1','Ymean1','Zmean1','Xmean2','Ymean2','Zmean2',
'Xmean3','Ymean3','Zmean3','Xmean4','Ymean4','Zmean4','Xmean5','Ymean5'
,'Zmean5','Xmedian1','Ymedian1','Zmedian1','Xmedian2','Ymedian2','Zmedi
an2','Xmedian3','Ymedian3','Zmedian3','Xmedian4','Ymedian4','Zmedian4',
'Xmedian5','Ymedian5','Zmedian5','Xstd1','Ystd1','Zstd1','Xstd2','Ystd2
','Zstd2','Xstd3','Ystd3','Zstd3','Xstd4','Ystd4','Zstd4','Xstd5','Ystd
5','Zstd5','Xskewness1','Yskewness1','Zskewness1','Xskewness2','Yskewne
ss2','Zskewness2','Xskewness3','Yskewness3','Zskewness3','Xskewness4','
Yskewness4','Zskewness4','Xskewness5','Yskewness5','Zskewness5','Xkurto
sis1','Ykurtosis1','Zkurtosis1','Xkurtosis2','Ykurtosis2','Zkurtosis2',
'Xkurtosis3','Ykurtosis3','Zkurtosis3','Xkurtosis4','Ykurtosis4','Zkurt
osis4','Xkurtosis5','Ykurtosis5','Zkurtosis5','Xmin1','Ymin1','Zmin1','
Xmin2','Ymin2','Zmin2','Xmin3','Ymin3','Zmin3','Xmin4','Ymin4','Zmin4',
'Xmin5','Ymin5','Zmin5','Xmax1','Ymax1','Zmax1','Xmax2','Ymax2','Zmax2'
,'Xmax3','Ymax3','Zmax3','Xmax4','Ymax4','Zmax4','Xmax5','Ymax5','Zmax5
','XfftCoeffSum1','YfftCoeffSum1','ZfftCoeffSum1','XfftCoeffSum2','Yfft
CoeffSum2','ZfftCoeffSum2','XfftCoeffSum3','YfftCoeffSum3','ZfftCoeffSu
m3','XfftCoeffSum4','YfftCoeffSum4','ZfftCoeffSum4','XfftCoeffSum5','Yf
ftCoeffSum5','ZfftCoeffSum5','XfftMaxCoeff1','YfftMaxCoeff1','ZfftMaxCo
eff1','XfftMaxCoeff2','YfftMaxCoeff2','ZfftMaxCoeff2','XfftMaxCoeff3','
YfftMaxCoeff3','ZfftMaxCoeff3','XfftMaxCoeff4','YfftMaxCoeff4','ZfftMax
Coeff4','XfftMaxCoeff5','YfftMaxCoeff5','ZfftMaxCoeff5','Activity'});

%% LongPasses

SegmentedTrials=["PP01sentratrial17","PP01sentratrial36","PP01sentratri
al57","PP01sentratrial76","PP02sentratrial17","PP02sentratrial38","PP02
sentratrial57","PP02sentratrial78","PP03sentratrial18","PP03sentratrial
41","PP03sentratrial61","PP03sentratrial86","PP04sentratrial19","PP04se
ntratrial40","PP04sentratrial61","PP04sentratrial82","PP05sentratrial17
","PP05sentratrial38","PP05sentratrial60","PP05sentratrial80","PP06sent
ratrial17","PP06sentratrial39","PP06sentratrial61","PP06sentratrial84",
"PP07sentratrial19","PP07sentratrial40","PP07sentratrial63","PP07sentra
trial90","PP09sentratrial24","PP09sentratrial47","PP09sentratrial69","P
P10sentratrial18","PP10sentratrial39","PP10sentratrial59","PP10sentratr
ial80","PP11sentratrial17","PP11sentratrial36","PP11sentratrial57","PP1
1sentratrial76","PP12sentratrial83"];


%Number of features per statistic
NumStat=15
%TotalNumOfActivities
NumOfActivitiesClass=40;

%TotalNumOfStats

TotalNumOfStats=135;
```

```
MatrixOfFeaturesLongPasses=zeros(NumOfActivitiesClass,TotalNumOfStats);


Mean=zeros(NumOfActivitiesClass,NumStat);
Median=zeros(NumOfActivitiesClass,NumStat);
Std=zeros(NumOfActivitiesClass,NumStat);
Skewness=zeros(NumOfActivitiesClass,NumStat);
Kurtosis=zeros(NumOfActivitiesClass,NumStat);
Min=zeros(NumOfActivitiesClass,NumStat);
Max=zeros(NumOfActivitiesClass,NumStat);
fftCoefficientSum=zeros(NumOfActivitiesClass,NumStat);
fftMaximumCoefficient=zeros(NumOfActivitiesClass,NumStat);


for i=1:length(SegmentedTrials)


    load(SegmentedTrials(i))
    Matrix1 =leftShank.gyroCal;
    Matrix2=leftThigh.gyroCal;
    Matrix3=pelvis.gyroCal;
    Matrix4=rightShank.gyroCal;
    Matrix5=rightThigh.gyroCal;
    %Means
Xmean1=mean(Matrix1(:,1));
Ymean1=mean(Matrix1(:,2));
Zmean1=mean(Matrix1(:,3));

Xmean2=mean(Matrix2(:,1));
Ymean2=mean(Matrix2(:,2));
Zmean2=mean(Matrix2(:,3));

Xmean3=mean(Matrix3(:,1));
Ymean3=mean(Matrix3(:,2));
Zmean3=mean(Matrix3(:,3));

Xmean4=mean(Matrix4(:,1));
Ymean4=mean(Matrix4(:,2));
Zmean4=mean(Matrix4(:,3));

Xmean5=mean(Matrix5(:,1));
Ymean5=mean(Matrix5(:,2));
Zmean5=mean(Matrix5(:,3));

%Median
Xmedian1=median(Matrix1(:,1));
Ymedian1=median(Matrix1(:,2));
Zmedian1=median(Matrix1(:,3));

Xmedian2=median(Matrix2(:,1));
Ymedian2=median(Matrix2(:,2));
Zmedian2=median(Matrix2(:,3));
```

```
Xmedian3=median(Matrix3(:,1));
Ymedian3=median(Matrix3(:,2));
Zmedian3=median(Matrix3(:,3));

Xmedian4=median(Matrix4(:,1));
Ymedian4=median(Matrix4(:,2));
Zmedian4=median(Matrix4(:,3));

Xmedian5=median(Matrix5(:,1));
Ymedian5=median(Matrix5(:,2));
Zmedian5=median(Matrix5(:,3));

%Std
Xstd1=std(Matrix1(:,1));
Ystd1=std(Matrix1(:,2));
Zstd1=std(Matrix1(:,3));

Xstd2=std(Matrix2(:,1));
Ystd2=std(Matrix2(:,2));
Zstd2=std(Matrix2(:,3));

Xstd3=std(Matrix3(:,1));
Ystd3=std(Matrix3(:,2));
Zstd3=std(Matrix3(:,3));

Xstd4=std(Matrix4(:,1));
Ystd4=std(Matrix4(:,2));
Zstd4=std(Matrix4(:,3));

Xstd5=std(Matrix5(:,1));
Ystd5=std(Matrix5(:,2));
Zstd5=std(Matrix5(:,3));

%Skewness
Xskewness1=skewness(Matrix1(:,1));
Yskewness1=skewness(Matrix1(:,2));
Zskewness1=skewness(Matrix1(:,3));

Xskewness2=skewness(Matrix2(:,1));
Yskewness2=skewness(Matrix2(:,2));
Zskewness2=skewness(Matrix2(:,3));

Xskewness3=skewness(Matrix3(:,1));
Yskewness3=skewness(Matrix3(:,2));
Zskewness3=skewness(Matrix3(:,3));

Xskewness4=skewness(Matrix4(:,1));
Yskewness4=skewness(Matrix4(:,2));
Zskewness4=skewness(Matrix4(:,3));

Xskewness5=skewness(Matrix5(:,1));
Yskewness5=skewness(Matrix5(:,2));
Zskewness5=skewness(Matrix5(:,3));
```

```
%Kyrtosis
Xkurtosis1=kurtosis(Matrix1(:,1));
Ykurtosis1=kurtosis(Matrix1(:,2));
Zkurtosis1=kurtosis(Matrix1(:,3));

Xkurtosis2=kurtosis(Matrix2(:,1));
Ykurtosis2=kurtosis(Matrix2(:,2));
Zkurtosis2=kurtosis(Matrix2(:,3));

Xkurtosis3=kurtosis(Matrix3(:,1));
Ykurtosis3=kurtosis(Matrix3(:,2));
Zkurtosis3=kurtosis(Matrix3(:,3));

Xkurtosis4=kurtosis(Matrix4(:,1));
Ykurtosis4=kurtosis(Matrix4(:,2));
Zkurtosis4=kurtosis(Matrix4(:,3));

Xkurtosis5=kurtosis(Matrix5(:,1));
Ykurtosis5=kurtosis(Matrix5(:,2));
Zkurtosis5=kurtosis(Matrix5(:,3));

%Min
Xmin1=min(Matrix1(:,1));
Ymin1=min(Matrix1(:,2));
Zmin1=min(Matrix1(:,3));

Xmin2=min(Matrix2(:,1));
Ymin2=min(Matrix2(:,2));
Zmin2=min(Matrix2(:,3));

Xmin3=min(Matrix3(:,1));
Ymin3=min(Matrix3(:,2));
Zmin3=min(Matrix3(:,3));

Xmin4=min(Matrix4(:,1));
Ymin4=min(Matrix4(:,2));
Zmin4=min(Matrix4(:,3));

Xmin5=min(Matrix5(:,1));
Ymin5=min(Matrix5(:,2));
Zmin5=min(Matrix5(:,3));

%Max
Xmax1=max(Matrix1(:,1));
Ymax1=max(Matrix1(:,2));
Zmax1=max(Matrix1(:,3));

Xmax2=max(Matrix2(:,1));
Ymax2=max(Matrix2(:,2));
Zmax2=max(Matrix2(:,3));

Xmax3=max(Matrix3(:,1));
```

```
Ymax3=max(Matrix3(:,2));
Zmax3=max(Matrix3(:,3));

Xmax4=max(Matrix4(:,1));
Ymax4=max(Matrix4(:,2));
Zmax4=max(Matrix4(:,3));

Xmax5=max(Matrix5(:,1));
Ymax5=max(Matrix5(:,2));
Zmax5=max(Matrix5(:,3));

%Fast Fourier Transform
Xfft1=fft(Matrix1(:,1));
Yfft1=fft(Matrix1(:,2));
Zfft1=fft(Matrix1(:,3));

Xfft2=fft(Matrix2(:,1));
Yfft2=fft(Matrix2(:,2));
Zfft2=fft(Matrix2(:,3));

Xfft3=fft(Matrix3(:,1));
Yfft3=fft(Matrix3(:,2));
Zfft3=fft(Matrix3(:,3));

Xfft4=fft(Matrix4(:,1));
Yfft4=fft(Matrix4(:,2));
Zfft4=fft(Matrix4(:,3));

Xfft5=fft(Matrix5(:,1));
Yfft5=fft(Matrix5(:,2));
Zfft5=fft(Matrix5(:,3));

%Real Part
Xfft1Real=real(Xfft1);
Yfft1Real=real(Yfft1);
Zfft1Real=real(Zfft1);

Xfft2Real=real(Xfft2);
Yfft2Real=real(Yfft2);
Zfft2Real=real(Zfft2);

Xfft3Real=real(Xfft3);
Yfft3Real=real(Yfft3);
Zfft3Real=real(Zfft3);

Xfft4Real=real(Xfft4);
Yfft4Real=real(Yfft4);
Zfft4Real=real(Zfft4);

Xfft5Real=real(Xfft5);
Yfft5Real=real(Yfft5);
Zfft5Real=real(Zfft5);
```

```
%fftCoefficientSum
XfftCoeffSum1=sum(Xfft1Real);
YfftCoeffSum1=sum(Yfft1Real);
ZfftCoeffSum1=sum(Zfft1Real);

XfftCoeffSum2=sum(Xfft2Real);
YfftCoeffSum2=sum(Yfft2Real);
ZfftCoeffSum2=sum(Zfft2Real);

XfftCoeffSum3=sum(Xfft3Real);
YfftCoeffSum3=sum(Yfft3Real);
ZfftCoeffSum3=sum(Zfft3Real);

XfftCoeffSum4=sum(Xfft4Real);
YfftCoeffSum4=sum(Yfft4Real);
ZfftCoeffSum4=sum(Zfft4Real);

XfftCoeffSum5=sum(Xfft5Real);
YfftCoeffSum5=sum(Yfft5Real);
ZfftCoeffSum5=sum(Zfft5Real);

%fftMaxCoefficient
XfftMaxCoeff1=max(Xfft1Real);
YfftMaxCoeff1=max(Yfft1Real);
ZfftMaxCoeff1=max(Zfft1Real);

XfftMaxCoeff2=max(Xfft2Real);
YfftMaxCoeff2=max(Yfft2Real);
ZfftMaxCoeff2=max(Zfft2Real);

XfftMaxCoeff3=max(Xfft3Real);
YfftMaxCoeff3=max(Yfft3Real);
ZfftMaxCoeff3=max(Zfft3Real);

XfftMaxCoeff4=max(Xfft4Real);
YfftMaxCoeff4=max(Yfft4Real);
ZfftMaxCoeff4=max(Zfft4Real);

XfftMaxCoeff5=max(Xfft5Real);
YfftMaxCoeff5=max(Yfft5Real);
ZfftMaxCoeff5=max(Zfft5Real);


 Mean(i,:)=[Xmean1 Ymean1 Zmean1 Xmean2 Ymean2 Zmean2 Xmean3 Ymean3
Zmean3 Xmean4 Ymean4 Zmean4 Xmean5 Ymean5 Zmean5];

 Median(i,:)=[Xmedian1 Ymedian1 Zmedian1 Xmedian2 Ymedian2 Zmedian2
Xmedian3 Ymedian3 Zmedian3 Xmedian4 Ymedian4 Zmedian4 Xmedian5 Ymedian5
Zmedian5];

 Std(i,:)=[Xstd1 Ystd1 Zstd1 Xstd2 Ystd2 Zstd2 Xstd3 Ystd3 Zstd3 Xstd4
Ystd4 Zstd4 Xstd5 Ystd5 Zstd5];
```

```
 Skewness(i,:)=[Xskewness1 Yskewness1 Zskewness1 Xskewness2 Yskewness2
Zskewness2 Xskewness3 Yskewness3 Zskewness3 Xskewness4 Yskewness4
Zskewness4 Xskewness5 Yskewness5 Zskewness5];

 Kurtosis(i,:)=[Xkurtosis1 Ykurtosis1 Zkurtosis1 Xkurtosis2 Ykurtosis2
Zkurtosis2 Xkurtosis3 Ykurtosis3 Zkurtosis3 Xkurtosis4 Ykurtosis4
Zkurtosis4 Xkurtosis5 Ykurtosis5 Zkurtosis5];

 Min(i,:)=[Xmin1 Ymin1 Zmin1 Xmin2 Ymin2 Zmin2 Xmin3 Ymin3 Zmin3 Xmin4
Ymin4 Zmin4 Xmin5 Ymin5 Zmin5];

 Max(i,:)=[Xmax1 Ymax1 Zmax1 Xmax2 Ymax2 Zmax2 Xmax3 Ymax3 Zmax3 Xmax4
Ymax4 Zmax4 Xmax5 Ymax5 Zmax5];

 fftCoefficientSum(i,:)=[XfftCoeffSum1 YfftCoeffSum1 ZfftCoeffSum1
XfftCoeffSum2 YfftCoeffSum2 ZfftCoeffSum2 XfftCoeffSum3 YfftCoeffSum3
ZfftCoeffSum3 XfftCoeffSum4 YfftCoeffSum4 ZfftCoeffSum4 XfftCoeffSum5
YfftCoeffSum5 ZfftCoeffSum5];

 fftMaximumCoefficient(i,:)=[XfftMaxCoeff1 YfftMaxCoeff1 ZfftMaxCoeff1
XfftMaxCoeff2 YfftMaxCoeff2 ZfftMaxCoeff2 XfftMaxCoeff3 YfftMaxCoeff3
ZfftMaxCoeff3 XfftMaxCoeff4 YfftMaxCoeff4 ZfftMaxCoeff4 XfftMaxCoeff5
YfftMaxCoeff5 ZfftMaxCoeff5];

 MatrixOfFeaturesLongPasses(i,:)=[Mean(i,:) Median(i,:) Std(i,:)
Skewness(i,:) Kurtosis(i,:) Min(i,:) Max(i,:) fftCoefficientSum(i,:)
fftMaximumCoefficient(i,:)];



end



G=[5];
[x,~]=size(MatrixOfFeaturesLongPasses);
for i=1:x-1
G=[G 5];
end

G=G';
MatrixOfFeaturesLongPasses=[MatrixOfFeaturesLongPasses G];


MatrixOfFeaturesLongPasses=array2table(MatrixOfFeaturesLongPasses,
'VariableNames',{'Xmean1','Ymean1','Zmean1','Xmean2','Ymean2','Zmean2',
'Xmean3','Ymean3','Zmean3','Xmean4','Ymean4','Zmean4','Xmean5','Ymean5'
,'Zmean5','Xmedian1','Ymedian1','Zmedian1','Xmedian2','Ymedian2','Zmedi
an2','Xmedian3','Ymedian3','Zmedian3','Xmedian4','Ymedian4','Zmedian4',
'Xmedian5','Ymedian5','Zmedian5','Xstd1','Ystd1','Zstd1','Xstd2','Ystd2
','Zstd2','Xstd3','Ystd3','Zstd3','Xstd4','Ystd4','Zstd4','Xstd5','Ystd
5','Zstd5','Xskewness1','Yskewness1','Zskewness1','Xskewness2','Yskewne
ss2','Zskewness2','Xskewness3','Yskewness3','Zskewness3','Xskewness4','
```

```
Yskewness4','Zskewness4','Xskewness5','Yskewness5','Zskewness5','Xkurto
sis1','Ykurtosis1','Zkurtosis1','Xkurtosis2','Ykurtosis2','Zkurtosis2',
'Xkurtosis3','Ykurtosis3','Zkurtosis3','Xkurtosis4','Ykurtosis4','Zkurt
osis4','Xkurtosis5','Ykurtosis5','Zkurtosis5','Xmin1','Ymin1','Zmin1','
Xmin2','Ymin2','Zmin2','Xmin3','Ymin3','Zmin3','Xmin4','Ymin4','Zmin4',
'Xmin5','Ymin5','Zmin5','Xmax1','Ymax1','Zmax1','Xmax2','Ymax2','Zmax2'
,'Xmax3','Ymax3','Zmax3','Xmax4','Ymax4','Zmax4','Xmax5','Ymax5','Zmax5
','XfftCoeffSum1','YfftCoeffSum1','ZfftCoeffSum1','XfftCoeffSum2','Yfft
CoeffSum2','ZfftCoeffSum2','XfftCoeffSum3','YfftCoeffSum3','ZfftCoeffSu
m3','XfftCoeffSum4','YfftCoeffSum4','ZfftCoeffSum4','XfftCoeffSum5','Yf
ftCoeffSum5','ZfftCoeffSum5','XfftMaxCoeff1','YfftMaxCoeff1','ZfftMaxCo
eff1','XfftMaxCoeff2','YfftMaxCoeff2','ZfftMaxCoeff2','XfftMaxCoeff3','
YfftMaxCoeff3','ZfftMaxCoeff3','XfftMaxCoeff4','YfftMaxCoeff4','ZfftMax
Coeff4','XfftMaxCoeff5','YfftMaxCoeff5','ZfftMaxCoeff5','Activity'});

%% Runs

SegmentedTrials=["PP01runtrial1","PP01runtrial21","PP01runtrial40","PP0
1runtrial41","PP02runtrial21","PP02runtrial42","PP02runtrial61","PP02ru
ntrial62","PP03runtrial1","PP03runtrial23","PP03runtrial45","PP03runtri
al68","PP04runtrial3","PP04runtrial23","PP04runtrial44","PP04runtrial67
","PP05runtrial1","PP05runtrial21","PP05runtrial44","PP05runtrial65","P
P06runtrial20","PP06runtrial45","PP06runtrial65","PP06runtrial67","PP07
runtrial22","PP07runtrial74","PP07runtrial75","PP09runtrial5","PP09runt
rial6","PP09runtrial7","PP09runtrial29","PP10runtrial4","PP10runtrial22
","PP10runtrial62","PP10runtrial63","PP11runtrial3","PP11runtrial20","P
P11runtrial38","PP11runtrial60","PP12runtrial41"];


%Number of features per statistic
NumStat=15
%TotalNumOfActivities
NumOfActivitiesClass=40;

%TotalNumOfStats

TotalNumOfStats=135;
MatrixOfFeaturesRuns=zeros(NumOfActivitiesClass,TotalNumOfStats);


Mean=zeros(NumOfActivitiesClass,NumStat);
Median=zeros(NumOfActivitiesClass,NumStat);
Std=zeros(NumOfActivitiesClass,NumStat);
Skewness=zeros(NumOfActivitiesClass,NumStat);
Kurtosis=zeros(NumOfActivitiesClass,NumStat);
Min=zeros(NumOfActivitiesClass,NumStat);
Max=zeros(NumOfActivitiesClass,NumStat);
fftCoefficientSum=zeros(NumOfActivitiesClass,NumStat);
fftMaximumCoefficient=zeros(NumOfActivitiesClass,NumStat);


for i=1:length(SegmentedTrials)
```

```
    load(SegmentedTrials(i))
    Matrix1 =leftShank.gyroCal;
    Matrix2=leftThigh.gyroCal;
    Matrix3=pelvis.gyroCal;
    Matrix4=rightShank.gyroCal;
    Matrix5=rightThigh.gyroCal;
    %Means
Xmean1=mean(Matrix1(:,1));
Ymean1=mean(Matrix1(:,2));
Zmean1=mean(Matrix1(:,3));

Xmean2=mean(Matrix2(:,1));
Ymean2=mean(Matrix2(:,2));
Zmean2=mean(Matrix2(:,3));

Xmean3=mean(Matrix3(:,1));
Ymean3=mean(Matrix3(:,2));
Zmean3=mean(Matrix3(:,3));

Xmean4=mean(Matrix4(:,1));
Ymean4=mean(Matrix4(:,2));
Zmean4=mean(Matrix4(:,3));

Xmean5=mean(Matrix5(:,1));
Ymean5=mean(Matrix5(:,2));
Zmean5=mean(Matrix5(:,3));

%Median
Xmedian1=median(Matrix1(:,1));
Ymedian1=median(Matrix1(:,2));
Zmedian1=median(Matrix1(:,3));

Xmedian2=median(Matrix2(:,1));
Ymedian2=median(Matrix2(:,2));
Zmedian2=median(Matrix2(:,3));

Xmedian3=median(Matrix3(:,1));
Ymedian3=median(Matrix3(:,2));
Zmedian3=median(Matrix3(:,3));

Xmedian4=median(Matrix4(:,1));
Ymedian4=median(Matrix4(:,2));
Zmedian4=median(Matrix4(:,3));

Xmedian5=median(Matrix5(:,1));
Ymedian5=median(Matrix5(:,2));
Zmedian5=median(Matrix5(:,3));

%Std
Xstd1=std(Matrix1(:,1));
Ystd1=std(Matrix1(:,2));
Zstd1=std(Matrix1(:,3));

Xstd2=std(Matrix2(:,1));
```

```
Ystd2=std(Matrix2(:,2));
Zstd2=std(Matrix2(:,3));

Xstd3=std(Matrix3(:,1));
Ystd3=std(Matrix3(:,2));
Zstd3=std(Matrix3(:,3));

Xstd4=std(Matrix4(:,1));
Ystd4=std(Matrix4(:,2));
Zstd4=std(Matrix4(:,3));

Xstd5=std(Matrix5(:,1));
Ystd5=std(Matrix5(:,2));
Zstd5=std(Matrix5(:,3));

%Skewness
Xskewness1=skewness(Matrix1(:,1));
Yskewness1=skewness(Matrix1(:,2));
Zskewness1=skewness(Matrix1(:,3));

Xskewness2=skewness(Matrix2(:,1));
Yskewness2=skewness(Matrix2(:,2));
Zskewness2=skewness(Matrix2(:,3));

Xskewness3=skewness(Matrix3(:,1));
Yskewness3=skewness(Matrix3(:,2));
Zskewness3=skewness(Matrix3(:,3));

Xskewness4=skewness(Matrix4(:,1));
Yskewness4=skewness(Matrix4(:,2));
Zskewness4=skewness(Matrix4(:,3));

Xskewness5=skewness(Matrix5(:,1));
Yskewness5=skewness(Matrix5(:,2));
Zskewness5=skewness(Matrix5(:,3));

%Kyrtosis
Xkurtosis1=kurtosis(Matrix1(:,1));
Ykurtosis1=kurtosis(Matrix1(:,2));
Zkurtosis1=kurtosis(Matrix1(:,3));

Xkurtosis2=kurtosis(Matrix2(:,1));
Ykurtosis2=kurtosis(Matrix2(:,2));
Zkurtosis2=kurtosis(Matrix2(:,3));

Xkurtosis3=kurtosis(Matrix3(:,1));
Ykurtosis3=kurtosis(Matrix3(:,2));
Zkurtosis3=kurtosis(Matrix3(:,3));

Xkurtosis4=kurtosis(Matrix4(:,1));
Ykurtosis4=kurtosis(Matrix4(:,2));
Zkurtosis4=kurtosis(Matrix4(:,3));
```

```
Xkurtosis5=kurtosis(Matrix5(:,1));
Ykurtosis5=kurtosis(Matrix5(:,2));
Zkurtosis5=kurtosis(Matrix5(:,3));

%Min
Xmin1=min(Matrix1(:,1));
Ymin1=min(Matrix1(:,2));
Zmin1=min(Matrix1(:,3));

Xmin2=min(Matrix2(:,1));
Ymin2=min(Matrix2(:,2));
Zmin2=min(Matrix2(:,3));

Xmin3=min(Matrix3(:,1));
Ymin3=min(Matrix3(:,2));
Zmin3=min(Matrix3(:,3));

Xmin4=min(Matrix4(:,1));
Ymin4=min(Matrix4(:,2));
Zmin4=min(Matrix4(:,3));

Xmin5=min(Matrix5(:,1));
Ymin5=min(Matrix5(:,2));
Zmin5=min(Matrix5(:,3));

%Max
Xmax1=max(Matrix1(:,1));
Ymax1=max(Matrix1(:,2));
Zmax1=max(Matrix1(:,3));

Xmax2=max(Matrix2(:,1));
Ymax2=max(Matrix2(:,2));
Zmax2=max(Matrix2(:,3));

Xmax3=max(Matrix3(:,1));
Ymax3=max(Matrix3(:,2));
Zmax3=max(Matrix3(:,3));

Xmax4=max(Matrix4(:,1));
Ymax4=max(Matrix4(:,2));
Zmax4=max(Matrix4(:,3));

Xmax5=max(Matrix5(:,1));
Ymax5=max(Matrix5(:,2));
Zmax5=max(Matrix5(:,3));

%Fast Fourier Transform
Xfft1=fft(Matrix1(:,1));
Yfft1=fft(Matrix1(:,2));
Zfft1=fft(Matrix1(:,3));

Xfft2=fft(Matrix2(:,1));
Yfft2=fft(Matrix2(:,2));
Zfft2=fft(Matrix2(:,3));
```

```
Xfft3=fft(Matrix3(:,1));
Yfft3=fft(Matrix3(:,2));
Zfft3=fft(Matrix3(:,3));

Xfft4=fft(Matrix4(:,1));
Yfft4=fft(Matrix4(:,2));
Zfft4=fft(Matrix4(:,3));

Xfft5=fft(Matrix5(:,1));
Yfft5=fft(Matrix5(:,2));
Zfft5=fft(Matrix5(:,3));

%Real Part
Xfft1Real=real(Xfft1);
Yfft1Real=real(Yfft1);
Zfft1Real=real(Zfft1);

Xfft2Real=real(Xfft2);
Yfft2Real=real(Yfft2);
Zfft2Real=real(Zfft2);

Xfft3Real=real(Xfft3);
Yfft3Real=real(Yfft3);
Zfft3Real=real(Zfft3);

Xfft4Real=real(Xfft4);
Yfft4Real=real(Yfft4);
Zfft4Real=real(Zfft4);

Xfft5Real=real(Xfft5);
Yfft5Real=real(Yfft5);
Zfft5Real=real(Zfft5);

%fftCoefficientSum
XfftCoeffSum1=sum(Xfft1Real);
YfftCoeffSum1=sum(Yfft1Real);
ZfftCoeffSum1=sum(Zfft1Real);

XfftCoeffSum2=sum(Xfft2Real);
YfftCoeffSum2=sum(Yfft2Real);
ZfftCoeffSum2=sum(Zfft2Real);

XfftCoeffSum3=sum(Xfft3Real);
YfftCoeffSum3=sum(Yfft3Real);
ZfftCoeffSum3=sum(Zfft3Real);

XfftCoeffSum4=sum(Xfft4Real);
YfftCoeffSum4=sum(Yfft4Real);
ZfftCoeffSum4=sum(Zfft4Real);

XfftCoeffSum5=sum(Xfft5Real);
YfftCoeffSum5=sum(Yfft5Real);
```

```
ZfftCoeffSum5=sum(Zfft5Real);

%fftMaxCoefficient
XfftMaxCoeff1=max(Xfft1Real);
YfftMaxCoeff1=max(Yfft1Real);
ZfftMaxCoeff1=max(Zfft1Real);

XfftMaxCoeff2=max(Xfft2Real);
YfftMaxCoeff2=max(Yfft2Real);
ZfftMaxCoeff2=max(Zfft2Real);

XfftMaxCoeff3=max(Xfft3Real);
YfftMaxCoeff3=max(Yfft3Real);
ZfftMaxCoeff3=max(Zfft3Real);

XfftMaxCoeff4=max(Xfft4Real);
YfftMaxCoeff4=max(Yfft4Real);
ZfftMaxCoeff4=max(Zfft4Real);

XfftMaxCoeff5=max(Xfft5Real);
YfftMaxCoeff5=max(Yfft5Real);
ZfftMaxCoeff5=max(Zfft5Real);


 Mean(i,:)=[Xmean1 Ymean1 Zmean1 Xmean2 Ymean2 Zmean2 Xmean3 Ymean3
Zmean3 Xmean4 Ymean4 Zmean4 Xmean5 Ymean5 Zmean5];

 Median(i,:)=[Xmedian1 Ymedian1 Zmedian1 Xmedian2 Ymedian2 Zmedian2
Xmedian3 Ymedian3 Zmedian3 Xmedian4 Ymedian4 Zmedian4 Xmedian5 Ymedian5
Zmedian5];

 Std(i,:)=[Xstd1 Ystd1 Zstd1 Xstd2 Ystd2 Zstd2 Xstd3 Ystd3 Zstd3 Xstd4
Ystd4 Zstd4 Xstd5 Ystd5 Zstd5];

 Skewness(i,:)=[Xskewness1 Yskewness1 Zskewness1 Xskewness2 Yskewness2
Zskewness2 Xskewness3 Yskewness3 Zskewness3 Xskewness4 Yskewness4
Zskewness4 Xskewness5 Yskewness5 Zskewness5];

 Kurtosis(i,:)=[Xkurtosis1 Ykurtosis1 Zkurtosis1 Xkurtosis2 Ykurtosis2
Zkurtosis2 Xkurtosis3 Ykurtosis3 Zkurtosis3 Xkurtosis4 Ykurtosis4
Zkurtosis4 Xkurtosis5 Ykurtosis5 Zkurtosis5];

 Min(i,:)=[Xmin1 Ymin1 Zmin1 Xmin2 Ymin2 Zmin2 Xmin3 Ymin3 Zmin3 Xmin4
Ymin4 Zmin4 Xmin5 Ymin5 Zmin5];

 Max(i,:)=[Xmax1 Ymax1 Zmax1 Xmax2 Ymax2 Zmax2 Xmax3 Ymax3 Zmax3 Xmax4
Ymax4 Zmax4 Xmax5 Ymax5 Zmax5];

 fftCoefficientSum(i,:)=[XfftCoeffSum1 YfftCoeffSum1 ZfftCoeffSum1
XfftCoeffSum2 YfftCoeffSum2 ZfftCoeffSum2 XfftCoeffSum3 YfftCoeffSum3
ZfftCoeffSum3 XfftCoeffSum4 YfftCoeffSum4 ZfftCoeffSum4 XfftCoeffSum5
YfftCoeffSum5 ZfftCoeffSum5];
```

```
 fftMaximumCoefficient(i,:)=[XfftMaxCoeff1 YfftMaxCoeff1 ZfftMaxCoeff1
XfftMaxCoeff2 YfftMaxCoeff2 ZfftMaxCoeff2 XfftMaxCoeff3 YfftMaxCoeff3
ZfftMaxCoeff3 XfftMaxCoeff4 YfftMaxCoeff4 ZfftMaxCoeff4 XfftMaxCoeff5
YfftMaxCoeff5 ZfftMaxCoeff5];

 MatrixOfFeaturesRuns(i,:)=[Mean(i,:) Median(i,:) Std(i,:) Skewness(i,:)
Kurtosis(i,:) Min(i,:) Max(i,:) fftCoefficientSum(i,:)
fftMaximumCoefficient(i,:)];


end



G=[6];
[x,~]=size(MatrixOfFeaturesRuns);
for i=1:x-1
G=[G 6];
end

G=G';
MatrixOfFeaturesRuns=[MatrixOfFeaturesRuns G];


MatrixOfFeaturesRuns=array2table(MatrixOfFeaturesRuns,
'VariableNames',{'Xmean1','Ymean1','Zmean1','Xmean2','Ymean2','Zmean2',
'Xmean3','Ymean3','Zmean3','Xmean4','Ymean4','Zmean4','Xmean5','Ymean5'
,'Zmean5','Xmedian1','Ymedian1','Zmedian1','Xmedian2','Ymedian2','Zmedi
an2','Xmedian3','Ymedian3','Zmedian3','Xmedian4','Ymedian4','Zmedian4',
'Xmedian5','Ymedian5','Zmedian5','Xstd1','Ystd1','Zstd1','Xstd2','Ystd2
','Zstd2','Xstd3','Ystd3','Zstd3','Xstd4','Ystd4','Zstd4','Xstd5','Ystd
5','Zstd5','Xskewness1','Yskewness1','Zskewness1','Xskewness2','Yskewne
ss2','Zskewness2','Xskewness3','Yskewness3','Zskewness3','Xskewness4','
Yskewness4','Zskewness4','Xskewness5','Yskewness5','Zskewness5','Xkurto
sis1','Ykurtosis1','Zkurtosis1','Xkurtosis2','Ykurtosis2','Zkurtosis2',
'Xkurtosis3','Ykurtosis3','Zkurtosis3','Xkurtosis4','Ykurtosis4','Zkurt
osis4','Xkurtosis5','Ykurtosis5','Zkurtosis5','Xmin1','Ymin1','Zmin1','
Xmin2','Ymin2','Zmin2','Xmin3','Ymin3','Zmin3','Xmin4','Ymin4','Zmin4',
'Xmin5','Ymin5','Zmin5','Xmax1','Ymax1','Zmax1','Xmax2','Ymax2','Zmax2'
,'Xmax3','Ymax3','Zmax3','Xmax4','Ymax4','Zmax4','Xmax5','Ymax5','Zmax5
','XfftCoeffSum1','YfftCoeffSum1','ZfftCoeffSum1','XfftCoeffSum2','Yfft
CoeffSum2','ZfftCoeffSum2','XfftCoeffSum3','YfftCoeffSum3','ZfftCoeffSu
m3','XfftCoeffSum4','YfftCoeffSum4','ZfftCoeffSum4','XfftCoeffSum5','Yf
ftCoeffSum5','ZfftCoeffSum5','XfftMaxCoeff1','YfftMaxCoeff1','ZfftMaxCo
eff1','XfftMaxCoeff2','YfftMaxCoeff2','ZfftMaxCoeff2','XfftMaxCoeff3','
YfftMaxCoeff3','ZfftMaxCoeff3','XfftMaxCoeff4','YfftMaxCoeff4','ZfftMax
Coeff4','XfftMaxCoeff5','YfftMaxCoeff5','ZfftMaxCoeff5','Activity'});

DATAfinal=[MatrixOfFeaturesPasses; MatrixOfFeaturesShots;
MatrixOfFeaturesTurn90; MatrixOfFeaturesTurn180; MatrixOfFeaturesJumps;
MatrixOfFeaturesLongPasses; MatrixOfFeaturesRuns];
toc;
```

```
%% Sum of confusion matrices and Average Test and Train Errors

NumIterations=100;
SumOfConfMatrices=zeros(7,7);
tic;
for k=1:NumIterations

pt{k}=cvpartition(DATAfinal.Activity,"Holdout",0.3);
G=pt{k};
hdTrain{k}=DATAfinal(training(G),:);
hdTest{k}=DATAfinal(test(G),:);

%Selection of classifier

% mdl{k}=fitcnb(hdTrain{k},"Activity");
% mdl{k}=fitcknn(hdTrain{k},"Activity");
% mdl{k}=fitcecoc(hdTrain{k},"Activity");
mdl{k}=fitcdiscr(hdTrain{k},"Activity");
% mdl{k}=fitctree(hdTrain{k},"Activity");
end
toc;
tic;
for k=1:NumIterations
S=hdTest{k};
T=mdl{k};

predGroups{k}=predict(T,S);
hdTestActivity=S.Activity;

predGroups{k}=string(predGroups{k});
hdTestActivity=string(hdTestActivity);

errTrain{k}=resubLoss(T);
errTest{k}=loss(T,S);
ClassesNames = {'Passes','Shots','Turns180','Turns90','Jumps','Long
Passes','Runs'};

ClassesNames = categorical(ClassesNames);
cm{k}=confusionchart(hdTestActivity,predGroups{k});
b=cm{k};
b=b.NormalizedValues;

A{k}=b;
SumOfConfMatrices=SumOfConfMatrices+A{k};

end
toc;

SumOfConfusionMatrices=SumOfConfMatrices;

SumOfConfusionMatrices=confusionchart(SumOfConfusionMatrices);
SumOfConfusionMatrices=SumOfConfusionMatrices.NormalizedValues;
```

```
SumOfConfusionMatrices=confusionchart(SumOfConfusionMatrices,ClassesNam
es);
SumOfConfusionMatrices.Title = 'Confusion Matrix';
SumOfConfusionMatrices.ColumnSummary = 'column-normalized';

% Average Errors

AverageTestError=mean(cell2mat(errTest));
AverageTrainError=mean(cell2mat(errTrain));
```