LAMPIRAN

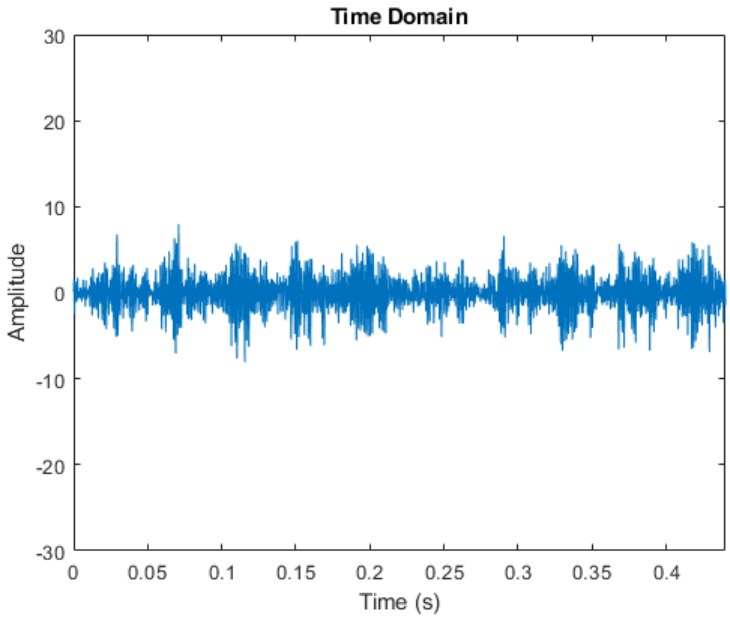
Lampiran 1. *Script* akuisisi data

```
%Script to run data acquisition using National Instrument NI 9234
%Created: Oct 2016, Berli Kamiel

clear all;
clc;
close all;


toc;

s = daq.createSession('ni');
s.DurationInSeconds = 10;
Dur = s.DurationInSeconds;
s.Rate = 17066;
%s.addAnalogInputChannel('cDAQ1Mod1', 'ai0', 'Accelerometer');
s.addAnalogInputChannel('cDAQ1Mod1', 'ai1', 'Accelerometer');
%s.addAnalogInputChannel('cDAQ1Mod1', 'ai2', 'Accelerometer');
s.addAnalogInputChannel('cDAQ1Mod1', 'ai3', 'Voltage'); %
Tachometer
% s.addAnalogInputChannel('cDAQ1Mod2', 'ai0', 'Microphone');
% s.addAnalogInputChannel('cDAQ1Mod2', 'ai1', 'Microphone');

s.Channels(1).Sensitivity = 97.60E-3; %mV/g Type 4507B
serial:11165
%s.Channels(2).Sensitivity = 97.60E-3; %mV/g Type 4507B
serial:30172
%s.Channels(3).Sensitivity = 99.56E-3; %mV/g Type 4507B
serial:10984
%s.Channels(4).Sensitivity = 94.50E-3;
%s.Channels(5).Sensitivity = 9.40E-3;  %mV/Pa Model 130B40
serial:41741
%s.Channels(6).Sensitivity = 8.60E-3;  %mV/Pa Model 130B40
serial:41842

for i=1:200

data = s.startForeground();           % start recording vibration
data
data_ch1 = data(:,1);
%data_ch2 = data(:,1);
data_ch3 = data(:,2);
%data_ch4 = data(:,2);
%data_ch5 = data(:,5);
%data_ch6 = data(:,6);

rootname = 'E:\Dokumen\TUGAS AKHIR\MATLAB\MAT File\1. NORMAL
RECORDING\';   % drive tujuan dan nama file
```

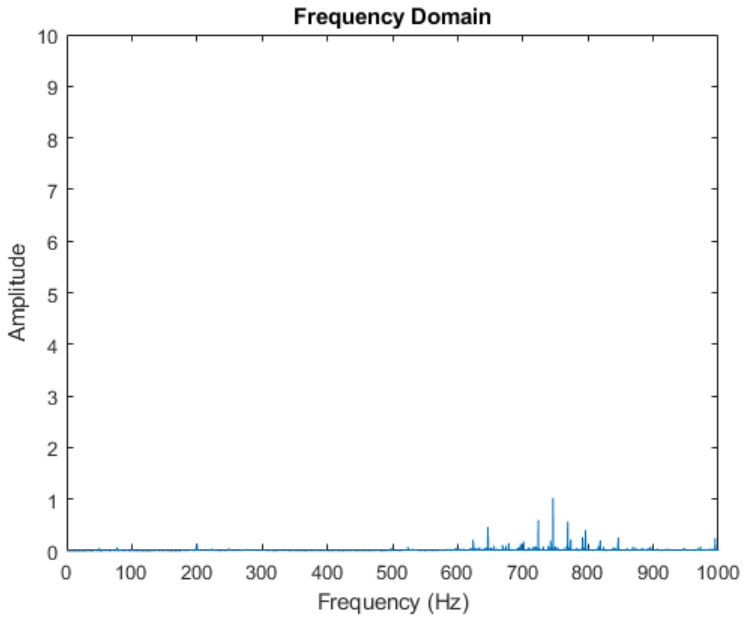
```
extension = '.mat';
% ekstension utk nama file
namafile = [rotname,'NORMAL_',num2str(s),extension];
data_all = [data_ch1 data_ch3];
eval(['save ', namafile ,' data_all']);

pause(2)
pesan = ['Acquiring and saving data at loop number: ',num2str(s)];
disp(pesan)
end

toc
```

Lampiran 2. *Script* pemrosesan kondisi normal

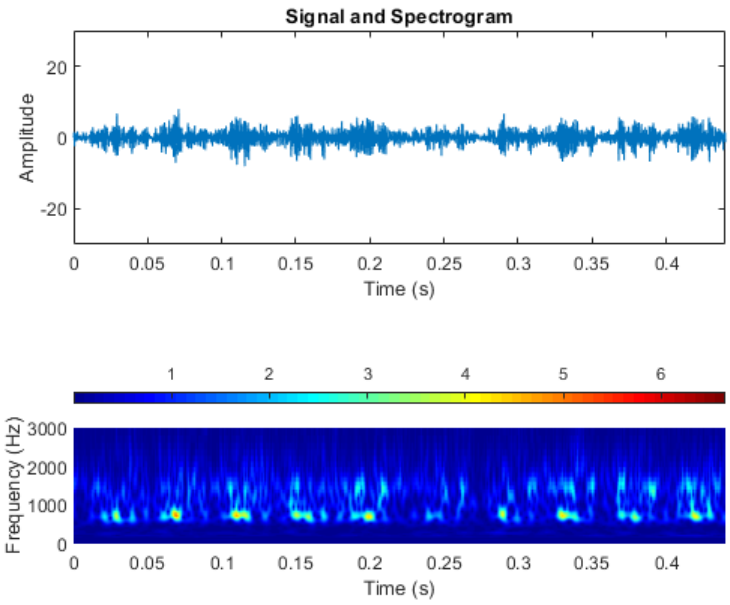
```
 % ======== Program Analisis Spektrum & CWT Roda Gigi Kondisi Normal
========

 % Dibuat Oleh : Agus Arianto

 close all;
 clear;
 clc;

 % Load File

     load('E:\Dokumen\TUGAS AKHIR\MATLAB\MAT File\1. NORMAL
RECORDING\NORMAL_79.mat');

     accel = data_all(:,1);
     tacho = data_all(:,2);

 % Parameter

     sampling_rate = 17066;
     recording_time = 10;

 % Plot Time Domain

     tma = (0:numl(accel)-1)/sampling_rate;

     figure
     plot(tma,accel)
     title('Time Domain')
     xlabel('Time (s)')
     xlim ([0 0,44])
     ylabel ('Amplitude')
     ylim ([-30 30])
```



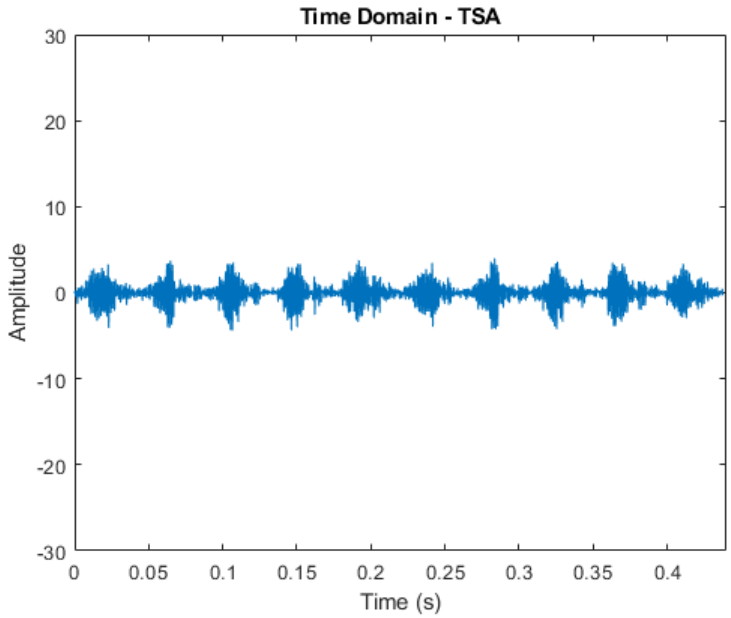

```
% Plot Frequency Domain

    L = sampling_rate*recording_time;
    NFFT = 2^nextpower2(L);
    Y = fft(accel,NFFT)/L;
    f = sampling_rate/2*linkspace(0,1,NFFT/2+1);
    A = 2*abs(Y(1:NFFT/2+1));

    figure
    plot(f,A)
    title('Frequency Domain')
    xlabel('Frequency (Hz)')
    xlim([0 1000])
    ylabel('Amplitude')
    ylim([0 10])
```



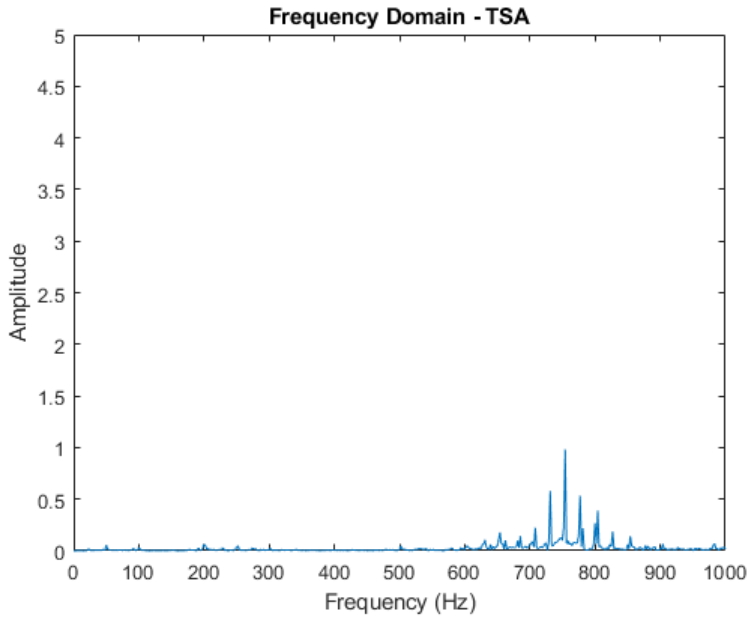

```
% Plot CWT
     [cfs,frq] = cwt(accel,sampling_rate);
     tms = (0:numl(accel)-1)/sampling_rate;


    figure
    subplot(2,1,1)
    plot(tms,accel)
    axis tight
    title('Signal and Spectrogram')
    xlabel('Time (s)')
    xlim([0 0,44])
    ylabel('Amplitude')
    ylim([-30 30])

    subplot(2,1,2)
    surface(tms,frq,abs(cfs))
    axis tight
    shading flat
    xlabel('Time (s)')
    xlim([0 0,44])
    ylabel('Frequency (Hz)')
    set(gca,'yscale','linear')
    set(gca,'ylim',[0 3000])
    set(gcf,'Colormap',jet)
    colorbar('northoutside')
```



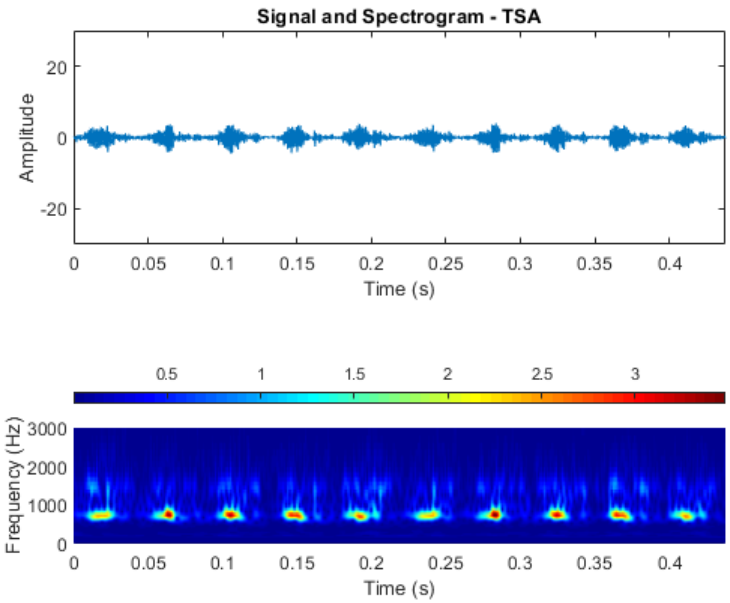

```
% Plot Spectrogram Continuous Wavelet Transform

    % --------Before Plotting, Run TSA for denoising signal-----

    % Plot Time Synchronous Averaging

        [rpm,t,tp] = tachrpm(tacho,sampling_rate);
        data_TSA = TSA(accel,sampling_rate,tp,'Numrotations',10);


    % Plot Domain Waktu Setelah TSA

        tmb = (0:numl(data_TSA)-1)/sampling_rate;

        figure
        plot (tmb,data_TSA)
        title('Time Domain - TSA');
        xlabel('Time (s)')
        xlim ([0 0,44])
        ylabel ('Amplitude')
        ylim([-30 30])
```




```
% Plot Domain Frekuensi Setelah TSA

    L2=length(data_TSA);
    NFFT2=2^nextpower2(L2);
    Y2=fft(data_TSA,NFFT2)/L2;
    f=sampling_rate/2*linkspace(0,1,NFFT2/2+1);
    A2=2*abs(Y2(1:NFFT2/2+1));

    figure
    plot(f,A2)
    title('Frequency Domain - TSA')
    xlabel('Frequency (Hz)')
    xlim([0 1000])
    ylabel('Amplitude')
    ylim([0 5])
```

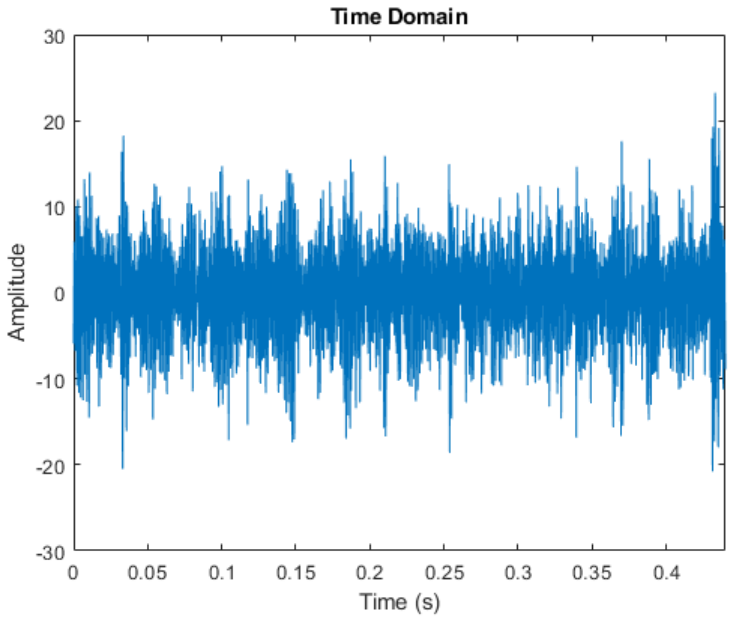



```
% Plot Signal and Spectrogram

      [cfs2,frq2] = cwt(data_TSA,sampling_rate);
      tms2 = (0:numl(data_TSA)-1)/sampling_rate;

      figure
      subplot(2,1,1)
      plot(tms2,data_TSA)
      axis tight
      title('Signal and Spectrogram - TSA')
      xlabel('Time (s)')
      ylabel('Amplitude')
      ylim([-30 30])

      subplot(2,1,2)
      surface(tms2,frq2,abs(cfs2))
      axis tight
      shading flat
      xlabel('Time (s)')
      ylabel('Frequency (Hz)')
      set(gca,'yscale','linear')
      set(gca,'ylim',[0 3000])
      set(gcf,'Colormap',jet)
      colorbar('northoutside')
```

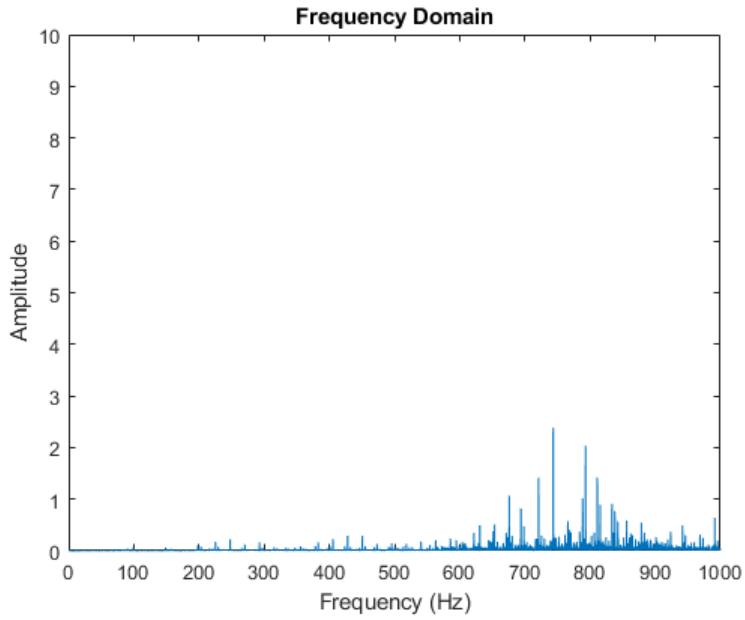

Signal and Spectrogram - TSA
Amplitude
20
0
-20
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time (s)
0.5
1
1.5
2
2.5
3
Frequency (Hz)
3000
2000
1000
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time (s)

Lampiran 3. *Script* pemrosesan kondisi cacat level 1

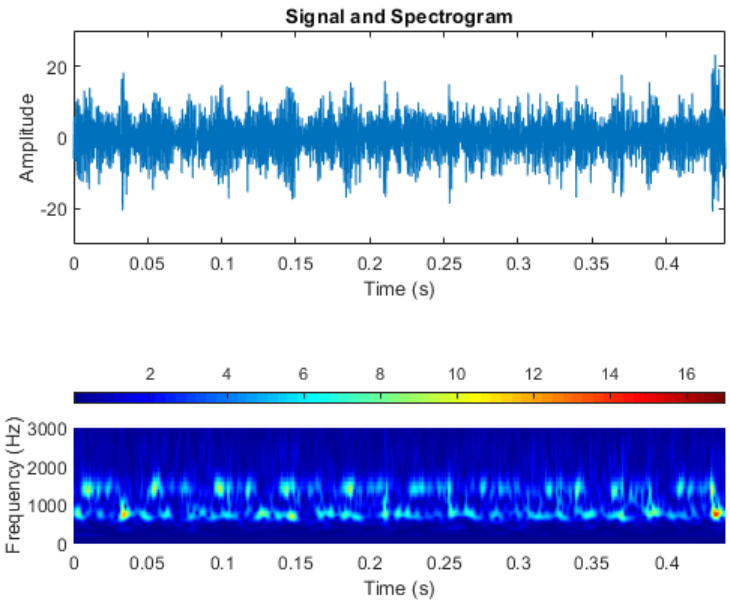
```
 % ======== Program Analisis Spektrum & CWT Roda Gigi Kondisi Cacat
Level 1 ========

 % Dibuat Oleh : Agus Arianto

 close all;
 clear;
 clc;

 % Load File

     load('E:\Dokumen\TUGAS AKHIR\MATLAB\MAT File\2. FAULT 1
RECORDING\CACAT1_96.mat');

     accel = data_all(:,1);
     tacho = data_all(:,2);

 % Parameter

     sampling_rate = 17066;
     recording_time = 10;

 % Plot Time Domain

     tma = (0:numl(accel)-1)/sampling_rate;

     figure
     plot(tma,accel)
     title('Time Domain')
     xlabel('Time (s)')
     xlim ([0 0,44])
     ylabel ('Amplitude')
     ylim ([-30 30])
```



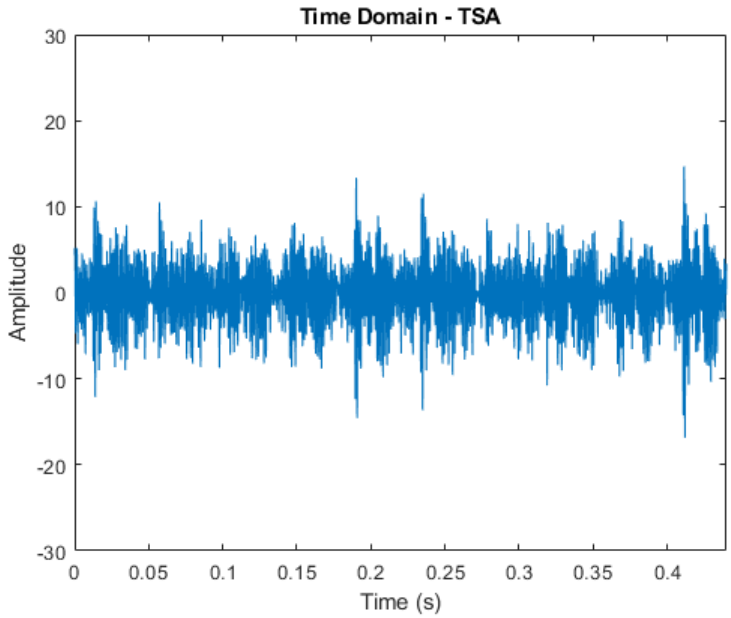

```
% Plot Frequency Domain

    L = sampling_rate*recording_time;
    NFFT = 2^nextpower2(L);
    Y = fft(accel,NFFT)/L;
    f = sampling_rate/2*linkspace(0,1,NFFT/2+1);
    A = 2*abs(Y(1:NFFT/2+1));

    figure
    plot(f,A)
    title('Frequency Domain')
    xlabel('Frequency (Hz)')
    xlim([0 1000])
    ylabel('Amplitude')
    ylim([0 10])
```



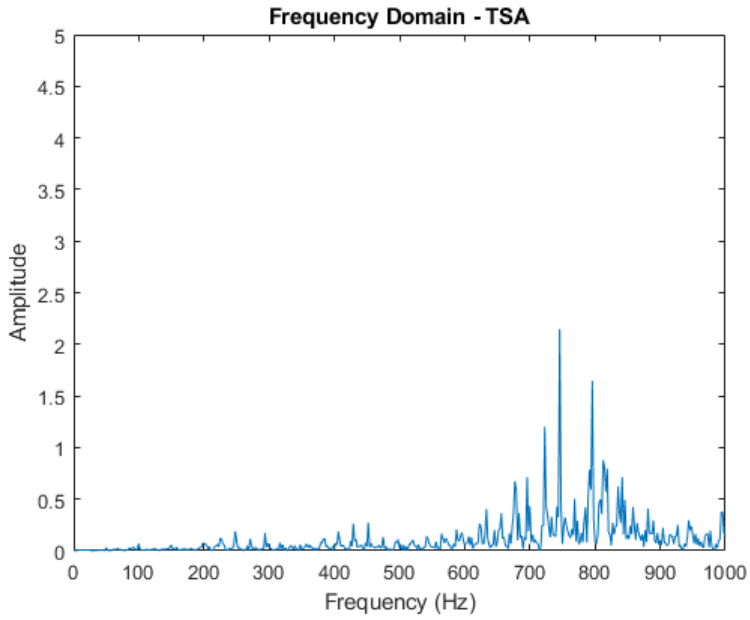

```
% Plot CWT
    [cfs,frq] = cwt(accel,sampling_rate);
    tms = (0:numl(accel)-1)/sampling_rate;

    figure
    subplot(2,1,1)
    plot(tms,accel)
    axis tight
    title('Signal and Spectrogram')
    xlabel('Time (s)')
    xlim([0 0,44])
    ylabel('Amplitude')
    ylim([-30 30])

    subplot(2,1,2)
    surface(tms,frq,abs(cfs))
    axis tight
    shading flat
    xlabel('Time (s)')
    xlim([0 0,44])
    ylabel('Frequency (Hz)')
    set(gca,'yscale','linear')
    set(gca,'ylim',[0 3000])
    set(gcf,'Colormap',jet)
    colorbar('northoutside')
```



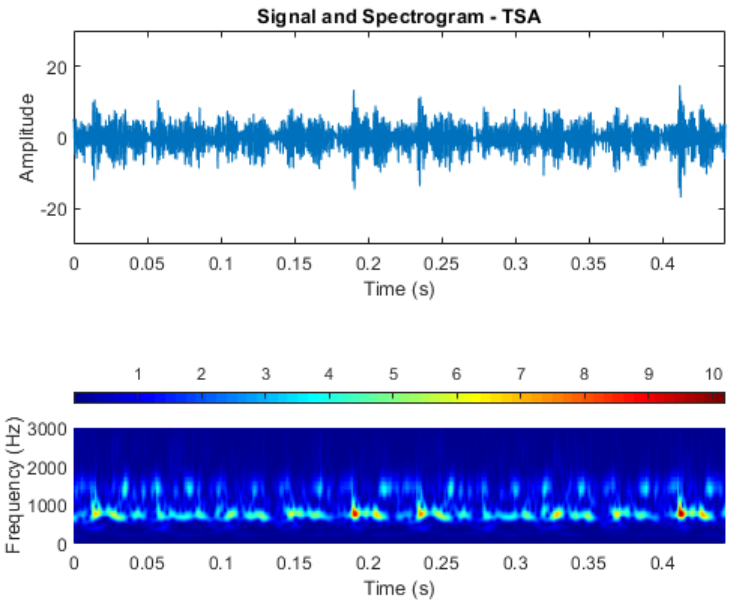

```
% Plot Spectrogram Continuous Wavelet Transform

    % --------Before Plotting, Run TSA for denoising signal-----

    % Plot Time Synchronous Averaging

        [rpm,t,tp] = tachrpm(tacho,sampling_rate);
        data_TSA = TSA(accel,sampling_rate,tp,'Numrotations',10);


    % Plot Domain Waktu Setelah TSA

        tmb = (0:numl(data_TSA)-1)/sampling_rate;

        figure
        plot (tmb,data_TSA)
        title('Time Domain - TSA');
        xlabel('Time (s)')
        xlim ([0 0,44])
        ylabel ('Amplitude')
        ylim([-30 30])
```




```
% Plot Domain Frekuensi Setelah TSA

    L2=length(data_TSA);
    NFFT2=2^nextpower2(L2);
    Y2=fft(data_TSA,NFFT2)/L2;
    f=sampling_rate/2*linkspace(0,1,NFFT2/2+1);
    A2=2*abs(Y2(1:NFFT2/2+1));

    figure
    plot(f,A2)
    title('Frequency Domain - TSA')
    xlabel('Frequency (Hz)')
    xlim([0 1000])
    ylabel('Amplitude')
    ylim([0 5])
```

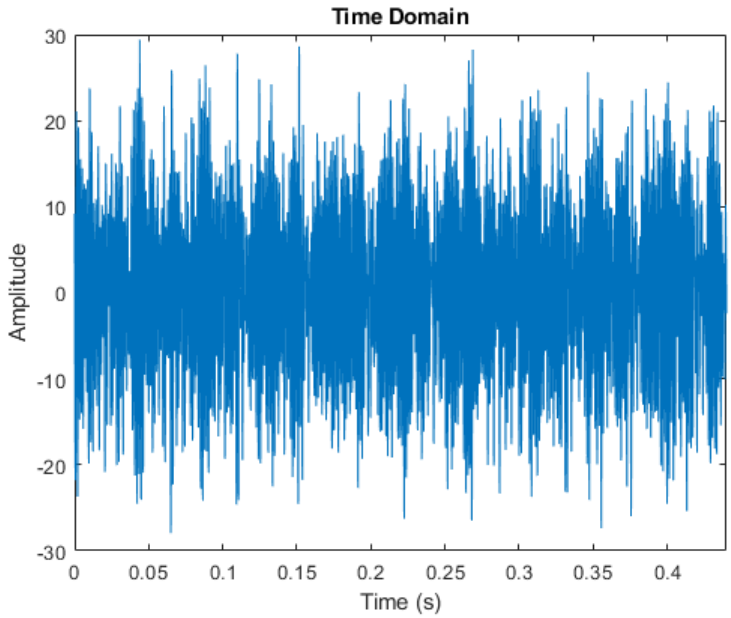



```
% Plot Signal and Spectrogram

    [cfs2,frq2] = cwt(data_TSA,sampling_rate);
    tms2 = (0:numl(data_TSA)-1)/sampling_rate;

    figure
    subplot(2,1,1)
    plot(tms2,data_TSA)
    axis tight
    title('Signal and Spectrogram - TSA')
    xlabel('Time (s)')
    ylabel('Amplitude')
    ylim([-30 30])

    subplot(2,1,2)
    surface(tms2,frq2,abs(cfs2))
    axis tight
    shading flat
    xlabel('Time (s)')
    ylabel('Frequency (Hz)')
    set(gca,'yscale','linear')
    set(gca,'ylim',[0 3000])
    set(gcf,'Colormap',jet)
    colorbar('northoutside')
```

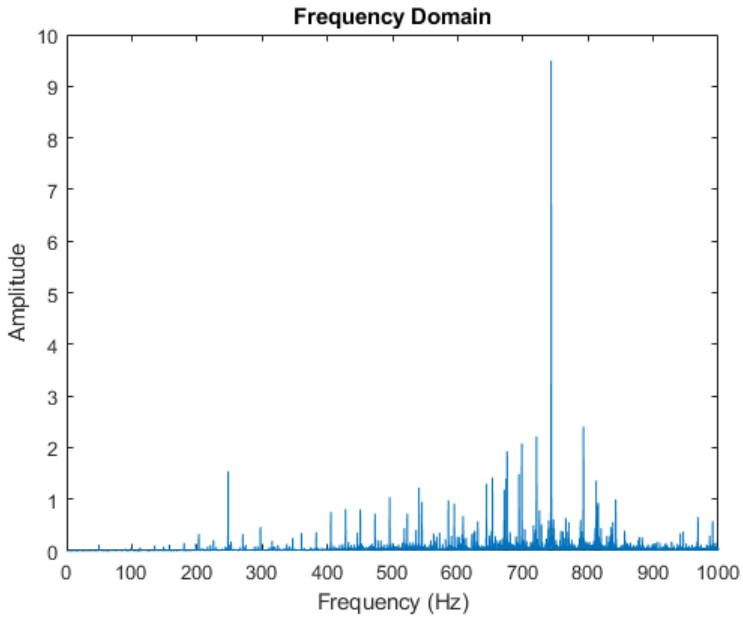

Signal and Spectrogram - TSA
Amplitude
20
0
-20
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time (s)
1
2
3
4
5
6
7
8
9
10
Frequency (Hz)
3000
2000
1000
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time (s)

Lampiran 4. *Script* pemrosesan kondisi cacat level 2

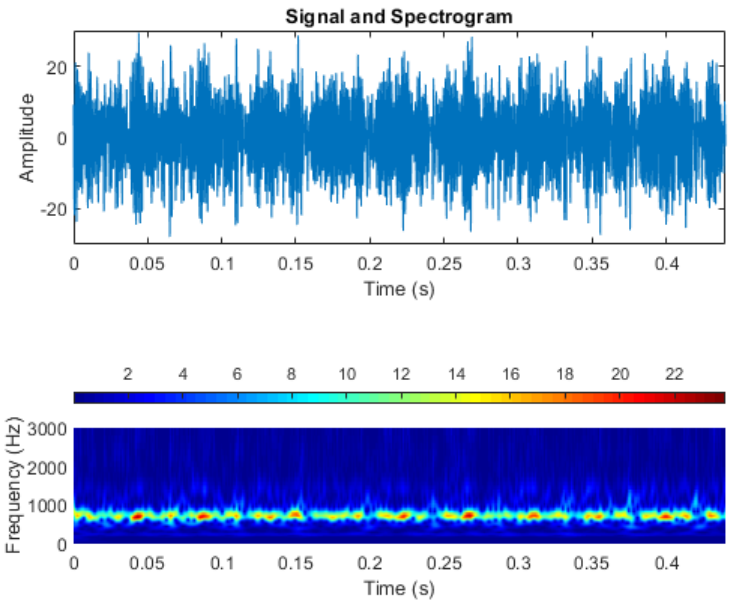
```
 % ======== Program Analisis Spektrum & CWT Roda Gigi Kondisi Cacat
Level 2 ========

 % Dibuat Oleh : Agus Arianto

 close all;
 clear;
 clc;

 % Load File

     load('E:\Dokumen\TUGAS AKHIR\MATLAB\MAT File\3. FAULT 2
RECORDING\CACAT2_56.mat');

     accel = data_all(:,1);
     tacho = data_all(:,2);

 % Parameter

     sampling_rate = 17066;
     recording_time = 10;

 % Plot Time Domain

     tma = (0:numl(accel)-1)/sampling_rate;

     figure
     plot(tma,accel)
     title('Time Domain')
     xlabel('Time (s)')
     xlim ([0 0,44])
     ylabel ('Amplitude')
     ylim ([-30 30])
```



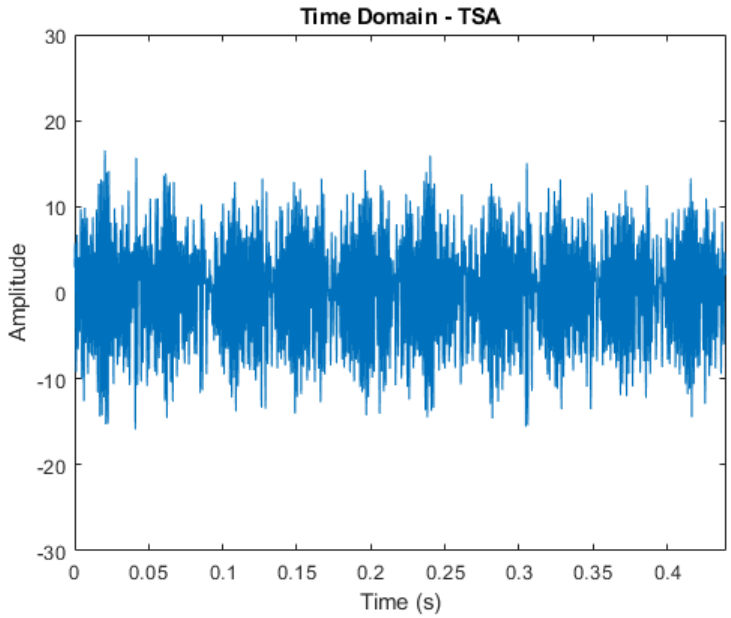

```
% Plot Frequency Domain

    L = sampling_rate*recording_time;
    NFFT = 2^nextpower2(L);
    Y = fft(accel,NFFT)/L;
    f = sampling_rate/2*linkspace(0,1,NFFT/2+1);
    A = 2*abs(Y(1:NFFT/2+1));

    figure
    plot(f,A)
    title('Frequency Domain')
    xlabel('Frequency (Hz)')
    xlim([0 1000])
    ylabel('Amplitude')
    ylim([0 10])
```



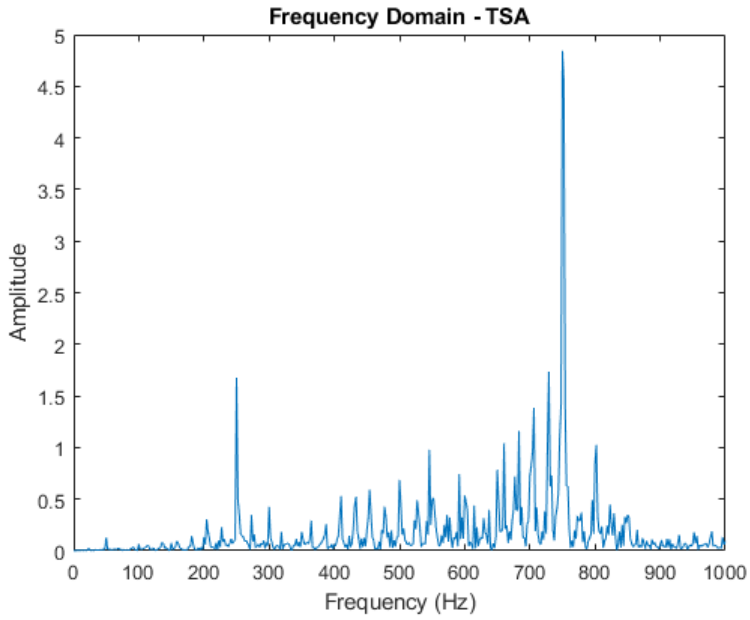

```
% Plot CWT
    [cfs,frq] = cwt(accel,sampling_rate);
    tms = (0:numl(accel)-1)/sampling_rate;

    figure
    subplot(2,1,1)
    plot(tms,accel)
    axis tight
    title('Signal and Spectrogram')
    xlabel('Time (s)')
    xlim([0 0,44])
    ylabel('Amplitude')
    ylim([-30 30])

    subplot(2,1,2)
    surface(tms,frq,abs(cfs))
    axis tight
    shading flat
    xlabel('Time (s)')
    xlim([0 0,44])
    ylabel('Frequency (Hz)')
    set(gca,'yscale','linear')
    set(gca,'ylim',[0 3000])
    set(gcf,'Colormap',jet)
    colorbar('northoutside')
```



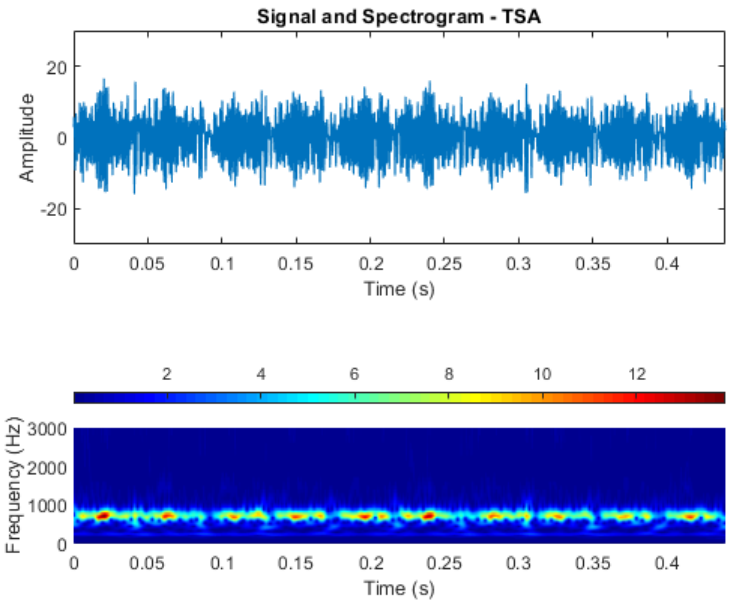

```
% Plot Spectrogram Continuous Wavelet Transform

    % --------Before Plotting, Run TSA for denoising signal-----

    % Plot Time Synchronous Averaging

        [rpm,t,tp] = tachrpm(tacho,sampling_rate);
        data_TSA = TSA(accel,sampling_rate,tp,'Numrotations',10);


    % Plot Domain Waktu Setelah TSA

        tmb = (0:numl(data_TSA)-1)/sampling_rate;

        figure
        plot (tmb,data_TSA)
        title('Time Domain - TSA');
        xlabel('Time (s)')
        xlim ([0 0,44])
        ylabel ('Amplitude')
        ylim([-30 30])
```




```
% Plot Domain Frekuensi Setelah TSA

    L2=length(data_TSA);
    NFFT2=2^nextpower2(L2);
    Y2=fft(data_TSA,NFFT2)/L2;
    f=sampling_rate/2*linkspace(0,1,NFFT2/2+1);
    A2=2*abs(Y2(1:NFFT2/2+1));

    figure
    plot(f,A2)
    title('Frequency Domain - TSA')
    xlabel('Frequency (Hz)')
    xlim([0 1000])
    ylabel('Amplitude')
    ylim([0 5])
```




```
% Plot Signal and Spectrogram

    [cfs2,frq2] = cwt(data_TSA,sampling_rate);
    tms2 = (0:numl(data_TSA)-1)/sampling_rate;

    figure
    subplot(2,1,1)
    plot(tms2,data_TSA)
    axis tight
    title('Signal and Spectrogram - TSA')
    xlabel('Time (s)')
    ylabel('Amplitude')
    ylim([-30 30])

    subplot(2,1,2)
    surface(tms2,frq2,abs(cfs2))
    axis tight
    shading flat
    xlabel('Time (s)')
    ylabel('Frequency (Hz)')
    set(gca,'yscale','linear')
    set(gca,'ylim',[0 3000])
    set(gcf,'Colormap',jet)
    colorbar('northoutside')
```


Signal and Spectrogram - TSA
Amplitude
20
0
-20
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time (s)
2
4
6
8
10
12
Frequency (Hz)
3000
2000
1000
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time (s)