**ECE3051 – Analog and Digital Signal Processing, Fall Semester 2022-2023**

**ELA DA – 4, Slot: L25-L26**

**By: Jonathan Rufus Samuel (20BCT0332) Date: 23.10.2022**

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**ELA DA 4 – DOS: 23.10.2022**

**Task - 4: ECG Signal Analysis**

**Q1) Using Abdominal and Direct Foetal ECG Database from Physionet, perform the following subtasks:**

* **Sub-Task 1 - Plot the ECG Graph**
* **Sub-Task 2 - Analyse the stationarity of the given ECG signal through appropriate waveforms**
* **Sub-Task 3 - Detect the diverse ECG abnormalities if any with respect to the given ECG signal**

**CODE:**

%Task - 4: ECG Signal Analysis

%Name: Jonathan Rufus Samuel (20BCT0332)

%Course: ECE3051 - ELA

%DOS: 23.10.2022

%Using Abdominal and Direct Fetal ECG Database from Physionet, perform the

%following subtasks:

%Sub-Task 1 - Plot the ECG Graph

data\_r1 = edfread("r01.edf","SelectedSignals","Direct\_1");

data2\_r1 = table2array(data\_r1);

data3\_r1 = vertcat(data2\_r1{:});

subplot(2,1,1);

plot(data3\_r1(1:5000));

title('Base ECG Signal - Direct1');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

fetus\_data\_r1 = edfread("r01.edf","SelectedSignals","Abdomen\_1");

fetus\_data\_r2 = table2array(fetus\_data\_r1);

fetus\_data\_r3 = vertcat(fetus\_data\_r2{:});

subplot(2,1,2);

plot(fetus\_data\_r3(1:5000));

title('Additional ECG Signal (from Fetus) - Abdomen1');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

%Sub-Task 2 - Analyse the stationarity of the given ECG signal through

% appropriate waveforms:

plot(data3\_r1(1:5000));

title('Base ECG Signal - Direct1');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

%Stationarity: A stationary time series is one whose properties do not

% depend on the time at which the series is observed. As seen above,

% waveform changes w.r.t time, over intervals 1 - 5000. Therefore,

% Stationarity property does not hold for goven signal.

%Sub-Task 3 - Detect the diverse ECG abnormalities if any with respect to

% the given ECG signal:

%Samplling of Base Signal:

samp1 = data3\_r1(1:300);

plot(samp1);

title('Sample ECG Signal - Direct1');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

%Auto-Correlation between Sample & Base Signal:

plot(autocorr(data3\_r1));

title('Auto-Correlation of Sample with Base Signal');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

%Cross-Correlation between Base Signal & Fetus Signal:

plot(xcorr(data3\_r1,fetus\_data\_r3));

title('Cross-Correlation of Sample with Base Signal');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

**OUTPUT:**

>> %Task - 4: ECG Signal Analysis

%Name: Jonathan Rufus Samuel (20BCT0332)

%Course: ECE3051 - ELA

%DOS: 23.10.2022

%Using Abdominal and Direct Fetal ECG Database from Physionet, perform the

%following subtasks:

%Sub-Task 1 - Plot the ECG Graph

data\_r1 = edfread("r01.edf","SelectedSignals","Direct\_1");

data2\_r1 = table2array(data\_r1);

data3\_r1 = vertcat(data2\_r1{:});

subplot(2,1,1);

plot(data3\_r1(1:5000));

title('Base ECG Signal - Direct1');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

fetus\_data\_r1 = edfread("r01.edf","SelectedSignals","Abdomen\_1");

fetus\_data\_r2 = table2array(fetus\_data\_r1);

fetus\_data\_r3 = vertcat(fetus\_data\_r2{:});

subplot(2,1,2);

plot(fetus\_data\_r3(1:5000));

title('Additional ECG Signal (from Fetus) - Abdomen1');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

%Sub-Task 2 - Analyse the stationarity of the given ECG signal through

% appropriate waveforms:

plot(data3\_r1(1:5000));

title('Base ECG Signal - Direct1');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

%Stationarity: A stationary time series is one whose properties do not

% depend on the time at which the series is observed. As seen above,

% waveform changes w.r.t time, over intervals 1 - 5000. Therefore,

% Stationarity property does not hold for goven signal.

%Sub-Task 3 - Detect the diverse ECG abnormalities if any with respect to

% the given ECG signal:

%Samplling of Base Signal:

samp1 = data3\_r1(1:300);

plot(samp1);

title('Sample ECG Signal - Direct1');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

%Auto-Correlation between Sample & Base Signal:

plot(autocorr(data3\_r1));

title('Auto-Correlation of Sample with Base Signal');

xlabel('time (t)');

ylabel('Magnitude (x(n))');

%Cross-Correlation between Base Signal & Fetus Signal:

plot(xcorr(data3\_r1,fetus\_data\_r3));

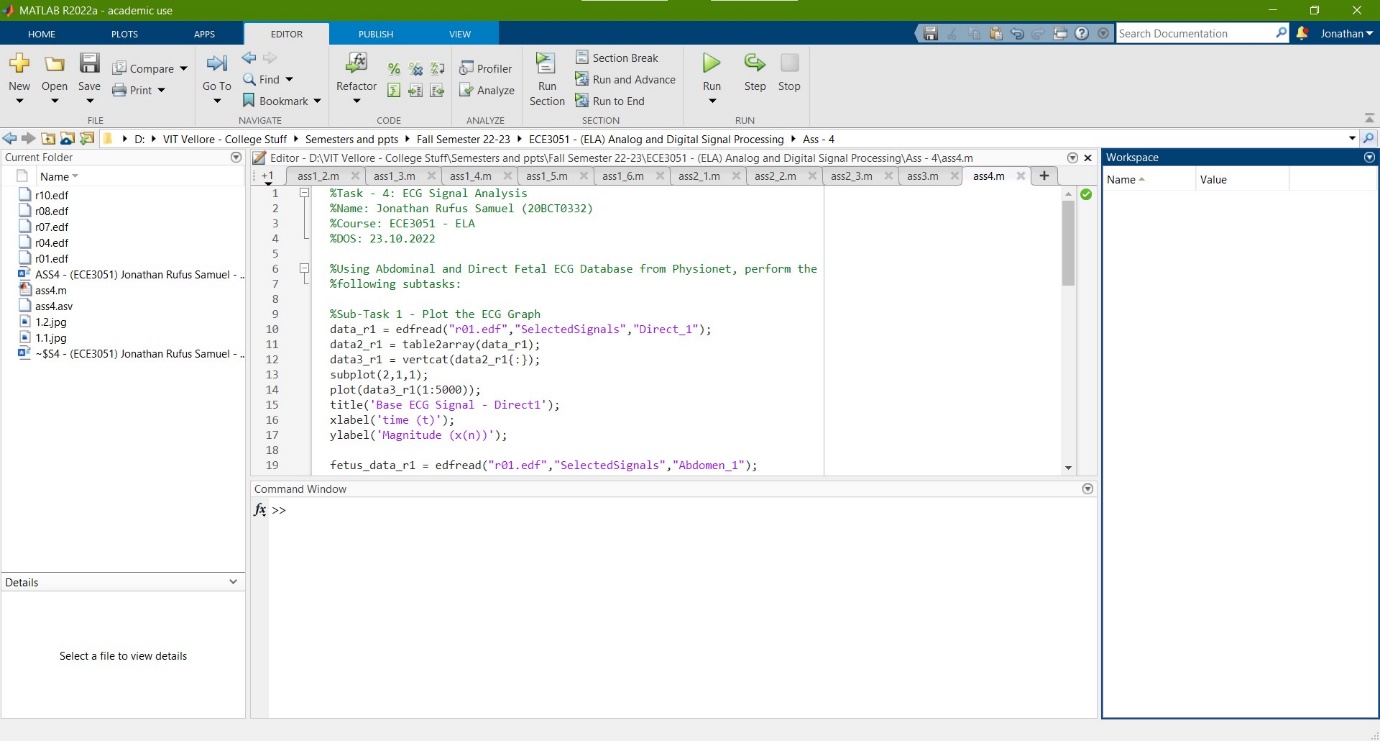
title('Cross-Correlation of Sample with Base Signal');

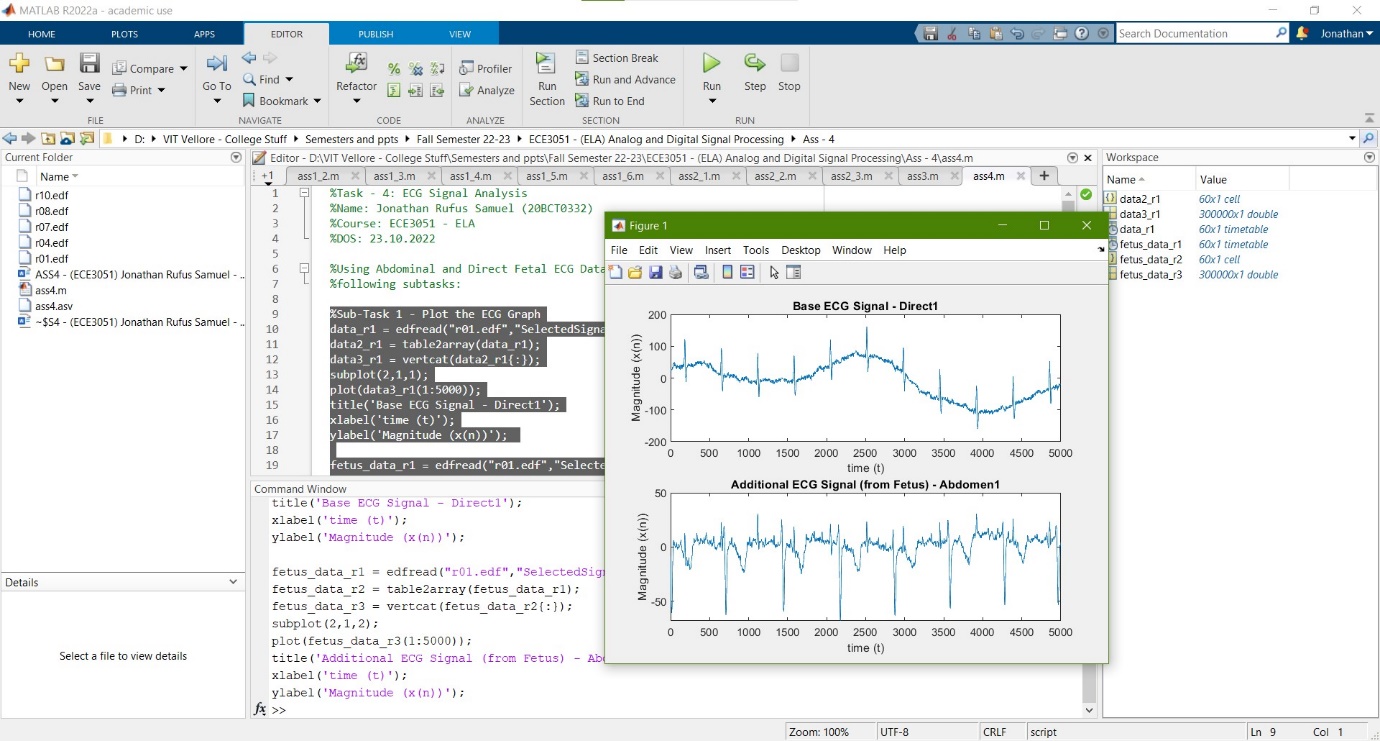
xlabel('time (t)');

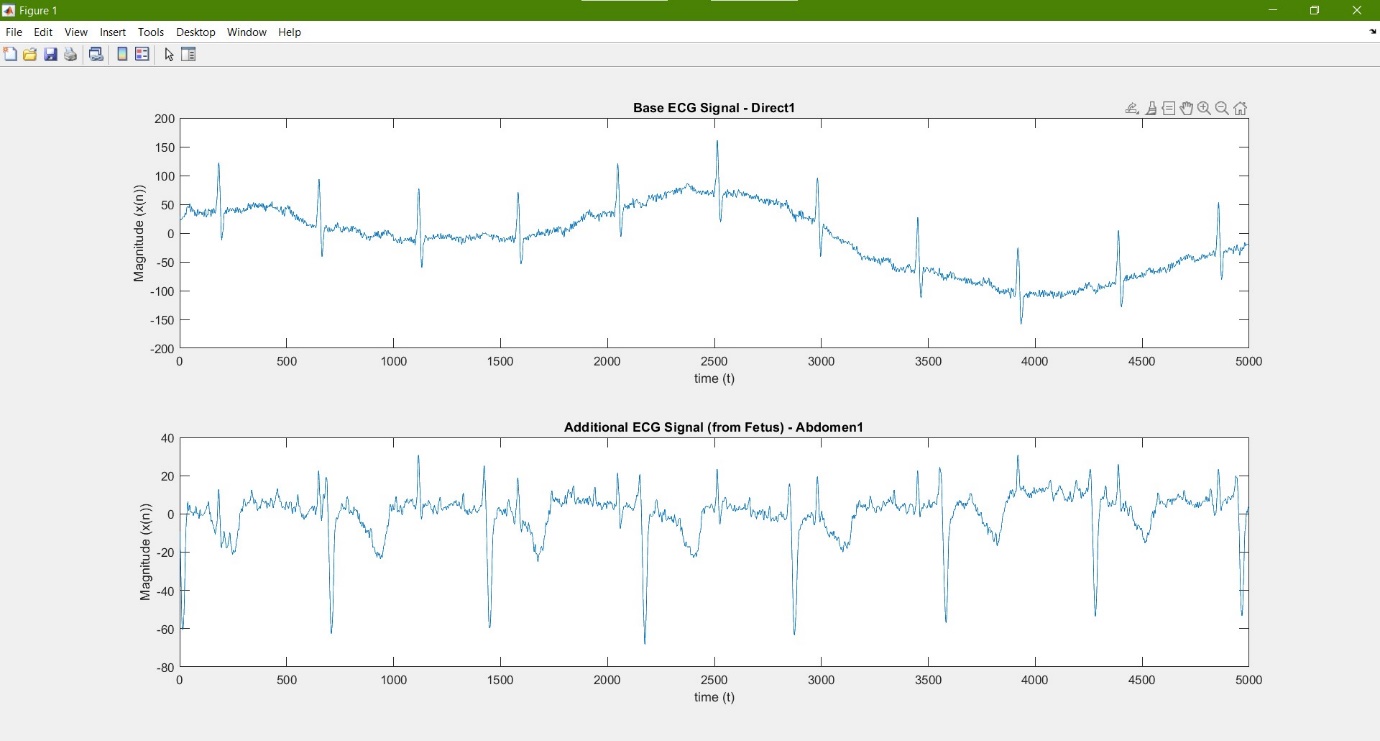
ylabel('Magnitude (x(n))');

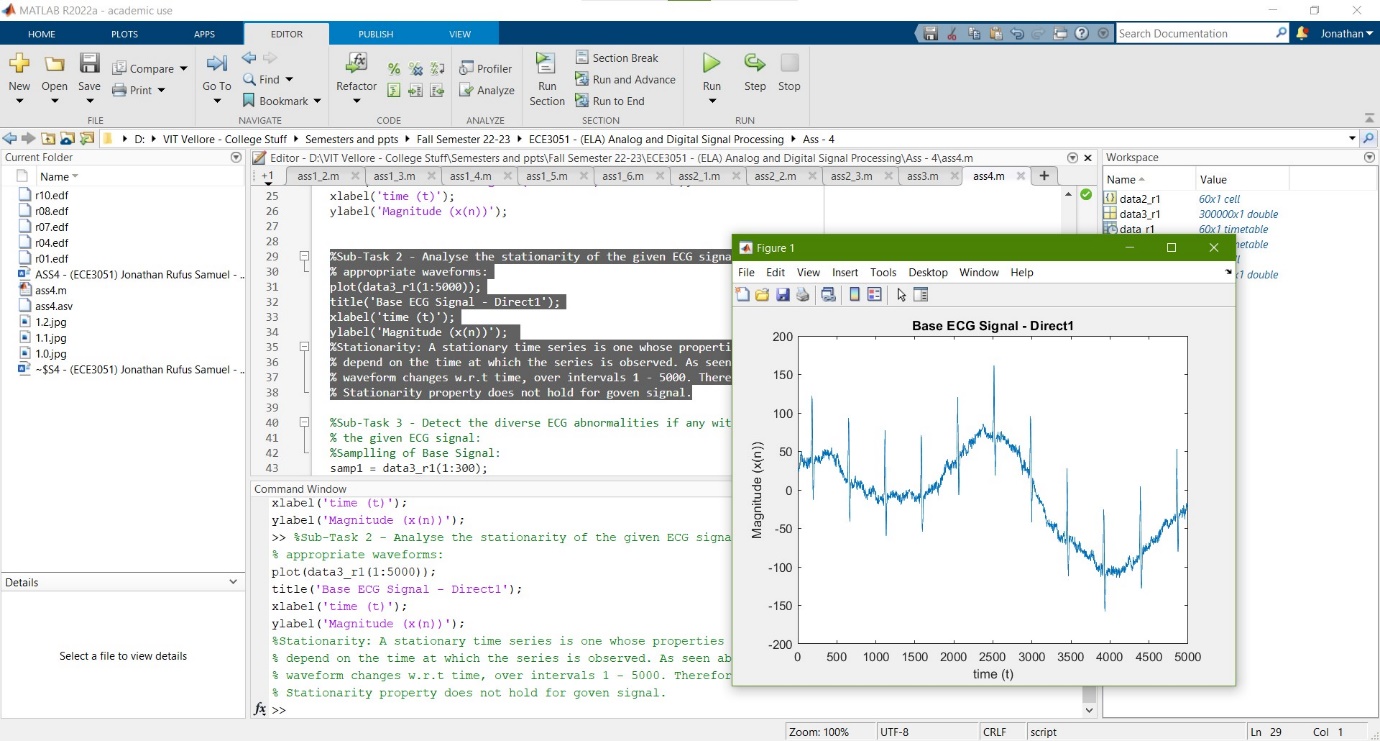
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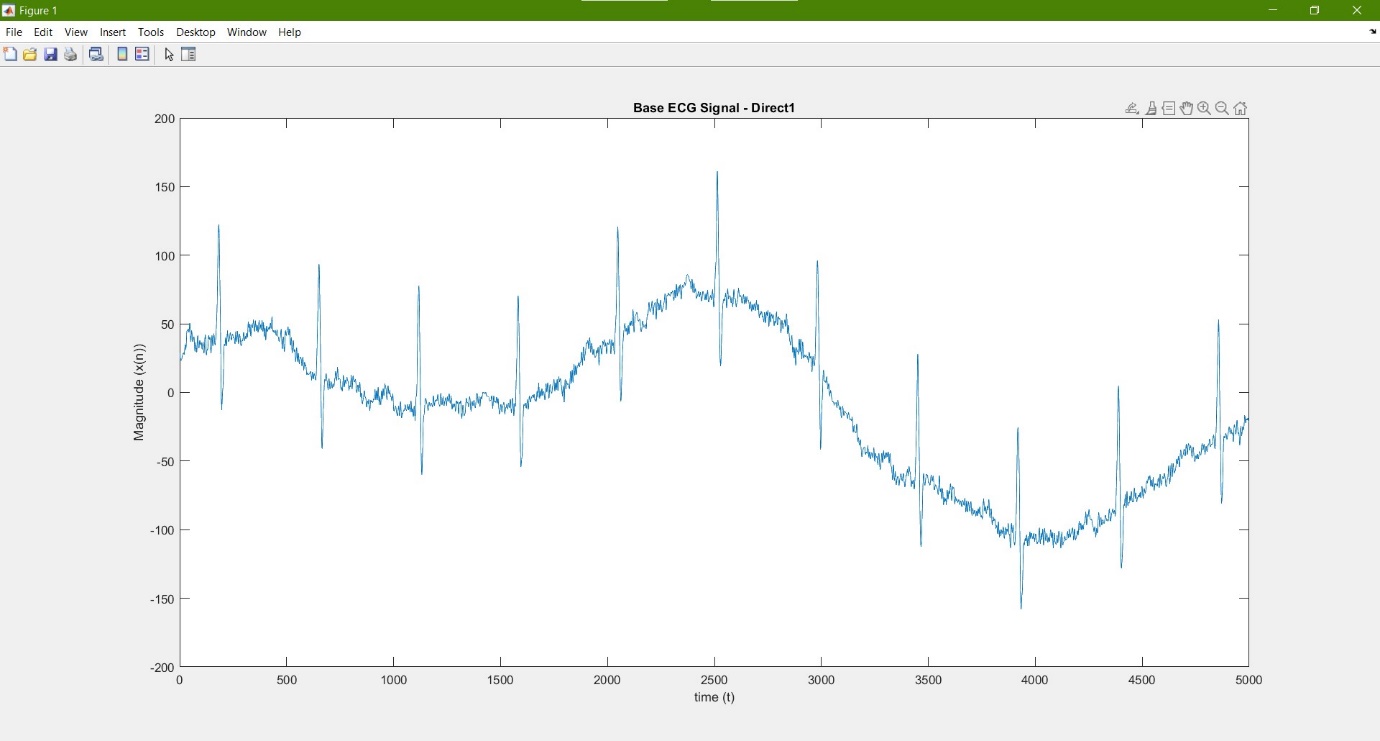
**OUTPUT (SS):**

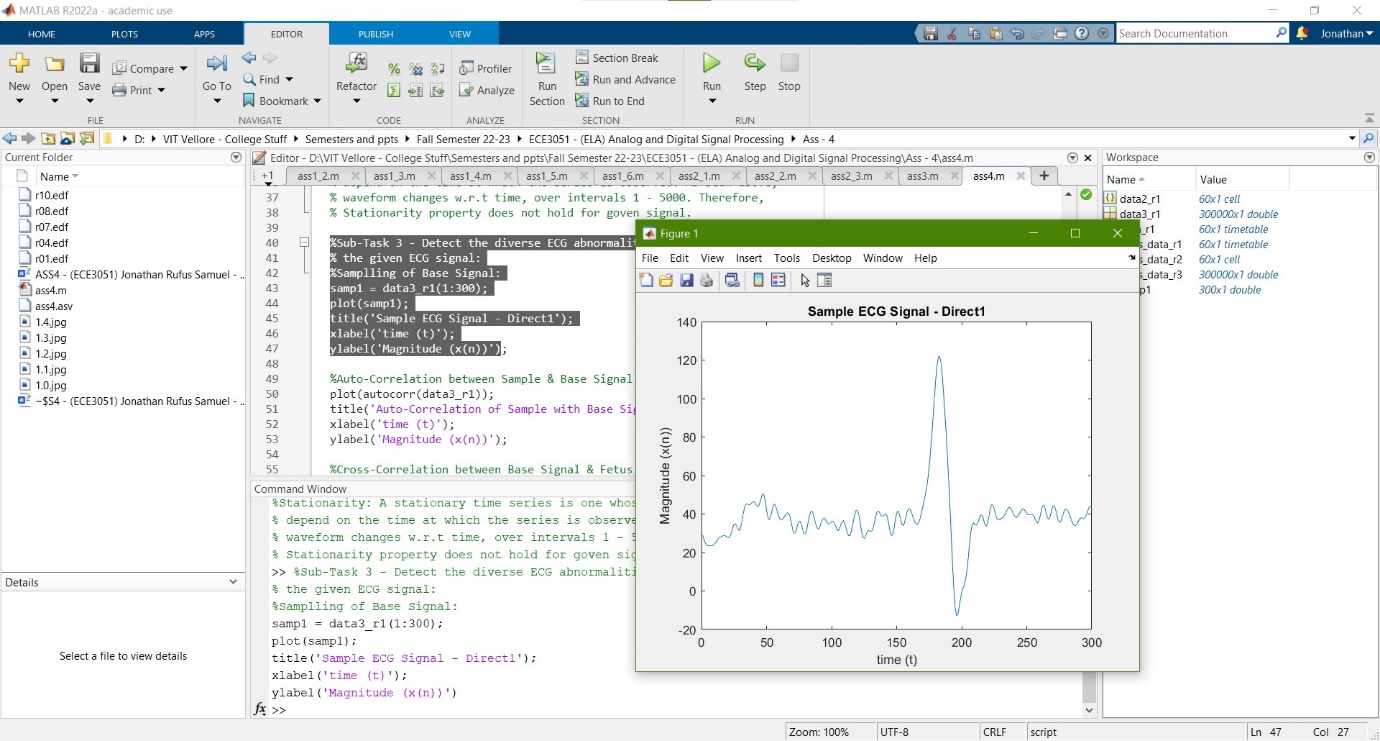


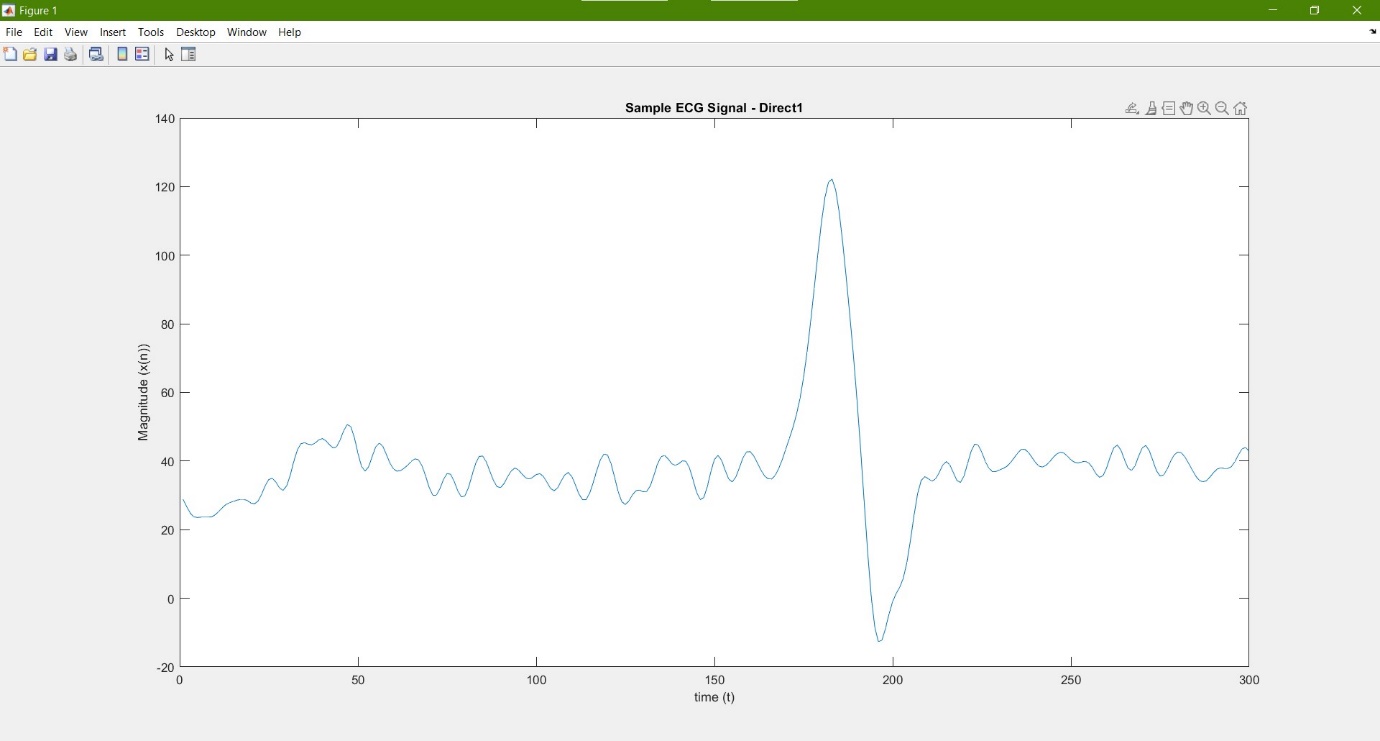


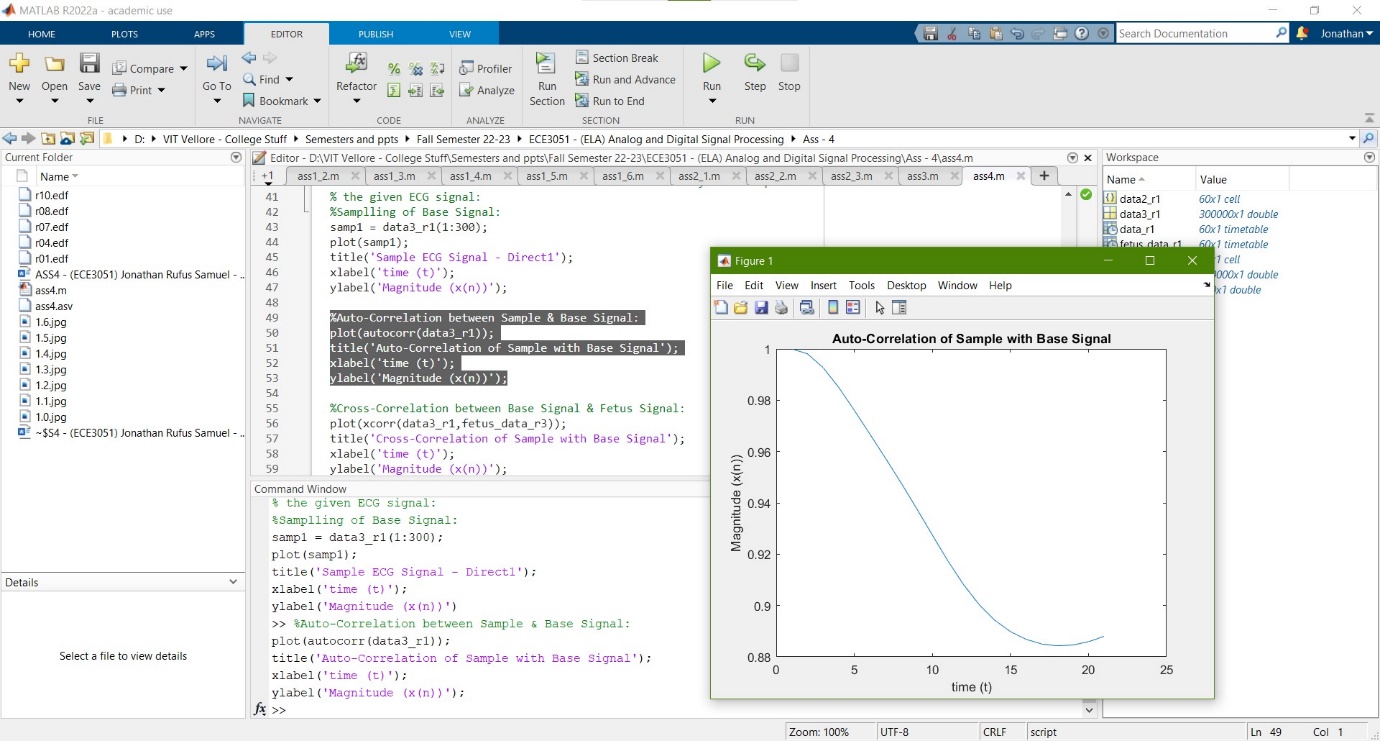


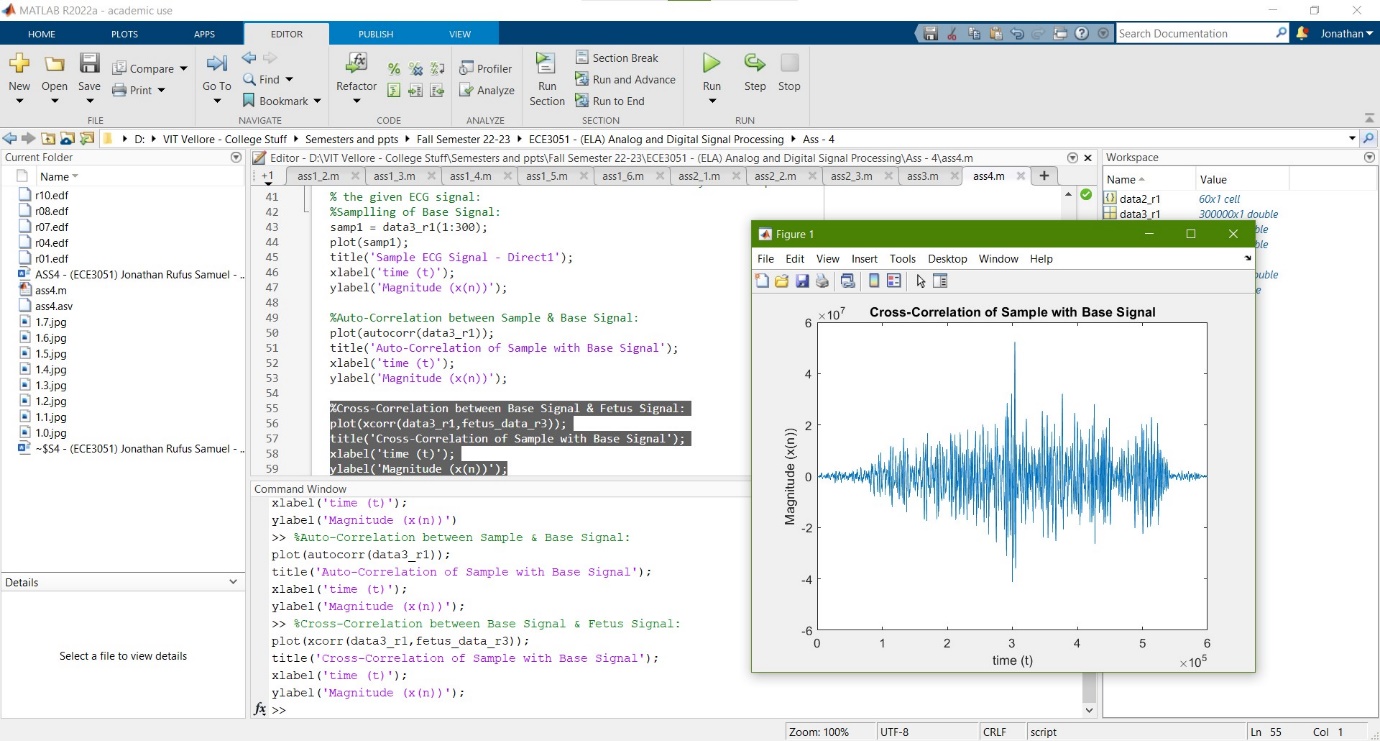


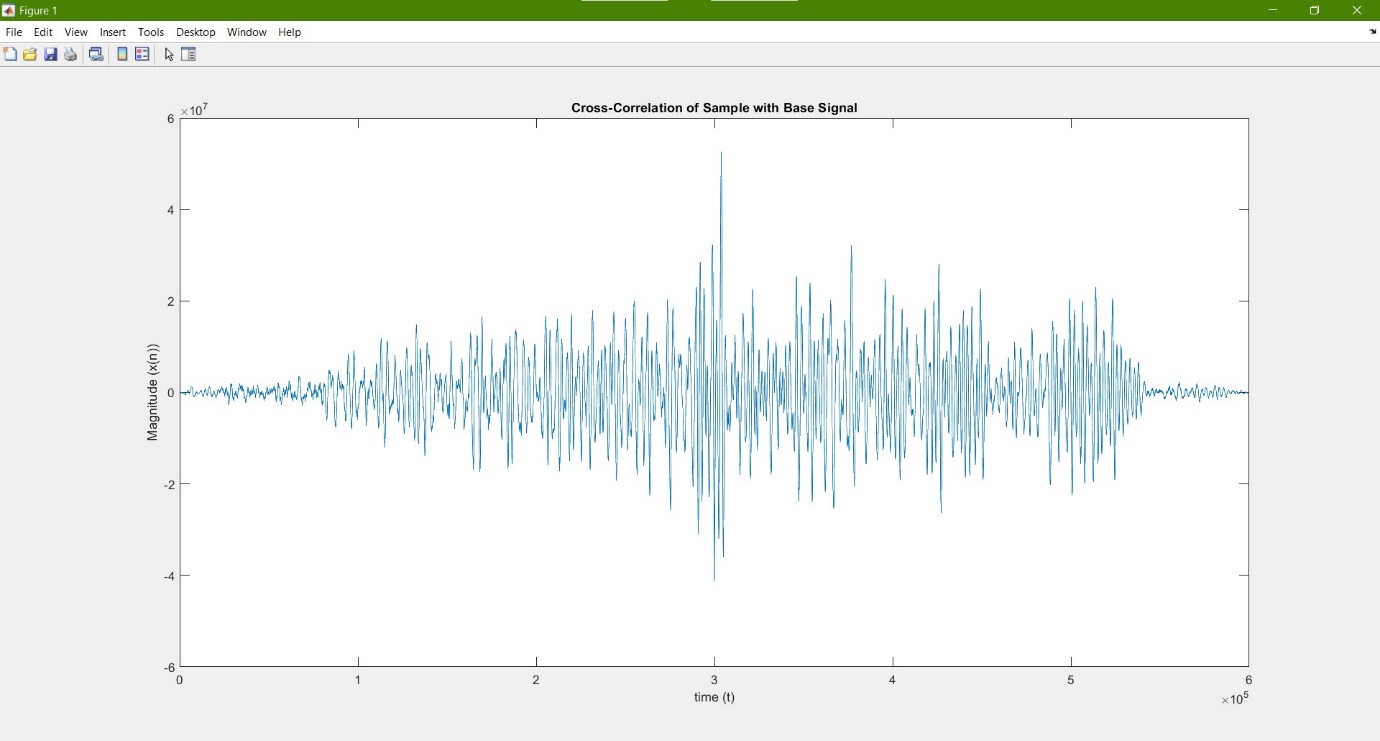












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