

## 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 given signal.

%Sub-Task 3 - Detect the diverse ECG abnormalities if any with respect to
% the given ECG signal:
%Sampling 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))');

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```

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 given signal.

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

% the given ECG signal:

%Sampling 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 (SS):















