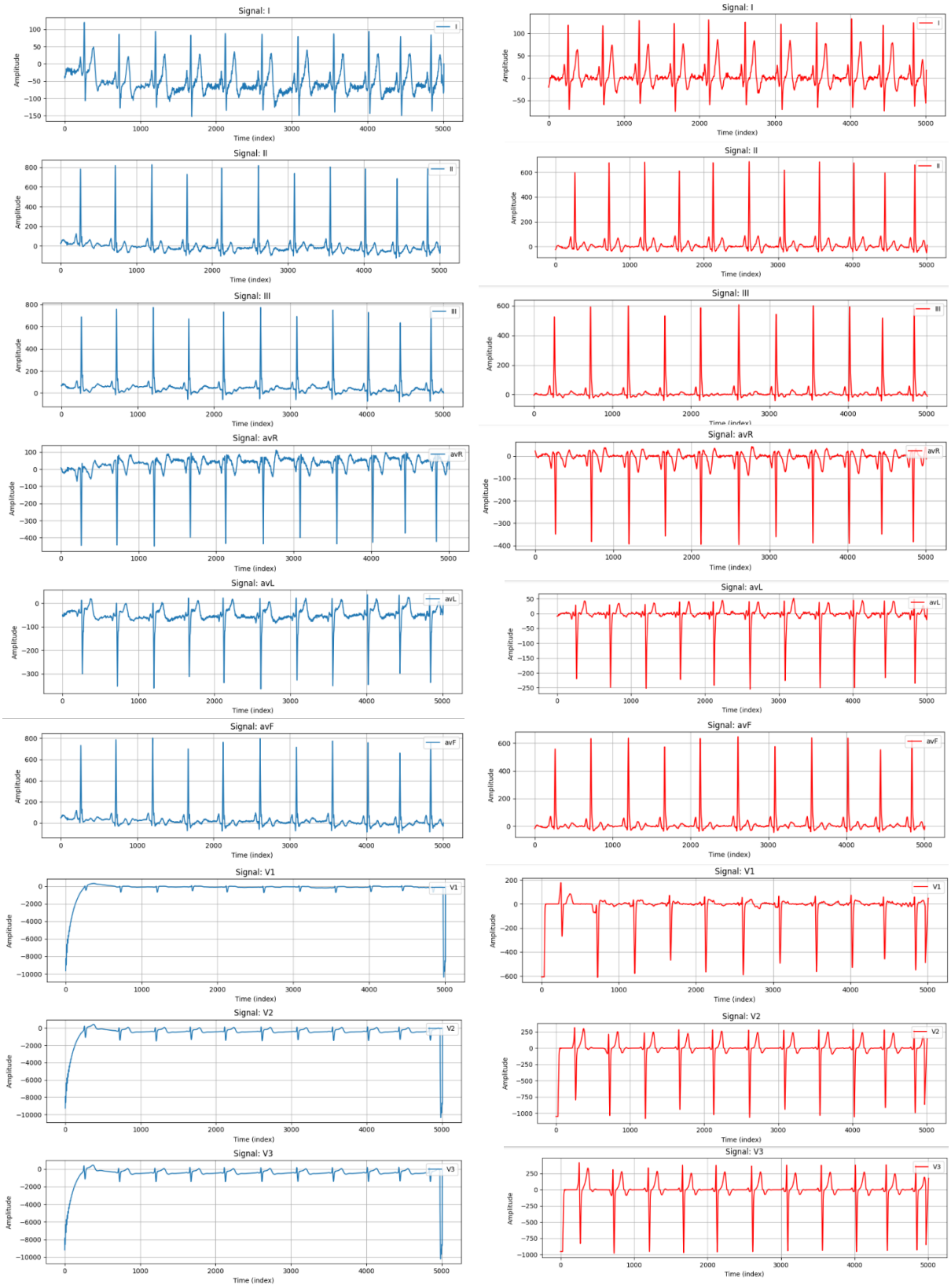
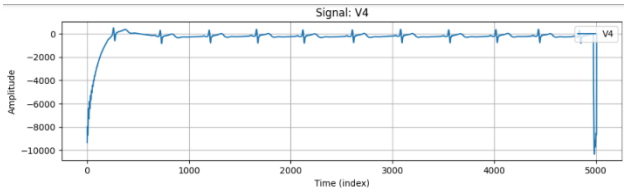
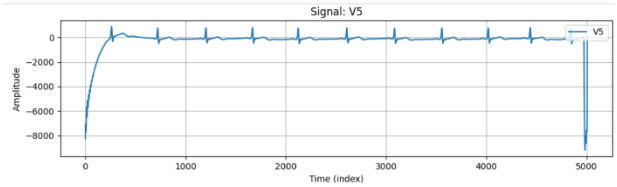
Normal Patient ECG Visualization

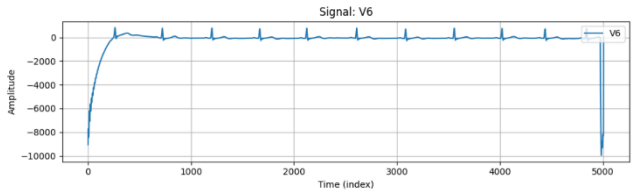
Provided 12 lead ECG data.

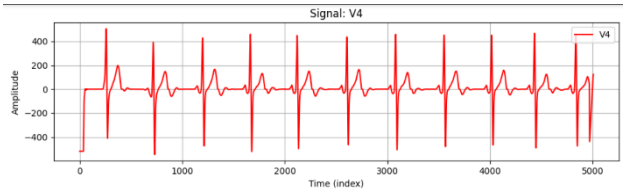
Patient name/ ID : 42998_Kassa Ishwar. Left side has raw plot V/S Right side which has the cleaned signal

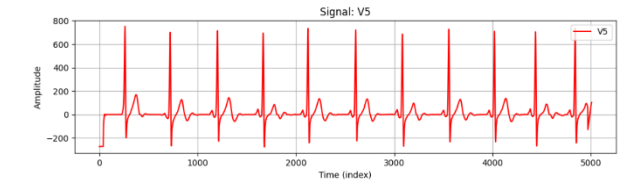


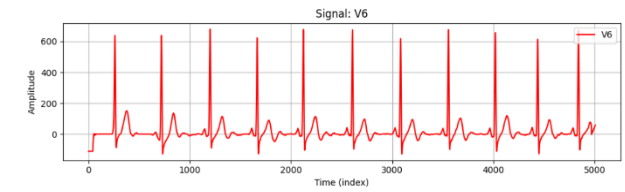

Signal: V4
V4
Amplitude
Time (index)


Signal: V5
V5
Amplitude
Time (index)


Signal: V6
V6
Amplitude
Time (index)

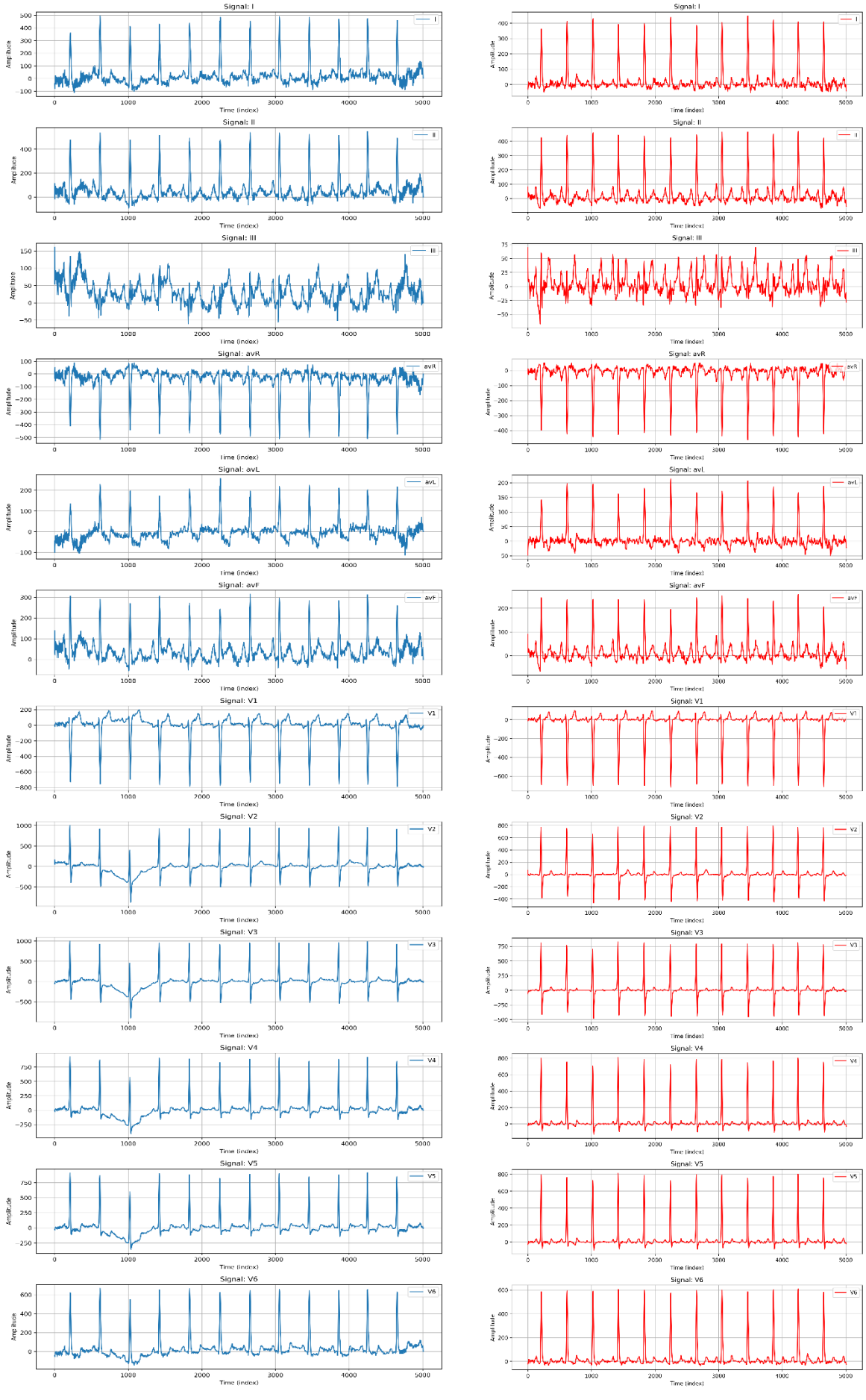

Signal: V4
V4
Amplitude
Time (index)


Signal: V5
V5
Amplitude
Time (index)


Signal: V6
V6
Amplitude
Time (index)

Left ventricular dysfunction patient

Patient ID : 38963-7324_Khilare Mahesh. Left side raw plot V/S right side cleaned signal



The data provided has different kinds of noise and anomalies present. The three main components of noise are the baseline drift, powerline (high frequency noise including but not limited to EMG noise) and outliers as well.

While the neurokit2 library does posses a huge arsenal for ECG analysis it was sometimes incapable of removing baseline drift heavily corrupted signals.

We have tried to implement a morphological filter based on different research articles. This method has yielded consistent visually sound ECG signals as compared to only using neurokit2's preprocessing tools.

High frequency noisy has been removed by the signal filter method provided by the Neurokit2 library.

To remove outliers we created a novel method of using a sliding window over the entire range of the signal to store the minimum and maximum values in the window. We then find out the steady state region and use it for our analysis.

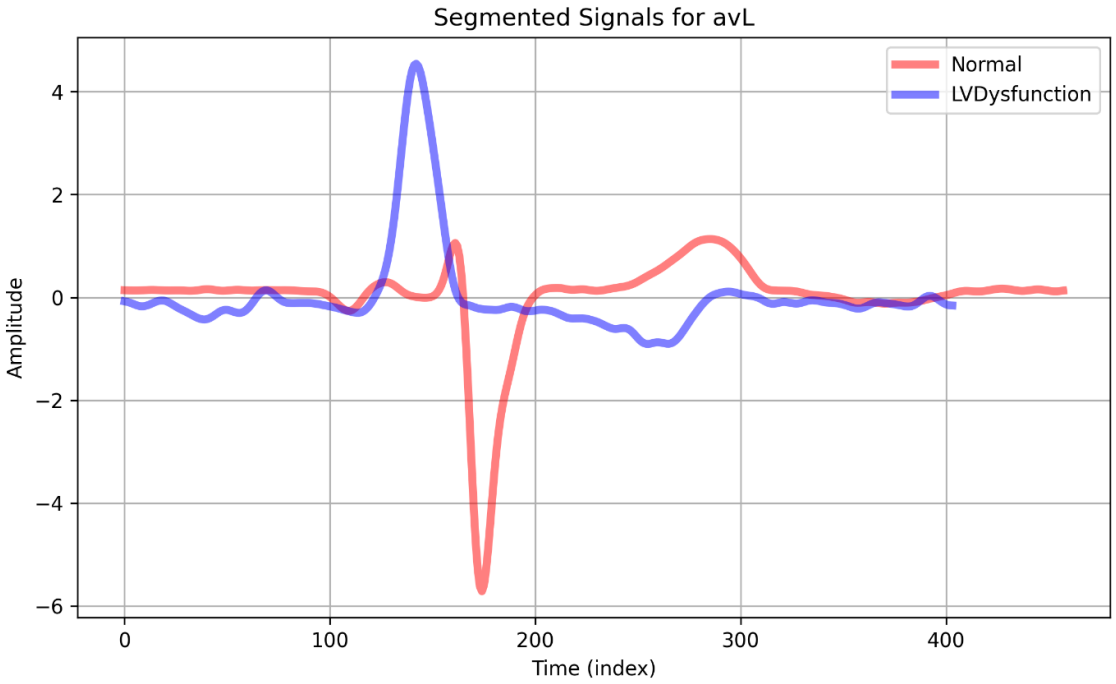
There may also be Premature Ventricular Contraction artifacts in the ECG signal. We can decide how we wish to deal with that issue as it is not a conventional noise but a different contraction.

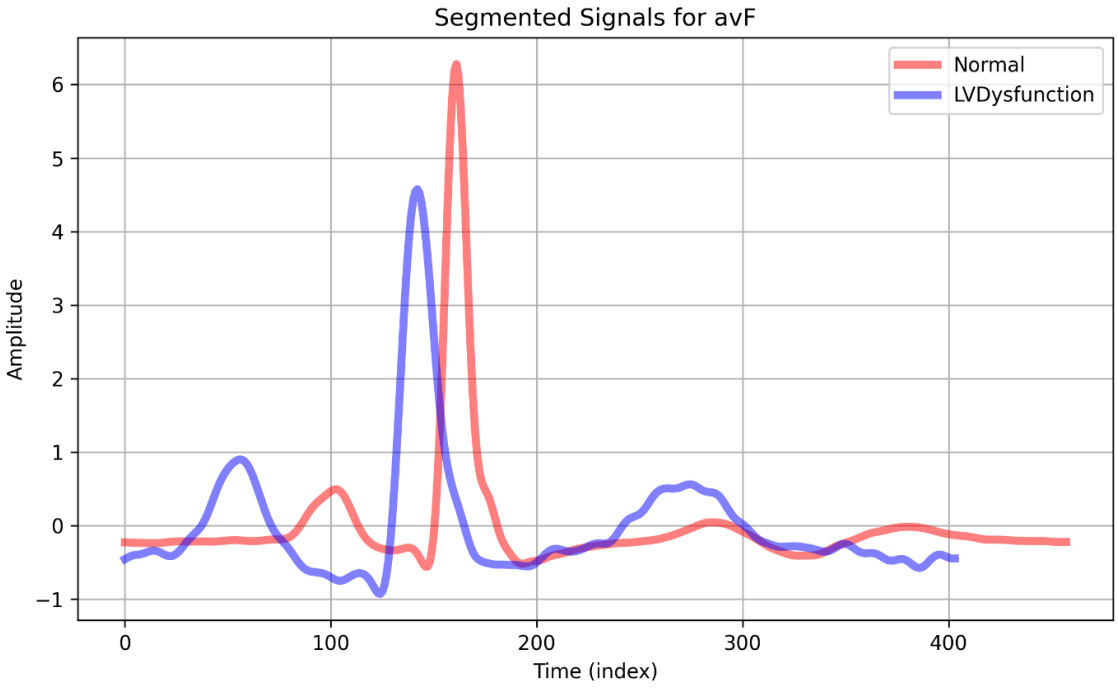
Visualization of Normal and LV Dysfunction Superimposed signals

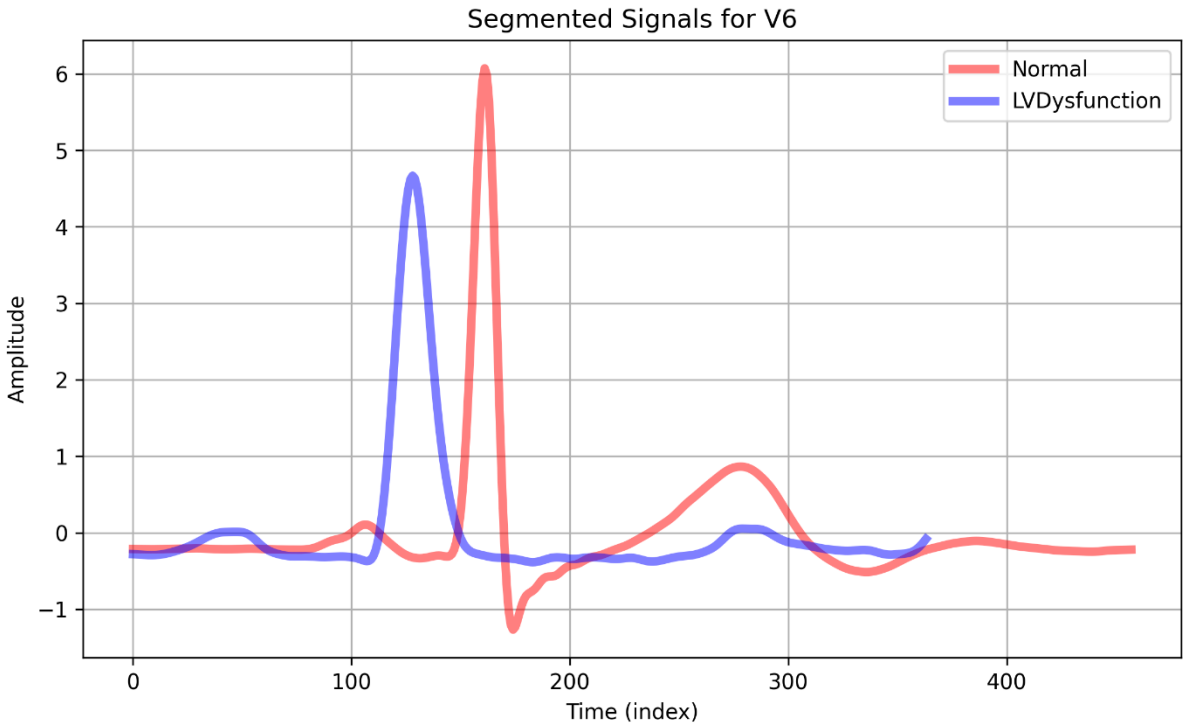
In the following diagrams we have plotted the average heart beat for a healthy and ailing patient for all 12 leads. This might allow us to see any early connection to L V dysfunction, or that we need more data to comment.

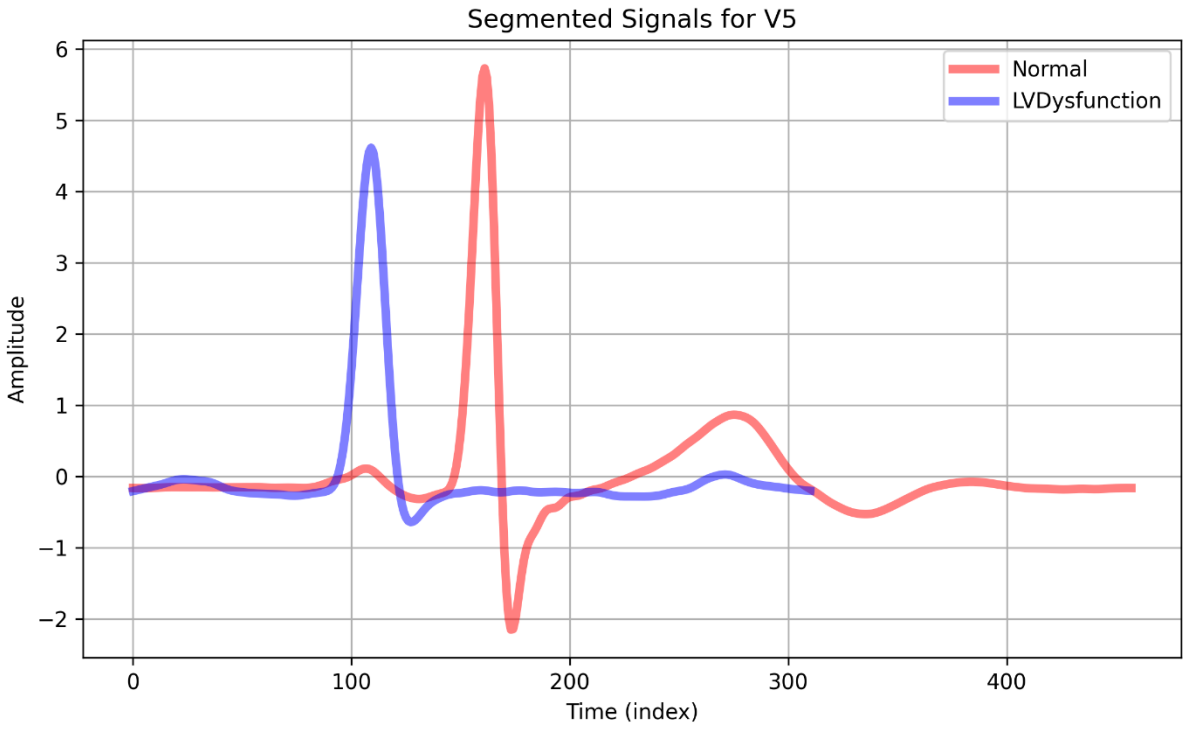
We have had to use Z- score normalization for the two plots to get a better understanding of the shape of the heart beats

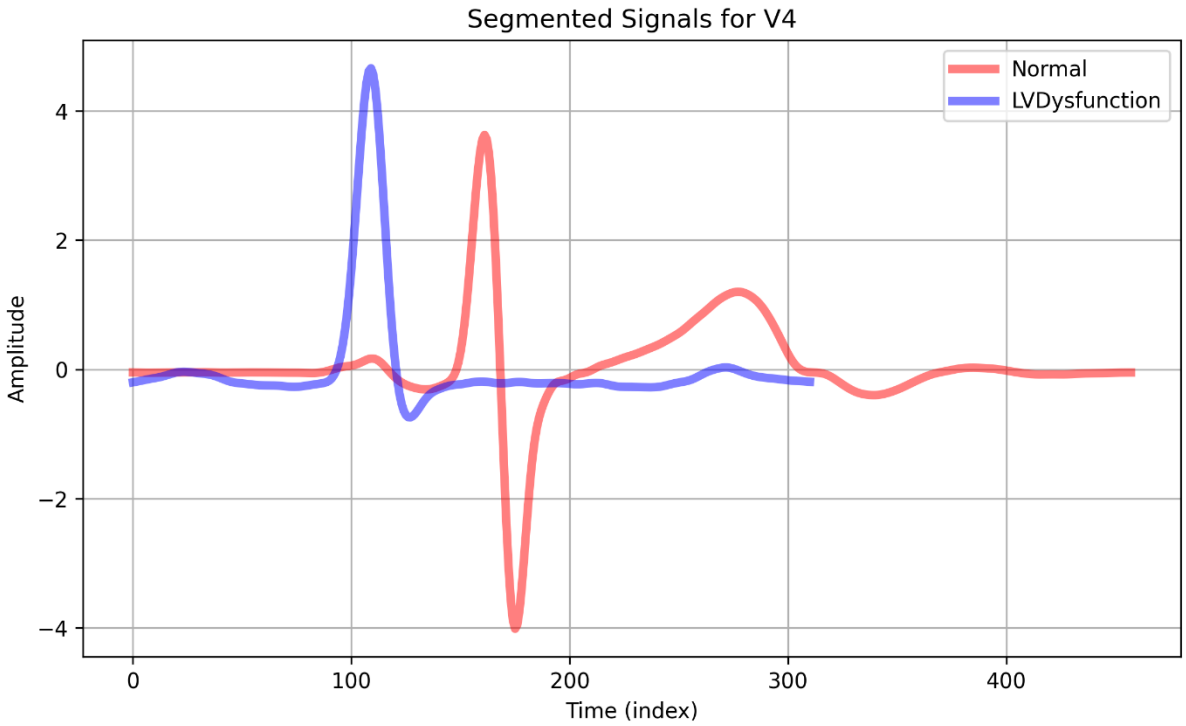
The 2 patients plotted are the same as above. (NOTE there is no particular order in which way the graphs have been attached below)

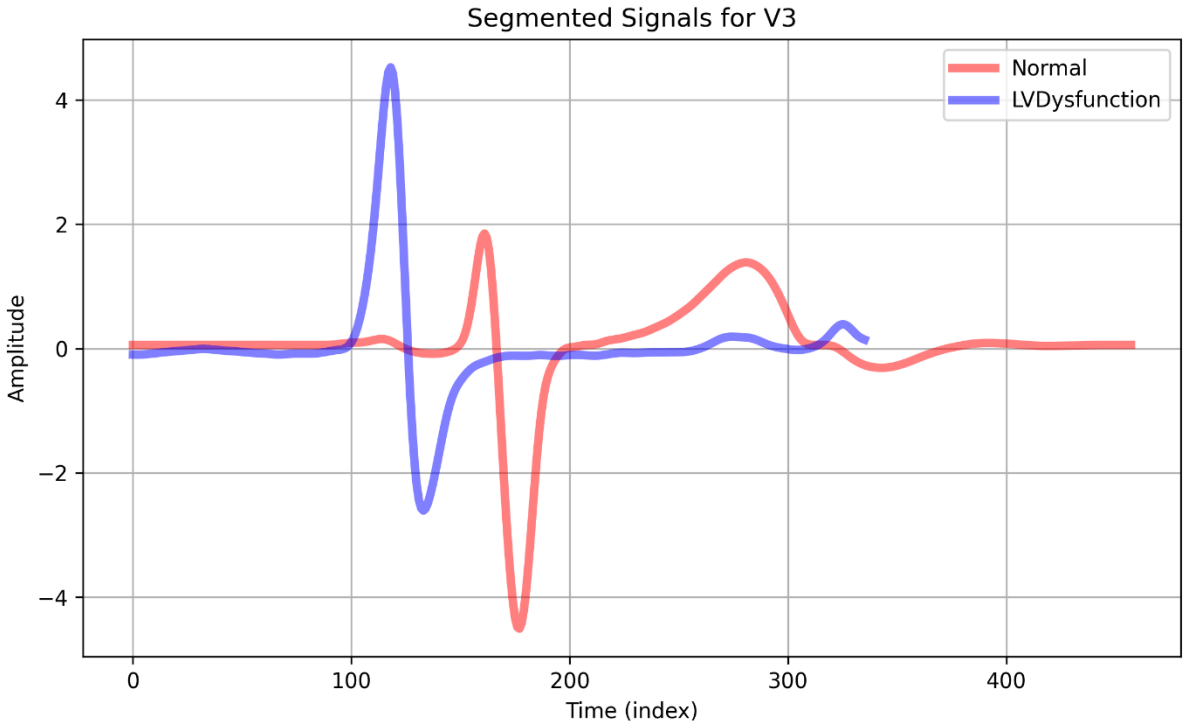


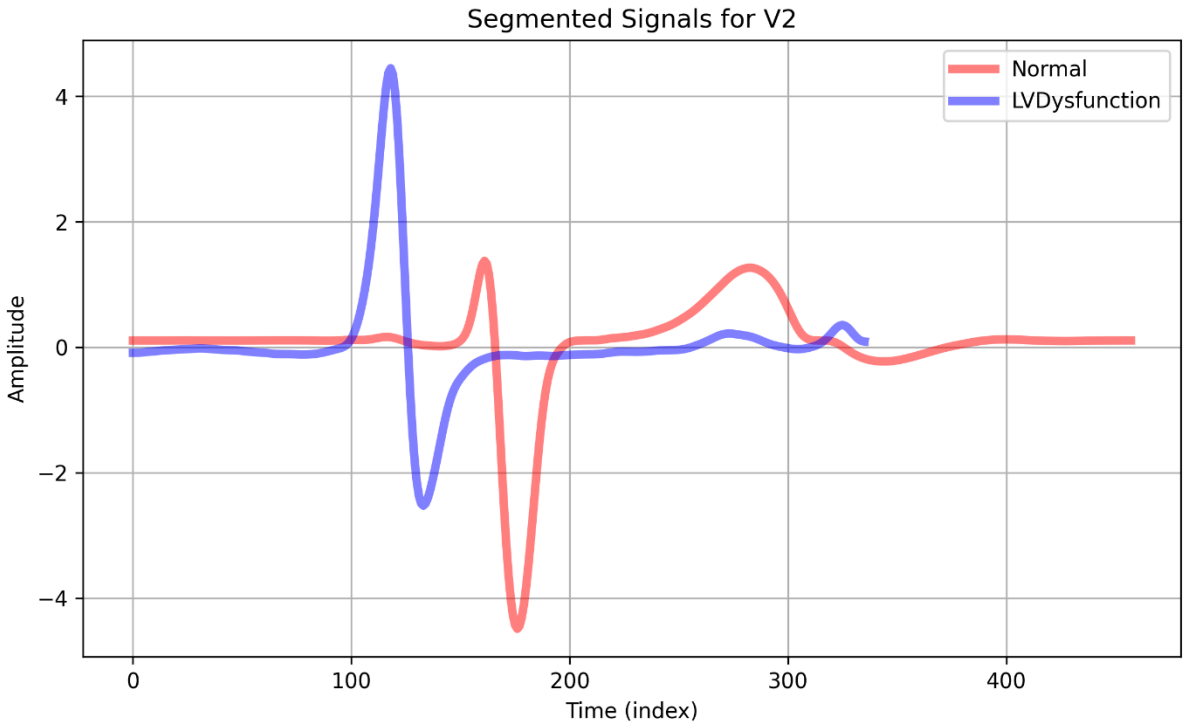


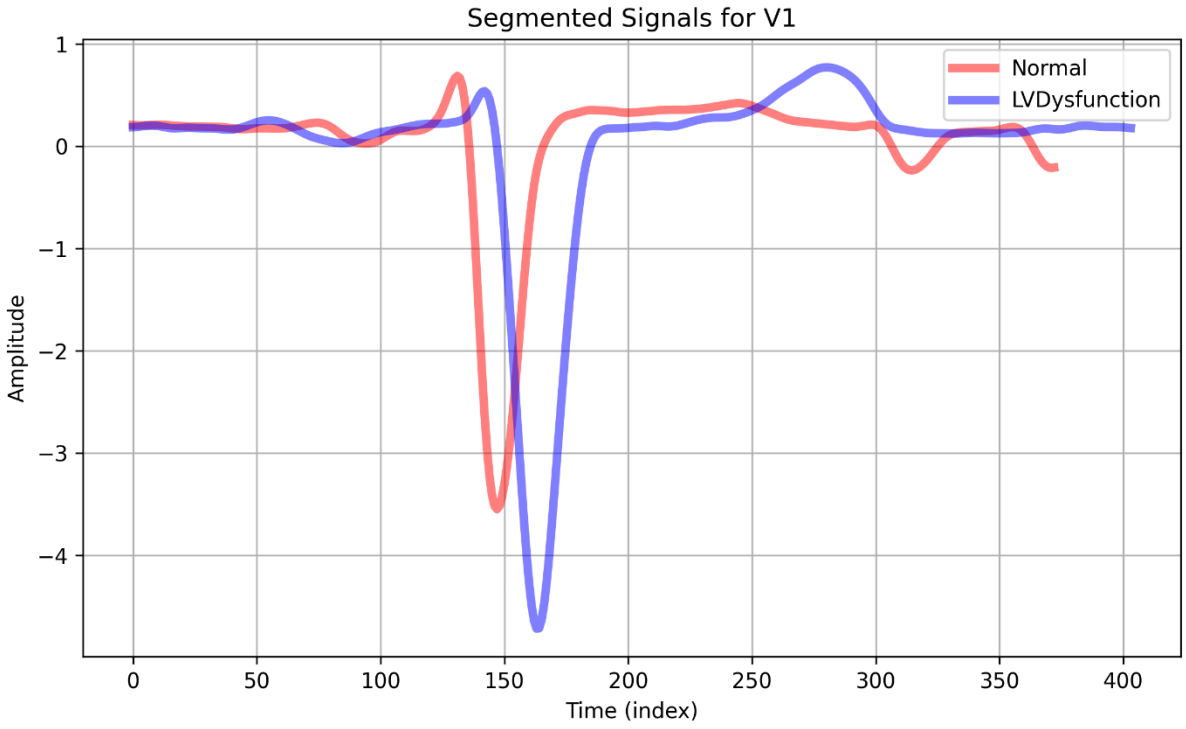

Segmented Signals for V6
Normal
LVDysfunction
Amplitude
Time (index)
6
5
4
3
2
1
0
−1
0
100
200
300
400

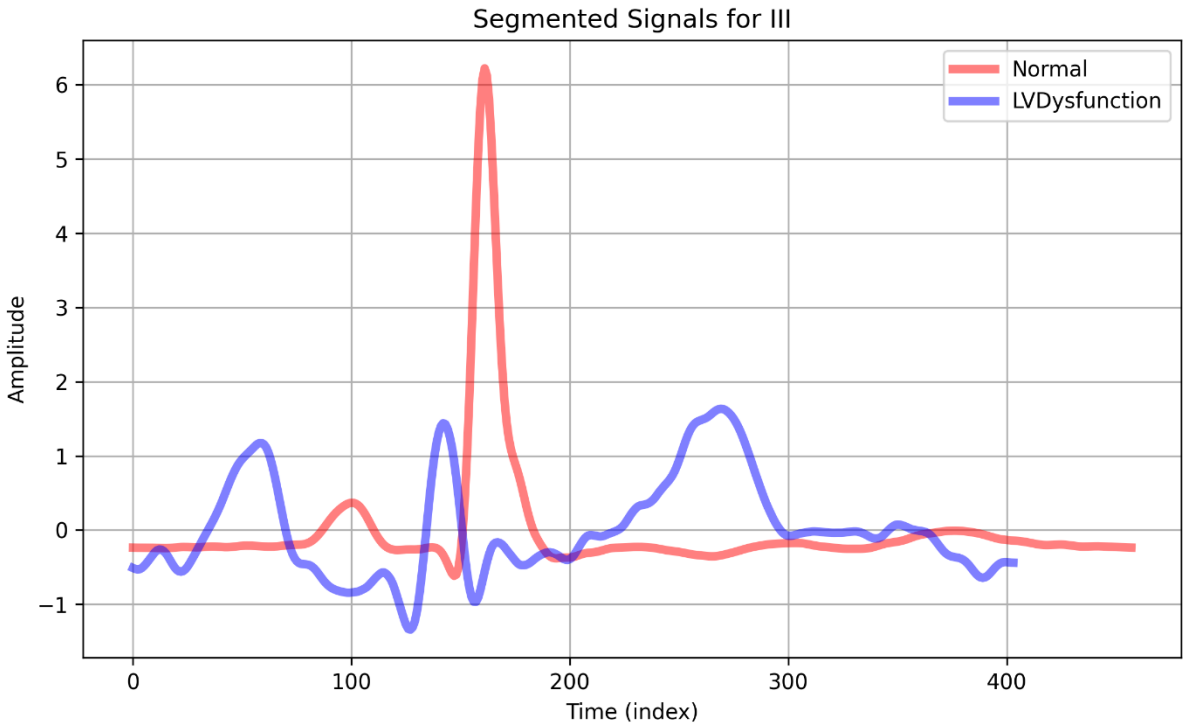

Segmented Signals for V5
Normal
LVDysfunction
Amplitude
Time (index)
6
5
4
3
2
1
0
−1
−2
0
100
200
300
400

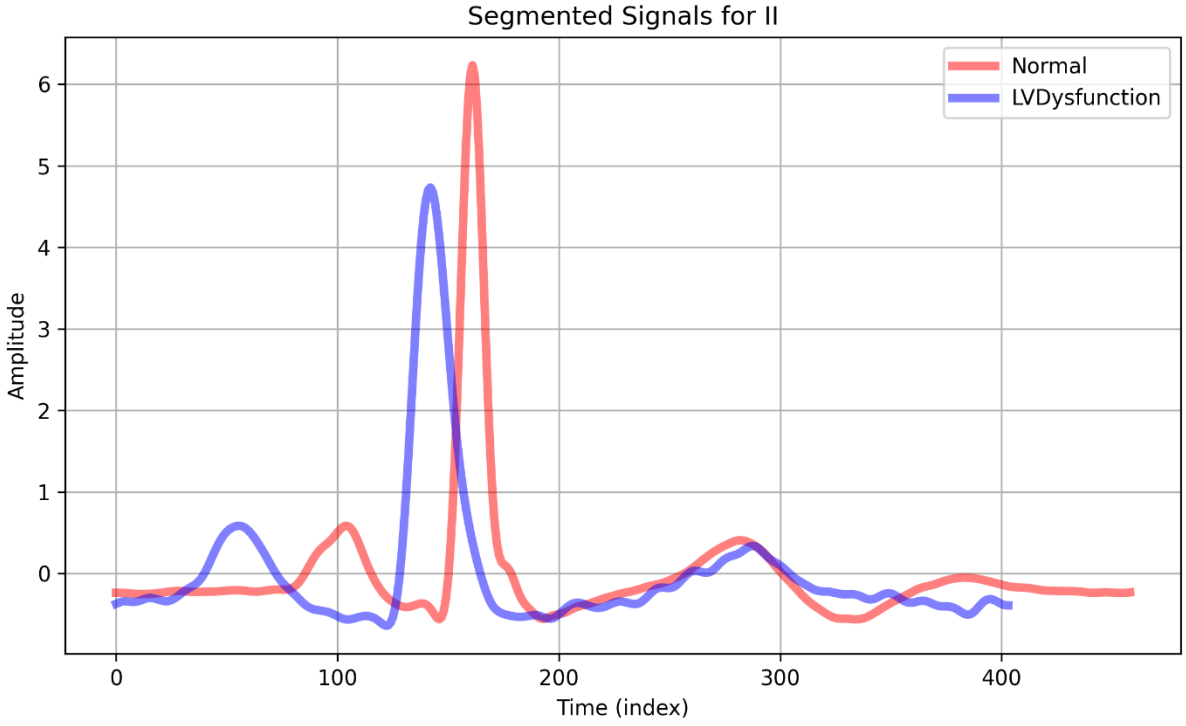

Segmented Signals for V4
Normal
LVDysfunction
Amplitude
Time (index)
4
2
0
−2
−4
0
100
200
300
400

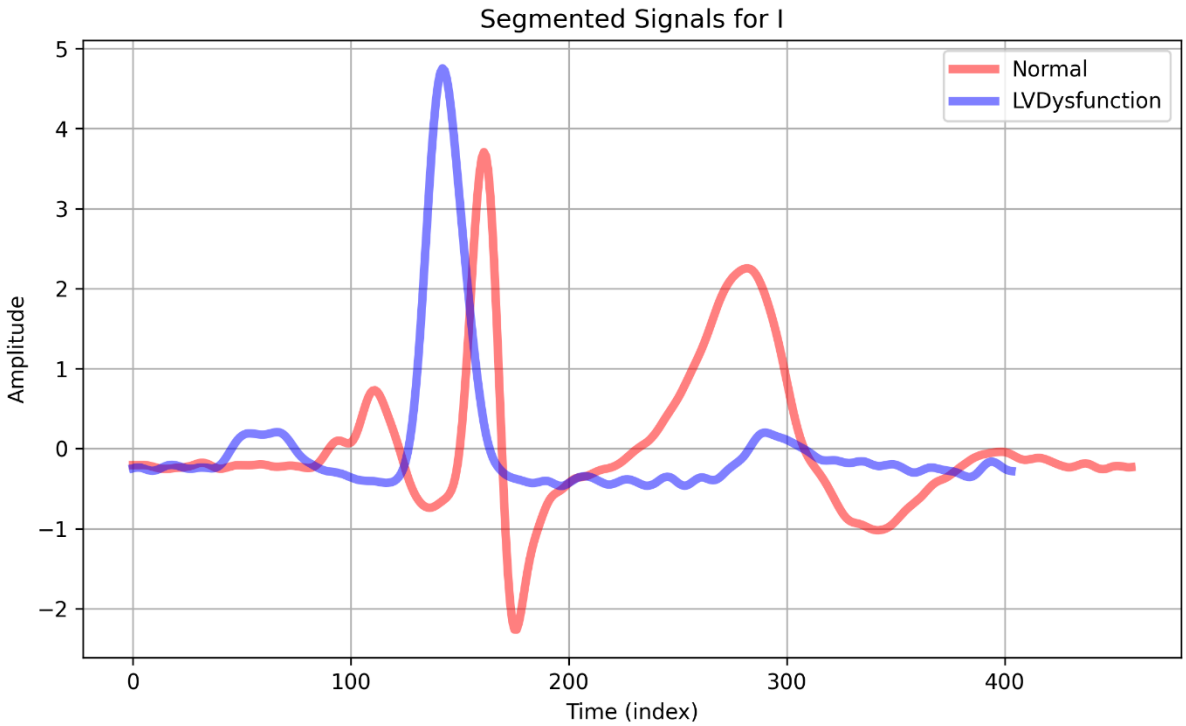

Segmented Signals for V3
Normal
LVDysfunction
Amplitude
Time (index)
4
2
0
−2
−4
0
100
200
300
400

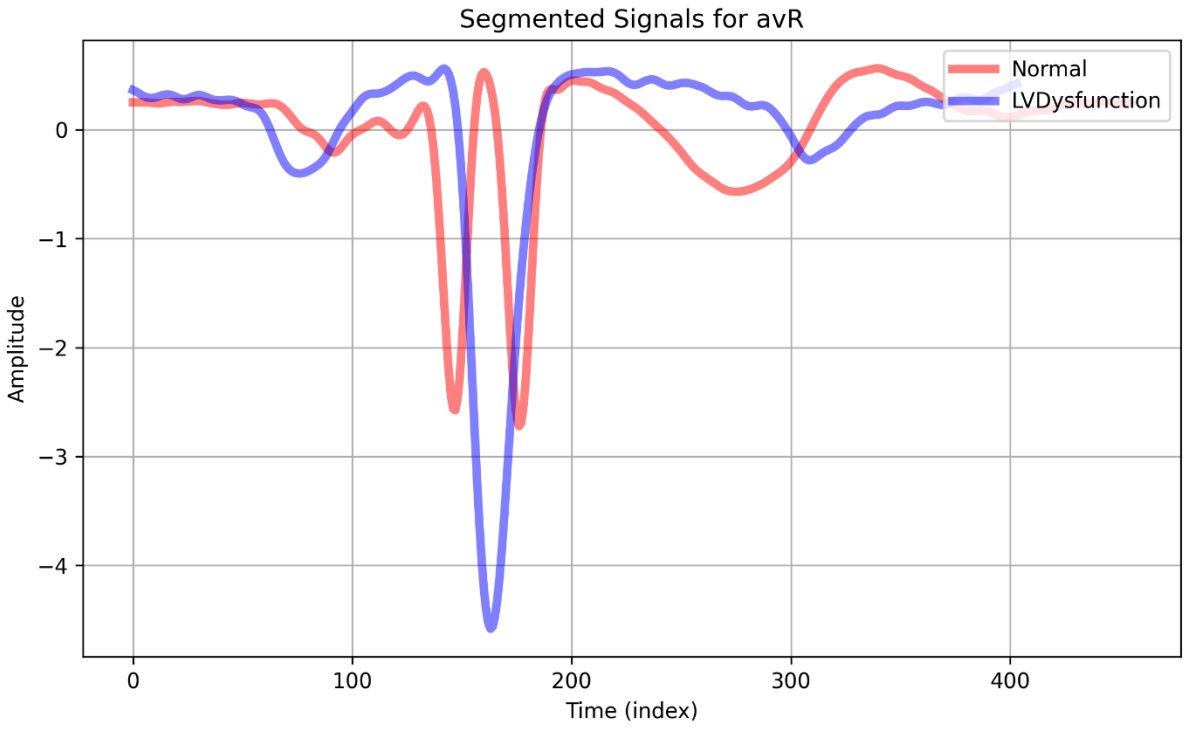

Segmented Signals for V2
Normal
LVDysfunction
Amplitude
Time (index)
4
2
0
−2
−4
0
100
200
300
400


Segmented Signals for V1
Normal
LVDysfunction
Amplitude
Time (index)
1
0
−1
−2
−3
−4
0
50
100
150
200
250
300
350
400


Segmented Signals for III
Normal
LVDysfunction
Amplitude
Time (index)
6
5
4
3
2
1
0
−1
0
100
200
300
400


Segmented Signals for II
Normal
LVDysfunction
Amplitude
Time (index)
6
5
4
3
2
1
0
0
100
200
300
400


Segmented Signals for I
Normal
LVDysfunction
Amplitude
Time (index)
5
4
3
2
1
0
−1
−2
0
100
200
300
400


Segmented Signals for avR
Normal
LVDysfunction
Amplitude
Time (index)
0
−1
−2
−3
−4
0
100
200
300
400