Andrew Chen   2/11/2026

Report for Cardio Lab – ECG

Follow the Colab file "HSI Lab 1 – ECG.ipynb" and record your process and results in this document.

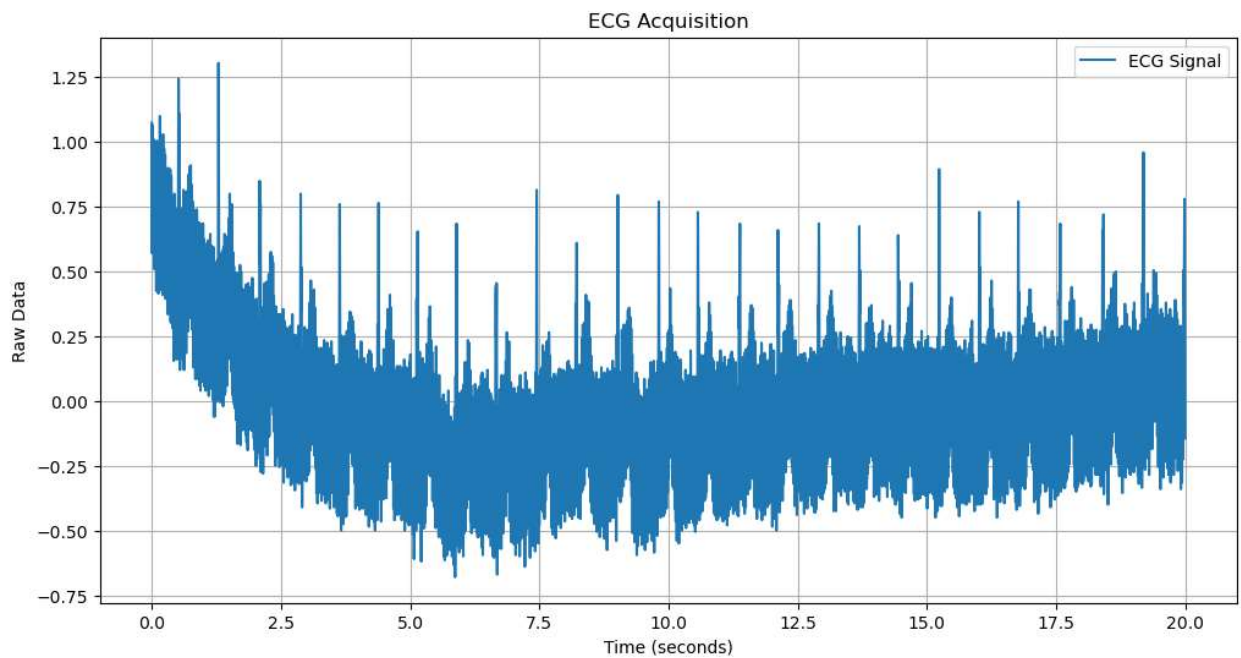*** For each step, provide sufficient explanation of the process of reaching the final result or plot**

* For each plot to report, include proper axis labels and units. For each numerical result to report, include proper units

1. **Load Raw Data**
   What I did:
   Used np loadtext() and arange() to create x and y arrays for ECG signal. Then used matplotlib to plot the graph.
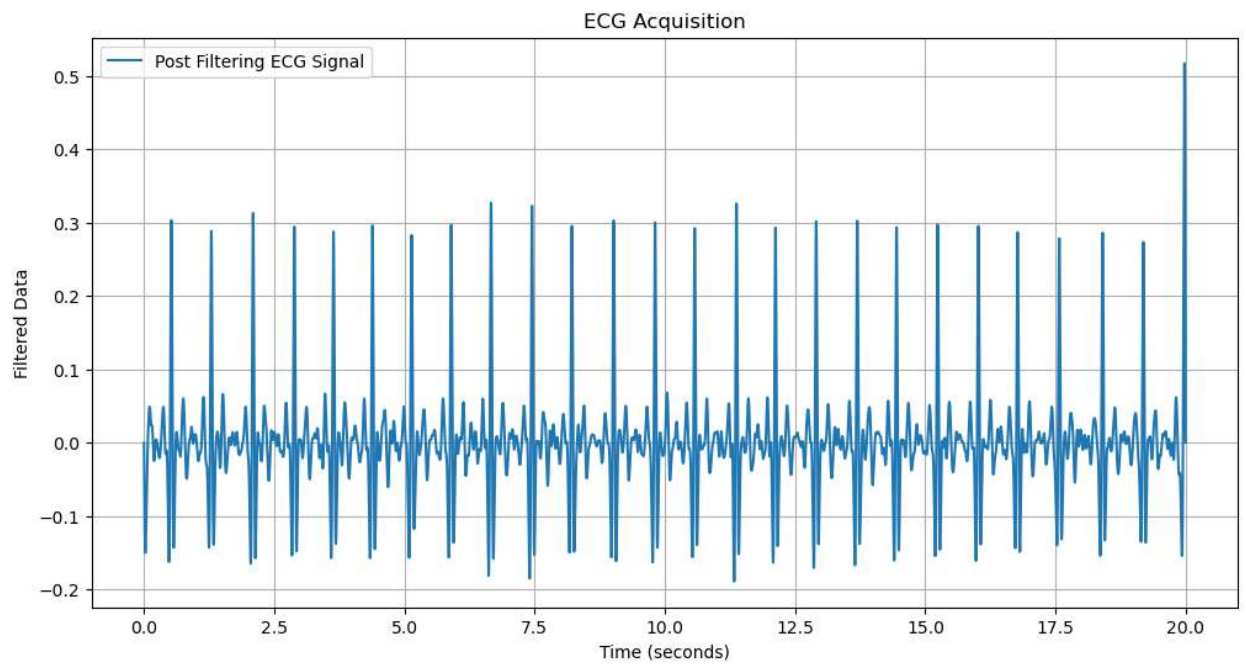   Plot:

2. **Apply Band-pass filter**
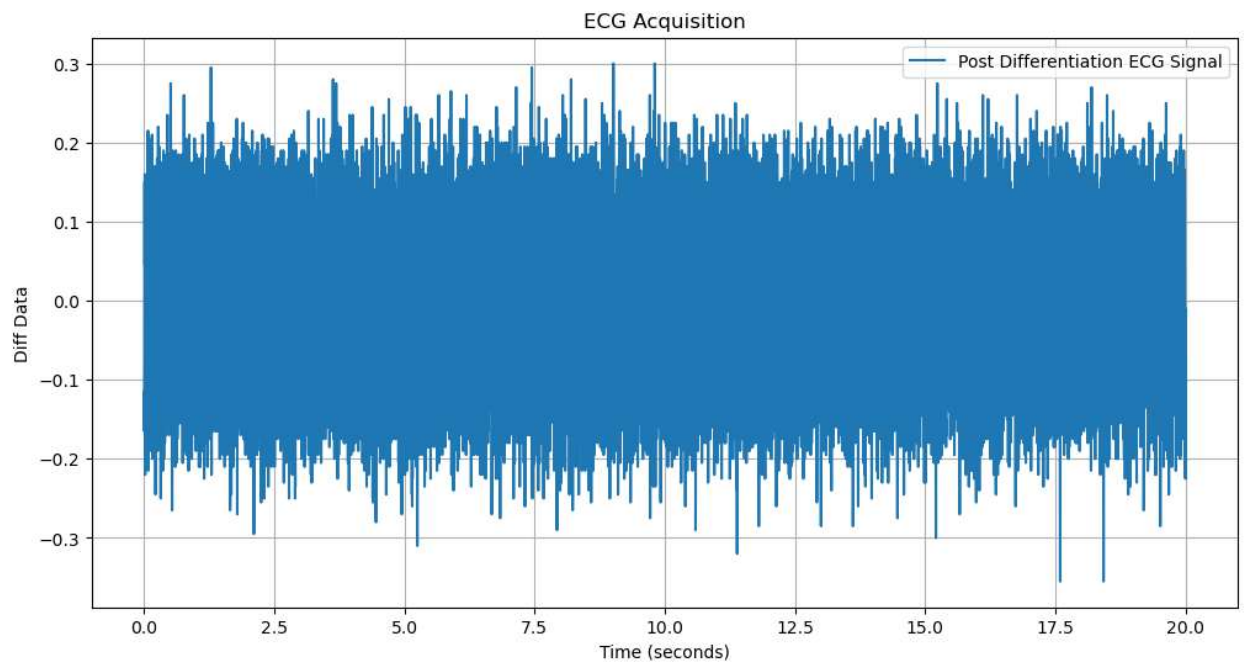   What I did: Applied band-pass filter, selecting for frequencies between 5 and 15 hz.
   Plot:

3. Apply Derivative filter

What I did: Took the derivative of the signal
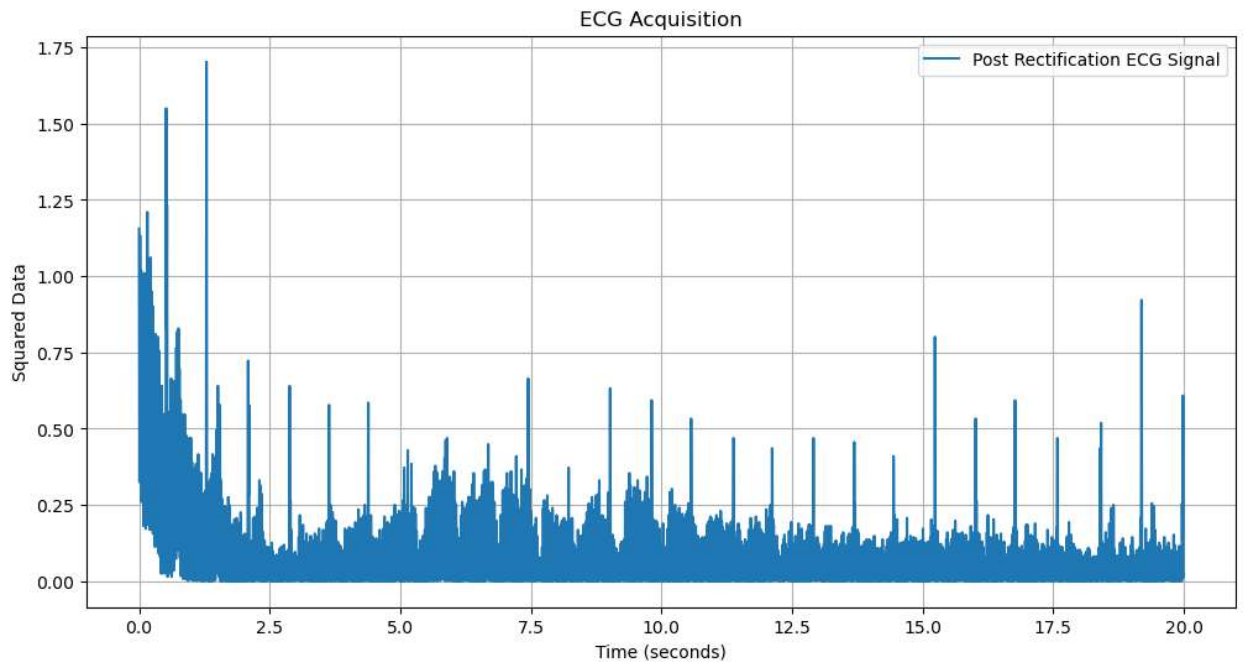
Plot:

4. Apply squaring filter

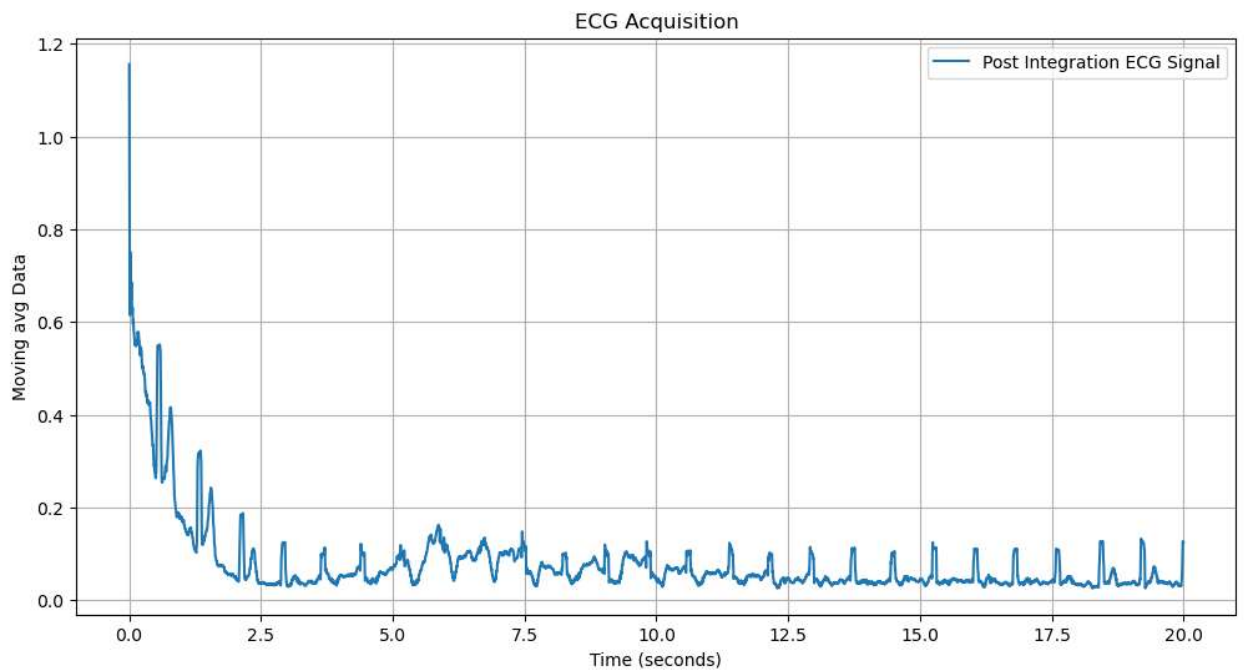What I did: Squared the signal using np.square.

Plot:

5. Apply moving average

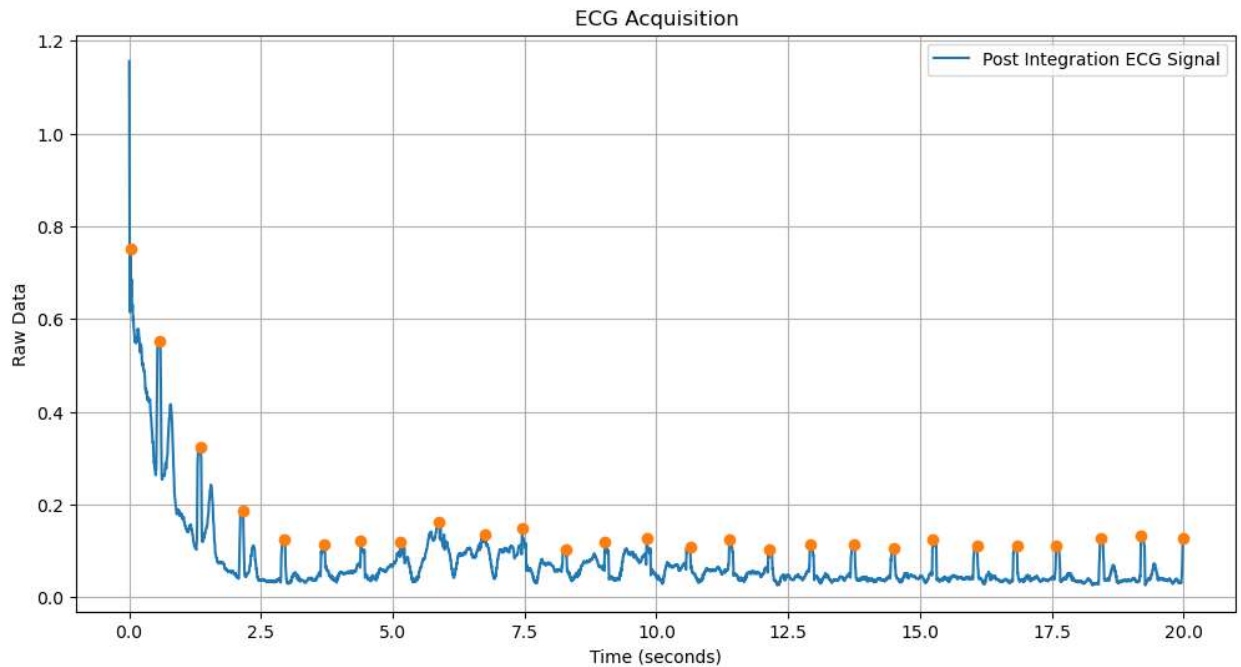What I did: Apply a moving average window by approximating the integral of the squared signal.

Plot:

6. Detect R-peaks

What I did: used find_peaks, with a distance parameter of 250. The value of 250 was manually tuned to achieve best results.
Plot:

ECG Acquisition
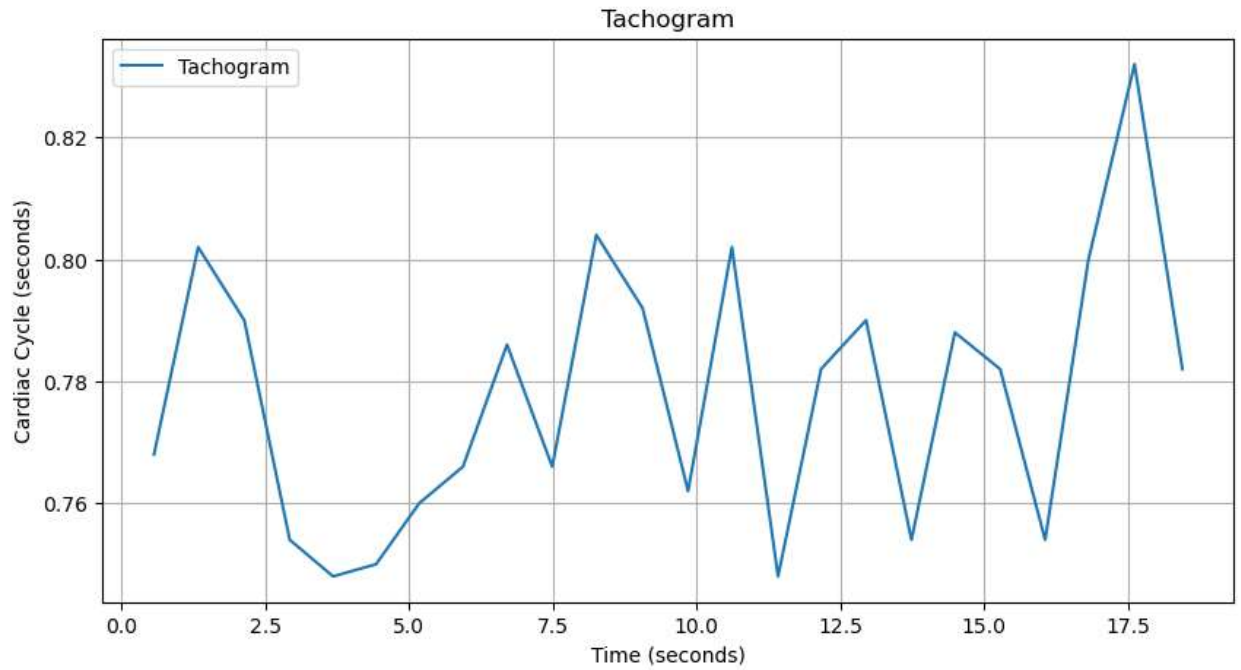
7. Calculate heart rate

What I did: Calculated the time difference between each peak in seconds, then did unit conversion to land at beats per minute.
Result: Average Heart Rate: 78.125

8. Calculate HRV

What I did: Calculated the RMSSD of the tachogram, which is the difference in time between peaks. Calculated HRV in ms (777.883).
Plot:

Tachogram

9. **Link to Colab file:** [Make sure to grant file access to "anyone with the link" to make sure TAs have access to the code]
https://drive.google.com/file/d/1_saFoHfa9kq0KaLhMX57wJvmKQXlrN_z/view?usp=sharing