Main

May 11, 2025

Connected to venv (Python 3.12.4)

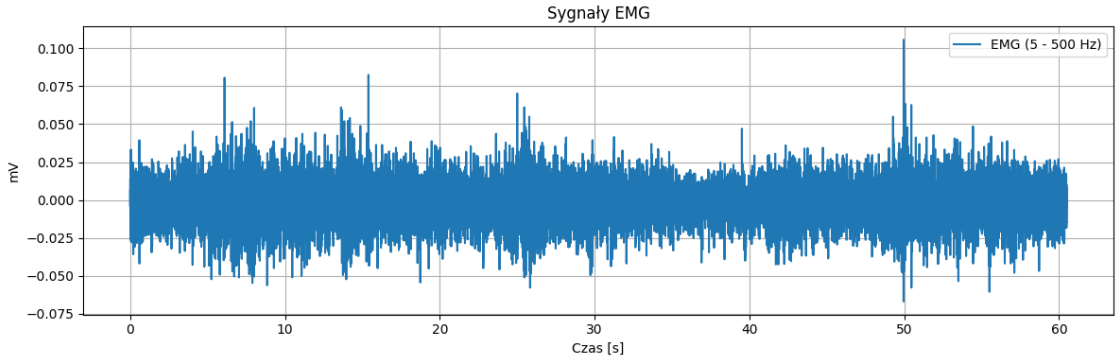
[ ]:
```
import utils.DataLoader as dl
import utils.BiopackAnalisis as ba
import heartpy as hp
import matplotlib.pyplot as plt
import numpy as np

path = "C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony/ai.acq"

#badanie = dl.load_data(path)
#ba.draw_plots(badanie)

badania = dl.mass_load("C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony")

ba.draw_plots(badania[3])

data = badania[0]
sample_rate = 1000  # Hz - dostosuj do swojego sygnału

_, _ = ba.heartrate_analisis(data, sample_rate)
badania_filtr = data.copy()
badania_filtr['PPG (Pulse)'] = ba.bandpass_ppg(badania_filtr['PPG (Pulse)'],␣
 ↪sample_rate)
badania_filtr['EMG (5 - 500 Hz)'] = ba.bandpass_emg(badania_filtr['EMG (5 - 500␣
 ↪Hz)'], sample_rate)
badania_filtr['EMG (5 - 500 Hz) 1'] = ba.bandpass_emg(badania_filtr['EMG (5 -␣
 ↪500 Hz) 1'], sample_rate)
badania_filtr['Respiration'] = ba.bandpass_resp(badania_filtr['Respiration'],␣
 ↪sample_rate)
ba.draw_plots(badania_filtr)
_, _ = ba.heartrate_analisis(badania_filtr, sample_rate)

_ = ba.respiratory_analysis(badania_filtr, sample_rate)
```

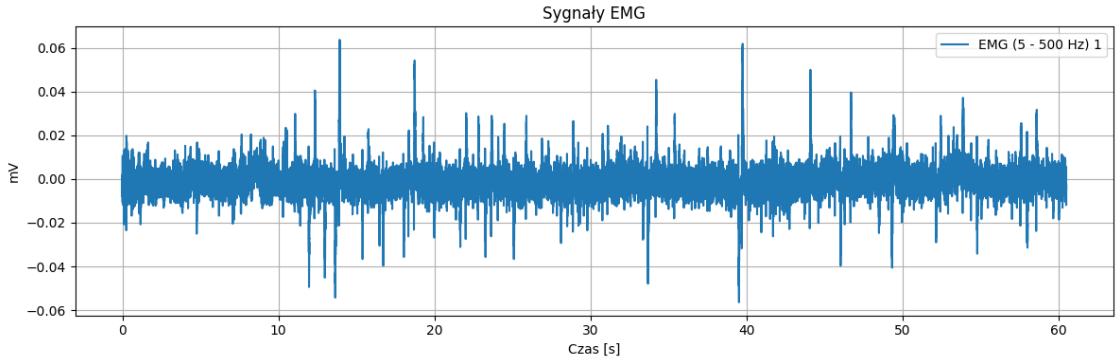
```
Znalezione pliki .acq:
  1. C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\ai.acq
  2. C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\hak.acq
```

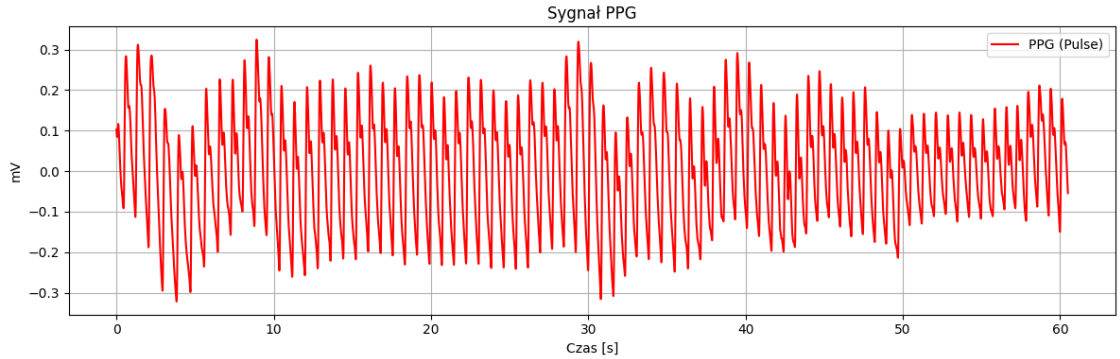
```
  3. C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\klasik.acq
  4. C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\lif.acq
  5. C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\nothing.acq
  6. C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\reference.acq
  7. C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\small.acq

Wczytywanie danych z pliku: C:/Users/jan/Documents/Aparatura -
Projekt/legia/jhony\ai.acq
C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\ai.acq
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: PPG (Pulse), Jednostka: mV
Nazwa kanału: Respiration, Jednostka: mV
          EMG (5 - 500 Hz)  EMG (5 - 500 Hz) 1  PPG (Pulse)  Respiration
Czas [s]
0.000            -0.013733            0.002747     0.054810     0.028381
0.001            -0.026550            0.006714     0.053955     0.028076
0.002            -0.029602            0.008545     0.053101     0.027771
0.003            -0.025024            0.006104     0.052185     0.027466
0.004            -0.021973            0.004272     0.051270     0.027161

Wczytywanie danych z pliku: C:/Users/jan/Documents/Aparatura -
Projekt/legia/jhony\hak.acq
C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\hak.acq
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: PPG (Pulse), Jednostka: mV
Nazwa kanału: Respiration, Jednostka: mV
          EMG (5 - 500 Hz)  EMG (5 - 500 Hz) 1  PPG (Pulse)  Respiration
Czas [s]
0.000            -0.044556           -0.002136     0.099670     0.192566
0.001            -0.033875           -0.000916     0.099060     0.191956
0.002            -0.018616           -0.003357     0.098450     0.191345
0.003            -0.006714            0.000916     0.097900     0.190735
0.004            -0.002136            0.002747     0.097351     0.190125

Wczytywanie danych z pliku: C:/Users/jan/Documents/Aparatura -
Projekt/legia/jhony\klasik.acq
C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\klasik.acq
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: PPG (Pulse), Jednostka: mV
Nazwa kanału: Respiration, Jednostka: mV
          EMG (5 - 500 Hz)  EMG (5 - 500 Hz) 1  PPG (Pulse)  Respiration
Czas [s]
0.000             0.011597           -0.009460    -0.038940    -0.088501
0.001             0.008240           -0.004578    -0.040466    -0.087891
0.002             0.007019            0.000305    -0.041931    -0.087280
```

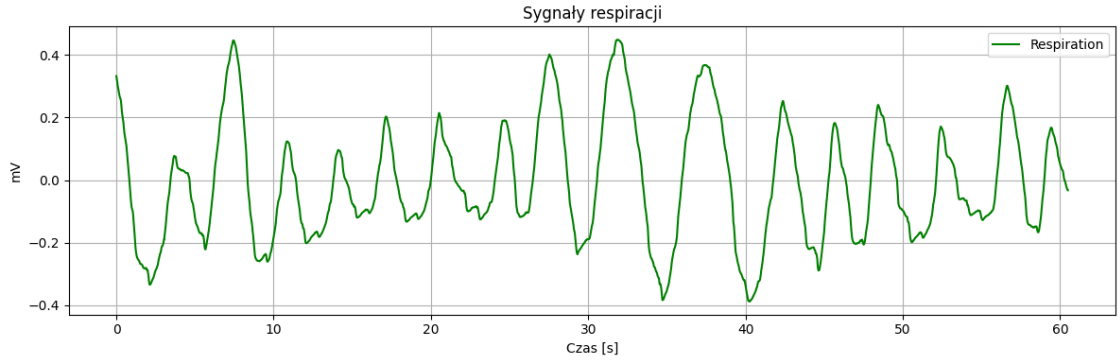
```
0.003             0.005188            0.006409    -0.043457    -0.086975
0.004             0.003662            0.004578    -0.044983    -0.086365

Wczytywanie danych z pliku: C:/Users/jan/Documents/Aparatura -
Projekt/legia/jhony\lif.acq
C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\lif.acq
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: PPG (Pulse), Jednostka: mV
Nazwa kanału: Respiration, Jednostka: mV
          EMG (5 - 500 Hz)  EMG (5 - 500 Hz) 1  PPG (Pulse)  Respiration
Czas [s]
0.000             0.013428           -0.001221     0.102844     0.332336
0.001             0.006714           -0.002747     0.101807     0.332031
0.002             0.001526           -0.007935     0.100769     0.331726
0.003            -0.004272           -0.005798     0.099854     0.331421
0.004            -0.002747            0.000305     0.098999     0.330811

Wczytywanie danych z pliku: C:/Users/jan/Documents/Aparatura -
Projekt/legia/jhony\nothing.acq
C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\nothing.acq
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: PPG (Pulse), Jednostka: mV
Nazwa kanału: Respiration, Jednostka: mV
          EMG (5 - 500 Hz)  EMG (5 - 500 Hz) 1  PPG (Pulse)  Respiration
Czas [s]
0.000            -0.005798           -0.005798    -0.152283    -0.094604
0.001            -0.005798           -0.004272    -0.152588    -0.094604
0.002            -0.009460           -0.002136    -0.152893    -0.094604
0.003            -0.010071           -0.003357    -0.153198    -0.094604
0.004            -0.004883           -0.003967    -0.153503    -0.094604

Wczytywanie danych z pliku: C:/Users/jan/Documents/Aparatura -
Projekt/legia/jhony\reference.acq
C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\reference.acq
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: PPG (Pulse), Jednostka: mV
Nazwa kanału: Respiration, Jednostka: mV
          EMG (5 - 500 Hz)  EMG (5 - 500 Hz) 1  PPG (Pulse)  Respiration
Czas [s]
0.000            -0.034485           -0.013733    -0.001831     0.073547
0.001            -0.047302           -0.012512    -0.002686     0.073242
0.002            -0.046387           -0.013733    -0.003540     0.072937
0.003            -0.041809           -0.012817    -0.004456     0.072327
0.004            -0.027466           -0.019836    -0.005310     0.072021
```

```
Wczytywanie danych z pliku: C:/Users/jan/Documents/Aparatura -
Projekt/legia/jhony\small.acq
C:/Users/jan/Documents/Aparatura - Projekt/legia/jhony\small.acq
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: EMG (5 - 500 Hz), Jednostka: mV
Nazwa kanału: PPG (Pulse), Jednostka: mV
Nazwa kanału: Respiration, Jednostka: mV
          EMG (5 - 500 Hz)  EMG (5 - 500 Hz) 1  PPG (Pulse)  Respiration
Czas [s]
0.000            -0.003357           -0.003052     0.100220    -0.098877
0.001             0.000916           -0.004578     0.100037    -0.098877
0.002             0.023804           -0.002747     0.099915    -0.099182
0.003             0.030212           -0.002136     0.099731    -0.099487
0.004             0.029907           -0.002441     0.099609    -0.099792
```





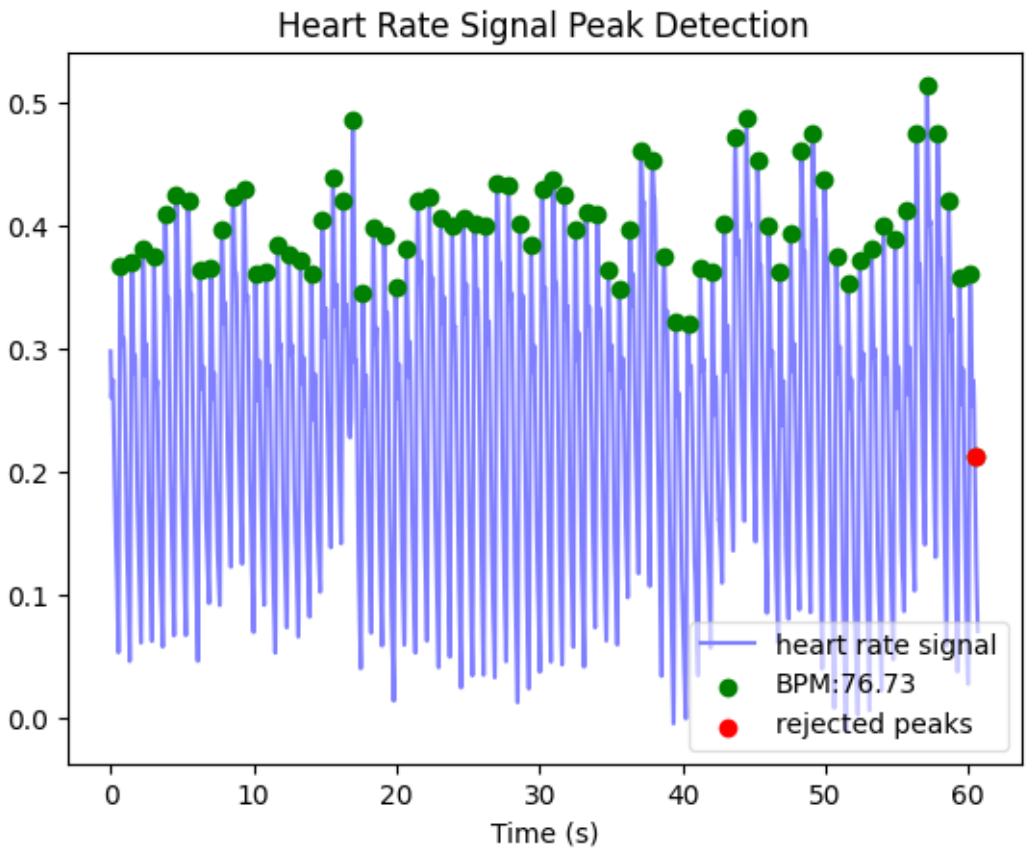


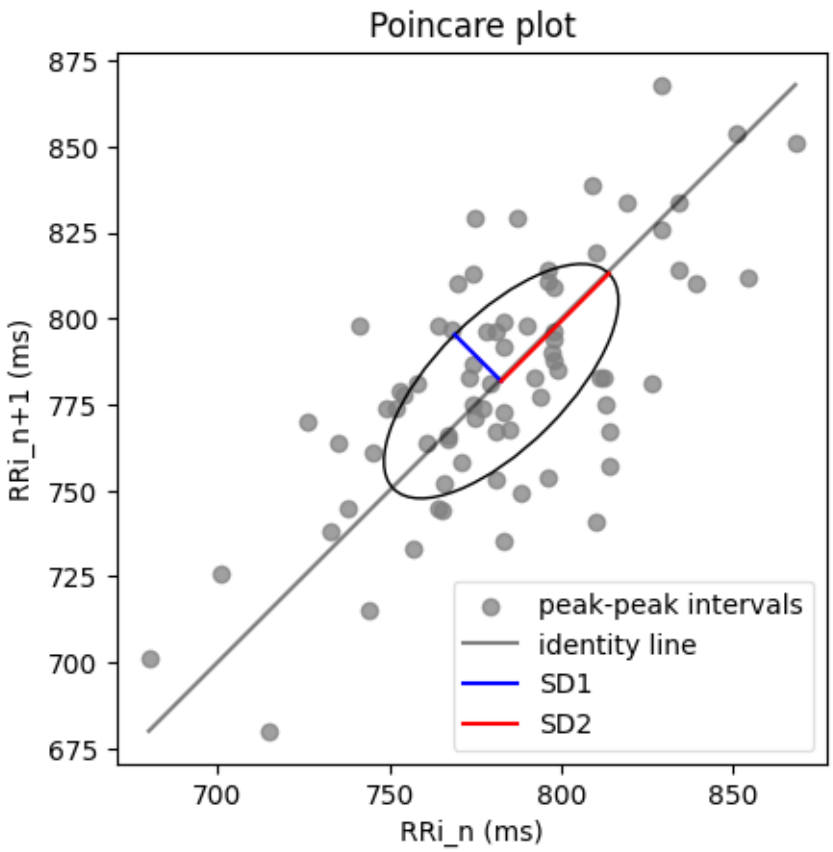


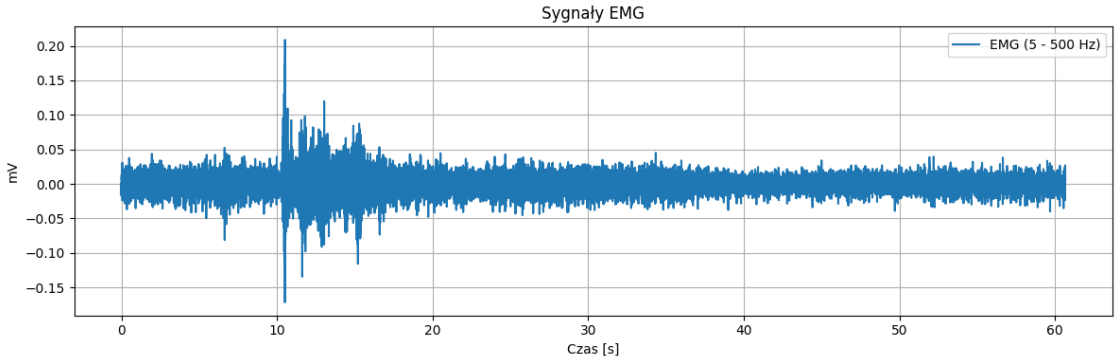

```
c:\Users\jan\Documents\Aparatura - Projekt\venv\Lib\site-
packages\heartpy\analysis.py:522: UserWarning: Short signal.

---------Warning:---------
too few peak-peak intervals for (reliable) frequency domain measure computation,
frequency output measures are still computed but treat them with caution!

HF is usually computed over a minimum of 1 minute of good signal. LF is usually
computed over a minimum of 2 minutes of good signal.VLF is usually computed over
a minimum of 5 minutes of good signal.The LF/HF ratio is usually computed over
minimum 24 hours, although an absolute minimum of 5 min has also been suggested.

For more info see:
Shaffer, F., Ginsberg, J.P. (2017), An Overview of Heart Rate Variability
Metrics and Norms.

Task Force of Pacing and Electrophysiology (1996), Heart Rate Variability, in:
European Heart Journal, vol.17, issue 3, pp354-381

This warning will not repeat
  warnings.warn(msg, UserWarning)
```

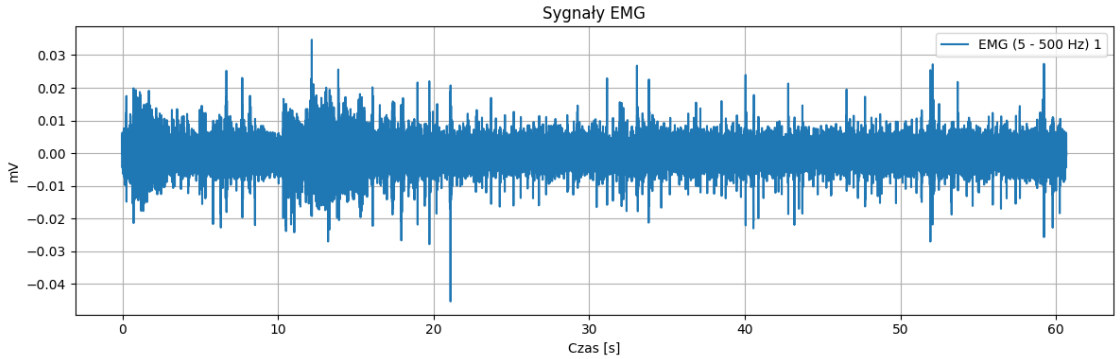
```
c:\Users\jan\Documents\Aparatura - Projekt\venv\Lib\site-
packages\heartpy\visualizeutils.py:119: UserWarning: FigureCanvasAgg is non-
interactive, and thus cannot be shown
  fig.show()
c:\Users\jan\Documents\Aparatura - Projekt\venv\Lib\site-
packages\heartpy\visualizeutils.py:299: UserWarning: FigureCanvasAgg is non-
interactive, and thus cannot be shown
  fig.show()
```

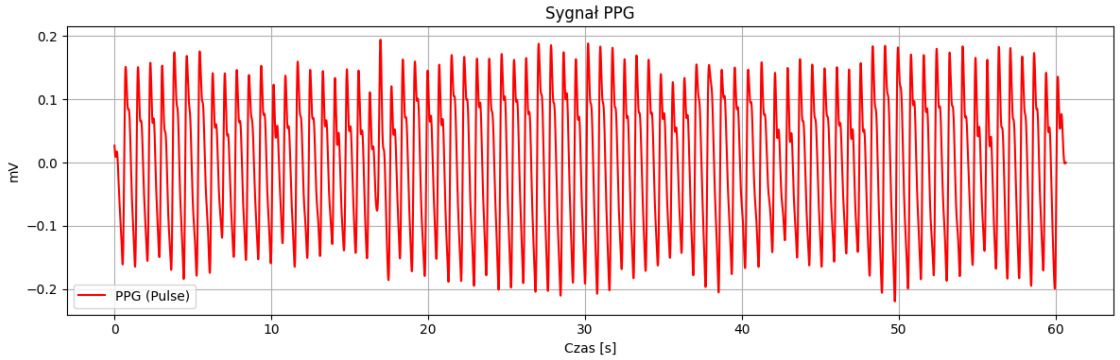
```
bpm: 76.73
ibi: 781.99
sdnn: 34.04
sdsd: 15.80
rmssd: 27.05
pnn20: 0.47
pnn50: 0.05
hr_mad: 17.00
sd1: 19.12
sd2: 44.28
s: 2660.24
sd1/sd2: 0.43
breathingrate: 0.13
vlf: 55.54
lf: 488.44
hf: 145.23
lf/hf: 3.36
p_total: 689.20
vlf_perc: 8.06
lf_perc: 70.87
hf_perc: 21.07
lf_nu: 77.08
hf_nu: 22.92
```

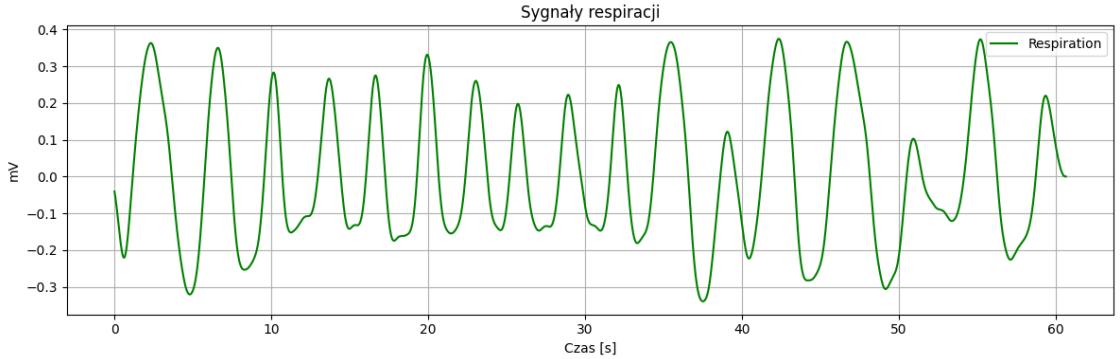

Heart Rate Signal Peak Detection
0.5
0.4
0.3
0.2
0.1
0.0
0
10
20
30
40
50
60
Time (s)
heart rate signal
BPM:76.73
rejected peaks


Poincare plot
RRi_n+1 (ms)
RRi_n (ms)
875
850
825
800
775
750
725
700
675
700
750
800
850
peak-peak intervals
identity line
SD1
SD2


Sygnały EMG
EMG (5 - 500 Hz)
mV
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
0
10
20
30
40
50
60
Czas [s]

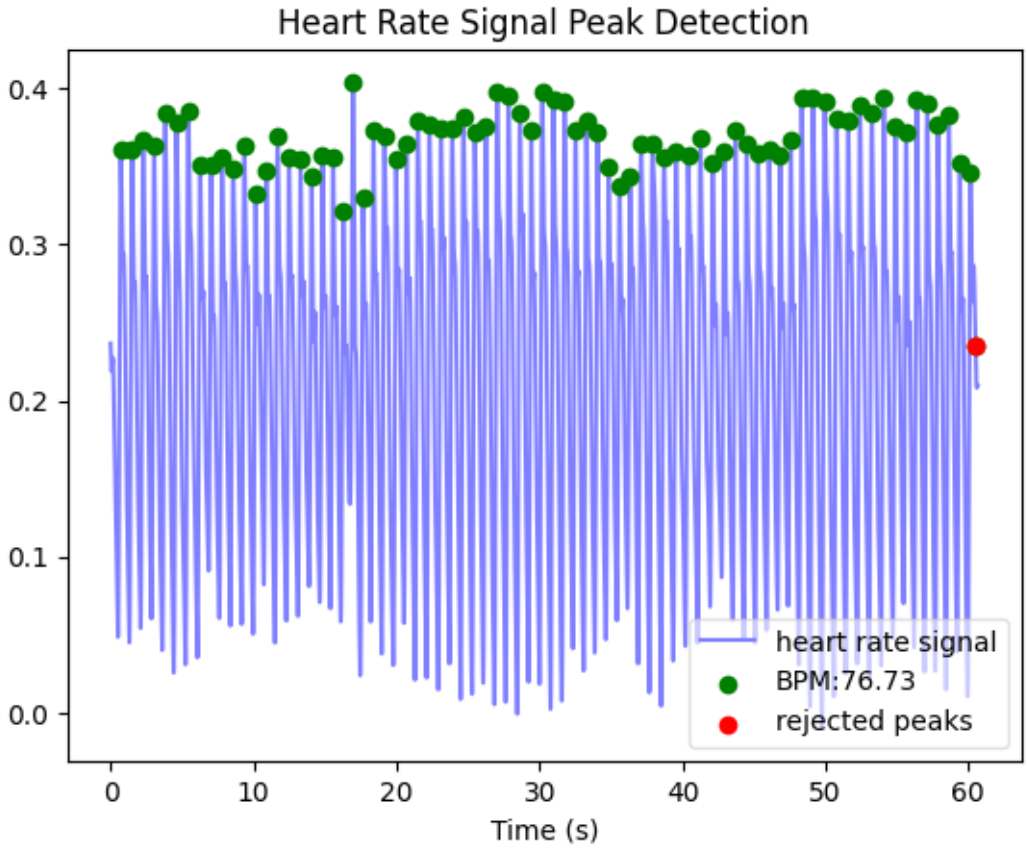


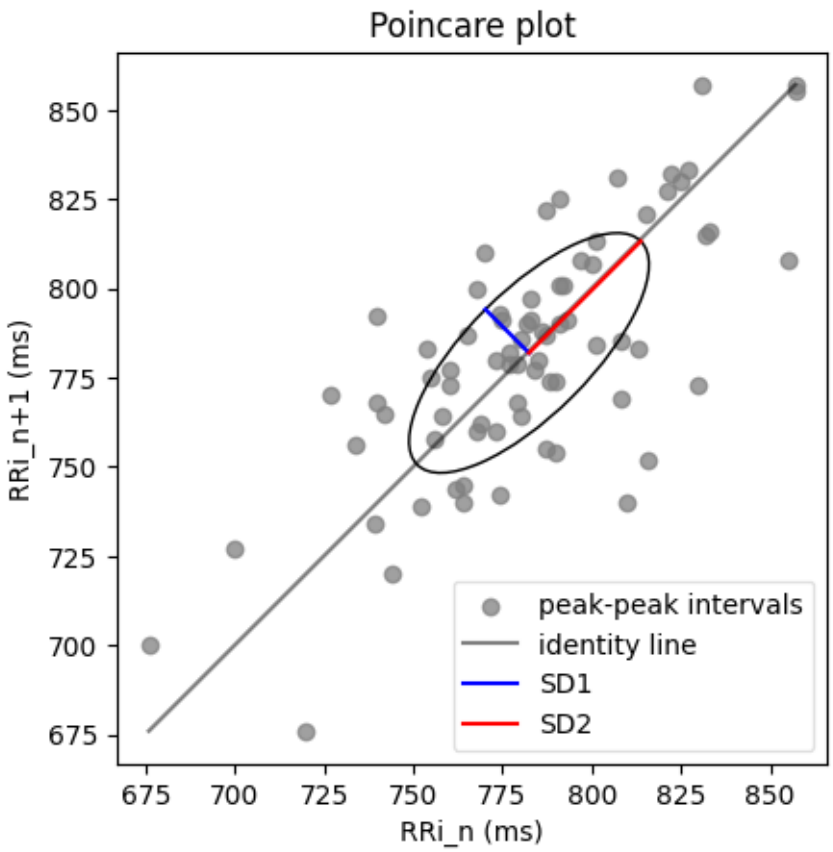


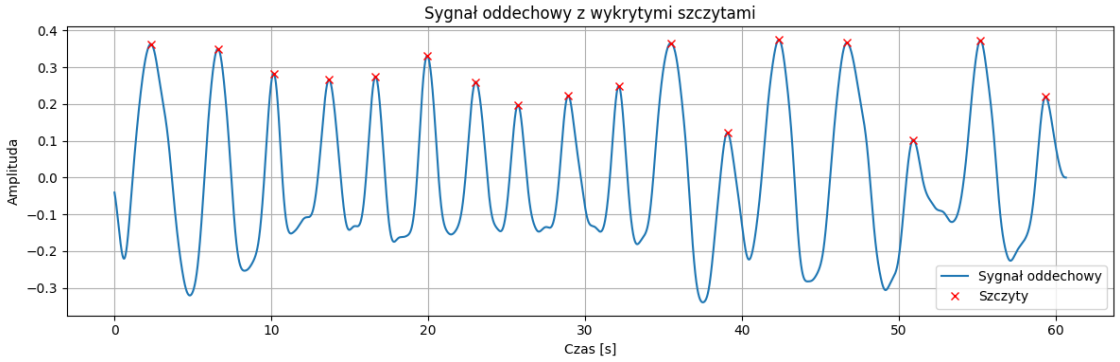



```
bpm: 76.73
ibi: 781.96
sdnn: 33.51
sdsd: 15.44
rmssd: 24.41
pnn20: 0.37
pnn50: 0.05
hr_mad: 18.50
```

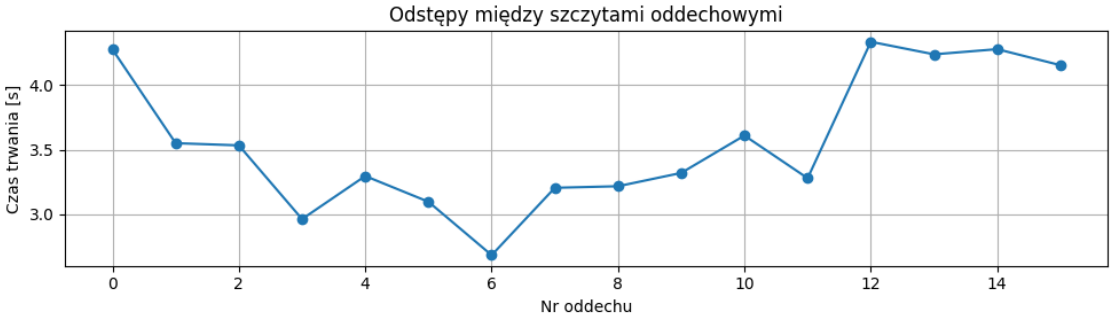
```
sd1: 17.26
sd2: 44.27
s: 2400.14
sd1/sd2: 0.39
breathingrate: 0.13
vlf: 57.99
lf: 517.18
hf: 146.43
lf/hf: 3.53
p_total: 721.59
vlf_perc: 8.04
lf_perc: 71.67
hf_perc: 20.29
lf_nu: 77.93
hf_nu: 22.07
```








```
Średnia częstość oddechu: 16.82 oddechów/min
Średni odstęp między oddechami: 3.57 s
Odchylenie standardowe odstępów: 0.51 s
Współczynnik zmienności: 14.41 %
```


Odstępy między szczytami oddechowymi
Czas trwania [s]
4.0
3.5
3.0
0
2
4
6
8
10
12
14
Nr oddechu