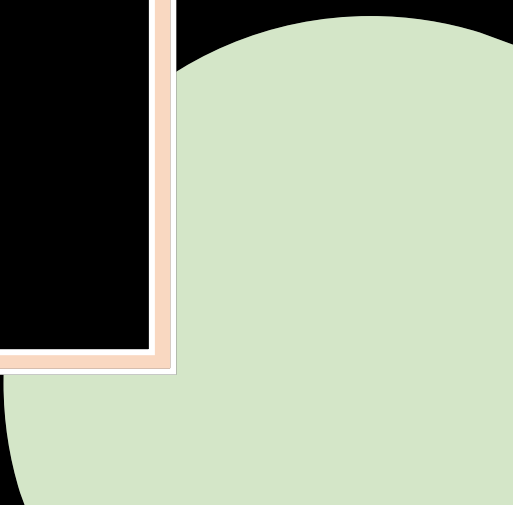# Challenge 2021: ICU False Alarm Detection

Physiological Signals Processing

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Signal Pre-processing

Filtering

- Filters implemented in each function, provided by BioSPPy.

ECG segmentation

- QRS detection using Hamilton segmenter.
- Last ten seconds are used in order to detect the false alarm.
- Extraction of individual heartbeats and its respective RR intervals using BioSPPy.

Procedure

- We employ the envelope of an ECG signal.
- Spectral estimation: Using the Welch´s periodgram of the first and second half of envelope of the signal.
- We trained four different Bayes detectors depending on the available signals of each patient (ECG, ABP, PLETH, PLETH + ABP).

First half of the periodogram
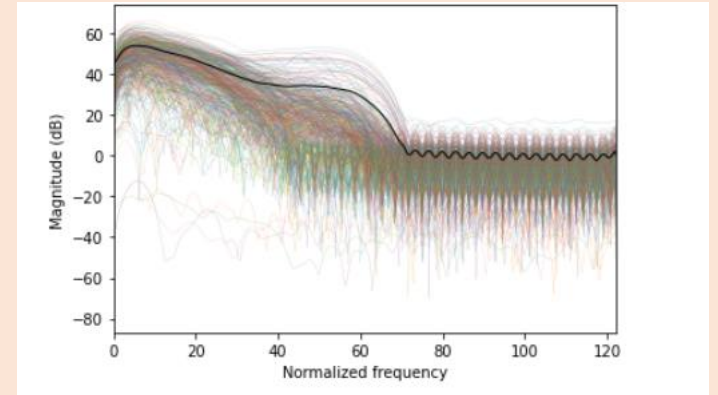
Second half of the periodogram
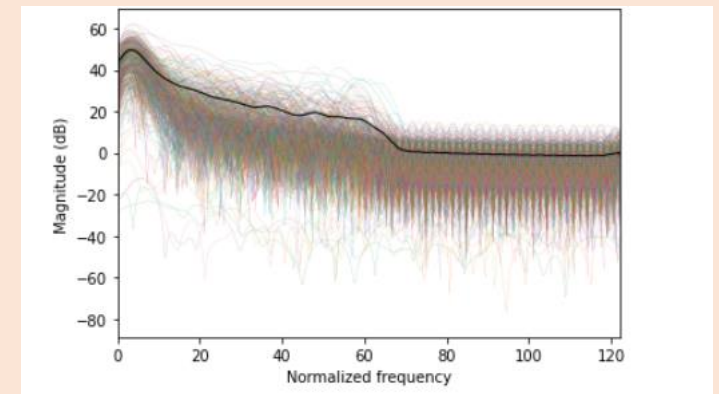
Features Extraction

- Standard deviation of HR
- Standard deviation of the instantaneous frequency maxima.
- Hjorths descriptors: activity, mobility, complexity.
- Ratio between the Average Power in the QRS band and the total Average Power.
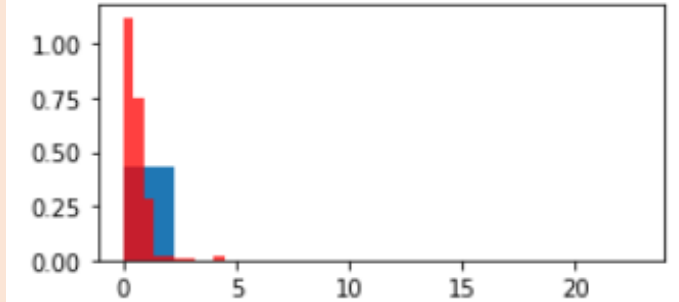- Standard deviation of the signals.

Why?

- Some characteristics between the true and false alarms are significantly different with a 90% confidence level.
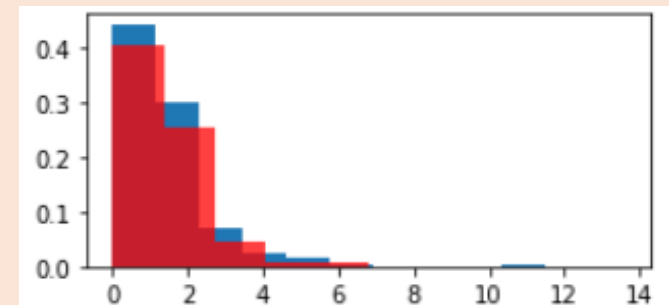
Features from...

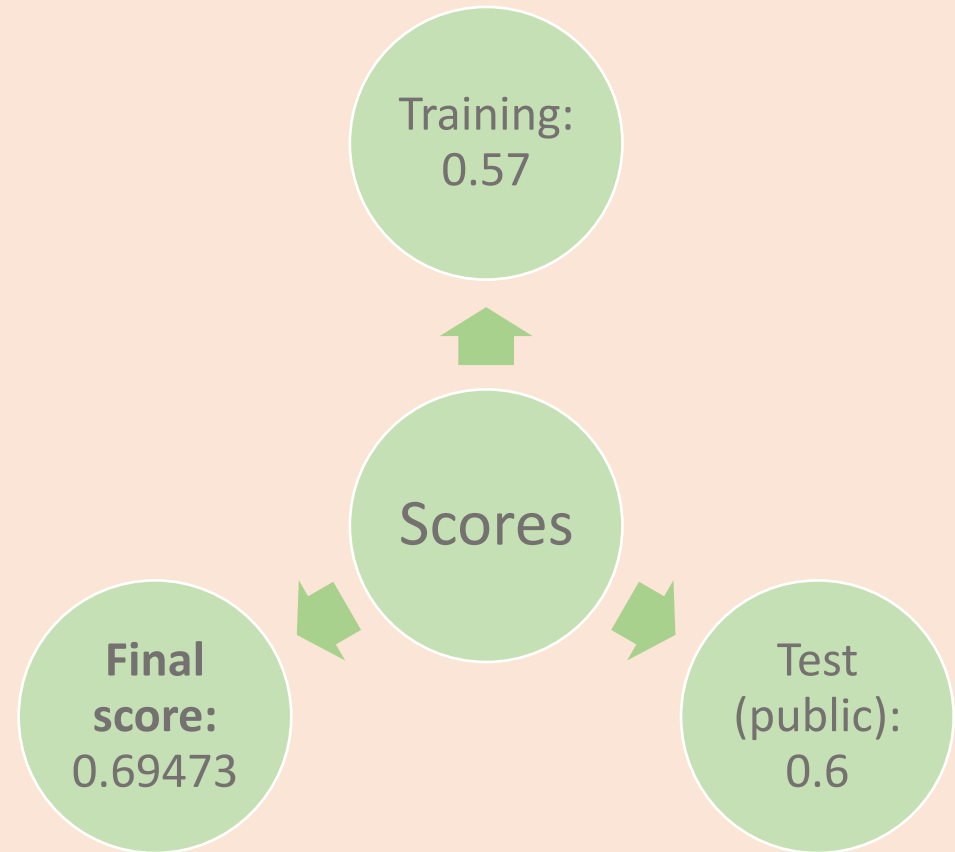- ABP
- PLETH
- ECG

Mobility : Dominant frequency

Complexity : Bandwidth

Analysis & Score

Our performance is better than expected since we used 4 detectors for each scenario that we have considering, achieving thus a better score.

Training: 0.57

Scores

Final score: 0.69473

Test (public): 0.6

Discussion & Conclusions

Strengths of our algorithm

Mobility is a highly descriptive feature.

4 different Bayes detectors: greater especificity for each scenario.

Standard deviation of the different signals.

We incorporate ABP and PLETH.

Weaknesses

Some characteristics of True and False Alarm overlap.

Not adequately managing the case of "strange" signals.

Summary

Final position: #13

Results can be easily improved by:
- Adding some other more relevant features.
- Having a more accurate management of the "strange" signals.

We have finally improve our programming skills through this Challenge.

Thank you all!