

InSense

Signal and Data Analysis

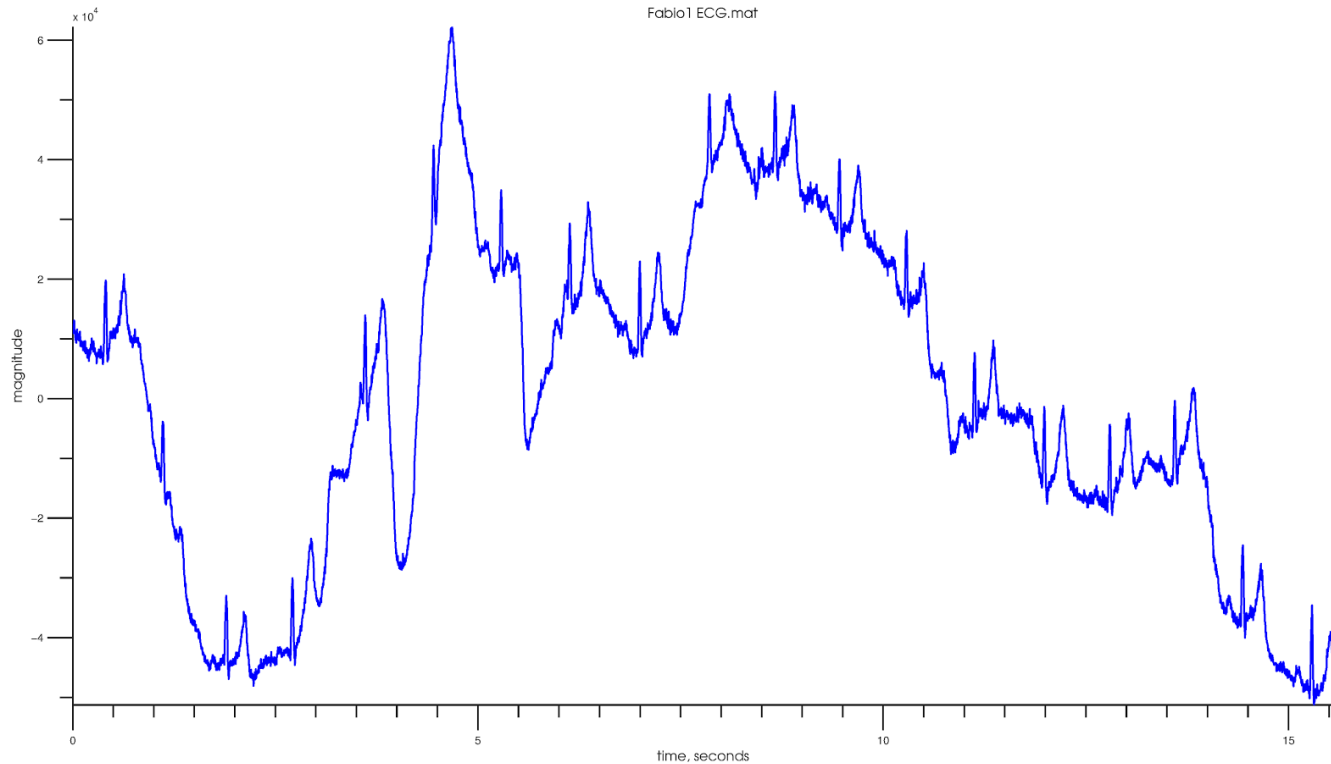
Procedure

- 5 subjects
- 2 exams per subject = 10 exams
- \approx 20 secs each

2 exams chosen for demonstration

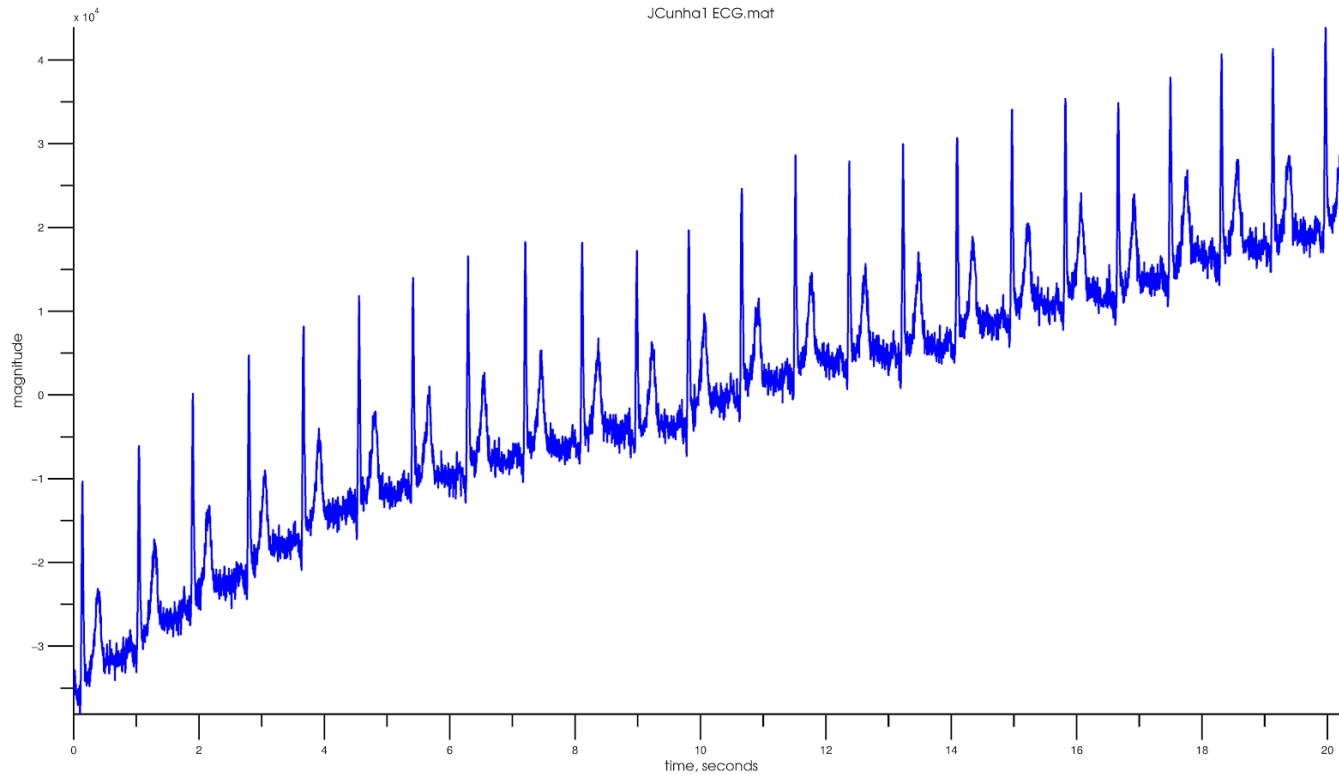
Raw Signal

Exam A:



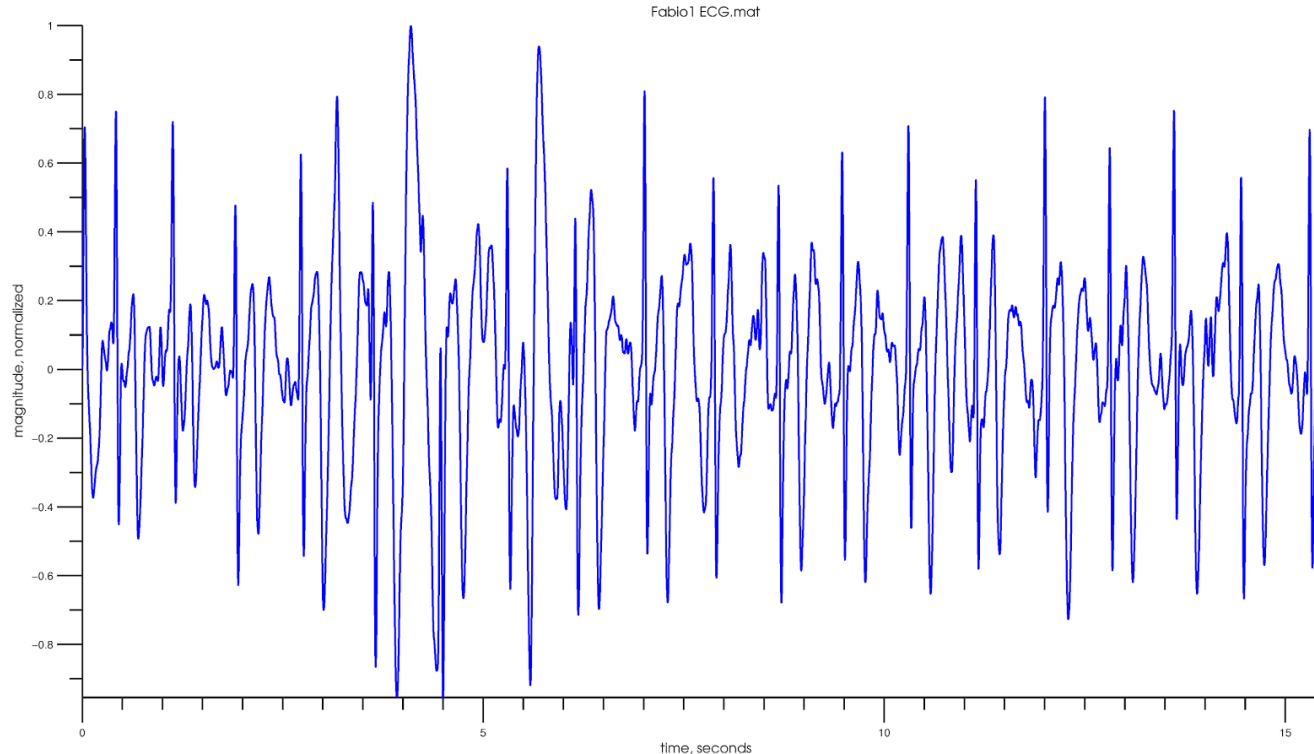
Raw Signal

Exam B:



Applying LP and HP filters

Exam A:

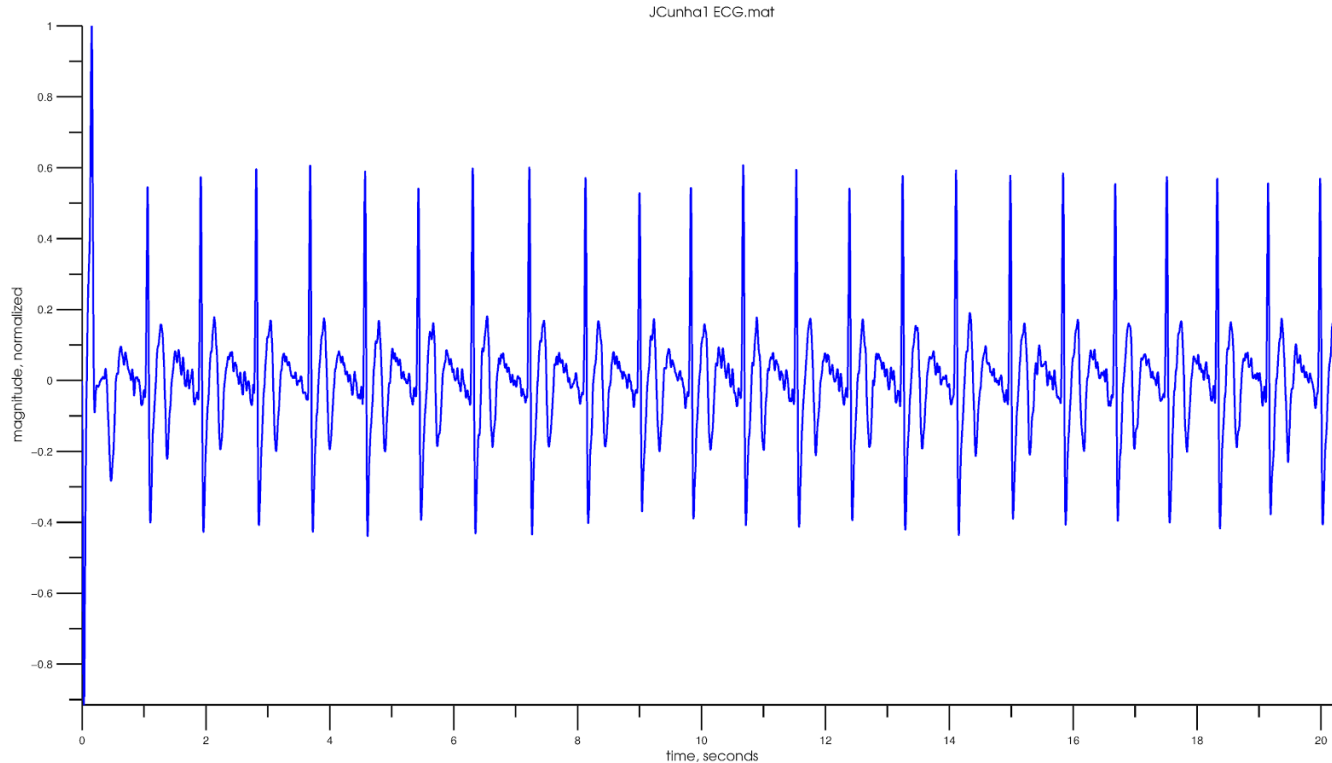


Notes:

- 3rd order Butterworth filters
- Low-pass @ $F_c = 18$ Hz
- High-pass @ $F_c = 2$ Hz
- $F_s = 500$ Hz
- Processed in Matlab

Applying LP and HP filters

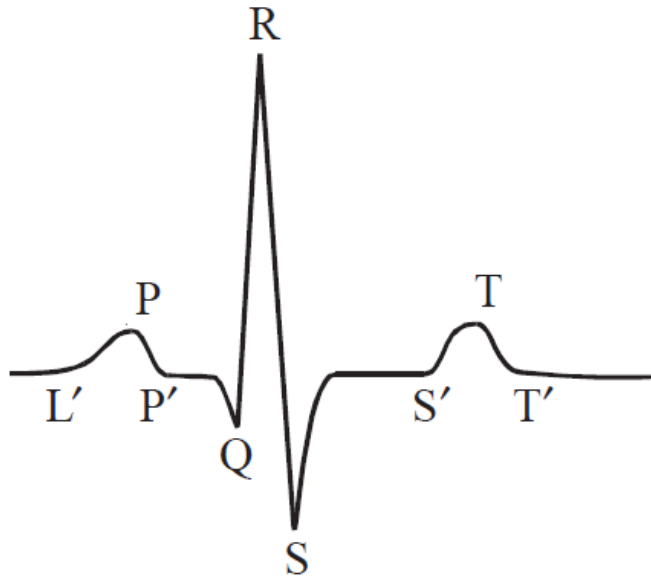
Exam B:



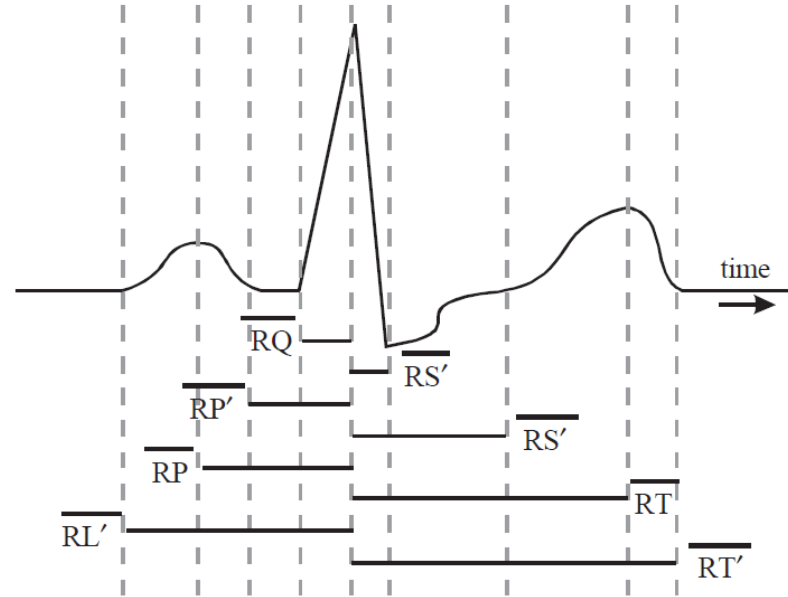
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Ecg wave - Fiducial Points



Ecg fiducial points*



Distances among the Ecg fiducials*

* - Figures extracted from paper entitled "Ecg to identify individuals", Steven A. Israel *et al*, *Pattern Recognition*, 2005

Signal Quality

Good quality:

- 1 subject
- 2 exams

Bad quality:

- 4 subjects
- 8 exams

→ **R peak** well depicted

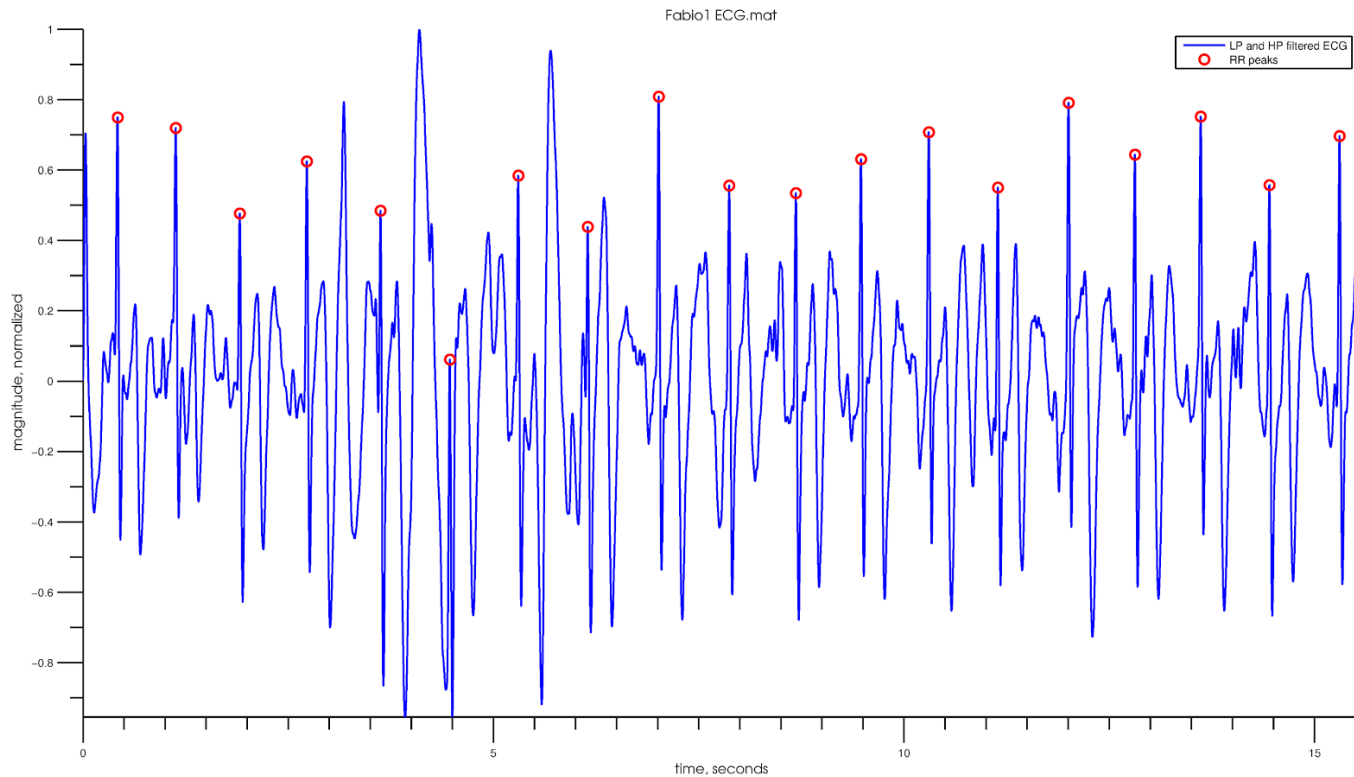
→ **T peak** well observed in most cases

→ **P peak** not easily or not observed at all

Detecting R peaks*

* - Using the Pan-Thompkins algorithm

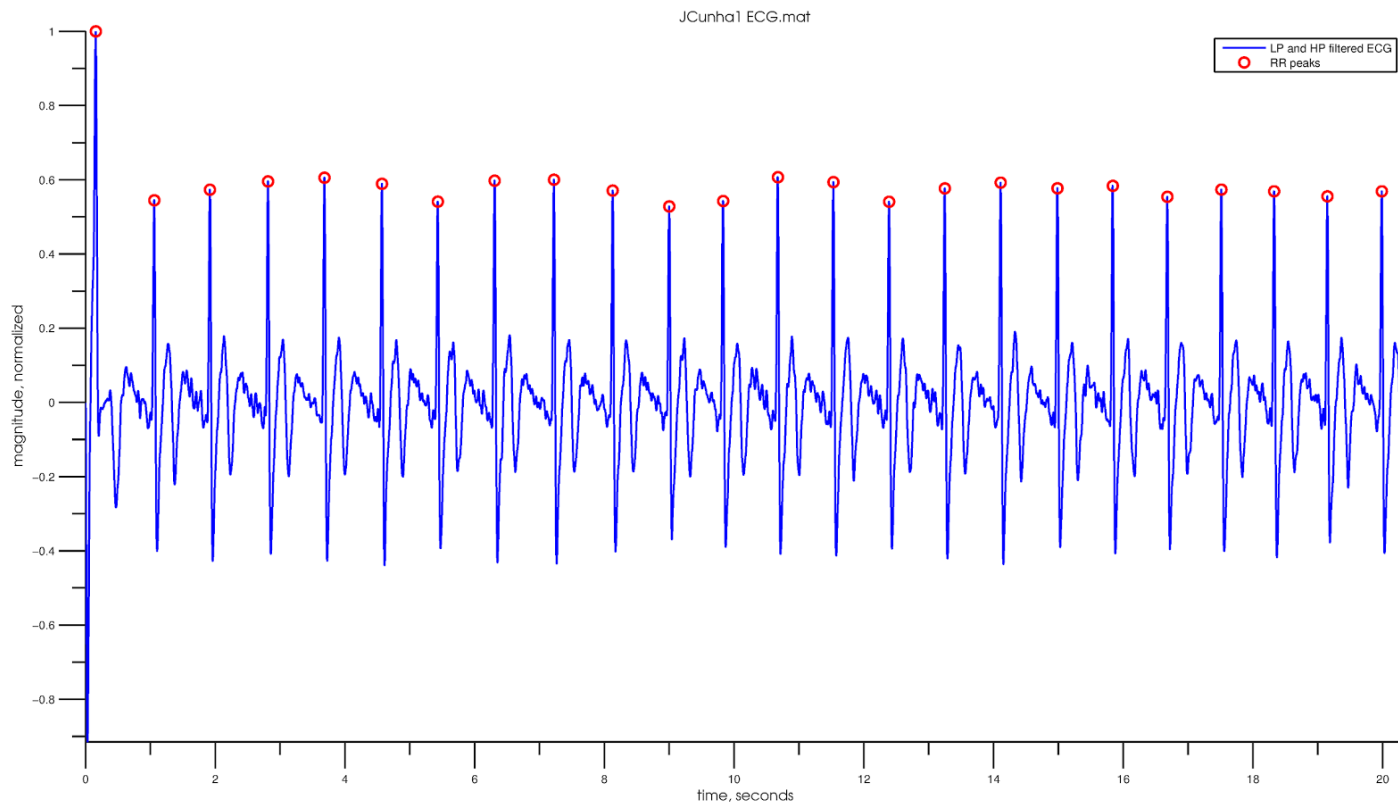
Exam A:



Detecting R peaks*

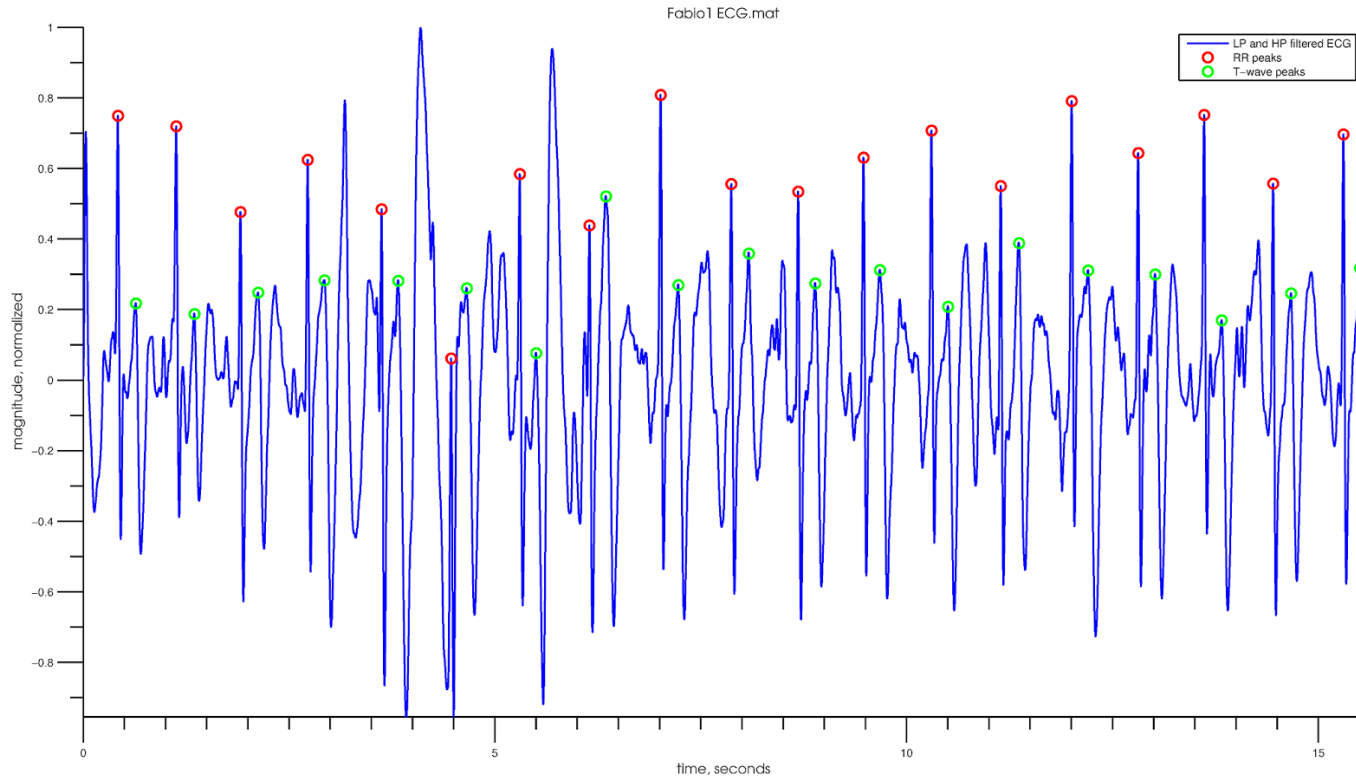
* - Using the Pan-Thompkins algorithm

Exam B:



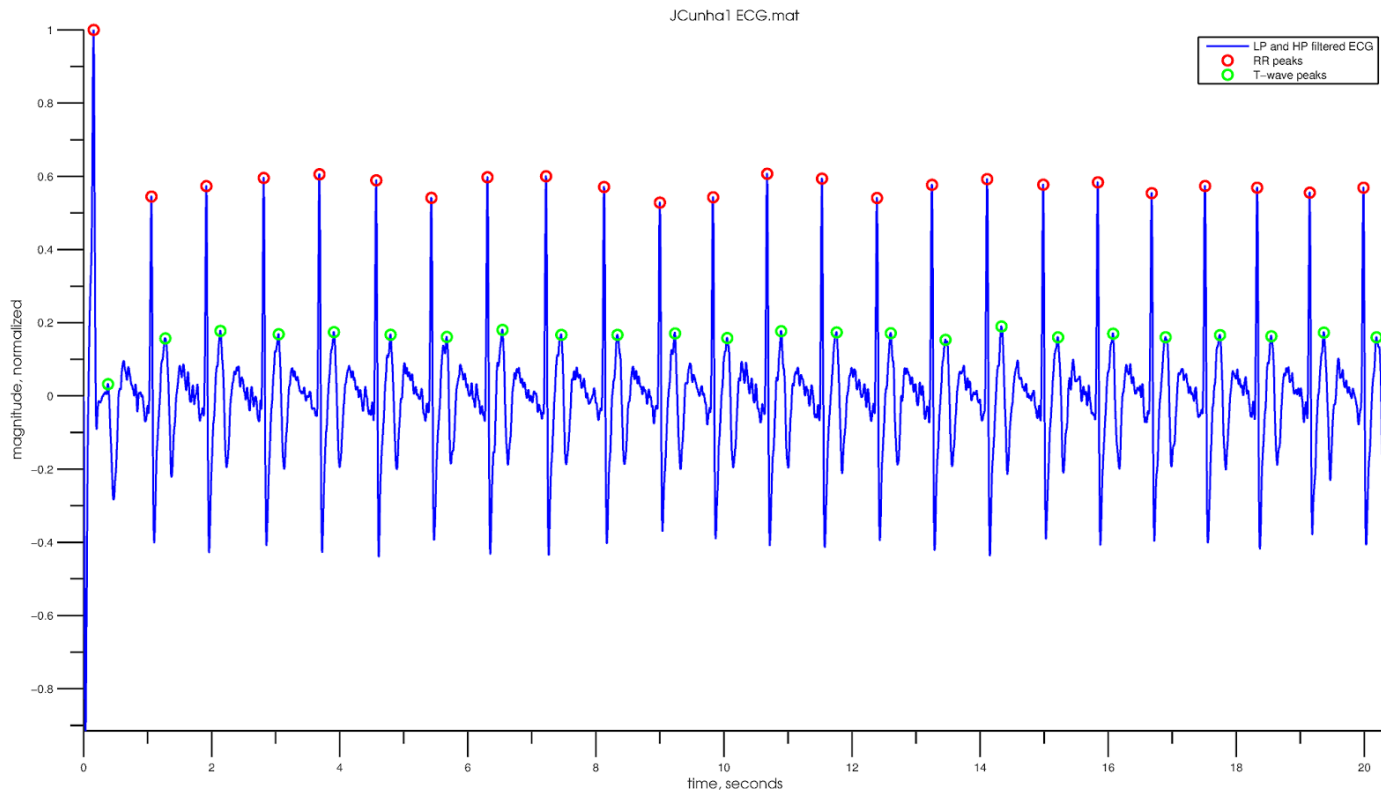
Detecting T peaks

Exam A:



Detecting T peaks

Exam B:



Biometrics: RT segments

For the Features:

- RT segment
- RT segment / mean of RR intervals

We computed:









































- Mean
- Coefficient of variation (Sd / Mean)

Subject	Exam	RT_Mean*	RT_Cv**	RT/RRm_Mean	RT/RRm_Cv**
Fabio	1	0.208	4.37	0.251	4.37
	2	0.209	3.73	0.249	3.73
JP Cunha	1	0.224	4.44	0.260	4.44
	2	0.226	6.96	0.258	6.96
Óscar	1	0.189	20.18	0.212	20.18
	2	0.176	19.62	0.194	19.62
Paulo	1	0.264	20.24	0.295	20.24
	2	0.269	16.28	0.303	16.28
Tiago	1	0.194	12.57	0.211	12.57
	2	0.214	23.68	0.216	23.68

* - given in seconds

** - given in %

Biometrics: RT segments

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Biometrics: individual intervals

By simply defining 1 interval per subject: (mean \pm sd)

[0.1989, 0.2181]

[0.2115, 0.2395]

[0.1400, 0.2200]

[0.2201, 0.3190]

[0.1560, 0.2490]

Impossible to get non-overlapping intervals.

Too much variation occurs in the last 3 subjects.

To sum up

RT segments alone cannot differentiate people!*

Because either:

1. The Ecg is too noisy for most cases
2. Or further investigation is needed:
more features need to be extracted, different models applied..

* - Based on this model and within this context.

Thank you

Team:

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