



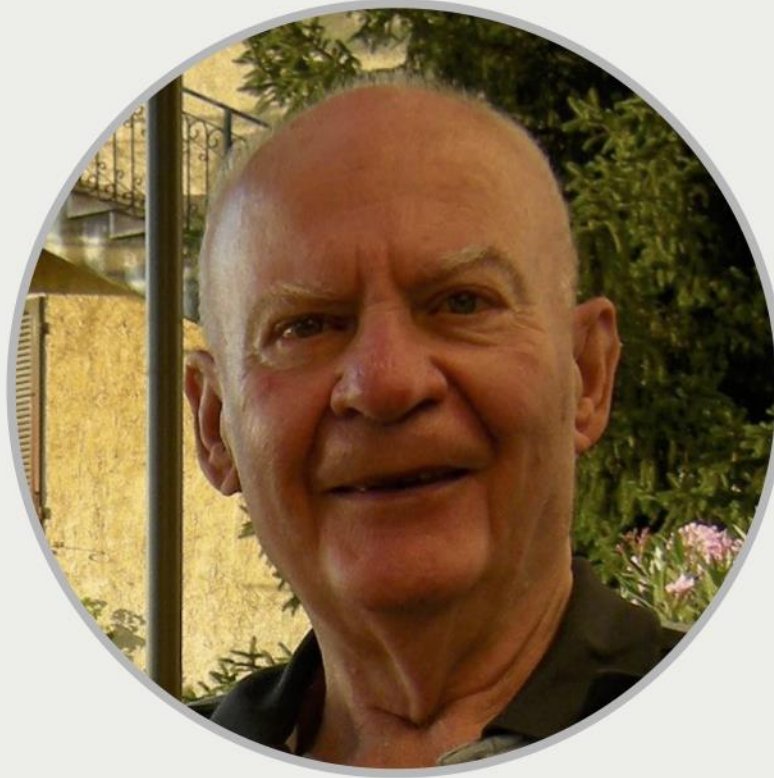
# HeartWatch



keep your heart watched

[www.heartwatch.it](http://www.heartwatch.it)

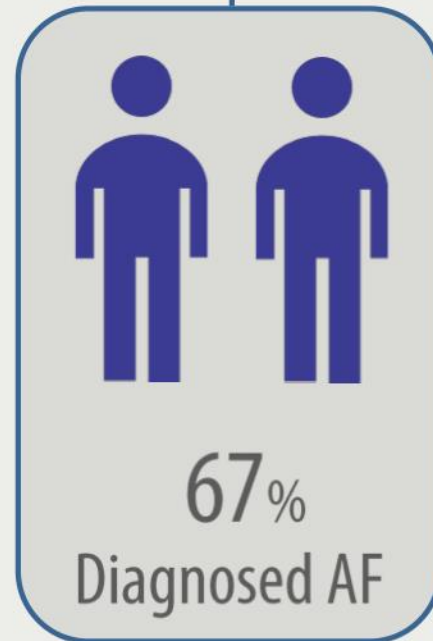
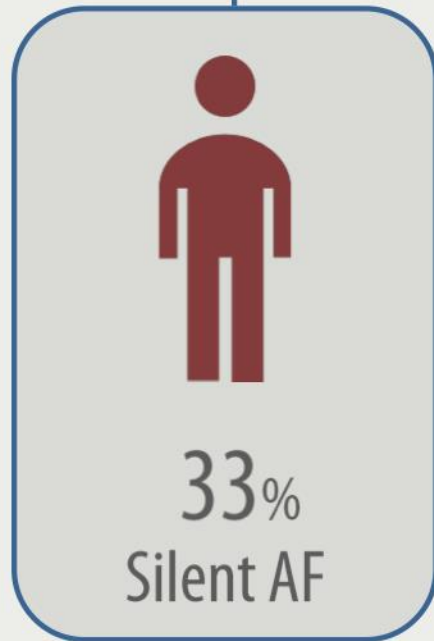
## A personal story



My grandfather suffered of **stroke**  
caused by **asymptomatic** heart problems

# How could this happen?

 33,5m people suffer from AF



AF can be paroxysmal



AF can be asymptomatic

# HeartWatch

Preventive Level 1 Device for Heart and Respiratory functions



your face  
*or any other  
exposed skin*

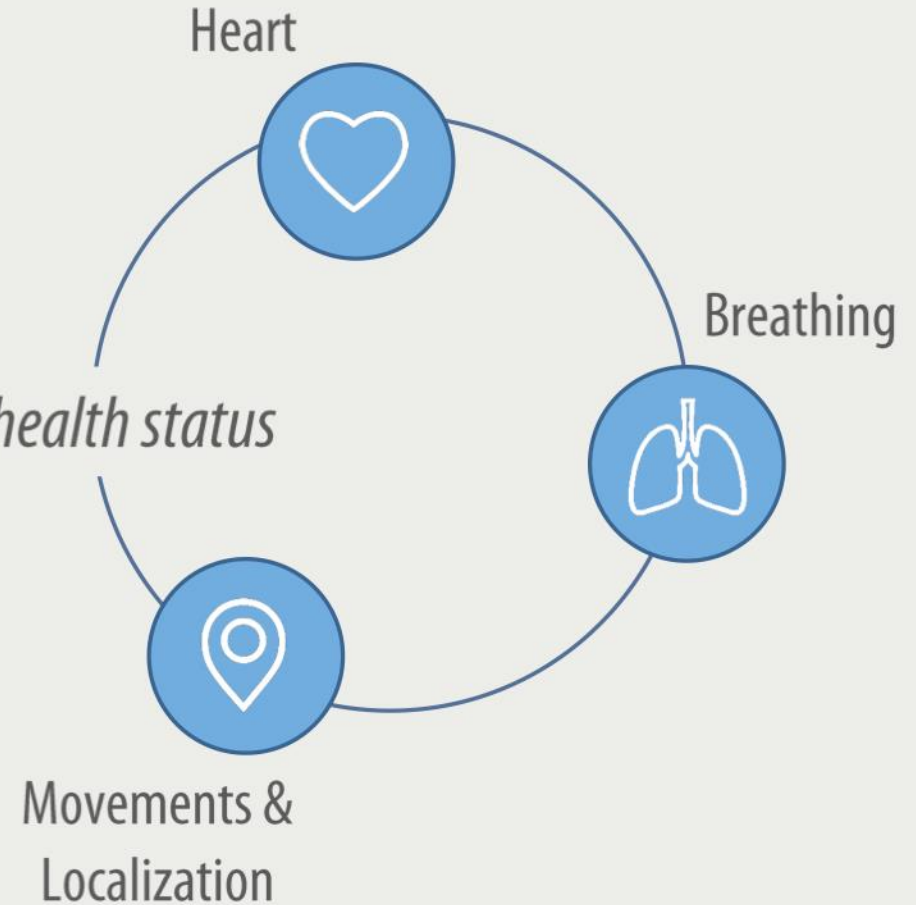
+

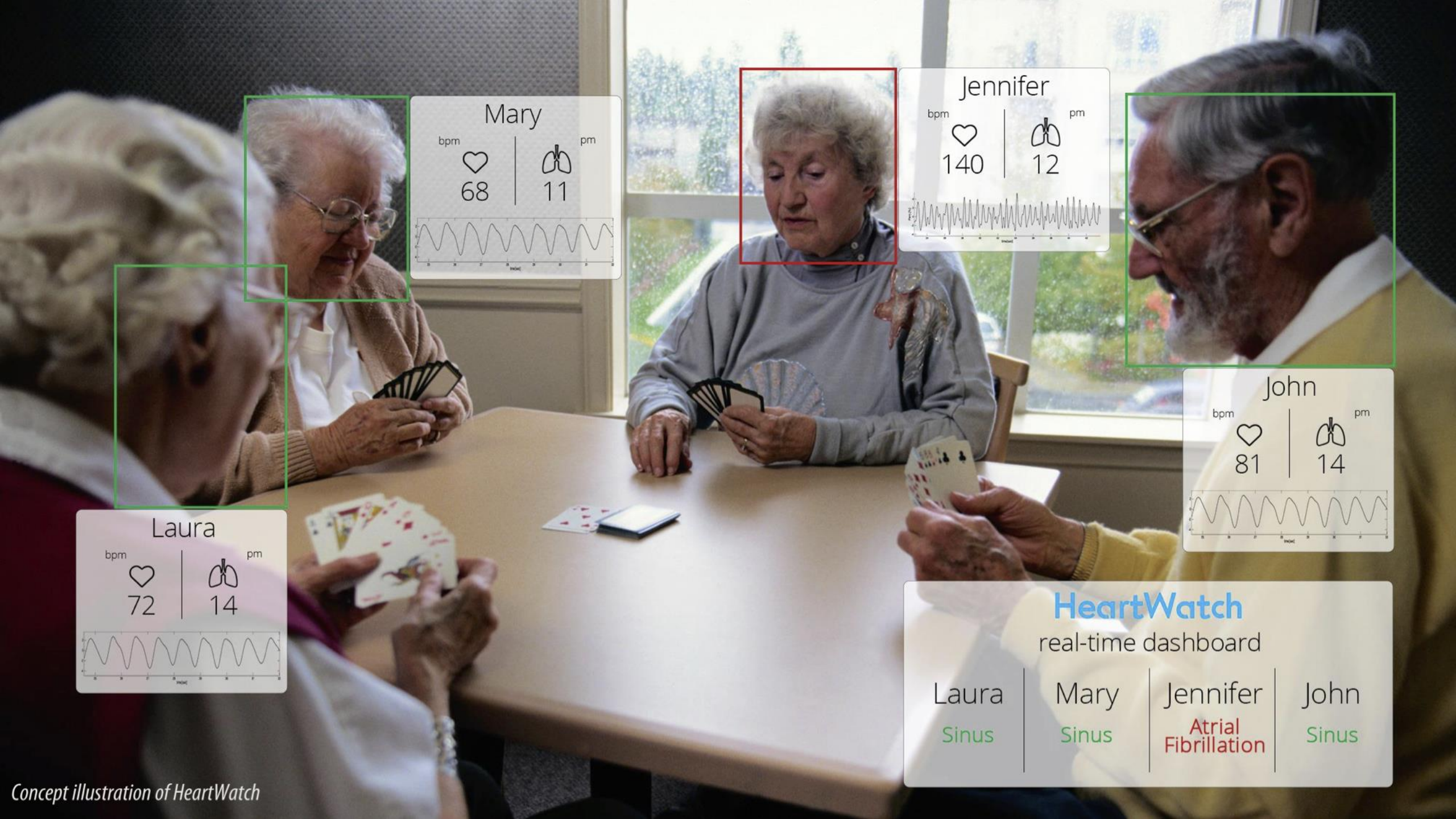


any camera  
*smartphone,  
PC or custom*

=

*Your health status*



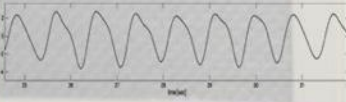


Mary

bpm | pm

♥ | 🫁

68 | 11



Jennifer

bpm | pm

♥ | 🫁

140 | 12

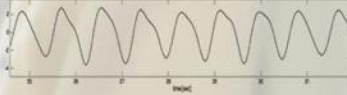


John

bpm | pm

♥ | 🫁

81 | 14

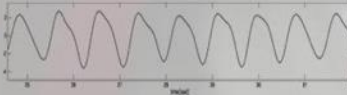


Laura

bpm | pm

♥ | 🫁

72 | 14



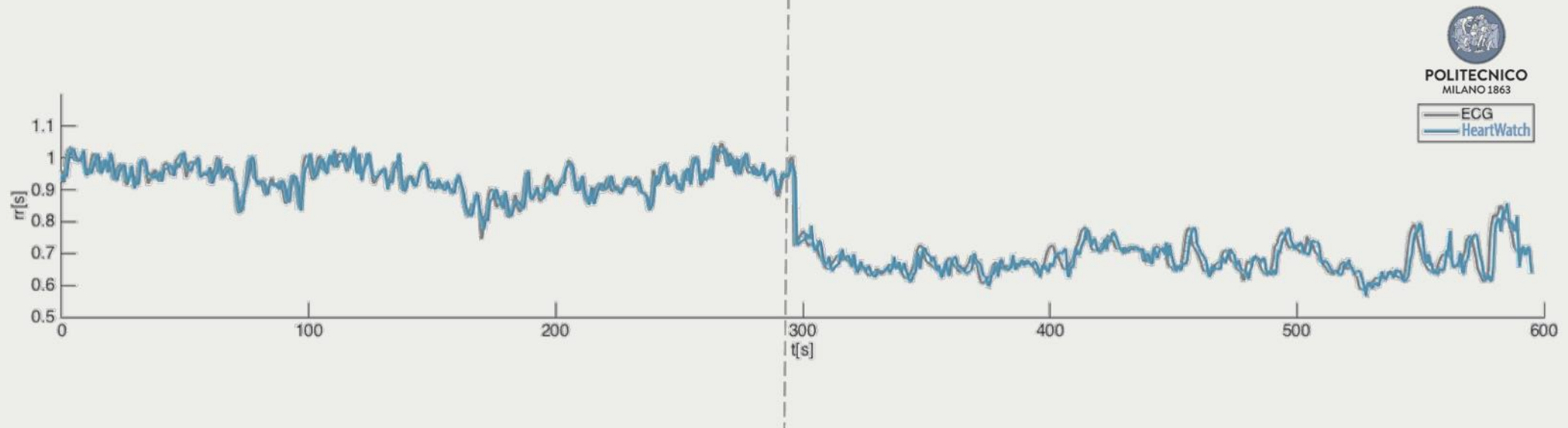
**HeartWatch**  
real-time dashboard

|       |       |                     |       |
|-------|-------|---------------------|-------|
| Laura | Mary  | Jennifer            | John  |
| Sinus | Sinus | Atrial Fibrillation | Sinus |

Concept illustration of HeartWatch

# Accuracy of HeartWatch

Beat to beat comparison on **80 healthy** subjects



97,5%

Accuracy

99%

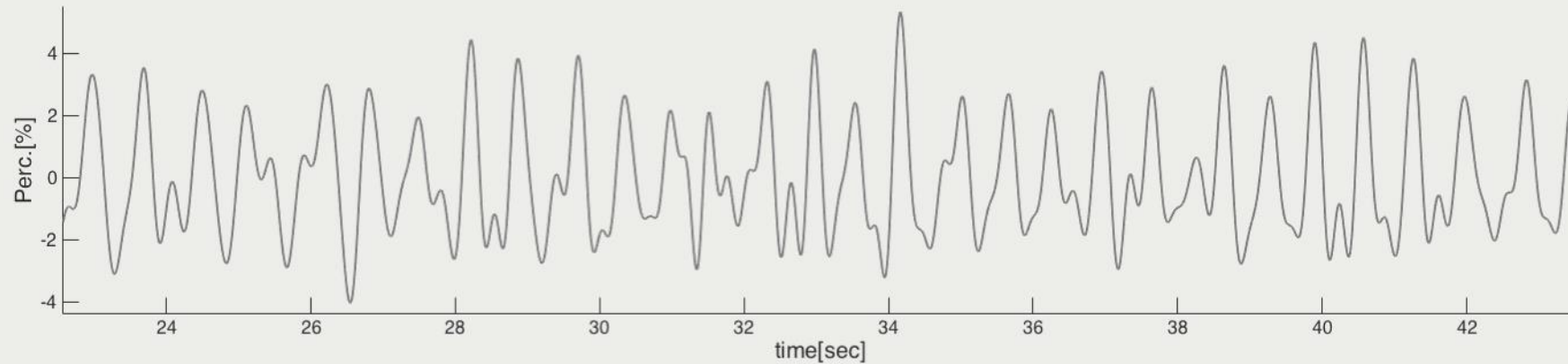
Sensitivity

98,3%

Positive Prediction

# Atrial Fibrillation Clinical Study

Clinical Trial on **80 healthy** subjects  
[November 2016 – April 2017]



*Sinus Rhythm*

92%

Accuracy

*Atrial Fibrillation*

92%

Accuracy

*Other Arrhythmias*

89%

Accuracy

*Signals obtained from Clinical Trial at Policlinico Maggiore of Milan. Results still to be published.*

# Main achievements



## Working Prototype

Cardiac Signal detection and first features



## 5 Scientific Publications

Major international biomedical journals\*



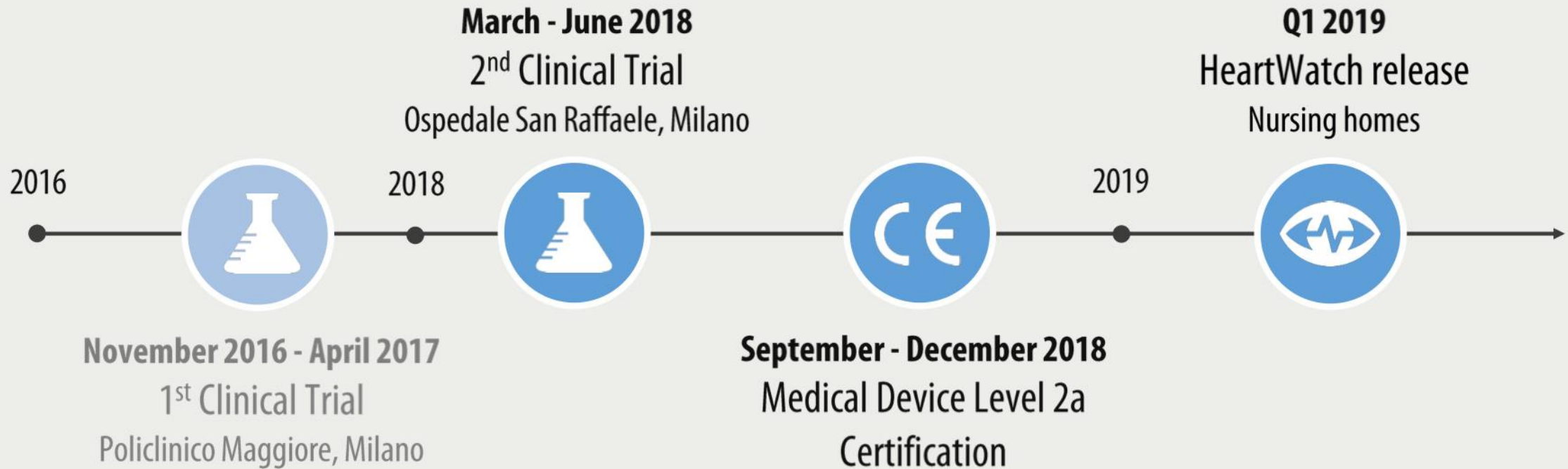
## LifeTech Fusion in Geneva

September 2017 – September 2018

*\*Physiological Measurements, Biomedical Engineering / Biomedizinische Technik,*



# Roadmap



# The team

## Founders



**Luca Iozzia, PhD**

**CTO**

Biomedical Engineering  
*Politecnico di Milano*



**Guido Magrin**

**CEO**

Business & Product Dev  
*Politecnico di Milano*



**Roberto Salamina**

**CMO**

Business Development  
*Politecnico di Milano*

## Main Advisors



**Stefano Benussi**

Director Cardiac Surgery Program  
*University Hospital Zurich*



**Domenico Cianflone**

Director Cardiovascular Rehab  
*Ospedale San Raffaele*



**Riccardo Barbieri**

Biomedical Engineering Prof.  
*MIT - Polimi*

## Main Collaborators



**Luca Bruno**

CIO, Web Developer  
*Università di Padova*



**Matteo Pilotto**

Design Engineer  
*Politecnico di Milano*



**Davide Silvestri, PhD**

Machine Learning & Signals  
*Università di Modena*

# Our vision



**Contactless** monitoring of heart and respiratory diseases,  
available to **everyone**



Guido Magrin  
CEO & co-founder

[guidom@heartwatch.it](mailto:guidom@heartwatch.it)

*Main Partners*



# Main Scientific Publications

L. Cerina, L. Iozzia, L. T. Mainardi,

**“Influence of acquisition frame-rate and video compression techniques on pulse-rate variability estimation from vPPG signal”**,  
Biom. Eng. / Biom. Technik., under submission.

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L. Iozzia, L. Cerina, L. T. Mainardi,

**“Relationships between Heart–Rate Variability and Pulse–Rate Variability obtained from video-PPG signal using ZCA”**,  
Physiological Measurements.

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L. Iozzia, L. Cerina, L. T. Mainardi,

**“Assessment of beat-to- beat heart rate detection method using a camera as contactless sensor”**,  
38th Annual International Conference of the IEEE Engineering in Medicine.

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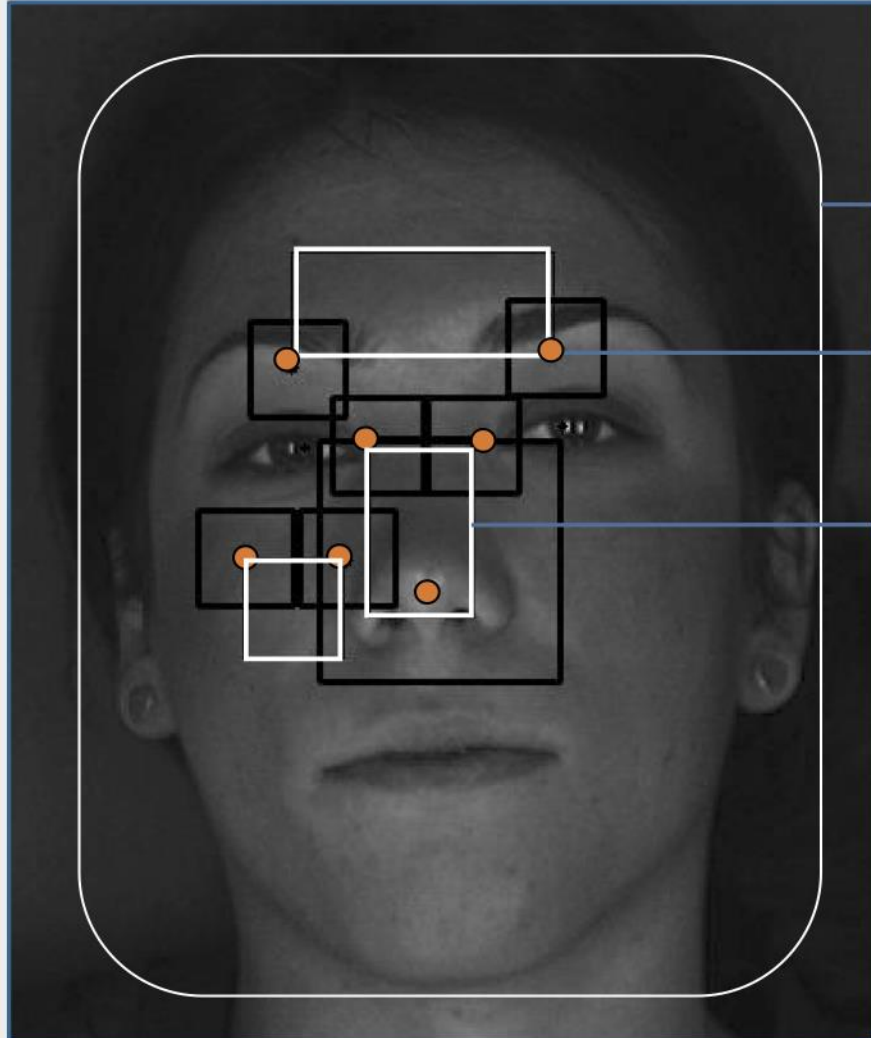
G. Valenza, L. Iozzia, L. Cerina, L.T, Mainardi, R. Barbieri,

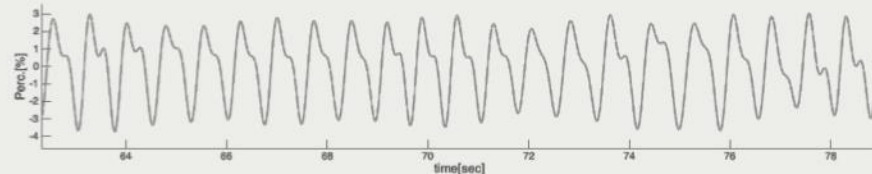
**“Preliminary investigation of instantaneous cardiovascular dynamics from contactless video-photoplethysmography”**,  
8th International Workshop on Biosignal Interpretation.

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# Basics of camera cardiac signal detection

# How does HeartWatch work?



- 0 Access HeartWatch software and start video recording
  - 1 Face Detection
  - 2 Identification of 7 fiducial points
  - 3 Identification of 3 Regions of Interests (ROIs)  
(forehead, nose, cheek)
  - 4 Cardiac signal extraction by small color changes in the ROIs
- 
- 5 Signal Entropy quantification -> **likelihood of A-Fib presence**

# Minimum requirements



Good lightning conditions



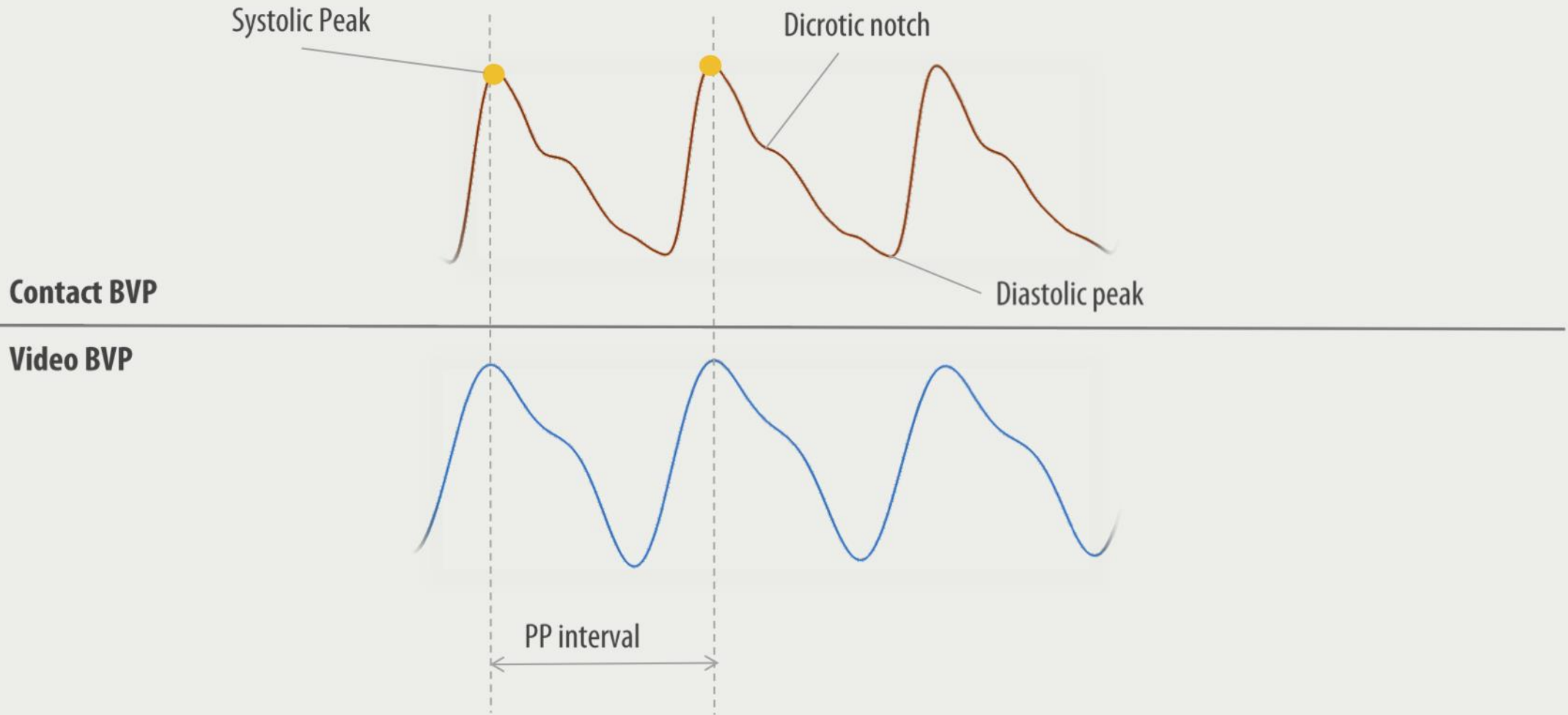
Limited movements by the user



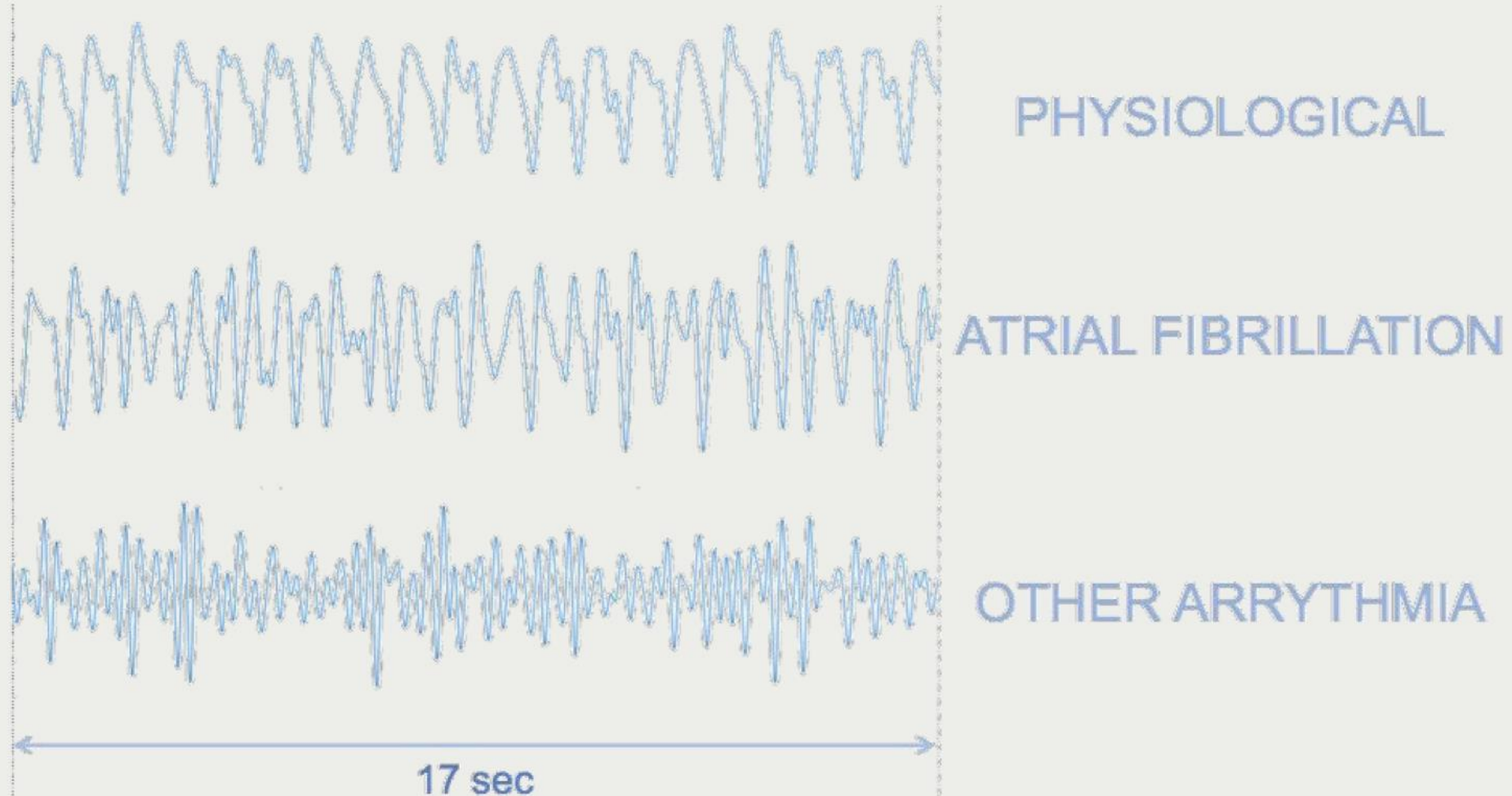
>2 megapixel camera resolution



# Comparison, Contact BVP - VideoBVP

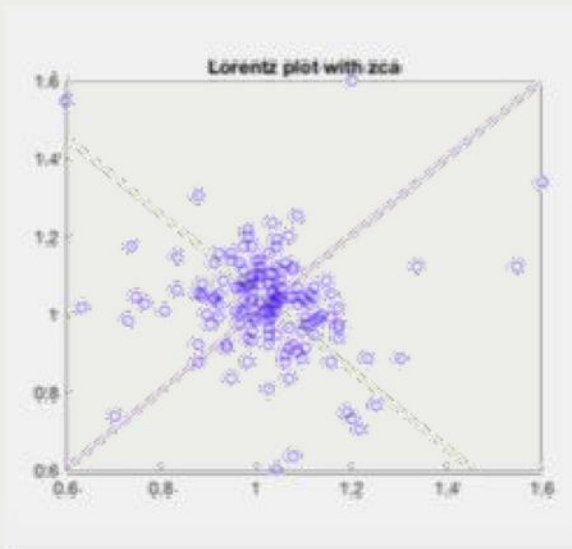


# Comparison, different Arrhythmias

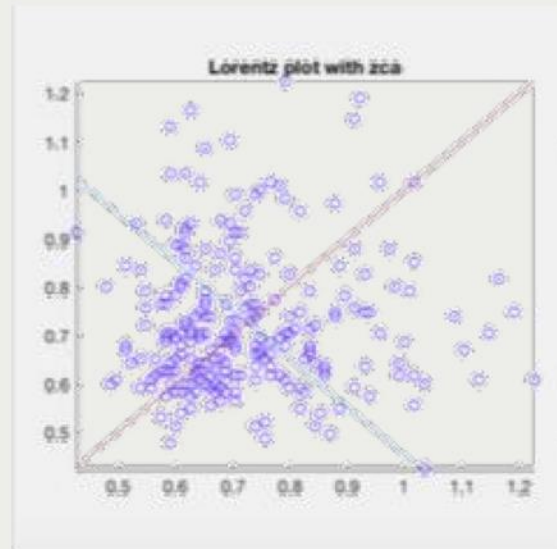


*Signals obtained with HeartWatch tech, from a clinical trial in progress at Policlinico Maggiore di Milano. Results to be published.*

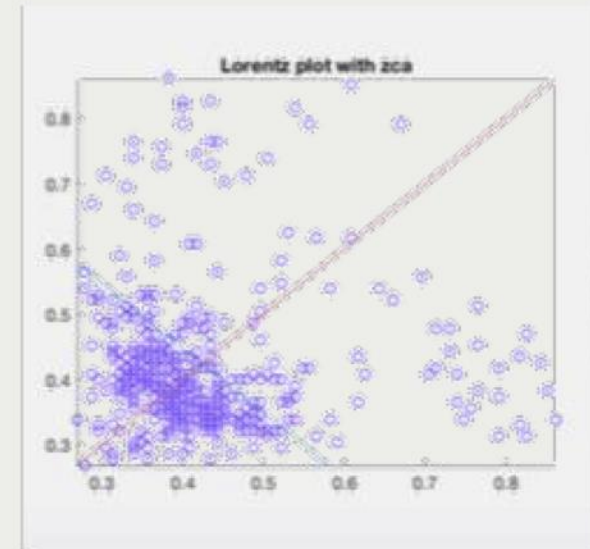
# Comparison, different Arrhythmias



PHYSIOLOGICAL

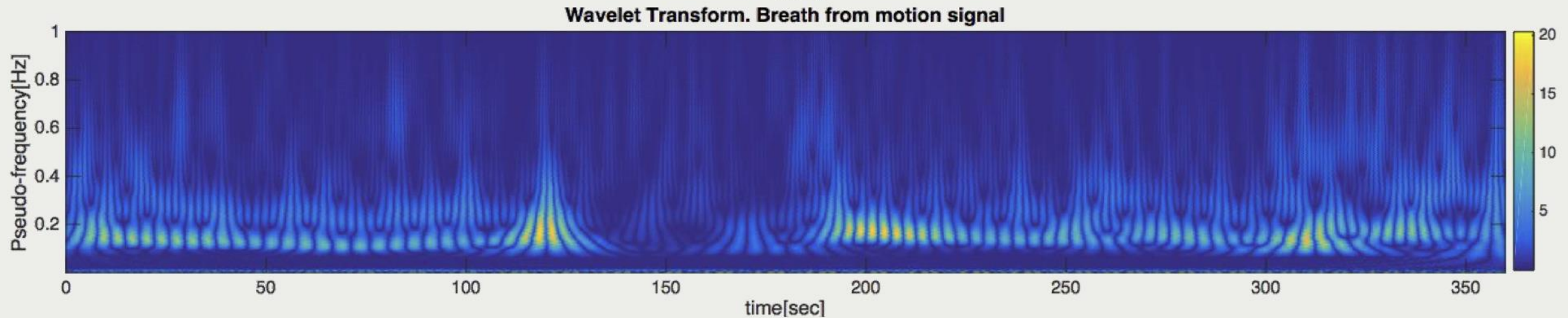
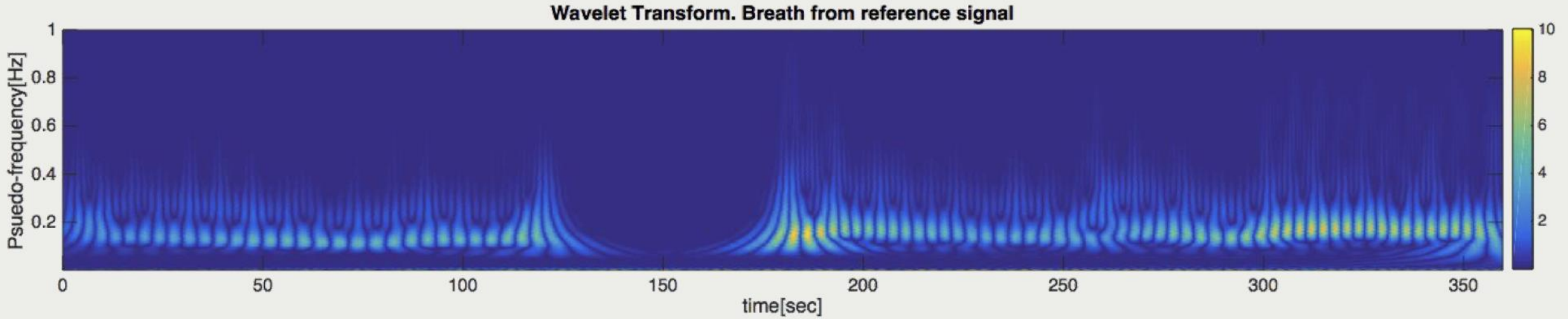


ATRIAL FIBRILLATION



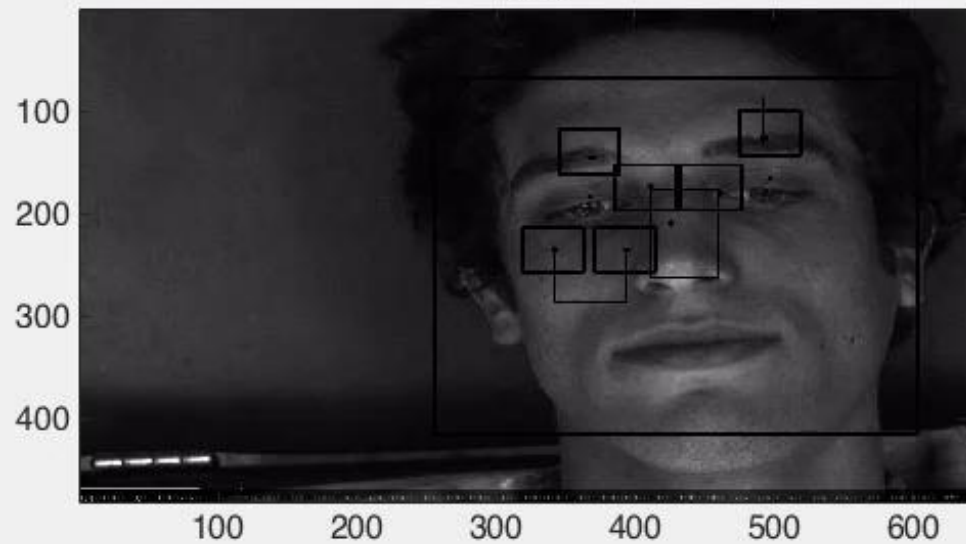
OTHER ARRHYTHMIA

# Breathing Rate accuracy

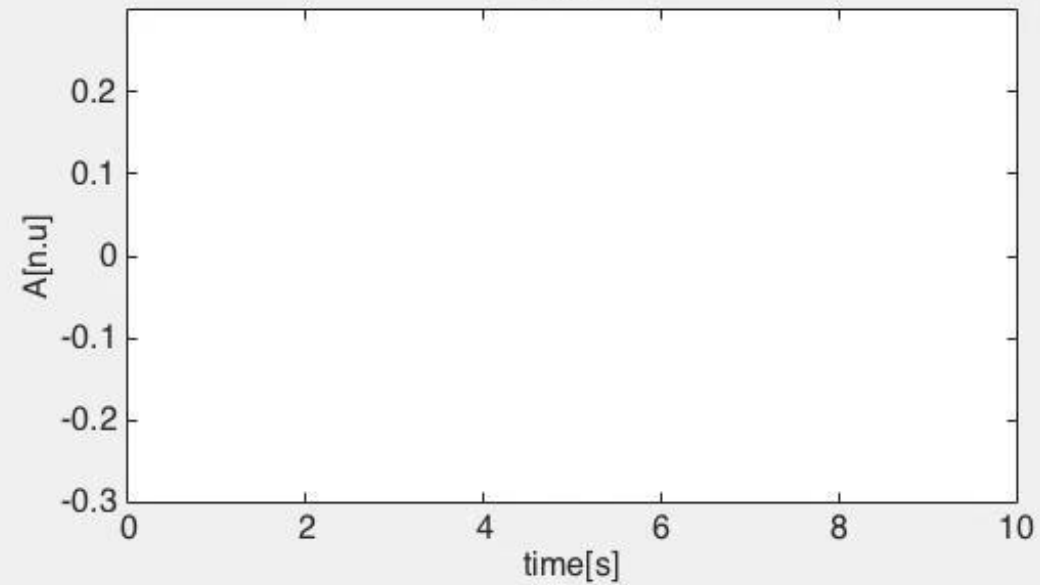


*Signals obtained with HeartWatch tech, from laboratory results. Results to be published.*

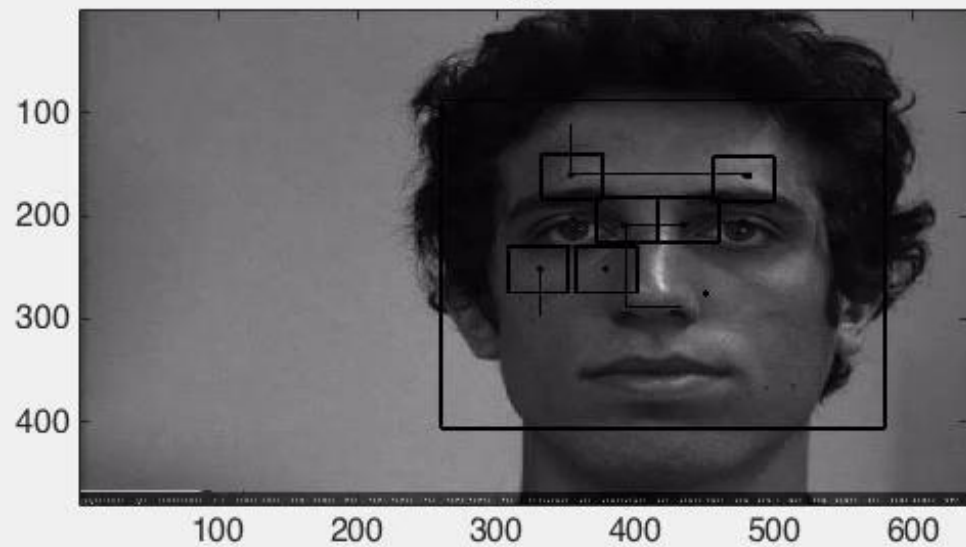
**Rest**



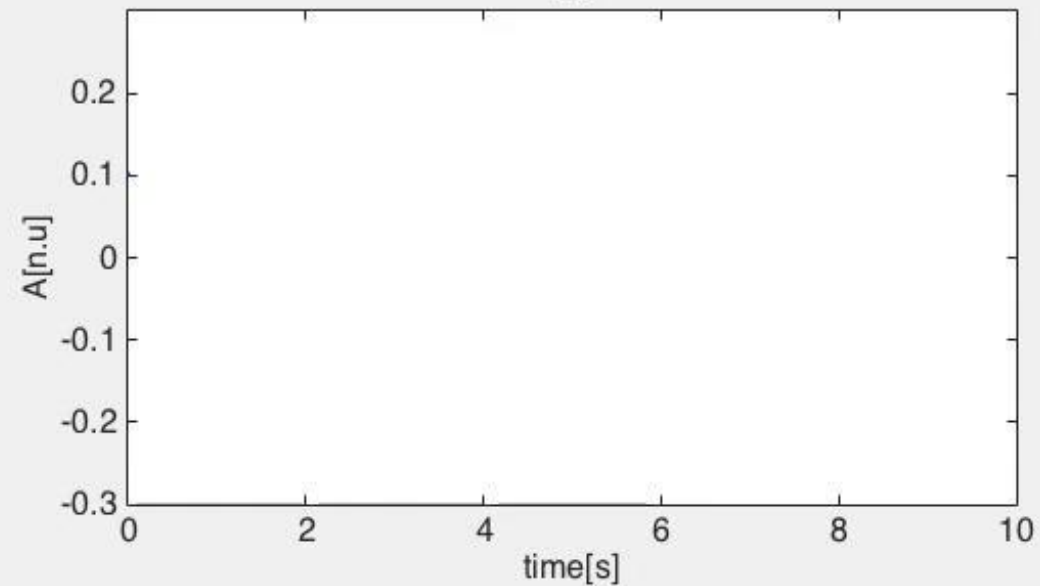
**Rest**



**Tilt**



**Tilt**



Run