keep your heart watched

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

33% Silent AF

67% Diagnosed AF

AF can be paroxysmal

AF can be asymptomatic

Source: AF Competence NETwork – The European Heart Rhythm Association
HeartWatch

Preventive Level 1 Device for Heart and Respiratory functions

Your health status

Heart

Breathing

Movements & Localization

your face
or any other exposed skin

any camera
smartphone, PC or custom
Accuracy of HeartWatch

Beat to beat comparison on 80 healthy subjects

97.5% Accuracy
99% Sensitivity
98.3% Positive Prediction

Assessment of beat-to-beat heart rate detection method using a camera as a contactless sensor, EMBC Conference 2016, Orlando, L. Iozzia, L. Cerina, L. T. Mainardi
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

- **2016**: November 2016 - April 2017
  1st Clinical Trial
  Policlinico Maggiore, Milano

- **2018**: March - June 2018
  2nd Clinical Trial
  Ospedale San Raffaele, Milano

- **2018**: September - December 2018
  Medical Device Level 2a Certification

- **2019**: Q1 2019
  HeartWatch release
  Nursing homes
The team

Founders

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Machine Learning & Signals  
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Our vision

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

L. Cerina, L. Iozza, L. T. Mainardi,
“Influence of acquisition frame-rate and video compression techniques on pulse-rate variability estimation from vPPG signal”,

L. Iozza, L. Cerina, L. T. Mainardi,
“Relationships between Heart–Rate Variability and Pulse–Rate Variability obtained from video-PPG signal using ZCA”,
Physiological Measurements.

L. Iozza, 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.

G. Valenza, L. Iozza, L. Cerina, L.T, Mainardi, R. Barbieri,
“Preliminary investigation of instantaneous cardiovascular dynamics from contactless video-photoplethysmography”,
8th International Workshop on Biosignal Interpretation.
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

- Systolic Peak
- Dicrotic notch
- Diastolic peak

Contact BVP

Video BVP

PP interval
Comparison, different Arrhythmias

Physiological

Atrial Fibrillation

Other Arrhythmia

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

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