

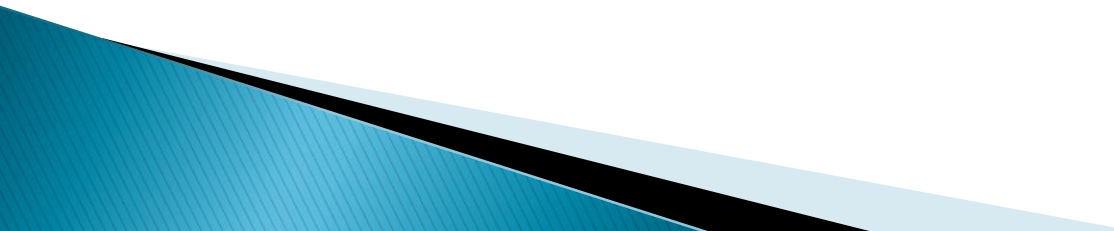


Analysis of Human heart using machine learning and 3-D visualization

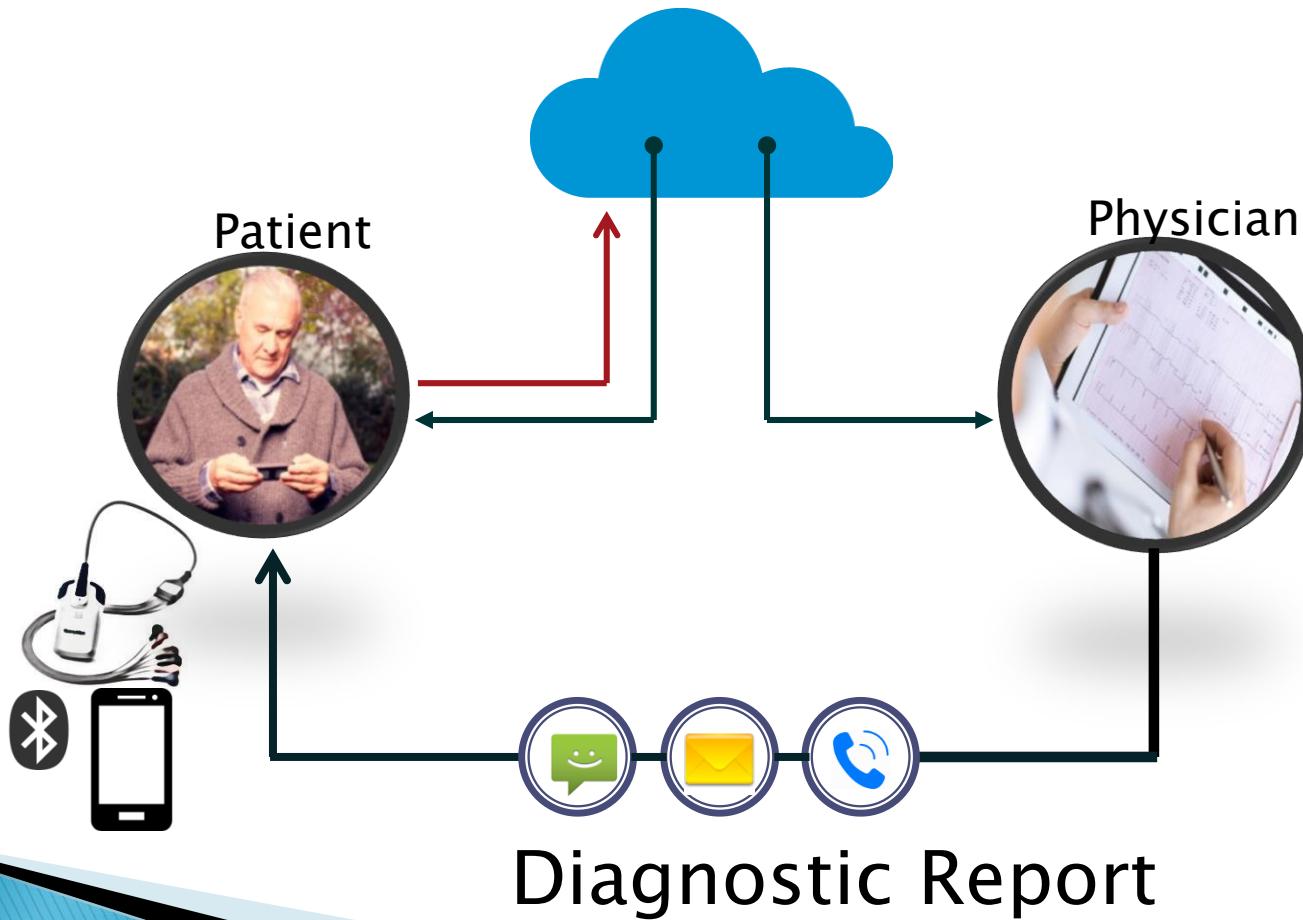
Problem Statement

- ▶ **Cardiovascular Diseases (CVD)**
 - Killing 17.3 Million globally every year
 - That's 30% of total deaths.
- ▶ **Early detection and treatment could have saved them**
 - HOLTER monitor (ECG \geq 24 Hours) used to detect Arrhythmias, Heart rate variations
- ▶ **Manual analysis**
 - Next to impossible
 - Inefficient in terms of time consumed
- ▶ **Theoretically, Heart beats 72 times per min. That's over one lakh times a day**

Solution

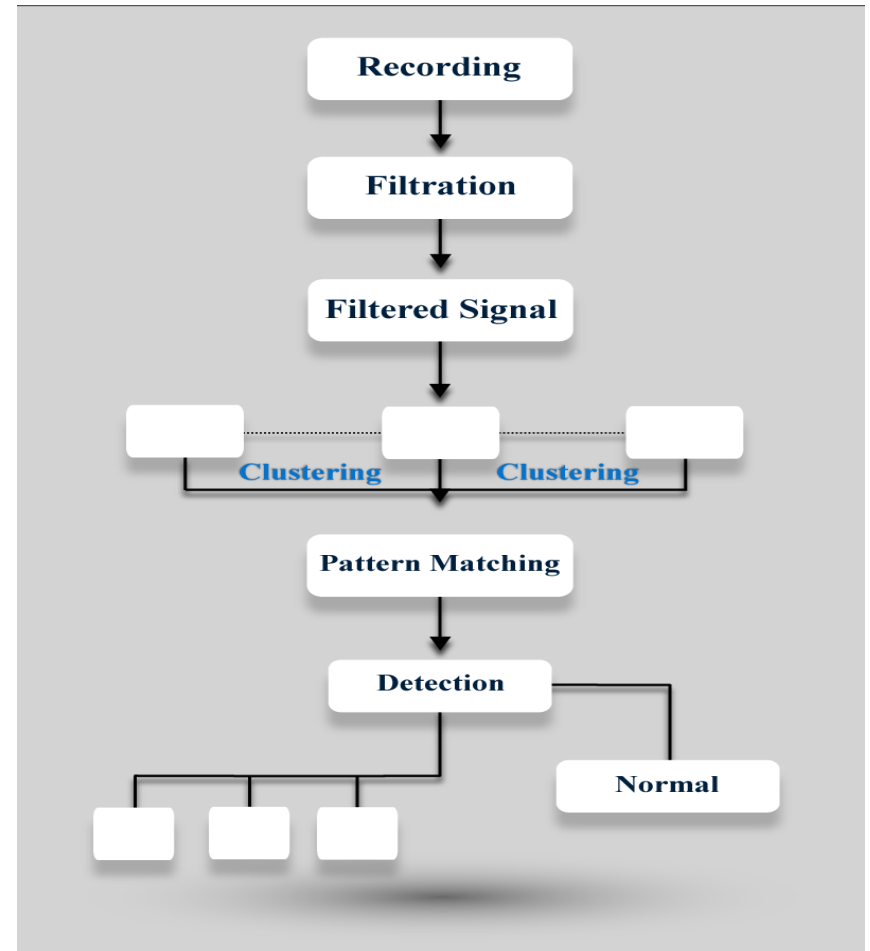
- Automated Monitoring tools
 - Beat to Beat analysis possible
 - Instant and accurate results
 - Detection of abnormalities
 - IOT based solutions
 - Remote monitoring possible
 - Unhindered Mobility and activity
 - Compact and cheap
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How Solution works

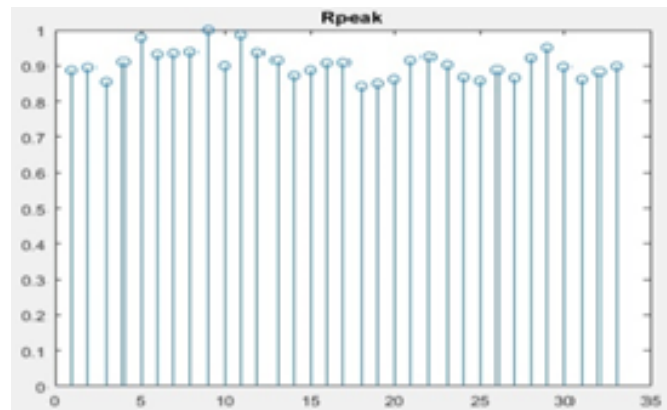
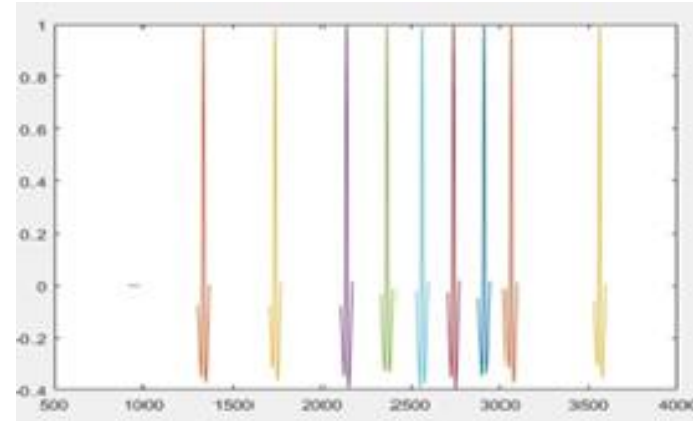
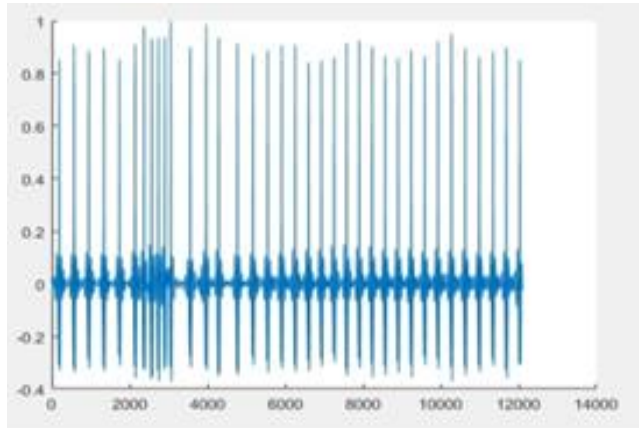


Approach

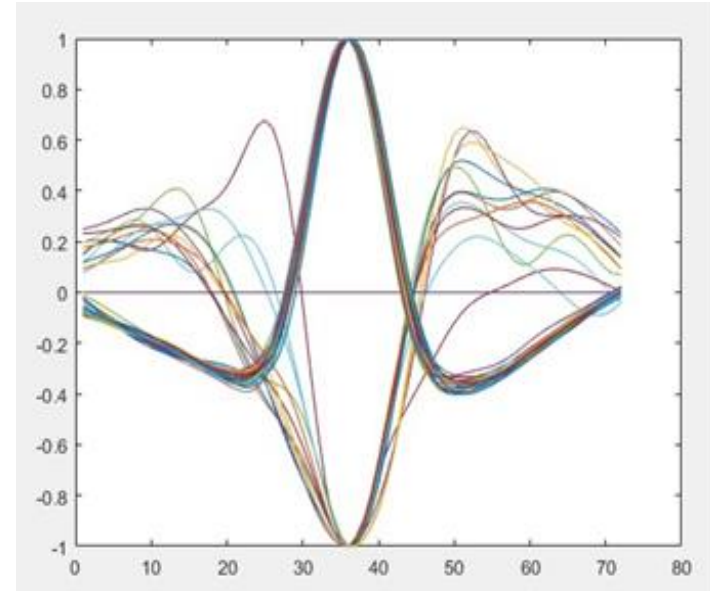
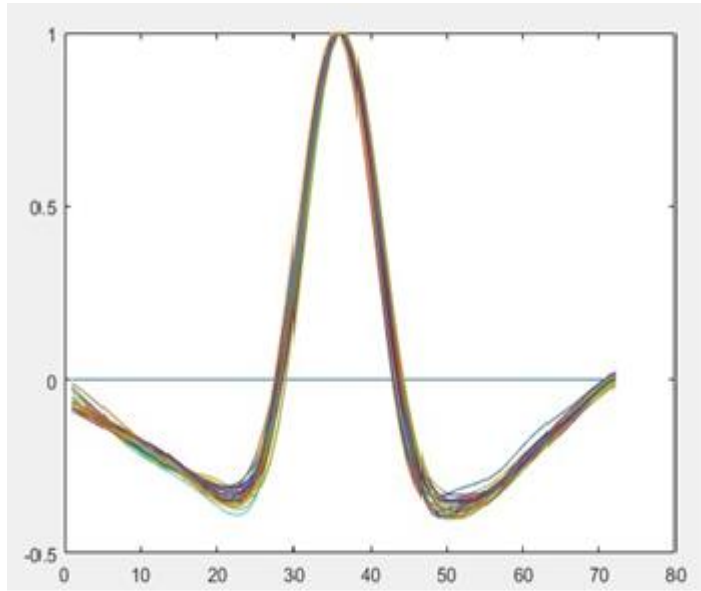
- Signal acquisition/Noise removal
- Clustering
- Pattern matching
- Smart detection



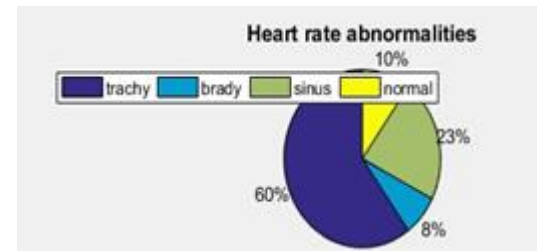
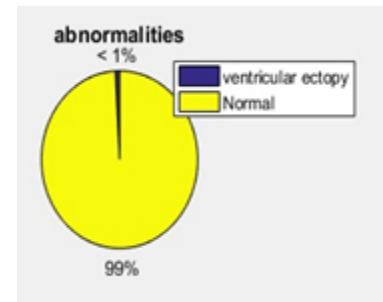
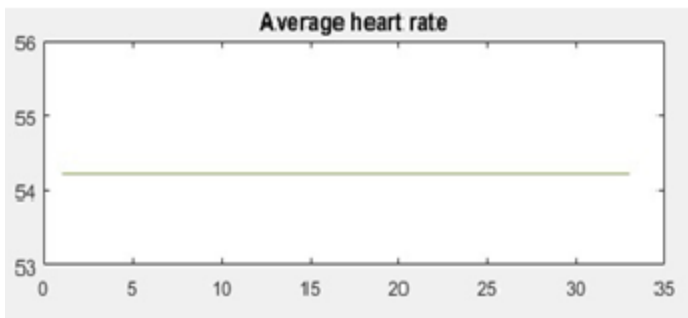
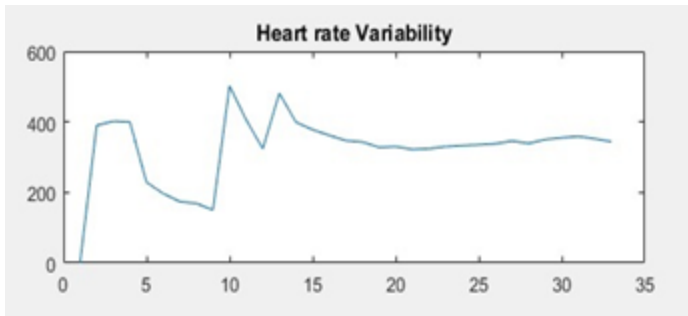
Signal Acquisition



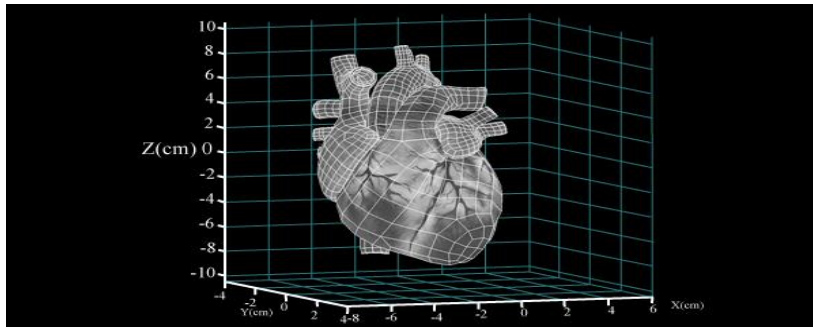
Clustering/Pattern matching



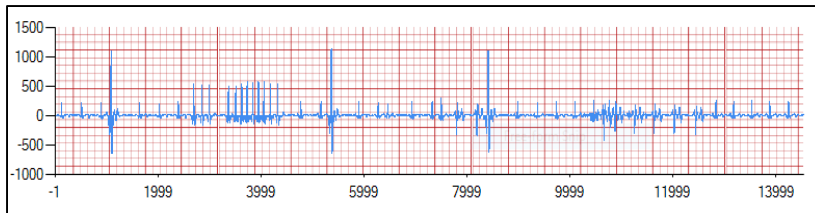
Smart Detection



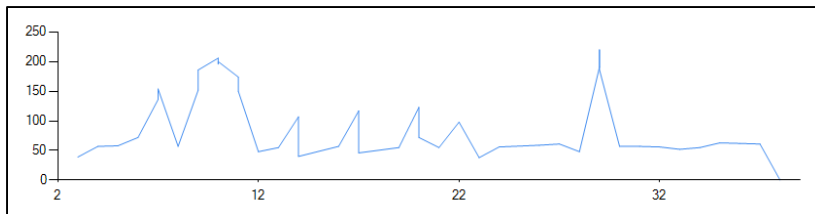
3D Model of Heart



Average Heart Rate

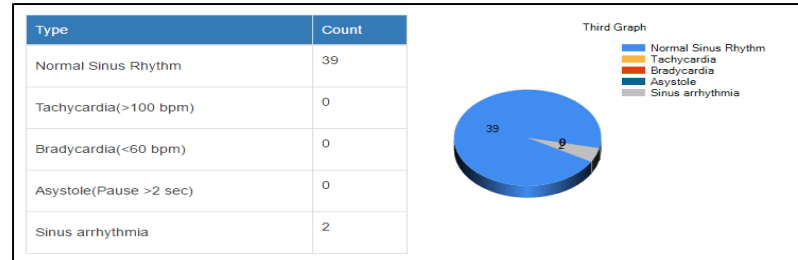
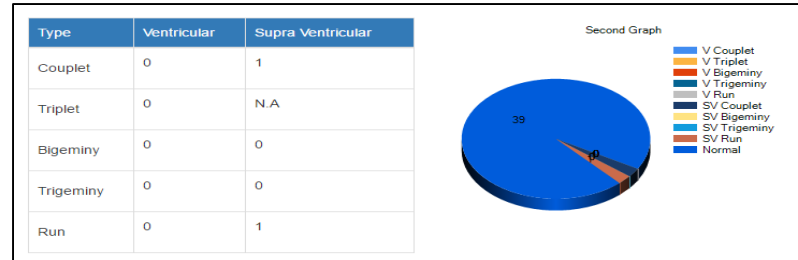
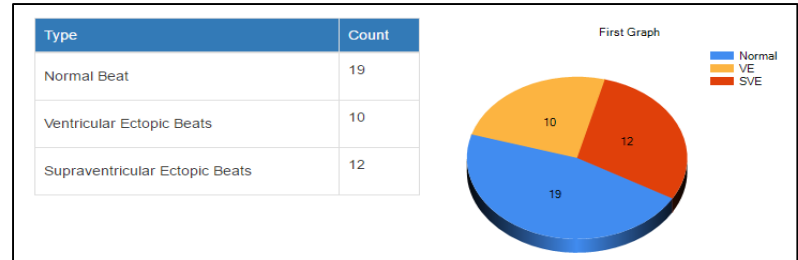


Heart rate variability

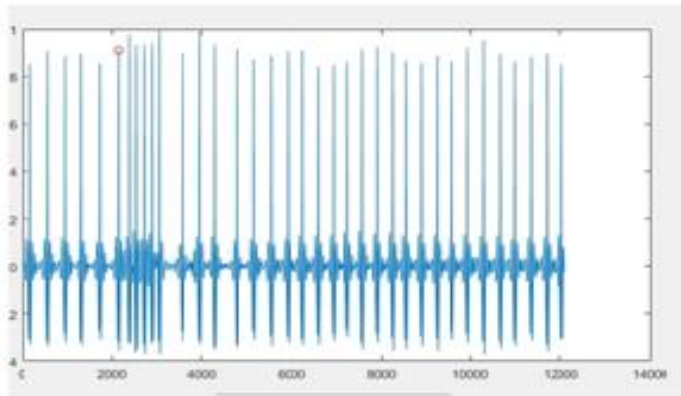
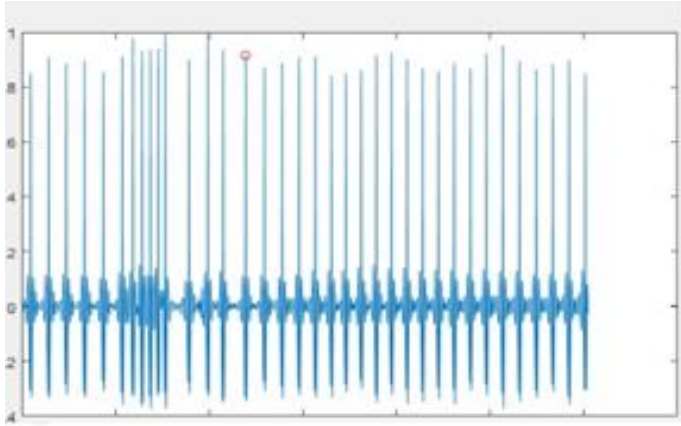


Monitoring Summary

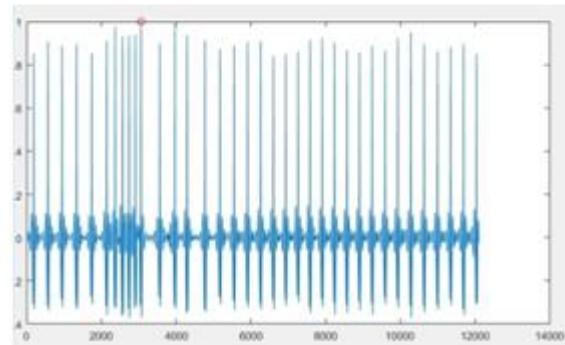
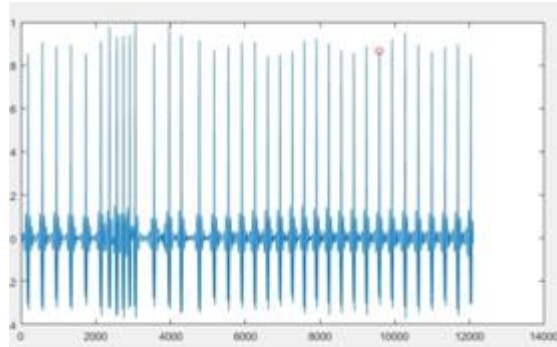
Start Time: 1602:34 on 22-Oct-16	End Time: 1532:34 on 23-Oct-16
Monitored Period: 24 Hours	Time Analyzed: 23hours 30minutes
Artifact Time: 1 hour 45 minutes	Off Time: 30 minutes



3 D visualisation



3D visualisation



Current Status / Achievements

▶ Test Results

- ECG – Tested with 300 patients(72 hours/patient). **Accuracy > 98%.**
- PCG – Physionet tested our algorithm against 3200 recordings – **88% accurate**

- ▶ **Publication** – “Monitoring Cardiac Stress from Heart Sounds” at 43rd International Annual Computing in Cardiology conference 2016, Vancouver, Canada