Team Rhythm
SIH-2018 (Arya)

Introduction:

The total number of deaths due to cardiovascular diseases read 17.3 million a year according to the WHO causes of death. Thus, how to predict cardiac arrhythmia in real life is of great significance. In this project, we plan to develop a machine learning system that can classify a patient into different cardiac arrhythmic classes by collecting data from wearable devices.

What is Arrhythmia:

An arrhythmia is an abnormal heart rhythm. Arrhythmias affect millions of people every year and cost a lot of money to treat. *Atrial Fibrillation, the most common serious arrhythmia, alone affects ~33.5 million people in the world.* Arrhythmias can produce a variety of symptoms, including a fluttering in the chest, a racing heartbeat, a slow heartbeat, chest pain etc. Sometimes there are no symptoms, but a doctor might diagnose an arrhythmia during a routine examination.

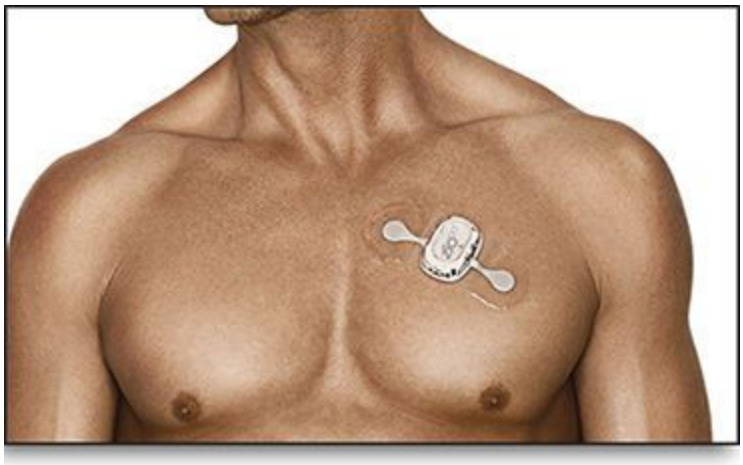
The doctor uses an electrocardiogram (ECG) test to check for problems. An ECG shows the heart's electrical activity over time.

ECG & PPG Sensors Defined

1. **ECG (electrocardiography) sensors** measure the bio-potential generated by electrical signals that control the expansion and contraction of heart chambers.
2. **PPG (photoplethysmography) sensors** use a light-based technology to sense the rate of blood flow as controlled by the heart's pumping action.

Zio patch by iRhythm:

Zio Patch by iRhythm, are designed to continuously monitor the ECG, able to capture data for up to 14 days and help doctors arrive at a diagnosis after a single monitoring period.
Over the 14 day period, the heart beats ~1.6 million times, it's not feasible for a doctor to go through all of the data manually. This motivates the need for automatic detection of arrhythmias.



Using Machine Learning to diagnose Arrhythmia:

We try 4 different approaches to diagnose Arrhythmia using Machine learning.

1. Neural Networks (Deep Learning)
2. Principal Component Analysis (PCA)
3. Random Forest
4. K-mean

Data Set Information:

https://archive.ics.uci.edu/ml/datasets/Arrhythmia
This database contains 279 attributes, 206 of which are linear valued and the rest are nominal.

Attribute Information:
-- Complete attribute documentation:
1 Age: Age in years , linear
2 Sex: Sex (0 = male; 1 = female) , nominal
3 Height: Height in centimeters , linear
4 Weight: Weight in kilograms , linear
5 QRS duration: Average of QRS duration in msec., linear
6 P-R interval: Average duration between onset of P and Q waves in msec., linear
7 Q-T interval: Average duration between onset of Q and offset of T waves in msec., linear
8 T interval: Average duration of T wave in msec., linear
9 P interval: Average duration of P wave in msec., linear
Vector angles in degrees on front plane of:, linear
10 QRS
11 T
12 P
13 QRST
14 J

15 Heart rate: Number of heart beats per minute ,linear