ECG Anomaly Detection System

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INTRODUCTION

- Early Detection and Treatment is an important aspect in Preventative Treatments

- Advancement in technology has allowed average people the ability to monitor their own health status at home

INTRODUCTION

- Traditional self-monitoring devices are **Clunky, Manual**

  Blood pressure monitor, thermometer, weight scale, etc.

- Modern high-tech monitoring devices are **Wearable, Automatic**

  Smart watch (Apple Watch), Blood glucose monitor, Owlet (heart rate checker for babies), etc.

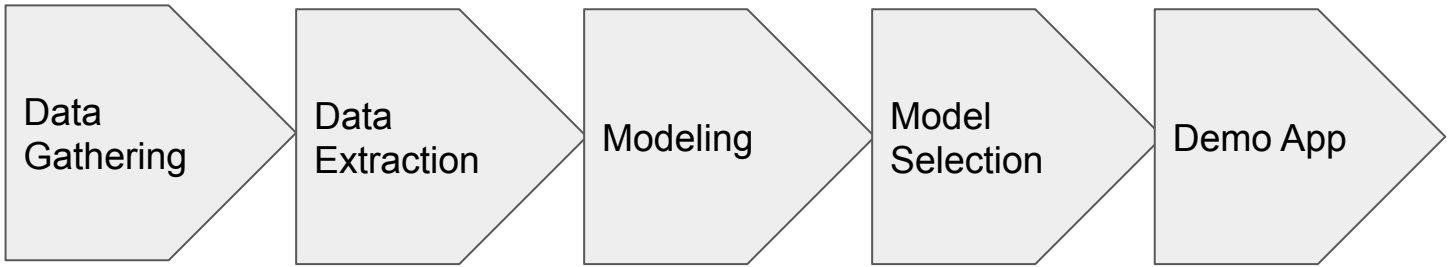
  Easily accessible Biometric Data for the Information Age

INTRODUCTION

- An ElectroCardioGram, or ECG, is a major health status indicator for the heart

- The purpose of this project is to create a model that can detect an irregular electrical heart signal from the ECG data using a wearable device and highlight those irregular areas through a web application.

WORK FLOW


Data Gathering
Data Extraction
Modeling
Model Selection
Demo App

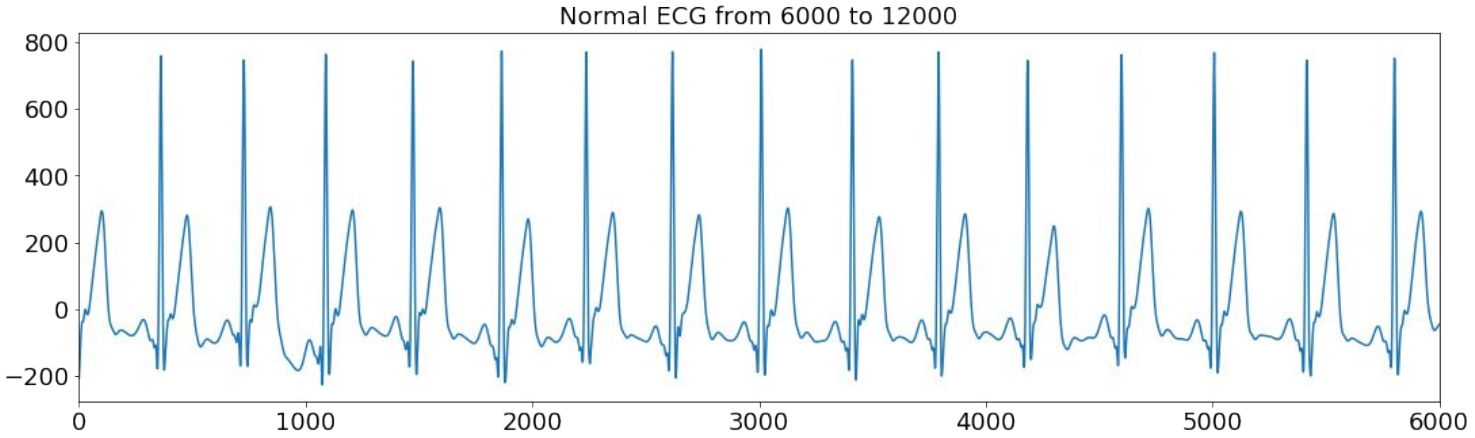
DATA GATHERING

- Device… The Apple Watch
  - ECG measuring function
  - 30 seconds recordings

- Data
  - Normal ECG
  - Abnormal ECG

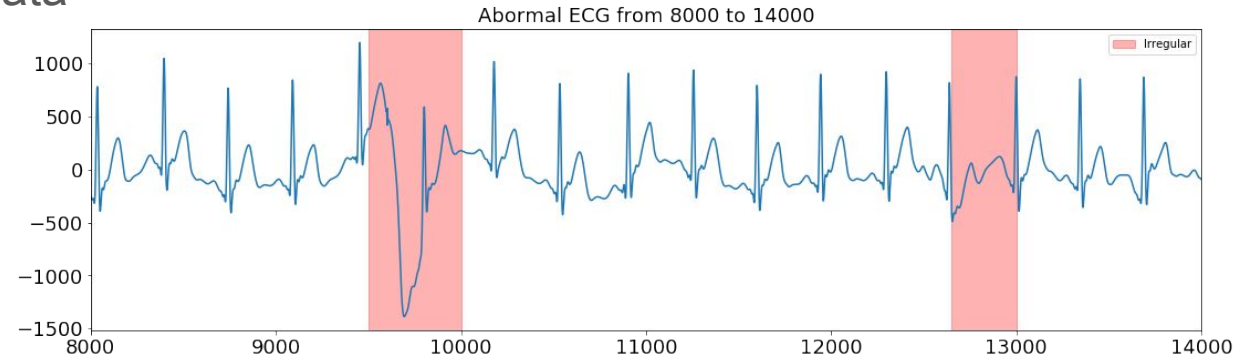
DATA EXTRACTION

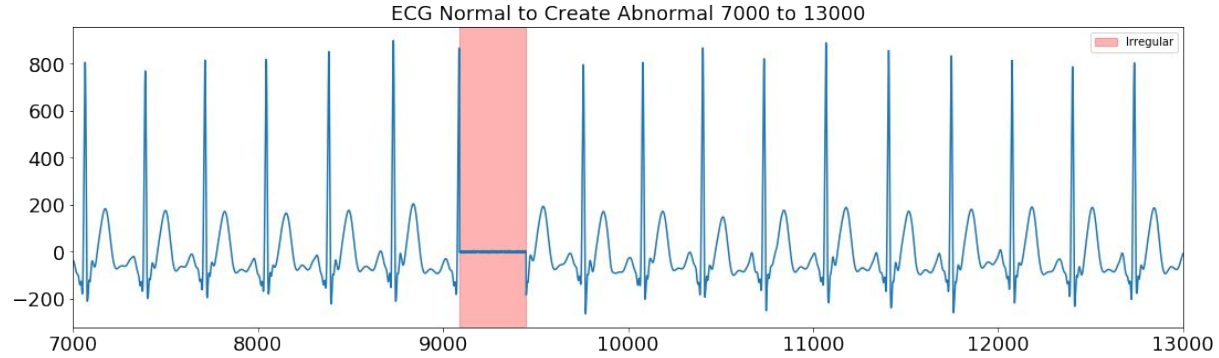
- Training data



DATA EXTRACTION

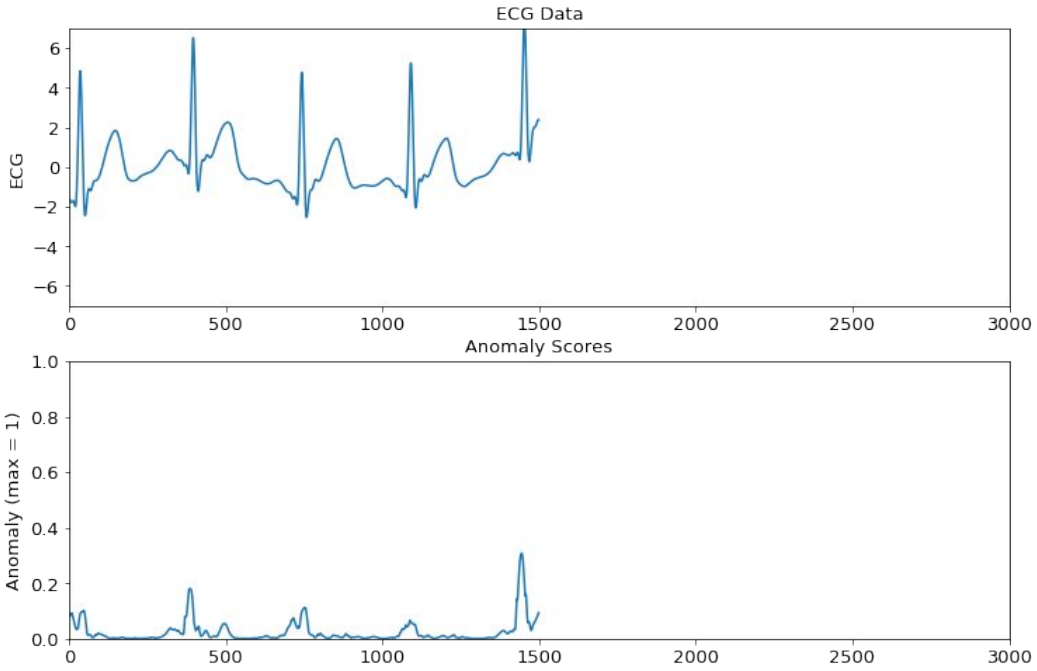
- Testing data





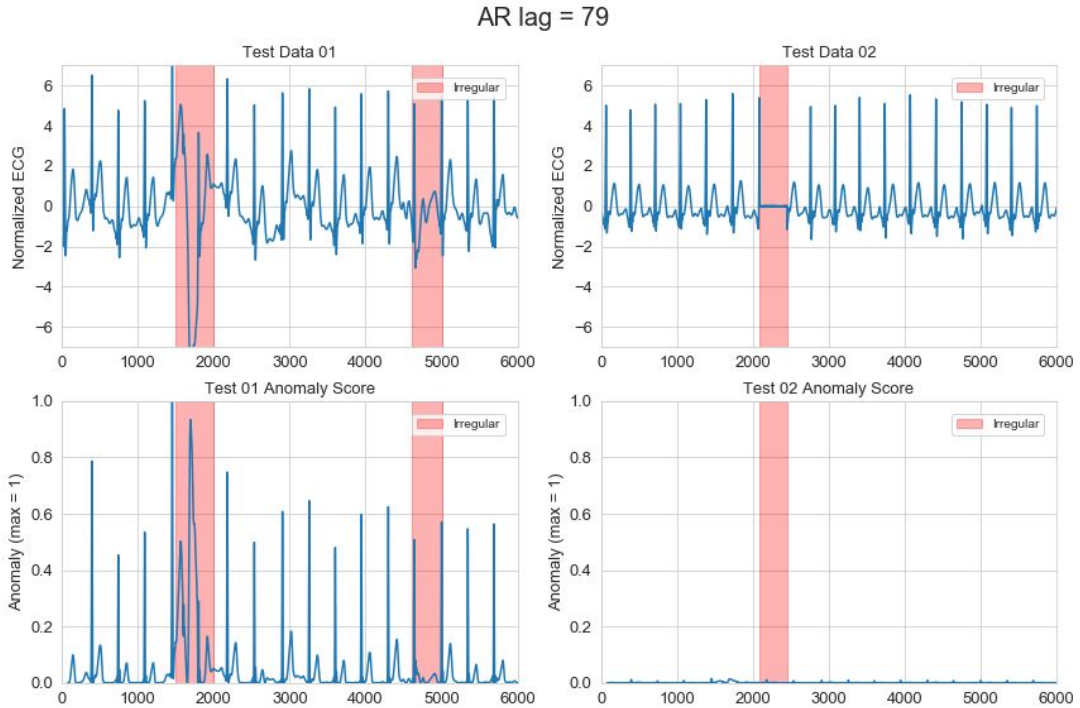
MODELING

Created Models
Auto Regression
Singular Spectrum Analysis
KNearest Neighbors

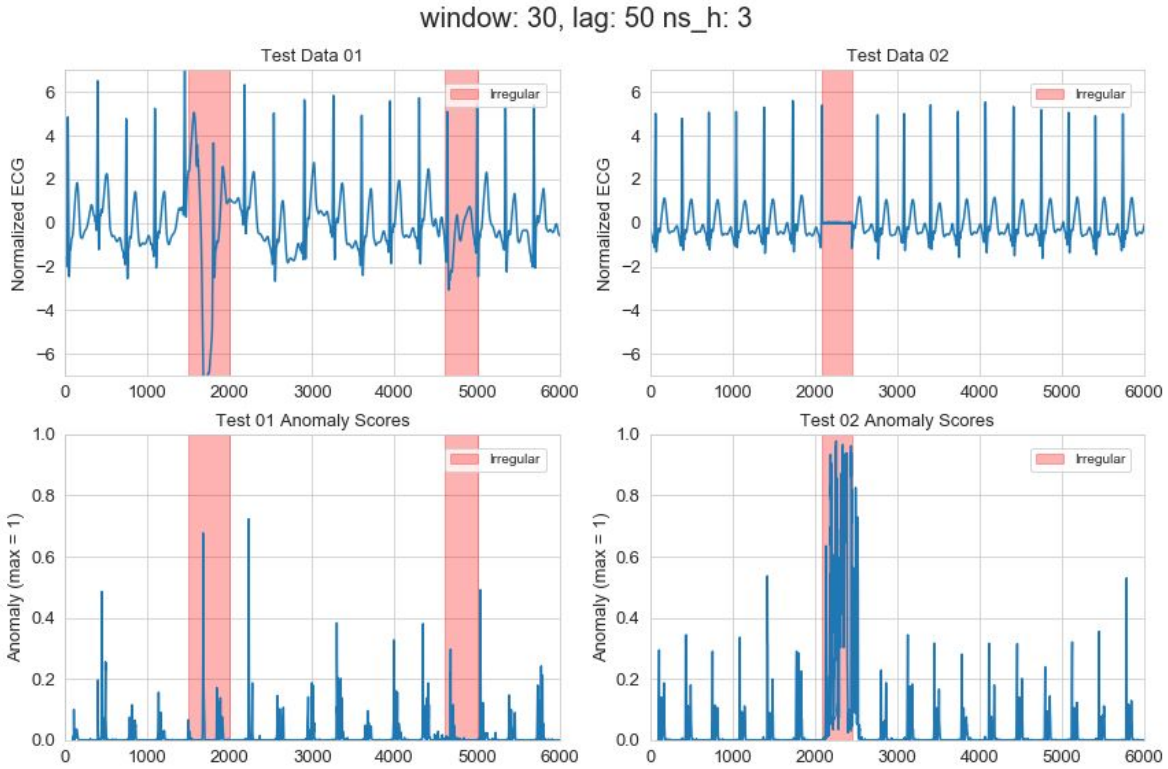


An example of anomaly score

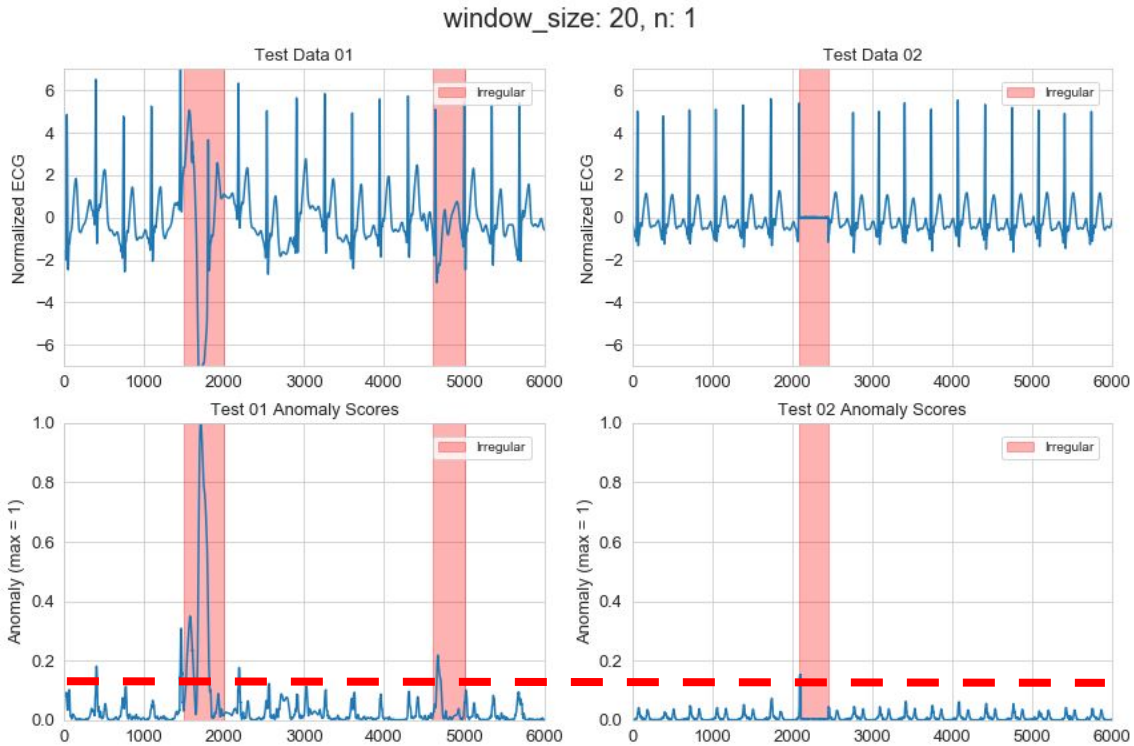
MODEL SELECTION (AR)



MODEL SELECTION (SSA)



MODEL SELECTION (KNN)



DEMO APP

- This app shows two use cases

- https://ecg-checker.herokuapp.com/

CONCLUSION

Limitations

- Not enough data
- Unable to classify the type of irregular pattern
- Real-time monitoring is still under development

Next step

- Gather more data
- Use labeled data for modeling
- combinations with other biometric data

SOURSES

https://www.diabetes.ca/DiabetesCanadaWebsite/media/Managing-My-Diabetes/Tools%20and%20Resources/Continuous_Glucose_Monitoring_Advocacy_Pkg_4.pdf?ext=.pdf(Glucose monitor)

Ide & Sugiyama (2015). Anomaly Detection and Change Detection, Machine Learning Professional Series.(https://ide-research.net/jpn/book/)

SSA Functions Source(https://qiita.com/s_katagiri/items/d46448018fe2058d47da)