

# Apple Watch Heart Rate Variability Monitor





# Introduction

## **Team:**

- Dillon Dalton

## **Clients:**

- Dr. Alicia Hegie
- Dr. Frank Jackson

## **Organization:**

- St. Luke's Rehabilitation Center; Providence Health Systems

## **Problem:**

- Sufferers of Post Traumatic Stress Disorder and Traumatic Brain Injury need a way to be notified of dangerous HRV levels in order to prevent a TBI/PTSD induced stress event

## **Solution:**

- Have an application that can be worn daily. This application shall accurately and reliably record and identify dangerous hrv levels and report these trends to the user



# Why Heart Rate Variability?





# Application Overview

- Active Monitoring of Heart Rate and HRV Levels
- Prediction of Dangerous HRV Trends
- Notification System Using Audio and Haptics
- Utilization of Machine Learning Methods for Predictive Analysis
- Learning Over Time to Improve Accuracy




# Requirements

- **R1: Mirror the SWELL dataset with all of the relevant calculations**
- **R2: Migrate the HRV dataset to the Companion Application**
- **R3 :Deploy the HRV application to a test Apple Watch and Companion**
- **R4: Test that the data export can export data as a .csv**




# R1: Mirror the SWELL dataset with all of the relevant calculations

- **What is the SWELL Dataset?**
  - ([SWELL dataset | Kaggle](#))
- **What calculations were chosen from the SWELL Dataset?**
  - meanRR
  - medianRR
  - pNN50



## R2: Migrate the HRV dataset to the Companion Application

- Our goal was to move the data storage from the Apple Watch to the Companion Application.
- This was to save storage space on the watch.
- Problems arose where the watch app and companion app interact.
- Moving storage would make the watch not work independently and need the phone.



## **R3 :Deploy the HRV application to a test Apple Watch and Companion**

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## R4: Test that the data export can export data as a .csv

- Original export for data was in .json format
- Goal was to convert it to a .csv
- This way the data can be sent and easily viewed by medical professionals.

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# Why is This Work Important?

- **SWELL Dataset Mirror**
- **Deploying the application to a live device**
- **Work Towards Dataset Migration**
- **CSV Export**

# Future Developments and Challenges

## Potential Future Enhancements:

- Improved Accuracy of ML Model
- Improved Integration testing
- Further integration of the SWELL dataset for validation and testing
- Data Visualization Feature on the companion application
- Fully implement the email alert feature.

## Challenges Faced During the Project:

- Newness to Swift and xCode
- Limitations of licensing and development environments

## Possible Solutions and Mitigation Strategies:

- Have licensing acquired before start of development
- Have MacOs available for all members

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# Conclusion.