

Forecasting stress from wearable devices

Kevin Spring
12 May 2023

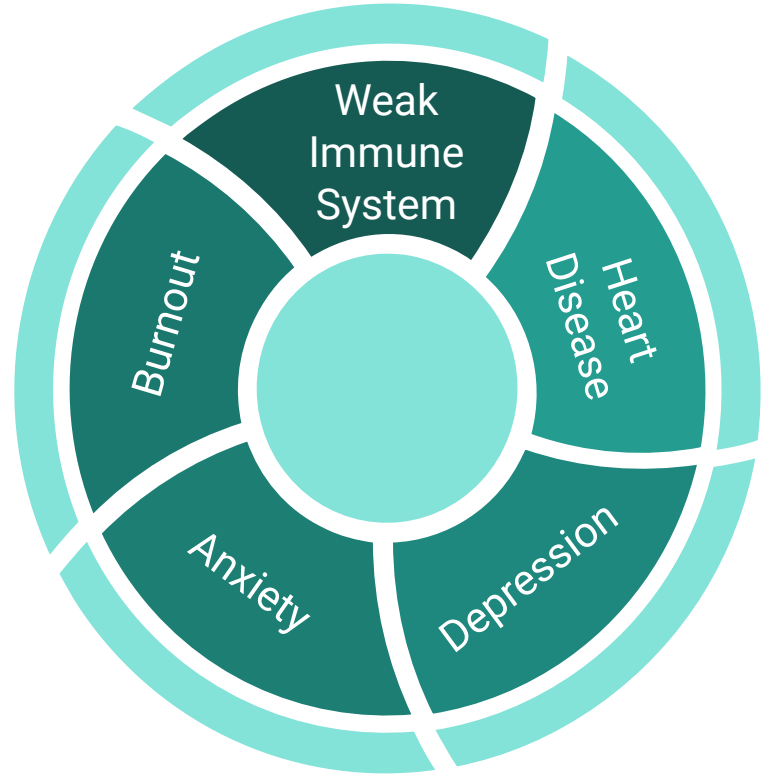
Presentation Outline

- Business Problem
- Business Solution
- Data Source
- Models & Results
- Recommendations



The Problem

- HealthOn is focused on improving the health of users through the development of wearable device technology



The Solution

Create model that forecasts stressful state in users



NORMAL

Users forecasted to be in a stressful state will be given recommendations to mitigate the stress



STRESS

- Breathing exercises
- Phone a friend
- Move to a new space

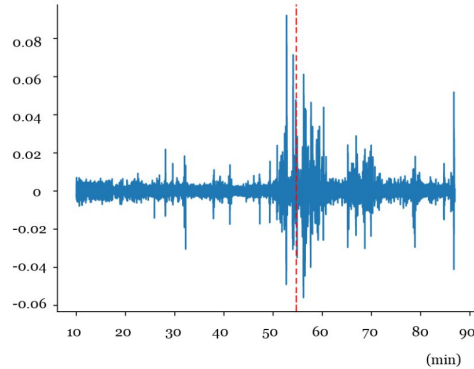
Data Source

- WESAD (Wearable Stress and Affect Detection) Data Set
- Physiological data measured on the wrist and chest of 15 subjects
- 90 minutes of baseline, amusement, meditation, and stressful conditions
- Physiological data is correlated with stress:
 - Heart rate
 - Sweating
 - Respiration

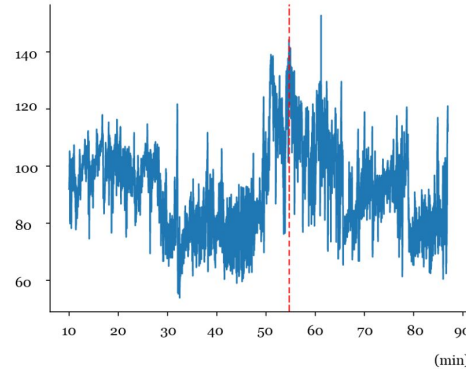


Physiological Data Used in Model Fitting

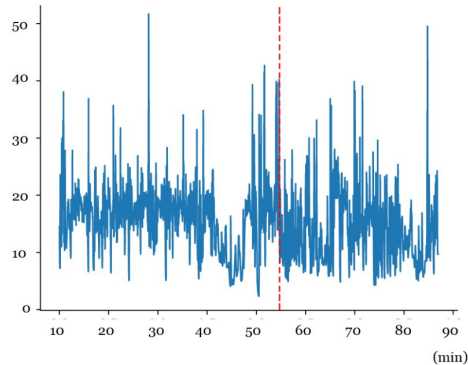
EDA Phasic



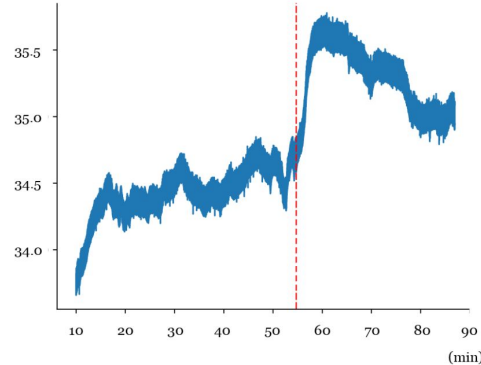
Heart Rate



Respiration Rate



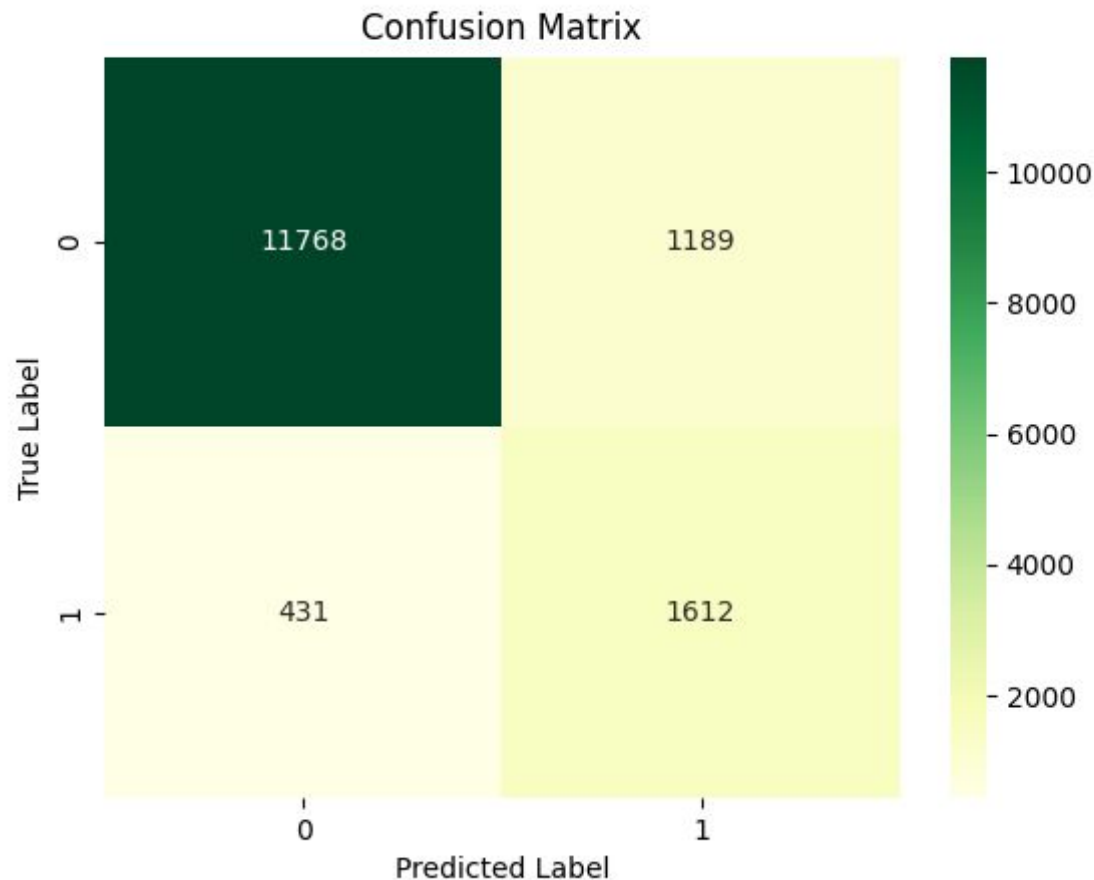
Body Temperature



Features extracted from the raw data

- Red line indicates when the stressful condition begins
- Phasic EDA is rapid change in the skin conductance from sweating
- Statistical feature extraction for 1-min and 5-min intervals was done all each

Model 11 using Random Forest is the best model

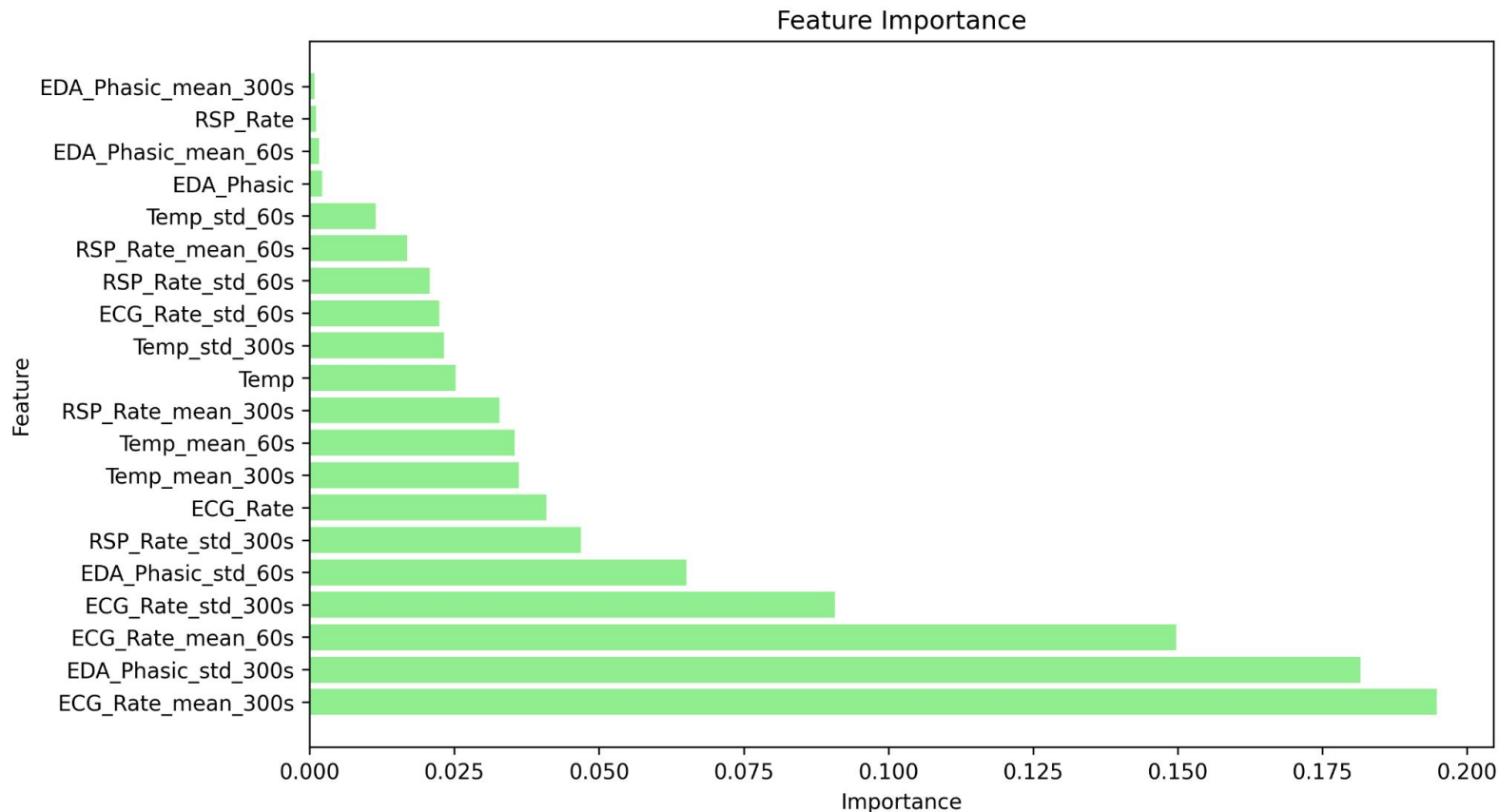


Sensitivity: 79%

F1-score: 67%

Low False Positives

Feature Importance from best model



Recommendations

1. Enhance Feature Measurement

The design of the next generation of HealthON devices should focus on measuring physiological features that have high causality with stress, such as EDA, heart rate, temperature, and respiration

2. Expand Data Collection

Leverage HealthON users data to expand and create a diverse dataset

3. Focus on Stressful Data Collection

Prioritize data collection during high-stress situations or and different stress related events

4. Continuous Model Improvement

Refine and enhance the learning models as new data is collected

Thank you!

Email

kevinjspring@gmail.com

Website

kevinspring.com

Questions?