

December 21,2024

# SMART WATCH DATA ANALYSIS PROJECT

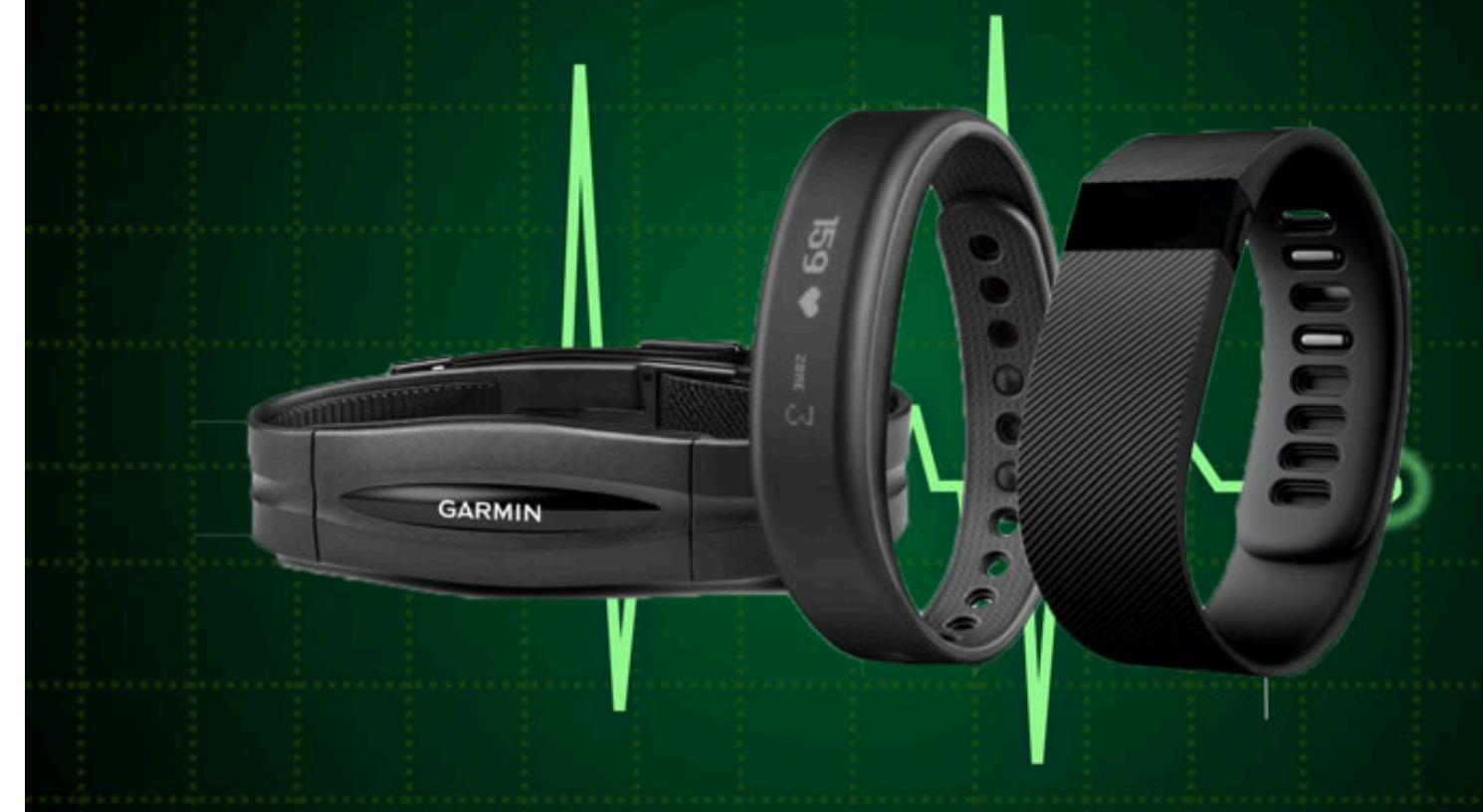
Presented by *Bernadette Nakazibwe*



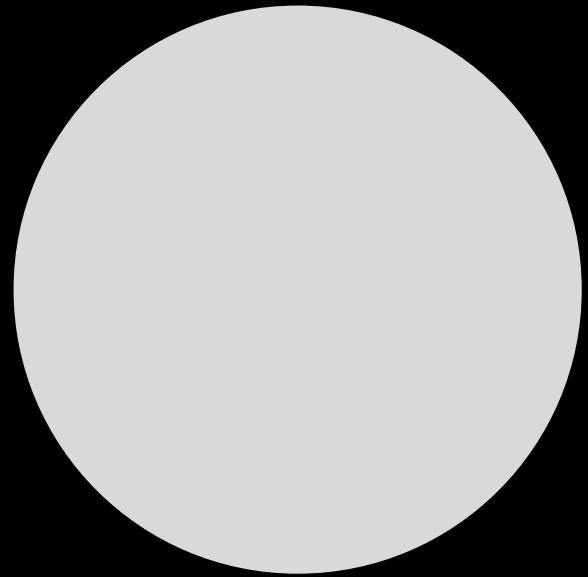
# Introduction

This data analysis project focuses on examining data collected from smartwatches worn by users to uncover patterns in heart rate, drowsiness, and Photoplethysmography (PPG) readings, including ppgGreen, ppgRed, and ppgIR.

The primary objective is to utilize this analysis to provide users with insights into potential signs of drowsiness, enhancing their awareness and promoting well-being through wearable technology.



# About Me



Bernadette  
Nakazibwe

## EDUCATION

- Deggendorf Institute of Technology
- B.Sc in Health Informatics

## WORK EXPERIENCE

Oeson Private Limited

- Data Analytics and Data Science Intern

# Project Inspiration and Concept

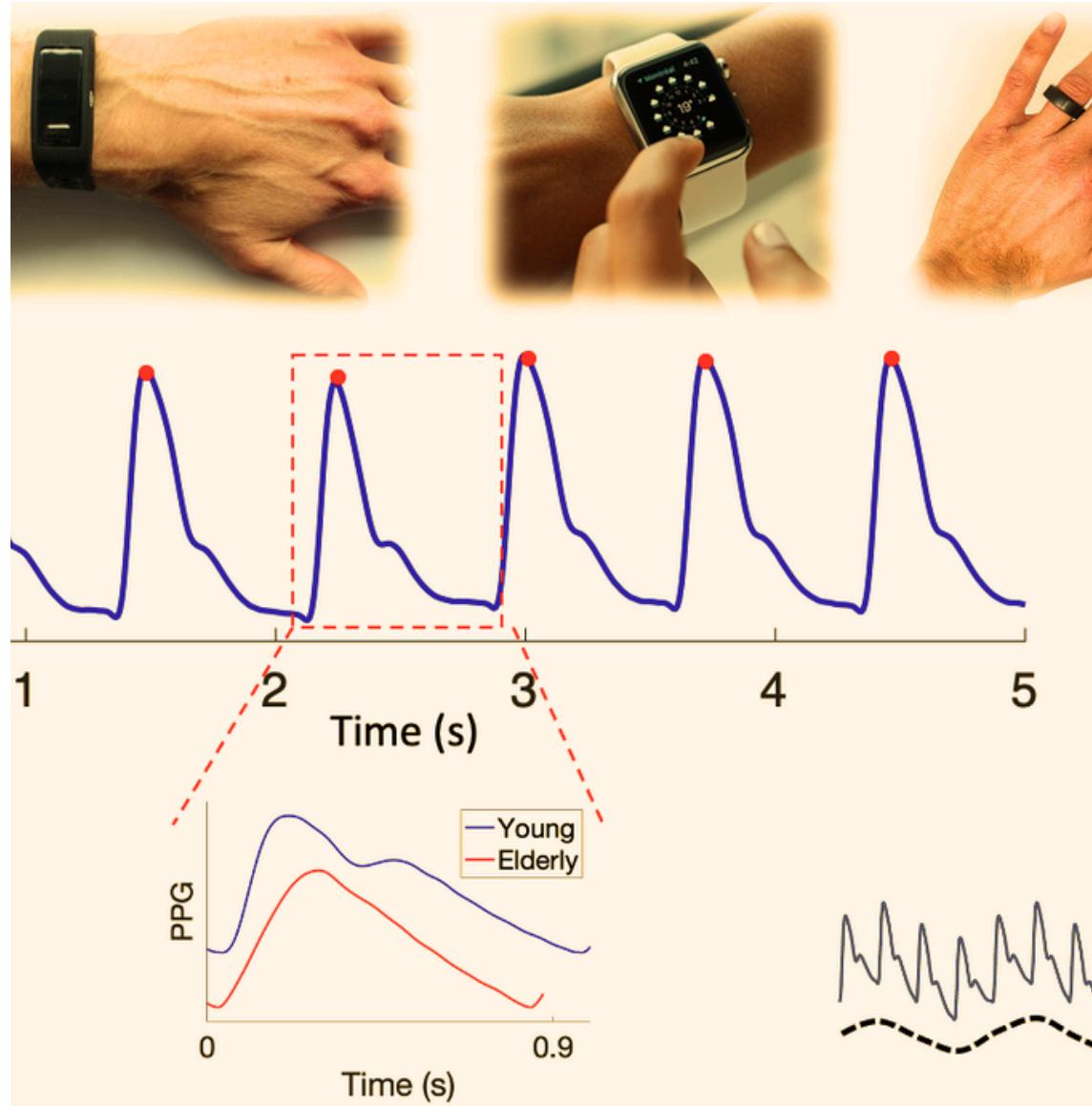
The challenges faced by individuals with conditions like Alzheimer's disease, who may unknowingly fall asleep due to drowsiness.

The aim of this project is to develop a system that helps users detect when they are likely to fall asleep, improving their well-being and enabling individuals with sleep disorders to safely carry out daily activities, such as driving and maintaining an active lifestyle.

By analyzing smartwatch data—including heart rate, drowsiness, and Photoplethysmography (PPG) signals (ppgGreen, ppgRed, and ppgIR)—this project seeks to provide valuable insights that promote safety and quality of life.



# Research and Influences

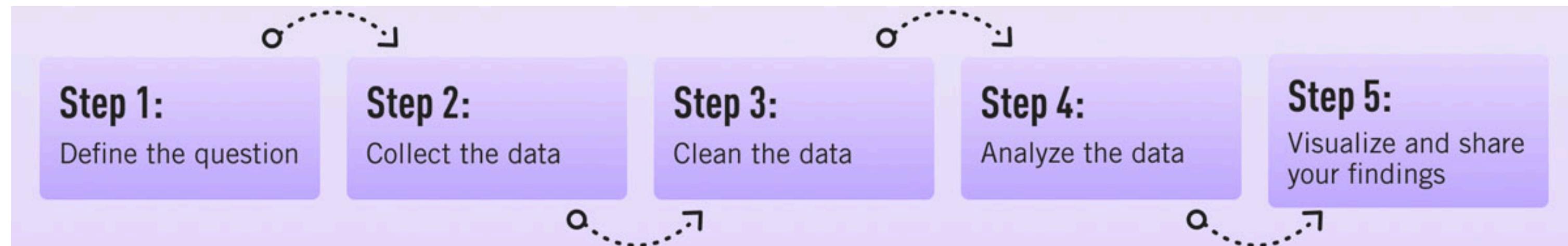


Recent studies highlight that heart rate and Photoplethysmography (PPG) signals—particularly ppgGreen, ppgRed, and ppgIR—are crucial for detecting drowsiness.

Drowsiness is linked to reduced heart rate variability (HRV) and changes in blood flow dynamics, both of which are measurable through PPG sensors. Green PPG signals are ideal for tracking superficial blood flow changes, while red and infrared signals, which penetrate deeper, help identify physiological states such as reduced oxygen levels and slower pulse rates associated with sleepiness. These insights enable the development of reliable drowsiness detection systems to enhance user safety and well-being.



# The Data Analysis Process

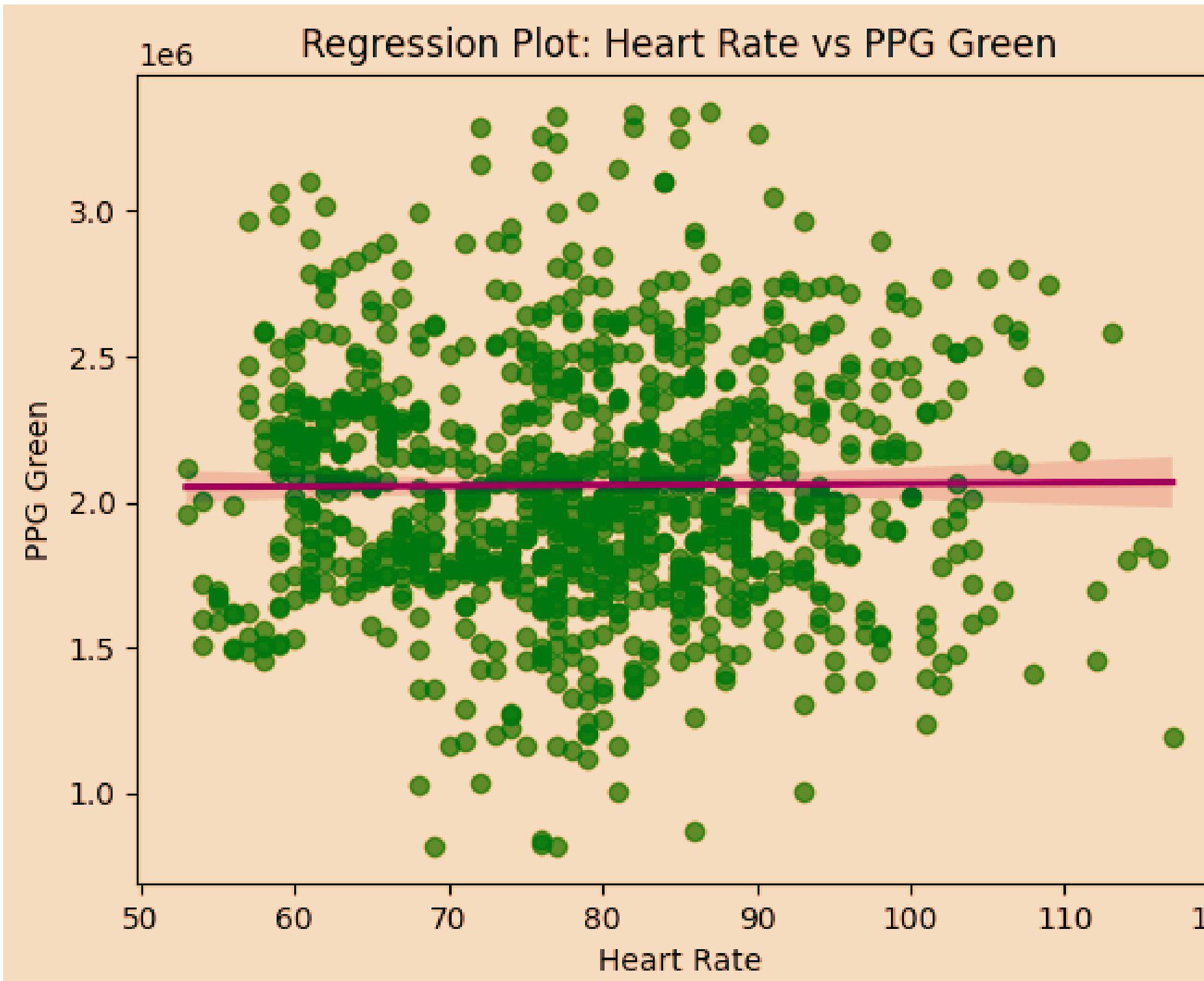


## Tools Used

- Python ( Matplotlib, Pandas, Seaborn)
- Ms. Excel

# Key Insights:

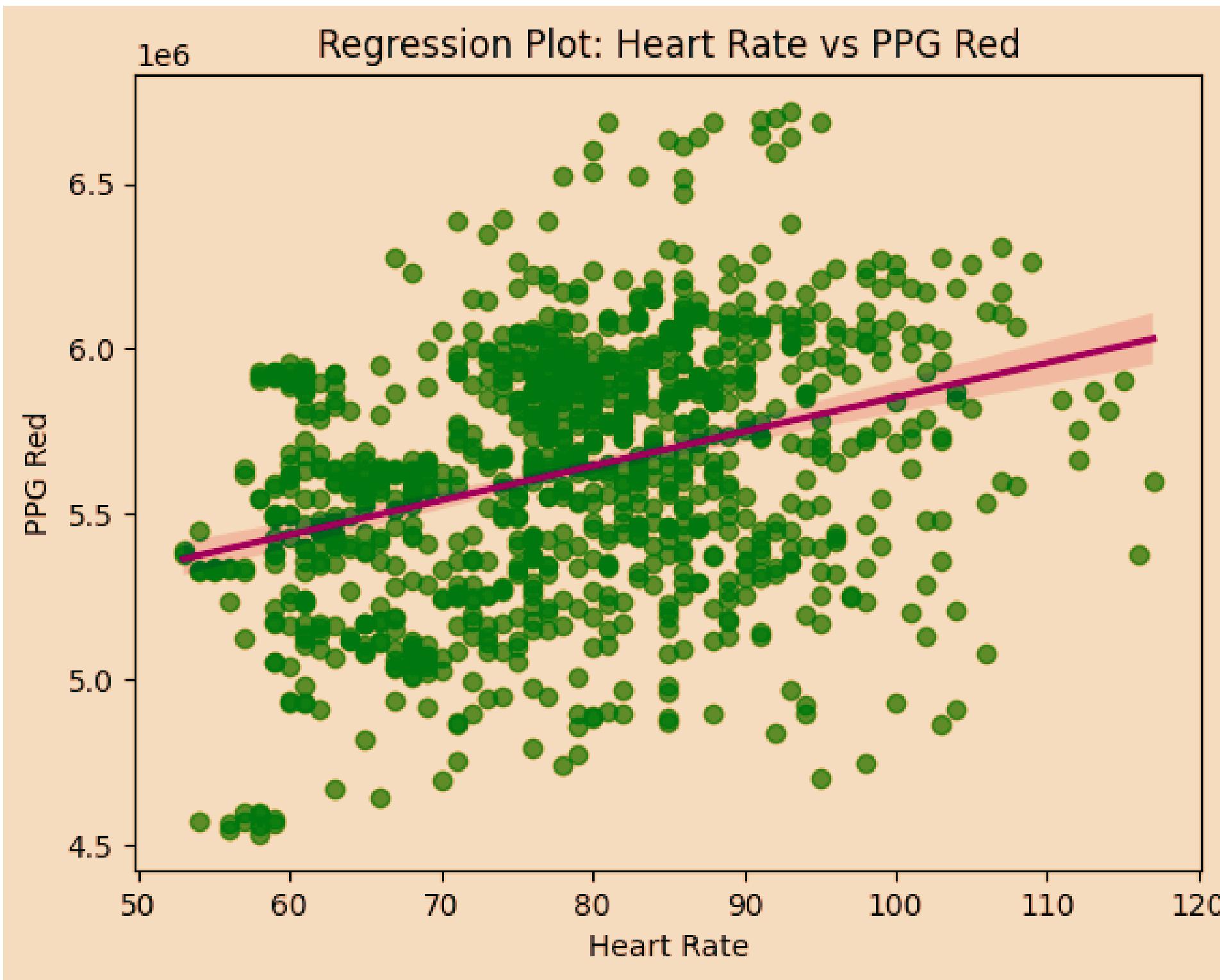
1



This plot shows indicates a weak or no clear linear relationship between heart rate and PPG Green values suggesting that PPG Green readings might not strongly correlate with heart rate across this dataset.

# Key Insights:

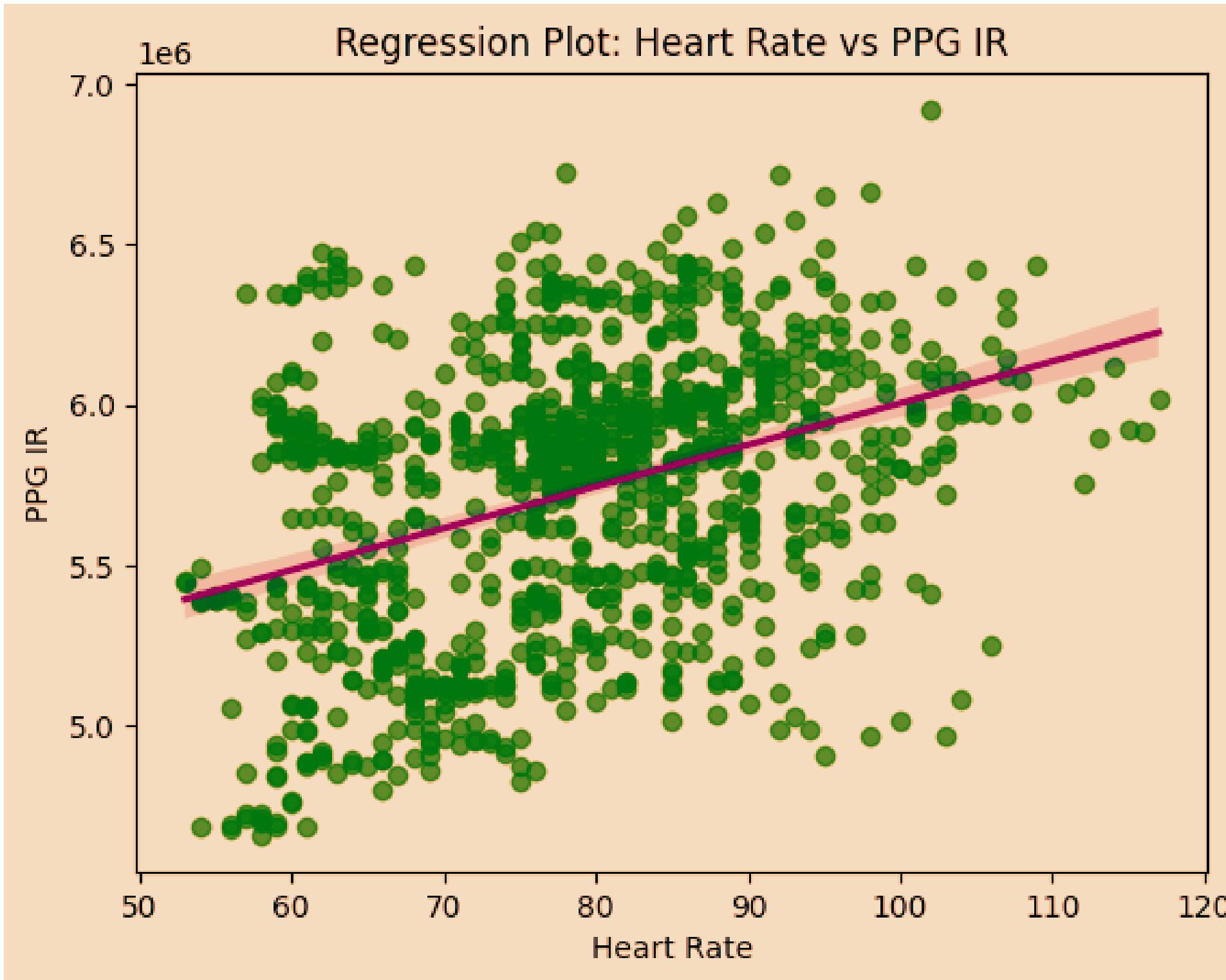
2



This plot shows indicates a moderate linear relationship between heart rate and PPG Red values and that PPG Red values increase with increase in the heartrate.

# Key Insights:

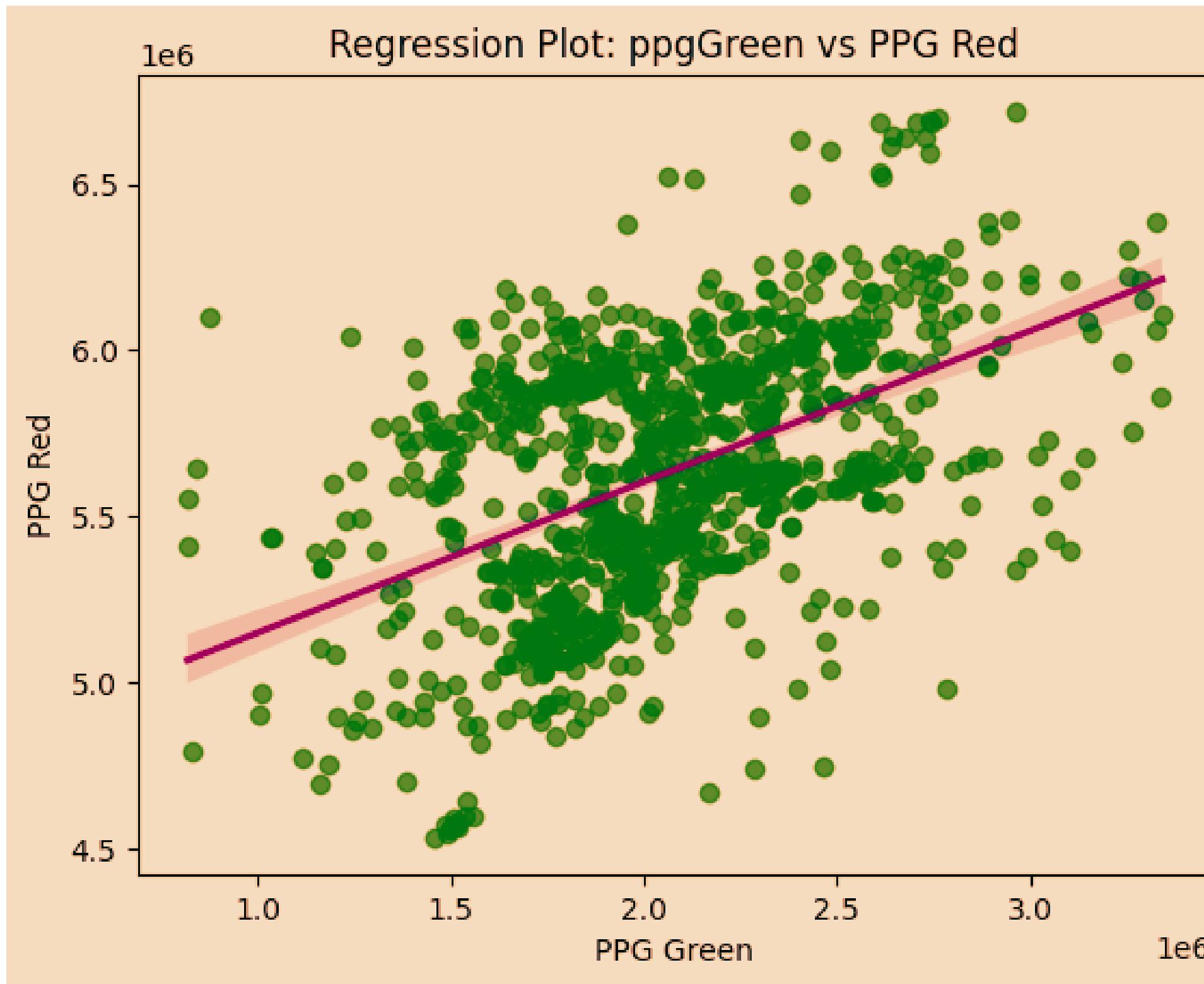
3



This plot shows indicates a moderate linear relationship between heart rate and PPG IR values and that PPG IR values increase with increase in the heartrate.

# Key Insights:

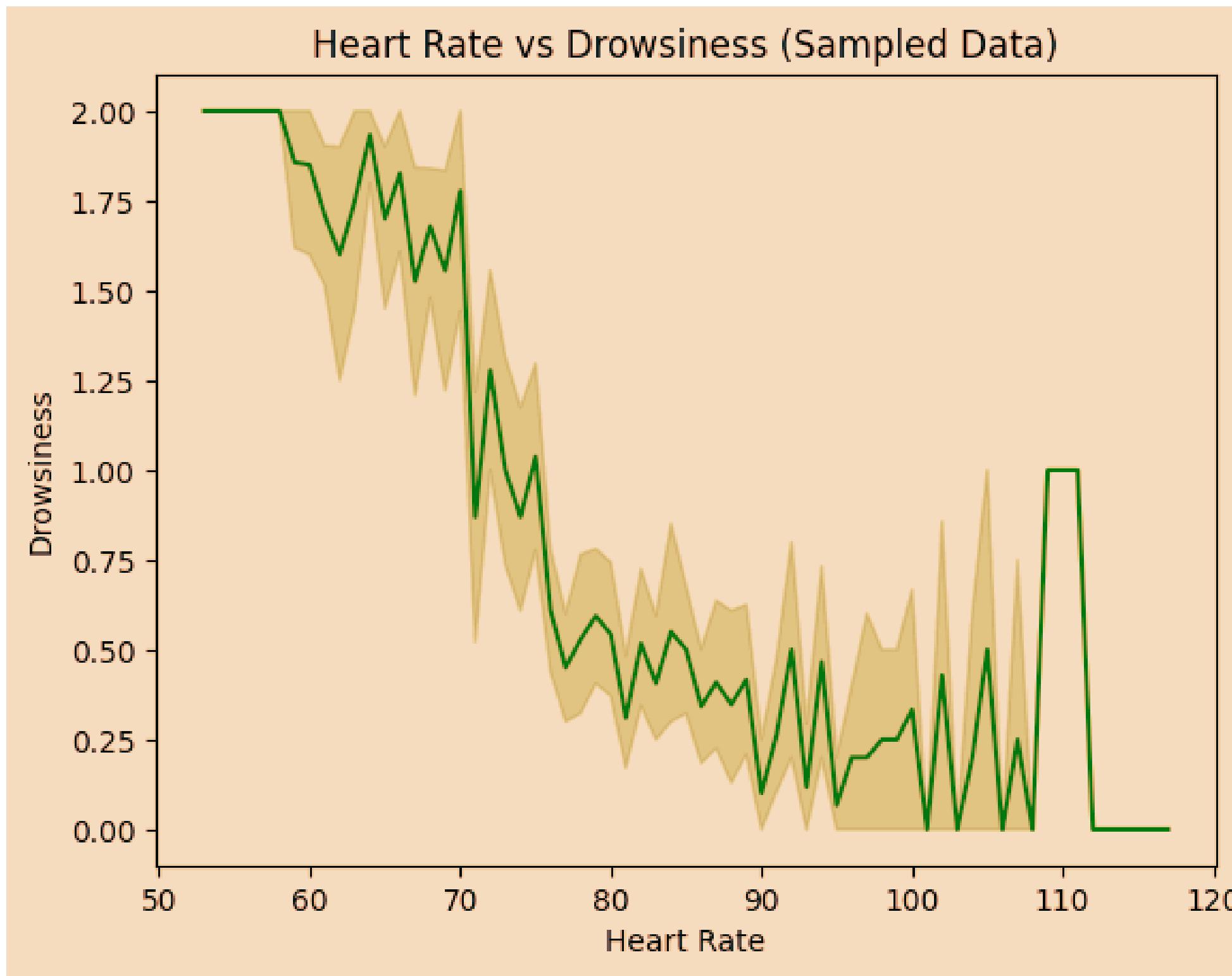
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This plot indicates a high linear relationship between PPG Green and PPG Red values and that PPG Red values increase with increase in the PPG Green values.

# Key Insights:

5

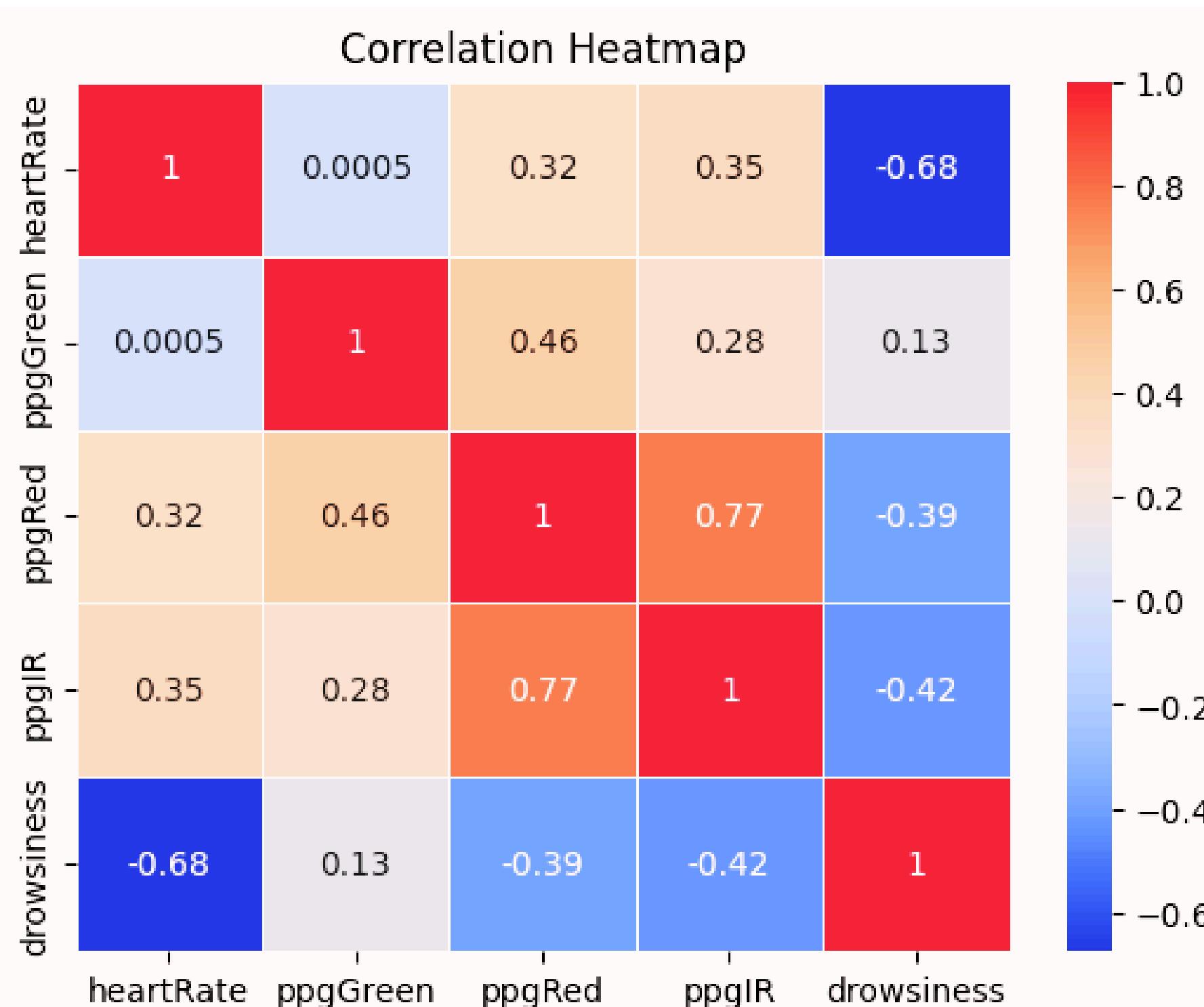


This plot shows indicates a negative relationship between heart rate and Drowsiness.

The level of Drowsiness decreases with increase in heart rate.

# Key Insights:

6



According to this heatmap, there is positive correlation only between PPG Green and drowsiness.

PPG Red, PPG Green, PPG IR and heart rate show positive correlation when related between each other.

It indicates a negative correlation between heart rate and drowsiness, ppgRed and drowsiness, ppgIR and drowsiness

# Findings and conclusion.

- There is a moderate positive correlation between heart rate and PPG Red, suggesting that PPG Red can be effectively used for heart rate monitoring.
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- PPG Green does not show a significant relationship with heart rate, indicating it may not be the most reliable sensor for this purpose, and its usage should be re-evaluated.
- A negative relationship between heart rate and drowsiness indicates that the wearable could detect drowsiness more accurately at lower heart rates, which could enhance the device's performance in alertness monitoring.
- PPG Green has a positive correlation with drowsiness, highlighting its potential for improving drowsiness detection.

In conclusion, combining multiple sensor data, especially PPG Red, PPG Green, and PPG IR, with heart rate monitoring could significantly improve the device's ability to monitor health metrics effectively.

Thank  
You