AI Cure: Where AI Meets Healing Touch

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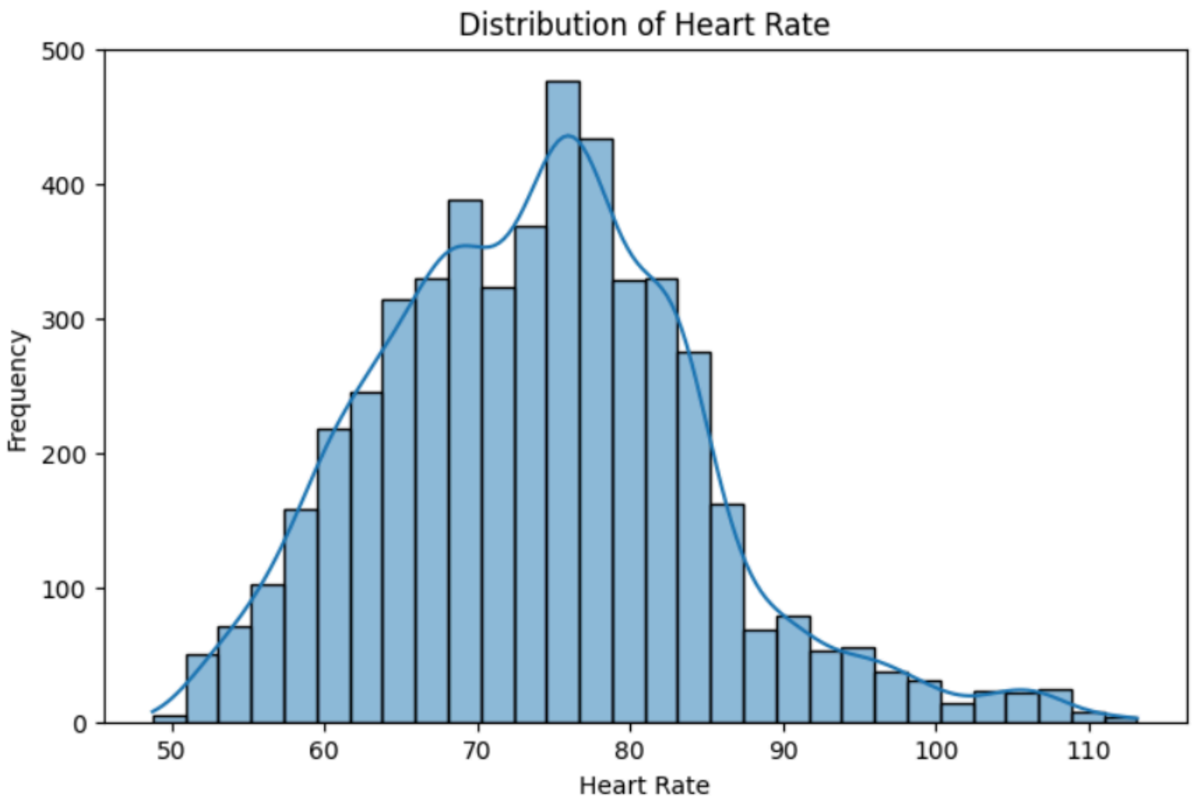
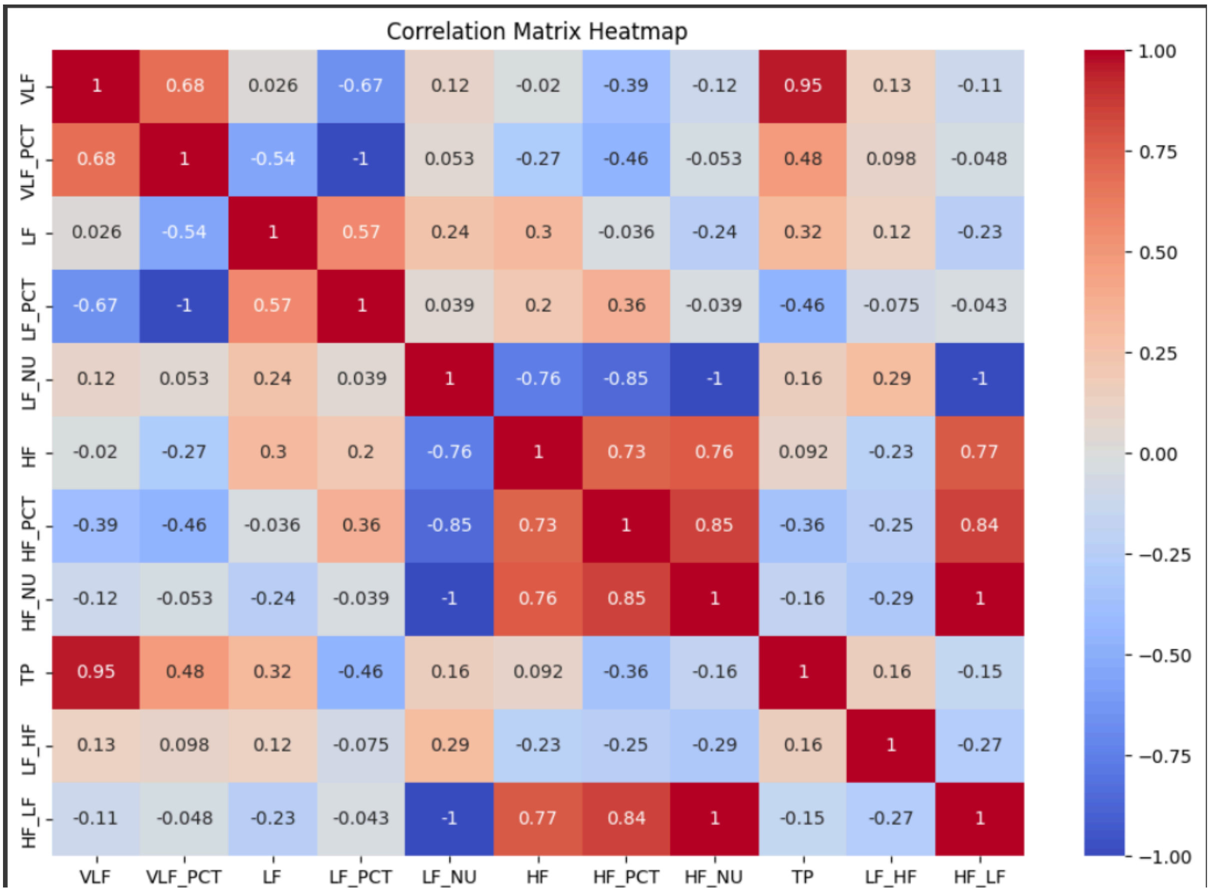
Overview

The objective of this research was to develop an effective solution for predicting heart rate (HR) based on given physiological features. The dataset used for this research was thoroughly analyzed, and various machine learning models were experimented with to achieve the best predictive performance.

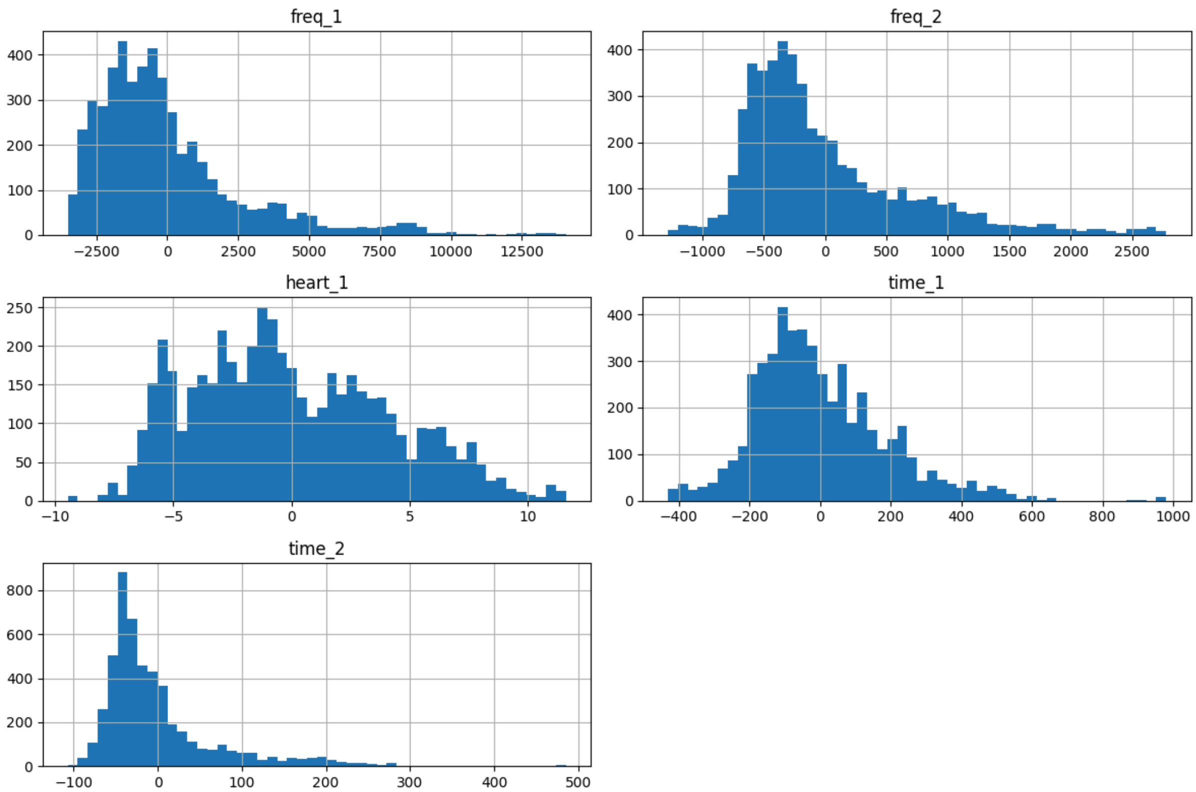
Data Analysis

The dataset used in this research was found to be well-prepared, containing no missing values or NaNs. This ensured a smooth start to the analysis and model development process.





this correlation shows the evenly distributed frequency values.



Probabilistic distribution between time, frequency and heart rate

Model Development

Linear Regression

The initial experiment involved implementing a Linear Regression model. The model demonstrated a commendable accuracy of 96.28%. It provided a solid baseline for further exploration.

Naive Bayes

A Naive Bayes model was then employed, resulting in a marginal improvement of 0.09% accuracy compared to the Linear Regression model. It is important to note that this improvement may vary in real-world applications due to different data distributions.

Random Forest Regressor

The Random Forest Regressor emerged as a standout performer among the experimented models. Its ability to capture complex patterns and handle probabilistic values led to superior predictive accuracy.

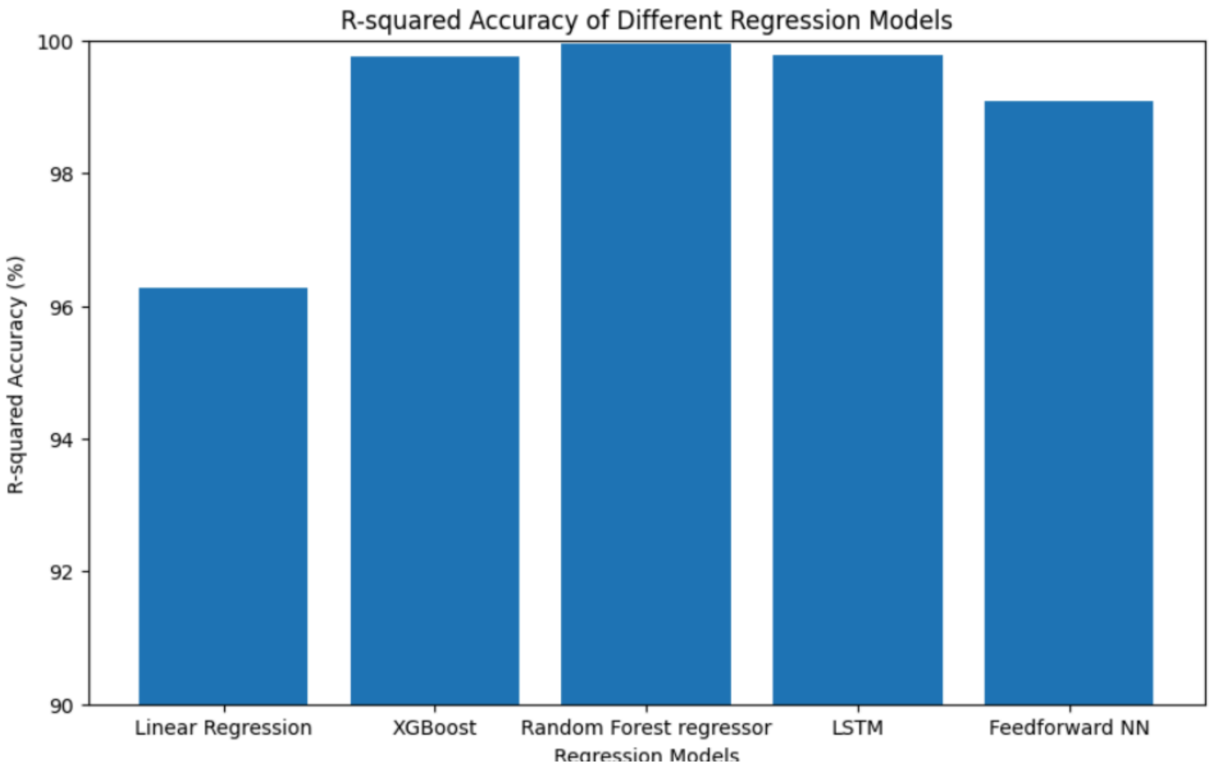
Optimized LSTM Networks

The exploration extended to neural networks with Optimized Long Short-Term Memory (LSTM) networks. While achieving a competitive accuracy, it was observed that these networks excel in capturing unseen patterns and probabilistic values.

XGBoost

XGBoost, a powerful ensemble learning algorithm, was also included in the experiments. It showcased robust predictive capabilities, aligning with the Random Forest Regressor in terms of performance.

Model Selection:



Model metrics

Model	accuracy
Linear Regression	96.28%
Naive Bayes	96.35%
Random Forest	99.95%
Optimized LSTM	99.85%
XGBoost	99.02%

In the pursuit of the most effective predictive model, we explored various algorithms, including Linear Regression, Naive Bayes, Random Forest Regressor, Optimized LSTM Networks, and XGBoost. Through comprehensive evaluation, we identified Random Forest Regressor as the optimal choice, excelling in capturing intricate patterns within the physiological data. This selection was further reinforced by the competitive performance of Optimized LSTM Networks and the robustness exhibited by XGBoost.

Future Work

- Despite achieving promising results, the research does not conclude here. Future work could explore further enhancements and modifications to existing models, potentially incorporating advanced neural network architectures and hyperparameter tuning.
- It's crucial to acknowledge that models may not always achieve 100% accuracy. A small deviation, such as 0.05%, is often acceptable. If models were to achieve perfect accuracy, all data points would align with the fitted regression line, indicating overfitting.