ABSTRACT

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Study Program : *Electrical Engineering*

Title : *Extraction of Photoplethysmography Signal Features for Blood Pressure Measurement Using Time Domain Analysis Methods.*

Hypertension, often referred to as the silent killer, is a major global health issue that causes significant morbidity and mortality worldwide. This study focuses on developing a more accurate and efficient non-invasive blood pressure prediction method using Photoplethysmography (PPG) signals. The main innovation of this research lies in the combination of advanced PPG signal preprocessing methods, namely linear detrending and Savitzky-Golay smoothing, as well as simple feature extraction based on gradient changes. Preprocessing successfully produced clean signals with an SNR of over 20 dB. The extracted features were then used as input for various machine-learning algorithms. The results showed that Exponential Gaussian Process Regression (Exponential GPR) achieved a Root Mean Squared Error (RMSE) of 11.823 mmHg for systolic blood pressure and 11.349 mmHg for diastolic blood pressure. Squared Exponential GPR achieved an RMSE of 10.888 mmHg for systolic blood pressure and 11.93 mmHg for diastolic blood pressure. The Ensemble (Bagged Trees) method achieved an RMSE of 12.494 mmHg for systolic blood pressure and 10.654 mmHg for diastolic blood pressure. These results indicate that the proposed combination of methods can be a promising alternative for improving the accuracy of PPG signal-based blood pressure predictions.

Keywords: Photoplethysmography, Blood Pressure, Preprocessing, Feature Extraction, Time-Domain Analysis, Prediction