

ABSTRAK

Penelitian ini mengembangkan model klasifikasi tingkat hipertensi berbasis Support Vector Machine (SVM) dengan memanfaatkan fitur fisiologis dari sinyal Photoplethysmograph (PPG) dan estimasi tekanan darah sistolik–diastolik. Data PPG dikumpulkan dari 276 partisipan di tiga lokasi menggunakan perangkat non-invasif yang terintegrasi ke platform web MR-IAT Robot Covid. Ekstraksi dan pra-pengolahan fitur dilakukan di MATLAB, sedangkan pengembangan serta evaluasi model SVM (scikit-learn) dijalankan pada Google Colab. Tiga varian kernel linier, kuadratik, dan kubik dibandingkan; kernel kubik terbaik dengan akurasi 96,4 %, diikuti kuadratik 94,9 % dan linier 91,3 %. Model keseluruhan mencapai akurasi 93,9 % dalam membedakan enam kategori tekanan darah (Hipotensi, Normal, Prahipertensi, Hipertensi Stage 1, Stage 2, Krisis). Analisis visual (scatter plot, confusion matrix, parallel coordinates) mengonfirmasi bahwa parameter sistolik, diastolik, usia, berat badan, dan laju respirasi berperan signifikan. Hasil ini menunjukkan potensi penerapan SVM dalam sistem portabel dan real-time untuk deteksi dini dan pemantauan kontinu hipertensi.

Kata kunci: klasifikasi hipertensi, *Support Vector Machine (SVM)*, *photoplethysmograph*, estimasi tekanan darah, pemantauan non-invasif.

ABSTRACT

This study develops a hypertension level classification model using Support Vector Machine (SVM) by exploiting physiological features extracted from photoplethysmograph (PPG) signals and systolic–diastolic blood pressure estimates. PPG data were collected from 276 participants across three sites with a non-invasive device integrated into the MR-IAT Robot Covid web platform. Feature extraction and preprocessing were carried out in MATLAB, while SVM training and evaluation (using scikit-learn) were performed on Google Colab. Three kernel types linear, quadratic, and cubic were compared: the cubic kernel achieved the highest accuracy at 96.4%, followed by quadratic at 94.9% and linear at 91.3%. Overall, the model attained 93.9% accuracy in distinguishing six blood pressure categories (Hypotension, Normal, Prehypertension, Hypertension Stage 1, Stage 2, and Crisis). Visual analyses (scatter plots, confusion matrices, parallel coordinates) confirmed that systolic and diastolic pressures, age, body weight, and respiratory rate are significant discriminators. These findings highlight the potential of SVM-based portable, real-time systems for early detection and continuous monitoring of hypertension.

Keywords: hypertension classification, Support Vector Machine (SVM), photoplethysmograph, blood pressure estimation, non-invasive monitoring.