

Abstract

Valvular heart disease (VHD) is a major cause of mortality in the world. In recent years, many researches have proposed methods for VHD detection with heart sound (PCG) signals by traditional machine learning, but they do not have the desired accuracy, sensitivity. Therefore, the current challenge is to develop a more effective approach for VHD identification. To overcome this limitation, our study utilizes deep learning, which is appropriately designed for VHD identification through PCG signal analysis. We investigated three deep learning algorithms, namely Convolutional Neural Network (CNN), Long Short-Term Memory (LSTM), and Recurrent Neural Network (RNN) for VHD classification. To evaluate the robustness, our study introduced the Valvular Heart Monitoring System (VAMIS), a prototype based on deep learning models, for the overall performance evaluation. VAMIS can distinguish different types of VHD, including aortic stenosis, mitral regurgitation, mitral valve prolapse, mitral stenosis, and normal conditions. Experiments were conducted in two scenarios: one without parameter tuning and one with parameter tuning for the *deep learning* model. The results showed that the fine-tuning RNN was the best model, achieving an impressive accuracy of 99.60%, precision of 99.04%, sensitivity of 99.00%, specificity of 99.74%, and F1 score of 98.99%. Furthermore, the evaluation of the VAMIS prototype showed "robustness" in the "deep learning" model, with an accuracy gap of 0.05%.

Keywords: VHD, Deep learning, DWT.