Accurate Cardiac Structure Segmentation from Echocardiographic Images using a Deep Neural Network: A Comprehensive Evaluation

AR. Seetharaman
Computer Science and Engineering, Annamalai University, Chidambaram, Tamil Nadu, India

Dr. R. Arunkumar
Computer Science and Engineering, Annamalai University, Chidambaram, Tamil Nadu, India

Abstract

Accurate segmentation of cardiac structures from echocardiographic images is crucial for reliable diagnosis and quantitative assessment of cardiac function. Manual segmentation is time-consuming and inconsistent. This paper presents a fully automated deep learning-based segmentation framework using the U-Net architecture, optimized for echocardiographic image analysis. The proposed approach is trained and validated on a locally collected dataset using a 70/20/10 split. It achieves a Dice Coefficient of 0.94 and Intersection over Union (IoU) of 0.91, demonstrating robust delineation of cardiac chambers. Comparative results show that the U-Net architecture outperforms traditional segmentation methods, confirming its potential for clinical integration.

Keywords

Cardiac segmentation, Echocardiography, U-Net, Deep learning, Medical image analysis, Automation.