

Cardiac Ultrasound: Self-supervised Learning in LV Segmentation

126018015 Hariharasudhan M

126018016 Harish M

126018042 Sanjai S

Abstract:

Robust automatic left ventricle (LV) segmentation of echocardiograms remains challenging due to sparsity in annotation; typically, only two crucial frames per video are annotated by clinicians. The present work introduces a new method, SimLVSeg, which enables video-based networks to perform consistent LV segmentation from sparsely annotated echocardiogram videos. SimLVSeg uses a two-step training process: (i) self-supervised pre-training with temporal masking to acquire the periodic patterns of echocardiograms from highly unannotated frames, and (ii) weakly supervised LV segmentation learning appropriate for sparse annotation settings. A rigorous evaluation using the EchoNet-Dynamic dataset shows that SimLVSeg achieves a 93.32% Dice score (95% CI: 93.21–93.43) compared to state-of-the-art methods, with improved computational efficiency. An out-of-distribution test on the CAMUS dataset further confirms SimLVSeg's superior generalizability to distribution shifts. These findings suggest that utilizing video-based networks for LV segmentation is a promising direction for robust performance at lower computational expense, with new opportunities for reliable automation in cardiac imaging pipelines

References:

1. Maani, F., Ukaye, A., Saadi, N., Saeed, N., & Yaqub, M. (2024). SimLVSeg: Simplifying Left Ventricular Segmentation in 2-D+Time Echocardiograms With Self- and Weakly Supervised Learning. *Ultrasound in medicine & biology*, 50(12), 1945–1954. <https://doi.org/10.1016/j.ultrasmedbio.2024.08.023>



Signature of the Guide

Dr. Karthikeyan B