Poster: Pre-training of U-Net encoder for improved keypoint detection in transmitral Doppler imaging.

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Abstract

Self-supervised learning enables models to extract meaningful representations from unlabelled data. These representations can then be effectively transferred to supervised learning tasks, often requiring less labelled data compared to traditional approaches. The BT-Unet method leverages the strengths of U-Net for medical image segmentation tasks and is specifically designed to facilitate Barlow twins pre-training of backbone networks, such as ResNet50. However, accurate keypoint detection in medical images remains a challenge. This study investigates the potential of pre-training these backbones with unlabelled, domain-specific medical imagery using the Barlow Twins method to enhance keypoint detection performance in BT-Unet. We hypothesise that pre-training with domain-specific data will lead to more accurate and robust detection of Doppler peak velocities in Mitral Inflow ultrasound images compared to models trained without pre?training. The findings from this study may contribute to more effective self-supervised learning strategies in echocardiographic image analysis, reducing the need for large annotated datasets. This work also supports my doctoral research on automated strain analysis using point tracking of the left ventricle (LV), where accurate keypoint detection is essential for reliable assessment of myocardial deformation.

Keywords

Transmitral Doppler imaging, U-Net encoder