

EP08.31 AI-driven fetal echocardiography with Colour Doppler for detection congenital heart defects: data from the international multicentre CAIFE study

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Introduction

Colour Doppler is an essential echocardiographic technique that aids in detecting fetal congenital heart defects (CHD). A novel paired-modality AI-based framework was developed to identify CHD from paired B-mode and Colour Doppler fetal echocardiographic videos.

Methods

- A dataset from the Clinical AI Fetal Echocardiography (CAIFE) study was compiled from 4 medical centres, which included 934 second-trimester participants and 3,800 spatially aligned pairs of B-mode and Colour Doppler videos.
- An AI-based framework was trained on normal paired data to predict Colour Doppler appearance based on its B-mode equivalent, while also estimating the expected discrepancies between the predicted and actual Colour Doppler for each input video.
- An anomaly score was generated by comparing the observed versus expected prediction error for each input video. Videos with larger-than-expected errors were considered more likely to be abnormal (*Figure 1*).

Results

Using the proposed paired-modality AI approach, overall discrimination of fetal CHD significantly improved from B-mode-only anomaly detection ($p<0.01$), achieving a specificity of 50% at 75% sensitivity and an area under the curve of 0.73

Conclusions

- The paired B-mode and color Doppler AI-based approach yields more informative indications for fetal CHD detection compared to using B-mode alone.
- This task remains challenging because of Color Doppler inter-centre, inter-scanner, and acquisition-related variability.

Fundings:



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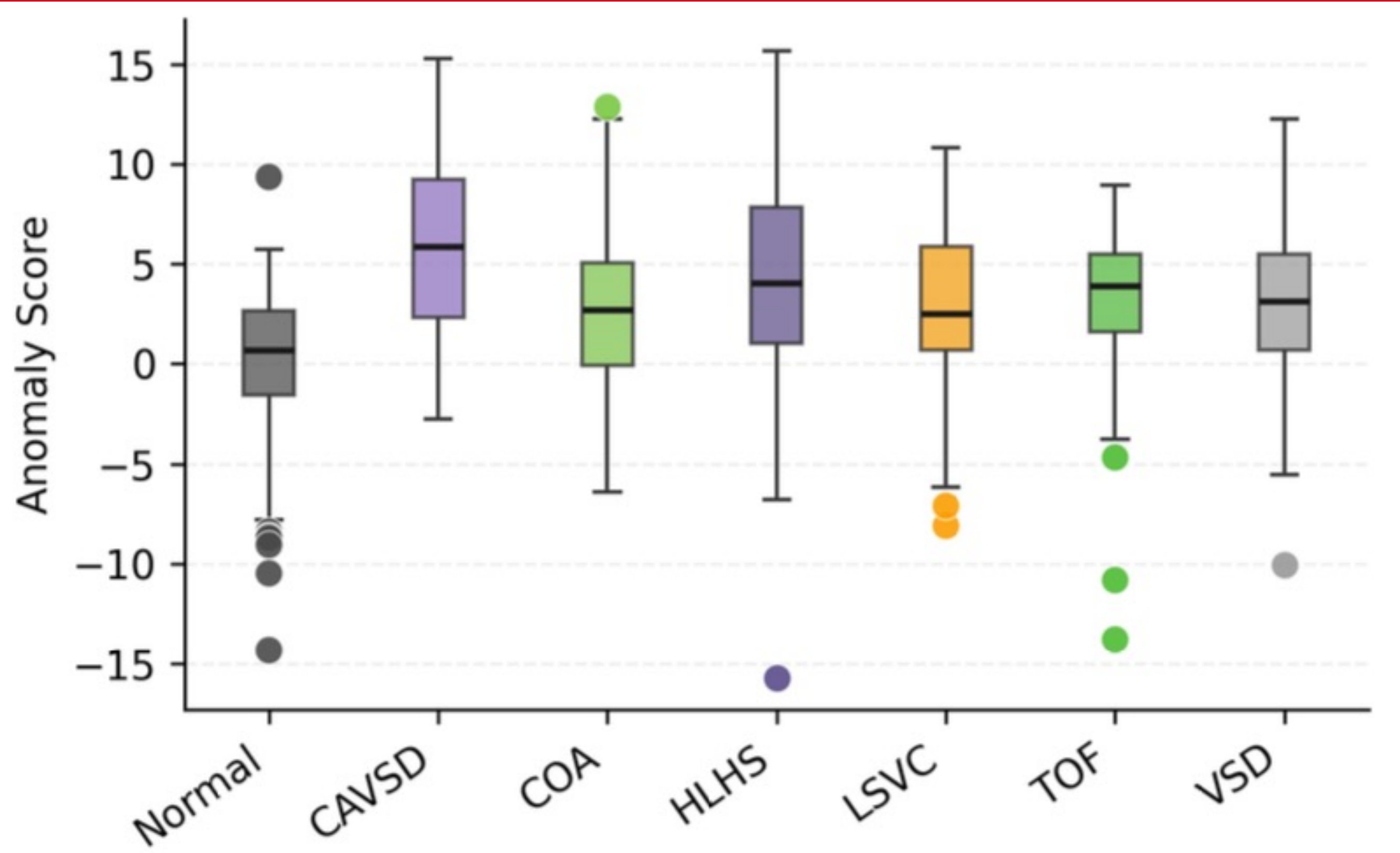


Figure 1. Distribution of participant-level anomaly scores produced by the proposed AI method (paired B-mode and Colour Doppler) across normal participants and five CHD types, where higher scores indicate more abnormal cases.
Abbreviations: CAVSD, complete atrioventricular septal; COA, coarctation of the aorta; HLHS, hypoplastic left heart syndrome; LSVC, left superior vena cava; TOF, tetralogy of Fallot; VSD, ventricular septal defect.