

Secure Health Data Transmission by Bayesian Fusion of Hybrid Domain and Deep Learning Steganography

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Abstract

Securing medical pictures during transmission is a major difficulty in telemedicine, necessitating approaches that preserve both security and diagnostic fidelity. This research provides a Bayesian fusion-based steganographic framework that combines two complimentary approaches to produce higher imperceptibility, resilience, and reconstruction quality. The first approach employs a Discrete Wavelet Transform (DWT), Singular Value Decomposition (SVD), Least Significant Bit (LSB), hybrid (DWT-SVD-LSB) technique, where the cover and secret medical images are transformed into frequency sub-bands by DWT and the low-frequency coefficients (LL bands) are embedded using SVD for high stability and noise resistance. The second technique uses a deep learning-based Convolutional Neural Networks and DWT (CNN-DWT) model, where both images go through convolutional feature extraction, multi-level wavelet decomposition, and attention-based enhancement for creating a perceptually accurate stegoimage. The two models are fused by using the results level Bayesian precision fusion, which combines their hybrid PSNR of 56.73 dB and the deep learning PSNR of 57.73 dB. The fused PSNR is 60.27 dB, which is an improvement of 2.54 dB above the best performing individual approach.

Keywords

Bayesian Fusion, CNN, DWT, Steganography, SVD.