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(57) Abstract :
ABSTRACT [0012] Steganography, the art of concealing secret information within digital media, has gained significant attention in secure communication. Traditional methods often struggle with balancing payload capacity, security, and imperceptibility The proposed model, named WGAN-Steg, operates in the frequency domain by applying Discrete Wavelet Transform (DWT) to decompose cover images into sub-bands. An attention-guided encoder embeds the secret message into the high-frequency components, minimizing visual distortion. The adversarial training between the generator (encoder-decoder) and a discriminator ensures that the stego images are indistinguishable from the original covers, enhancing security against steganalysis. The model is trained and evaluated on standard datasets such as DIV2K and COCO, demonstrating superior performance in terms of Peak Signal-to-Noise Ratio (PSNR), Structural Similarity Index (SSIM), and robustness against detection. Experimental results show that WGAN-Steg achieves higher embedding capacity and better visual quality compared to existing deep learning and traditional steganographic techniques. This work contributes to the advancement of secure data hiding by integrating frequency-domain analysis with deep adversarial learning, paving the way for next-generation steganographic systems.

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