

## ABSTRACT

This research introduces an advanced digital audio watermarking system designed to bolster the security of digital data, specifically focusing on ownership and copyright protection. Conventional audio watermarking methods often encounter limitations and reliability issues against various attacks. To address these challenges, a novel approach is proposed, leveraging deep learning and integrating the Discrete Wavelet Transform (DWT) with an optimized deep Convolutional neural network (DCNN). The primary contribution lies in the DCNN's adeptness in selecting optimal embedding locations, a critical factor for robust watermarking. Through hyper parameter tuning and search location optimization, classifier errors are minimized. Experimental results showcase superior performance, with the proposed model achieving a Bit Error Rate (BER) of 0.082, Mean Square Error (MSE) of 0.099, and Signal-to-noise ratio (SNR) of 45.363. This model surpasses the existing watermarking models and underscores the effectiveness of neural network architectures, particularly the DCNN, in optimizing watermark embedding and extraction with minimal bit error. The research also explores various hybrid and innovative techniques in digital audio watermarking, highlighting the utility of neural networks in advancing the field. The discussion encompasses classical and modern approaches incorporating machine learning, deep learning, bio-inspired algorithms, and cryptographic methods to enhance watermarking efficiency and security. The research provides insights into the challenges and opportunities in achieving robustness, imperceptibility, and security in digital audio watermarking, ultimately showcasing the applicability of neural network architectures in this domain.