# Genetic algorithm based Deep Time Series Similarity Searching approach for Acoustic Fingerprinting

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With the exponential growth in music consumption, the demand for robust audio identification systems has intensified, especially for copyright detection and content-based retrieval. Acoustic fingerprinting, which identifies audio using unique spectral features, is a core technique in this domain. In this study, we propose a novel Deep Time Series Similarity Searching (DTSSS) framework for audio fingerprinting, leveraging a Long Short-Term Memory (LSTM)-based Siamese Neural Network. A key innovation of this work is the integration of a Genetic Algorithm (GA) to optimize hyperparameters critical to model performance. To enhance robustness, audio degradations such as noise, pitch, and tempo alterations were applied during data augmentation. The proposed system significantly outperforms the Shazam algorithm, achieving an accuracy of 64.44% compared to Shazam's 21.22% on the same dataset of degraded audio. This result highlights the potential of combining deep learning with evolutionary optimization for high-fidelity, real world audio retrieval systems.

**Keywords:** *Music information retrieval, Acoustic fingerprinting, Genetic algorithm, Hyperparameter optimization*