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GAN-Enhanced Vocal Biomarker Analysis for Respiratory Health Assessment

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Abstract: *Nearly two centuries ago, people became aware that various diseases, such as the common cold, asthma, Alzheimer's, and psychological disorders, manifest changes in a human voice. The recent emergence of the virus known as "COVID-19" has claimed millions of lives due to delayed detection of infected individuals. Traditional medical techniques for virus detection are time-consuming and costly. However, recent advancements in Artificial Intelligence (AI) offer remote diagnosis for analysing and identifying diseases that cause variations in voice. The evolution of machine learning provides numerous techniques to extract meaningful information from vocal biomarkers.*
This study explores innovative techniques to enhance the analysis of vocal biomarkers, emphasizing Generative Adversarial Networks (GANs) and machine learning for assessing respiratory diseases. The end goal of the study is to improve the performance by utilizing synthetic data for training purposes. Subsequently, machine learning models are employed to analyze real-time data for detecting respiratory illnesses. Comparing different machine learning algorithms gives us a better understanding of their capabilities and drawbacks

Keywords: Generative Adversarial Network (GAN), Wasserstein GAN, Conditional GAN, Artificial Intelligence (AI), Cough Detection, Respiratory Health Assessment, Vocal Biomarkers, MFCC, Mel-Spectrogram, Croma, Machine Learning, L2-regularization, Classification, Normalization, Support Vector Machine (SVM), Covid-19, Convolutional Neural Network (CNN), Audio Synthesis, Synthetic Data Generation, LSTM, Synthetic Minority Over-Sampling Technique (SMOTE), Deep Learning, Recurrent Neural Network (RNN), Data Augmentation, Cross-Validation, Principle Component Analysis (PCA), Zero Crossing Rate (ZCR)

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