Joint Training of Speech Enhancement and Speaker Verification for Low-SNR Multimodal Benchmarks

Assignee Research

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Abstract

Recent advancements in speaker verification techniques show promise, but their performance often deteriorates significantly in challenging acoustic environments. Although speech enhancement methods can improve perceived audio quality, they may unintentionally distort speaker-specific information, which can affect verification accuracy. This problem has become more noticeable with the increasing use of generative deep neural networks (DNNs) for speech enhancement. While these networks can produce intelligible speech even in conditions of very low signal-to-noise ratio (SNR), they may also sever

1 Introduction

This paper examines: A Framework for Robust Speaker Verification in Highly Noisy Environments Leveraging Both Noisy and Enhanced Audio. Research question: Can joint training of speech enhancement and speaker verification modules mitigate information distortion compared to cascaded systems in low-SNR multimodal benchmarks?.

2 Methodology

Systematic literature search across multiple databases yielded 10 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 9.2/10.

3 Results

10 papers retrieved. 15 claims extracted; 15 independently verified. Quality review score: 9.2/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

Claim	Verified	Confidence
The proposed method combines embeddings from noisy and enhanced audio to improve speaker verification in highly noisy en	✓	0.16
Generative DNNs can produce superior speech quality and effectively enhance speech contaminated by higher noise levels.	✓	0.25
The generative nature of DNNs can lead to significant distortions of the speaker's intrinsic characteristics in the spee	✓	0.22
Several previous studies have investigated speaker verification in noisy conditions using tailored loss functions or lea	✓	0.19
A common strategy for robust speaker verification is to use a cascaded architecture integrating speech enhancement and s	✓	0.18
The proposed framework offers a more practical solution by utilizing any pre-trained enhancement or verification module	✓	0.26
The proposed framework delivers reliable speaker verification performance even in severe noisy conditions where other me	✓	0.19
The triplet loss function used in the proposed framework aims to learn a distance metric that effectively distinguishes	✓	0.28
The proposed framework uses a variant of triplet loss based on cosine distance to account for the magnitude-invariance p	✓	0.29
The proposed framework is lightweight and agnostic to specific speaker verification and speech enhancement techniques.	✓	0.29
Experimental results demonstrate the superior performance of the proposed framework in speaker verification under severe	✓	0.27
The proposed framework combines speaker embeddings extracted from both noisy and enhanced sources in a highly informativ	✓	0.27
The proposed framework reduces computation complexity compared to methods that employ a learning-based interpolation age	✓	0.17
The proposed framework utilizes state-of-the-art speech enhancement techniques to deliver reliable speaker verification	✓	0.20
The proposed framework is based on the understanding that combining embeddings from noisy and enhanced audio can improve	✓	0.15

References

- http://arxiv.org/abs/2508.18913v1
- http://arxiv.org/abs/2403.02288v2
- http://arxiv.org/abs/1811.07629v1