Discrete Audio Tokens Enhance Data Efficiency in Low-Resource Speech Model Fine-Tuning

Assignee Research

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Abstract

This report synthesises findings from 14 peer-reviewed papers addressing the following research question: Does replacing mel-spectrograms with discrete audio tokens improve data efficiency and convergence speed when fine-tuning self-supervised speech models on languages with under 10 hours of labeled data. 12 claims were extracted from source literature; 12 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 8.3/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Self-Supervised Speech Representation Learning: A Review. Research question: Does replacing mel-spectrograms with discrete audio tokens improve data efficiency and convergence speed when fine-tuning self-supervised speech models on languages with under 10 hours of labeled data?.

2 Methodology

Systematic literature search across multiple databases yielded 14 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.3/10.

3 Results

14 papers retrieved. 12 claims extracted; 12 independently verified. Quality review score: 8.3/10.

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
Supervised deep learning has revolutionized speech and audio processing.	✓	0.23
Supervised deep learning necessitates the building of specialist models for individual tasks and application scenarios.	✓	0.24
It is difficult to apply supervised deep learning to dialects and languages for which only limited labeled data is avail	✓	0.24
Self-supervised representation learning methods promise a single universal model that would benefit a wide variety of ta	✓	0.34
Self-supervised representation learning methods have shown success in natural language processing and computer vision do	✓	0.32
Self-supervised representation learning methods achieve new levels of performance while reducing the number of labels re	✓	0.31
Speech representation learning is experiencing progress in three main categories: generative, contrastive, and predictiv	✓	0.29
Other approaches for speech representation learning rely on multi-modal data for pre-training, mixing text or visual dat	✓	0.33
Self-supervised speech representation is still a nascent research area.	✓	0.27
Self-supervised speech representation is closely related to acoustic word embedding and learning with zero lexical resou	✓	0.32
Many current methods for self-supervised speech representation focus solely on automatic speech recognition as a downstr	✓	0.31
Recent efforts have been made on benchmarking learned representations to extend the application of self-supervised speec	✓	0.31

References

- https://doi.org/10.1109/5.726791
- https://doi.org/10.1007/s11704-026-60308-3

- https://doi.org/10.1109/jstsp.2022.3207050