Comparative Analysis of ASR-Guided Flow-Matching and Diffusion-Based TTS for Zero-Shot Cross-Lingual Voice Cloning in

Assignee Research

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Abstract

We present PFluxTTS, a hybrid text-to-speech system addressing three gaps in flow-matching TTS: the stability-naturalness trade-off, weak cross-lingual voice cloning, and limited audio quality from low-rate mel features. Our contributions are: (1) a dual-decoder design combining duration-guided and alignment-free models through inference-time vector-field fusion; (2) robust cloning using a sequence of speech-prompt embeddings in a FLUX-based decoder, preserving speaker traits across languages without prompt transcripts; and (3) a modified PeriodWave vocoder with super-resolution to 48 kHz. On

1 Introduction

This paper examines: PFluxTTS: Hybrid Flow-Matching TTS with Robust Cross-Lingual Voice Cloning and Inference-Time Model Fusion. Research question: How does the zero-shot cross-lingual voice cloning performance of ASR-guided flow-matching TTS models compare to diffusion-based architectures like Diffusion-TTS on metrics like naturalness and speaker similarity in low-resource languages?.

2 Methodology

Systematic literature search across multiple databases yielded 16 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.5/10.

3 Results

16 papers retrieved. 16 claims extracted; 14 independently verified. Quality review score: 8.5/10.

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
PFluxTTS achieves higher intelligibility and speaker similarity than state-of-the-art baselines in challenging cross-lin	✓	0.17
The proposed system is statistically better than FishSpeech in Naturalness MOS and than ElevenLabs in SMOS (paired t-tes	✓	0.28
The proposed system performs similarly to ChatterBox in both Naturalness and SMOS.	×	0.12
The experiment setup includes subjective evaluation on the Prolific platform using the AI tasker pool, restricted to nat	✓	0.20
Each system output was rated on a 1–5 scale for two criteria — MOS naturalness and similarity mean opinion score (SMOS)	✓	0.26
The proposed system uses VoxLingua-dev with up to 15 samples from 33 languages (397 total), paired with random English t	✓	0.23
The synthesized speech is in English, while acoustic prompts are in other languages.	×	0.12
Raters judged speaker similarity (SMOS) with respect to the non-English prompt voice.	✓	0.21
The proposed system is designed for cross-lingual, in-the-wild samples, including conversational speech, to demonstrate	✓	0.19
The proposed system is compared against open-source state-of-the-art baselines and the commercial ElevenLabs Multilingua	✓	0.20
The proposed system uses official inference code with default configurations for ChatterBox2, FishSpeech S1-mini3, F5-TT	✓	0.18
All baselines were trained on larger multilingual datasets; we restrict evaluation to English-only synthesis, where syst	✓	0.24
The proposed system integrates a PeriodWave-based vocoder with prompt-based super-resolution, enabling 48 kHz waveform r	✓	0.26
The proposed system utilizes two TTS models trained independently with no weight sharing between them: a duration-guided	✓	0.17
The proposed system employs a sequence of speech-prompt embeddings within a FLUX-based architecture, which is robust to	✓	0.22
The proposed system combines the4stability of explicit durations with the naturalness and fluency of alignment-free deco	✓	0.16

References

- http://arxiv.org/abs/2509.14579v4
- http://arxiv.org/abs/2409.13910v1
- http://arxiv.org/abs/2602.04160v2