De-AntiFake: Rethinking the Protective Perturbations Against Voice Cloning Attacks

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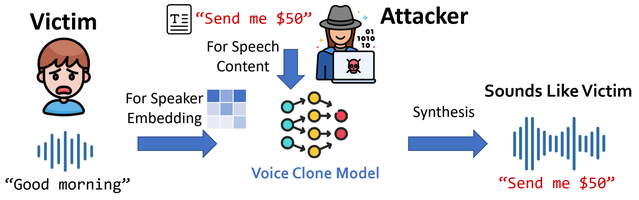
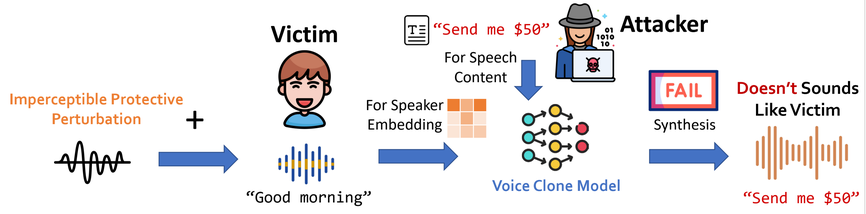
Motivation

❶ Voice Cloning Attacks Bring Security Risks



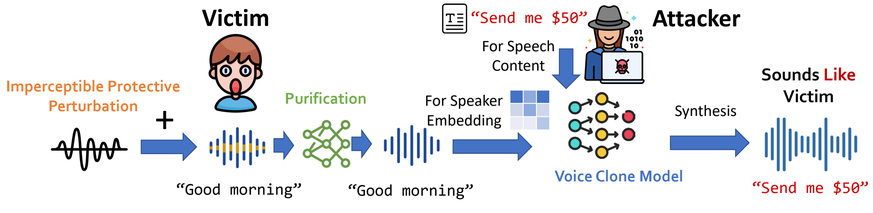
😈 Deceive human and speaker verification, carry **security and privacy risks**

❷ Current Active Defenses Against Voice Cloning



🛡️ Relying on **imperceptible adversarial perturbations** to prevent voice cloning models from generating victim-like speech

❸ But If the Attackers Try to *Purify* the Audio...



😟 If existing defenses are vulnerable to purification, they **may provide a false sense of security**

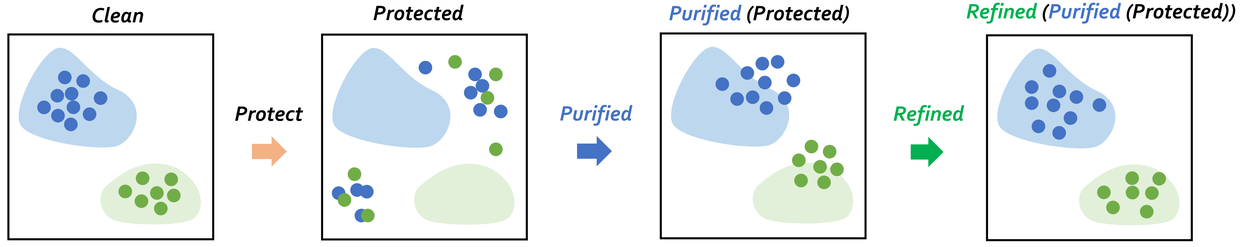
Our Work

1. Analyzing the Impact of Purification Attacks on Existing Perturbation-based Voice Cloning Defenses.

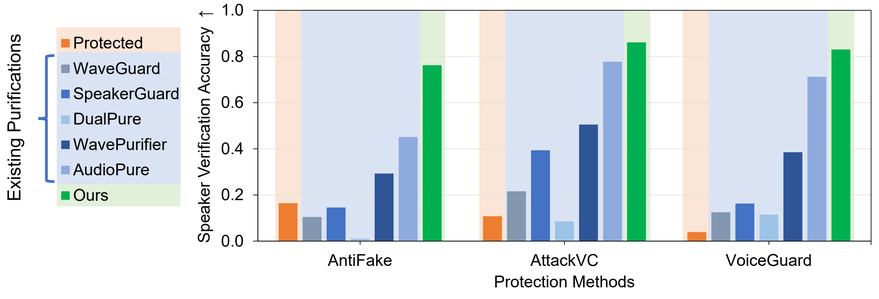
- ✓ **Conclusion:** Existing defenses are shown to be vulnerable to purification (at least **45.1%** protected samples can be bypassed).
- ✓ **Observation:** Existing purification introduces *distortions in voice cloning model embedding spaces*, which degrades voice cloning performance.

2. Proposing *PhonePuRe*: A Novel Purification Attack to Further Reveal the Brittleness of Existing Voice Cloning Defenses.

- ✓ **PhonePuRe: Two-Stage Framework** (**Pu**rification + **Phone**me-Guided **Re**finement)
  - ❑ Purification Stage: Preliminarily mitigate noise (unconditional diffusion).
  - ❑ Phoneme-Guided Refinement Stage: *Mitigate distortions in voice cloning model embedding spaces* (conditional diffusion).



- ✓ **Our Method Outperforms Existing Purification Methods, Increasing the Attack Success Rate: 45.1% → 76.2%.**



⚠️ Our work **reveals vulnerabilities** in existing voice cloning defenses, underscores the need for **more robust defenses to protect our voice**

Code and audio samples: de-antifake.github.io
Contact: range@mail.ustc.edu.cn

Project Page | Code