**A U-NET BASED AUDIO DENOISER**

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**Abstract:**

Noise reduction is a crucial problem in the field of audio processing, as it significantly impacts the quality and intelligibility of sound signals. In this project, we propose a novel approach based on the U-Net architecture to tackle sound noise reduction efficiently. The U-Net is a deep learning model known for its effectiveness in image segmentation tasks, and we adapt it to handle the challenges posed by audio denoising. The introduction of the project provides an overview of the significance of noise reduction in audio processing and the growing interest in leveraging deep learning techniques for this purpose. We highlight the drawbacks of traditional methods, which often struggle to effectively remove noise while preserving the original audio content.

**Existing Model:**

We review the conventional noise reduction techniques that have been used in the past. These methods primarily rely on signal processing and statistical approaches to reduce noise in audio signals. These techniques may include filtering methods, spectral subtraction, statistical approaches, and more. While some of these methods have demonstrated success in specific scenarios, they often fall short when dealing with variable and complex noise patterns. This limitation motivates the need for novel approaches that can better handle the challenges posed by real-world noise.

**Proposed Model:**

Our proposed method is based on the U-Net architecture, which is a convolutional neural network (CNN) with a U-shaped encoder-decoder structure. We employ the U-Net to learn the mapping between noisy and clean audio signals. The U-Net's skip connections enable direct access to low-level features from the encoder, facilitating the preservation of essential audio characteristics during the denoising process. The core of our model lies in its ability to capture and understand the underlying structures of noisy audio signals, thus enabling precise denoising. By leveraging the hierarchical nature of audio data, our model learns to remove noise while preserving important audio features. Additionally, we focus on reducing the computational complexity, making the denoising process efficient enough for real-time applications.

**Objectives:**

* To achieve state-of-the-art denoising performance by capturing and understanding the underlying structures of noisy audio signals.
* To reduce the computational complexity of the denoising process.
* Real-world Applicability.
* This work opens up exciting possibilities for high-quality audio denoising in real-world applications, such as speech enhancement, audio restoration, and voice recognition systems.

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