T5— Acoustic echo is a persistent issue in telecommunication that degrades the quality of speech . the demand for AEC has significantly risen after the global pandemic 2020 . this paper proposes a novel transQT neural network (TNN) that leverages the constant Q transform (CQT) and transformer-inspired self-attention module to eliminate the echo and noise in noisy scenarios . the attention module has been incorporated among the layers of the proposed TNN to focus on double-talk and noisy parts of speech

Bart —-- Novel TransQT Neural Network: A Deep Learning Framework for Acoustic Echo Cancellation in Noisy Double-Talk Scenario. Acoustic echo is a persistent issue in telecommunication that degrades the quality of speech. This paper proposes a novel transQT neural network (TNN), an end-to-end neural network that leverages the constant Q transform (CQT) and transformer-inspired self-attention module. The proposed TNN model demonstrated superior performance in terms of speech quality, as measured by the perceptual evaluation ofspeech quality (PESQ) and it also showed a significant reduction of echo, quantified by echo return loss enhancement (ERLE) The performance was further evaluated using the correlation coefficient, which indicates the relationship between the clean and the echo signal. The primary aim of CQT is to improve speech quality as it aligns more closely with the human auditory system due to its use of a logarithmic frequency scale. It aids the AEC model by making it easier to separate the clean target signal from the parts affected by double-talk and noise. The smooth L1 loss is employed to ensure smooth training and stable and efficient convergence. It is also less sensitive to variability in data, therefore reducing large errors and overall loss. An experimental implementation was conducted for both causal and non-causal scenarios. It was found that the TNN was more effective than the adaptive filters in eliminating the echo and noise in noisy scenarios.

Gemini The TransQT Neural Network (TNN) is an end-to-end deep learning framework for acoustic echo cancellation (AEC) in noisy double-talk scenarios. It employs the Constant Q Transform (CQT) to extract time-frequency features and a Transformer-inspired self-attention module to focus on noisy and double-talk speech segments. The smooth L1 loss function facilitates efficient training and stable convergence. Experimental results show that TNN effectively eliminates echo and noise, leading to improved speech quality (PESQ) and echo reduction (ERLE). Its performance is validated in both causal and non-causal scenarios, demonstrating its potential for real-time AEC applications in challenging communication environments.

Gpt-4 In recent years, the growing field of telecommunication has faced challenges with acoustic echo, particularly in the context of increased remote interactions post-2020. Acoustic echo cancellation (AEC) systems are crucial as they enhance speech quality by eliminating echoes that disrupt communication. Numerous studies have addressed this topic with varying approaches, including adaptive filters and deep learning techniques. However, these methods often fall short in noisy double-talk scenarios where both near-end and far-end speakers are active simultaneously.

This paper introduces a novel TransQT Neural Network (TNN), an innovative deep learning framework designed to tackle the complexities of acoustic echo cancellation in noisy double-talk environments. The TNN leverages the constant Q transform (CQT) and a transformer-inspired self-attention module, enhancing its ability to discern and eliminate unwanted echo and noise. The CQT, used at the front end, converts audio signals from the time domain to the time-frequency domain, aligning closely with the human auditory system through its logarithmic frequency scale. This alignment significantly improves the speech quality.

The integration of the self-attention module within the TNN architecture allows the system to focus specifically on segments of speech affected by double-talk and background noise, facilitating more effective separation of the clean target signal. To optimize training and performance, the TNN employs a smooth L1 loss function, which ensures stable and efficient convergence of the model by being less sensitive to data variability and reducing large errors.

Experimental results from implementing the TNN in both causal and non-causal settings have demonstrated its superior performance. The model not only shows a significant enhancement in speech quality, as measured by the perceptual evaluation of speech quality (PESQ) but also achieves a considerable reduction in echo, evidenced by improvements in echo return loss enhancement (ERLE). Further validation using the correlation coefficient confirmed the effective relationship between the clean and echo-affected signals, underscoring the TNN's robust capabilities in complex acoustic scenarios.

Gpt-3 The paper introduces a novel TransQT Neural Network (TNN) for Acoustic Echo Cancellation (AEC) in noisy double-talk scenarios, addressing the challenges faced in telecommunication due to echo and noise disruptions, especially in unpredictable environments like home settings. Traditional AEC methods struggle in double-talk situations and noisy environments, prompting the need for advanced solutions. The TNN leverages the constant Q transform (CQT) and transformer-inspired self-attention module to effectively eliminate echo and noise. By utilizing the smooth L1 loss function, the model ensures efficient training and enhanced performance. The CQT transforms signals from the time domain to the time-frequency domain, aligning closely with human auditory perception. The attention module focuses on double-talk and noisy speech segments, aiding in separating the clean target signal from the affected parts. The smooth L1 loss function contributes to stable training and reduced sensitivity to data variability. Experimental results demonstrate the TNN's superior performance in speech quality, quantified by perceptual evaluation and echo reduction measured by echo return loss enhancement. The model's effectiveness is further validated through correlation coefficient analysis, highlighting its ability to distinguish between clean and echo signals. Overall, the TNN presents a promising solution for AEC in challenging double-talk scenarios, offering significant improvements in communication quality and echo suppression.