**SEGAN Fine-Tuning for Audio Denoising**

In this project, I experimented with the Speech Enhancement Generative Adversarial Network (SEGAN) model to perform audio denoising. SEGAN is a deep learning model that leverages Generative Adversarial Networks (GANs) for improving the quality of noisy speech by generating cleaner audio. The model works by training two components:

* Generator: A neural network that generates clean audio from noisy input.
* Discriminator: A neural network that evaluates how realistic the generated clean audio is, compared to actual clean audio.

I used the original SEGAN model, which is known for its ability to remove noise from speech, but found that without fine-tuning, it would amplify the noise, leading to poor performance. After fine-tuning the model using a dataset of noisy and clean audio pairs, the results improved significantly.

**Fine-Tuning the Model**

To improve the model's performance, I fine-tuned the SEGAN model by training it on a custom dataset of noisy and clean audio pairs. The dataset consists of noisy audio as input and clean audio as the target output. During fine-tuning, the model learns to generate cleaner versions of the noisy input by minimizing the difference between the generated audio and the actual clean audio. Additionally, I used a discriminator to guide the generator by distinguishing between real (clean) and fake (generated) audio.

After fine-tuning, the model showed substantial improvement in its ability to denoise the audio. The previously amplified noise was greatly reduced, and the denoised output was much closer to the clean audio. This fine-tuned model is now ready to be considered as the final model for implementation in audio denoising tasks.

**Some evaluation metrics to consider for this model are:**

Signal-to-Noise Ratio (SNR) Improvement, Mean Squared Error (MSE), and PESQ (Perceptual Evaluation of Speech Quality).

Hope this might be helpful in our evaluation process.