0.1 Signal Processing

0.1.1 Short-Time Fourier Transform

The Short-Time Fourier Transform is the most used method of time-frequency analysis. The main concept relies on multiplying $x(t)$ with an analysis window $y * (t - r)$ and then compute the Fourier Transform of this windowed signal.

STFT formula:

In a digital environment we will use the discrete formula instead:

The window y*(t-r) suppresses x(t) outside a certain region and the FT outputs a local spectrum. The FT is complex valued, so we use a spectrogram to display it. This also helps us for further processing the signal. In our application we will use the amplitude spectrum as input for our neural network. The spectrogram is created by computing the squared magnitude of the STFT:

After we are done filtering the spectrum, we will need to reconstruct the signal to get an audio back. A reconstruction of x(t) is possible and is done so easily by the Inverse Short-Time Fourier Transform (ISTFT) formula:

We will implement the equivalent discrete formula to reconstruct our signal.

0.1.2 Time-Frequency Masking

sdffsdf

0.2 Deep Learning

0.2.1 Generalization

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0.2.2 Supervised Learning

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0.2.3 Artificial Neural Network

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0.2.4 Recurrent Neural Network

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0.2.5 Vanishing gradient

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0.2.6 Long Short-Term Memory

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0.2.7 Overfitting

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0.2.8 Optimization

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