Linear Convolution

Linear convolution is a mathematical operation used to combine two signals to produce a third signal. It's a fundamental operation in signal processing and systems theory. Mathematical Definition: Given two signals, x(t) and h(t), their linear convolution is defined as: y(t) = x(t) * h(t) = $\int x(\tau)h(t-\tau)\, d\tau_{-\infty}^{\infty}$

Applications:

• Filtering: Convolution is used to filter signals, removing unwanted frequencies or noise.
• System Analysis: The impulse response of a system completely characterizes its behavior, and convolution can be used to determine the output of the system given a known input.
• Image Processing: Convolution is used for tasks like edge detection, blurring, and sharpening images.