

Convolution

Not that convolution...

Definition

Discrete time convolution:

$$(f \ast g)[n] \equiv \sum_{m = -\infty}^{\infty} f[m]g[n-m]$$

Continuous time convolution:

$$(f \ast g)(t) \equiv \int_{-\infty}^{\infty} f(\tau)g(t - \tau) d\tau$$

Properties

- Convolution is commutative:

$$f \ast g = g \ast f$$

- Convolution is associative:

$$f \ast (g \ast h) = (f \ast g) \ast h$$

- Convolution is distributive over addition:

$$(f + g) \ast x = f \ast x + g \ast x$$

Frequency domain

- Convolution in the time/spatial domain is equivalent to multiplication in the frequency domain. The inverse is also true.

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