

# Circular Convolution

Circular convolution is a mathematical operation that is like linear convolution but is performed in a periodic or circular manner. This is particularly useful in discrete-time signal processing where signals are often represented as periodic sequences. Mathematical Definition: Given two periodic sequences  $x[n]$  and  $h[n]$ , their circular convolution is defined as:  $y[n] = (x[n] \circledast h[n]) = \sum_{k=0}^{N-1} x[k]h[(n-k) \bmod N]$

## Applications:

- Discrete-Time Filtering: Circular convolution is used for filtering discrete-time signals.
- Digital Signal Processing: It's a fundamental operation in many digital signal processing algorithms.
- Cyclic Convolution: In certain applications, such as cyclic prefix OFDM, circular convolution is used to simplify the implementation of linear convolution