

Medical Image Processing

Medical image processing involves analyzing and manipulating images from various medical imaging techniques (like CT scans and MRI) to enhance, segment, or fuse images for better diagnosis and treatment planning. Key goals include improving image quality, extracting useful information, and combining images from different sources.

What is Wavelet?

A wavelet is a small, wave-like function used to analyze signals or images by breaking them down into different frequency components. It captures both the details and the overall structure of the data, allowing for multi-resolution analysis.

How Wavelet Transformation Works?

1) Decomposition:

1. In a typical DWT, the signal (or image) is analyzed at different scales. It is split into approximation coefficients and detail coefficients.
2. Approximation Coefficients (LL): Capture the low-frequency information (smooth areas).
3. Detail Coefficients (LH, HL, HH): Capture high-frequency information (edges and details)

2) Levels of Decomposition:

- You can repeat the wavelet transform on the approximation coefficients (LL) multiple times. This allows you to analyze the data at multiple levels:
 - First level: LL, LH, HL, HH.
 - Second level: Further decomposition of LL from the first level into new coefficients.

3) Reconstruction:

- You can reconstruct the original signal or image from the wavelet coefficients using the Inverse Discrete Wavelet Transform (IDWT).
- The reconstruction process combines the approximation and detail coefficients back to form the original signal.