* Compare recent advancements in edge-preserving image filtering techniques, such as bilateral filters, anisotropic diffusion filters, and newer methods like guided filters and non-local means filters.
* Discuss the implications of advancements in edge-preserving image filtering techniques for improving patient outcomes and the overall quality of medical diagnostics.

**Bilateral filter**

It combines distance and range filters, assigning a weight depending not only on its spatial position relative to the central pixel but also on the similarity of its intensity compared to the value of the center pixel.

Impact: on a homogeneous region with similar intensities, bilateral filer is a linear weight average and similar intensity pixels on the edges are smoothed.

Gaussian function with different standard deviations and could be used for the range proportional to the squared distance of pixel (x,y) for ex, coordinates and each coordinates.

Robust, recommended approach for most of the applications

Cons

Requires tuning of parameter “Sigma”.

When a pixel has few similar pixels around it (often on an edge), the Gaussian weighted average is unstable.

Guided Filter

For a given pixel, it found in a guidance image G, the corresponding pixel and its corresponding spatial neighborhood:

* If the guidance image G is the same as the input image to filter, the output image remains the same as the input image
* Otherwise, the output image is, locally, a linear transformation of the guidance image G. The linear optimization aims in minimizing the error (least squares method) between the output image and the input image.

Pros

Parameter free, effective and efficient

Cons: can introduce blurry effects and artifacts