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BSCS - 4B
CCST106

Comparison
Blurring, Noise Reduction, Edge Preservation, Artistic Effects, Sharpening

ASPECT	BLURRING	NOISE REDUCTION	EDGE PRESERVATION	ARTISTIC EFFECTS	SHARPENING
PURPOSE	Smoothens image by reducing details	Reduce random variations (noise) in the image	Maintains edges while performing other operations like smoothing	Enhances aesthetic or creative aspect of the image	Enhances edges and fine details in the image
TYPICAL FILTERS/ALGORITHM	Gaussian Blur, Median Blur	Gaussian, Median, Bilateral, Non-Local Means	Bilateral Filter, Guided Filter	Oil Painting, Cartooning, Stylization	Unsharp Mask, High-Pass Filter
EFFECT ON EDGE	Softens edges	Can preserve or blur edges depending on the method	Maintains edge sharpness	Can vary—may soften or highlight edges	Enhances and makes edges more pronounced
EFFECT ON DETAILS	Reduces fine details	Reduces unwanted noise while aiming to keep details	Maintains important details while reducing noise	Transforms details for visual creativity	Enhances fine details and textures

COMMON APPLICATION	**Defocusing, Background Softening**	**Image Denoising in Photography**	**Medical Imaging, Computer Vision**	**Photo Editing, Filters in Social Media**	**Enhancing clarity in Photography**
PARAMETER TUNING	**Blur radius, kernel size**	**Filter strength, search window size**	**Smoothing vs. Edge preservation balance**	**Stylization intensity, stroke size**	**Strength, radius**
COMPUTATIONAL COST	**Low to Moderate**	**Moderate to High (depending on algorithm)**	**Moderate to High (edge-aware algorithms**	**Moderate to High**	**Low to Moderate**
ARTIFACTS	**Over-blurring may cause loss of important details**	**Over-smoothing may result in loss of details**	**May produce halo artifacts if not properly balanced**	**Can create unrealistic or overly processed look**	**Over-sharpening can introduce noise**

Edge Detection Techniques:

Sobel edge detection is a simple and computationally efficient method. It's sensitive to noise and can produce double edges.

Laplacian edge detection is less sensitive to noise than Sobel edge detection but can be more susceptible to noise. It may also produce multiple edges for a single edge.

Prewitt edge detection is also a simple and computationally efficient method. It's like Sobel edge detection in terms of sensitivity to noise and the potential for double edges.

Canny edge detection is considered one of the most robust edge detection algorithms. It's less sensitive to noise than Sobel and Laplacian, and it can produce thin, continuous edges.

Comparison:
Sensitivity to Noise, Edge Thinness, Edge Continuity, Computational Efficiency

Algorithm	Sensitivity to Noise	Edge Thinness	Edge Continuity	Computational Efficiency
Canny Edge Detector	High	Good	Excellent	Medium
Sobel Edge Detector	Medium	Poor	Poor	High
Laplacian Edge Detector	High	Poor	Poor	High
LoG (Laplacian of Gaussian)	High	Good	Excellent	Low