

# IMAGE PROCESSING

## ABSTRACT

Image processing has emerged as a vital research area in the field of computer vision and artificial intelligence, enabling the extraction of meaningful information from visual data. This research focuses on developing advanced image processing techniques to enhance image quality, improve feature extraction, and enable accurate analysis for various real-world applications. The proposed framework integrates traditional image enhancement algorithms with deep learning-based approaches to achieve superior accuracy, robustness, and computational efficiency.

The study explores multiple domains including noise reduction, contrast enhancement, image segmentation, and object recognition. A hybrid method combining spatial and frequency domain techniques is introduced to preserve structural details while improving visual clarity. Additionally, deep convolutional neural networks (CNNs) and transformer-based models are utilized for automated feature learning and classification tasks.

The proposed methodology is validated using benchmark datasets and real-world case studies, including applications in medical imaging, remote sensing, and industrial inspection. Experimental results demonstrate significant improvements in accuracy, processing time, and visual quality compared to existing state-of-the-art techniques. This research contributes to the advancement of intelligent image analysis systems and lays a foundation for future developments in computer-aided diagnosis, autonomous vision, and smart imaging technology.