

Low-Complexity Convolutional Neural Network for Salt and Pepper Noise Removal in Digital Images

Abstract: Digital images are well-used in various fields like satellite communication, mobile communication, medical and security etc... Visualized information helps people to understand things easily by seeing. Improper capturing, age of the camera lens, imperfect storage, and transmission may lead to introducing noise in the image. Gaussian noise, salt and pepper/impulse noise, and speckle noise may affect the original image due to the aforementioned reasons. Out of these, impulse noise/salt and pepper noise is one of the major types, degrades the image with black and white spots it results loss of required information. Hence, the restoration of ground-truth images from such types of noisy images is a challenging task to provide quality and clear visuals to users. Several linear and non-linear methods have been proposed by researchers for more than four decades. Non-linear methods based on; the median filtering approach; adaptive median filter approach; median filter with switching condition; and median filter with rank order type; were proposed from the early 1980's onwards. All these are operated directly on pixels in the spatial domain. Hence, they are very easy to implement and most of them are not that much robust in middle and higher noise density circumstances. Further, various researchers have implemented linear methods such as wavelet transform methods like SWT and DWT. In these, most of them work well up to 50% noise density conditions. Very few work well at higher noise density conditions. To overcome these problems CNN's based methods have been developed tremendously by various researchers from last decade and these methods require huge number of images for training and testing purposes. The accuracies achieved by most of the CNN models are good at higher noise densities if they have been designed with more layers and it leads to the complexity of the network. Training time is also too high when the network complexity is high. Hence, this project concentrates on designing a low-complexity CNN model for salt and pepper noise removal in digital images.

Keywords: *Digital image, visualized information, salt and pepper noise, linear and non-linear methods, convolutional neural network, complexity, training time.*

Under the esteemed guidance of

B. Prudhvi Raj

Asst. Professor

Team Members

20PA1A0462 - J. Anand Sai Santosh

20PA1A0478 - K. N. V. N. Gupta

20PA1A0491 - M. Srihari

20PA1A04B1 - N. S. S. N. Venkat

21PA5A0415 - K. Yogisahas Reddy