**(i) Problem Statement:**

Image Denoising Using Convolutional Autoencoders

**(ii) Objectives:**

* To develop a Convolutional Autoencoder model that can learn to encode and decode noisy MNIST images effectively.
* To evaluate image quality using performance metrics like PSNR (Peak Signal-to-Noise Ratio) and SSIM (Structural Similarity Index Measure).

**(iii) Methodology:**

* Data Preparation: MNIST images are normalized and reshaped for input to the model. Gaussian noise is added to simulate real-world noisy inputs.
* Model Design: A Convolutional Autoencoder architecture is used, consisting of encoding (Conv2D + MaxPooling2D) and decoding (Conv2D + UpSampling2D) layers.
* Training: The model is trained using binary cross-entropy loss and the Adam optimizer for 10 epochs.
* Evaluation: Output images are evaluated against original images using PSNR and SSIM, along with visual inspection.

**(iv) Outcomes:**

* The trained model successfully removes noise from test images and reconstructs digits clearly.
* Visual plots show significant improvement from noisy to denoised images.
* Quantitative analysis via PSNR and SSIM confirms high similarity between the original and denoised images.

**(v) Results – Screenshots**

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