Chapter 6

Results and Discussions

6.1 Denoising Results for MRI with Gaussian Noise

Initially, we created a CNN-based denoising autoencoder (CDAE), which performed excellently in removing Gaussian noise from brain MR images. Using CDAE,we got a Peak Signal to Ratio (PSNR) of 34 dB and Structural Similarity Index (SSIM) of 0.92.

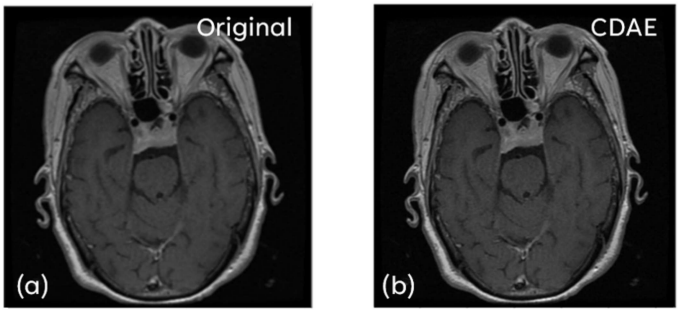

Figure 6.1: a) Original Image b) Reconstructed Image using CDAE

6.1.1 Comparison with Traditional Methods

To evaluate the efficiency of the developed model we compared it with some filters like Gaussian, TV, Wavelet , Bilateral, NLM, Shift Invariant and BM3D. The preprocessed

input (ie, converted to grayscale, normalized and resized) are added with a gaussian noise having noise factor of 0.1, mean of 0 and standard deviation of 1 to create a noisy version of the input image. This image is used for testing. Figure 6.1 depicts the denoised image from our model, whereas Figure 6.2 depicts those from filter methods. The comparison results are shown in Table 6.2. SSIM values closer to 1 and PSNR values between 30 - 40 dB are better reconstructed images.

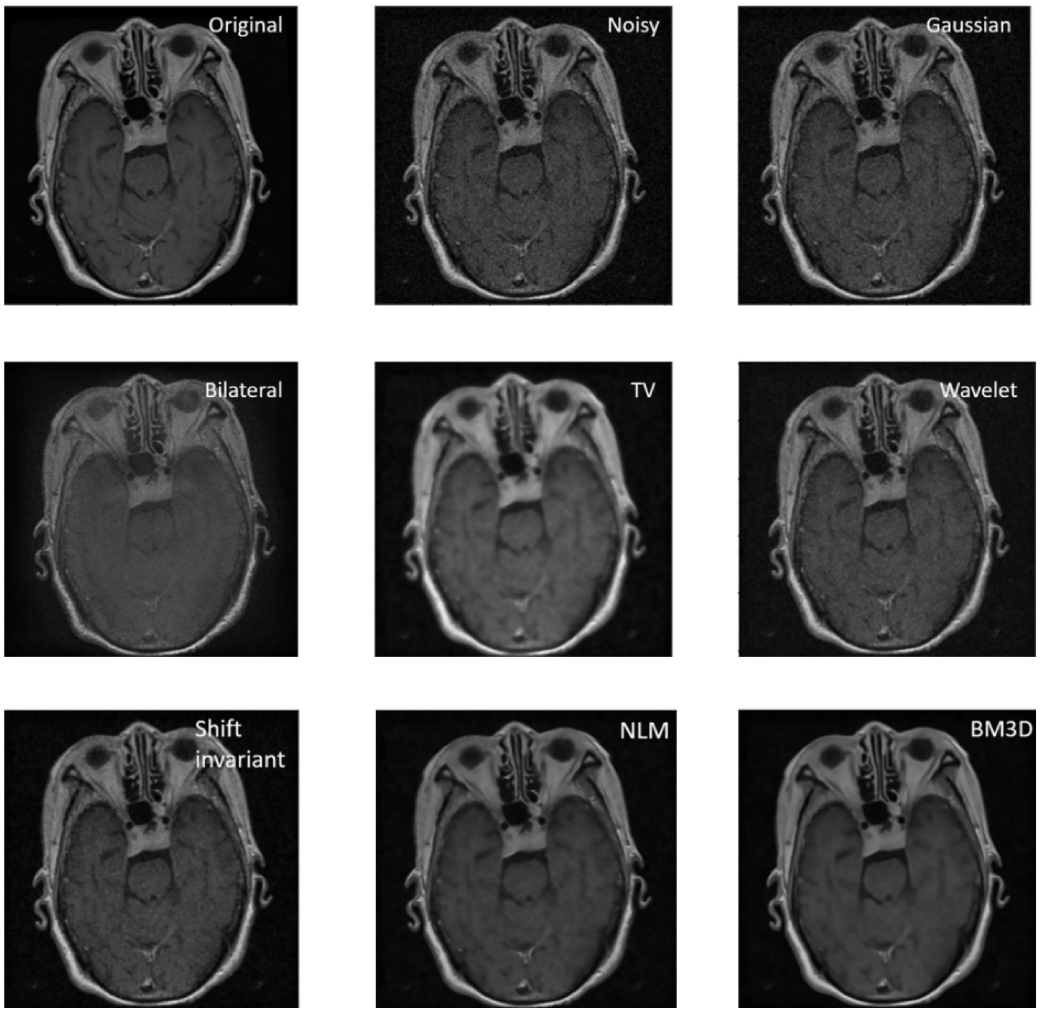

Figure 6.2: Visual inspections of brain MRI with gaussian noise denoised by traditional methods

It is evident that our model outperforms all other traditional methods. This demonstrates that the suggested technique is very efficient for denoising MRI images with gaussian noise .

Table 6.1: Comparison of denoising performance of different methods with our model for gaussian noise with noise factor=0.1, mean=0 and standard deviation =1

Filter	**SSIM**	**PSNR**
Gaussian	0.5681	24.6228
Bilateral	0.6805	21.9754
Total Variation(TV)	0.6824	22.3618
Wavelet	0.7574	24.9854
Shift invariant	0.7982	26.1192
Non Local Means(NLM)	0.8214	26.3957
Block Match 3D(BM3D)	0.8343	29.1254
CDAE	0.9235	33.7564
UNet-DCTD-A	0.9613	38.4684

The performance of the Convolutional Denoising Autoencoder (CDAE) fell short when confronted with MR images affected by Rician noise. To address this limitation, we extended our model to the UNet-DCTD-A architecture, incorporating essential components such as transfer learning and attention mechanisms.