Results show that Cuckoo Search gives better performance, however at low noise levels, JADE and Firefly work significantly but as the noise level rises, the edge and details in the image are not much preserved as that with Cuckoo. Apart from Optimization techniques, the algorithms also outdoes the standard state of art Techniques. The key factor behind these results is the use of 4\*4 decimation done in the coefficients of wavelets. Instead of feeding the whole lot of coefficients wavelet transform, breaking into matrixes of dimension 4\*4 has helped the Thresholding Function to adapt to the local noise variance precisely. The level of edge and Detail preservation is the result of the fact that our Thresholding function is shaped by three tuning parameters, k, the deterministic of hard or soft thresholding, m and n, which are shape tuning parameters and, when this function is applied at much finer details of coefficients, it gives better performance than existing techniques. The proposed Cuckoo Search technique continues to give better optimized values of these parameters, as compared to other optimization techniques, even at higher noise levels.