Lossless Image Solidity Using Neural Network

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ABSTRACT- *In this paper, new multilayer perceptron's feed forward back propagation Neural Network (NN) performance using BFGS quasi newton , Levenberg -Marquardt (LM), Gradient descent back propagation with adaptive learning rate(GDA) Algorithms are being anticipated with the project detached to develop a lossless image solidity technique using NN and to design and contrivance image compression using Neural network to achieve maximum peak signal to noise ratio (PSNR), and low mean square error (MSE) and compression levels. This paper presents a NN based procedure that may be practical to data compression and breaks down large images into smaller blocks (1x64) and eradicates redundant information. Lastly, this technique uses a NN training functions like and conversion of block codes to vector codes and vice versa. Results obtained with proposed techniques leads to better compression material. Finally, this technique uses a NN training functions like and adaptation of block codes to vector codes and vice versa. Consequencesacquired with proposed techniques leads to better compression ratio at the same time conserving the image quality. The investigational result shows that the BFG quasi newton algorithm is best among the three proposed algorithm which offers better PSNR value and also reduces the MSE value.*

Keywords— *Neural network (NN), Multilayer perceptron's, peak signal to noise ratio (PSNR), mean square error (MSE).*

I. INTRODUCTION

In communication, Image compression plays an imperative role. To remove idleness from image, compression is required. There are generally two types of image compression methods lossy and lossless. The exercise through neural network is one of the methods in image compression to remove redundancy as it processes the data in equivalent and with limited bandwidth and hence requires less time and therefore, it is superior over any other technique like cosine transform, wavelet etc. Based on neural network models, anerudition approach has been developed and it consists of input layer, hidden layer and output layer. In this project, dissimilar learning rule is laboring to train multilayer neural network and the network is assembled from input layer, hidden layer, and output layer. In this mission image should besegmented into sub blocks and the pixels grey level values within the block will be reshaped into a column vector and input given to the neural network through the input layer. Input pixels will be used as the target values, and consequently the MSE could be adjusted as needed.

II. BACK-PROPAGATION NEURAL NETWORK

The neural network structure is shown in figure 1. It contain of three layers input layer, output layer and hidden layer. Together of input layer and output layer are attached to hidden layer. Compression of image is achieved by transmission the value of the number of neurons at the hidden layer which is less than that of neurons at both input and output layers.

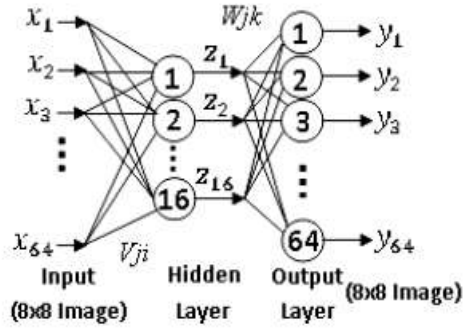


Fig 1. Neural network structure

The above neural network could be moreover linear or nonlinear network conferring to the transfer function employed in the layers.

Function used for back propagation in matlab is,

{newff(minmax(in31),[4,16],{'tansig','purelin'}
Mean square error is designed as,

MSE=(mean(mean(double(a11)-double(a61)))).
Peak signal to noise ratio is calculated as,

PSNR=10*log (248*248/MSE).
There are several other parameters like goal setting (1e-5), mc=.2 and alpha=.8%. In this project, all exercise algorithms have been developed using MATLAB 2013a.

III. TOOLS AND METHODOLOGY

In this project a literature survey has been supported out to find and efficient multi-layered neural network. MATLAB software along with its Neural Network and Image Processing toolbox will be used to contrivance the given technique. The MATLAB2013a software provides various easy to use and readily accessible built in functions for realizing Neural Network algorithms in quick time (Levenberg-Marquardt Algorithm, quasi newton method). An extensive study of this will be required as well.

Algorithm to be used Levenberg-Marquardt (LM) Algorithm, BFG quasi newton method, GDA algorithm
The usability and effectiveness of the power of neural network for image compression lies on the following three important aspects:
(a) Assortment of competent multi layered network.
(b) Selection of exercise methods.
(c) Test vector.

The Approach:

Neuron:

The supreme basic element of the human brain is a detailed type of cell, which provides with the abilities to remember, think, and apply previous understandings to our every action. These cells are known as neurons; each of these neurons can join with up to 200000 other neurons. The power of the brain comes from the numbers of these basic machineries and the multiple connections between them.

The Artificial Neuron:

The elementary unit of neural networks, the artificial neurons, pretends the basic functions of natural neurons. Artificial neurons are much humbler than the biological neuron, the figure 2 below shows the basics of an artificial neuron.

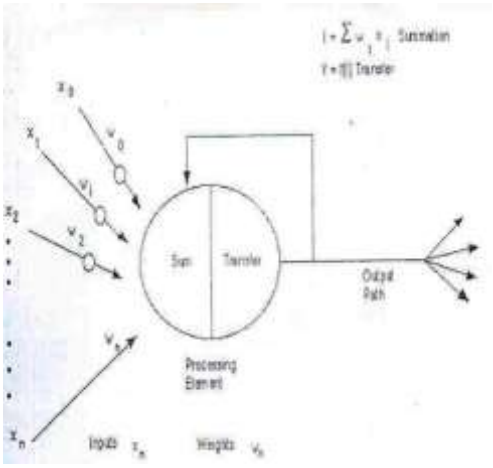


Fig 2. Artificial neuron

The several inputs to the network are characterized by the mathematical symbol, x(n). Each of these inputs are replicated by a connection weight, these weights are embodied by w(n). In the simplest case, these products are simply summed, fed through a transfer function to produce a result and then output. Even though all reproduction neural networks are constructed from this basic building block the essentials may vary in these building blocks and there are differences.

Design:

The design goes through a retro of trial and error in the decisions before coming up with a suitable neuron design. The design issues in neural networks are composite and are the major concerns of system developers.
Designing a neural network consists of,

- Positioning neurons in various layers.
- Determining the type of connections among neurons for dissimilar layers, as well as among the neurons within a layer.
- Conclusive the way a neuron receives input and produces output.
- Defining the strength of connection within the network by allowing the network learns

the opposite values of connection weights by using a training data set.

IV. EXPERIMENTAL RESULTS

In order to estimate the performance of the proposed approach of image compression using LM, BFGs, GDA Algorithm. Customary image of baboon is considered from Matlab library. The work is implemented using MATLAB 2013a. The estimation of the proposed approach in image compression is completed based on the following two factors, PSNR and MSE values.

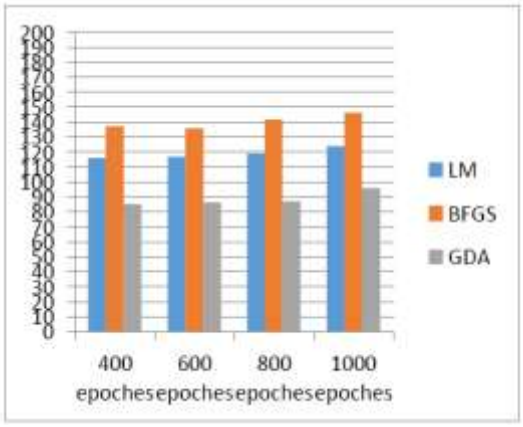


Fig 3. PSNR(db) comparison values

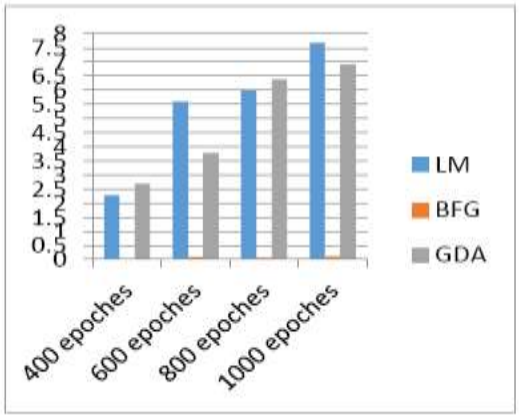


Fig 4. MSE(db) comparison values

Neural network result using LM, BFGS, GDA Algorithms Result in MATLAB 2013a:

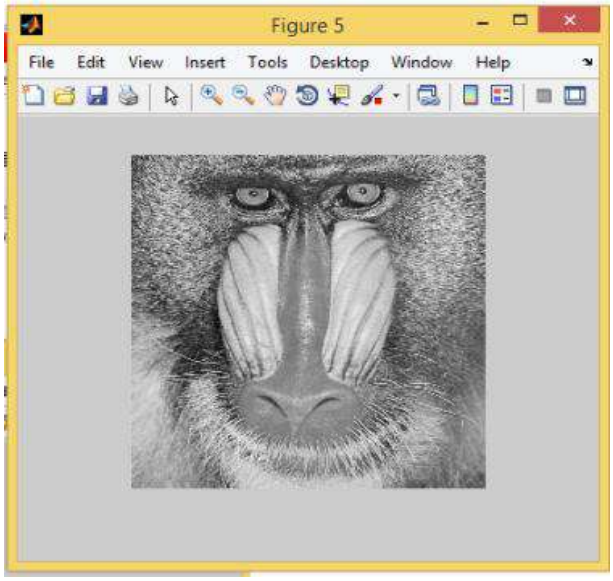
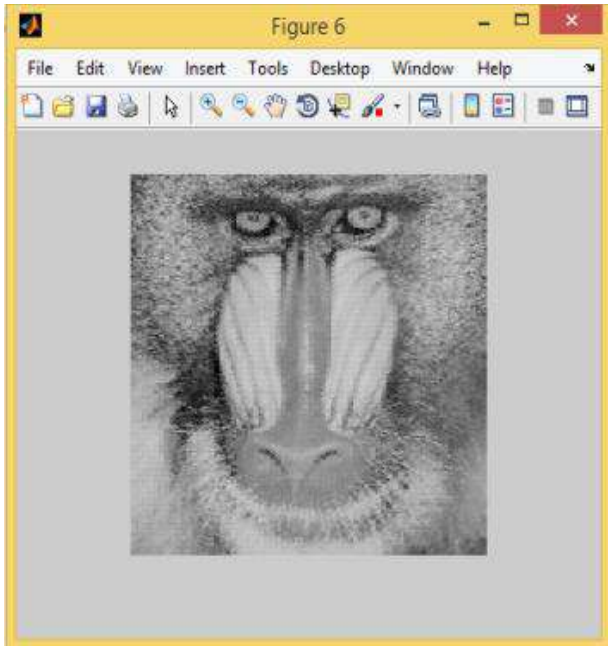


Fig (a) Originalimage (256 x 256)



Fig(b) Compressed image

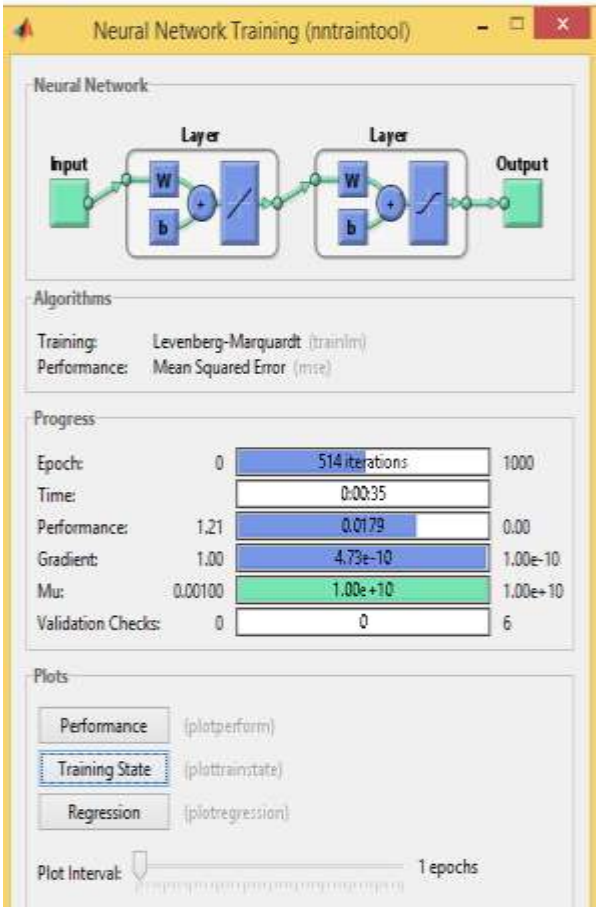


Fig (c) Trained neural network using LM algorithm

V. CONCLUSION

In this paper, neural network procedure is proposed and trained using LM, BFGS and GDA algorithm for image compression. The neural network is proficient with the small 8 × 8 blocks of image and tested. It is pragmatic from the results that BFG system is best among projected image for parameters like MSE and PSNR. Spending this method, a good quality of expanded image is obtained. It has high PSNR and very less error. Thus, this method achieves high compression. In this procedure the neural network is trying to normalize the updated weights and biases in each step to moderate the systems errors.

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