# Comparison of Online Image Compression Tools in Grayscale and Colored Images

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*Abstract*— **The growing content of multimedia on the world wide web thrive the need to study online image compression. There are many online image compression tools are available but the knowledge of the best tool still is an undiscovered area. This research is about analyzing as to which is the best online image compression tool available for coloured images and to develop a framework using neural network so that large number of images and large number of online image compression tools can be evaluated for their performance. To evaluate the performance of these tools Objective measurement technique is applied by calculating some image quality parameters namely Peak Signal Noise Ratio, Mean Square Error, Normalized Correlation, Maximum Difference. The results of these image quality parameters are rated on Likert scale from 1 to 5 and the average Likert scale points are processed to be fed to Back Propagation Neural Network Model to classify and evaluate the performance of these online image compression tools.**

*Index Terms*— **Online Image Compression Tools, Image Quality parameters, Neural Network.**

## I. INTRODUCTION

The basic idea behind the research is to compress the image maintaining its quality mathematically and physically. The need of growing graphics on the internet has led to emergence of online image compression tools that compress the image online and can be uploaded on the website for commercial or personal use. Image quality is a characteristic of an image that measures the perceived image degradation as compared to an ideal or perfect image. Images when processed introduce some amounts of distortion or artifacts in the signal. By considering a large set of images, and determining a quality measure for each of them, statistical methods can be used to determine an overall quality measure of the compression method.

### A. Measuring Image Quality:

It is important to measure the quality of the image for image processing application. How good the image compression algorithm is depends upon the quality of compressed image produced on application of that algorithm. There are basically two approaches for image Quality measurement[8].

1. Subjective measurement
2. Objective measurement

**Subjective Measurement**
A number of observers are selected, tested for their visual capabilities, shown a series of test scenes and asked to score the quality of the scenes. It is the only "correct" method of quantifying visual image quality.

**Objective Measurement**

- **Mean Square Error**
 **MSE** is the average squared difference between a reference image and a distorted image. The large value of MSE means that image is poor quality.

$$MSE = \frac{1}{MN}\sum_{m=1}^{M}\sum_{n=1}^{N}(x(m,n) - x'(m,n))^2$$

- **Peak Signal Noise Ratio**
 **PSNR**, defines ratio between the maximum possible power of a signal and the power of corrupting noise The large value of Peak Signal to Noise Ratio (PSNR)[4] means that image is of good quality.

$$PSNR = 10\log\frac{255^2}{MSE}$$

- **Maximum Difference (MD)**
 The maximum difference is the maximum difference of the pixels in original and compressed image among all differences. The large value of Maximum Difference (MD) means that image is poor quality.
$$MD = MAX(|x(m,n) - x'(m,n)|)$$

- **Normalized Absolute Error (NAE)**
 Normalized absolute error is a measure of how far is the decompressed image from the original image with the value of zero being the perfect fit. Large value of NAE indicates poor quality of the image.

$$NAE = \frac{\sum_{m=1}^{M}\sum_{N=1}^{N}|x(m,n) - x(m,n)|}{\sum_{m=1}^{M}\sum_{n=1}^{N}|x(m,n)|}$$

- **Normalized Correlation (NK)**
The closeness between two digital images can also be quantified in terms of correlation function. The large value of NK means that image is of good quality[7].

$$NormalizedCorrelation(NK) = \frac{\sum_{m=1}^{M}\sum_{n=1}^{N}(x(m,n) - x'(m,n))}{\sum_{m=1}^{M}\sum_{n=1}^{N}x(m,n)^2}$$

● **Average Difference (AD)**

A lower value of Average Difference (AD) gives a "cleaner" image as more noise is reduced i.e. lower the average difference better is the quality of the image[8].

$$AverageDifference(AD) = \frac{1}{MN}\sum_{m=1}^{M}\sum_{n=1}^{N}(x(m,n)-x'(m,n))$$

● **Structural Content (SC)**

It is an estimate of the similarity of the structure of two signals. Large value of SC means that the image is of poor quality.

$$StructuralCorrelation/Content(SC) = \frac{\sum_{m=1}^{M}\sum_{n=1}^{N}(x(m,n))^2}{\sum_{m=1}^{M}\sum_{n=1}^{N}(x'(m,n))^2}$$

*B. Online Image Compression Tools:*

These are the tools that compress the image online. There are various image compression techniques available that compress the image. The basic advantage of online image compression tool is that there is no need to download these tools saving memory space on one's computer and these tools also hold the advantage of directly uploading the resultant compressed image for personal or commercial use. The images compressed can also be saved for future use. The different tools can reduce the size of various images of various formats and can produce customized results on the user preference. For example image compression can be done by reducing the size of the image as specified by the user. These tools can optimize, compress and resize the image as per the need.

*C. Study of neural Network:*

The term neural network usually refers to a network or circuit of biological neurons. The modern usage of the term often refers to artificial neural networks, which are composed of artificial neurons or nodes[6].

**Artificial Neural Network:** The neural network is formed by a set of neurons interconnected with each other through the synaptic weights. The basic neural network consists of 3 layers.

1) **Input layer:** The input layer consists of source nodes. This layer captures the features pattern for classification. The number of nodes in this layer depends upon the dimension of feature vector used at the input.

2) **Hidden layer:** This layer lies between the input and output layer. The number of hidden layers can be one or more. Each hidden layers have a specific number of nodes (neurons) called as hidden nodes or hidden neurons. The output of this layer is supplied to the next layer.

3) **Output layer:** It results the output after features is passed through neural network. The set of outputs in output layer decides the overall response of the neural network for a supplied input features.

## II. METHODOLOGY

*A. Overview of proposed Methodology*

1. The first step is to identify 4 online image compression tools that will be used to compress the images online.
2. The second step is to determine the input i.e. selecting the Image dataset for grayscale images and coloured images on which online compression tool will be run.
3. Next step is to determine the image quality measuring parameters to be implemented for objective measurement.
4. Develop a likert scale i.e. rate the values of quality measuring parameters on the scale of 1-5, where 5 represents best case and 1 represents worst case for performance evaluation.
5. Run Neural Network on the values obtained by application of Likert scale and develop classification.

*B. Select four Online Image Compression Tools*

**I.** **Web Resizer:** It allows uploading of images of size less than 5 MB.

**II.** **Shrink Pictures:** Shrink Pictures permits you to upload images at a maximum size of 6Mb. The maximum dimension of the image should be of 1000 pixel.

**III.** **Jpeg Optimizer:** JPEG-Optimizer is a free online tool for resizing and compressing your digital photos and images for displaying on the web in forums or blogs, or for sending by email.

**IV.** **Dynamic Drive:** It enables to convert your images from one format to another. However, the upload limit for any image is 300 KB.

**IMAGE DATA SET**



*Fig 1 Sample Images*

*C. Process data on all image compression tools*

*Table 1: Index of Web Compressed Grayscale and Colored Images*

| Online Image Compression Tool | Index Number |
|---|---|
| Dynamic Drive | 1-10 |
| JPEG Optimizer | 11-20 |
| Shrink Pictures | 21-30 |
| Web Resizer | 31-40 |

### D. Apply Performance Evaluator

After compressing all the images on all the four tools we have a set of 40 images of gayscale and colored each.

a. Mean Square Error
b. Peak Signal Noise Ratio
c. Normalized Co-relation
d. Average Difference

Divide the values into five parts by calculating the maximum and minimum value for each of the parameter.

### E. Develop Likert Chart

Likert Scale is developed to categorize the images based on the quality which in turn is determined by the value of seven mentioned parameters. The Likert Scale was developed using point rating system.

## III. RESULTS

### A. Confusion Matrix for Grayscale Images:

Accuracy table is obtained by changing the number of hidden layers and calculating the accuracy or success rate. The below table indicates that best accuracy rate was obtained at 10 hidden layers i.e. of 97.5%.
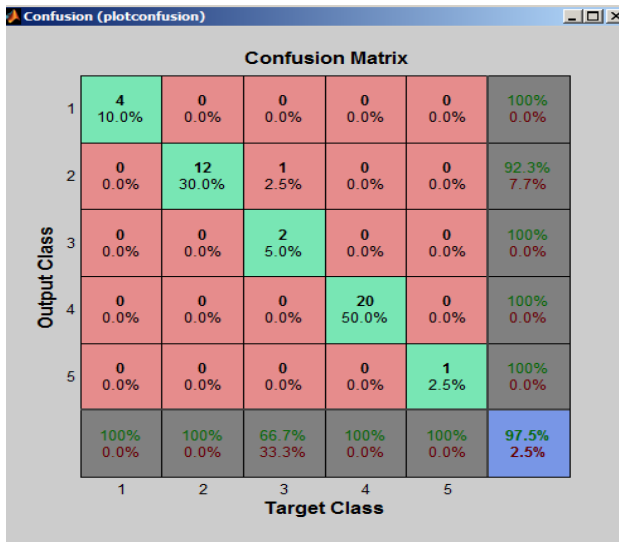


*Fig 2: Confusion matrix for Grayscale Images*

**Classification for Grayscale Images:**
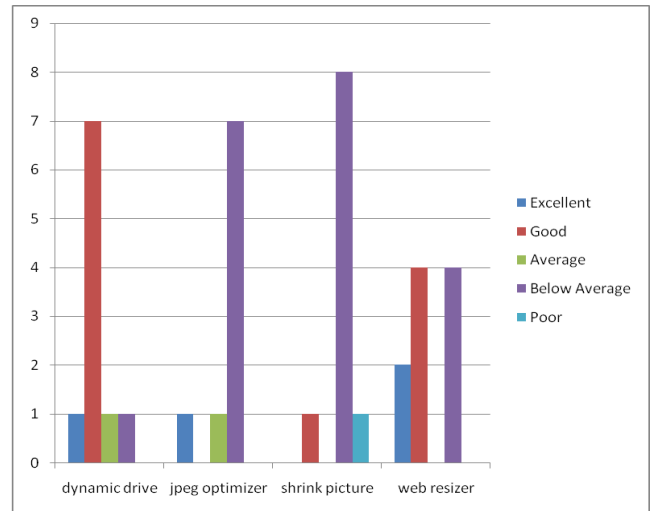


*Fig 3: Classification for Garyscale Images*

Following inferences can be drawn from Figure 3:

1) **Dynamic Drive** produces **1** image of **excellent** quality, **7** images of **good** quality, **1** image of **average** and **1** image of **below average** quality.
2) **Jpeg Optimizer** produces **1** image of **excellent** quality, **1** images of **average**, **7** images of **below average** quality and **1** image is **unclassified.**
3) **Shrink pictures** produces **1** image of **good** quality, **8** images of **below average** and **1** image is of **poor** quality.
4) **Web resizer** produces **2** images of **excellent** quality, **4** images of **good** quality and **4** images of **below average** quality.

| Online Image Compression Tool | Ranking |
|---|---|
| Web Resizer | 1 |
| Dynamic Drive | 2 |
| JPEG Optimizer | 3 |
| Shrink pictures | 4 |

### B. Confusion Matrix for Colored Images

Accuracy table is obtained by changing the number of hidden layers and calculating the accuracy or success rate. The below table indicates that best accuracy rate was obtained at 10 hidden layers i.e. of 95%.
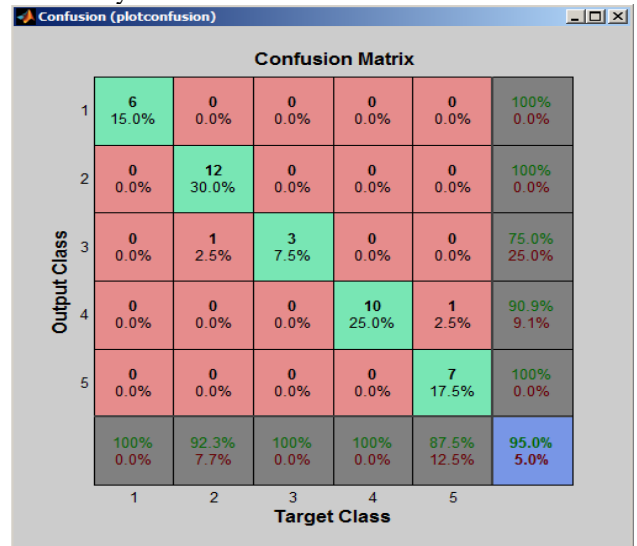


*Fig 4: Confusion matrix for coloured Images*
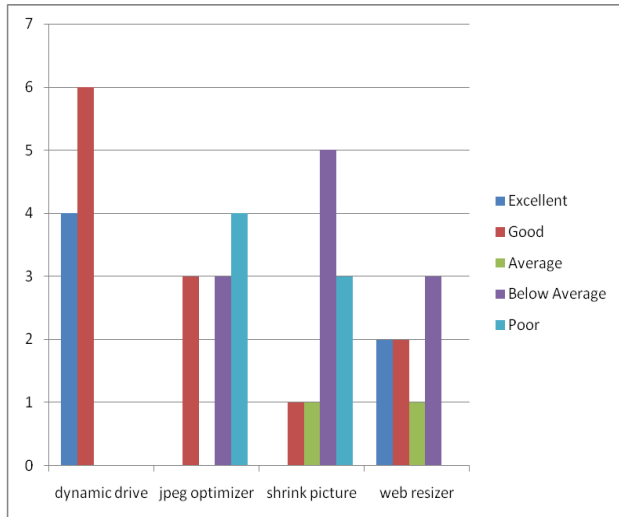
**Classification for Colored Images:**



*Fig 5: Classification for coloured Images*

1) **Dynamic Drive** Produces **4** images of **excellent** quality, **6** images of **good** quality.
2) **Jpeg Optimizer** Produces **3** images of **good** quality, **3** images of **below average** quality and **4** images of **poor** quality.
3) **Shrink pictures** produces **1** image of **good** quality. **1** image of **average** quality, **5** images of **below average** quality and **3** images of **poor** quality.
4) **Web resizer** produces **2** images of **excellent**, **2** images of **good**, **1** images of **average** and **3** images of **below average** quality and **2** images are **unclassified.**

*Table 3:  Ranking Table for Coloured Images*

| Online Image Compression Tool | Ranking |
|---|---|
| **Dynamic Drive** | 1 |
| **Web Resizer** | 2 |
| **JPEG Optimizer** | 3 |
| **Shrink pictures** | 4 |

Following inferences can be drawn from Figure 4:

**Image Quality Parameters for Grayscale Images**

| Index | MSE | PSNR | NK | AD | SC | MD | NAE |
|---|---|---|---|---|---|---|---|
| 1 | 35.8804 | 35.5822 | 0.9989 | 0.0066 | 1.0003 | 35 | 0.0304 |
| 2 | 8.6271 | 38.7721 | 1.0005 | 0.0014 | 0.9985 | 25 | 0.0145 |
| 3 | 13.5523 | 36.8107 | 1.0023 | -0.1811 | 0.9948 | 25 | 0.0188 |
| 4 | 143.5046 | 26.5621 | 0.9956 | -0.2848 | 1.0025 | 61 | 0.071 |
| 5 | 79.2457 | 29.141 | 0.9967 | 0.0238 | 1.0031 | 55 | 0.0457 |
| 6 | 38.2558 | 32.3038 | 0.9985 | -0.0167 | 1.0004 | 55 | 0.0376 |
| 7 | 31.4688 | 33.152 | 0.9986 | 0.0381 | 1.001 | 45 | 0.0268 |
| 8 | 163.2747 | 26.0016 | 0.9932 | 0.0163 | 1.0048 | 85 | 0.0699 |
| 9 | 154.0509 | 26.2542 | 0.994 | 0.0373 | 1.0036 | 66 | 0.0731 |
| 10 | 22.0223 | 34.7022 | 0.9998 | -0.0452 | 0.9991 | 48 | 0.023 |
| 11 | 35.8804 | 35.5822 | 0.9989 | 0.0066 | 1.0003 | 35 | 0.0304 |
| 12 | 8.6271 | 38.7721 | 1.0005 | 0.0014 | 0.9985 | 25 | 0.0145 |
| 13 | 13.5523 | 36.8107 | 1.0023 | -0.1811 | 0.9948 | 25 | 0.0188 |
| 14 | 113.5671 | 27.5783 | 0.9981 | -0.2869 | 0.9987 | 49 | 0.0628 |
| 15 | 79.2457 | 29.141 | 0.9967 | 0.0238 | 1.0031 | 55 | 0.0457 |
| 16 | 38.2558 | 32.3038 | 0.9985 | -0.0167 | 1.0004 | 55 | 0.0376 |
| 17 | 31.4688 | 33.152 | 0.9986 | 0.0381 | 1.001 | 45 | 0.0268 |
| 18 | 163.2747 | 26.0016 | 0.9932 | 0.0163 | 1.0048 | 85 | 0.0699 |
| 19 | 154.0509 | 26.2542 | 0.994 | 0.0373 | 1.0036 | 66 | 0.0731 |
| 20 | 16.6925 | 35.9056 | 0.9999 | -0.0489 | 0.9992 | 40 | 0.02 |
| 21 | 0.5735 | 50.5456 | 1 | -0.0016 | 0.9999 | 6 | 0.0033 |
| 22 | 0.2481 | 54.1841 | 1.0001 | -8.17E-04 | 0.9999 | 4 | 0.0018 |
| 23 | 0.3398 | 52.8183 | 1.0001 | 7.69E-04 | 0.9999 | 4 | 0.0022 |
| 24 | 2.0827 | 44.9446 | 0.9999 | -0.0901 | 1.0001 | 8 | 0.0079 |
| 25 | 0.81 | 49.0457 | 0.9997 | 0.0097 | 1.0005 | 10 | 0.0042 |
| 26 | 0.7095 | 49.6211 | 1.0001 | 0.003 | 0.9998 | 5 | 0.0048 |
| 27 | 0.5623 | 50.6311 | 1 | 6.01E-04 | 0.9999 | 6 | 0.0031 |
| 28 | 1.7127 | 45.7941 | 0.9997 | 0.0053 | 1.0006 | 12 | 0.007 |
| 29 | 2.0714 | 44.9682 | 0.9995 | 0.0034 | 1.0008 | 12 | 0.0081 |
| 30 | 0.3682 | 52.4703 | 1 | -4.33E-04 | 0.9999 | 8 | 0.0023 |
| 31 | 5.0351 | 41.1107 | 1.0002 | 0.0219 | 0.9994 | 18 | 0.0111 |
| 32 | 0.6105 | 50.274 | 1.0001 | -0.024 | 0.9997 | 6 | 0.0036 |
| 33 | 0.8393 | 48.8915 | 0.9999 | -0.0223 | 1.0002 | 9 | 0.0039 |
| 34 | 8.0315 | 39.0828 | 1.0006 | -0.1661 | 0.9984 | 24 | 0.0164 |
| 35 | 6.1509 | 40.2414 | 1.0005 | -0.0014 | 0.9987 | 19 | 0.0128 |
| 36 | 3.7742 | 42.3626 | 1.0004 | 0.0015 | 0.999 | 13 | 0.0119 |
| 37 | 3.8246 | 42.3049 | 1.0007 | -0.0198 | 0.9984 | 14 | 0.0093 |
| 38 | 11.9498 | 37.3572 | 1.0021 | -0.0105 | 0.9951 | 21 | 0.019 |
| 39 | 9.7711 | 38.2314 | 1.0012 | -0.002 | 0.997 | 22 | 0.0181 |
| 40 | 2.8859 | 43.5279 | 1.0001 | 0.004 | 0.9996 | 15 | 0.0081 |

**Image Quality Parameters for Colored Images:**

| Index | MSE | PSNR | NK | AD | SC | MD | NAE |
|---|---|---|---|---|---|---|---|
| 1 | 66.1386 | 29.9263 | 0.9971 | -0.0104 | 1.0021 | 62 | 0.0446 |
| 2 | 38.2803 | 32.3011 | 0.9991 | -0.1067 | 0.9999 | 57 | 0.0325 |
| 3 | 35.956 | 32.5731 | 0.999 | -0.063 | 1 | 61 | 0.0315 |
| 4 | 83.8671 | 28.8949 | 0.9953 | 0.0741 | 1.0051 | 63 | 0.0499 |
| 5 | 20.3026 | 35.0553 | 0.9992 | -8.65E-04 | 1.0004 | 46 | 0.022 |
| 6 | 30.3035 | 33.3159 | 0.9987 | 0.0107 | 1.0008 | 44 | 0.0259 |
| 7 | 108.4186 | 27.7798 | 0.9957 | -0.0248 | 1.0027 | 59 | 0.0563 |
| 8 | 10.7973 | 37.7977 | 0.9988 | 0.0142 | 1.0015 | 37 | 0.019 |
| 9 | 17.9687 | 35.5856 | 0.9988 | -0.034 | 1.0004 | 38 | 0.0296 |
| 10 | 45.5527 | 31.5457 | 0.9985 | 0.0767 | 1.0016 | 68 | 0.0269 |
| 11 | 66.1386 | 29.9263 | 0.9971 | -0.0104 | 1.0021 | 62 | 0.0446 |
| 12 | 38.2803 | 32.3011 | 0.9991 | -0.1067 | 0.9999 | 57 | 0.0325 |
| 13 | 35.956 | 32.5731 | 0.999 | -0.063 | 1 | 61 | 0.0315 |
| 14 | 83.8671 | 28.8949 | 0.9953 | 0.0741 | 1.0051 | 63 | 0.0499 |
| 15 | 17.0492 | 35.8138 | 0.9989 | 0.0456 | 1.0013 | 44 | 0.0203 |
| 16 | 30.3035 | 33.3159 | 0.9987 | 0.0107 | 1.0008 | 44 | 0.0259 |
| 17 | 108.4186 | 27.7798 | 0.9957 | -0.0248 | 1.0027 | 59 | 0.0563 |
| 18 | 9.0423 | 38.568 | 0.9987 | 0.0819 | 1.0018 | 32 | 0.0174 |
| 19 | 14.6764 | 36.4646 | 0.9986 | 0.065 | 1.0012 | 40 | 0.0273 |
| 20 | 45.5527 | 31.5457 | 0.9985 | 0.0767 | 1.0016 | 68 | 0.0269 |
| 21 | 1.0311 | 47.9977 | 0.9999 | -0.0063 | 1.0001 | 13 | 0.0051 |
| 22 | 0.7879 | 49.166 | 1 | -0.0254 | 1 | 9 | 0.0042 |
| 23 | 0.5517 | 50.7135 | 1 | -0.0023 | 1.0001 | 6 | 0.0035 |
| 24 | 1.2707 | 47.0902 | 0.9995 | -0.0109 | 1.0009 | 9 | 0.0058 |
| 25 | 0.3924 | 52.1935 | 1 | -0.0038 | 1 | 8 | 0.0024 |
| 26 | 0.5175 | 50.992 | 0.9998 | 0.0149 | 1.0003 | 6 | 0.0029 |
| 27 | 1.2965 | 47.0031 | 0.9998 | 7.93E-04 | 1.0002 | 9 | 0.0059 |
| 28 | 0.3111 | 53.2014 | 0.9997 | 0.0122 | 1.0005 | 7 | 0.0024 |
| 29 | 0.3274 | 52.9797 | 0.9999 | -0.0102 | 1.0001 | 7 | 0.003 |
| 30 | 0.8822 | 48.6751 | 0.9998 | 0.0344 | 1.0005 | 8 | 0.0035 |
| 31 | 5.6867 | 40.5822 | 1.0006 | -0.0192 | 0.9984 | 22 | 0.013 |
| 32 | 4.6825 | 41.426 | 1.0004 | -0.0513 | 0.9989 | 14 | 0.0111 |
| 33 | 4.5963 | 41.5067 | 1.0004 | -0.0065 | 0.999 | 16 | 0.0112 |
| 34 | 8.2304 | 38.9766 | 1.0001 | 0.0054 | 0.9994 | 22 | 0.0158 |
| 35 | 2.1979 | 44.7108 | 1.0001 | -0.0026 | 0.9996 | 12 | 0.0071 |
| 36 | 3.9468 | 42.1683 | 1.0001 | 0.0122 | 0.9995 | 13 | 0.0093 |
| 37 | 80.1728 | 39.0071 | 1.0012 | -0.004 | 0.9972 | 18 | 0.0156 |
| 38 | 1.4909 | 46.3964 | 0.9996 | 0.0388 | 1.0006 | 13 | 0.0067 |
| 39 | 2.4006 | 44.3277 | 1 | 0.0134 | 0.9997 | 15 | 0.0104 |
| 40 | 4.7135 | 41.3973 | 0.9998 | 0.0636 | 1.0003 | 15 | 0.0087 |

**Scores for Grayscale images:**

| Index No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 0 | 1 | 0 | 0 | 0 |
| 2 | 0 | 0 | 1 | 0 | 0 |
| 3 | 0 | 1 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 1 | 0 |
| 5 | 0 | 1 | 0 | 0 | 0 |
| 6 | 0 | 1 | 0 | 0 | 0 |
| 7 | 0 | 1 | 0 | 0 | 0 |
| 8 | 0 | 1 | 0 | 0 | 0 |
| 9 | 0 | 1 | 0 | 0 | 0 |
| 10 | 1 | 0 | 0 | 0 | 0 |
| 11 | 1 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 1 | 0 |
| 13 | 0 | 0 | 1 | 0 | 0 |
| 14 | 0 | 0 | 0 | 1 | 0 |
| 15 | 0 | 0 | 1 | 0 | 0 |
| 16 | 0 | 0 | 0 | 1 | 0 |
| 17 | 0 | 0 | 0 | 1 | 0 |
| 18 | 0 | 0 | 0 | 1 | 0 |
| 19 | 0 | 0 | 0 | 1 | 0 |
| 20 | 0 | 0 | 0 | 1 | 0 |
| 21 | 0 | 0 | 0 | 1 | 0 |
| 22 | 0 | 0 | 0 | 1 | 0 |
| 23 | 0 | 1 | 0 | 0 | 0 |
| 24 | 0 | 0 | 0 | 1 | 0 |
| 25 | 0 | 0 | 0 | 1 | 0 |
| 26 | 0 | 0 | 0 | 1 | 0 |
| 27 | 0 | 0 | 0 | 1 | 0 |
| 28 | 0 | 0 | 0 | 0 | 1 |
| 29 | 0 | 0 | 0 | 1 | 0 |
| 30 | 0 | 0 | 0 | 1 | 0 |
| 31 | 0 | 0 | 0 | 1 | 0 |
| 32 | 0 | 0 | 0 | 1 | 0 |
| 33 | 0 | 0 | 0 | 1 | 0 |
| 34 | 0 | 1 | 0 | 0 | 0 |
| 35 | 0 | 0 | 0 | 1 | 0 |
| 36 | 0 | 1 | 0 | 0 | 0 |
| 37 | 0 | 1 | 0 | 0 | 0 |
| 38 | 0 | 1 | 0 | 0 | 0 |
| 39 | 1 | 0 | 0 | 0 | 0 |
| 40 | 1 | 0 | 0 | 0 | 0 |

**Scores for Colored Images:**

| Index No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 1 | 0 | 0 | 0 |
| 3 | 1 | 0 | 0 | 0 | 0 |
| 4 | 0 | 1 | 0 | 0 | 0 |
| 5 | 0 | 1 | 0 | 0 | 0 |
| 6 | 1 | 0 | 0 | 0 | 0 |
| 7 | 0 | 1 | 0 | 0 | 0 |
| 8 | 0 | 1 | 0 | 0 | 0 |
| 9 | 1 | 0 | 0 | 0 | 0 |
| 10 | 0 | 1 | 0 | 0 | 0 |
| 11 | 0 | 1 | 0 | 0 | 0 |
| 12 | 0 | 1 | 0 | 0 | 0 |
| 13 | 0 | 1 | 0 | 0 | 0 |
| 14 | 0 | 0 | 0 | 1 | 0 |
| 15 | 0 | 0 | 0 | 0 | 1 |
| 16 | 0 | 0 | 0 | 0 | 1 |
| 17 | 0 | 0 | 0 | 1 | 0 |
| 18 | 0 | 0 | 0 | 0 | 1 |
| 19 | 0 | 0 | 0 | 0 | 1 |
| 20 | 0 | 0 | 0 | 1 | 0 |
| 21 | 0 | 0 | 0 | 0 | 1 |
| 22 | 0 | 0 | 0 | 0 | 1 |
| 23 | 0 | 1 | 0 | 0 | 0 |
| 24 | 0 | 0 | 0 | 0 | 1 |
| 25 | 0 | 0 | 0 | 1 | 0 |
| 26 | 0 | 0 | 0 | 1 | 0 |
| 27 | 0 | 0 | 0 | 1 | 0 |
| 28 | 0 | 0 | 1 | 0 | 0 |
| 29 | 0 | 0 | 0 | 1 | 0 |
| 30 | 0 | 0 | 0 | 1 | 0 |
| 31 | 0 | 0 | 0 | 0 | 1 |
| 32 | 0 | 0 | 0 | 1 | 0 |
| 33 | 0 | 0 | 0 | 1 | 0 |
| 34 | 1 | 0 | 0 | 0 | 0 |
| 35 | 0 | 0 | 1 | 0 | 0 |
| 36 | 0 | 1 | 0 | 0 | 0 |
| 37 | 0 | 1 | 0 | 0 | 0 |
| 38 | 1 | 0 | 0 | 0 | 0 |
| 39 | 0 | 1 | 0 | 0 | 0 |
| 40 | 0 | 0 | 1 | 0 | 0 |

## IV CONCLUSION

From the results obtained, mentioned in the previous chapter, it can be clearly stated that

1) Dynamic Drive and Web resizer is the best online image compression tool among all four online image compression tools.
2) Shrink pictures don't produce the desired results for compressed images and the results are unacceptable.
3) Now we have a framework that can test any number of images and, can classify and evaluate the performance of any number of online image compression tools.
4) It is an automated framework that analyses the results scientifically thus providing a proven fact for the comparison of online image compression tool.
5) The quality of the compressed image is not calculated on the basis of human perception but widely known and accepted seven image quality parameters.
6) The interpretation of the results of image quality parameters which is done mostly manually, is done by the back propagation model of ANN by implementing Levenberg-Marquardt (trainlm) method.
7) Large input dataset is used so that it increases the area of evaluation and also facilitated ANN model as ANN remains inefficient on lesser number of images.

## ACKNOWLEDGMENT

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