compress.io

PRODUCT BENCHMARKING OF OUR MODEL vs current techniques

Our main comparison in market is with the prevailing traditional compression techniques such as JPEG , RAW , MP4 , etc , brief study of which is mentioned below based on some standard parameters in the world of image compression.

JPEG-"JPEG" stands for Joint Photographic Experts Group

- One of the most popular standards for compression of photographic images – widely used on the internet.
- Widely used in digital cameras.
- Implemented in all standard image processing software (MATLAB, OpenCV, etc.)
- Essentially lossy (though there are some lossless variants)
- Applicable for color as well as grayscale images.
- A user-specified quality factor (Q) between 0 and 100 (higher Q means better quality)
- JPEG algorithm compresses the image based on the user-provided Q.
- Higher the Q, less will be the compression rate (but higher image quality). Lower Q will give higher compression rate (but poorer image quality).
- JPEG can achieve 1/10 or 1/15 compression rate with little loss of quality.

JPEG image compression algorithm in brief :
1. Divide the image into non-overlapping 8 x 8 blocks and compute the discrete cosine transform (DCT) of each block. This produces a set of 64 “DCT coefficients” per block.
2. Quantize these DCT coefficients, i.e. divide by some number and round off to nearest integer (that’s why it is lossy). Many coefficients now become 0 and need not be stored!
3. Now run a lossless compression algorithm (typically Huffman encoding) on the entire set of integers.

TIFF

- TIFF files are significantly larger than their JPEG counterparts, and can be either uncompressed or compressed using lossless compression.
- Unlike JPEG, TIFF files can have a bit depth of either 16-bits per channel or 8-bits per channel, and multiple layered images can be stored in a single TIFF file.
- Moreover, it is the uncompressed version of all image formats.

RAW

- The RAW file format uses a lossless compression, and so it does not suffer from the compression artifacts visible with "lossy" JPEG compression.
- RAW files contain more information and achieve better compression than TIFF, but without the compression artifacts of JPEG.

IMAGE COMPRESSION USING DEEP LEARNING

- Our compression techniques work on variable-rate image compression and an architecture based on Convolutional Neural Networks.
- An encoder that takes in an image and converts it into an encoder that takes in an image and converts it into a bottleneck (usually a flat neural net layer) that represents the compressed data that's then transformed by a decoder into a figure that resembles the original image.
- The bottleneck allows for the visual fidelity and compression rate of the encoded image to be controlled by changing the number of nodes in this layer. For every architecture described in this paper, a function E takes an input image and emits an encoded version. This is then processed by a binarization function B. A decoder function D takes the binary version and outputs a reconstructed version. These three components form an auto encoder, which is used in all compression networks.

In digital image compression, there are four types of redundancies that can be used to compress images:

Coding redundancy , Inter pixel redundancy , Psycho visual redundancy , Set redundancy

Comparison parameter wise	Lossy or Lossless Compression	Algorithm used in backend	Density of compressed images in px xpx
JPEG	Lossy , can be optimised	Huffman coding	32 x 32 , 64 x 64
RAW	Lossless	Traditional Lossless compression	32 x 32
TIFF	Lossy or Lossless	ZIP & LZP	64 x 64
DEEP LEARNING MODEL(compress.io)	Lossy	CNN - Convolutional Neural Networks , LSTM	32 x 32 , 64 x 64 ,128 x 128

WHY compress.io ?

A large fraction of Internet traffic is now driven by requests from mobile devices with relatively small screens and often stringent bandwidth requirements. Due to these factors, it has become the norm for modern graphics-heavy websites to transmit low-resolution, low - byte count image previews (thumbnails) as part of the initial page load process to improve apparent page responsiveness. Increasing thumbnail compression beyond the capabilities of existing codecs is therefore a current research focus, as any byte savings will significantly enhance the experience of mobile device users. Toward this end, we propose a general framework for variable-rate image compression and a novel architecture based on convolutional and deconvolutional LSTM recurrent networks. Our models address the main issues that have prevented auto encoder neural networks from competing with existing image compression algorithms:(1) our networks only need to be trained once (not per-image), regardless of input image dimensions and the desired compression rate; (2) our networks are progressive, meaning that the more bits are sent, the more accurate the image reconstruction; and (3) the proposed architecture is at least as efficient as a standard purpose-trained auto encoder for a given number of bits. On a large-scale benchmark of 32×32 thumbnails, our LSTM-based approaches provide better visual quality than (headless) JPEG, JPEG2000 and WebP, with a storage size that is reduced by 10% or more.

Thus our model works on the latest technology in the market with customer favourable features.