

## Analysis of Image Compression Techniques Using CNN

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**ABSTRACT:** This paper is about, an analysis of different image compression techniques has been performed by classifying images using Convolution Neural Network . JPEG and PNG are the two main compression techniques used here which are lossy compression and lossless compression technique respectively. Image classification is process of taking image as an input and giving category/class of a image as output. CNN's are now widely used in the field of image classification and the convolution network work by feature extraction from images which helps us by no need of manual extraction of the image.

Initially, a dataset which contains several images of multiple classes is loaded to the CNN model and preprocessing of the dataset is done which is followed by training the model. Finally, these compression techniques are compared using parameter like testing accuracy.

**KEYWORDS-**PNG,JPEG,CNN,Image classification.

### I. INTRODUCTION

An Image is a collection of pixels in a rectangular grid and it has finite width and height .Image processing is a technique to change over a picture into advanced shape and play out certain procedure on it, so as to get an upgraded picture or to extricate some helpful data from it. It is a kind of sign allotment where info is picture, similar to video edge or photo and yield might be picture or attributes related with that picture.

It is among quickly developing advancements today, with its applications in different parts of a business. Picture Processing

structures center research region inside building and software engineering disciplines as well.

In the current situation image compression discovers applications in practically all machines. Picture handling is a strategy to play out certain procedure on a picture, so as to get an improved picture or to remove some helpful data from it .

Image processing fundamentally incorporates the accompanying three stages:

- Analysis of images which incorporates information pressure and picture improvement and spotting designs that are not to natural eyes like satellite photos.
- Output is the last stage where result can be changed picture or report that depends on picture investigation.

Importing the picture with optical scanner or by advanced photography.

### PNG vs JPEG Images

#### PNG Images:

PNG is a extension that represents Portable Network Graphic, and is viewed as .png in programs and working frameworks. It is a raster illustrations record position that underpins lossless pressure. This was initially intended to supplant the GIF record position. Variant 1.0 was discharged in October 1996 and characterized in RFC 2083. The primary program support showed up in IE 4 and Netscape 4. PNG is intended to function admirably in web based review applications, for example, the World Wide Web, so it is completely streamable with a dynamic presentation alternative. The MIME media type for PNG is picture/png.

### JPEG Images:

When people refer to JPEG, you might also see them mention JPG. These are essentially the same thing. JPEG, and or JPG, is a file extension that stands for Joint Photographic Experts Group. The ISO standard was originally released back in 1992. It is a bitmap compression format, most commonly used for lossy compression, with compression ratios ranging from 10:1 to 20:1. The compression ratio can be adjusted which means you can determine your own balance between storage size and quality. The JPEG extension is most commonly used by digital cameras and photo sharing devices

### Image classification:

Image classification alludes to a procedure in PC vision that can arrange a picture as per its visual substance. For instance, a picture grouping calculation might be intended to tell if a picture contains a human figure or not. While distinguishing an article is trifling for people, powerful picture characterization is as yet a test in PC vision applications.

Image classification is process of taking image as an input and giving category/class of a image as output. CNN's are now widely used in the field of image classification and the convolution network work by feature extraction from images which helps us no need of manual extraction of the image.

### Convolution Neural Network Introduction

The use of computer vision (CV) is increasing day by day. Computer vision is actually how a computer gains its understanding on digital images or videos. Image classifications, face recognition, and object detection is examples of CNN in computer vision.

Layers in CNN:

- I. Input layer
- II. Convo layer (Convo+ReLU)
- III. Pooling layer
- IV. Fully connected layer
- V. Softmax layer
- VI. Output layer

### Input layer:

Input layer should contain the data on image which is represented three dimensionally as represented earlier. Suppose if the image of dimension  $32 \times 32 = 1024$ , we need to convert it into  $1024 \times 1$  before feeding into input. If there are "n"

training examples then dimension of input will be  $(1024, n)$ .

### Convo layer:

It is also called as feature extractor because in the layer the feature of images are extracted. Convolution in general is the dot product. The activation function is also present in this layer. We are using ReLU activation function which makes all negative values obtained to zero.

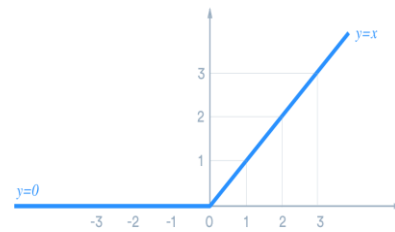


Figure 1.1 :ReLU activation function

### Pooling Layer:

Pooling layer helps in lessening the space involved of the picture sent after convolution. It is used between two convolution layers. On the off chance that pooling isn't ever, layer enormous calculation happens. Along these lines, we have applied max pooling with stride value (2) We get  $2 \times 2$  from earlier  $4 \times 4$ .

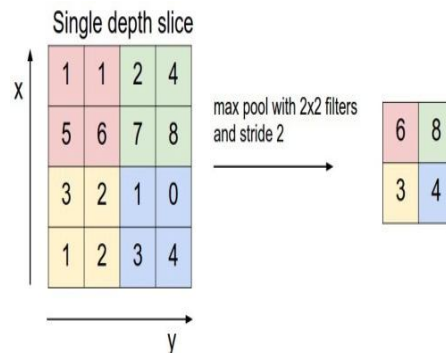


Figure 1.2: Max pooling i.e. converting  $4 \times 4$  to  $2 \times 2$

In our project, the output of every Conv2D and MaxPooling2D layer is a 3D tensor of shape (height, width, channels). The width and height dimensions tend to shrink as you go deeper in the network. The number of output channels for each Conv2D layer is controlled by the first argument (e.g., 32 or 64). Typically, as the width and height shrink, we can afford (computationally) to add more output channels in each Conv2D layer.

### Fully Connected Layer:

Fully connected layer involves weights, biases, and neurons. In this layer neurons from one layer is connected to neurons of another nearby layer. By training this layer we can classify images to different categories.

SoftmaxLayer: Softmax or Logistic layer is the last layer of CNN. It resides at the end of FC layer binary classification is done using logistic and multiclassification through softmax.

Output Layer: It is the final layer of CNN. Output layer contains the label which is in the form of one-hot encoded.



Figure 1.3: Layers in CNN

Add Dense layers on top:

## II. WORKING

### 2.1 Dataset Description

Flower Recognition

- This dataset is used for object recognition and it is highly used computer vision dataset.
- There are 4242 images of about 320\*240 pixels but we are considering only 500 images.
- It is divided as 5 object classes .
- These object classes are further classified as follows:
  - Tulip
  - Rose
  - Sunflower
  - Dandelion
  - Daisy
- All these classes have their own objects and they are not mixed.



Figure 3.6: Flower Recognition dataset

To finish our model, we will take care of the last yield tensor from the convolutional base (of shape (64,3,3)) into at least one Dense layers to perform characterization. Thick layers or dense layer accept vectors as information (which are 1D), while the current yield is a 3D tensor. Initially, you will level (or unroll) the 3D yield to 1D, at that point include at least one Dense layers on top. Flower dataset has 5 output classes, so you use a final dense layer with 5 outputs and a softmax activation.

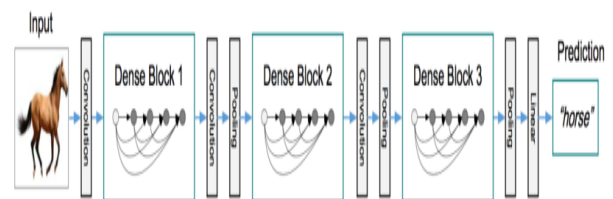


Figure 1.4: Structure of CNN in image classification process

### 2.2 Data preparation:

It starts with formatting images into preprocessed tensors of floating point and then sent to network:

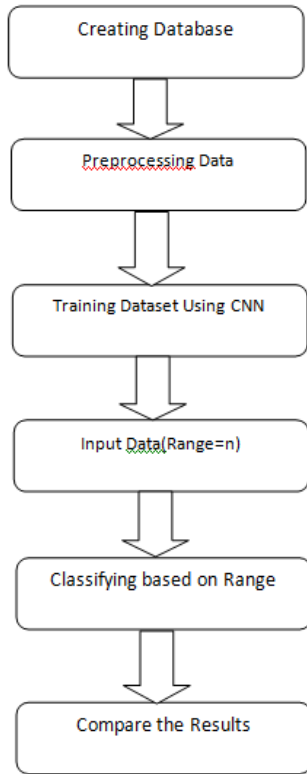
1. Analyzing the images that are present on a disk.
2. Decoding these image so as to convert in RGB(red,green,blue) formats.
3. Changing the above into floating point tensors for small input images.
4. Change the tensor value 0-255 to 0-1 values for input with lesser.

But all tasks can be performed through **imagedatagenerator** (idg) by **tf.keras**. they can analyse image that are in disk and can process them into proper point tensors. Generators convert images to different batches of tensors.

### 2.3 Image Representation

CNN occupies tensors of format ( **image\_height, image\_width, colour\_channels**), without using size of batch. Here colour channels refers to (R, G, B). According to our project, we can use CNN to access the input shape of image (32,32,2), of kaggle images. This can be done through sending an arguments to the initial layer.

### 2.4 Flowchart



### III. RESULTS

#### Results and discussion

**Dataset:** Flowers Recognition from kaggle  
 There are 4242 images of about 320\*240 pixels but we are only considering 500 images . It is further divided into 5 classes as follows:

- Tulip
- Rose
- Sunflower
- Dandelion
- Daisy

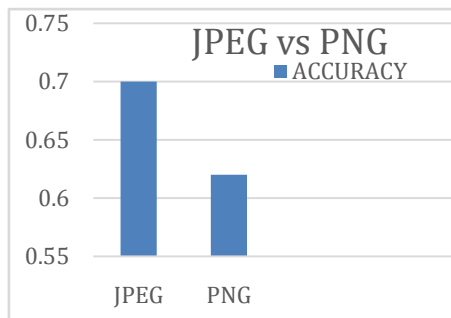


Figure 3.1: Accuracy of Jpeg & Png

### 3.1.1 Working using CNN

#### JPEG

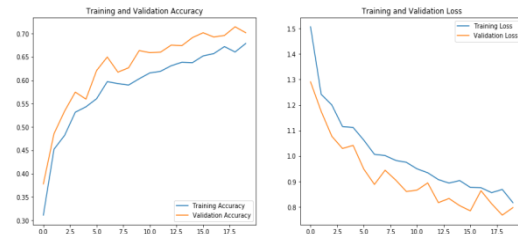


Figure 3.1.2: JPEG classification result

Few classification examples for JPEG:



Figure 3.1.3: JPEG classification example

#### PNG:

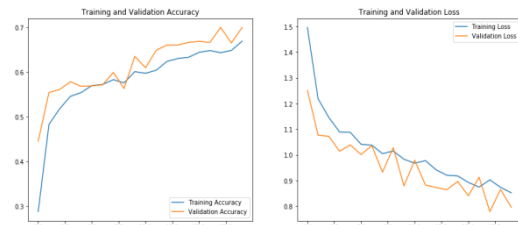


Figure 3.1.4: PNG classification result

Few classification examples for PNG:



Figure 3.5: PNG classification example

### V. FUTURE WORK

The main outcomes in our project are based on outcome results of kaggle dataset. In future, we can increase the accuracy of the result obtained in our present model. It can be necessary that additional datasets are considered for the correcting of problems that occur while classifying as the information in recent are increasing beyond assumptions.

In future, the accuracy of image classification can be increased and can also be compared with different image compression techniques. Also, a

real world problem can be solved by creating neural network model like classification of disease.

#### IV. CONCLUSION

Kaggle dataset can be used to differentiate JPEG and PNG image formats. It can be used for testing the cnn for appropriate results. It can provide the accuracy at rate of 70.1263% for JPEG images classification and 62.4621% test accuracy for PNG image classification. Images used in the training purpose are small and with medium blur images.

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