

# G2C Transformation

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**Abstract:** Conversion of grayscale image to color image is accessible system for anyone to use color features to sense the terrain, fete objects and convey information. With the help of this analysis everyone will get more clear idea about much further dynamic range of colors, tones, and tinges than argentine scale image. In this system, the system takes grayscale image as an input, and as a result gives colored image as an affair. Our thing is to convert the bystander in the light heartedness of colorized image. Gray scale image comprise only highlights, murk, and the tones of argentine between. It helps to see images more easily for the mortal eye. We propose a colorization tool which utilizes the both minimum stoner input and the traditional convolutional neural networks to the color argentine- scale images. Deep literacy can only go so far in working colorization.

**Keywords:** Machine Learning, Deep Learning, Python, Numpy, Convolution, etc.

## I. INTRODUCTION

Grayscale images, a kind of black- and-white or argentine snap, are composed simply of tones of argentine. Grayscale images have numerous tones of argentine in between. Color can only live when three factors are present a bystander, an object and light. The aim of colorization is to realize the viewer, to make him believe in the authenticity of the colorized image, and not to reconstruct the color accurately.

With the help of machine learning we are going to build a model to convert grayscale images to colored images. Since the data is in the form of image dataset, the model requires frequent backtracking to predict colors between layers to minimize predicted errors. Thus we select Caffe Model (Convolutional Architecture for fast feature embedding). Caffe is an open source framework for CNN and Deep learning. It allows user to create image classification and image segmentation models.

## II. RELATED WORK OR LITERATURE STUDIES

This section provides the literature review of the work that has previously done on coloring the grayscale image by different methodology. There have been several project and studies performed on topics related to this topic-

S. No.	Title	Year	Author	Project Category	Result
[1]	“Colorful image colorization”	2016	R.Zhang, P.Isola, Alexi A.Efros	Machine learning, Deep learning	It takes grayscale photographs as an input. It used feed forward neural network and trained million of images.
[2]	“Learning representation for automatic colorization”	2016	G.Larsson, M.Maire, G.Shaknarovi	Machine learning	It is the model which used ResNets for building the model. It combines the dense labeling results with the structured prediction.
[3]	“Unsupervised diverse colorization via Generative Adversial	2017	Weizan, Zhang, Xong Yn	Machine learning, Deep learning	It uses unsupervised learning and takes the LSUN dataset for training and testing the data

	Network				
[4]	“Colorization using ConvNet and GAN”	2017	Qiwen Fu, WeiTing Hsu, MuHeng Yang	Machine learning	In this, the discriminator gets colored image from both generator and original data along with grayscale or input image.
[5]	“Colorization of black-and-white images using deep neural networks”	2018	David Futschik	Machine learning	To implement this model, they proposed and compared two distinct convolutional neural network architecture trained under various loss functions

### III. MOTIVATION FOR THE PROJECT

Colored photography and film did not really exist until the early 1900s and did not become economically feasible for people until even later. The first cameras were produced in the early 1800s and could only produce images in black and white. Black and white photograph persisted well into the 1900s and is surprisingly making a comeback even in the modern day.

Because of this, there are a large amount of black and white images and videos that people would like to see colored.

#### 3.1 Problem Domain

- Literal black and white images are regarded as irreplaceable, with exceptional cultural value. By looking at them it's insolvable to completely imagine the factual scene, as color is a veritably important element of visual representation.
- The colorization of black and white images greatly alters the perspective of the bystander. The time gap between the history and the present fades away while making the scene more conceivable.

#### 3.2 Problem Statement

In this colorized and visualized era, color images are in demand as compared to Grey scale images. Images of past needed to be transformed for the better visualization and understanding. Sometimes it is difficult to analyze what does grey images represent even it give dull appearance to image.

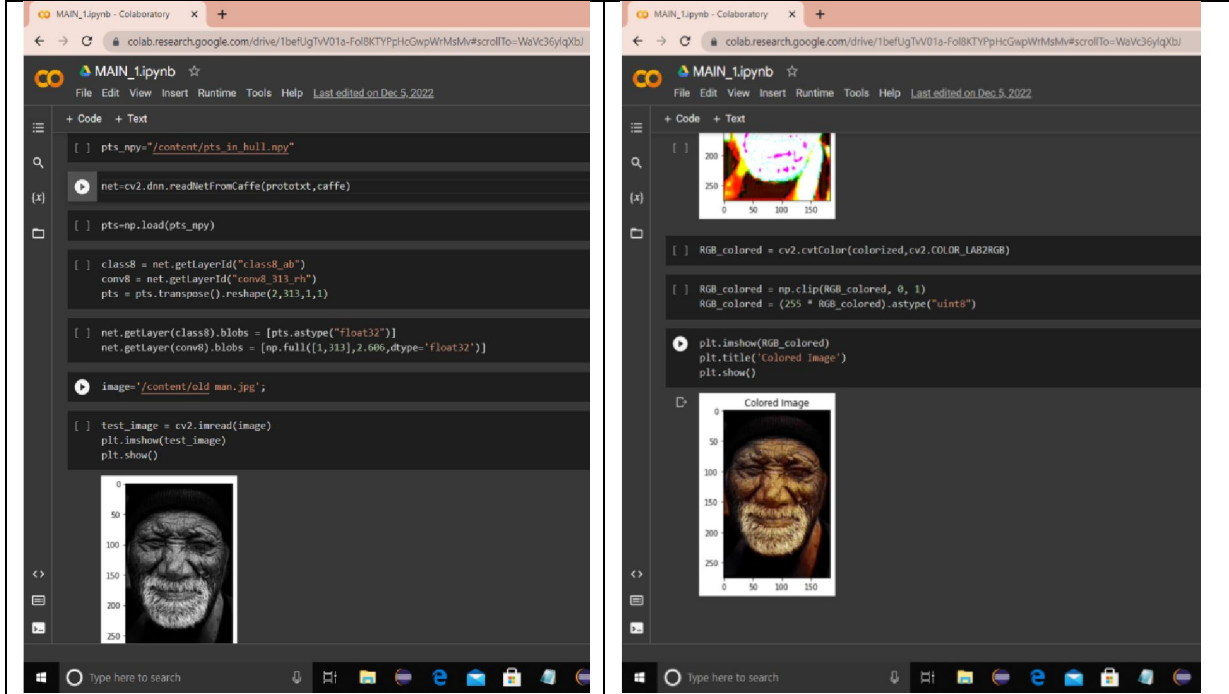
The main problem involves:

- Images produced in Grey-scale which might exaggerate an actual shape or size.
- Small field of view – requires large quantity of data to make it representative.
- Rough images & low thoughtput.

### IV. INNOVATIVE CONTENT

- As we had read one of the reference and got to know various things which give a innovative idea that there are so many images which is not colored as at the time of 1800s and 1900's, there is only existence of black and white images. Color images are those pictures which represent a way of recording and presenting information visually. These pictures are important to us because they can be extraordinarily effective medium for the storage and communication of information. We use photography in everyday life as we love to see colors and different shades of us in color format.
- We got to know coloring a grey scale image is a hot and tough topic in image transformation since it involves information re-generation. Color images are vivid and visually appealing to viewers. Color images contain more information than a grayscale image and in most of the scenarios color image is more useful to extract information from the image.
- When we compared with similar types of projects and their results, we realized that everyone used different kind of model to process the image but the motive was same, to be in the color, to realize everyone and make them believe in the beautiful representation of colored image.

- Reading some other references we also got to know that some model predict results on the basis of neural network model, resnet model, etc. while some gave result not on the basis of model used but on the basis of their luminance and color components.



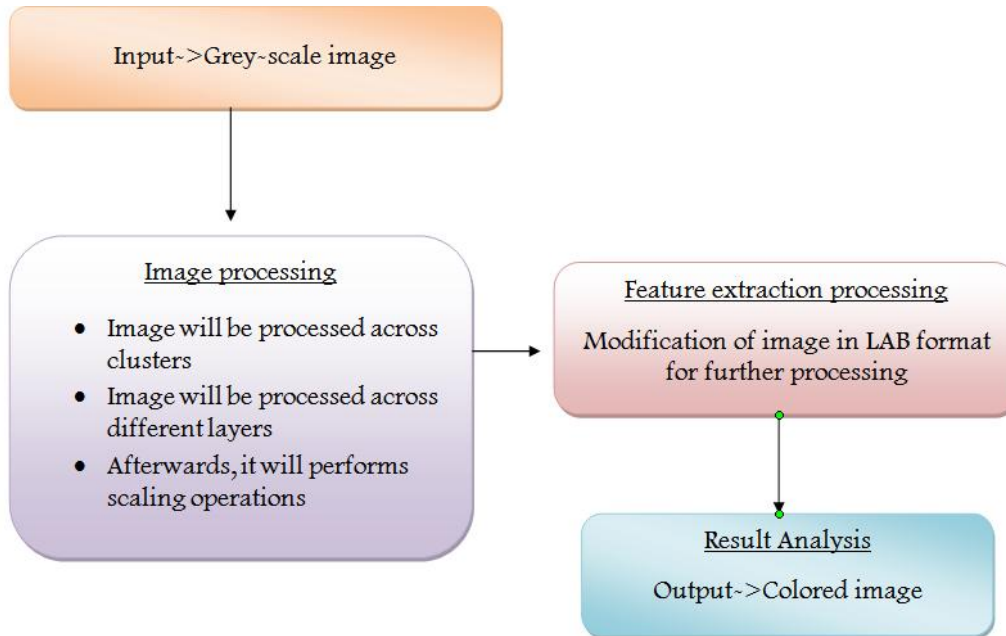
### V. RESULT AND SENSITIVITY ANALYSIS

Color space isn't dependent on only one value like grayscale image. Each pixel in color image is represented by further than one value and combined effect of these values gives appearance of a color.

As a result, we proposed the system which did transformation from the grey scale image to colored images as considering the various disadvantages of grey scale image the system is designed so that it can classify the grey scale image and do the most appropriate processing to convert it into colored version.



**VI. WORKFLOW OF THE MODEL**



Some of the features of our model are stated below:-

- Predicting Output
- User Interface
- Accurate Prediction

Hardware Requirement

- System: > i3 1.84 GHz.
- Hard Disk: 1 TB.
- Monitor: 15 VGA Color.
- Ram: 4-8 GB.

Software Requirement

- Operating system: Windows 7/8/10.
- Python
- Python module's: NumPy, pandas, matplotlib, scikit-learn etc.

**VII. COMPARISON WITH SIMILAR TYPE OF PROJECTS AND THEIR RESULTS**

S. No.	Title	Year	Author	Project category	Result
1)	G2C Transformation	2022 - 2023	Gurjeet Singh, Riyanshi Saxena	Machine learning, Deep learning	We used Caffe model for transformation of grayscale images to color images in a visually acceptable way.
2)	Learning representation for automatic colorization	2016	G. Larsson, M.Maire, G.Shaknarovi	Machine learning	They used ResNets for building the model. It combines the dense labeling results with the structured prediction.
3)	Colorful image colorization	2016	R.Zhang, P.Isola, Alexi A.Efros	Machine learning	They used feed forward neural network and trained million of images.

4)	Colorization of black-and-white images using deep neural networks	2018	David Futschik	Machine learning, Deep learning	They proposed and compared two distinct convolutional neural network architecture trained under various loss functions
5)	Unsupervised diverse colorization via Generative Adversarial Network	2017	Weizan, Zhang, Xong Yn	Machine learning	They used unsupervised learning model and takes the LSUN dataset for training and testing the data
6)	Colorization using ConvNet and GAN	2017	Qiwen Fu, Wei-Ting Hsu, Mu-Heng Yang	Machine learning	They proposed the model in that way that the discriminator gets colored image from both generator and original data along with grayscale or input image
7)	Automatic colorization of grayscale image	2018	Aman Kumar, Tapas Agarwal	Machine learning	They used YCbCr color space approach towards colorization. Here, Y is a luminance component and Cb and Cr provides the color component to image.
8)	An approach for automatic colorization of grayscale image	2018	Ahmad S. Alhadidi	Machine learning	They proposed novel approach for colorization grayscale image and feed forward artificial neural network (ANN) is used.
9)	Colorization using Neural Network Ensemble	2019	Ze Zhou Cheng, Qinxiong Yang, Bin Sheng	Machine learning	They proposed a mixture learning model (neural network) representing the presence of sub-colorstyle within an overall image dataset.

### VIII. JUSTIFICATION OF RESULTS

So let's see a quick review of our project and other references. As we discussed before, output is been predicted mostly using machine learning algorithms in our model and as well as in other's model too. In our model "G2C Transformation", user gets an authenticity of results.

The main aim is to change the perspective of the viewer, make him believe in veridicality of the colorized image, and not to rehabilitate the color accurately.

Reading other references we got to know that some model predict results on the basis of neural network model, resnet model, etc. while some gave result not on the basis of model used but on the basis of their luminance and color components.

### IX. CONCLUSION

The colorization of natural images is a grueling image processing and computer vision task. The colorization is successful if a bystander is converted in the light heartedness of colorized image.

#### X. FUTURE WORK

Future development of colorization systems will be oriented to the creation of even more imaginative architectures adapted for the colorization problem.

#### XI. ACKNOWLEDGEMENT

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