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Old Gray Scale Images Conversion

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ABSTRACT*:* The primary ideal of this paper is to automate the colorization of nonfictional black- and white images using Convolutional Neural Networks(CNN). Traditional image colorization requires significant user intervention and remains time consuming, tedious, and precious task. To address these challenges, we have developed a CNN-predicated model suitable of the automatically colorizing grayscale images. Our model utilizes all four layers of CNN, which have not been fully exploited in being disquisition. This results in a 13.75 improvement in affair quality compared to former deep crossbred models. The CNN layers and architecture will be detailed in the accompanying explanation file. While former studies have primarily concentrated on stationary images, our approach extends to real-time live video feeds captured from a webcam, offering a dynamic colorization result. still, the live feed colorization results are still sour, processing areas for further improvement.

I. INTRODUCTION

Colorizing black- and-white films has been a generality in cinema since 1902. firstly, filmmakers defied colorization, viewing it as a distortion of their artistic vision. Over time, still, colorization has come to be seen as a way to enhance and round the original work. The technology has evolved from labor-ferocious manual styles to moment's largely automated ways. A notable illustration is the use of automated colorization by Legend films in the USA to bring classic films to life in color. In India, the iconic 1960 movie Mughal-E-Azam was colorized in 2004, drawing huge cult from multiple generations and proving to be a massive success once again. and increased energy consumption(EC).During the migration process, service interruptions are ineludible, which may reduce the overall quality of service(QoS). In this paper, we present a system to automatically colorize black- and-white images.

Our approach utilizes trained Caffe model, which can be entered through OpenCV in Python. The core idea is to develop a fully automated system suitable of generating realistic and visually appealing colorizations of grayscale images. Deep knowledge, a branch of artificial intelligence, mimics the mortal brain's knowledge process by assaying data and recognizing patterns for decision- timber. In our model, the grayscale image is treated as the lightness(L) channel of an image in the LAB color space,
Where :

Lchannel: Represents lightness intensity
- **a channel**: Encodes the green-to-red component.
- **b channel**: Encodes the blue-to-yellow component

The thing of our model is to predict the a and b factors(chrominance) while conserving the original lightness(L) element. This is achieved by the CNN layers, which learn to induce plausible color distributions for each pixel. Once the predicted LAB image is generated, it's converted to the RGB colour.

II.RELATED WORK

Di Blasi et al., proposed a system of transferring colour to a grayscale image from a base image grounded on the luminance information of the black & white pixels(2). This is asemi-automatic system that minimizes the quantum of mortal trouble needed in colorization; it uses a large collection of „ colour words " to achieve the final image. Ref.(3) is another system that transfers colour to grayscale images.

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Hwang et al., proposed two approaches to image colorization, one using a retrogression literacy model and another VGG16 model to classify the image after retrogression to recolor images grounded on the subject matter(4). They use a 224 x 224 size image with RGB channels to train the model and convert the final affair of the grayscale image to a CIELUV image. They set up that adding a bracket model was a better choice in coloring the images compared to just using the retrogression model.

Cheng et al., delved a completely automatic system of coloring grayscale images using a patch matching fashion with a lowlevel patch point,mid-level DAISY features, and a high- position semantic point with Chrominance refinement to achieve presto high- quality color conversion(5).

III.METHODOLOGY -ALGORITMS USED

1. Deep Hybrid Model

In this paper, we introduce a deep hybrid model designed for the task of automatic image colorization. Our approach integrates three parallel Convolutional Neural Networks (CNNs) alongside an encoder-decoder network, creating a model that is both straightforward and highly effective. The strength of our model lies in its ability to leverage the complementary features of three pre-trained CNNs, which collectively enhance the quality of the colorization process.
Through extensive analysis of various fusion techniques and pre-trained models, we selected the most accurate and efficient combination to incorporate into our architecture. The deep learning framework we employ allows our model to surpass current state-of-the-art methods, achieving superior performance in automatic image colorization. By harnessing the power of thesesophisticated neural networks, weare able to generate realistic and visually coherent colorized images with minimal manual intervention.

2. CNN algorithm

Our approach utilizes the pre-trained Caffe model for training and testing. The Caffe model is based on the ImageNet dataset, which helps in converting input images into the LAB color space. Since training the model with millions of images from scratch is not feasible, we use a pre-trained Caffe model as the foundation. For the testing phase, we rely on the pretext file, where we define and implement the four CNN layers that will contribute to improved performance. The existing system typically uses only two layers, but by introducing four layers, we aim to enhance the output, as this setup incorporates a more refined learning process through advanced loss functions.

The model employs four layers to improve colorization accuracy. **Layer 1** starts with a convolutional layer followed by a ReLU activation and batch normalization, stabilizing training and speeding up convergence. **Layer 2** introduces a pooling layer to reduce feature map dimensions, enhancing efficiency and robustness. **Layer 3** continues with convolution, ReLU, and batch normalization, deepening feature extraction. Finally, the **softmax** function in the last layer converts output scores into a normalized probability distribution, enabling precise color prediction. This combination of operations, including convolution, ReLU, pooling, and softmax, outperforms models using fewer layers by enhancing learning and accuracy.

IV.RESULTS

ADVANTAGES OF PROPOSED SYSTEM

It automatically detects the important features without any human supervision. It learns distinctive features for each class by itself.The system can be adapted for live colorization, making it useful for not just static grayscale images but also real-time applications such as colorizing historical video footage or live streams.

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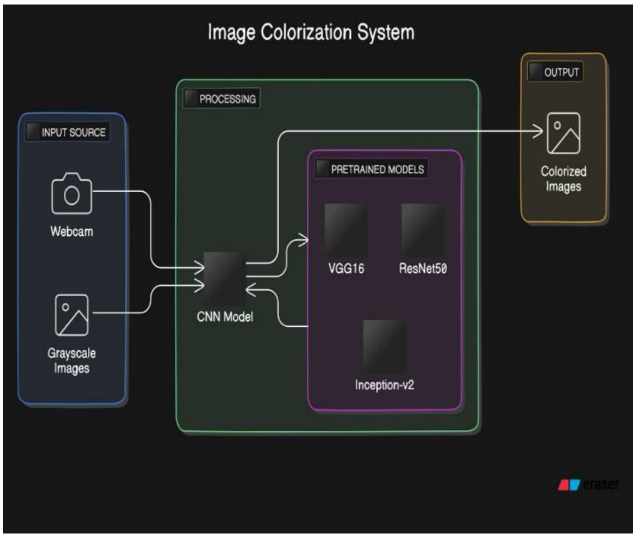

The **Image Colorization System** is designed to transform grayscale images or live video feeds into vibrant, colorized outputs using deep learning techniques. Its architecture is composed of three major modules: **Input Source**, **Processing**, and **Output.**

1.Input Source: This module accepts inputs in the form of grayscale images or real-time feeds from a webcam. Grayscale photographs, such as old black-and-white images, can be uploaded, while live inputs from a webcam enable dynamic colorization in real-time.

2.Processing: At the core of the system lies a **Convolutional Neural Network (CNN)**, which processes the grayscale inputs. The CNN is augmented by **pretrained models** such as **VGG16**, **ResNet50**, and **Inception-v2**, which are well-known for their ability to extract deep features. These models analyze the structure, patterns, and spatial context of the grayscale image to predict realistic colors for every pixel. By leveraging their pretrained weights and learned representations, the system ensures that the colorization aligns with the natural characteristics of the image, such as lighting, texture, and object boundaries.

3.Output: The final module generates fully colorized images. The results are vibrant and lifelike, capable of restoring old black-and-white photographs or enhancing video feeds. The colorized images can be saved, viewed, or further edited.

V. CONCLUSION

We introduced a completely automated approach for colorizing grayscale images, using advanced Convolutional Neural Network(CNN) ways. By precisely opting applicable loss functions and color representations, we demonstrated that our system can induce presumptive and vibrant colorizations for certain image regions, indeed when applied to a relatively grueling dataset. still, the system's performance declines when extended to videotape sequences. Through trial, we compared colorful CNN infrastructures, loss functions, and regularization ways to optimize the model's affair. Our findings reveal that the model struggles with large, invariant areas like the sky or walls, but performs better when dealing with lower objects and further intricate features. To enhance the colorization results, we proposed two new strategies that significantly ameliorate the visual quality, making the generated images more nearly act ground verity. A crucial invention in our approach is the use of a residual CNN- grounded model for colorization. Despite having a lower open field(ERF) and smaller parameters, this model demonstrates remarkable conception capabilities, frequently outperforming traditional CNNs in colorization tasks and yielding better results on unseen data.

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