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Image super resolution using Generative Adversarial Network.

Vinaya Akhade[1], Rutuja Naikwade[2], Harshada Sherkar[3],Mrs. Asmita R. Kamble [4]

[1,2,3,4] B.Tech student, Computer Science, Sinhgad Institute of Technology and Science , Pune, India

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Abstract -

Super-resolution (SR) is an image processing technique that aims to increase the resolution of an image by adding sub- pixel detail. The information used for adding detail can come from sub-pixel shifts provided by sequences of images (frequency domain), or by a good understanding of the degradation processes, including blurring, that cause the loss of detail. Convolutional neural networks (CNNs) are especially suited for this type of application due to their ability to empirically map the underlying connections between an image pixel and those surrounding it. Conversion from multiple low resolution (LR) images to high resolution (HR) image is done by using super-resolution techniques. Anyone can achieve more information in detail from high- resolution images, which helps further for many satellite image applications. This growing technology interest in the reconstruction of imagery leads to several methodologies in the field of advanced digital color image processing.

Recent years have seen growing interest in the problem of super-resolution restoration of video sequences. Whereas in the traditional single image restoration problem only a single input image is available for processing, the task of reconstructing super-resolution images from multiple under sampled and degraded images can take advantage of the additional patio-temporal data available in the image sequence. In particular, camera and scene motion lead to frames in the source video sequence containing similar, but not identical information. The additional information available in these frames make possible reconstruction of visually superior frames at higher resolution than that of the original data.

***Key Words*: Convolutional Neural Network (CNN), Super-Resolution (SR), High-resolution (HR) , Low resolution (LR)**

1. INTRODUCTION

Image Super-Resolution (SR) is an important class of image processing techniques to enhance the resolution of images and videos in computer vision. Recent years have witnessed remarkable progress of image super-resolution using deep learning tech- niques. Super resolution is the process of combining a sequence of low-resolution (LR) noisy blurred images to produce a higher resolution image or sequence. Super- resolution of image is the most widely used and extensive area of research. The resolution is referred as an important aspect of image. The problem of limited reso- lution by image acquisition devices can be solved by super resolution.

Image super-resolution (SR), which refers to the process of recovering high-resolution (HR) images from low resolution (LR) images, is an important class of image pro- cessing techniques in computer vision and image processing. It enjoys a wide range of real-world applications, such as medical imaging, surveillance and security , amongst others. Other than improving image perceptual quality, it also helps to improve other computer vision tasks. In general, this problem is very challenging and inherently ill-posed since there are always multiple HR images corresponding to a single LR image. In literature, a variety of classical SR methods have been pro- posed, including prediction-based methods , edge-based methods ,statistical methods, patch-based methods and sparse representation methods etc.

The main contributions of this survey are three-fold: 1) We give a comprehensive review of image super resolution techniques based on deep learning, including problem settings, benchmark datasets, performance metrics, a family of SR methods with deep learning, domain-specific SR applications, etc. 2) We provide a systematic overview of recent advances of deep learning based SR techniques in a hierarchical and structural manner, and summarize the advantages

and limitationsof each component for an effective SR solution. 3) We discuss the challenges and open issues, and identify thenew trends and future directions to pro- vide an insightful guidance for the community.

2. Literature Review

Priyanka and Rishabh Shukla (2020) Studied on the Image Restoration of Imagewith Gaussian Filter. In proposed system Gaussian filter was been used and the varied reasonably noise was added hence de-blurring method was employed to get a blurred image. When this image filtering was additionally enforced for removing these noises.

Tamilsel vi K and Prof. T. Thenmoz hi (2020) Restoration Techniques Available for Satellite Image Sensing Applications – A Review. In this surveys various degradation models used for satellite images and presents the inferences from the survey, which helps the readers to choose specific restoration for specific degradation model a brief detail on the various existing restoration techniques for satellite image restoration.

Hetvi Soni and Darshana Sankhe (2019) Image Restoration using Adaptive Median Filtering. The proposed work adaptive median filtering was used to get a better image restoration as Generally median removes only the presence of such noise but median filter can works fine for about intensity of 20% noise in the image.

Abhilash Bag (2018) A Review on Various Restoration Techniques in Digital Image Processing. The main objective of there work was to carry out a comparative study. Though every technique may have got its own way of dealing with the problem and have their own pros and cons. It also concluded from their explanations that usage of the techniques was governed by the understanding, requirement and the standard of the output needed. They also said median filter works better for impulse noise.

Basava Prasad B and Ravi M (2014) A Study On The Importance Of Image Processing And Its Applications. The goal of their operation can be said to be divided into 3 categories. Firstly image processing in which input can be an image and output was also an image; secondly image analysis where input may be an image and output are the dimensions or measurements. Finally image understanding in which input was an image and output was in the standard description of an image.

Shivani Dere, Anurag Chaudhari, Adarsh Laddha, Yashaswini Deora and Dhanalekshmi Yedurkar (2021) Digital Image Colorization, Style Transfer And Image Inpainting using Deep Learning. The proposed method combines all the three applications into a single web-based application termed as Neuron. Here, colorization is performed by CNN, image inpainting is obtained by Generative Adversarial Network (GAN), style image is generated by Neural Style Transfer (NST) techniques. We trained the distinct models for all three applications and produced qualitative and quantitative comparisons with other traditional approaches to endorse this approch.

Sravya Vattem, Varun Kumar Bejugam, Janani Pokkuluri(2021) Style Transfer for Artistic Image Reconstruct ion using Convolution al Neural Networks. Proposed system was implemented by generating the output image such that it preserves some notions of the content imagewhile adapting to certain characteristics of the style image.

These characteristics were extracted from the images using a convolutional neural network. The aim was to implement a loss function that will minimize the distance between the generated image and extracted content and style representations.

3. METHODOLOGY

3.1 IMPLEMENTATION

We are collecting dataset and apply algorithm (CNN: - Convolutional Neural Net- works)Prepare a trained file to compare with further peoples data. Convolutional Neural Networks is a popular deep learning technique for current

visual recognition tasks. There are four layered concepts in Convolutional Neural Networks:

- Convolution,
- ReLu,
- Pooling and
- Full Connectedness (Fully Connected Layer).

The input data features will be compared with the already trained image on the basis of closed match the result will be predicted. Once the input image is processed the system further predicts whether the patient is infected with COVID-19 or Not. We have designed a system using python as backend and HTML/CSS as front end, we have a webpage where we can upload an image and submit and system then process that image and output is predicted.

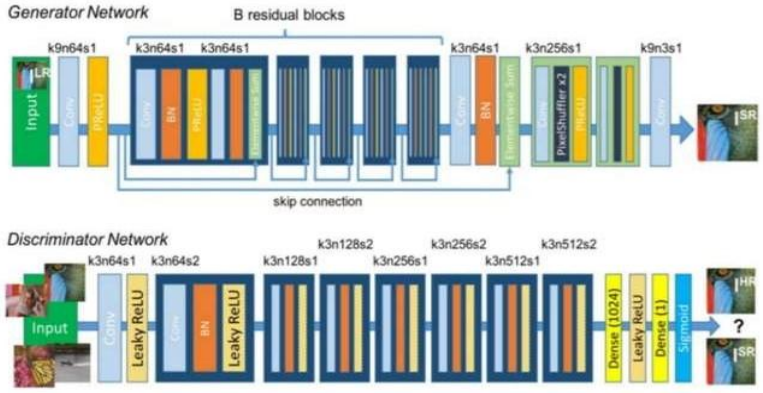

Fig-1: System Architecture

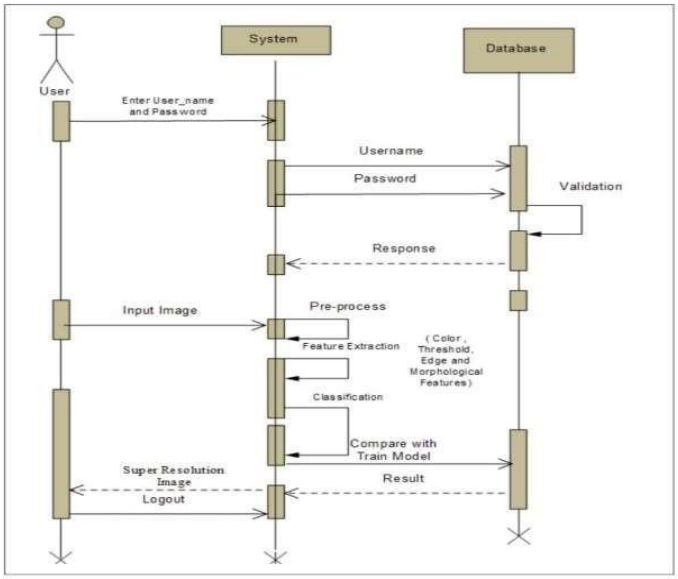

Fig-2: Sequence Diagram

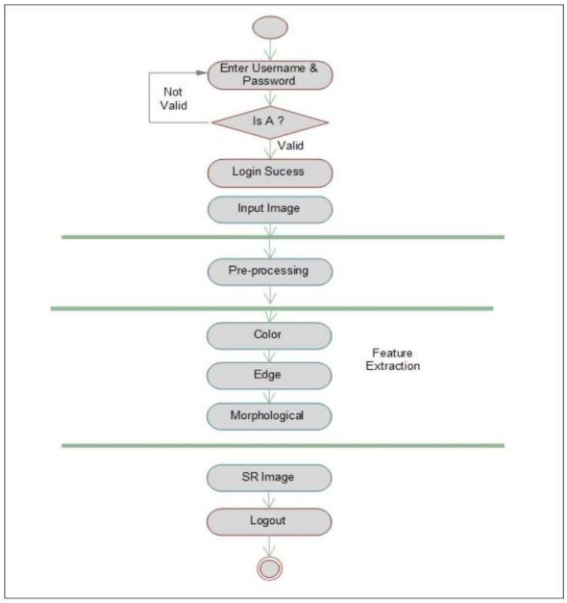

Fig-3: Use Case Diagram

- Hidden layers consisting of convolution layers, ReLU (rectified linear unit) layers, the pooling layers, and a fully connected Neural Network.

It is very important to understand that ANN or Artificial Neural Networks, made up of multiple neurons is not capable of extracting features from the image. This is where a combination of convolution and pooling layers comes into the picture. Similarly, the convolution and pooling layers can't perform classification hence we need a fully connected Neural Network. Before we jump into the concepts further let's try and understand these individual segments separately.

The role of CNN is to reduce the images into a form that is easier to process, without losing features critical towards a good prediction. This is important when we need to make the algorithm scalable to massive datasets.

The challenge with images having multiple color channels is that we have huge volumes of data to work with which makes the process computationally intensive. In other worlds think of it like a complicated process where the Neural Network or any machine learning algorithm has to work with three different data (R-G-B values in this case) to extract features of the images and classify them into their appropriate categories.

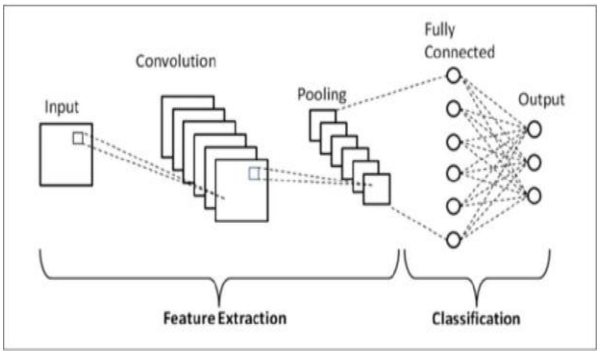

Fig-4: CNN Architecture

3.2 Algorithm Convolutional Neural Network (CNN)

CNN or the convolutional neural network (CNN) is a class of deep learning neu- ral networks. In short think of CNN as a machine learning algorithm that can take in an input image, assign importance (learnable weights and biases) to various as- pects/objects in the image, and be able to differentiate onefrom the other.

CNN works by extracting features from the images. Any CNN

- The input layer which is a grayscale image consists of the fol- lowing:
- The Output layer which is a binary or multi-class labels

3.3. Dataset

Dataset contain different type of images like Blur images, Low resolution images, High Resolution images which are used for resolution.

4. CONCLUSIONS

We have proposed a single frame based SR approach which can adaptively choose parameter of regularization terms while generating high space resolution image. To achieve self- adaptive parameter chosen, we also propose a robust reference image quality assessment which focuses on blurring and ringing effect to provide feedback to regularization terms. Our approach can effectively generate high resolution image from single input low resolution image using CNN Techniques.

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6. REFERENCES

[1] Priyanka and Rishabh Shukla , “Image Restoration of Image with Gaussian Filter” , International Research Journal of Engineering and Technology 2020.

[2] Tamilselvi. K and T. Thenmozhi, “Restoration Techniques Available for Satel- lite Image Sensing Applications – A Review ”, International Research Journal of Engineering and Technology, 2020.

[3] Madhuri VM, Samyama Gunjal GH, Savitha Kamalapurkar , “Image Restora- tion using Adaptive Median Filtering”, International Research Journal of En- gineering and Technology, 2019.

[4] Mauro Castelli and Fabiana Martins Clemente, "A Review on Various Restora- tion Techniques in Digital mage Processing" ,, International Research Journal of Engineering and Technology,2018.

[5] Basavaprasad B , Ravi M , "A Study On The Importance Of Image Processing And Its Applications ", International Journalof Research in Engineering and Technology , 2014.

[6] Shivani Dere, Anurag Chaudhari, Adarsh Laddha, Yashaswini Deora, Dhanalek- shmi Yedurkar , "Digital Image Colorization, Style Transfer and Image In- painting using DeepLearning" , International Research Journal of Engineering andTechnology (IRJET) 2021.

[7] https://www.analyticsvidhya.com/blog/ 2021/05/deep-learning-for-image-super- resolution/

[8] https://developers.google.com/machine- learning/gan/ganstructure.

7. BIOGRAPHIES

Vinaya Akhade is currently a final year B. E. student of savitribai phule pune University.
Rutuja Naikwade is currently a final year B. E. student ofsavitribai phule pune University.
Harshada Sherkar is currently a final year B. E. studentofsavitribai phule pune University.
Mrs. Asmita R. Kamble is currently working as a Professor inSinhgad Institute of Technology and Science, Narhe