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Image Super Resolution Using Deep Learning Techniques

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ABSTRACT: Image super resolution (SR) is a technique to estimate or synthesize a high-resolution (HR) image from one or several low-resolution (LR) images. Super-resolution (SR) technique reconstructs a higher-resolution image or sequence from the observed LR images. In this project we are going to present about the methods in super resolution and the advancements that are taking place, since it has many applications in various fields. As SR has been developed for more than three decades, both multi-frame and single-frame SR have significant applications in our daily life. Most super-resolution techniques are based on the same idea, using information from several different images to create one upsized image. Algorithms try to extract details from every image in a sequence to reconstruct other frames.

KEYWORDS: Interpolation Techniques, Deep Learning, Convolution Neural Networks.

I. INTRODUCTION

In the last decade the world has seen an immense global advancement in technology, both in hardware and software. The industries took advantage of the advanced technology to produce electronic gadgets such as computers, mobile phones, PDAs and many more at affordable prices. The camera sensor manufacturing units also advanced in their manufacturing techniques to produce good quality high-resolution (HR) digital cameras. Although, HR digital cameras are available, many computer vision applications such as satellite imaging, target detection, medical imaging and many more still had a strong requisition for higher resolution imagery which very often exceeded the capabilities of these HR digital cameras. To cope up with the strong demand for higher-resolution imagery, these applications approached image-processing techniques for a solution to generate good quality HR imagery. Super Resolution image reconstruction is a promising technique of digital imaging which attempts to reconstruct HR imagery by fusing the partial information contained within a number of under-sampled low-resolution (LR) images of that scene during the image reconstruction process. Super-resolution image reconstruction involves up-sampling of under-sampled images thereby filtering out distortions such as noise and blur. In comparison to various image enhancement techniques, super-resolution image reconstruction technique not only improves the quality of under-sampled, low-resolution images by increasing their spatial resolution but also attempts to filter out distortions. The central aim of Super-Resolution (SR) is to generate a higher resolution image from lower resolution images. High resolution image offers a high pixel density and thereby more details about the original scene. The need for high resolution is common in computer vision applications for better performance in pattern recognition and analysis of images. High resolution is of importance in medical imaging for diagnosis. Many applications require zooming of a specific area of interest in the image wherein high resolution becomes essential, e.g. surveillance, forensic and satellite imaging applications. However, high resolution images are not always available. This is since the setup for high resolution imaging proves expensive and also it may not always be feasible due to the inherent limitations of the sensor, optics manufacturing technology. These problems can be overcome through the use of image processing algorithms, which are relatively inexpensive, giving rise to the concept of super-resolution. It provides an advantage as it may cost less and the existing low resolution imaging systems can still be utilized.

II. DIGITAL IMAGE PROCESSING

Computerized picture preparing is a range portrayed by the requirement for broad test work to build up the practicality of proposed answers for a given issue. A critical trademark hidden the plan of picture preparing frameworks is the huge level of testing and experimentation that typically is required before touching base at a satisfactory arrangement. This trademark informs that the capacity to plan approaches and rapidly model hopeful arrangements by and large assumes a noteworthy part in diminishing the cost and time required to land at a suitable framework execution.

Processing on image:

Processing on image can be of three types They are low-level, mid-level, high level.

Low-level Processing:

Preprocessing to remove noise

Contrast enhancement.

Image sharpening

Medium Level Processing:

Segmentation

Edge detection

Object extraction.

High Level Processing:

Image analysis

Scene interpretation

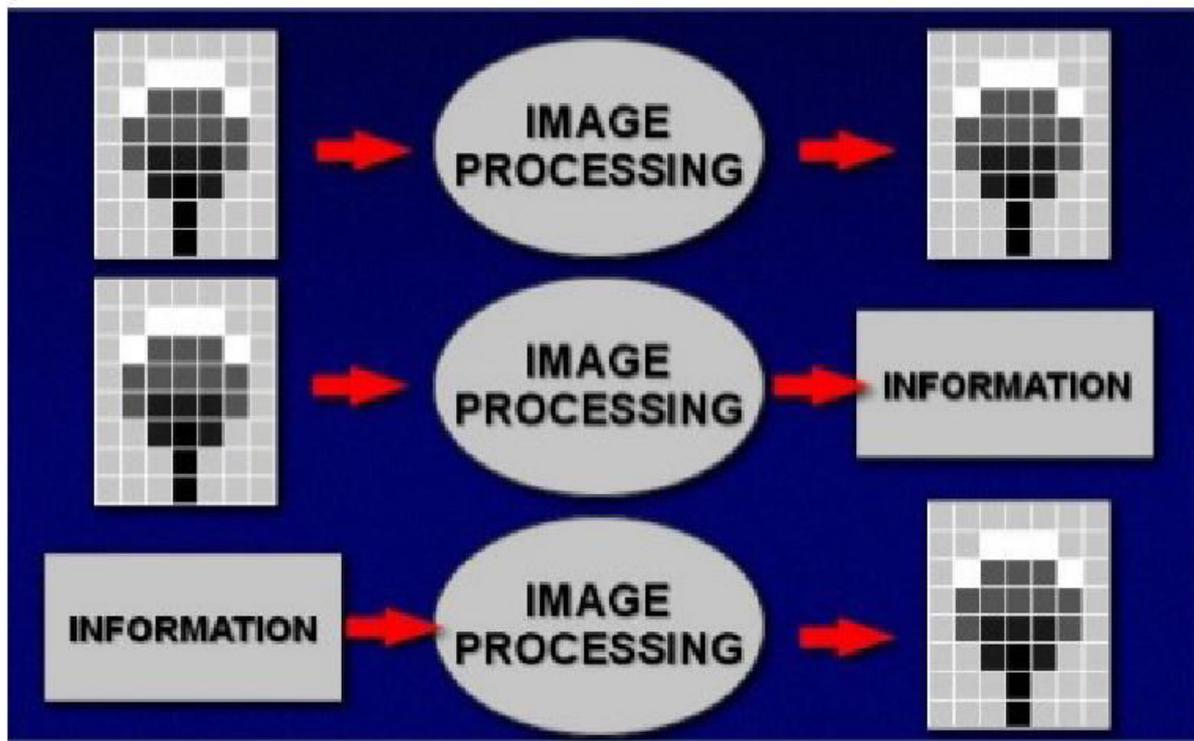
Since the digital image is invisible , it must be prepared for viewing on one or more output device(laser printer, monitor etc).The digital image can be optimized for the application by enhancing the appearance of the structures within it .

There are three of image processings used. They are

Image to Image transformation

Image to Information transformations

Information to Image transformations



Pixel :

Pixel is the smallest element of an image. Each pixel correspond to any one value. In an 8-bit gray scale image, the value of the pixel between 0 and 255.Each pixel store a value proportional to the light intensity at that particular location. It is indicated in either Pixels per inch or Dots per inch .



Resolution :

The resolution can be defined in many ways. Such as pixel resolution, spatial resolution, temporal resolution, spectral resolution .In pixel resolution, the term resolution refers to the total number of count of pixels in an digital image. For example , If an image has M rows and N columns, then its resolution can be defined as M X N. Higher is the pixel resolution, the higher is the quality of the image.

Resolution of an image is of generally two types.

- Low Resolution image
- High Resolution

Since high resolution is not a cost effective process . It is not always possible to achieve high resolution images with low cost . Hence it is desirable to go for Super Resolution imaging.I n Super Resolution imaging , with the help of certain methods and algorithms we can be able to produce high resolution images from the low resolution images .

Gray Scale Image

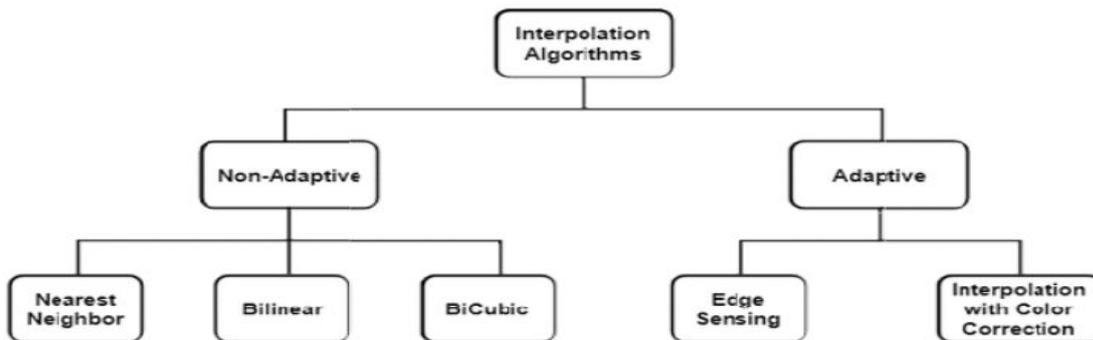
A gray scale picture is a capacity I (xylem) of the two spatial directions of the picture plane. I(x,y) is the force of the picture at the point (x, y) on the picture plane. I (xylem) take non-negativeesteems expect the picture is limited by a rectangle [0, a] '[0, b] I: [0, a] " [0, b] ® [0, data] .

Color Image

It can be spoken to by three capacities, R (xylem) for red, G (xylem) for green and B (xylem) for blue. A picture might be persistent as for the x and y facilitates and furthermore in adequacy. Changing over such a picture to advanced shape requires that the directions and the adequacy to be digitized. Digitizing the facilitate's esteems is called inspecting. Digitizing the adequacy esteems is called quantization

Basic Interpolation Methods

Interpolation is a method of constructing new set of known data points.

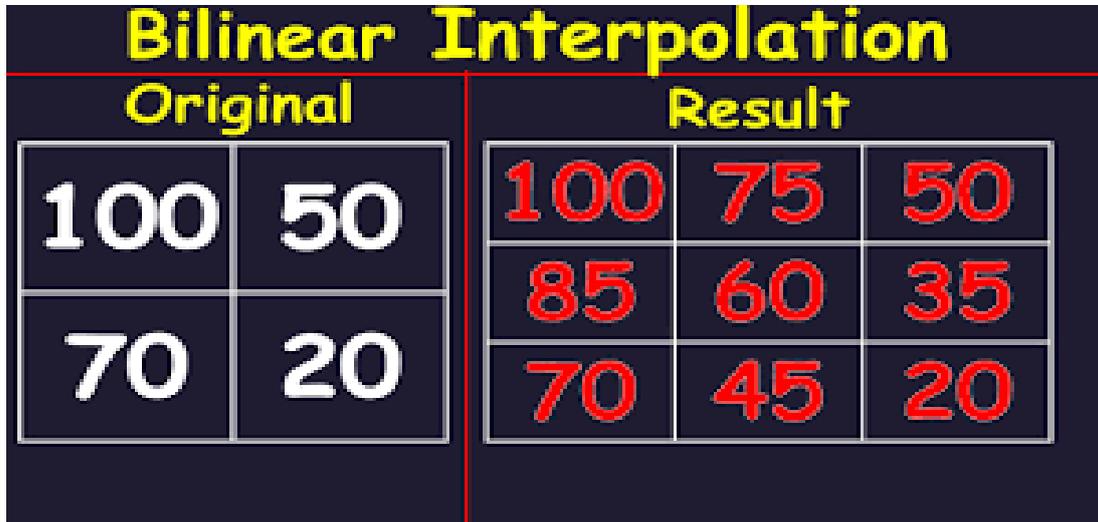


The three basic methods of interpolation here we used are:

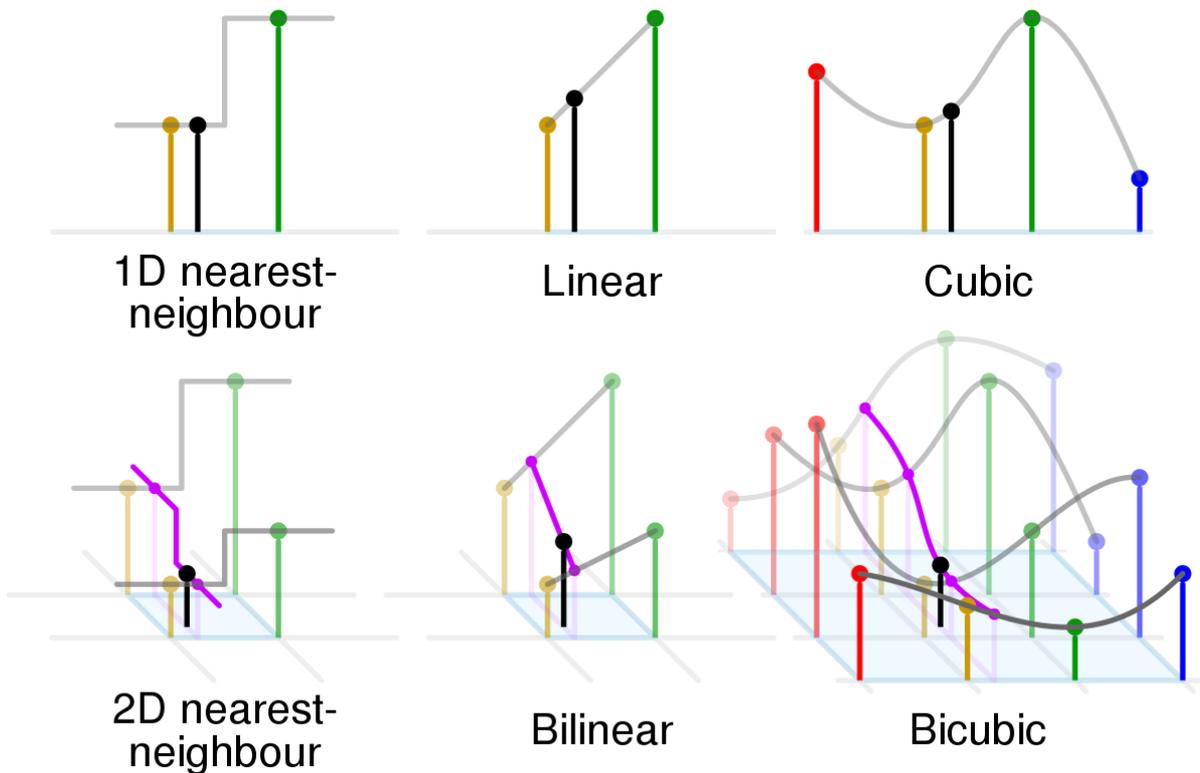
1)Nearest Neighbor Interpolation

Original			Result		
10	4	22	10	4	22
10	4	22	10	4	22
2	18	7	2	18	7
2	18	7	2	18	7
9	14	25	9	14	25
9	14	25	9	14	25

2) Bilinear Interpolation



3) Bicubic Interpolation

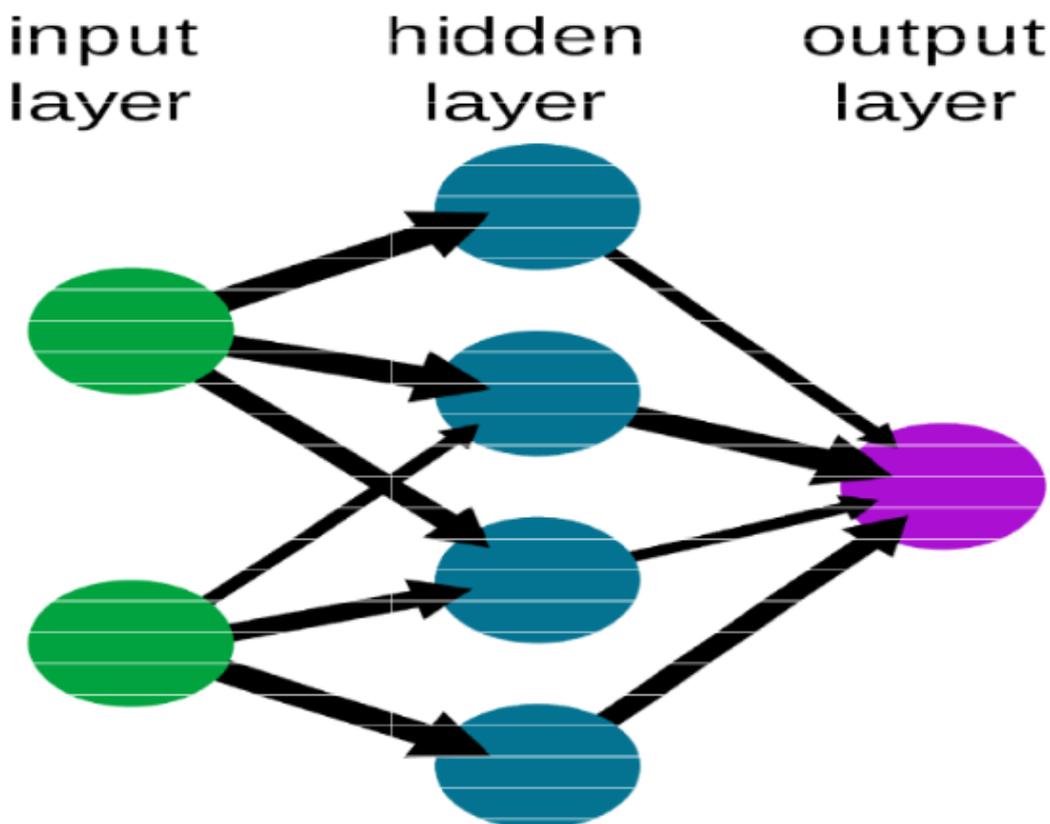


III. INTRODUCTION TO CONVOLUTIONAL NEURAL NETWORK

Neural Network:

A neural network is a neural network, composed of a biological neural network, made up of real biological neurons, or an artificial neural network, for solving artificial intelligence modeled as weights. A positive weight reflects an excitatory connection, while negative values mean inhibitory connections. referred as a linear combination. Finally, an activation function controls the output. For example, an acceptable range of output is usually between 0 and 1, or it could be and 1. These artificial networks may be used for applications where they can be trained via a dataset. Self

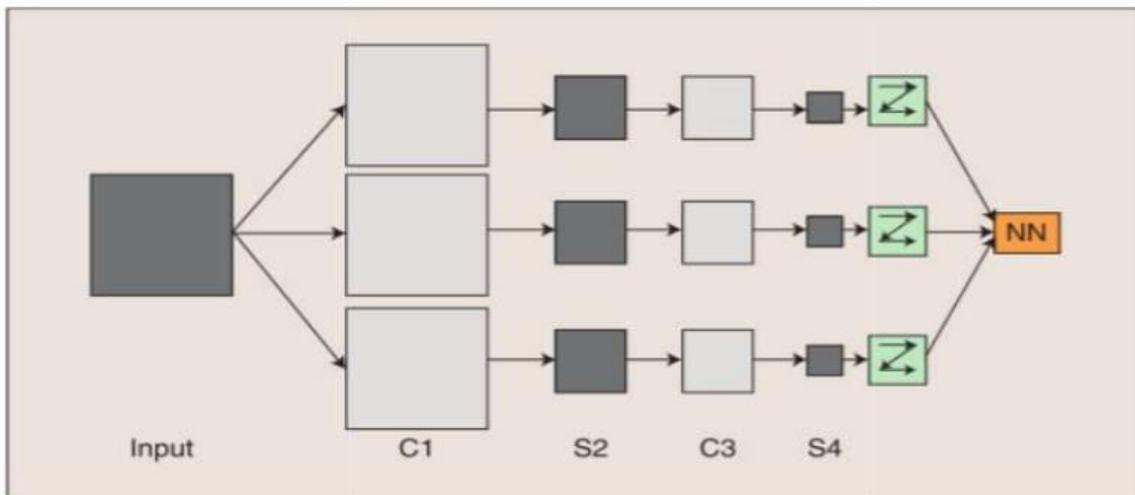
occur within networks, which can derive conclusions from a complex and seemingly unrelated set of information network or circuit of neurons, or in a modern sense, an of artificial neurons or nodes.[1] Thus a neural network is either made up of real biological neurons, or an artificial neural network, artificial intelligence (AI) problems. The connections of the biological neuron are modeled as weights. A positive weight reflects an excitatory connection, while negative values mean inhibitory connections. All inputs are modified by a weight and summed. This activity is referred as a linear combination. Finally, an activation function controls the acceptable range of output is usually between 0 and 1, or it could be These artificial networks may be used for predictive modeling, applications where they can be trained via a dataset. Self-learning resulting from experience can occur within networks, which can derive conclusions from a complex and seemingly unrelated set of information.



A deep neural network (DNN) is an artificial neural network (ANN) with multiple layers between the input and output layers. The DNN finds the correct mathematical manipulation to turn the input into the output, whether it be a linear relationship or a non-linear relationship.

Convolutional Neural Network:

In deep learning, a convolutional neural network deep, feed-forward artificial neural networks, most commonly applied to analyzing visual imagery. Convolutional networks were inspired by biological processes in that the connectivity pattern between neurons resembles the organization of the little pre-processing compared to other multi-layer NNs applied to 2-d arrays (usually images), based on spatially localized neural input. CNN Generate ‘patterns of patterns’ for pattern recognition. previous layers.



Convolutional Networks are trainable multistage architectures composed of multiple stages Input and output of each stage are sets of arrays called feature maps feature map represents a particular feature extracted at all locations on input composed of: a filter bank layer, a non composed of 1, 2 or 3 such 3-layer stages, Convolutional layers apply a convolution operation to the input, passing the result to the next layer. The convolution emulates the response of an individual neuron to visual stimuli convolutional neural network (CNN, or ConvNet) is a class of forward artificial neural networks, most commonly applied to analyzing visual Convolutional networks were inspired by biological processes in that the connectivity pattern between neurons resembles the organization of the visual cortex. processing compared to other image classification algorithms. CNN is a special kind of d arrays (usually images), based on spatially localized neural input.

IV. CONCLUSION

In most of the applications higher resolution is desired to get detailed information of the captured image. This can be achieved either by better image sensors or advanced optics. But it has cost implications and also hardware limitations. We can opt signal processing, specially image processing to overcome these limitations of the sensors and optics manufacturing technology. An economical and effective solution to obtain a HR image from low resolution images is the use of image super resolution algorithms. . The super resolution methods combine the details of low quality multiple images to extract information on unknown pixels of high quality image. Thus, the fusion of information from multiple LR images enables the reconstruction of HR image easier as compared to single LR image. This is because multiple LR images contain different information and this additional information can be exploited to obtain a HR image. Thus it remains a challenging task to reconstruct a HR image from single LR image which has less amount of information at hand. The proposed work is primarily concentrated on single image super resolution.

V. FUTURE SCOPE

To improve the accuracy of the image super resolution, a different deep learning techniques might be explored. In fact, greater research into the image super resolution in medical imaging is possible to improve the data's suitability for future analysis

REFERENCES

- [1].A New Single Image Interpolation Technique For Super Resolution ,Hassan Aftab Departmentof Avionics Engineering, National University of Sciences and Technology, Pakistan .
- [2.] T. Blu, P. Thevenaz and M. Unser, "Linear interpolation revitalized," in IEEE Transactionson Image Processing, vol. 13, no. 5, pp. 710-719, May 2004.
- [3.] E. Maeland, "On the comparison of interpolation methods," in IEEE Transactions on Medical Imaging, vol. 7, no. 3, pp. 213-217, Sept. 1988.
- [4.]Bicubic Interpolation Algorithm Implementation for Image Appearance Enhancement 1Prachi R Rajarapolu, Vijay R Mankar ,Amaravati, Maharashtra, India

- [5.] R. Matsuoka, M. Sone, N. Sudo and H. Yokotsuka, "Comparison of Image Interpolation Methods Applied to Least Squares Matching," 2008 International Conference on Computational Intelligence for Modelling Control & Automation, Vienna, 2008
- [6.] An Introduction to Super-Resolution Imaging Jonathan Simpkins and Robert L. Stevenson University of Notre Dame, 275 Fitzpatrick Hall, Notre Dame, IN 46556, USA
- [7.] An adaptive single image method for super resolution Azade Mokari Electrical and Robotic Engineering Department Shahrood University Shahrood
- [8.] Image Super-Resolution Using Deep Convolutional Networks Chao Dong, Chen Change Loy, Member, IEEE, Kaiming He, Member, IEEE, and Xiaoou Tang, Fellow, IEEE
- [9] Lowlesh Yadav and Asha Ambhaikar, "IOHT based Tele-Healthcare Support System for Feasibility and performance analysis," Journal of Electrical Systems, vol. 20, no. 3s, pp. 844–850, Apr. 2024, doi: 10.52783/jes.1382.
- [10] L. Yadav and A. Ambhaikar, "Feasibility and Deployment Challenges of Data Analysis in Tele-Healthcare System," 2023 International Conference on Artificial Intelligence for Innovations in Healthcare Industries (ICAIIHI), Raipur, India, 2023, pp. 1-5, doi: 10.1109/ICAIIHI57871.2023.10489389.
- [11] L. Yadav and A. Ambhaikar, "Approach Towards Development of Portable Multi-Model Tele-Healthcare System," 2023 International Conference on Artificial Intelligence for Innovations in Healthcare Industries (ICAIIHI), Raipur, India, 2023, pp. 1-6, doi: 10.1109/ICAIIHI57871.2023.10489468.
- [12] Lowlesh Yadav and Asha Ambhaikar, Exploring Portable Multi-Modal Telehealth Solutions: A Development Approach. International Journal on Recent and Innovation Trends in Computing and Communication (IJRITCC), vol. 11, no. 10, pp. 873–879, Mar. 2024.11(10), 873–879, DOI: 10.13140/RG.2.2.15400.99846.
- [13] Lowlesh Yadav, Predictive Acknowledgement using TRE System to reduce cost and Bandwidth, March 2019. International Journal of Research in Electronics and Computer Engineering (IJRECE), VOL. 7 ISSUE 1 (JANUARY-MARCH 2019) ISSN: 2393-9028 (PRINT) | ISSN: 2348-2281 (ONLINE).



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