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Diamond Quality Assessment System

Shivani Thakur[1], Dheeraj Tambare[2], Urmez Panthaki[3], Cyril Jose[4], Gajanan. B. Aochar[5]

Student, Department of Computer Engineering, Modern Education Society's College of Engineering, Savitribai Phule Pune University, Pune, Maharashtra, India[1,2,3,4]

Professor, Department of Computer Engineering, Modern Education Society's College of Engineering, Savitribai Phule Pune University, Pune, Maharashtra, India[5]

ABSTRACT: Diamonds for the most part should be cut with correct shape and extent before they can indicate dazzling appearance. Precious stones ought to be dull on the off chance that they are solidified from unadulterated carbon molecules. At present, jewels are regularly estimated and evaluated by experienced graders with some extraordinary devices like amplifying glasses, standard ace stones, colorimeters, ideal scopes, and so forth. Nonetheless, manual estimation and evaluating has various disadvantages, for example, restricted exactness, subjectivity, poor view of respectability, low proficiency and mind-boggling expense. Therefore to develop an integrated auto-measuring system for diamond grading is becoming a challenging research topic. Therefore to develop an integrated auto-measuring system for diamond grading is becoming a challenging research topic. This system presents methodology for diamond quality grading based on color of diamond, texture of a diamond and clarity. In order to get accurate diamond images, a special hardware source is employed. Quality assessment done through three important feature extraction of the diamond like color, texture and clarity. Then extracted features are passed to the classifier for grading. On the basis of grading quality of a diamond will be determine.

KEYWORDS: Image Processing; Convolutional Neural Network; Pre-Processing; Machine Learning; Classification

I. INTRODUCTION

Normal precious stones for the most part should be cut with correct shape and extent before they can demonstrate shining appearance. Jewels ought to be boring on the o chance that they are solidied from unadulterated carbon particles. On account of a little measure of Nitrogen in most regular precious stones, jewels regularly demonstrate different shades of yellow shading. Since common precious stones regularly demonstrate distinctive shading, different considerations or then again surrenders, and characteristic cutting mistakes, they should be re viewed. Other than carat reviewing, jewel evaluating incorporates shading re viewing, clearness evaluating, and cut evaluating. At present, jewels are regularly estimated and evaluated by experienced graders with some extraordinary devices like amplifying glasses, standard ace stones, colorimeters, ideal scopes, and so forth. Nonetheless, manual estimation and evaluating has various disadvantages, for example, restricted exactness, subjectivity, poor view of respectability, low proficiency and mind-boggling expense. Particularly, after ceaselessly labouring for 60 minutes, the graders eyes regularly progress toward becoming extremely worn out, and wronged value acting can be made effortlessly. Therefore to develop an in teg rated auto-measuring system for diamond grading is becoming a challenging research topic. Proposed system works on diamond quality grading based on colour of diamond, texture of a diamond and clarity. In order to get accurate diamond images, a special hardware source is employed. Quality assessment done through three important feature extraction of the diamond like colour, texture and clarity. Then extracted features are passed to the classier for grading On the basis of grading quality of a diamond will be determine.

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II. RELATED WORK

Diamond Color Grading Based on Machine Vision [1] this paper shows a powerful strategy for precious stone shading reviewing dependent on machine vision. So as to gain attractive precious stone pictures, an uncommon light source dependent on a coordinating circle is utilized. Subsequent to repaying the variance of the light source, the compositive shading highlights, including free and joint circulation highlights of Hue and Saturation, are extricated in portioned uniform areas. At that point, contingent upon a prepared BP Neural Network, jewels can be evaluated by shading. Perceptual Correction for Color Grading of Random Textures

Correction for color grading of random textures, Machine Vision andApplications [2]This paper present a technique for shading shade evaluating for mechanical investigation of irregular. Surfaces, the differences of which are at the edge of human observation. This strategy utilizes picture rebuilding strategies to recoup an unblurred form of the picture, and after that obscures it indistinguishable path from the human visual framework does, to copy the procedure of the picture being caught by the human sensor. In this way, the shading picture is changed into a perceptually uniform shading space, where shading evaluating happens

A Threshold Selection Method fromGrey-Level Histograms [3] A nonparametric and unsupervised technique for programmed limit determination for picture division is exhibited. An ideal limit is chosen by the discriminant rule, to be specific, in order to boost the detachability of the resultant classes in dim dimensions. The technique is exceptionally straightforward, using just the zeroth-and the main request aggregate snapshots of the dark dimension histogram. It is clear to stretch out the technique to multi threshold issues. A few exploratory outcomes are additionally exhibited to help the legitimacy of the technique.

Performance analysis of a Colorimeter designed with RGB color sensor [4]This paper shows a viable technique for jewel shading evaluating dependent on machine vision. So as to secure palatable precious stone pictures, an exceptional light source dependent on a coordinating circle is utilized. In the wake of remunerating the vacillation of the light source, the focused shading highlights, including autonomous and joint dispersion highlights of Hue and Saturation, are separated in portioned uniform districts. At that point, contingent upon a prepared BP Neural Network, jewels can be evaluated by shading. Examination results demonstrate that the proposed strategy can achieve an acceptable precision to substitute manual reviewing for genuine precious stones. The proposed strategy can likewise be utilized to group different questions by little shading distinction

Development of a Colorimetric sensor for monitoring of fish spoilage amines in packaging headspace[5] A methodological report on essentialness of picture preparing and its applications in the field of PC vision is completed here. Amid a picture preparing Task the information given is a picture and its yield is an upgraded top notch picture according to the systems utilized. Picture handling normally alluded as advanced picture preparing, yet optical and simple picture handling likewise are conceivable. Our examination gives a strong prologue to picture handling alongside division strategies, PC vision essentials and its connected applications that will be of worth to the picture preparing and PC vision look into networks.

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III. PROPOSED ALGORITHM

Proposed system

Proposed system works on diamond quality grading based on color of diamond, texture of a diamond and clarity. In order to get accurate diamond images, a special hardware source is employed. Quality assessment done through three important feature extraction of the diamond like color, texture and clarity. Then extracted features are passed to the classifier for grading. On the basis of grading quality of a diamond will be determine.

Pre-processing –

In image pre-processing, image/picture information recorded by sensors on a satellite or taken by uncommon equipment limit mistakes identified with geometry and splendor estimations of the pixels. These blunders are amended utilizing suitable scientific models which are either distinct or factualmodels. Picture upgrade is the alteration of picture by changing the pixel splendor esteems to enhance its visual effect. Picture upgrade is the adjustment of picture bychanging the pixel brilliance esteems to enhance its visual effect. Picture upgrade includes an accumulation of procedures that are utilized to enhance the visual appearance of a picture, or to change over the picture to a shape which is more qualified for human or machine elucidation.

Convolutional neural networks - are similar to feed forward neural networks, where the neurons have learn-able weights and biases. Its application have been in signal and image processing which takes over OpenCV in field of computer vision.

in this neural network, the input features are taken in batch wise like a filter. This will help the network to remember the images in parts and can compute the operations. These computations involve conversion of the image from RGB or HSI scale to Gray-scale. Once we have this, the changes in the pixel value will help detecting the edges and images can be classified into different categories.

ConvNet are applied in techniques like signal processing and image classification techniques. Computer vision techniques are dominated by convolutional neural networks because of their accuracy in image classification. The technique of image analysis and recognition, where the agriculture and weather features are extracted from the open source satellites like LSAT to predict the future growth and yield of a particular land are being implemented. In proposed system CNN is used for image classification it includes image dataset belong to six different classes.

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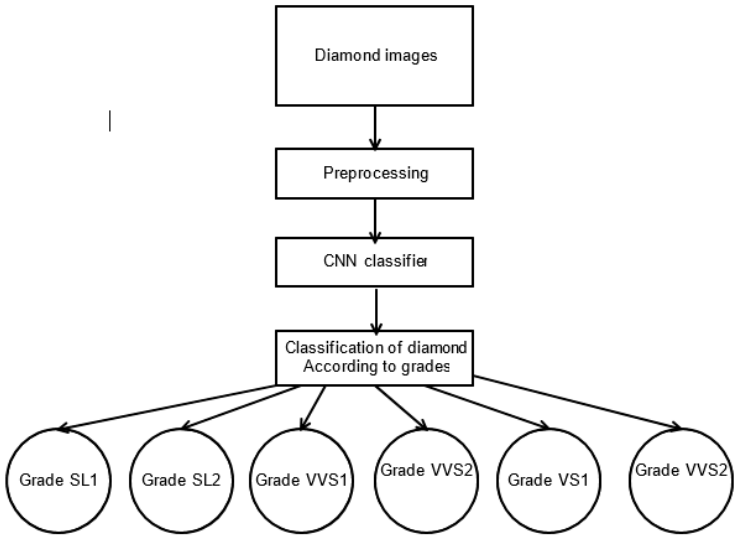

Fig: Proposed system architecture diagram

IV. PSEUDO CODE

CNN Steps

- Step 1: Convolution Operation

The first building block in our plan of attack is convolution operation. In this step, we will touch on feature detectors, which basically serve as the neural network's filters. We will also discuss feature maps, learning the parameters of such maps, how patterns are detected, the layers of detection, and how the findings are mapped out.

- Step 1(b): ReLU Layer

The second part of this step will involve the Rectified Linear Unit or ReLU. We will cover ReLU layers and explore how linearity functions in the context of Convolutional Neural Networks.

Not necessary for understanding CNN's, but there's no harm in a quick lesson to improve your skills.

- Step 2: Pooling

In this part, we'll cover pooling and will get to understand exactly how it generally works. Our nexus here, however, will be a specific type of pooling; max pooling. We'll cover various approaches, though, including mean (or sum) pooling. This part will end with a demonstration made using a visual interactive tool that will definitely sort the whole concept out for you.

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- Step 3: Flattening

This will be a brief breakdown of the flattening process and how we move from pooled to flattened layers when working with Convolutional Neural Networks.

- Step 4: Full Connection

In this part, everything that we covered throughout the section will be merged together. By learning this, you'll get to envision a fuller picture of how Convolutional Neural Networks operate and how the "neurons" that are finally produced learn the classification of images.

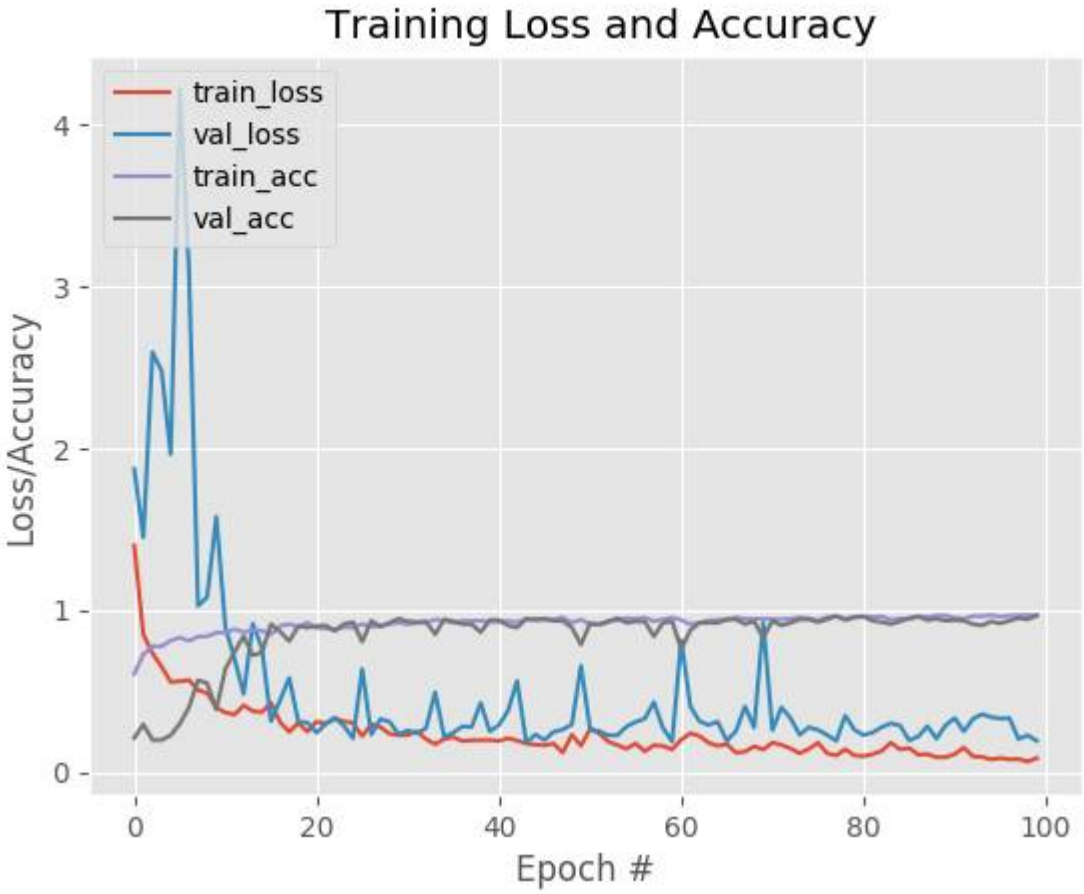

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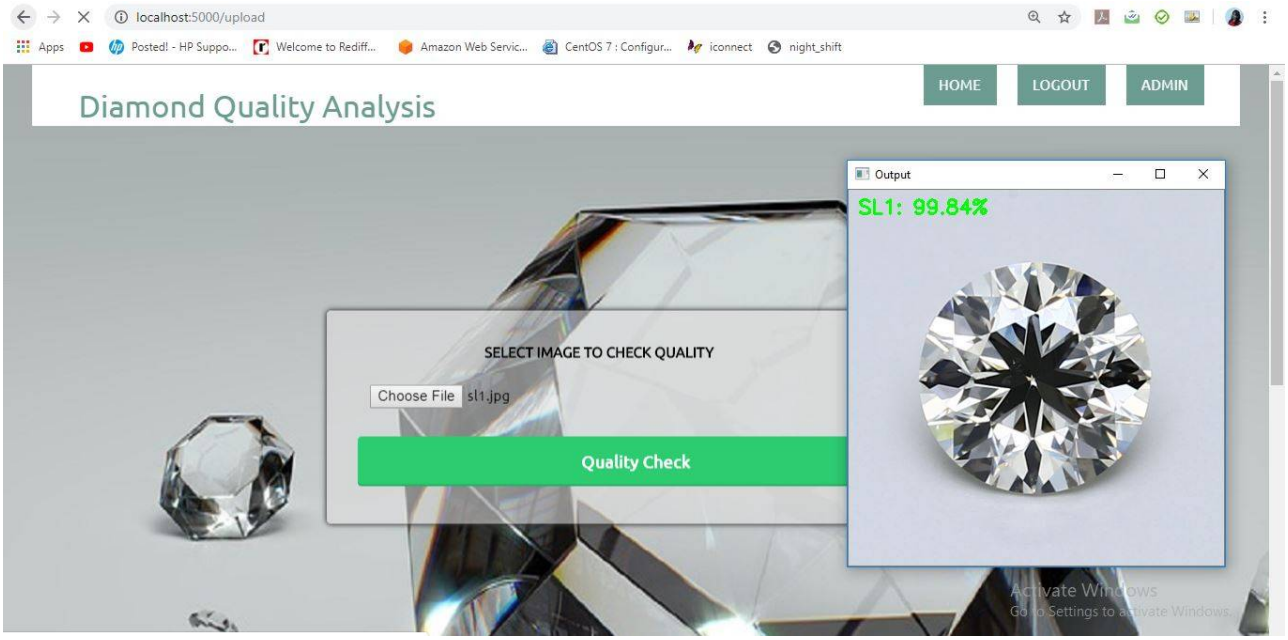
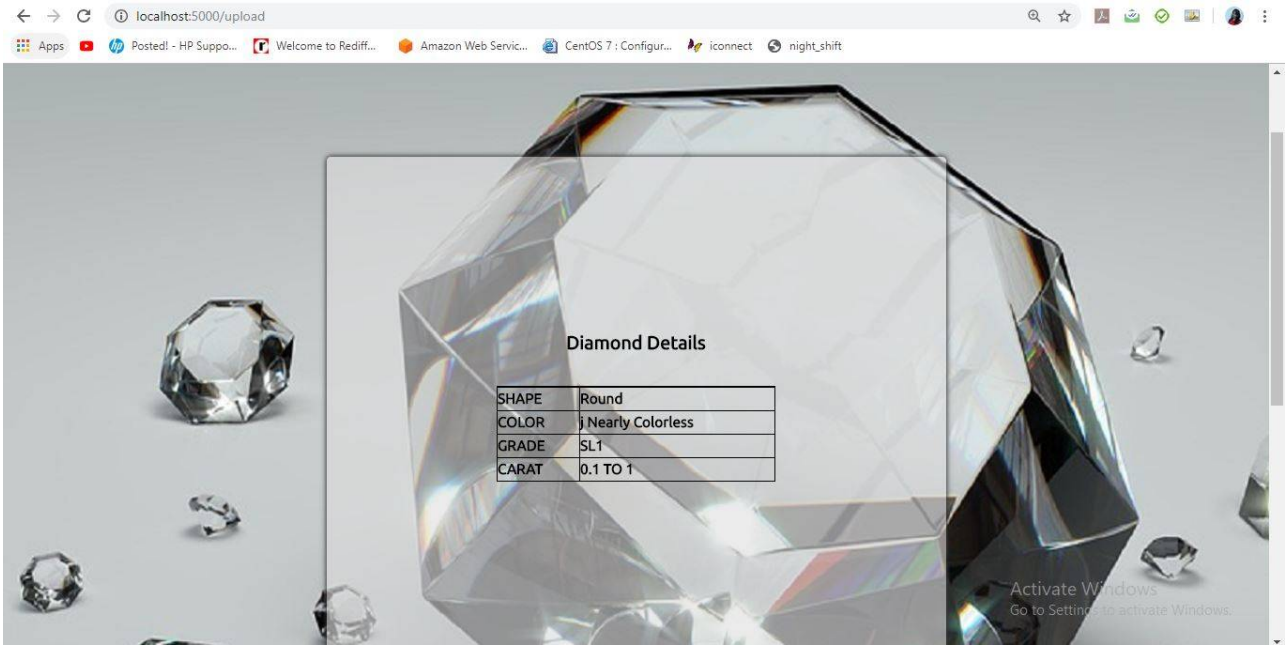
Image classification result –



Diamond details –



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V. CONCLUSION AND FUTURE WORK

This system grades diamond quality very effectively with the image processing techniques and deep learning concepts. Quality of assessment is increased as compared to the existing system as all the quality measurements are taken into the consideration while determining grading like texture, colour and clarity of a diamond.

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