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Disc Diffusion Antibody Sensitivity Testing Using Image Processing and Machine Learning

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Abstract: *The aim in many Image Processing applications is to extract important features from image data, from which a description, interpretation, or understanding of the scene can be provided by the machine. Image processing can be defined as, the processing or altering an existing image in a desired manner. This system allows the user to take hard copy of the image using printer routines and allows the user to store screen image into the disk file using file format (bmp, jpg.gif). Image processing in its general form pertains to the alteration and analysis of pictorial information. We find instances of image processing occurring all the time in our daily lives probably the most powerful image processing system is the human brain together with the eye. The system receives, enhances, and stores images at enormous rates of speed. Machine Learning is a booming technology because it benefits every type of business across every industry. The applications are limitless. From healthcare to financial services, transportation to cyber security, and marketing to government, machine learning can help every type of business adapt and move forward in an agile manner. Machine learning allows businesses to collect insights quickly and efficiently, speeding the time to business value. That's why machine learning is important for every organization. Machine learning also takes the guesswork out of decisions A computer has become an essential commodity in every hospital. Everything is computerized today. from open heart surgeries to X-rays to various clinical tests. Everything is carried out efficiently and effectively by the computer. There are many advantages of computers that make it a must have by every medical professional. Thus, we have using computer for getting fast and accurate result for calculating area of inhibition and suggesting medicine by the results. By using this type of technique manual error can be reduce and accurate result can be fetched.*

Keywords: Antibody Sensitivity, Machine Learning, Image Processing, Inhibition

I. INTRODUCTION

Computers are widely used in all the hospitals for numerous purposes apart from administration, accounting, billing, and appointments. It literally helps doctors in performing various surgeries, especially laparoscopic surgeries are possible because of computers where doctors insert the medical tools and small camera and conduct an operation with the help of computers and monitors. Many high-tech surgical machines and instruments are endowed with small computer systems so that every surgical process is recorded and monitored to avoid complications. Many clinical imaging processes are conducted and examined with the help of computers, such as X-ray and CT scan, etc. Computers also play a vital role in conducting various clinical and biological laboratory tests in hospitals that help in correct diagnosis of the disease. Many critical patients, whose heart rate, pulse rate, and brain readings, etc., need be recorded and monitored continuously, are observed through computers. Its virtually impossible for humans to note down every movement of the internal organs of the patients but computers do it with ease. Importance of computers in medicine has grown so much that many patients who need to be provided with life support system are also governed by the special computerized system only. Such is the impact of computers on a medical practice.

A computer has become an essential commodity in every hospital. Everything is computerized today from open heart surgeries to X-rays to various clinical tests. Everything is carried out efficiently and effectively by the computer. There are many advantages of computers that make it a must have by every medical professional. This article tells you about the use of computers in the medicine that would help you understand the wide array of computer applications used across the medicinal practice. It contributes a lot to the hospital administration where all the administrative processes are computerized.

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For example, staff records, recording incoming and outgoing time of the staff, the holiday records of the staff, etc. It is difficult to keep track of such things manually but with the help of computers, the task is simplified and is less time-consuming. In most of the offices, accounting is also computerized that helps you keep the daily record of the financial transactions of the office. In seminars and paper presentations on the health-related topics, computerized presentations create. More impact on the audience. It also helps the audience understand the issues well. With the help of computer networking, doctors across the world can communicate with each other about new inventions and unique health conditions, etc. All the countries are conducting research studies and this information can be mutually shared by the medical fraternity with the help of computers and internet technology. The computer makes the world smaller and brings people together.

II. LITERATURE REVIEW

In [1], we propose a generalized equalization model for image enhancement. Based on our analysis on the relationships between image histogram and contrast enhancement white balancing, we first establish a generalized equalization model integrating contrast enhancement and white balancing into a unified framework of convex programming of image histogram. We show that many image enhancement tasks can be accomplished by the proposed model using different configurations of parameters. With two defining properties of histogram transform, namely contrast gain and nonlinearity, the model parameters for different enhancement applications can be optimized. We then derive an optimal image enhancement algorithm that theoretically achieves the best joint contrast enhancement and white balancing result with trading-off between contrast enhancement and tonal distortion. Subjective and objective experimental results show favourable performances of the proposed algorithm in applications of image enhancement, white balancing, and tone correction. Computational complexity of the proposed method is also analysed.

In[2], The visual appearance of an image may be significantly improved by emphasizing its high frequency contents to enhance the edge and detail information in it. The classic linear unsharp masking (UM) technique is often employed for this purpose. In the UM technique, a high pass filtered, scaled version of an image is added to the image itself. Even though this method is simple and works well in many applications, it suffers from two main drawbacks. i) The presence of the linear high pass filter makes the system extremely sensitive to noise. This results in perceivable and undesirable distortions, particularly in uniform areas of even slightly noisy images. ii) It enhances high-contrast areas much more than areas that do not exhibit high image dynamics. Consequently, some unpleasant overshoot artifacts may appear in the output image.

In [3], Computational techniques involving contrast enhancement and noise filtering on two-dimensional image arrays are developed based on their local mean and variance. These algorithms are no recursive and do not require the use of any kind of transform. They share the same characteristics in that each pixel is processed independently. Consequently, this approach has an obvious advantage when used in Real-time digital image processing applications and where a parallel processor can be used. For both the additive and multiplicative cases, the prior mean and variance of each pixel is derived from its local mean and variance. Then, the minimum mean-square error estimator in its simplest form is applied to obtain the noise filtering algorithms.

In [4], Digital image processing supports strong research program in areas of image enhancement and image-based pattern recognition. Among the various image processing techniques image segmentation plays a vital role in step to analyses the given image. Image segmentation is the fundamental step to analyses images and extract data from them. This work deals on the basic principles on the methods used to segment an image. Segmentation has become a prominent objective in image analysis and computer vision. To segment the images, from segmentation techniques edge detection, thresholding, region growing, and clustering are taken for this study. Segmentation algorithms are based on two properties similarity and discontinuity. This paper focuses on the various methods that are widely used to segment the image.

In [5], Segmentation of 2D images is a fundamental problem for biomedical image analysis. The most widely used architecture for biomedical image segmentation is U-Net. U-Net introduces skip connections to restore the spatial information loss caused by down-sampling operations. However, for some tasks such as the retinal vessel segmentation, the loss information of structure cannot be fully recovered since the vessels are merely a curve line that cannot be detected after several convolutions. In this paper, we introduce a deep guidance network to segment the biomedical image.

In [6], Grab Cut algorithm is one of the most popular methods in the field of image segmentation. It uses texture information and boundary information of image and achieves good segmentation results with a small number of user interaction. But there are two significant drawbacks about this algorithm. Firstly, If the background is complex or the

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background and the object are very similar, the segmentation will not be very good. On the other hand, the relatively slow speed and Complex iterative process of the algorithm are greatly limited its application. In this paper, to develop these aspects, we proposed an improved grab cut algorithm. This algorithm is the combination of grab cut and graph-based image segmentation. After the experiment, the improved algorithm is applied to more complex situation.

In [7], Text extraction, detection and recognition in images aims at integrating advanced text-based searching technologies. Basically, it is a twostep approach combining maximally stable extremal regions (MSER) and stroke width transformation for the accurate detection of text. Firstly, the MSER image is obtained on which canny edge detection is performed for edge enhancement. To exclude non-text parts, the image is filtered using stroke width information as well as geometric filtering. Algorithm can be effectively used for detecting superimposed or embedded text for the inpainting purpose, text recognition-based search engines, etc. But the algorithm is not effective on blurred images.

In [8], Focusing on scene text detection, this paper adopts an improved scene text detection algorithm based on YOLOv3 network. Firstly, for a single detection target, the training speed of Darknet53 backbone network used by YOLOv3 is slow due to too many layers, so that this paper proposes a method for replacing it by Darknet19. Secondly, multi-scale detection was retained in the original network, and three anchors of different sizes were used to predict the bounding boxes. This paper mainly improves the network structure for scene text detection based on YOLOv3 and compares the training speed and detection effect of the two networks on the same data set. but there are some problems such as optimization of network structure details.

In [9], Text detection technique incorporates Edge-enhanced Maximally Stable Extremal Regions (eMSER) method to preserve shape of characters and modified fuzzy C-means clustering to converge faster. In this paper, we provide an experimental analysis of our improved text detection technique. To show the effectiveness of our proposed text detection technique, we have performed experiments considering videos having text of different sizes as well as considering blur videos. text detection technique that detects text from videos having blurriness and having text of different sizes. Experimental results show that an improved text detection technique marginally increases accuracy and reduces average processing time compared to eMSER text detection technique.

In [10], In this paper, that propose an adaptive method based on Hough transform to detect the circle shapes in digital image. The Mexican Hat filter derived from edge filter is used to concentrate the peaks of Hough local maxima. So, the circle centre and its radius can be extracted easily and accurate. Each edge in image is transformed into 3D Hough space. The first two dimensions in Hough space corresponds to the coordinates of circle centre. The third dimension is its radius. The voting scheme in Hough space influences the accuracy of circle detection. The voting of right peaks represents the real circles. The first step prepares the image for transformation into Hough space. The colour image is converted into Gray level. Then, it is convoluted with the Sobel filter, both vertical and horizontal filter. The gradient can be calculated using Euclidean distance norm.

III. Proposed System

System architecture is the conceptual model that defines the structure, behaviour, and more views of a system. System architecture of our project is System design defines the system architecture. It also describes the modules and interfaces. As shown in fig 4.1 explains the architecture of our system. The system architecture provides an insight of how the flow of process will be.

Entire process of how the system will move forward that will generate the end-result is depicted. There are mainly two parts in system Architecture: In first part, the laboratory person will capture the image of slit of a particular patient to predict best medicine. We have a dataset of different patients with best antibody. we are going to check the radius of antibody and fetching the names of antibody from the slit. In second part, We will carry out classification with the help of different machine learning classification. And then after applying CNN (Convolution neural network) model we can detect the medicine only by scanning antibiotic slit. And we will predict antibiotic medicine to cure the disease.

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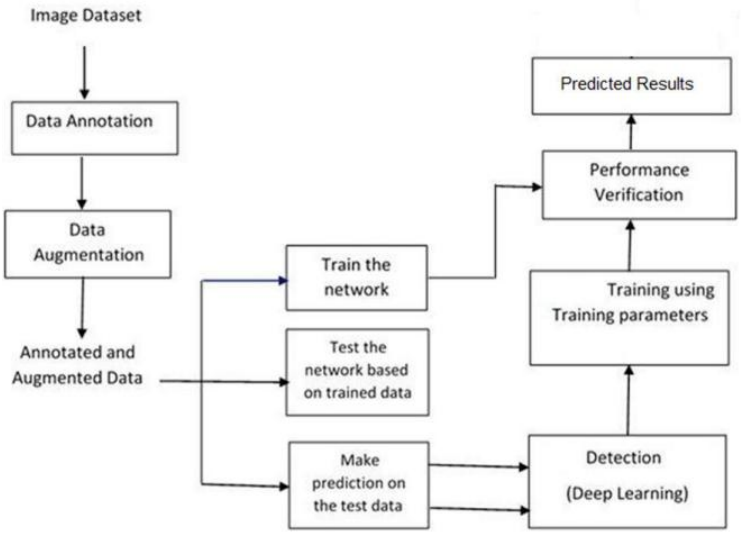
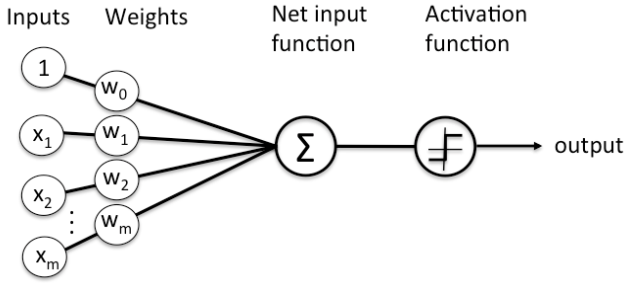


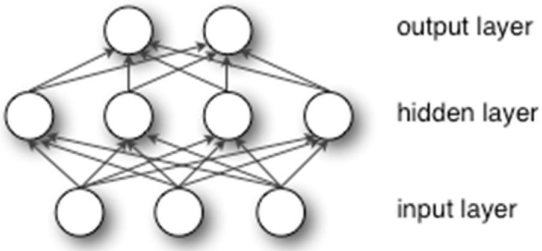
Figure 1: System Architecture

IV. METHODOLOGY-CNN

Deep learning is the name we use for "stacked neural networks"; that is, networks composed of several layers. The layers are made of nodes. A node is just a place where computation happens, loosely patterned on a neuron in the human brain, which fires when it encounters sufficient stimuli. A node combines input from the data with a set of coefficients, or weights, that either amplify or dampen that input, thereby assigning significance to inputs with regard to the task the algorithm is trying to learn; e.g. which input is most helpful is classifying data without error? These input-weight products are summed and then the sum is passed through a node's so-called activation function, to determine whether and to what extent that signal should progress further through the network to affect the ultimate outcome, say, an act of classification. If the signals pass through, the neuron has been "activated."



A node layer is a row of those neuron-like switches that turn on or off as the input is fed through the net. Each layer's output is simultaneously the subsequent layer's input, starting from an initial input layer receiving your data.



Blending the model's customizable loads with input highlights is the manner by which we relegate importance to those highlights concerning how the neural organization groups and bunches input.

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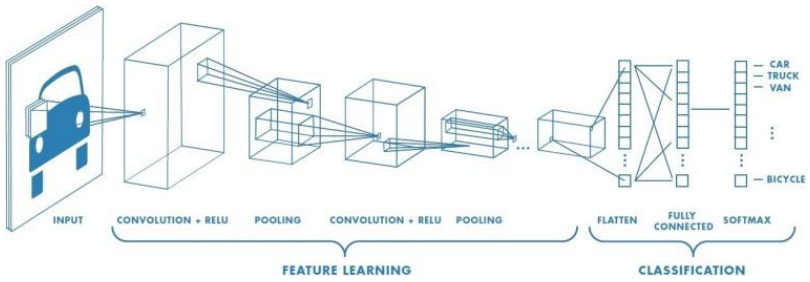

Figure 2: Architect CNN

V. CONCLUSION

Testing the susceptibility of bacteria is important for patient treatment and, if done systematically, gathering data can provide precious epidemiological information. Different test methods exist. Arguably the most widely used is the Kirby–Bauer disk diffusion test. An application is to be developed which includes very accurate artificial intelligence solution for detecting and classifying different antibody it will also suggest appropriate medicine to be used, antibiotic and prediction of crop yield. We are going to use SVM algorithm for classification of detecting best medicine, CNN for accurately detecting medicine and their types, KNN and decision tree algorithm for predicting best antibody and medicine.

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