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Leveraging the Convoluted Neural Network(CNN) for Enhancing the Efficacy of the Early Diagnosis of Disease using Thumbnail Images

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ABSTRACT

The system's main goal is to find the disease without harming people. Observing a person's nails can reveal the presence of a number of diseases. Be that as it may, it tends to be extremely challenging for our eyes to track down varieties in the shade of nails. Our framework can conquer the constraint since the entire cycle occurs through the PC. Nail images serve as the system's input. The framework takes the nail picture of the individual and attempts to recognize assuming that any highlights are available. The patterns and colors of the nails can help identify diseases. Here, first, the nail pictures are prepared with different illnesses through the CNN model. These prepared pictures of nails are contrasted with the information picture with distinguish the sickness. The disease will be identified if the features of the input nail image and the trained nail images match. The nail images are subjected to various processes in order to accurately identify the features. The necessary features are extracted from the images through accurate analysis and processing.

INTRODUCTION

The proposed framework being created centers around picture acknowledgment in view of variety and example examination. Human nails can be used to identify various diseases in the medical field. Using hand nail images, many diseases can be diagnosed. The person's nail image is all that is needed for the proposed system. The image is fed into the model as an input, and various processes are used to identify its features. The image is segmented into numerous parts and filtered to remove distortions. The features in the nail image are extracted by algorithms like CNN and ANN. The trained nail images will be compared to the nail image's color and pattern features. The system determines the disease by comparison.

PROPOSED SYSTEM

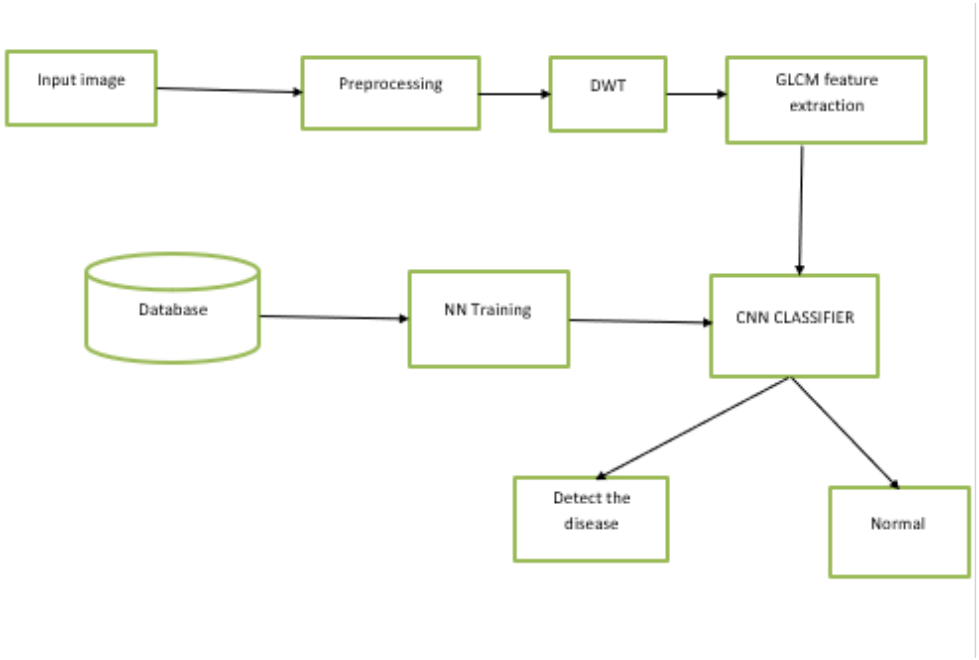

Fig 1: Block Diagram

A. Implementation

1) Image of the Input: Obtaining the input image is the first step. Only the jpg and png formats are acceptable for the image.

2) Preparation: Pre-handling implies the elements of the picture noticed and broke down. examines the nail's characteristics, such as its color and patterns. reducing the image's size to 256 x 256. A grey image replaces the color image. It is done to improve feature extraction. During pre-processing, the image is also filtered to get rid of any distortions that aren't needed. The distortions can take many forms, including motion blur, noise, camera misfocus, and camera misfocus. These distortions are removed during pre-processing, which results in a clean image. Pre-processing also uses segmentation.

This means that in order to extract the feature from the image, it divides the given image into several regions.

B. DWT (Discrete Wavelet Transformation)

The Discrete Wavelet Transform is used to break down the input image into its component parts. The proposed system has four levels of decomposition. We compress images here from a high level to a low level. It makes the other interaction simple. Additionally, we can reduce storage consumption by compressing the images. Decomposition accuracy can be improved as a result of this.

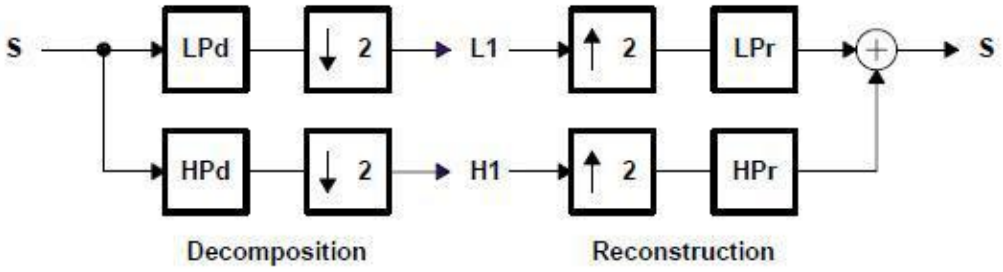

Fig. 2 Discrete Wavelet Transform

C. The Gray-Level Co-Occurrence Matrix, also known as the GLCM

The Dim Co-grid capability can make GLCM. It is used to examine the characteristics of nail images. Additionally, it looks at how the image's pixel values are determined. Statistics like color contrast, average value, entropy, homogeneity, and correlation are used to look at features. We first change the RGB image into a grey one before creating GLCM. The pixel values are obtained by comparing and analysing each pixel in conjunction with the pixels that are adjacent to it. A square matrix is required to hold these pixel values.

D. An Artificial Neural Network, also known as an ANN, consists of numerous layers connected by numerous neurons. In order to produce the output, the provided input will be processed through each layer. The images are categorized using ANN. Regression is another capability. It accepts text, images, and other types of input. The input layer receives the image to be processed; the neurons in the information layer take the contribution to process it further.

ANN's layers:

1) Layer of Input: The first layer of an ANN that receives input. The info might be as text, picture, voice or information. The input layer's output serves as the hidden layer's input.

2) A Secret Layer: It is the ANN's intermediate layer. This layer's primary function is to extract the input image's high-level features.

3) Layer of Output: The final ANN layer can be found here. The classification label, numerical value, or probability distribution, which is the network's final output, is produced by this layer.

E. A deep-learning algorithm is CNN (Convolutional Neural Network)

It very well may be utilized for handling information and for perceiving articles and pictures. It carries out classification. It performs at a higher rate than any other algorithm. CNN is able to recognize images as well as any object. CNN is able to better classify the images. Within the layers of CNN, there are numerous filters. In CNN, many models can perform picture and article acknowledgment. In the proposed framework, we are utilizing DenseNet121.

It has 3 layers

1) Convolutional Layer: This layer is where most of the computations take place. For further processing, this layer makes use of a kernel filter.

In order to determine whether the features are present, the filter will be applied to the entire image.

2) Layer With Pools: It works on the proficiency of CNN. It makes things simpler. Pooling layers are of two sorts.

Maximum Pooling: It takes the elements' maximum value. It eliminates features that aren't important and only takes into account the ones that are.

o Pooling by Min: The average value of the elements is used. It produces output that is smooth and less noisy.

3) Layer with all connections: Image classification is this layer's primary function. As the output layer, the final layer is used.

F. DenseNet121

A trained CNN model is DenseNet121. The handling of information occurs through 121 layers. The neuron availability of DenseNet is more, and it can cover more region of the given info picture. It can be utilized for object recognition, image classification, and recognition. It has the same layers as CNN, but there are four more dense blocks with convolutional layers. There will be 64 filters of size 7x7 on each layer. The picture is given as contribution to the information layer. Additionally, the pooling layer is used to process the image, and its output

is connected to the dense blocks. The next dense block is connected to every output. Every dense block is separated by transition layers. It performs better. efficiently classifies the images and provides more accurate results.

A. Diseases based on Nail colour and Patterns

Type of Nail	Nail Image	Disease	Causes
Black Nail		Skin Cancer	• Exposure to UV radiation • Exposure to chemicals
Yellow Nail/Greenish nail		Jaundice	• Infections • Genetic Disorders
Bluish Nail		Thyroid	Fungal Infection
White Nail/Pale Blue Nail		Liver Disease	• Obesity • Alcohol misuse

Fig. 3 Diseases Based on Colour

EXPERIMENTAL RESULTS

Two algorithms for classification namely Artificial Neural Network and Convolution neural network were used. The two algorithms

are compared based on the following parameters:

1) Accuracy

2) Specificity

3) Sensitivity

The parameters used for analysis are

TP-True Positive, TN-True Negative, FP-False Positive, FN-False Negative.

All the three parameters are compared between the two algorithms. ANN is the older version which is less accurate. CNN is the latest model which can perform the classification better and it gives better results than ANN. CNN gives more accuracy and sensitivity than ANN. And the specificity is almost equal in both the algorithms.

TABLE I

METRIC VALUES FOR ANN AND DENSENET121

S.no	Metrics	ANN	DenseNet121
1	Accuracy	63.64	90
2	Specificity	66.66	60
3	Sensitivity	60	94.28

CONCLUSION

In the proposed method, we trained a model that uses the nail's color and pattern to classify the disease. Based on their characteristics, the system identifies diseases. It can also identify subtle color variations and patterns,

resulting in a system with a higher success rate. We have utilized two calculations, ANN and CNN(DenseNet121), to obtain exact outcomes. Due to its ability to circumvent the limitations of the human eye, such as recognizing variations in nail color and patterns, the proposed model produces results that are more accurate than human vision.

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