ISSN 2321 3361 © 2021 IJESC

Research Article Volume 11 Issue No.04

Early Stage Diseases Diagnosis using Human Nail in Image Processing

A. Kanchna[1], D. Navanisha[2], V. Pavithra[3], D. Reshika[4]
Assistant Professor[1], UG Scholar[2, 3, 4]
Panimalar Engineering College, Chennai, Tamilnadu, India

Abstract:
Human's hand nail features are used to identify many diseases at early stage of diagnosis as nail is farthest from heart and last to receive oxygen in our body part. Nail colour is used to identify the diseases. The proposed system guides in such scenario to take decision in disease diagnosis. This paper contend deep learning, a convolutional neural network to classify disease diagnosis from nail images. Nail is taken as a input image in proposed system. The image of a nail is processed by system and extract features of nail which is used for disease diagnosis. By using Kaggle website the first training set data is prepared from nail images of affected nail. The input nail image is extracted from the feature is compared with the training data set to get result. In this experiment we found that using color feature of nail image average 65% results are correctly matched with training set data during three tests conducted. Human nail consist of various features, out of which proposed system uses nail color changes for disease diagnosis.

Keywords: Human Nail, Deep Learning, CNN.

I. INTRODUCTION

In healthcare domain many diseases are going to be predicted by observing color of human nails. Doctors observe nails of patient to induce assistance in diseases identification. Usually pink nails indicate healthy human. The need of system to research nails for diseases prediction is because human eye has subjectivity about colors, having limitation in resolution and tiny amount of color change in few pixels on nail wouldn't be highlighted to human eyes which may end in wrong result whereas computer recognizes small color changes on nail. The proposed system will extract color feature of human nail image for disease prediction. The system that target image recognition on the thought of human nail color analysis. Many diseases could even be identified by analyzing nails of human hands. During this method human nail image is captured using camera. Captured image is uploaded to our system and region of interest from nail area is chosen from uploaded image manually. Selected area is then processed further for extracting features of nail like color of nail. This color feature of nail is matched using simple matcher algorithm for diseases prediction. In this way the system is useful in prediction of diseases in their initial stages In Literature study we mentioned number of the diseases in their initial stages. In Literature study we mentioned number of the diseases with its related color changes in nails Human nail are going to be used for the prediction of various systemic and dermatological diseases.

The proposed system – Nail Image Processing Systemhelps us to create a model which could perform the analysis of human nail and thereby help us in predicting various diseases. Common signs which be noticeable around the nail are discoloration of nail to black, white, yellow or green, thickening of nail, dry or scaly skin around the nail.This project contend a deep convolutional network to classify diseases from images. This work has been tested on our dataset and it ends up to great performance in feature extraction. This proposed system will help the doctors within the early diagnosis of diseases.

II. RELATED WORKS

Ting wie-houe proposed that the digital image processing plays a key role in medical imaging. Nail diagnosis is one in every of the methods in medical imaging to predict the diseases. Nails can reflect the current health condition, genetically inheritance information, and historical information of drug or alcohol usage for the past months or perhaps a year, etc. This paper explores the prevailing research works associated with nail plate and nail matrix as tool for bio-metric system, nail fold capillaries to spot the disease severity levels & affected organs, nail surface as evidence in forensic science to spot the chemical effects, nail samples to spot drug intake and abuse etc. So that, Nail is analyzed by various imaging types and processing algorithms to acknowledge the person's uniqueness, health condition and its history. This paper also identifies the research challenges and issues. ace shape of nails is given within the article DM Shah proposed that the paper is targeted on the system of image recognition on the idea of color analysis. In healthcare domain, study of human nail color is incredibly important. Many diseases might be identified by analyzing nails of hands. Human eye has limitation in resolution also as subjectivity in color analysis. The proposed system is predicted on the algorithm which automatically extracts only nails' area from scanned back side of palm. These selected pixels are processed for further analysis. The system is computer based, so small dis continuities in color values also are also observed, and that we can detect color changes within the initial stage of disease. During this way, system is sort of useful in prediction diseases in their initial stages It is focused on the system of image recognition on the thought of color analysis. The proposed system is predicted on the algorithm which automatically extracts only nails area from scanned back side of palm (Region of Interest). These selected pixels are processed for further analysis using median filters. The system is computer

based, so small discontinuities in color values are observed, which we are able to detect color changes within the initial stage of disease. During this method, system is all fairness of useful in prediction of diseases in their initial stages. Dr. M. Renuka Devi proposed that this paper explores the prevailing research works associated with nail plate and nail matrix as tool for bio-metric system, nail fold capillaries to identify the disease severity levels & affected organs, nail surface as evidence in forensic science to identify the chemical effects, nail samples to identify drug intake and abuse etc. The proposed system relies supported the algorithm which automatically extracts only nails' area from scanned back side of palm. These selected pixels are processed for further analysis. The system is computer based, so small discontinuities in color values are observed, which we are able to detect color changes within the initial stage of disease. During this manner, system is type of useful in prediction of diseases in their initial stages disease. During this way, system is sort of useful in prediction of diseases in their initial stages. Computer vision Based identification of nail's surface shape article presents the principle and application of a computer-vision-based method of identifying the surface shape of human' s nail. The tactic first acquires two images of a human nail respectively with the identical source of illumination but different light angles, obtains from the two images the data on the nail and calculates the surface shape of the nail within the tip. The foremost algorithm of obtaining the surface shape of nails is given within the article.

III. PROPOSED SYSTEM

The main objective of this system design to provide an application for use in healthcare domain this is an advantage in terms of cost and time. The proposed system will take nail image as an input and will perform some processing on input image then finally it will predict probable disease this system can be used by people as well as by doctors in health care domain. This methodology uses a deep transfer learning algorithm using CNN that extracts features of the nail image and describes whether the condition is normal or abnormal. If the condition is abnormal it checks whether it is melanoma or onycholysis and accordingly it generates the result.

Advantages

• In the proposed technique we have trained a model that classifies the disease based on the pattern on the nail.
• This proposed system is able to predict the disease for the respective pattern of the nail with high accuracy.
• It is able to identify the small patterns also such that providing a system with higher success rate.
• The limitations of the existing model are eliminated by the proposed model

MODULE 1: EXPLORING THE DATASET

It is the action of retrieving both normal and abnormal nail image for further analysis. Which are all having either .jpg, png, .bmp format. The dataset used for this project will be the nail images (Melanoma) from Kaggle. The dataset consists of training data, validation data, and testing data. The training data consists of 5, 216 nail images with 3,875 images shown to have Melanoma, nail images shown to be Onycholysis and 1,341 images shown to be normal. The validation data is relatively small with only 16 images with 8 cases of Melanoma, 8 cases of Onycholysis and 8 normal cases. The testing data consists of 624 images split between 390 Melanoma cases nail images Onycholysis cases and 234 normal cases.

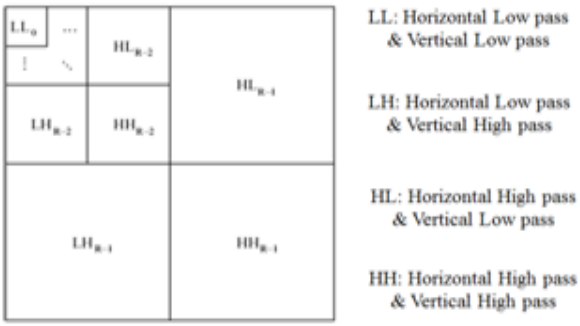
MODULE 2: PRE-PROCESSING

Image pre-processing is the term for operation on images at lowest level of operation. The human nail image is given as input to the pre-processor. If the image are of poor contrast, the pre-processor will enhance the contrast for clear classification type. Steps involved in pre-processing are collecting the dataset, resizing, conversion and filtering. In data collection, the data will be gathered using using Weka tool which consist of specific human nail diseases. Resizing images is a critical pre-processing step in computer vision. Resizing is altering the size of the image without cutting anything out. Principally, our deep learning models train faster on smaller images. An input image that is twice as large requires our network to learn from four times as many pixels — and that time adds up. Moreover, many deep learning model architectures require that our images are the same size and it helps to provide more accuracy in image. In pre-processing the image converted into gray scale image. Unnecessary noise is removed using median filter. These process are done to obtain the accuracy of the image. The gray scale image is compressed by DWT.

DWT (Discrete Wavelet Transform): Discrete Wavelet Transform is used in lossless image compression of gray level image. High quality images that require large storage are to be compressed. DWT transforms a discrete signal. L represent the low-pass filtered signal L (low frequency) allows the perfect reconstruction of original Image.

Steps

1. Digitize the source image into signal.
2. Decompose signal to wavelet (sub bands) LL, LH, HL, HH
3. DWT retains images from LL to produce next level of decomposition, because the low frequency images has finer frequency and time resolution than high frequency images.
4. For each level of decomposition DWT produces 4 images and size is reduced to 1/4 of original image.



MODULE 3: DATA LABELING

Data labeling is the process of identifying information adding one or more meaningful and informative labels to produce context. Labelers asked to tag all the images in a dataset where "does a photo contain a bird" is true. The tagging will be as simple yes/no or as granular as identifying the particular pixels in image related to the bird. The result's the trained model that may be want to make prediction on new data.

The steps followed in data labeling are:

 Labeling:

Labeling is the initial process of containing the images from which they are categorized into classes.

 Assigning Classes:
Classes are assigned as normal and abnormal, normal indicates disease less nail and abnormal indicates disease affected nail.

 Allocating Index:
Classes are allocated with index. Normal as index 0 and abnormal as index 1.

 Setting the Path:
Finally path of the images are set to the program.

MODULE 4: CONVOLUTIONAL NEURAL NETWORK CLASSIFICATION

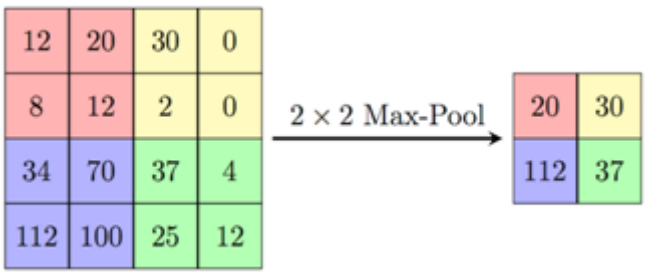
 CNNs are a category of Deep Neural Networks which will recognize and classify particular features from images and are widely used for analysing visual images.
 Their applications can be seen widely within the medical images analysis.
 The term 'Convolution" in CNN denotes that two images can be represented as matrices which are multiplied to give an output that is used to extract features from the image.

Convolutional Neural Network Layers

Input Layer
Input layer generally represents the pixel matrix of the image and brings the initial data into the system for further processing by subsequent layers

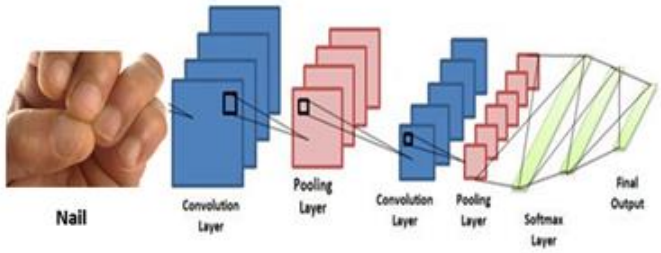
Convolutional layer
This layer performs task called "convolution". The con volutional layer is employed to extract image features and a filter of a specific size MxM. The dot product is taken between the filter and therefore the parts of the input image with reference to the scale of the filter (MxM). The sum of these dot products is employed to provide the output image which is fed as input to next layer

Pooling Layer
Pooling layer is obtained by applying pooling operator to aggregate information within each small region of the input feature channels and so down sampling the results. Accustomed reduce the dimensions of the feature maps. Thus, it reduces the quantity of parameters to hunt out . The foremost common approach employed in pooling is max pooling.

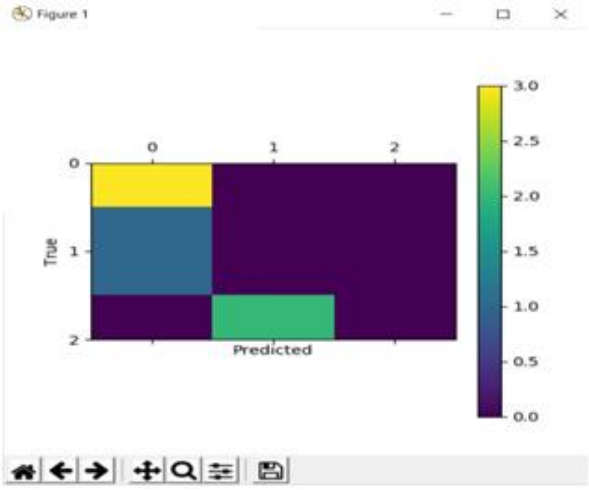


Fully-Connected Layer
The input to the fully connected layer (FC) is that the output from the ultimate Pooling, which is flattened and then fed into the fully connected layer. This layer carries with it the weights and biases together with the class score for every of the classification category. Fully connected layers connect every neuron in one layer to each neuron in another layer.

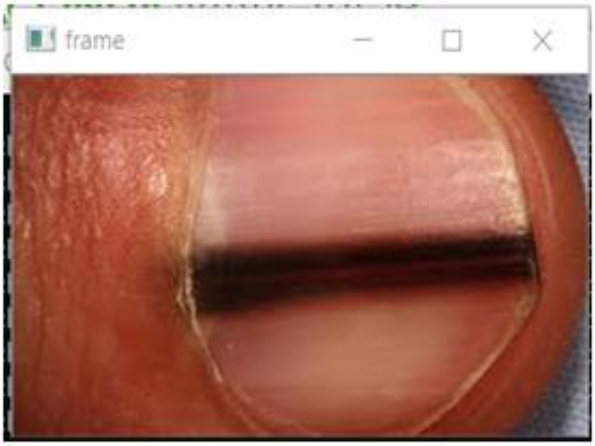
Output Layer
The output layer is chargeable for producing the ultimate result. There should be one output layer in an exceedingly neural network. The output layer takes within the inputs which are passed in from the layers before it, performs the calculations via its neurons and so the output is computed.

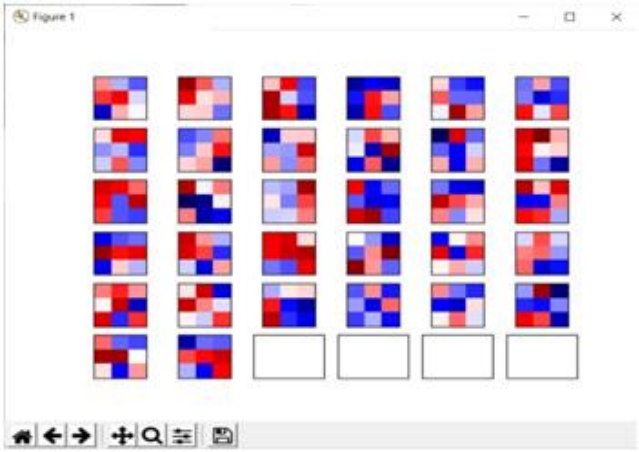


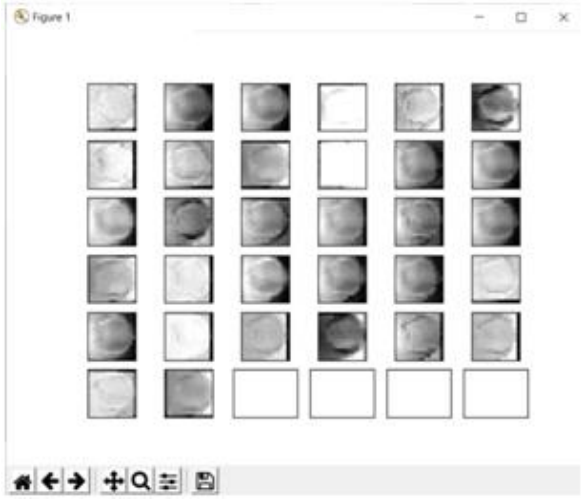
Performance Analysis
The performance of the CNNs trained with the nail dataset was estimated bythe classification performance of the modelswith the normal, melanoma and onycholysis validation datasets.The performance of fine image selector helps in assessing image quality with thechange in the illumination and reduction noise level of the images. The levels of brightness and noisewere gradually reduced to classify the image easily. If the validation loss decreases then the accuracy will increase.The number of epochs should be as high as possible and terminate training based on the error rates.An epoch is one learning cycle where the learner sees the whole training data set. Here we are having 12 epochs and we are getting 100% validation and training accuracy. In this experiment we found that using color feature of nail image average 65% results are correctly matched with training set data during three tests conducted and we are getting 65% accuracy on test dataset.

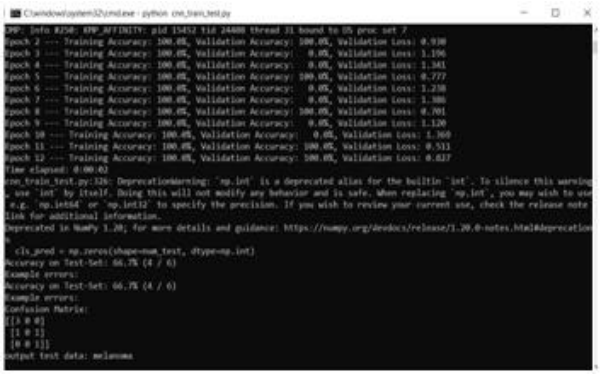


IV. EXPERIMENTAL RESULTS









V. CONCLUSION

In the proposed technique we have trained a model that classifies the disease based on the pattern on the nail. This proposed system is able to predict the disease for the respective pattern of the nail with high accuracy. It is able to identify the small patterns also such that providing a system with higher success rate. The limitations of the existing model are eliminated by the proposed model.Moreover in theproposed system only the images of nails of fingers have been used for classifying the diseases, but in future wecan combine other features of human body and predict variousdiseases based on the symptoms of patient and hence would beable to detect a lot of diseases with good precision and accuracy.

VI. REFERENCES

[1]. A. Bourquard, I. Butterworth, A. Sanchez-Ferro, L. Gia ncardo, L. Soenksen, C. Cerrato, R. Flores, and C. Castro-Gonzalez, “Analysis of white blood cell dynamics in nailfold capillaries,” Proceedings of the Annual International Con ference of the IEEE Engineering in Medicine and Biology Society, EMBS, vol. 2015-Novem, pp. 7470–7473, 2015.

https://www.researchgate.net/publication/290194520_Analysis_of_White_Blood_Cell_Dynamics_in_Nailfold_Capillaries

[2]. A. Bourquard, A. Pablo-Trinidad, I. Butterworth, Á. Sán chez-Ferro, C. Cerrato, K. Humala, M. FabraUrdiola, C. Del Rio, B. Valles, J. M.Tucker-Schwartz, E. S. Lee, B. J. Vakoc, T. P. Padera, M. J. Ledesma-“Non-invasive detection of severe neutropenia in chemotherapy patients by optical imaging of nailfold microcirculation,” Scientific Reports, vol. 8, no. 1, pp. 1–12, 2018. Carbayo, Y. B. Chen, E. P. Hochberg, M. L. Gray, and C. Castro-González,

https://doi.org/10.1038/s41598-018-23591-0

[3]. M. EtehadTavakol, A. Fatemi, A. Karbalaie, Z. Emrani, and B.-E.Erlandsson, “Nailfold Capillaros copy in Rheumatic Diseases: Which Parameters Should Be Evaluated?,” Bio Med research international, vol. 2015, p. 974530, 2015.

https://www.researchgate.net/publication/281409144_Nailfold_Capillaroscopy_in_Rheumatic_Diseases_Which_Parameters_Should_Be_Evaluated

[4]. M. Cutolo, A. Sulli, M. E. Secchi, S. Paolino, and C. Piz zorni, “Nailfoldca pillaroscopy is useful for the diagnosis and follow-up of autoimmune rheumatic diseases. A future tool for the analysis of micro vascular heart involvement?,” Rheumatology, vol. 45, pp. iv43–iv46, oct 2006.

https://doi.org/10.1093/rheumatology/kel310

[5]. A. Karbalaie, M. Etehadtavakol, F. Abtahi, A. Fatemi, Z. Emrani, and B.-E.Erlandsson, “Image enhancement effect on inter and intra-observer reliability of nailfold capillary assessment,” Microvascular Research, vol. 120, pp. 100 – 110, 2018.

https://www.researchgate.net/publication/338521756_DA-CapNet_Dual_Attention_Deep_Learning_based_on_U-Net_for_Nailfold_Capillary_Segmentation

[6].A. Karbalaie, Z. Emrani, A. Fatemi, M. Etehadtavakol, and B.-E.Erlandsson, “Practical issues in assessing nail fold capillaroscopic images: a summary,” Clinical rheumatology, pp. 1–12.

https://doi.org/10.1007/s10067-019-04716-w

[7]. F. Isgrò, F. Pane, G. Porzio, R. Pennarola, and E. Pen narola, “Segmentation of nailfold capillaries from microscopy video sequences,” Proceedings of CBMS 2013 - 26th IEEE International Symposium on Computer-Based Medical Systems, pp. 227–232, 2013.

https://doi.org/10.1109/CBMS.2013.6627793

[8]. J. Long, E. Shelhamer, and T. Darrell, “Fully convol utional networks for semantic segmentation,” in Proceedings of the IEEE conference on computer vision and pattern recognition, pp. 3431–3440, 2015.

https://doi.org/10.1109/CVPR.2015.7298965

[9]. O. Ronneberger, P. Fischer, and T. Brox, “U-net: Convol utional networks for biomedical image segmentation,” in Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 2015

https://arxiv.org/abs/1505.04597

[10]. L.-C. Chen, G. Papandreou, I. Kokkinos, K. Murphy, and A. L. Yuille,“Deeplab: Semantic image segmentation with deep convolutional nets, convolution, and fully connected crfs,” IEEE transactions on pattern analysis and machine intelligence, vol. 40, no. 4, pp. 834–848, 2017.

https://www.researchgate.net/publication/303812083_DeepLa b_Semantic_Image_Segmentation_with_Deep_Convolutional _Nets_Atrous_Convolution_and_Fully_Connected_CRFs