

# An Automated Medical Support System for detecting human health conditions based on Noval Bicluster Method

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## ABSTRACT

Diagnosis of Disease is a crucial task which requires high examination by the experts. Traditional way of predicting diseases is through doctor's examination and various test like blood test, urine test etc. which leads to costly treatment. In order to reduce heavy treatment cost and avoid high health risk there is a need to generate a system which tries to predict diseases by identifying human nail at early stage. The proposed work guides in such scenario to take decision in disease diagnosis. An Automated Medical Support System for detecting human health conditions is proposed based on new Bicluster Method for Nail Color Analysis.

The nail images of human being are preprocessed to extract the features which contributes for disease diagnosis. Human nail consist of various features, out of which mainly changes in nail color and nail textures are used for the proposed system for disease diagnosis. The dataset containing patients nail images is trained on well known classifiers like Decision tree, Neural Network and Support Vector Machine. This knowledge base is created under the supervision of doctors. The features extracted from unknown nail images of patients are tested against the trained data set. For experimentation purpose, nail datasets from standard sites like, Medicinenet.com, Dermnet.com are also used. Disease identification system gives 88% accuracy with neural network.

**Keywords:** Nail Colour, Nail Texture, Classifier, Bicluster.

## 1. INTRODUCTION

Medical science has invented different ways and has developed various methods for diagnosis of diseases in human body. There are various parameters which can be analyzed for identifying the diverse effect in human body. One of the ways to identify disease is through nails of the human. There are various features of nail on which human health condition can be analyzed [1]. Nail is defined as the envelope like structure which covers the tip of the fingers. Nails are farthest from the heart, they are last to receive oxygen. Therefore in healthcare domain, Nails are the first who shows the symptoms of disease in human body. In healthcare domain many diseases can be predicted by observing color and texture of human nails. Doctors observe nails of patient to get assistance in disease identification. Usually pink nails indicate healthy human. In literature study we mentioned some of the diseases with its related texture change in nails.

There are different ways available in healthcare domain to diagnose the diseases in human body. Analysis of human nail's texture is one of the ways to predict or ensure the existence of disease. Human nails plays important role for predicting diseases with nail's texture changes, shape changes and color Changes etc.[5]. Human nails provide useful information about disorders or any nutritional imbalances depending upon their shape, texture and color.

The proposed system is based on extracting Texture and color feature from nail image. On the basis of Nail texture and Nail color the system will predict the initial health condition of human. This paper extracts

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this two feature with the help of two algorithm as Bicolor algorithm and GLCM algorithm. The nail texture observations and allied disease symptoms are; “Clubbing” a painless increase in tissue around the ends of the fingers, or inversion of the nail : Lung diseases, such as emphysema, Irregular red lines at the base of the nail fold : Lupus or connective tissue disease, Pitting of the nail surface :Psoriasis, Dark lines beneath the nail ‘Rarely the First Clue’:Melanoma(Type of skin cancer)[6].

## 2. RELATED WORK

Nail Color and Texture Analysis for Disease Detection [1,3] in the human body mainly examines the nail image of human fingers by analyzing the various features of nail color and texture.








The distribution density of the nail color pixels on the surface of nail is used to detect the fingernails. The fingernail detection involves confiscating the nail portion which is usually shiny from the entire skin area. Image segmentation technique also separates the specific object from the image. Image segmentation splits the image pixels into identical region.

An application of Digital Image Processing [4] presented a model of nail color analysis for prediction of diseases using digital image processing. This model detects color of nails of human palm on the basis of the principles of medical science, and predicts probable diseases. The nails are mostly observed by the Medical practitioners as a preliminary investigation for the prediction of diseases. A model of nail color analysis is based on such predictions without human intervention. The accurate prediction results are obtained as it overcomes the limitations of human vision like prejudice and perseverance power. The proposed model is completely computerized and works successfully [2,8].






An Automated Medical Palmistry System based on Image processing techniques [2] is an Automated Medical Palmistry System which is used as an application of digital image processing and analysis technique. This system can become very useful for human being to predict probable disease. The images of human palm form input to the system. Then, system applies digital image processing techniques on input images to identify certain features in the image and by using knowledge base of medical palmistry it analyzes certain features in image and predicts probable disease. Prediction is made on several symbols on palm images [9, 11, 12]. The experimental results demonstrate that AMPS is reliable if the images represent a distinct view of the palm and are of 300dpi resolution or more.

Table 1 represents the diseases associated with the texture of nails and Table 2. represents the diseases associated with the Nail color. The source is Dermnet.com, Medicinnet.com [13, 15, 16].

**Table 1**  
**Diseases based on nail Texture and shape[16]**

<i>Sr. No.</i>	<i>Nail Type</i>	<i>Image</i>	<i>Possible Diseases</i>
i.	Nail pitting		Psoriasis
ii.	Nail pitting		Psoriasis
iii.	Clubbing		Lung diseases, such as emphysema.
iv.	Thin and brittle nail		Metabolic bone disease, Thyroid disorder
v.	Nail beading		Diabetes mellitus ,Thyroid disorder
vi.	Ridge Nail		Iron deficiency,Protein deficiency
vii.	Beau’s lines		Sign of Significant illness

**Table 2**  
**Diseases based on nail color[16]**

<i>Sr. No.</i>	<i>Nail Type</i>	<i>Image</i>	<i>Possible Diseases</i>
1.	White Nails		<ul style="list-style-type: none"> <li>i. Jaundice</li> <li>ii. liver trouble</li> <li>iii. Anemia</li> </ul>
2.	Yellow Nails		<ul style="list-style-type: none"> <li>i. lung disease</li> <li>ii. diabetes orpsoriasis</li> <li>iii. thyroid disease</li> </ul>
3.	Bluish Nails		<ul style="list-style-type: none"> <li>i. heart problems</li> <li>ii. Emphysema</li> </ul>
4.	Pale Nails		<ul style="list-style-type: none"> <li>i. Anemia Congestive heart failure</li> <li>ii. Liver disease</li> <li>iii. Malnutrition</li> </ul>
5.	Half White Nails Half pink Nail		<ul style="list-style-type: none"> <li>i. Liver disease</li> </ul>

### 3. PROPOSED DISEASE DETECTOR

The diagnosis of disease is mostly done through various tests and symptoms available on various parts of the body. The proposed work identifies various diseases based on changes in nail color and textures. The proposed work is an attempt to design and develop early disease detection system which may result in low

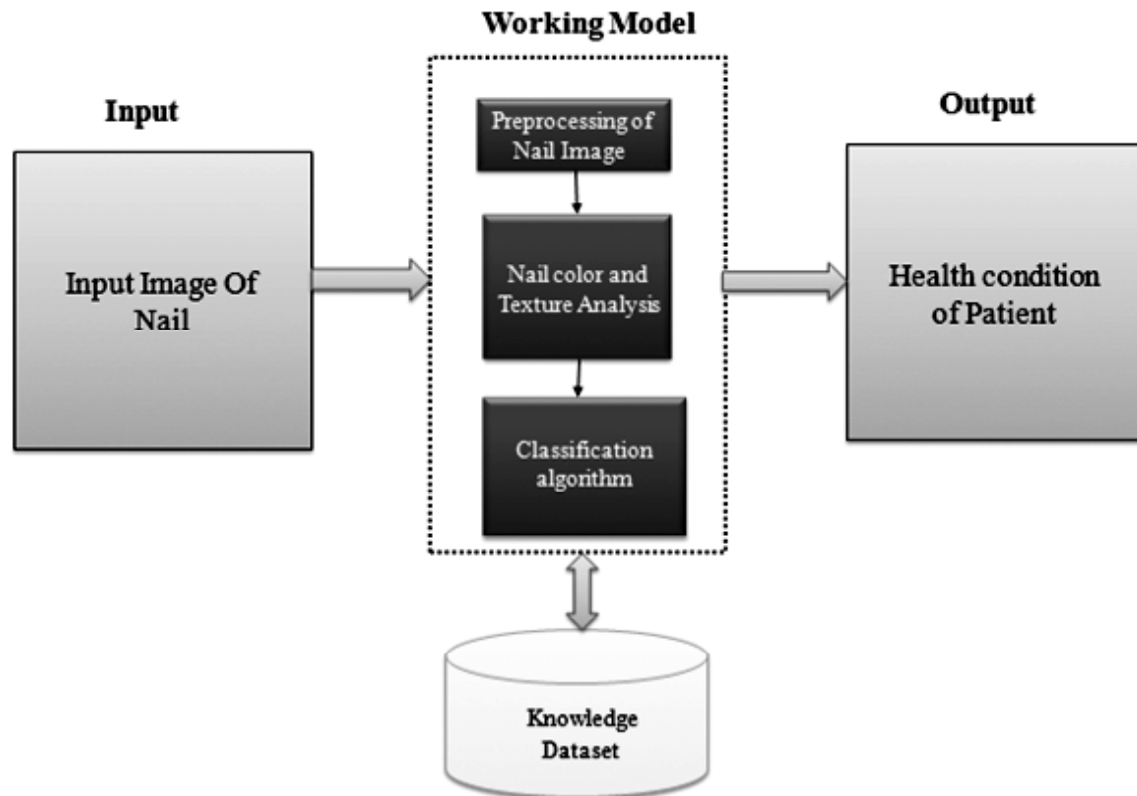


Figure 1: Proposed System architecture

cost treatment for the human being. The nail images are preprocessed to generate the feature vectors. After color analysis and Texture analysis on input nail images, these two features are used to predict probable diseases. This system can be used by people as well as by doctors in healthcare domain. Fig 1.1 represents proposed system architecture.

Knowledge Database will be created through Doctors and other from useful websites such as Dermnet.com, Medicinenet.com etc. Affected Nail sample images should be collected and train the dataset using Neural Network and Decision tree algorithm[9].

Decision Tree Generator is implemented on Weka tool. In this we have used j48 classifier (C4.5 algorithm) to classify and train data available from patients. An algorithm C4.5 is used to generate decision trees. The decision trees generated by C4.5 can be used for classification, and for this reason, C4.5 is often referred to as a statistical classifier. The input images are trained on Neural Network Classifier. Input images taken from patients are trained using Neural Network algorithm. We have used Multilayer Perceptron (MLP) to classify and train data available from patients. Preprocessing of Images is the most important step to increase and Enhance the visual appearance of images. It helps to improve the manipulation of datasets. It consists of three steps as, Convert Gray Scale, Convert Image Blurr and Convert Up Scale [7, 10].

The proposed work is targeted on seven diseases out of which some diseases predict through nail color and some diseases can be predict through Nail texture. The system includes Diabetes, Heart, Anemia, Liver, Psoriasis, Cancer and Leukemia Nail samples. The system works on these two features of nail like color and texture. Nail color having R,G,B value. In Nail color model, we are extracting the average R,G,B color by leaving  $1/6^{\text{th}}$  margin vertically and  $1/6^{\text{th}}$  margin Horizontally so that we can get actual average of pixels which comes into the defected area. And providing these features to the classification algorithm. Generally it is identified that the upper part of the Nail and Lower part of the Nail having different color. In that case averaging of Nail color fails to give prominent result for that reason we add one more algorithm i.e bicolor model for color extraction. In this algorithm first we calculate upper nail part average. Second we calculate lower Nail part average. With the help of these two initial points we generate clusters of pixels.

In second module i.e Nail texture analysis here gray Level Co-occurrence Matrix i.e GLCM is used. GLCM consist of some feature out of which we used Contrast, Energy and Entropy and Homogeneity. GLCM algorithm calculate texture feature in two ways as vertically and horizontally. All these 8 features are going as input to the classification algorithm.

#### 4. RESULTS AND DISCUSSION

The proposed Nail color and Texture Analysis is implemented with a system of having i3 processor and main memory of 4 GB RAM using Eclipse Mars. The dataset is collected from hospital and other useful website as, Medicinenet.com, Dermnet.com. To analyze the nail color and Nail Texture, three classification algorithms as, Neural network, Support vector machine and Decision tree algorithm are used.

The performance of the proposed system is measured in terms of GAR and FAR. The genuine acceptance rate (GAR) is the ratio of truly matching samples and total number of tests. The false acceptance rate (FAR) is the ratio between the number of truly non-matching samples matched by the system and total number of tests. Following Table 2 shows Nail color and Nail Texture Analysis with the help of classification algorithm. The results for Nail Color Analysis using classifiers are tabulated in Table 3 and the results for Nail Texture analysis are tabulated in Table 1.4. Table 1.5. represents Results of Average + Bicluster + GLC M method with classifiers.

**Table 3**  
**Nail Color Analysis using classifiers**

<i>Sr. No.</i>	<i>Color Analysis algorithm</i>	<i>Total No. of Instance</i>	<i>Correctly Classified</i>	<i>Accuracy of Classifier</i>
Decision Tree Classifier				
1	AverageColor	150	120	80%
2	Bicluster	150	125	82.26%
3	Average + Bicluster	150	126	84%
Neural Network classifier				
4	AverageColor	150	120	80.1%
5	Bicluster	150	118	79.26%
6	Average + Bicluster	150	130	86.04%

**Table 4**  
**Nail Texture Analysis using classifiers**

<i>Sr. No.</i>	<i>Texture Analysis algorithm</i>	<i>Classifiers</i>	<i>Total No. of Instance</i>	<i>Correctly Classified</i>	<i>Accuracy of Classifiers</i>
1	GLCM	Decision Tree	150	121	80.1%
2	GLCM	MLP Neural Network	150	126	84.26%

**Table 5**  
**Results of Average + Bicluster + GLC Mwith classifiers**

<i>Sr. No.</i>	<i>Texture and color Analysis algorithm</i>	<i>Classifiers</i>	<i>Accuracy of Classifier</i>
1	Averagecolor+Bicluster+GLCM	Decision Tree	80.1%
2	Averagecolor+Bicluster+GLCM	MLP Neural Network	86.33%

## 5. CONCLUSION

Human Nails have five main parts namely lunula, cuticle, nail root, nail plate, nail lines; Whereas Nail plate can be used more effectively for Nail color and Nail Texture Analysis. An Automated Medical Support System for detecting human health conditions based on Noval Bicluster Method is proposed. Here, for disease detection, we extract some feature of Thenailcolor feature is extracted with the help of averaging color algorithm. The nail Texture feature is calculated through texture analysis algorithm i.e. GLCM algorithm. Both of these features are given as input to the Neural network algorithm which results in 88% accuracy in prediction. The proposed system gives more accurate results which may overcome the limitations of human vision [1]. This system may be useful for healthcare camp in villages for preliminary investigations.

## 6. FUTURE SCOPE

The human health conditions can also be identified by using sense organs like eyes, tongue, skin, toe nail etc. This may give more accurate result for identifying human health condition.

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