Review on Extraction and Classification of Skin Lesion towards Melanoma Cancer Using Machine Learning Techniques

A.S. Solanke[1*], Y.M. Rajput[2], P.D. Deshmukh[3]

[1,2,3]Department of Computer Science, MGM University, Dr. G. Y. Pathrikar College of C.S. & I.T. , Aurangabad, Maharashtra, India.

*Corresponding Author: asolankeresearch@gmail.com

Abstract— In recent days, skin cancer is one of the most dangerous form of the cancers found in humans. Skin cancer is found in various types such as Melanoma, Basal and Squamous Cells Carcinoma among which Melanoma is the most unpredictable. The diagnosis of Melanoma cancer in early stage will be helpful to cure it. Melanoma is type of skin cancer that evolve from melanocytic cells. Because of Malignancy feature melanoma skin cancer is also defined as Malignant Melanoma. Melanoma cancers have so many stages which will increase the death rate of patients. So early diagnosis and treatment of Melanoma implicate higher chances of cure. Traditional methods to diagnose skin cancer are excruciating, invasive and time consuming. So to overcome this problem different techniques used for skin cancer detection. These techniques use Machine learning and image processing tools for the detection of Melanoma skin cancer. The input to the system is the skin lesion image and then by applying image processing techniques, it analyses to conclude about the presence of skin cancer. The lesion image analysis tools checks for various Melanoma parameters which are like Asymmetry, Border, Colour and Diameter (ABCD) by texture, size and shape analysis for image segmentation and feature stages. The extricated feature parameters are used to classify the image as Normal skin and Melanoma cancer lesion.

I. INTRODUCTION

The skin is the biggest organ in the body, Which helps to protects the whole body against infection and injury and helps regulate body temperature. The skin is made up of 3 main layers and The Epidermis is the outer layer of skin. The flat cells at the top of this layer are called Squamous cells, Cells called Melanocytes are also in the Epidermis. These cells make the brown pigment melanin, which gives the skin its tan or brown colour. Melanocytes are the cells that can become Melanoma.

Cancer starts when cells that can become Melanoma. Cancer begins when cells in a part of the body commence to grow out of control. Cells which are in any part of the body can become cancer. Melanoma is a cancer that commence in a certain type of skin cell. Melanoma starts in the Melanocytes. Most of these cells still make Melanin, so Melanoma tumours are often brown or black. But Melanoma can also looks with a colour pink, tan or even white. Melanoma is very less common than some other types of skin cancer. But Melanoma is so harmful because it's much more likely to spread to other parts of the body if it is not caught and treated early. Other names of this cancer which include Malignant Melanoma and Cutaneous Melanoma. Melanoma can evolve anywhere on the skin but they are more likely to start on the trunk in men and on the legs in women.

Manifestation of skin to UV radiation is also one of the major reason for the source of Melanoma. Dermoscopy is a technique which is used to exam the form of the skin. An observation based detection technique can be used to detect Melanoma using Dermoscopy images. The rightness of the dermoscopy depends on the training of the dermatologist. The exactness of Melanoma detection can be 75% to 85% even though the experts in skin use dermoscopy as a method for diagnosis. The detection which is performed by the system will help to increase the speed and accuracy of the diagnosis. The detection is performed by the system will help to increase the speed and accuracy of the diagnosis. Computer will be able to extract some information like Asymmetry, Colour variation texture features, these minute parameters may not recognised by the human naked eyes.

II. RELATED WORK

Now day's diagnosis system for skin diseases is computerized. There are few solutions available which are still under research developments. Certain limitation and drawbacks are identified in those hence this solution tries to overcome the existing problems with different approach. R.S. Gound et. al[1], has proposed system which considers a train of images that will be obtained from the user and pre-processing and segmentation will be performed on each image. Then feature extraction is done on each image to extract features that can be used to create classification

model. With this classification model, system finally can predict the disease for a new image of a skin disease which will be obtained by the user through Android application. And based on this predicted disease, system will ask question from the user and based on answer, system will decide disease type. Finally, our system suggests medical treatment or the advice based on predicted skin disease result

Er. Shrinidhi Gindhi et. al[2], constructed a diagnosis system based on the techniques of image processing and data mining. Matlab software is used to perform the pre-processing and processing of the skin images which will be obtained from the given data set.

In paper [3] is an non-invasive automated skin lesion analysis system for melanoma early detection and prevention.In this paper first skin image is preprocessed by using 84 directional filter. Lesion segmentation performed using Otsu thresholding. In feature extraction shape and color features are extracted. Support vector machine (SVM) classifier is used to classify the image as normal skin and melanoma cancer lesion.

Nisha Yadav et.al[4], presents a survey of various skin disease diagnosis systems using image processing techniques in recent times. A comprehensive study of a number of skin disease diagnosis systems are done in this paper, with different methodologies and their performances In this paper [5], classification of two types of skin cancer whether melanoma or non-melanoma was performed. Rather than using color or gray image alone, the combination of both was used to get better results. Segmentation is performed using k-means clustering, whereas ABCD method (Asymmetry, Boundary irregularity, color, Diameter). Total of 150 images are used out of which 75 images are melanoma and non-melanoma each. The performance evaluation is done using four classifiers, in which SVC and 1-NN achieved highest accuracy with the same number of feature set.

This paper [4] proposes an idea to classify the melanoma using shearlet transform coefficients and naïve Bayes classifier. The dataset is decomposed using shearlet transform with the predefined number of (50, 75 and 100) shearlet coefficients. Then to the naïve bayes classifier, the required coefficients are applied. The accuracy achieved at 3rd level of classification using 100 coefficients of shearlet transform.

This paper [6] includes different techniques of feature extraction and proposed a best way for the skin cancer detection application. In this proposed system, Hair removal is the basic and first step, then followed by segmentation using OTSU method. In the proposed system, the extracted features include circularity, High luminance Scale, Fast corners, solidity, shape skewness and border skewness and the accuracy of all are computed. Among them, shape and texture + color features achieve high accuracy of about 97%, which implies them as most

suitable type of technique for skin cancer feature extraction.

III. METHODOLOGY

There are 4 stages in an automated dermoscopy image analysis system.

3.1 Pre-processing
The main purpose of this pre-processing is to upgrade the quality of skin image by removing distinct and excess parts in the back ground of image for further processing. The objective of the pre-processing is to execute three process stages i.e. image enhancement, image restoration and hair removal.

3.2 Segmentation and Analysis
Image segmentation is a technique which helps to determine the shape and size of the border. It divides the object from its background based on different features extracted from the image. After removing the noise and hair from the lesion area, the lesion needs to be separated from the skin, and therefore the analysis for diagnosis is conducted purely using the necessary area.

3.3 Feature Extraction
A feature is a segment of information which is applicable for solving the computational task related to a certain application. Feature extraction is the process of extracting this information from an image. Following features can be extracted from the skin lesions i.e. GLCM Features, First-Order Histogram Features, Dermoscopic Features etc.

3.4 Classification
Selected features are used for the recognition and classification of benign and malignant lesions. A wide range of classifiers can be built and used for this purpose. Classifiers such as supervised and unsupervised learning can be used for this purpose.
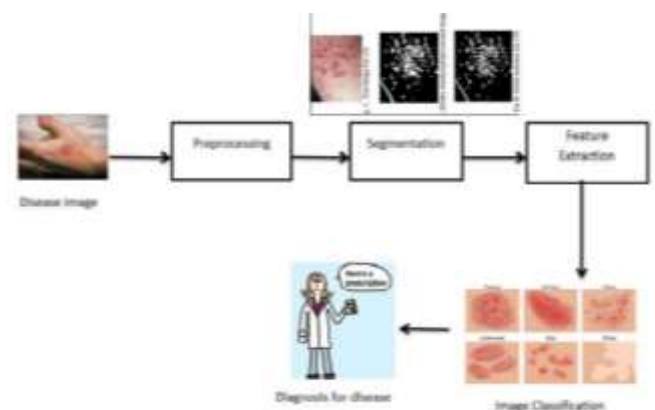

Figure 1. Workflow of Proposed System

IV. CONCLUSION AND FUTURE SCOPE

The aim of this research is to determine the accurate prediction of skin cancer and also to classify the skin cancer as malignant or non-malignant melanoma. To do so, some

preprocessing steps were carried out which followed hair removal, shadow removal, glare removal and also segmentation. The novelty of the present methodology is that it should do the detection in very quick time hence aiding the technicians to perfect their diagnostic skills.

REFERENCES

[1] R. S. Gound, Priyanka S. Gadre, Jyoti B. Gaikwad, Priyanka K. Wagh, "Skin Disease Diagnosis System Using Image Processing and Data Mining", International Journal of Computer Applications (0975-8887), **Volume 179, No.16, p.p.38-40, January 2018.**

[2] Er. Shrinidhi Gindhi, Ansari Nausheen, Ansari Zoya, Shaikh Ruhin, "An Innovative Approach for Skin Disease Detection Using Image Processing and Data Mining", International Journal of Innovative Research in Computer and Ctional Journal and Communication Engineering, **Vol. 5, Issue 4, April 2017.**

[3] O. Abuzaghleh, B. D. Barkana and M. Faezipour, "Noninvasive Real- Time Automated Skin Lesion Analysis System for Melanoma Early Detection and Prevention", IEEE Journal of Translational Engineering in Health and Medicine, **vol. 3, 2015.**

[4] Nisha Yadav, Virender Kumar Narang,Utpal Shrivastava,"Skin Diseases Detection Models using Image

[5] Processing: A Survey", International Journal of Computer Applications (0975-8887), **Volume 137-No.12, March 2016, 34-39**

[6] MohdAnas, Ram Kailash Gupta, Dr. Shafeeq Ahmad, "Skin Cancer Classification Using K-Means Clustering", International Journal of Technical Research and Applications, Volume 5, Issue 1, 2017. [2] T.Y. Satheesha, D. Dr, D.r. Satyanaray

[7] S. Mohan Kumar, J. Ram Kumar, K. Gopalakrishnan, Skin cancer diagnostic using machine learning techniques –

[8] shearlettransform and naïve bayes classifier, Int. J. Eng. Adv. Technol. (IJEAT) 9 (2) (2019) 2249–8958. VedantiChintawar, JignyasaSanghavi, ''Improving Feature Selection Capabilities in Skin Disease Detection System", International Journal of Innovative Technology and Exploring Engineering (IJITEE), **Volume 8, Issue 8S3, June, 2019**

[9] Tschandl, C. Rosendahl, H. Kittler, The HAM10000 dataset, a large collection of multi-source dermatoscopic images of common pigmented skin lesions, Sci. Data 5 (2018), https://doi.org/10.1038/sdata.2018.161 180161.