SURVEY ON EARLY DETECTION OF MELANOMA

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Abstract: *Melanoma occurs when the pigment producing cells that gives color to the skin becomes cancerous. It typically occurs in the skin, but may rarely occur in mouth, intestine or eye. Sometimes cancer can be diagnosed simply by looking at the skin. The medically used method for detection of melanoma recommended by doctor is biopsy-an examination of tissue from a living body to discover the presence of disease. In this paper an overview of about the methods implemented for early detection of melanoma are been discussed. The most commonly used method is the ABCD rule. The other proposed method include, pattern recognition, feature extraction from dermatoscopic images, deep learning algorithm, computerized based skin lesion classification. The deep learning algorithm includes back propagation neural network, convolutional neural network, SVM. The methods and their limitation in some of the existing studies are highlighted and suggestion for future research is been provided.*

Keywords: *image processing, melanoma, neural network, classifier, feature extraction.*

I.INTRODUCTION

Melanoma is the serious form of skin cancer. At the point when discovered early, melanoma can frequently be restored with medical procedure. Once melanoma has spread deeper into the skin or other parts of the body, it becomes more difficult to treat and can be deadly. The estimated five year survival rate for U.S patients whose melanoma is detected early is about 98%. It is an estimation that 7,230 people will die due to melanoma in 2019. There are 192,310 cases of melanoma in U.S in 2019. In that, 95,830 are non-invasive and 69,480 cases are invasive. With advancement in various technologies, the melanoma can be detected in its earlier stages using Computer Aided Diagnosis (CAD) or automated detection. Based on medical images, CAD system helps in cancer detection, where it is a non-invasive method unlike biopsy. Computer aided diagnosis or Automated detection involves image processing. The processing of image and the feature extraction technique are helpful for the dermatologist's for detecting cancer cells. The extracted feature from the dermatoscopic images can help dermatologist to discover the cells in real time and speeding up treatment process. In melanoma, there are several other types hence one melanoma differs from another melanoma. It can be benign or may be malignant. The preference of any one algorithm or one method for every type of melanoma may not provide efficient result.

Automated detection of cancerous cells is still an hard task, since every cancer differ from each other. Melanoma does not always begin as a mole. It can also occur on normal appearing skin. A normal mole generally look in a normal color like brown, black and white, whereas unusual moles is completely contrast from the normal mode. The characteristic of unusual mole includes shape, irregular border, change in color, diameter which are extracted as features for classification in Image processing. This ABCD method is utilized in some proposed models.

The usage of classification and pattern recognition has increased and also machine learning has become to be the key factor. In image processing, classification and segmentation are vital. Mainly the texture feature and geometric features are used in pattern recognition. The techniques employed for segmentation are histogram, edge detection, smoothening, finding structure and shapes.

This paper provides a survey about the image processing algorithm which is used for cancer detection. The image processing involves image preprocessing, segmentation, feature extraction, selection and classification. The texture feature and the geometric feature help to classify the melanoma as malignant and benign. The classifiers that are widely used are support vector machine, artificial neural network, decision tree, KNN. Thus the malignancy of the melanoma is analyzed and earlier treatment is provided.

II. LITERATURE SURVEY

This section presents a survey of recent literature on early detection of melanoma using image processing algorithms:

Reference [2] shows, Feature extraction is the way toward ascertaining parameters that speaks to the characters of the information picture. “Fig.2” gives the difference to identify the melanoma and normal image.

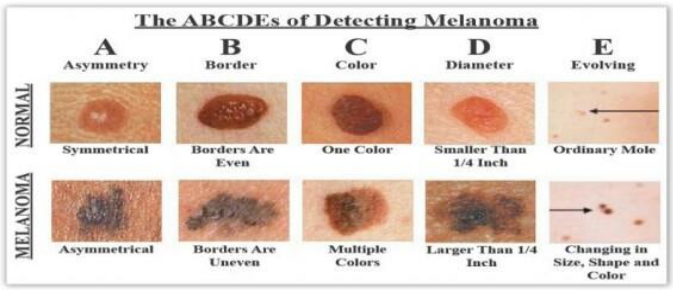


Fig. 2. ABCD’s of melanoma

The parameters used are Area (A), Perimeter (P), Greatest Diameter (GD), and Shortest Diameter (SD). Region is the quantity of pixels of the injury. Border is the quantity of edge pixels. The length of the line going through sore centroid and interfacing two most distant focuses and closest focuses is the best and briefest measurement. ABCD is discovered utilizing the accompanying recipes and conditions Asymmetry/Symmetry: Look for moles with irregular shapes, such as two very different –looking halves. Border Irregularity –Looks for moles with irregular, notched or scalloped borders- characteristics of melanoma. Cancerous edges are battered, indented or obscured. The width ranges from 0 to 8.Color – look for growths that have many color or an uneven distribution of color. Cancerous skin sore pigmentation isn't uniform. The width extends from 0 to 6. Diameter –new growth in a mole larger than ¼ inch Cancerous sores are more prominent than 6mm.Total Dermatoscopy Score (TDS) is utilized in the conclusion of melanoma. Count of TDS depends on ABCD rule. The event that TDS is less than 4.75, at that point it is considered as non-melanoma, on the off chance that it is more prominent than 5.45, at that point it is considered as melanoma and in the event that is somewhere in the range of 4.75 and 5.45, at that point it is the suspicious instance of skin injury. [7] ABCD principle is applied for the fragmented threatening melanoma picture. Asymmetry, outskirt, shading variety, measurement parameters are determined. The TDS worth is determined depends on the ABCD parameters.

Reference [8] shows, Deep learning algorithm is a class of AI calculations that uses numerous layers to logically remove higher level highlights from crude information. Rather than legitimately utilizing feedforward convolutional structure to concentrate picture highlights, base up and top down structures with feedforward convolutional structure is used. The architecture of attention module is illustrated in “fig.3”. The cover branch is the base up and top down structure, down examining is accomplished by convolution and up inspecting can be accomplished by deconvolution or straight interjection. The storage compartment branch is feedforward convolutional structure which is the customary multi-layers convolution. In consideration module, every trunk branch is relating to a cover branch to learn consideration that is specific for its highlights. Highlight maps learned by veil branch and trunk branch are in a similar size. The yield of consideration module H can be registered on the accompanying articulation [8]. Where M(x) highlights maps learned by cover branch, T(x) are highlight maps learned by trunk branch.

The design of profound consideration organize, which is a parallel classifier incorporate 19 layers and partitioned into three consideration modules technique, the veil branch can maintain a strategic distance from to break great property of trunk branch. The profound consideration organize they proposed is a 19 layers arrange, they isolated it into three sections and recreated each part dependent on consideration module. The cover part of every consideration module incorporate two convolutional (down example) steps and two direct introduction (up test) steps. It additionally utilize 1×1 convolution and worldwide normal pooling in last two layers rather than completely associated layers to lessen parameters of system [6].

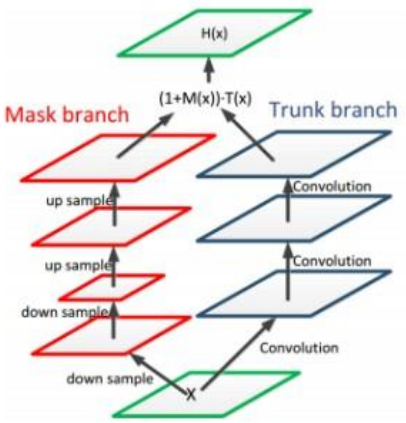


Fig. 3 The architecture of deep attention module, which contains of mask branch and trunk branch.

Reference [8] shows, Data set are taken from ISIC the resolution of the images should be very above 1000*70, and requires a high cost of computation. Resizing of image to our convenience is required. To obtain the shape of the lesion, cropping the center area and resizing it to the desired size. In "fig.4" the lesion area not only is been enlarged for detection, but the skin lesion is also been maintained. For preprocessing the image are been separated as melanoma and non-melanoma.

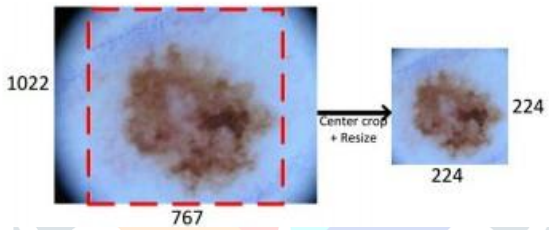


Fig. 4 Pre- processing for dermoscopy images

The color constancy algorithms are accomplished utilizing MATLAB, and the proposed profound consideration arrange (DAN) is created utilizing Tensor Flow. The expanded dataset incorporates 20000 pictures, we relatively extricated various quantities of pictures in various trial. Classification models were enhanced by Stochastic Gradient Descent (SGD) with an underlying learning pace of 0.05 and an energy of 0.9, the learning rate diminishes with gamma = 0.1. We prepared classification models with a smaller than normal bunch of 30 on GPU (NVIDIA-SMI 367.48) and results were seen to meet after 10 ages of preparing [8].

Reference [4] shows, Support Vector Machine (SVM) is a managed learning calculation that can be utilized for twofold characterization or relapse. Change indicators (input information) to a high-dimensional component space. Just the help vector browsed the preparation information are required to develop the choice surface. Support Vector Machine is prominent in application, for example, normal language handling, discourse and picture acknowledgment, and PC vision. A Support Vector Machine develops an ideal hyperplane as a choice surface with the end goal that the edge of division between the two classes in the information is amplified. Bolster vector allude to a little subset of the preparation perceptions that are utilized as help for the ideal area of the choice surface.

SVM feature is separated from fragmented injury. In feature extraction complete 10 features were removed in which edge, region, inconsistency, differentiate, connection, vitality, homogeneity and shading highlights are separated. These features are given to the SVM classification [5] .

Decision tree classifiers classify the data in the form of a tree structure. The decision tree classifier breaks the data into many subunits and the tree is developed incrementally. The final result in decision tree classifier contains nodes and leafs. The node carries the sub branches, whereas the leaf carries the classification or the result or the decision. The primary node has the root node which is great predictor. The decision tree is a simple representation and is efficiently used for making decision. Decision tree handles both numerical and categorical data. There are two types in decision tree (i) classification (ii) regression tree. The classification tree is used for the lesion classification. This tree provides the outcome in the discrete manner (i.e.,) it gives the predicted class to which the data belong. The regression tree provides the output in the form of real numbers. The algorithms for producing decision tree usually a top-down process. The homogeneity is mainly measured for producing subsets [9].

Reference [1], Neural Network consists of neural units, which are arranged in layers. These neural networks converts input vector into some output. The output from each input is fed to every unit in the next layer. There is no feedback to the previous layer. Neural network has a wide application in pattern recognition. After pre-processing and feature extraction have been done, feature extricated before are utilized to prepare the backpropagation neural system (BNN) [1]. The yield of NN is contrasted and wanted yield and on the off chance that it doesn't coordinate, at that point a blunder sign is produced.

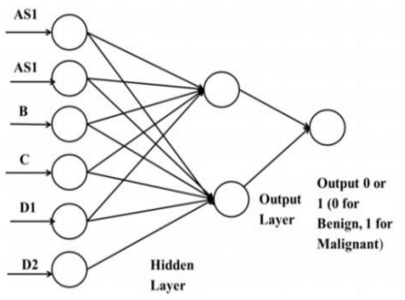


Fig. 5 Structure of Neural Network

To limit the mistake, loads are being balanced and this procedure proceeds until the blunder winds up zero. The system comprises of an information layer with an initiation work, in any event one shrouded layer and yield layer. The learning proves in the neural networks are supervised, unsupervised and reinforcement learning. The most widely neural network is CNN [2]. Convolution Neural Network is very effective in image classification. In CNN, the input is found in the form of images. When an image contains more pixels, color, channels, it is difficult to train; hence CNN tries to transform the complex function into easier function by retaining the important feature. In CNN, the matrix multiplication is carried by filters over the pixels of the image, until the final subsite arrives. The main aim of the filter is to capture the important features by avoiding the unnecessary features. A convolution layer is formed after filtering. The layer that is produced after convolution layer is the pooling layer. The pooling layer provides the maximum and average subset value. Finally the matrix is converted vector of pixels [2].

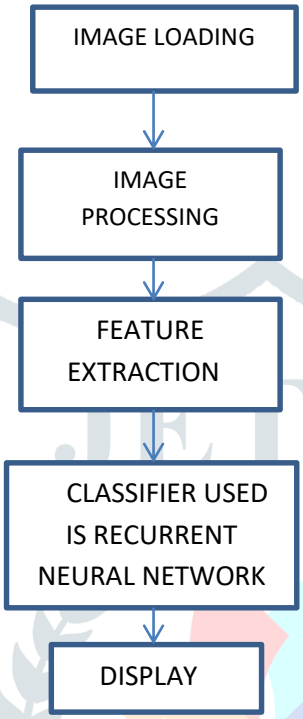
Naïve Bayesian works on the principle of probability. The inputs are in the form of datasets. The dataset is of two types, (1) Feature matrix (2) Response matrix Feature matrix contains all the vectors. Response vector have the value of class variable. Every feature considered in this classifier is independent. Here the datasets are converted to frequency table. An input table is created and naïve Bayesian equations are used to calculate the posterior probability for each class. The class with the most elevated back likelihood is the result of expectation [5].

III.LIMITATIONS

The achieved sensitivity and specificity [1] obtained from ABCD rule is 80% and 75% respectively when compared to the results obtained from geometrical feature. The main disadvantage of the SVM algorithm [4] is that it has several key parameters that need to be set correctly to achieve the best classification results for any given problem. The time required for training the data more. Result transparency is low. The decision tree produces a wide range of changes in output when trained data are changed. A complex tree does not produce effective output. The convolutional neural networks [2] don’t encode the position and direction of the image into their forecast. They totally lose all their inner information about the posture and direction of the article. In Bayes classifier produces an output which is not satisfactory because it produces an output based on the probability. It is an independent predictor [5]. Although dermascopy is highly sensitive, it is limited by specificity, which remains low even when performed by experts. To use dermascopy effectively, clinicians require extensive training, and few formal resources exist [3].

IV. PROPOSED METHOD

In the proposed method the images are been loaded from online websites or collected from near by hospitals. These images are processed, and are been segmented. The process involves the convertion of color image to gray scale image. The RNN can use their internal state to process a range of inputs.



After processing steps the lesion should be segmented from the original image using certain segmentation process. The feature extraction step include extraction of geometrical feature from the lesion using the "Recurrent Neural Network" classifier. The advantages of using RNN is that internal state to process a range of inputs.

V. CONCLUSION

This paper review and summarizes some proposed method in Image Processing. These methods and technique can be used for object-recognition, feature extraction and classification of skin lesion. The selection of suitable technique & method is based on the input image. Each technique has its limitation & advantages. But widely used method is artificial neural network. This paper contains the researches understanding the concepts of image processing. In our method for early detection of melanoma by image processing algorithm the classifier used is "Recurrent Neural Network" where we train the classifier with databases of melanoma for an efficient detection. The advantage of RNN over ANN is that, RNN can module sequence of data such that each sample can be assumed to be dependent on previous one. It is been used with convolutional layers to extend the effective pixel neighborhood.

VI. REFERENCE

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