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Detection of Melanoma Skin Cancer in Early Stages Using CNN Classification

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Abstract

Melanoma or Begins or skin cancer is one of the most dangerous type of skin disease. Skin exposure to UV radiation causes alterations or transformations in the melanocytes, which results in uncontrolled cell growth and causes burning or tanning of the skin. Even while some skin diseases are less common than others, they are dangerous because, if left untreated, they will likely progress and spread. In early stage it may not be treated properly. The usual method of detecting skin is called a biopsy, which involves scraping off the patient's skin lesion and sending it for laboratory analysis. This approach is painful, challenging, and tiresome. Skin cancer from melanoma requires a dermatologist to devote a lot of effort to treating it. Here, in this study a new method is used which involves machine learning to identify skin cancer. With dermoscopy images of melanoma cancer, detecting of skin cancer is easily done with less human effort.

Keywords: Image Pre-Processing, Segmentation, Feature Extraction, Classification, CNN.

1. INTRODUCTION:

Melanoma is a serious skin condition that it becomes uncontrollable, once the melanocytes start to develop. On the skin, melanoma can appear anywhere. Melanoma is a rare variety of malignant skin tumour. Unlike other types of skin cancer, it is certain to spread to various parts of the body and destroy tissues near to them. To detect melanoma Biopsy is taken which involves a procedure to remove the abnormal tissue plus a little amount of the surrounding healthy tissue. The tissue is examined by a pathologist under a microscope to look for cancerous development cells and then differentiate between a coloured mole on skin and an early melanoma damage which can be challenging.

Patients might need to have the instance of tissue checked by a subsequent pathologist. Skin malignant growth is hazardous . Unusual development of melanocytic cells causes a skin malignant growth. due to threat which includes skin malignant growth that is melanoma[1]. Melanoma shows that the skin's information that the skin is due to the presence of bright radiation and hereditary elements or not. Melanoma sore shows up as dark or darker in shading. Early recognition of melanoma may be curable completely. Biopsy could be a conventional strategy to identifying skin malignant growth. this method is agonizing and intrusive [2].Skin Cancer is most typical malignant growth within the fair looking populace and it is for the most part caused by introduction to bright light. skin disease is uncontrolled development of anomalous skin cells [3].

Melanoma starts in melanocytes. On any skin surface melanoma can happen. Melanoma is rare in brown complexion individuals. It will occur on skin on the top, on the neck, between the shoulders, on lower legs, on palms of the hands, on the bottoms of feet or under the finger nails. Basal Cell Skin Cancer is a disease which starts within the skin layer of basal cell. It's typically happens in places that are exposed to the sun. Basal cell skin disorder is that the most commonly recognized kind of malignant growth in reasonable individuals.

Squamous cell skin cancer is a disease starts in squamous cells. Squamous cell skin malignant growth is that the most well-known form of skin problem in dim individuals and it's normally found in places that aren't exposed to the sun, for instance, the legs or feet [4].

Numerous exploratory inquires about endeavor to assemble programmed skin disease identification also, improve the precision of assurance. within the going with, the composed takes an effort at these

undertakings are assessed. In like manner, to realize a trustworthy skin threat area system, the proper way data which is explained straight away dire.

The ABCDEs of melanoma: Most moles, dark colored spots and developments at the skin are harmless. The initial 5 letters A, B, C, D, E can be applied as a easy guide for help you with perceiving the awareness symptoms of cancer.

A is for Asymmetry. Most melanomas are uneven. If a line is drawn through the center of the injury, then the two halves received't match with each other. The melanoma appears to be unique from a round to oval and even common mole.



Figure 1: **Asymmetry**

B is for Border. Melanoma border will be normally uneven and may have scalloped or indented edges. Normal moles will in popular have smoother, all the greater even borders.



Figure 2: **Border**

C is for Color. Various sun shades of dark coloured, tan or dark might be the main indication of cancer. As melanomas development, the colorings purple, white or blue may show up. Harmless moles are generally one to two shades of dark colored.

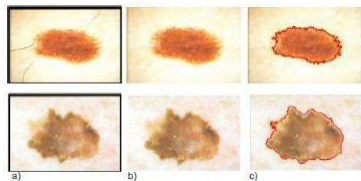


Figure 3: **Colour**

D is for Diameter or Dark. Melanomas at the initial stage are normally bigger than the size of a pencil eraser (around 6 mm, or ¼ inch, in distance across). Nonetheless, they may likewise be littler. Melanomas

likewise frequently seem darker in shading when contrasted with typical moles. Be that as it may, they can likewise be lighter in shading or pink in shading. Rare, a melanotic melanomas are dismal or colorless.

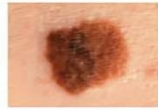


Figure 4: **Diameter**

E is for Evolving. Any adjustment in size, shape, shading or height of a spot on your skin, or any new manifestation in it, for example, bleeding, tingling or crusting, might be an admonition indication of melanoma. In the event that you see any of these notice signs, see a dermatologist instantly.



Figure 5: **Evolving**

2. SYSTEM FLOW DIAGRAM

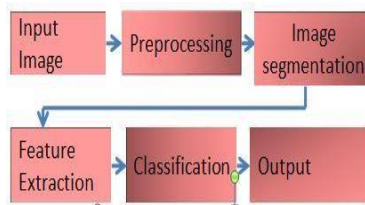


Fig.6. System flow diagram

3. COMPONENTS OF METHODOLOGY:

In our study 3 steps are involved which are as follows:

Dataset: The images were collected from the ISIC dataset; the ISIC dataset provide the collection of images for melanoma skin cancer. This ISIC dataset contains approximately 23,000 images of which we have collected 10,015 images and trained and tested over these images.

1. It involves collection of data. In this study the data used is ISIC dataset. Here the data is preprocessed which involves hair removal, glare removal and shading removal. And then identify texture, color, size and shape of the malignant cell. **Image Pre-processing:** The images are dimensions 600*450 and bit depth 24 bit. In this step input picture is converted into grey image. To convert color image into grey color image following formula is used: **Gray Image = 0.2989*R+0.5870*G+0.1140*B** the image may contain some noise and undesirable things, for example, hair and air bubbles. The Gaussian filter is utilized to eliminate the hairs from an image.

2. In this step image segmentation using Ostu's Segmentation and feature extraction is done for finding color, shape and size and texture. **Image Segmentation:** The second and important step is to detect and isolate the affected area. This process is called image segmentation and is done using one of the techniques. Skin image possess normal part and sore part. If you take these two parts together for further processing then it will lead to less accurate classification. As the affected part is only required for image examination, segmentation is performed with this goal. Different image segmentation techniques are used which will change the gray image into binary image. After segmentation, edges of the output picture become irregular, for smoothing the edges of an image different filters are applied. **Feature Extraction:** Feature extraction means to find the unique features of the segmented area of an image. The properties of the input image are represented by these features. This is another significant step. Melanoma possess the shading variety and general injury contains uniform shading. Another distinction is Benign (non-malignant) sore have round shape whereas melanoma has sporadic or irregular shape. From the skin image, using properties like abnormalities in shading, edges, region shape and texture, various features will be extracted.

3. This involves classification of melanoma or not. Here we used CNN. The dataset is trained and then tested and the results are obtained.

Classification: CNN (Convolution Neural Network) are a supervised learning method and are therefore trained using data labeled with the respective classes. Essentially, CNNs learn the relationship between the input objects and the class labels and comprise two components: the hidden layers in which the features are extracted and, at the end of the processing, the fully connected layers that are used for the actual classification task. Unlike regular neural networks, the hidden layers of a CNN have a specific architecture. In regular neural networks, each layer is formed by a set of neurons and one neuron of a layer is connected to each neuron of the preceding layer. The architecture of hidden layers in a CNN is slightly different. The neurons in a layer are not connected to all neurons of the preceding layer; rather, they are connected to only a small number of neurons. This restriction to local connections and additional pooling layers summarizing

local neuron outputs into one value results in translation invariant features. This results in a simpler training procedure and a lower model complexity.

5. RESULT AND DISCUSSION

Input: An example images from the dataset chosen is as shown in fig.6 below. The sample image represented cancerous part of the skin infected.



Fig.6. Input image(ISIC_0029321.jpg)

Pre-Processing stage: Firstly, for the input image, dull razor method is applied, then its is converted into grey scale, followed by application of Gaussion filter and Black hat filter. The pre-processing result are shown in fig.7 (a), (b).

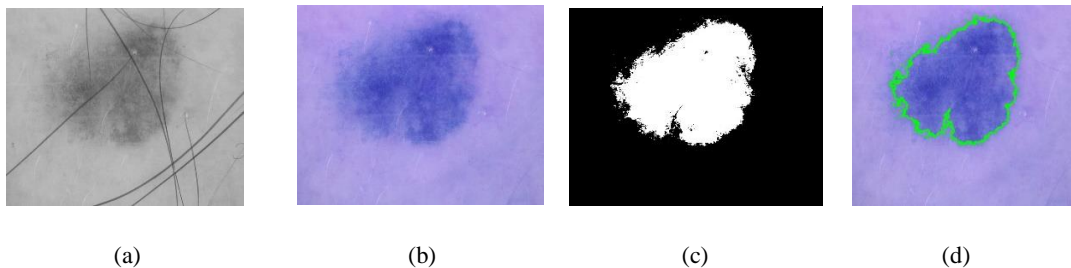


Fig.7. Pre-processing stage results, (a) Grey scale image (b) Clean image (c) Segmentation image (d) Detected image

Segmentation: The image is segmented using color based OTSU thresholding and result are show in fig.7 (c).

Feature Extraction: Extracted feature for the input image using ABCD and GLCM methods are listed in the Table 1 given below:

Table 1

Extracted features and their values.

Features	Values
Standard vector	20.8532
Diameter	2.1480
Asymmetry index	1
Color values of r, g, b	37.0471, 23.2337, 27.0009
Auto correlation	2.520931623931624e + 01
Contrast	1.228632478632479e-01
Correlation	9.894224944536026e-01
Energy	1.669194389655928e-01
Entropy	2.156049329513495e + 00
Homogeneity	9.411574074074074e-01

Classification: CNN is used for classification. Since the ISIC dataset consist of about 10,015 images which involves complexity, total of 800 images are considered by following 200 images for each class. The training to testing ratio 70:30. The confusion matrix is show in below in fig.8.

The accuracy and precision archived is about 96.25% and 96.32%

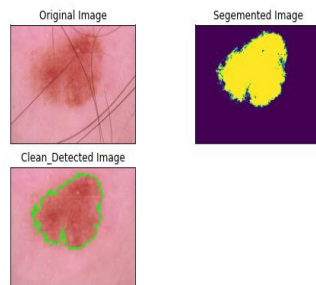


Fig.8. Segmentation result

6. CONCLUSION

In this work it has been concluded that Melanoma skin cancer detection is the technique to detect malignant melanoma disease from the skin. The Melanoma skin cancer detection technique consist of Image Preprocessing, Segmentation, Feature Extraction and Classification steps. In this paper we have presented feature extraction techniques with their accuracy, from which Convolutional Neural Network method gives the more accurate results in minimum amount of time. The accuracy achieved is about 96.25%. The proposed system uses seven types of skin cancer for classification and obtain high accuracy and precision.

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