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Skin Melanoma Cancer Detection and Classification using Machine Learning

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Abstract: *Early identification of melanoma skin cancer is essential for effective therapy. Melanoma is currently recognized as the most lethal type of skin cancer among all others due to its high propensity to metastasize to distant organs if undiagnosed and untreated. In the clinical diagnosis of many disorders, non-invasive medical computer vision or medical image processing is becoming increasingly important. These methods offer an automatic image analysis tool for a quick and accurate lesion evaluation. The steps in this study's methodology include gathering a database of dermoscopy images, pre-processing, segmentation using thresholding, statistical feature extraction using Gray Level Co-occurrence Matrix (GLCM), Asymmetry, Border, Color, Diameter, etc., and feature selection using Principal Component Analysis.*

Keywords: Melanoma, Convolution Neural Network (CNN), Gray Level Co-occurrence Matrix (GLCM), Asymmetry, Border, Color, Diameter, (ABCD)

I. INTRODUCTION

Skin cancer rates as the 6th most types of cancer that are increasing globally. Generally, skin consists of cells and these cells comprise tissues. Thus, cancer is caused due to the abnormal or uncontrolled growth of the cells in the corresponding tissues or to the other adjacent tissues.

Exposure to UV rays, depressed immune system, family history, etc., maybe the reason for the occurrence of cancer. This type of irregular pattern of cell growth can be given as either benign or malignant. Benign tumors are cancer type and generally, they are considered as moles, which are not harmful. Whereas, malignant tumors are treated as cancer which is threatening to life. They can also damage the other tissues of the body. The layer of the skin consists of three types of cells: Basal cell, Squamous cell, and Melanocyte. These are responsible for the tissues to become cancerous. There are different types of skin cancers, of which Melanoma, Basal cell carcinoma (BCC), Squamous cell carcinoma (SCC), which are considered as dangerous types. And the other types include Melanocytic nevus, Actinic keratosis (AK), Benign keratosis, Dermatofibroma, Vascular lesions. Of all the types, Melanoma is the most dangerous type and can grow back even after removal. Australia and the

Authors [1] Proposed system rely on the prediction of three different methods: A convolutional neural network and two classical machine learning classifiers trained with a set of features describing the borders, texture and the color of a skin lesion. These methods are then combined to improve their performances using majority voting. The experiments have

United States are the most affected by skin cancer. This paper uses the most suitable techniques to categorize Benign keratosis and Malignant of cancer that are mentioned above. The above steps are considered as preprocessing stage.

Color-based k- means clustering is used to segment the preprocessed images. To extract the features from the segmented images, two methods known as the ABCD method and GLCM methods are used. Features from both the methods are combined for further classification. Lastly, to achieve high accuracy MSVM classifier is used for classification purposes.

II. PROBLEM STATEMENT

The existing system is Time consuming process, and it is very difficult to detect it in its early stages as its symptoms appear only in the advanced stages. Implementing the system to automate the classification process using CNN and other transfer learning techniques for the early detection of Skin Cancer.

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III. MOTIVATION

Although the majority of people who are diagnosed with skin cancer have a higher chance of being cured, melanoma survival rates are lower than those of non-melanoma skin cancer. Melanoma incidence rates have increased over the past three decades. Every surface of the skin can develop melanoma skin cancer (MSC), and over the past 20 years, many parts of the world have seen an increase in the disease's occurrence. In contrast to how frequently it appears on the skin of women's lower thighs or in the space between their shoulders and hips, it frequently appears on the skin of the head, the neck, or between the shoulders and the hips in men. Dark skinned individuals are less likely to get it, and when they do, it is typically found under the fingernails.

IV. PROJECT OVERVIEW

The purpose of this project is to detect and classify the Skin cancer using machine learning algorithms using the most suitable techniques to categorize Benign keratosis of cancer. Color-based k- means clustering is used to segment the preprocessed images. To extract the features from the segmented images, two methods known as the ABCD method and GLCM is used for the feature extraction whereas SVM is used as a classifier to classify the various types of skin cancer.

V. LITERATURE SURVEY

shown that using the three methods together, gives the good accuracy level.

In article [2], ISIC image dataset and HAM10000 dataset will be used in this implementation. Transfer learning improves the performance of the model in CNN's and provides 89.9% accuracy.

The paper first proposes a literature survey of multiple methods used for performing skin cancer classification, Reference Paper [3] Our methodology consists of using Convolutional Neural Network (CNN) to identify and diagnose the skin cancer using the IS IC dataset containing 2637 images. The proposed model gives an accuracy of 80%.

In this project skin lesion images were downloaded from International Skin Imaging Collaboration (ISIC) Reference work[4] in which 328 images of benign and 672 images of melanoma. The classification result obtained is 92% of Accuracy and 0.94 Area under Curve using SVM classifiers.

In the reference work [5], propose a new supervised approach which combines discretization and feature selection to select the most relevant features which can be used for classification purpose. The classification technique to be used is Associative Classifiers. The features used are Harlick Texture features extracted from MRI Images. The results show that the proposed method is efficient and well-suited to perform preprocessing of continuous valued attributes.

One flaw we found in all of these well-known published papers was that each paper's authors concentrated on one factor (either detection or classification) to determine skin cancer. However, in our opinion, for the most efficient and accurate result, both of these aspects should be taken into account simultaneously.

VI. RESEARCH SCOPE

The scope of this research project is to detect and classify the Skin cancer using machine learning algorithms using the most suitable techniques to categorize Benign keratosis and malignant types of cancer. The research will include collecting dermoscopy image database, pre-processing, segmentation using thresholding, statistical feature extraction. The study will also include the evaluation of the performance of the trained model using a variety of algorithms and libraries present in python.

VII. METHODOLOGY

The system architecture is shown in Fig. using a block diagram and each block is explained in detail below.

Input image: A dataset made up of high-resolution dermoscopic images is used by the suggested system. Eight different classes from the ISIC 2019 challenge dataset are compressed into 800 photos and applied to the suggested system.

Pre-processing: The method of acquiring images must be non-uniform in a number of ways. In order to improve image attributes like quality, clarity, etc., the preprocessing step's primary objective is to eliminate or reduce the undesired portions of the image or the background. The key preprocessing procedures are noise reduction, image enhancement, and grayscale conversion. All of the photographs in this suggested system are first made grayscale. Finally, for image improvement and noise removal, two filters—the Gaussian filter and the median filter—are applied. The Dull Razor Technique is employed along with filters to get rid of the unwanted hair from the skin lesion. By making an image more visible, image enhancement attempts to intensify the image's quality. In general, most Body hair makes up of the skin lesions, which can be a barrier to achieving high accuracy

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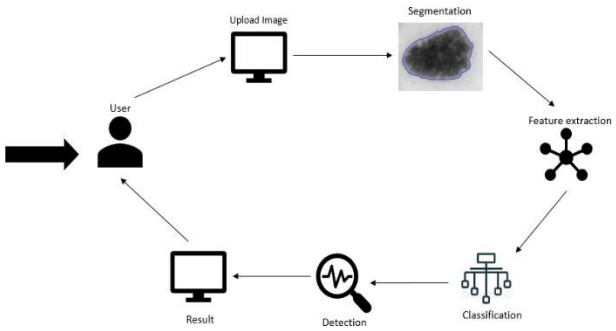
at the time of classification. Thus, the dull razor approach is utilised to eliminate the undesirable hair from the photos. These tasks are primarily carried out by the Dull Razor method: a) The position of the hair on the skin lesion is recognised using the grayscale morphological operation. b) It then replaces the hair pixel after determining the hair pixel's location and verifying that it is either a thin or long structure. b) The restored hair pixel is then smoothed using an adaptive median filter.

Segmentation: Segmentation is the process of dividing the image's region of interest. By assigning a comparable characteristic to each pixel in the image, this separation can be achieved. The key benefit in this situation is that an image that has been segmented into segments can be processed rather than the complete image. The most popular method is to mark the boundaries of the specific area. The other methods, including thresholding, clustering, and region expanding, make use of similarity detection in the targeted area. Color-based k means clustering is implemented here.

Feature extraction: The most important step in the classification process is thought to be feature extraction. Feature extraction is the process of extracting useful characteristics from the provided input dataset to carry out additional computations like detection and classification. Our suggested approach extracts the features from the skin lesions using two methods, including ABCD and GLCM. For further categorization purposes, features such the asymmetry index, diameter, standard vector, mean colour channel values, energy, entropy, autocorrelation, correlation, homogeneity, and contrast are generated. The usual procedure for all dermatological applications is the ABCD technique. Asymmetry, Border irregularity, Color, and Diameter, often referred to as the ABCD characteristics, are some specific signs that should be taken into account in cases of skin cancer. The ABCD technique is the name given to the procedure for determining these parameters.

Classification: MSVM, a component of the support vector machine, is used to address multiclass issues. SVM is an extremely accurate implementation technique. SVM divides things into many classes using the decision planes concept, which is its primary working principle.

VIII. SYSTEM ARCHITECTURE



IX. FUTURE SCOPE

In the future, our aim is to work on the diagnosis of real-time skin lesions with improvement in the testing accuracy. We also hope to implement our proposed model to work on larger datasets if available for skin-cancer image categorization. It will in turn help us to enhance the performance metric scores. It is anticipated that the proposed work will help the dermatologist to examine and classify the class of skin cancer in lesser time duration and with more precision. Additionally, it will assist in reducing the total costs associated with skin cancer diagnosis. There is a scope for further enhancement in performance metrics such as accuracy, precision, and recall.

X. CONCLUSION

Many causes have contributed to a sharp rise in skin cancer cases worldwide. Hence, early detection is essential for both detection and therapy. As a result, this study proposes a strategy based on MSVM classification that employs the efficient feature extraction techniques ABCD and MSVM. Two different types of skin cancer are used in the suggested system's classification in order to achieve high precision and accuracy.

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