

## SKIN CARE DISEASE ANALYSIS AND DETECTION USING MACHINE LEARNING

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### ABSTRACT

Now Melanoma skin cancer detection at an early stage is crucial for an efficient treatment. Recently, it is well known that, the most dangerous form of skin cancer among the other types of skin cancer is melanoma because it's much more likely to spread to other parts of the body if not diagnosed and treated early. The non-invasive medical computer vision or medical image processing plays increasingly significant role in clinical diagnosis of different diseases. Such techniques provide an automatic image analysis tool for an accurate and fast evaluation of the lesion. The steps involved in this study are collecting Dermoscopy image database, preprocessing, segmentation using thresholding, statistical feature extraction using Gray Level Co-occurrence Matrix (GLCM), Asymmetry, Border, Colour, Diameter, (ABCD) etc., feature selection using Principal component analysis (PCA), calculating total Dermoscopy Score and then classification using Convolutional neural network (CNN). results show that the achieved classification accuracy is 92.1.

**Keywords:** Melanoma Skin Cancer, Image Pre-processing, Segmentation, Feature Extraction, CNN.

### I. INTRODUCTION

Skin cancer is the most prevalent type of cancer. It can be divided into two groups, in general: Melanoma (5%), and non-melanoma (95%). Nevertheless, due to their fast-metastasizing potential, melanoma remains the most dangerous skin cancer. However, the skin cancer may be mainly associated with highly exposure in UV light. Hence, one of the best chances for curing is early detection that can be done through study value of melanoma detection. Melanoma occurs when melanin-producing cells (melanocytes) have problems, giving them color. Some of the risk factors for melanoma are fair skin, sunburn history, genetic factors, weakened immune system, tanning beds and excessive.

Dermatology imaging researchers believe that diagnosis of skin melanoma can be automated based on certain physical features and color information that are characteristic of the different categories of skin cancer. It has been revealed that the major diagnostic and prognostic parameters of melanoma are the vertical thickness, three-dimensional (3D) size and shape, and color of the lesion. The other characteristic features of early melanoma include irregularities in the boundary of the lesion, and the appearance of non-uniform pigmentation with a variety of color. Many experimental researches attempt to build automatic skin cancer detection and improve the accuracy of diagnosis.

In the following, the literatures on these attempts are reviewed. Also, in order to achieve a reliable skin cancer detection system, the right path knowledge which is explained in this paper seems crucial.

### II. LITERATURE REVIEW

#### A. Using Some Data Mining Techniques for Early Diagnosis of skin Cancer

Skin cancer is a disease of uncontrolled cell growth in tissues of the skin, skin cancer is one of the most common and deadly diseases in the world. Detection of skin cancer in its early stage is the key of its cure. In general, a measure for early-stage skin cancer diagnosis mainly includes those utilizing, CT, MRI, etc. Medical images mining is a promising area of computational intelligence applied to automatically analyzing patient's records aiming at the discovery of new knowledge potentially useful for medical decision making. Firstly, we will use some processes are essential to the task of medical image mining, Data Preprocessing, Feature Extra coronand Rule Generation. [1]

### **B. A Fully Automated Method for Skin Nodule Detection From Postero- Anterior Chest Radiog**

In the past decades, a great deal of research work has been devoted to the development of systems that could improve radiologists' accuracy in detecting skin nodules. Despite the great efforts, the problem is still open. In this paper, we present a fully automated system processing digital postero-anterior (PA) chest radio graphs, that starts by producing an accurate segmentation of the skin field area. The segmented lung area includes even those parts of the lungs hidden behind the heart, the spine, and the diaphragm, which are usually excluded from the methods presented in the literature. This decision is motivated by the fact that lung nodules may be found also in these areas. [2]

### **C. Diagnosis of Skin Cancer Prediction System Using Data Mining Classification Techniques**

Cancer is the most important cause of death for both men and women. The early detection of cancer can be helpful in curing the disease completely. So, the requirement of techniques to detect the occurrence of cancer nodule in early stage is increasing. A disease that is commonly misdiagnosed is lung cancer. Earlier diagnosis of Lung Cancer saves enormous lives, failing which may lead to other severe problems causing sudden fatal end. Its cure rate and prediction depend mainly on the early detection and diagnosis of the disease. One of the most common forms of medical malpractices globally is an error in diagnosis. [3]

### **D. Ultra-Wideband, Stable Normal and Cancer Skin Tissue Phantoms for Millimetre-Wave Skin Cancer Image**

This work introduces new, stable, and broadband skin equivalent semisolid phantoms for mimicking interactions of millimeter waves with the human skin and skin tumors. Realistic skin phantoms serve as an invaluable tool for exploring the feasibility of new technologies and improving design concepts related to millimeter-wave skin cancer detection methods. [4]

### **E. Wearable Antenna for Skin Cancer Detection**

This paper presents a high gain wearable metamaterial antenna for biomedical applications. The wide band antenna is designed such that it mimics the electrical properties of the human skin. The proposed antenna operating in the X band (8-12 GHz) allows sensing of varying differences in dielectric properties among skin tissues over a wide band of frequency and thus, can be used for skin cancer detection. The proposed antenna resonates at 11.72GHz with gain of 10.9dBi. This wideband antenna is designed and simulated using EM wave solver i.e., High Frequency Structured Simulator (HFSS). [5]

## **III. METHODOLOGY**

In the recent 3 decades Melanoma incidence rates have been increasingly high, though most people diagnosed with skin cancer have higher chances to cure, Melanoma survival rates are lower than non-Melanoma skin cancer. Melanoma skin cancer (MSC) can occur on any skin surface, and its incidence has continued to rise over the past two decades in many regions of the world. In men, it's often found on the skin on the head, on the neck, or between the shoulders and the hips while, in women, it's often found on the skin on the lower legs or between the shoulders and the hips. It's rare in people with dark skin and when it does develop in people with dark skin, it's usually found under the fingernails, under the toenails, on the palms of the hands or on the soles of the feet.

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 for the early detection of skin Cancer.

### **OBJECTIVE**

The objective of the project "Skin Care Disease Analysis and Detection Using Machine Learning" is to develop a robust and accurate system for the early detection and analysis of skin diseases through the application of machine learning techniques. This project aims to improve the diagnosis and management of skin conditions, enhancing healthcare outcomes and accessibility.

The project aims to contribute to the early detection of skin diseases, improved patient care, and enhanced accessibility to dermatological expertise through the power of machine learning and technology.

#### IV. AUTOMATION OF SKIN CARE DETECTION

Automation of skin cancer detection can reduce the false positive or false negative clinical diagnosis because it adds a quantitative observation to the “clinical eye observation”. The common approach to skin lesion early detection is divided into four stages of pre-processing, segmentation, feature extraction, and classification as figure1.

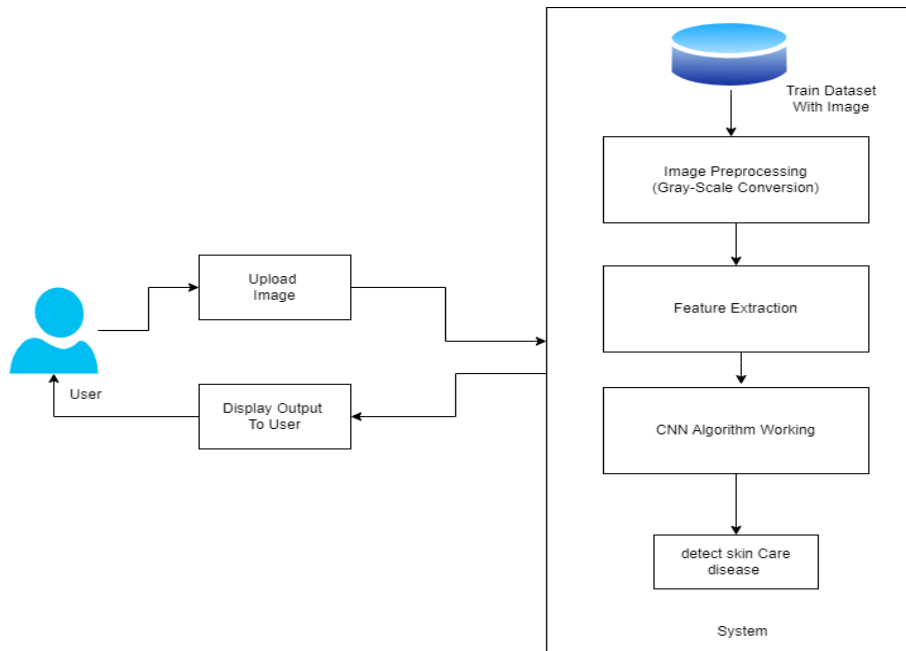


Figure 1: Common steps for Skin Disease Detection

##### A. Preprocessing

Pre-processing is to perform image processing on original image to obtain the enhanced image. The common operations in pre-processing step are as follows; to reduce the processing time, images are resized to lower resolution pixels. To remove this bright area around the lesion a binary mask is generated and a new image is produced. This image is cropped for removing extra areas. In the next step, by performing some filtering the hairs are removed. Finally, to suppress large variations within the lesion and background, and also to reduce the effect of different skin color variations, the original color RGB images are transformed into intensity (grayscale) ones.

##### B. Feature Extraction

In this stage, the features of segmented lesion are extracted to feed into classifiers. The features extracted must be measurable and of high sensitivity, i.e., high correlation of the feature with skin cancer and high probability of true positive response. In addition, the features should have high specificity, i.e., high probability of true negative response.

Based on the features inspected by dermoscopy, different diagnostic models have become more reliable by clinicians:

- Pattern analysis: The pattern analysis method tries to identify specific patterns, which may be global (reticular, globular, cobblestone, homogeneous, starburst, parallel, multicomponent, nonspecific) or local (pigment network, dots/globules/moles, streaks, blue-whitish veil, regression structures, hypopigmentation, blotches, vascular structures).
- The ABCD-rule of dermoscopy: This method is based on a semi-quantitative assessment using four dermoscopic criteria: asymmetry (A), border (B), color (C) and different structures(D).
- The ELM 7-point checklist: It is a scoring diagnosis analysis and considers only seven standard ELM criteria includes atypical pigment network, blue-whitish veil, atypical vascular pattern, irregular streaks, irregular dots/globules, irregular blotches, and regression structures.

- **Menzies Method:** This method seeks negative features such as symmetry of pattern and presence of a single color, also positive features such as blue-white veil, multiple brown dots, pseudopods, radial streaming, scar like depigmentation, peripheral black dots/globules, multiple (five to six) colors, multiple blue/gray dots and broadened network.
- **Texture Analysis:** This method tries to quantify texture notions such as “fine,” “rough,” and “irregular” and to identify, measure, and utilize the differences between them.

These extracted parameters constitute the entry of the stage of classification.

### C. CNN Algorithm Working

Convolutional Neural Networks (CNNs) are a class of deep learning algorithms particularly well-suited for image analysis and detection tasks, making them highly relevant for skin disease analysis and detection in the field of dermatology.

- **Data Collection:** The first step is to collect a large dataset of skin disease images. This dataset should include images of various skin conditions, such as eczema, psoriasis, melanoma, and others. It's important to have high-quality and diverse data for training a robust model.
- **Data Preprocessing:** This step involves cleaning and preparing the data. This includes tasks like resizing images to a consistent size, normalizing pixel values, and augmenting the data by applying random transformations like rotations, flips, and color adjustments. Data augmentation helps improve the model's generalization.
- **Model Architecture:** A CNN model consists of multiple layers, including convolutional layers, pooling layers, and fully connected layers. Convolutional layers are responsible for extracting features from the input images, which is crucial for identifying skin conditions. The deeper layers typically capture more abstract and complex features.

CNNs have shown promising results in the field of dermatology, helping dermatologists make faster and more accurate diagnoses. However, it's crucial to involve medical professionals in the development and evaluation of such systems to ensure their clinical relevance and safety. Additionally, regulatory compliance and ethical considerations are paramount in healthcare AI applications.

### D. Results

Detecting skin diseases using a Convolutional Neural Network (CNN) algorithm is a promising approach to automate the process of disease identification from skin images.

Using a CNN for skin disease detection can be a valuable tool in dermatology. Keep in mind that this is a simplified overview, and the specific implementation details may vary based on the dataset and the skin diseases you're targeting.

## V. CONCLUSION

In this project, different phases of image processing were applied on skin Nodules. From these different image processing techniques, the fuzzy filter will provide the efficient de-noising. Segmentation done by marker-based watershed algorithm, gives various regions of image. GLCM is used to extract the different features of image and which takes less time for generating the result. These results are passed through CNN Classifier, which classifies the nodules as benign or malignant. CNN classifier provides 92.5 percentage accuracy.

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