SKINCANCERDETECTIONREDEFINED: HARNESSING THE POWER IMAGE PROCESSING AND MACHINE LEARNING

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Keywords:

Melanoma detection, Dermo scopy,Lesion segmentation,Feature extraction,Texture analysis,Color analysis,Machine learning classifiers,Convolution neural networks(CNNs),Support vector machines (SVM),Feature selection,Region of interest(ROI) detection,Image enhancement,Clinical validation,Sensitivity and specificity,False positive rate,Diagnostic accuracy

Introduction:

Skin cancer is a term used to describe a group of diseases in which abnormal skin cells grow uncontrolled and form tumors. Melanomas make up just one percent of skin cancers. Skin cancers or basal cell carcinomas make up the remaining cases. In the United States, about five million different skin diseases are thought to be recorded annually. Dermoscopy has improved the absolute accuracy of picture identification by fifty percent, from seventy-five to eighty-four percent. Machine learning (ML) technology can be used for classification tasks rather than manually extracting features. Machine learning algorithms have improved cancer prediction accuracy by 15% to 20% over the last two decades. Artificial intelligence's deep learning discipline is fast growing and has many possible applications. One of the most powerful and widely used machine learning (ML) techniques for recognizing and categorizing pictures is deep learning, using specifically convolutional neural networks (CNNs), CNN's can aid in developing computer-aided categorization systems for skin lesions used by dermatologists. Also, it's a common knowledge that the early detection in cases on many diseases reduces the chances of serious outcomes. The recent environmental factors have just acted as catalyst for these skin diseases. The general stages of these diseases are as:

STAGE1-diseases in situ,survival 99.9%,
STAGE2-diseasesin high risk level, survival 45-79%,
STAGE3-regionalmetastasis, survival24-30%,
STAGE4-distantmetastasis-survival7-19%

Objectives:

The objective is to establish a model that diagnoses skin cancer as well as classifies it into various classes through the Convolution Neural Network. The diagnosing methodology uses concept of image processing and deep learning. Through using different tactics of image augmentation, the number of images has also been enriched. In the realm of skin cancer detection, the paramount objective lies in leveraging image processing techniques to develop robust algorithms capable of accurately discerning signs of skin cancer from visual data. This pursuit centers on achieving a high level of accuracy in distinguishing between benign and malignant lesions, with a keen focus on early detection to enhance treatment outcomes. Sensitivity and specificity metrics serve as guiding beacons, ensuring the system adeptly identifies positive and negative cases alike. Furthermore, the quest extends to real-time processing capabilities, crucial for seamless integration into medical devices or mobile applications.

Methodology:

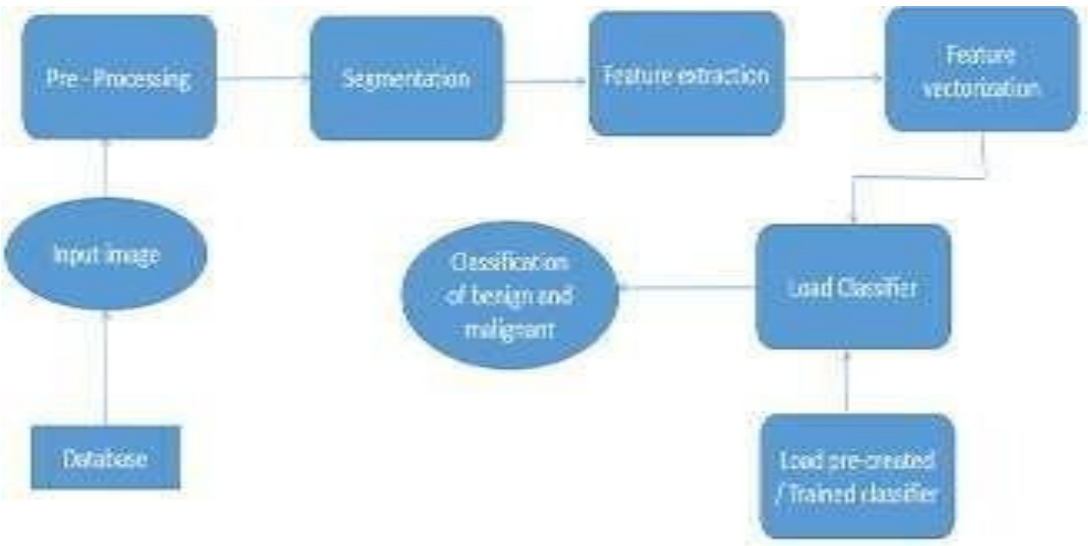


Fig-3.1-ExecutionFlow

(1). Input data: The proposed system uses dataset consists of high-resolution dermo scopic images.

(2). Pre-processing: The acquisition of images process must be non-uniform in several terms. Thus, the main goal of the pre-processing step is to enhance the image parameters such a quality, clarity, etc., by removing or reducing the unwanted parts of the image or the background. The main steps of the pre- processing are gray scale conversion, image enhancement and noise removal.processing are gray scale conversion, image enhancement and noise removal.

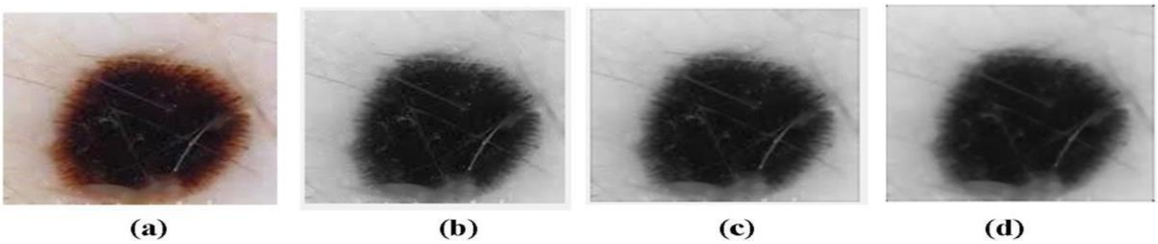
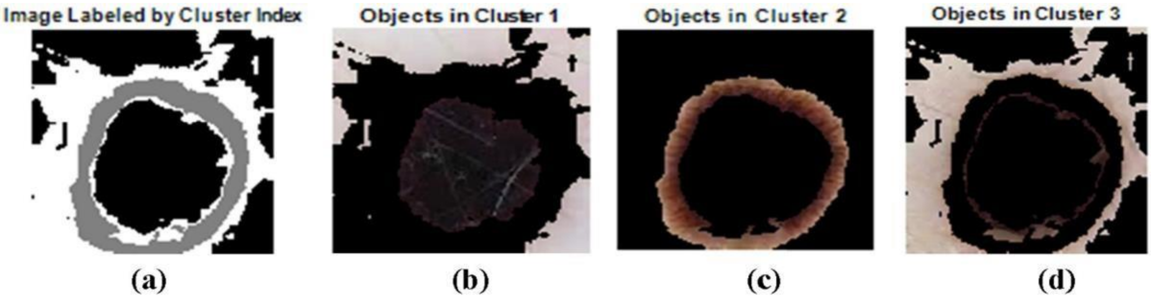


Fig-3.2Pre-processing stage results (a)Dull razor image (b) Gray scale image (c) Gaussian filter (d) Median filter.

(3). Segmentation: Segmentation is the process of separating the region of interest of the image.This separation can be done by considering each pixel of the image with a similar attribute . The main advantage here is instead of processing the entire image, the image which is divided into segments can be processes. The algorithms are used to segmentation: k means, ROI clustering.



Segmentation results:(a)Image labeled by cluster index,(b)Objectsin cluster1,(c) Objects in cluster 2, (d)Objects in cluster 3.

(4) Feature extraction: Feature extraction is considered as the most crucial part in the entire process of classification. The extraction of relevant features from the given input dataset for performing computations such as detection and classification further is called feature extraction.

Conclusion:

The aim of this project 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 pre-processing steps were carried out which followed Hair removal, shadow removal, glare removal and also segmentation. SVM and Deep Neural networks will be used to classify. classifier will be trained to learn the features and finally used to classify. The novelty of the present methodology is that it should do the detection in very quick time hence aiding the technician stop effect their diagnostic skills. The dataset used is from the available ISIC (International Skin Image Collaboration)dataset, hence any dataset can be used to find the efficiency.

Globally, there is a drastic increase in the rate of skin cancer cases because of several factors. So early detection plays a crucial role in detection and treatment. It is an approach based on the MSVM classification, where it uses two effective methods called ABCD and MSVM for feature extraction. The accuracy achieved is about 96.25%. The proposed system uses eight types of skin cancers for classification and to obtain high accuracy and precision.

Scope for future work:

1. Enhanced Accuracy: Continuously improving the accuracy of skin cancer detection algorithms is crucial. Future research can focus on refining existing algorithms or developing new ones that utilize advanced machine learning techniques such as deep learning.

2. Real-Time Detection: Developing algorithms capable of real-time skin cancer detection would be invaluable for medical professionals. This involves optimizing algorithms for speed without compromising accuracy, potentially enabling the development of mobile applications or devices for on-the-spot diagnosis.

3. Multimodal Imaging: Combining multiple imaging modalities, such as visible light, infrared, and hyper spectral imaging, could provide richer information about skin lesions. Future work could explore the integration of these modalities to improve the accuracy and reliability of skin cancer detection systems. that can fold around the main

4. Large-Scale Datasets: Building larger and more diverse datasets of skin lesion images is essential for training robust machine learning models. Future research could focus on collecting annotated datasets from different demographics, ethnicities, and skin types to ensure the generalizability of detection algorithms.

5. Interpretability and Explain ability: Increasing the interpretability and explain ability of skin cancer detection models is crucial for gaining trust from medical professionals. Future work could explore techniques for explaining the decision-making process of machine learning models, such as attention mechanisms or saliency maps.

6. Automated Dermoscopic Analysis: Dermoscopy is a specialized imaging technique used by dermatologists for skin cancer diagnosis. Future research could focus on developing automated analysis algorithms specifically tailored for dermoscopic images, leveraging the unique features visible under dermoscopy.

7. Clinical Validation and Integration: Validating the performance of skin cancer detection algorithms in real-world clinical settings is essential for their adoption. Future research could involve large-scale clinical trials to evaluate the effectiveness of these algorithms when used by medical professionals.